Report to the Board of Directors
of the Institute of Agricultural Research

ISNAR R26

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REVIEW OF RESEARCH PROGRAM MANAGEMENT AND MANPOWER PLANNING AT THE INSTITUTE OF AGRICULTURAL RESEARCH IN ETHIOPIA

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International Service for National Agricultural Research

The International Service for National Agricultural Research (ISNAR) began operating at its headquarters in The Hague, Netherlands on September 1, 1980. It was established by the Consultative Group on International Agricultural Research (CGIAR), on the basis of recommendations from an international task force, for the purpose of assisting governments of developing countries to strengthen their agricultural research. It is a non-profit autonomous agency, international in character, and non-political in management, staffing, and operations.

Of the 13 centers in the CGIAR network, ISNAR is the only one that focuses primarily on national agricultural research issues. It provides advice to governments, upon request, on organization, planning, manpower development, staff requirements, financial and infrastructure requirements, and related matters, thus complementing the activities of other assistance agencies. ISNAR also has active training and communications programs that cooperate with national agricultural research programs in developing countries.

ISNAR also plays an active role in assisting these national programs to establish links with both the international agricultural research centers and donors.

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March 1987

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International Service for National Agricultural Research

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LIST OF ACRONYMS

ADD	Agricultural Development Division
ADZ	Agricultural Development Zone
AEZ	Agro-Ecological Zone
AGDP	Agricultural Component of Gross Domestic Product
AGRIS	International Information for the Agricultural Sciences and Technology
ARO	Assistant Research Officer
AVRDC	Asian Vegetable Research and Development Center
CAB	Commonwealth Agricultural Bureaux
CARIS	Current Agricultural Research Information System
CGIAR	Consultative Group on International Agricultural Research
CIAT	Centro Internacional de Agricultural Tropical
CIMMYT	Centro Internacional de Mejoramiento de Maíz y Trigo
CIP	Centro Internacional de la Papa
EEC	European Economic Community
FAO	Food and Agriculture Organization
FSR	Farming Systems Research
GDP	Gross Domestic Product
IAR	Institute of Agricultural Research
IARC	International Agricultural Research Center
IBSRAM	International Board for Soil Research and Management
ICARDA	International Center for Agricultural Research in the Dry Area
IDA	International Development Association
IDRC	International Development Research Center
IFPRI	International Food Policy Research Institute
IITA	International Institute of Tropical Agriculture
ILCA	International Livestock Center for Africa
ILRAD	International Laboratory for Research on Animal Diseases
IRRI	International Rice Research Institute
ISNAR	International Service for National Agricultural Research
MOA	Ministry of Agriculture
NCIC	National Crops Improvement Conference
ONCCP	Office of National Committee for Central Planning
PA	Peasants Association
PC	Peasants Cooperative
RELC	Research Extension Liaison Committee
RO	Research Officer
TA	Technical Assistant
UNDP	United Nations Development Programme
WB	World Bank

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The members of the ISNAR Review Team wish to express their appreciation to Dr. Seme Debela, General Manager, Institute of Agricultural Research, for his assistance and support to the team throughout its stay in Ethiopia. The team was most favorably impressed with the leadership which he is providing to IAR to enable it to fulfil its role in agricultural development.

The team wishes to also express its thanks to all members of the staff of IAR who gave so freely of their time in discussion and in presenting their research programs. A special vote of thanks goes to Dr. Hiruy Belayneh and to Ato Mulugeta Mekuria who travelled with members of the team and responded cheerfully to the endless number of questions put to them.

And, the team members express their appreciation to all those we met during the review who gave of their time and knowledge. Without such assistance this report would not have been possible.

Matthew Dagg, Team Leader
The Hague, January 1987

SUMMARY

Review of Research Program Management and Manpower Planning at the Institute of Agricultural Research

The Government of Ethiopia has recognized the importance of developing a strong national research system to back the progressive development plans for agriculture. It has sought financial support from the United Nations Development Programme and the World Bank to help strengthen the research system, and recently decided to expand substantially the research station network and resource base of the Institute of Agricultural Research. A key resource in research is trained manpower to prepare and carry out the research program, and in July 1986 the General Manager of IAR invited the International Service for National Agricultural Research to assist in the development of a manpower plan for IAR on the basis of an appropriate long-term research program; and also to review the management processes for determining the program.

The ISNAR team, with the close collaboration of IAR staff, reviewed aspects of the research system of IAR in relation to its role in agricultural development in Ethiopia, and examined the implications of the planned expansion of stations for the development of trained manpower for research, in relation to the likely requirements of research in the short-, medium-, and long-term perspective. It became apparent that the rate of supply of new researchers might place a constraint on the rate of establishment of new research stations that could operate efficiently. A balanced planning for the development of the research stations and manpower was necessary.

Any national research system is basically concerned with determining a research program, carrying it out, and interpreting and communicating the conclusions to development agencies, planners, and producers. This summary therefore reviews first the findings and recommendations concerning the organization for determining the program; then the program; followed by linkages with other institutions. It then considers manpower planning for implementing the research program.

The Institute of Agricultural Research has a sound basic structure and organization for efficient research, with an appropriate semi-autonomous status and a strong Board of Directors whose mempership is firmly linked with IAR's client development ministries. The recent reorganization at headquarters and in research centers is very commendable, and the new proposals for revising the scheme of service for research personnel are strongly endorsed by the ISNAR team as being very appropriate for the special requirements of a research organization.

The research program formulation has three distinct phases: determining major priorities; developing a long-term program; and formulating the detailed annual program. The Board of Directors is well qualified to deliver clear decisions on policy and priorities for research, provided it is given appropriate and reliable information. The team recommends that a small technical secretariat be assigned the task of servicing the Board.

Long-term programming is not so well served at present, and it is recommended that a senior technical group, advisory to the General Manager, be established for this purpose.

Groups responsible for short-term program formulation at centers are already established; they should always be interdisciplinary, and they would benefit from a long-term program plan. Moreover, at some research centers, research staff proposing experiments are young and relatively inexperienced: they should have some mature guidance. Time and travel of experienced research staff should be assigned to assist young research staff in the critical phase of program formulation to help ensure good quality experiments and studies.

A formal program budgeting procedure should be introduced to define clearly what annual program has been decided on, and what means are needed for carrying it out.

IAR has developed a moderately strong set of research centers, and significant expansions are under way. In all agricultural research systems a balance has to be struck between maintaining an effective "critical mass" of research scientists at viable research stations, and having research stations in many ecological zones in the country. The team strongly endorses the plan to establish five commodity research centers and eight zonal research centers and recognizes the urgent need for new sub-centers in new settlement areas and in special circumstances, but questions the need or desirability for IAR to operate as many as 43 sub-centers. New stations should be added only as national and expatriate personnel become available to staff and provide program leadership for them, without diluting unduly the barely "critical masses" of national research strength at existing research centers. The team recommends that IAR's plans for the development of sub-centers should be combined with those of the Ministry of Agriculture for a Field Trials Network of 56 sites, with collaborative management by IAR and MOA. This could help achieve the desirable agro-ecological coverage without overstretching the manpower resources of IAR, while forging firm links with extension at an operational level of mutual concern.

The national research program is central to the research system's operation. It is made up of urgent short-term, medium-term, and long-term elements; it is essentially the future long-term program that guides the recruitment and manpower development plans which are necessarily long-term investments, looking towards the program ten years ahead. The current research program emphasis, reflected in the allocation of research time and areas of specialized training, is heavily towards research efforts in improvement in specific crop components, cross breeding in livestock for milk and beef production and, more recently, farming systems research. The future research program must take into account dynamic changes in the circumstances in the country, and emerging problems to be overcome or new opportunities to be exploited. The team recognizes at least four areas of significant change that might influence the thrust of a future research program: demand from the new agriculture development zones for information related to the newly prepared description of the natural resource base; the opportunities for opening up new agricultural areas (perhaps including more intensive use of the black soils); the demand for conservation-oriented farming systems for sloping soils; and new insight into socio-economic constraints to improving farming systems, including

the need to incorporate the nutrition of rising numbers of draught animals. Such changes would suggest some shift of emphasis from crop component research to cropping systems in relation to the natural resource base, and an increase in the future proportion of agronomists, livestock scientists, and natural resource scientists in IAR.

The team recommends that the five national commodity centers be allocated full interdisciplinary teams to expand current crop component research to all the major constraints in the priority commodity-based farming systems; and that appropriate teams (with more emphasis on agronomic practices than breeding) be built up at the zonal research centers as staff becomes available. The team recommends that the balance of emphasis in the livestock research program be changed considerably to reduce the level of effort on crossbreeding, and increase the research effort on nutritional and other management problems. As IAR expands into more research centers, there will be an increasing demand for more central support services, such as biometrics and data processing, analytical services, and library facilities, for which increased provision should be made.

As a quantitative, illustrative exercise, the team set out a possible distribution of research staff across existing and new research centers and sub-centers as it might be in 1994, assuming that the planned expansion of staff had been achieved, and that changes in program emphasis had been made in accordance with the suggestions discussed in the report. A more definitive plan must await corporate decisions by IAR staff, with the Board's approval, about the future long-term program thrusts and research center development. Target staffing positions for each year of the plan could then be developed along an agreed set of priorities.

The success of a research program depends heavily on the linkages of the research system with other research and development institutions and individuals, both national and international. The list is long, involving several ministries, departments, and institutions. Of particular reference to manpower planning and program formulation are IAR's linkages with the Ministry of Agriculture, and Alemaya University of Agriculture.

The team strongly endorses the recent establishment of Research and Extension Liaison Committees in each of the new Agricultural Development Zones as a mechanism to improve transfer of new technology to extension and to define problems for research more sharply. The process of generating and testing new technology, and facilitating its widespread adoption, is continuous, involving both research and extension. Currently, the area of overlap of jurisdiction is at the field trials stage: as indicated earlier, the team recommends that the separate plans for expansion at this stage should be merged and the trial plans managed in close collaboration. Two stages of on-farm research will probably be necessary: one at an early stage of research to confirm research direction; the other after validation of technology, to facilitate diffusion by extension.

Alemaya University is vital for the provision of high quality recruits to IAR, and it has an important reservoir of well-trained potential research capability. IAR should therefore encourage and support national research activities by University staff in every way possible, and develop even closer linkages with the academic body.

The success of the planned expansion of the research system will depend critically on the availability of well-trained manpower. The proposed target of 486 research staff in IAR by 1994, to cater for 54 million people, is modest in relation to the task, but may still be difficult to achieve. IAR currently has about 230 Research and Assistant Research Officers, 17 staff at PhD level, 60 MSc, and 153 BSc. Average tenure of position is only 5.1 years, and many staff are relatively new. By 1994, the planned research complement will be 40 PhD, 125 MSc, and 321 BSc, supported by 560 diploma-level staff (from a current total of 279).

To achieve these targets, recruitment of BSc-level graduates would have to be between 35 and 55 per annum, depending on assumed attrition rates, and about 55 per annum at the diploma level. About 23 MSc two-year fellowships and 7 PhD four-year fellowships per annum would be required.

Output from junior colleges is about 800 diploma holders per year, and is planned to increase. No supply limitation is anticipated at this level.

Output from Alemaya University is about 200 graduates per year, and is not planned to increase. In 1985, out of a request for 43, IAR was allocated 26 new graduates who had a good chance of being accepted into subsequent MSc courses. The adequate supply of quality graduate recruits in the future, is doubtful.

The supply of a sufficienct number of candidates from IAR for postgraduate training will be no problem. However, Alemaya University currently cannot cope with the magnitude of MSc and PhD training required to meet the targets, and IAR will have to depend on fellowships for postgraduate training courses overseas. IAR should strongly endorse Alemaya University's plans to upgrade its BSc and MSc programs.

Meanwhile, the team recommends that IAR take all feasible steps to meet a possible deficit in the planned rate of graduate supply, including: recruiting graduates in appropriate natural and social sciences from Addis Ababa University; increasing the number of expatriate staff for short-term research objectives, and contracting out specific research tasks to other national groups with suitable research capacity.

Any deficit would have implications for the planned expansion of reseach programs at new centers. The team recommends that national research strength be built up and focussed initially at commodity research centers and zonal research centers, and that strategic sub-centers be staffed by expatriates and AROs.

The ISNAR team strongly recommends that the staff postgraduate development program implied in the expansion program be pursued as vigorously as possible, and that a small manpower development unit be established at headquarters to facilitate this. The particular priorities for training in different specializations will depend greatly on decisions reached on the future long-term thrusts of the research program, and the required balance of disciplines among research staff. Some suggestions of major factors have been included in this report, but firm decisions to put to the Board of Directors for approval must follow further detailed discussions within IAR, preferably under the guidance of the proposed senior technical advisory committee to the General Manager.

TERMS OF REFERENCE AND REVIEW PROCEDURE

Following on decisions by the Government of Ethiopia to expand the research station network and resource base for agricultural research in Ethiopia, the General Manager of the Institute of Agricultural Research (IAR) in July 1986 invited ISNAR to help in the development of a manpower plan for IAR on the basis of an appropriate short- and long-term research program to meet the needs of development in the country; and also to review the program management processes in IAR.

The Director General of ISNAR accepted the invitation, and terms of reference for a review mission to IAR were drawn up and agreed in discussions with the General Manager, IAR, at ISNAR headquarters in September 1986, as follows:

Terms of Reference

General Statement

At the request of the General Manager of the IAR, an ISNAR team of approximately five persons will, in close collaboration with management and staff of IAR, review and make recommendations on the IAR research program management and organization, and will assist IAR in its preparation of its manpower plan.

Specific Terms

1. Research Program

   a) The ISNAR team through interviews with IAR staff and others acquainted with its role in agricultural research in Ethiopia will review the strengths and weaknesses of the IAR research program formulation, execution, monitoring, evaluation and staff, and propose improvements where appropriate.

   b) The ISNAR team will review and comment upon the role of IAR in agricultural research in relation to other organizations conducting agricultural research in Ethiopia.

   c) The ISNAR team, in close cooperation with IAR staff, will review and comment upon the linkages between research and development (extension) and the utilization of research results.

2. Organization

   a) The ISNAR team, in close cooperation with IAR management, will review and comment on the strengths and weaknesses of the policies, organization, and structure of IAR which facilitate or inhibit its ability to formulate, execute, monitor, and evaluate its research program. Particular attention will be given to IAR's ability to provide appropriate administrative support for its program and staff.

3. Manpower Planning

a) Manpower planning should be developed from IAR's research program and organization. Therefore, the review and comments on the program and organization will be aimed at providing a sound basis for further development of IAR's manpower plan.

b) IAR staff will be responsible for development of its manpower plan. The ISNAR team will provide its general comments and recommendations on staffing in relation to program and organization and, if requested, will assist in the development of the manpower plan to the extent that may be determined by the Director General of ISNAR.

A team of five experienced research managers from a range of disciplinary backgrounds was assembled. (Brief details of team members are given in Annex A.) FAO was invited to join in the mission because of its long association with IAR, but was unable to field a member for the team in the time available. The team carried out the review in Ethiopia from October 22 to November 11, 1986, with the essential assistance and contributions from two senior IAR research leaders. A comprehensive briefing document on the current management operations and organization of IAR had been prepared for the team. Not only were visits and briefings arranged at the headquarters, most of the research centers, and some of the sub-centers, but an extensive set of interviews was arranged with users of IAR's research output in several departments of the Ministries of Agriculture, State Farms, Coffee and Tea Development; in the Office of the National Committee of Central Planning; and in the Commission for Higher Education. The team also visited Alemaya and Addis Ababa Universities and the International Livestock Centre for Africa. Discussions were also held with representatives of the major donor agencies: UNDP, FAO, EEC, and World Bank. A brief itinerary is given in Annex B. Excellent cooperation was offered to the team at all places.

INTRODUCTION

1.1 Background on Ethiopian Agriculture

The most productive agriculture in Ethiopia is carried out in the highland at altitudes above 1500 m, where about 95% of the regularly cropped lands are found as well as 88% of the country's 42 million people. Temperate climate cereals such as wheat, barley and maize all do well in this climate as do pulses, oil seeds and teff (*Eragrostis tef*). This latter crop is grown almost exclusively in Ethiopia and is an important item in the diet. Coffee, which originated in Ethiopia, is a major highland crop and accounts for 75% of Ethiopia's export earnings. The cattle population in Ethiopia is the largest of any African country and about two-thirds of the 27 million head as well as the majority of sheep and a large number of goats are raised in the highlands.

Cotton and sugarcane are found at low elevations, while sorghum, a very important cereal crop, and vegetables, are found at mid to low elevations. Low elevation in Ethiopia can mean anything below 1500 m.

Agriculture is the most important sector of the economy, employs about 85% of the labor force, contributes more than 40% of the Gross National Product (GNP) and accounts for 85% of the country's exports.

Prior to the Revolution in 1974, much of the agricultural production came from large private land holdings. The agrarian reform following the Revolution brought sweeping changes in land holdings and tenure with the estates being divided into small holdings or into a network of state farms. The government's goal is to incorporate the approximately seven million peasant families into 25,000 peasant associations (PA's) and/or producer cooperatives (PC's). A further goal is to expand the state farms from their present holdings of about 200,000 ha to 500,000 ha by 1994. The peasant sector, with holdings of about 1.5 ha per family, cultivates 90% of the land and accounts for 95% of the agricultural output, including most food crops and virtually all livestock. The state farms produce a number of crops and most of the cotton and sugarcane.

The total area under cultivation is 12 to 13 million ha but with only about 6 million ha under cultivation annually. There are normally 3 to 4 million ha in fallow each year, with the balance in perennial crops such as ensete (*Ensete edulis*) and coffee. There are large areas of permanent pasture used as common grazing lands for livestock. Productivity for crops and pastures is very low, with cereal yields averaging just over one ton per ha.

Ethiopia has regularly imported 300 to 400 thousand tons of food grains each year, but due to the 1983/84 drought and subsequent food aid there is now an annual importation of about one million tons. There was a previous drought in 1973/1974 and drought conditions in parts of Ethiopia are a regular occurrence. There is also a serious soil erosion

problem throughout much of Ethiopia which is reducing the land potential for crop production. Food production goals must be based on a long-term view and need to accomodate a strategic grain reserve. At the present time the food gap is widening in Ethiopia with agricultural production increasing annually at about 1.8% while population growth is approximately 3%.

Ethiopia has set itself a target of self sufficiency in food grains by 1994. It should be possible to achieve this target, but a very great effort will be required as well as some shifts in policies concerning input supplies, marketing and pricing. It appears that in Ethiopia, as elsewhere, the peasants are responsive to incentives, and significant increases in production could be expected with some increased attention and positive action to assure increased incentives to producers. Increased attention needs to be given to livestock production in addition to the effort targeted for food grains.

1.2 The Institute of Agricultural Research (IAR)

The IAR was established in 1966 as a semi-autonomous public organization under the general supervision of a ministerial Board of Directors. A limited amount of agricultural research had been conducted by various organizations in the country dating back to the early 1950s. However, IAR was the first organization in Ethiopia to have a clear mandate solely for agricultural research. It was mandated to:

- formulate a national agricultural research policy;
- carry out agricultural research programs in relevant disciplines in research centers that were to be established in selected parts of the country;
- coordinate agricultural research programs carried out by various organizations in the country.

The Institute has successfully completed 20 years of development and has made significant contributions to Ethiopian agriculture with primary emphasis on the development of new and improved crop varieties. During this 20-year period, there have been a number of factors beyond the control of the organization which have disrupted the research program. Without these difficulties, undoubtedly even more progress would have been apparent. The fact that IAR has survived, has a well developed program, a small but dedicated staff and that it has strong leadership and support suggests that it is well placed for further development and fulfilment of its role in the years ahead.

In the period 1966 to 1986 IAR developed seven main research centers, 22 subcenters and a large number of test sites. Its professional staff now numbers over 200, of whom 77 have an MSc or higher degree and 153 have a BSc degree. An additional 279 technical assistants have a diploma from one of the agricultural colleges.

In addition to the Government's growing financial support for IAR, it has received significant support from the United Nations Development Programme (UNDP) in a major project 1966-83, for which the Food and

Agriculture Organization (FAO) was the Executing Agency. The contribution made by FAO to the development of IAR has been very positive and is well documented. Since March 1985, additional financial and technical support is being provided through an IDA-funded loan to the Government of Ethiopia.

As a part of the Government's ten-year Plan -- 1983/1984-1993/1994 -- the IAR is to expand its research coverage through a doubling of its research centers and manpower. This will be a difficult challenge to meet within the period allocated due to several manpower constraints. The major problem will be to maintain and strengthen major commodity programs while launching urgent research activities in new areas. The Institute is using innovative techniques in its manpower allocation to meet the very important needs. Such innovation will be required throughout the Plan Period since manpower and manpower development will remain the key problem area for IAR for many years to come.

The research facilities -- land, buildings and equipment -- at the existing seven main stations (Awassa, Bako, Holetta, Jimma, Mekele, Melka-Werer and Nazreth) vary a great deal. For the most part each center has sufficient land. However, of all the seven centers it is only at Holetta that facilities can be considered adequate to meet the needs for agricultural research. Even here there is a need to improve the facilities, particularly in terms of maintenance or replacement of equipment. However, it is equally important to increase the number of senior staff at each of the seven centers.

Improvements to buildings and equipment are soon to be made at existing main centers. Meanwhile seven new main centers are planned: three are under construction at Abobo, Adet, and Sinana, the latter two with EEC support. A fourth, Kolumsa, is to be transferred to IAR from the Ministry of Agriculture. Another two, Omo-Ratte and Gode are in the planning stage, while Kobo is to be up-graded from a sub-center. Several sub-centers in the new settlement areas and elsewhere are also being developed which will require significant numbers of research staff (see Annex D).

These developments will allow the policy decision to be carried out which designates 5 centers as national commodity research centers (maize (Bako); coffee (Jimma); wheat (Kolumsa); sorghum (Miesso); and cotton (Melka-Werer)) and 8 centers as zonal research centers to serve the needs of the new Agricultural Development Zones (see Chapter 3).

1.3 The Policy Environment

1.3.1 Agricultural Development Policy

In its ten-year plan the Government's agricultural development policy is clearly identified "to achieve self sufficiency in food grains and to increase export earnings from coffee and other agricultural commodities".

Agriculture and the need to improve its performance is well recognized by decision makers and the sector ranks high in the economic planning for the country. The agricultural development policy specifically identifies six areas of concern and has set forth objectives and strategies and production targets in relation to each. The six areas are:

a) Organization and Strengthening of Peasant Associations and Producer Cooperatives;

b) Natural Resources Conservation and Development;

c) Animal Resource Development;

d) Seed Improvement and Multiplication Program;

e) State Farm Development;

f) Agricultural Research.

With the exception of newly established resettlement areas being developed subsequent to the 1983/1984 drought, the development policy calls for increased production on existing lands rather than by bringing more land under cultivation. The goal is to double production per unit area, which would release a large number of hectares now under food crop production to be used for production of additional export crops.

1.3.2 Agriculture Research Policy

The agricultural research policy is based upon four objectives:

a) to help the country use efficiently its natural resources and meet its demand for food and raw materials, both in quantity and quality, by generating and developing appropriate agricultural production technology;

b) to help increase the country's foreign exchange earnings by generating technologies that can improve the productivity of exportable agricultural products in quantity and quality;

c) to generate and develop the means of production that would expand and strengthen socialist agricultural production through mass organizations and state farm enterprises;

d) to extend every effort to provide a technological base for the agricultural sector.

In the implementation of its agricultural research policy, emphasis has been given to plant breeding for the development of improved varieties of wheat, maize, sorghum, pulses and oil seed crops and for disease resistance in coffee. The policy is to give greater priority to peasant agriculture than to the state farms, but in the implementation of research programs it appears that considerable attention is being given to state farm agriculture. Further, as a part of implementation, top priority has been assigned to three food commodities, wheat, sorghum and maize, and two cash crop commodities, cotton and coffee.

The agricultural research policy appears to be in line with the Government's agricultural development policy and priorities, and the Government has backed IAR vigorously in recent years, Government funding having risen from about 0.3% of the agricultural part of Gross Domestic Product (AGDP) in 1983 to about 0.6% of AGDP in 1986. However, the implementation of the research policy is seriously constrained by shortage of trained and experienced manpower.

1.3.3 Role of Agricultural Research in Policy Formulation

At the time IAR was founded it was given a responsibility to formulate a national policy for agricultural research. While it is carrying out this responsibility, it does not appear that it has been successful in fully formulating a national policy and in coordinating all research carried out by all organizations in the country. This is an area where manpower constraints have adversely affected the degree to which IAR could meet its responsibility.

There is another area beyond agricultural research policy to which IAR should be making a contribution but to date has done very little. This concerns research which would provide guidance in the formulation of agricultural policy. The ISNAR team recommends that IAR should take a more active role in this kind of research and develop a strong professional relationship with the Office of the National Committee for Central Planning (ONCCP) in the area of agricultural policy formulation through macro-economic research which will provide guidelines for policy.

1.4 Structure of Report

The next section briefly reviews the content and balance of the current research program of IAR and considers future research thrusts that are likely to be necessary over the plan period and beyond, and their demands on manpower and specialized training. This is followed by a discussion of the research structure and organization and management processes necessary to carry out the research program efficiently.

Important linkages between IAR and other institutions concerned with agricultural research and development are then considered, followed by a review of the factors influencing the balance of future supply and demand of trained manpower for IAR. The final section summarizes conclusions recommendations emerging from the review.

Chapter 2

THE RESEARCH PROGRAM OF THE INSTITUTE OF AGRICULTURAL RESEARCH

2.1 The Research Setting

The role of the national agricultural research service is to provide information to policy makers, planners, development agencies and producers on how best to utilize the country's natural resources of land, climate, people, and livestock to achieve the goals of agricultural and national development in accordance with government policy. The staff of IAR are well aware of this role and are working to fulfull it. There are, however, additional opportunities to increase the rate by which the information is obtained and assembled. A great deal can be obtained from increased interpretation of world knowledge and advances relevant to Ethiopia. As IAR staff realize, some information and material can be used directly; most will need testing for suitability; some will need detailed work to understand how to overcome local constraints and to adapt or develop technology to match local circumstances. A national research program can be expected to include all of the above aspects, responding to the constantly changing, dynamic national circumstances. Short-term exploratory research trying well-known technologies in novel situations will be combined with longer-term, more intensive research to adapt technology to overcome defined problem situations, or to make the most of defined development opportunities.

In the simplest functional terms, the national agricultural research system decides on a balanced research program, and makes arrangements to carry it out. Program formulation is discussed at more length in the next section, but in brief, the main priorities for research are set by the high-level Board in relation to national objectives. Within those priorities of commodities and zones, senior technical leaders draw up a long-term research program to meet major opportunities for and constraints to improved productivity on a 5-20-year time scale; and finally, within these broad program guidelines, researchers on research stations propose individual experiments, studies, or time-bound projects of a group of experiments and studies, from which annual work plans are determined. These are aggregated into a national research program for the year, after due review and consideration of the relevance and value of the proposals by appropriate reviewing groups at station, zonal, and national levels.

The annual program and short-term projects must be determined on the basis of existing research staff and major facilities, together with the possibility of short-term recruitment of experienced researchers.

It is the long-term program projection that must influence the pattern of recruitment and disciplinary balance in a staff development plan to solve the anticipated problems of the future. In the brief scenario above, it is the responsibility of the senior technical group in IAR, advisory to the General Manager, to maintain a long-range view on likely development constraints and opportunities to which research can make decisive contributions, and on this basis to develop the manpower plan.

2.2 Research Program Objectives and Changing Circumstances

The broad agricultural development and research policies of the Government of Ethiopia have been set out in section 1.3. These might be presented as having long-term research objectives of:

* development of productive and economically profitable conservation-based agricultural systems in all agro-ecological zones;

* production of sufficient quantities of food of all types for a healthy and optimally nutritive national diet;

* maximizing agricultural exports and minimizing imports.

In the shorter run, objectives would include more specific aspects such as:

* self sufficiency in food grains;

* measures to halt degradation of natural resources;

* minimization of imports of food and agro-industrial raw materials while increasing exports of coffee, oil seeds, and animal products.

On a very short time scale, urgent objectives might include:

* information to planners and farmers for improved productivity in resettlement areas;

* information to zonal extension services for improved practices in different agro-ecological zones;

* solution of immediate problems on State, PA and PC farms.

The research program must maintain a judicious balance between these conflicting demands. Urgent problems demand urgent attention, but they should not command all the research resources. Progress towards longer-term goals must also be maintained. In particular, when planning manpower development, research management must retain a long-term program perspective and take note of major changes in the research environment in the country. Recent significant changes that affect research planning would appear to include:

* The completion of a much-improved description of the physical natural resource base of Ethiopia in terms of soils, morphology, climate, and temperature parameters that are of direct quantitative significance to crop and forage production.

* The development of decentralized Agricultural Development Zones generally embracing a number of different agro-ecological areas, which are requesting zonal research services. The Agricultural Development Division and Extension Services are attempting to relate their activities to the agro-ecological zones defined by the new natural resource description, and will require research conclusions expressed in those terms.

* The recognition of the major hazard of erosion facing Ethiopia as population and livestock pressure increases in the highlands. The Highland Reclamation Study calls for conservation-oriented agricultural systems that will be both economically productive and safe, minimizing erosion hazards.

* New agricultural areas are being opened up to relieve pressure on the erosion-prone highlands. New cropping and farming systems are urgently needed to exploit the new opportunities in lowland areas. Opportunities for the introduction of new and more productive cropping systems on the very extensive black soils may also become available if promising drainage techniques with ox-drawn equipment prove viable and economically attractive.

* The recent strengthening of socio-economic research work in IAR is revealing fresh opportunities and constraints for research to modify improved production practices to meet farmers' operational capabilities.

There may well be other major factors to consider in identifying broad constraints to and opportunities for improving productivity, but these points at least suggest a heavy emphasis on agronomic research in cropping systems, and for appropriate varietal characteristics that will meet improved farming systems needs rather than simply improving individual crop components.

2.3 Program Content and Balance

2.3.1 Program Content

As indicated above, it is the future long-range program that is most critical for development of a manpower plan. No attempt is made, therefore, to give a detailed review of the current research program of IAR on the basis of the brief presentations made to the team, when the main issue for a manpower plan is future program. Some pointers for the future are discussed.

2.3.1.1 Farming systems approach

Initially in the life of IAR a great deal of exploratory research was necessary, and the testing of proven technologies from elsewhere in the world. Much proved unsuitable, and a vigorous program of selection and breeding was adopted to improve the productivity of primary materials. In crops, considerable progress has been made in increasing yield potential, pest and disease resistance. Agronomic trials have been mainly designed to help the crop achieve its yield potential, and soils work has focussed mainly on plant nutrient requirements. In livestock work, in similar terms, the focus has been on the meat and milk yield potential in crossbred cattle, with supplementary work on animal nutrition through pasture and forages. There is a growing realization among IAR staff that a wider set of constraints within a broader appreciation of the farming system should now be addressed, in case constraints other than those addressed in the program should be limiting potential productivity.

Professional staff have been recruited and trained to work with breeders on four major crop constraints: agronomists on crop potential, entomologists on pests, pathologists on diseases, soil chemists on plant nutrition - and more of such such staff will be required to strengthen both national commodity teams and zonal centers in the future.

However, recent developments suggest that research on other constraints are also important in the wider farming system, and other trained professionals will be required to work with the breeders and agronomists. The socio-economic teams have already pointed out farmers' operational and risk constraints. The droughts have emphasized the importance of water stress. Degradation by erosion points to the need for cropping system practices that maintain protective cover and help conserve soil. The joint pressure on the land of increasing human and livestock populations suggests a fully integrated approach to cultivation requirements, including livestock requirements and the role of forage and pasture species.

In brief, it is recommended that the selection and breeding program should consider a wider set of constraints of the farming system, and select characters to achieve multiple objectives in a cropping or farming system related more closely to a well-defined natural resource environment.

2.3.1.2 Natural resources research

Responsibility for the description of the natural resource base has rested with the Land Use Planning and Regulation Department of MOA. However, the mandate for research into the efficient utilization of the natural resources in productive agriculture rests with IAR. Some competencies in natural resources research in IAR need strengthening. Most work at IAR on natural resources to date has focussed on soil fertility, with some work on drainage and irrigation.

However, with the recent completion of the natural resources description, and its adoption as a base for development activities by MOA, there is an urgent need for IAR agronomic and crop improvement research activities to relate closely and quantitatively to this resource base. This will mean development of more staff expertise in the field of soil, plant, water, atmosphere relationships, which is central to the agro-ecological zone classification system, and which will be valuable in predicting the feasibility of cropping systems in new settlement areas. This specialization is also highly relevant to developing multiple cropping patterns to the longer growing season available on many black soils if the drainage problem is solved - another area of natural resources research that is likely to be of considerable future importance. Extra professional competence in agricultural engineering and soil physics may also be essential in developing viable and effective conservation-oriented cropping systems. Aspects of agro-forestry will also be valuable, not only for land conservation, but also for fuel supply and fodder for livestock. Professionals to match these needs could be soil physicists, crop physiologists, agricultural engineers, agro-meteorolgists or specialists in agro-forestry.

It is strongly recommended that IAR begin to build up increased professional competence in natural resources research to relate ongoing research closely to the natural resource base description now available.

2.3.1.3 Crops research

A very wide range of field and horticultural crops is being studied at various levels of intensity in all research centers, involving research contributions from several divisions: Field Crops, Horticulture, Coffee, Agronomy and Physiology, Crop Protection, Soil Science and Water Management, Farm Implements, and Agricultural Economics. The emphasis has been heavily on the Field Crops Division, which is mainly concerned with introduction, selection, and plant breeding, targeted on release of varieties, with the other divisions generally playing supporting roles. A systematic breeding strategy and an extensive network of national observational and yield trials has been established, with national activity coordinated by commodity team leaders.

Together with screening trials for pest and disease resistance, such national trials constitute more than half the number of experiments carried out at main research stations and substations, and are the basis for a large part of the ADD/IAR field trials system. While it is not possible at present to estimate how much research staff time is allocated to carrying out national network trials, it is clearly a substantial and important proportion. The program has led to the release of a broad range of improved varieties, especially in the main crops. However, it has been reported that there has not yet been widespread adoption of the new varieties, for reasons that are not yet clear. It has been variously reported that the yield advantage has not been great enough in farmers' practice to convince them of the value of changing materials and practices; and that farmers have not had the new information and/or inputs adequately presented to them. This ongoing program will clearly continue to be a major part of IAR activity, with responsibility for primary breeding and coordinating work on the five top priority crops being vested in the national commodity research centers, and varietal testing being carried out at zonal centers, sub-centers and other trial sites.

However, it is anticipated that much more attention will have to be given in future experiments to the interaction of variety and cropping practices in relation to farmers' capabilities and the needs of soil conservation. These do not lend themselves so readily to replicable experiments in a network mode, and will need more intensive participation by agronomists, and more complex evaluation criteria than yield alone. Similarly, a move to interface variety testing more closely with the national natural resource database will need better classification of environmental conditions for trial results, including the dynamic profile of the weather at the time, rather than relying on average site characteristics. More intensive work on matching multiple field (and tree) crops to environmental opportunities, or new resource opportunities, will also involve, principally, agronomists and natural resource scientists (and possibly economists and animal scientists) in association with plant breeders.

The crop protection research program seems reasonably balanced between survey, screening for tolerance, and direct control measures. There will undoubtedly be an increased demand for special advisory services and solution of urgent pest and disease problems within the development zones when the zonal centers are operational; this will in due course require extra staff.

The relatively young socio-economic research program has begun very effectively through the "FSR" methodology to make its contribution to the specification of variety and cultivation practices needed to match farmers' micro-economic environments. Socio-economics should be an essential disciplinary component of all research teams at national commodity and zonal research centers, and in manned centers in resettlement areas. The strongest comparative advantage of micro socio-economists is in organizing multidisciplinary diagnostic studies, and in the conceptualizing of, and evaluation of results from, on-farm and on-station trials in terms of relevance to the farmers' situation. The actual design and conduct of trials both on- and off-station is best done by technical scientists, usually agronomists.

The horticultural research program attempts to cover an enormous array of vegetables, fruit and nut trees, roots and tubers, and spices in a number of research centers. Inevitably the substantial allocation of research manpower (9%) (Annex E) is spread very thinly with respect to any particular crop, and most of the wide range of introductions are on an exploratory, maintenance, and observation status pending definition of opportunity and market interest. The national priority for horticultural crops needs specific definition to guide and focus future research work: widely contrasting views were expressed to the team. Detailed studies should be concentrated on a few promising crops at a time (as, for example, in the case of hot pepper, which currently consumes 80% of the research effort in horticulture at Bako).

The Plant Genetics Resources and Conservation Unit and the Agricultural Engineering Program on Farm Implements are relatively self-contained sub-projects in IAR that are reasonably well staffed.

The creation of national commodity research centers will give needed added focus to five major crops, and will require the assembly of a full inter-disciplinary team for each crop to support a core of plant breeders. It is strongly recommended that such interdisciplinary teams be built up, but that the thrust of research should be towards an improved "national commodity" based farming system, rather than only towards the improvement of the crop itself. Currently, the manpower in the cereal crops teams is spread inefficiently among several centers. None has a full team with full-time disciplinary specialists.

Coffee research presents a very special case in that no other country in the world has the range of germplasm (or variety in mode of cultivation) that is found in Ethiopia. It could almost certainly attract strong international support if the Government of Ethiopia so wished. Meanwhile, as the leading earner of foreign exchange, the team suggests that coffee deserves a much stronger and more complete research team, (including research specialists in liquoring and processing), than the present allocation of only 8.11 man years (Annexes A and B).

The future role of the zonal research station has yet to be defined. It will almost certainly be much less concerned with selection and plant breeding than the commodity research station, and much more concerned with testing improved materials in a range of environments and different cropping practices. Advisory services to the zonal agricultural office will no doubt be in strong demand, and in-service training sessions for extension staff will probably be a regular component of research activity. The pattern of staffing will differ from that in commodity research stations (as illustrated in Annex F).

2.3.1.4 Livestock research

The Department of Animal Science is comprised of three divisions: Animal Production, concerned with breeding, physiology, and management; Animal Feeds and Nutrition, that includes forage and pasture research; and Animal Health. Livestock research is concentrated at the research centers at Holetta, Bako, and Melka Werer, and at the subcenter at Adami Tulu. Forage and pasture trials are also conducted at eight IAR/MOA(ADD) trial sites.

Major research efforts have been concentrated on cattle and sheep breeding programs, together with associated managerial problems. About 60 percent of the Department's graduate staff and an even larger proportion of its total resources are employed in these programs.

The milk production potential of indigenous Boran, Horro, Barka, and Fogera cattle under improved management and feeding has been studied, while a major crossbreeding experiment was commenced in 1974, in which three exotic breeds - Friesian, Jersey, and Simmental - were crossed with Boran, Barka, and Horro under good management and feeding in varying environmental conditions. This experiment is drawing to the end of its second cycle. The results confirm that the indigenous breeds are poor milk producers compared with the firstcross (F_1) cattle.

At the same time, Adal and Blackface Somali sheep and Adal goats have been involved in a selection program at Melka Werer, while Horro sheep have been selected at Bako. Managerial and fattening studies have also been conducted, mainly in association with the breeding program.

Animal Feeds and Nutrition Division has identified a number of suitable grass and legume species for different agro-ecological zones. Ethiopian feeds have been analyzed, and feeding trials using forages and crop residues have been conducted. To date the Animal Health Division has acted as a service division.

Few research results have been translated into practice.

(Recommendations are included later in 2.3.2.1.)

2.3.1.5 Food research

At present this is a very minor program, concerned primarily with the technological and not the nutritional aspects of food science. Nevertheless, it could be of future importance as production problems are solved and methods of processing foods assume greater significance. The team suggests that IAR should give some priority to a plan for the future development of this area of research to accomodate component disciplines, including food microbiology, food chemistry, and food engineering.

2.3.1.6 Biometrics and data processing

As IAR expands into more research centers, there will be an increasing need for a common, central biometrics and data processing unit, as it would be uneconomic to have professional staff in this area at each center. The team recommends that a well-staffed unit, fully computerized, be established to deal with all biometrics and data processing for IAR. It could be at headquarters in Addis Ababa or at Holetta; both sites have merits.

2.3.2 Balance in the Research Program

The multiplicity of research objectives and changing circumstances in the IAR research program, as listed in section 2.2, suggest that optimal program balance is a dynamic entity that is not easily attained. However, there are factors that can be reviewed and, if necessary, changed from time to time. Some of the more important of these are: (a) the balance within major research sub-sectors; (b) the balance between major sub-sectors; and (c) the balance between zonal and national commodity research programs.

The team recommends that balances in the research program be reviewed at specific intervals of about 3 to 4 years.

There are various ways of presenting the research program balance: each has its merit and deserves consideration. The critical limiting resource is usually trained manpower. Tables 2 and 3 (pages __ and __) show distribution of manpower in IAR by center, and by research division (discipline), but perhaps the most valuable and revealing presentation is in terms of researcher man years devoted to different crops, commodities, and special topics. Information from "task analysis" questionnaires completed by most individuals was used to prepare the tables given in Annex E. These tables are not complete, covering only 169 of the research staff, but they are illustrative and give an approximate idea of current distribution of research effort. It is recommended that more complete tables of research time allocated to crops and commodities be constructed from time to time.

2.3.2.1 Balance within major research sub-sectors

Socio-economic research. It is now apparent that the balance between disciplines required in socio-economic research (including farming systems research) will be somewhat different from what was originally planned. For example, not only are additional agronomists and livestock specialists required for the FSR teams, but if socio-economic research is to include investigation of agricultural policy, as suggested in section 1.3.3, then macro- as well as micro-economists will be required.

Natural resource research. Similarly, as the natural resource research staff may be expected to develop conservation oriented, and multiple cropping systems and new cropping systems for lowland areas, vertisols, etc., the balance between the types of disciplines employed in this research sub-sector will change as soil physicists, crop physiologists, agro-meteorologists, and possibly "agro-sylvo-pastoralists" are recruited to join the soil scientists and water management research staff.

Crops research. The overwhelming influence to date in crops research appears to have been that of the plant breeders, while at the same time there has been some dispersal of effort, as limited research cover has been extended over a very large number of crops. It has been suggested previously that research efforts be more closely focussed on:

(a) the strengthening of cereal research teams, particularly with regard to the role of cereals in sustainable cropping systems;

(b) the selection of a few priority horticultural crops on which there would be intensive research at specific stations; and

(c) the coffee crop: on breeding, but also particularly with regard to management problems, such as the use of multi-purpose trees for shade and multicropping, especially with forage crops, either under or in association with the coffee.

If crops research is intensified in some such manner, as is suggested above, then there would have to be appreciable changes in time in the balance of disciplines, with a higher proportion of agronomists, crop physiologists, and other crop specialists in the research teams (as illustrated in Annex F).

Livestock research. There has been an imbalance in the livestock research program for many years, with overemphasis on cattle crossbreeding and associated trials. These have used a very high proportion of the resources of the department, but the data obtained from them have not yet been fully analyzed, nor has there been an attempt to test any results under farm conditions. Under these circumstances the livestock research sub-sector has not contributed as fully as it might have done to the development of Ethiopian agriculture, and the ISNAR Team considers that a radical restructuring of the program is required in order to bring it into balance. It is therefore recommended that:

(a) The long-term cattle crossbreeding program be terminated as quickly as is practicable at the end of the second cycle in order to release manpower and facilities for research which is now of higher priority. The termination date should be decided after a short-term review and analysis of relevant data.

(b) A new livestock research program be prepared, based on national needs and objectives; possibly incorporating some, if not all, of the following features:

(i) a shift in priorities to the nutritional, managerial, and health requirements of work oxen, cattle used for milk production, and cattle and sheep raised primarily for meat production in the high and medium altitude regions;

(ii) management of indigenous breeds of cattle and sheep, not yet subjected to intense selection, at specific centers in order to: select for productivity under local environmental conditions and in some breeds for trypanotolerance; and conserve (with international assistance) valuable livestock genetic resources;

(iii) concentration of nutritional research resources on specific problems associated with the utilization of pasture, forage crops, and crop by-product feeds;

(iv) close cooperation between animal health researchers and the proposed MOA Epidemiology and Economic Unit; and

(v) a shift in emphasis of research location from center to farm as Peasant Associations and Producer Cooperatives can now provide an exceptionally appropriate environment in which on-farm investigations may be planned, facilitating increased participation of FSR teams in the investigation of livestock systems.

2.3.2.2 Balance among major research sub-sectors

The balance among the major sub-sectors will depend more on the relative importance of the sub-sectors and the opportunities for progress in them through research.

At present, approximately 65 percent of the total graduate research staff of IAR work in crop or crop-related research, while 15, 11, and 7 percent work in livestock, natural resource, and socio-economic research, respectively. In the long-term the present balance among research sub-sectors in the program should slowly change, reflecting:

(a) a limited increase in the number of socio-economists (including macro-economists) and in the number of agronomists and livestock production specialists required in the farming systems research teams

(b) a substantial increase in the number of natural resource scientists such as soil physicists, crop physiologists, agro-meteorologists, agro-foresters, etc., required in the natural resources research sub-sector;

(c) an increase in the proportion of agronomists, and crop protection specialists in the crop science research sub-sector required for cropping system research and testing advisory and training services in zonal research centers;

(d) changes in the balance of research within the livestock sub-sector (as outlined in section 2.3.2.1) and in overall requirements for livestock research; and

(e) some increase in the number of food scientists.

The importance of livestock within the agricultural economy needs emphasis. Livestock production is estimated to contribute one third of agricultural GDP, but is more important than these data suggest, insofar as the integration of livestock into the farming system apparently improves crop production. For example, results from research at ILCA suggest that in the highlands, farmers owning two or more oxen produce on average 35 percent more grain than farmers with one or no oxen. The team therefore recommends that the proportion of resources allocated to livestock research be increased, especially taking note that livestock research requires higher inputs than almost any other type of agricultural research; and that livestock research should spread to more than the current three national centers and one sub-center (subject to a realistic long-term livestock research program being adopted).

Despite such changes that are likely to occur in the balance between the major research sub-sectors in the program the crops research sub-sector must certainly remain by far the largest.

2.3.2.3 Balance between zonal and national commodity research programs

The probable differences in the roles of the new national commodity and zonal research centers have been mentioned previously in 2.3.1.3. By the end of the plan period, if the planned expansion of research staff is achieved, it will be possible to have a reasonable complement of research

personnel at each main center and some sub-centers, even if many will still have little experience in research (as illustrated in Annex B). In the meantime, balance in research staff among the centers will be a very important issue, while staff numbers are growing to meet the requirements.

There will be excessive demand for the relatively few Research Officers (ROs) with experience beyond MSc. The team recommends that as a first priority, a solid core of 5 or 6 experienced researchers be built up and maintained at each national commodity research center; second, that a multi-disciplinary pool of at least 20 mature and experienced researchers be retained at Holetta as a reference source of specialist services and advice for the country, and as a center for disciplinary leadership to assist less experienced researchers at newer centers in formulating high quality research programs; third, that senior staff at zonal research centers be built up around a small core of one or two ROs as staff become available (in the near future they would have to rely on experienced guidance from senior specialists at other centers); and fourth, that new substations in settlement areas should be staffed permanently only by national AROs and resident, short-term expatriate research staff, with guidance from visiting ROs from other centers.

2.4 Library, Documentation, and Publications

2.4.1 Present Practices

Scientific staff need ready access to relevant international scientific literature, while research users require results to be presented and published in comprehensive and easily understood terms. These should be the primary tasks of the Documentation and Publications Department, with its three divisions - library, documentation, and publications.

Center libraries are generally inadequate. On request, books and journals are purchased by headquarters library, their cost being charged to center budgets. Scientific journals are not circulated from headquarters library, though other publications may be borrowed.

Documentation procedures, consisting of the compilation of reports on the annual research program, continue as they were first established by an FAO consultant. In addition, the division acts as a FAO participating documentation center, providing CARIS (Current Agricultural Research Information Service) and AGRIS (International Information System for the Agricultural Sciences and Technology) services and communicating and exchanging information with other documentation centers.

Regular publications include stencilled annual research progress reports, proceedings of the NCIC and the Ethiopian Agricultural Research Conference (EARC), reports of seminars, workshops, and symposia and abstracts. Intermittent publications have included a newsletter, an annual report and limited editions of printed technical manuals and bulletins, handbooks, extension bulletins, and leaflets. The Ethiopian Journal of Agricultural Sciences is not published by the Department. A committee of six nominated staff control publications.

2.4.2 Possible Changes

· Not only are library services ineffective and the needs of research users not well served, but there is also no sustained projection of the overall aims and recent successes of the IAR. This is partly due to constraints such as a lack of fully trained professional staff and inadequate supplies of books, scientific journals, and publishing equipment; constraints that should be partially removed in the implementations of the World Bank project. However, the team considers that further training of additional staff to the MSc level will still be required.

Economic methods must be sought in order to provide scientific staff ready access to the world's scientific literature. There are a number of options that should be examined by a newly constituted library committee, including taking maximum advantage of the newest technology. The team suggests that purchasing information on compact disks is one option that should be evaluated. For instance, in 1987 CAB International will be producing CD-ROM* disks, each holding 180,000 abstract records, with playback equipment costing $9-12,000.

Present weaknesses in the presentation of research results to users include the isolation of publication from scientific staff, a limited understanding of the needs of different users, and a certain lack of style. The team recommends that one priority should be the production of an up-market IAR brochure, citing the Institute's role, attitudes and successes, targeted on peer organizations in and outside government. Another high priority should be the publication of up-to-date printed technical bulletins, primarily produced for MOA extension staff. With regard to the presentation of research results for farmers, there must be a very close relationship between research/extension liaison and publications staff and close examination given to the most suitable media by which to assist farmers. It could be that radio and/or video are more suitable than the printed word.

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* Compact Disk - Read Only Memory

Chapter 3

ORGANIZATION AND MANAGEMENT IN THE INSTITUTE OF AGRICULTURAL RESEARCH

3.1 Structure of Organization

The organization chart for IAR, which has recently been approved by its Board of Directors, is presented in Annex C.

3.1.1 Deputy General Managers

The revised structure provides for important additions in management which have been needed for some time, including the addition of three Deputy General Managers, one each for Research, Research Support, and Administration. The addition of the deputy position for research is particularly important for leadership in the research program. Although the General Manager is highly qualified to provide the leadership for research, he has many other demands which keep him from devoting the time required to guide and lead the program. Now that the deputy positions have been provided and the position of Deputy General Manager for Administration has been filled, the team recommends that highest priority should be given to the recruitment of a senior research scientist with good leadership qualities for the position of Deputy General Manager for Research.

In regard to the Deputy General Manager for Research Support some additions could be considered under the direction of this position. These could include, for instance, those central analytical laboratories and reference collections which may be located at Holetta but which support all of IAR; and perhaps food science/food technology laboratory services. In both cases, priority judgements may be needed between general support services and local program demands.

3.1.2 Commodity and Zonal Research Centers

The other very important changes in the organization include the establishment of commodity research centers and the designation of zonal research centers. The former are centers for each of the designated priority commodities, coffee, cotton, maize, sorghum and wheat. In the past, there have been national commodity programs for the five priority commodities, but only for coffee and cotton have they operated from single centers. The present plan is to bring at least all the plant breeders for each of the priority commodities together at one center and to have the program for that center focus almost exclusively on a single commodity.

The zonal centers are being designated to serve each of the eight agricultural development zones (ADZ) as determined by the Ministry of Agriculture (MOA). The zones have been primarily determined by administrative boundaries and most contain several major agro-ecological zones. The research centers located in each zone, with the exception of the commodity centers, are to focus on the agricultural problems of the

zone. In some cases there is more than one main research center in a single zone, and where this occurs the General Manager of IAR will designate one of the centers as "the" zonal center. The officer-in-charge of the designated center will represent the center and other centers in the same zone at meetings with the zonal Research Extension Liaison Committee (RELC).

The establishment of commodity and zonal research centers has both program and manpower implications which are still to be determined. The proposed zonal approach will need to be carefully monitored and evaluated to determine whether it most effectively utilizes scarce manpower and has the desired impact. The Regional Research Coordinator, as shown on the organization chart, gives emphasis to the zonal ADZs. There is an opportunity for the person in this position to work to reinforce linkages with the RELCs, adaptive trials, State Farms, and others for increased utilization of IAR's research product.

3.1.3 Modifications to Strengthen the Organization

The above comments recognize the strong points of the organization: the ISNAR team suggests that the Board and General Manager consider some other modifications and additions to further strengthen the organization and its information base for long-term planning and priority setting.

The ISNAR team suggests that one point on the organization chart be clarified. The chart indicates the line of authority to be from the General Manager to the commodities and the ADZs rather than to the individual centers, which the team believes to be the actual line of authority.

Further, the team recommends that the role of the Technical Advisory Council and its place in the organization chart be clarified. The location between the Board and the General Manager does not indicate whether the Council advises the Board or the General Manager. The team suggests that the Council's role may have two quite separate functions. First, when requested by the General Manager, the Council may review documents prepared by the General Manager for the Board in order to provide technical advice on these before they are presented to the Board. Second, the Council can have an important function in their own respective ministries in following up on actions taken by the Board to assist in implementation.

The team recommends two further changes in the organization. First, the team recommends that there be additional support for the General Manager from a small technical committee for the preparation of background documentation for the Board which will provide a sound basis on which the Board can formulate policy for IAR. In the long run, a Policy and Planning Unit which reports directly to the General Manager could fulfil this role. However, in the short run, due to the realities of the availability of required manpower, the three Deputy General Managers should assist the General Manager in the preparation of appropriate documentation.

Second, the team strongly recommends that the General Manager appoint a small group of senior technical staff from among Division Heads and Commodity Leaders to serve as a technical advisory committee to the

General Manager on long-term program planning and preparing medium-term program guidelines for research centers. This inter-disciplinary committee's main task would be to identify the major researchable constraints and opportunities for increased productivity for commodities and areas within the high-priority topics prescribed by the Board, and to advise the General Manager on the balanced requirements in major capital issues, such as staff recruitment, postgraduate training, large research facilities, etc. Specific terms of reference should be set out by the General Manager and the Deputy General Manager for Research.

3.2 The Process of Research Program Formulation

At the present time the budget for the research program is prepared prior to the preparation of the program and the two come together in the Office of the National Committee for Central Planning (ONCCP), where responsibility for final approval is held for program and budget.

Budget guidelines issued by the ONCCP are used by IAR to develop the annual budget, based upon past experience and expected new research experiments to be initiated. The budget is developed according to commodities and divisions at the research center level and forwarded to headquarters where the budget figures are reviewed and combined with the headquarters budget for presentation to ONCCP. At headquarters, in presentation to ONCCP, the budget is put together in a format used by ONCCP for budgetary purposes, which differs from that of the IAR divisions. Therefore, it loses the basis on which it was prepared by IAR centers. When the budget is approved, it returns to those who formulated it in the ONCCP format. This has a disadvantage for program management in the administration of funds in relation to specific programs or experiments, but IAR Management see an advantage for administration in the increased flexibility they have in the allocation of funds.

The research program formulation process follows a logical sequence (except for the fact that it is developed separately from the budget), starting from the national plan for agricultural development which emphasizes two major objectives: 1) self-sufficiency in food grains by 1994, and 2) increased exports of agricultural commodities, and coffee in particular. Based upon these broad guidelines, the research program is developed from the bottom up, starting with the divisions in the research centers. Here, the sections within each division prepare their proposed set of experiments, both continuing and new, and develop a program for the research division.

Despite this logical sequence, the ISNAR team has some reservations on the process in practice. First, national plan guidelines, and even Board of Directors' priorities, are so broad that they leave enormous scope for choice of individual experiments, and therefore constitute little guidance. It is very important that more focussed medium-term guidelines emanate from a more detailed analysis of researchable constraints to productivity within priority commodities - as, for instance, by the technical advisory committee to the GM recommended earlier. This valuable guidance would still leave plenty of scope for researchers' initiative at individual centers.

Second, a section within a division at a center often consists of one relatively inexperienced researcher: this is not a good base for research proposals that are of high quality and closely relevant to producers' problems. The base should be wider. The team recommends that during the preparation of the sets of experiments at centers there should be greater interaction between scientists from several sections and divisions concerning both crops and livestock to assure an integrated approach to problem solving. The team also recommends that there be increased attention at this point in the program formulation process to a feed-in of information from the farming systems research on the operational constraints at the producer level which can impose limits on viable treatments and hence on the design of relevant experiments. Furthermore, it is strongly recommended that researchers preparing proposals seek assistance on design from senior scientists in their discipline (at Holetta?) to help assure quality of experiments. This may well involve time and expense in travelling - but may save many months of wasted effort. Good program preparation is worth a great deal of effort.

The next step in the established process is for the division heads at the center level to meet with the officer-in-charge of the center and discuss their respective programs and the integration of these. The discussion is primarily on proposed new projects rather than ongoing experiments. Out of this review and discussion comes the center's program which is then submitted to a higher level for further review.

In the case of the commodity centers, the program is submitted for review to the General Manager (in the future to the Deputy General Manager for Research), aided by national leaders for commodities and disciplines. While this review is necessary to check balance and direction in relation to the long-term program, the ISNAR team recommends that the critical place for increased involvement by the disciplinary leaders is at the division level at the centers at the time experiments are being formulated, as indicated above. After review and modification, if any, the programs go before a national review committee made up of selected senior IAR staff and representatives from the Ministries of Agriculture, State Farms, and Coffee and Tea and other relevant organizations. All programs approved at this level go forward to the IAR Board of Directors and General Manager for final review before going to ONCCP for inclusion in the budget.

The team considers this review process satisfactory and thorough, and not unduly long, provided each reviewing group keeps to its terms of special responsibility: the Board, with accordance with policy and priorities; the national review committee, with balance among development thrusts (or whatever is prescribed to it); the technical heads, with consistency with the long-term technical plan to meet constraints; the RELC, with zonal issues; and leave detailed discussions on technical quality and microrelevance of component experiments to the research center level (provided, also, that the centers have had good program guidelines fed to them in the first instance from the senior groups).

All programs other than those for the five priority commodities follow the same development and review process with the addition of a zonal review before the national review. Where there is more than one main research center in an ADZ, the centers' programs are integrated by the IAR zonal coordinator designated by the General Manager. The zonal

review is carried out by a Research Extension Liaison Committee (RELC) in each zone which is made up of IAR scientists, policy makers from the zonal office of the Ministry of Agriculture, and experts and policy makers from some of the relevant public and mass organizations in the ADZ. The representative of the MOA chairs the RELC. Following the RELC review, the program is forwarded to IAR headquarters with comments and recommendations from the RELC, and the program then goes through the national and IAR Board review process.

3.2.1 Program Budgeting System

After careful study of the program formulation process, the ISNAR team recommends a change to match or develop the program and budget at the same time. The team believes that with a modest addition to the project proposal formats now being used by IAR, a system of program budgeting could easily be developed. The added elements would be determination of the staff time allocation for each experiment or unit of research, and the costing out of items of operation (supplies, labor, transport, travel allowances, etc.). With this additional information the IAR management would be in a position to monitor, evaluate and document its research program in a cost-effective manner to achieve maximum benefits to the desired research output.

A program budgeting system is a project-based management tool to facilitate programming, budgeting, and accounting. It requires the intensive participation in the programming process of all those concerned with proposals for research experiments and should be started at the point of determination of experiments by sections within divisions at the center level. It is not essential for this process to be computerized, but a computerized system is a much more flexible and powerful tool for management. Software and appropriately formulated data sheets are readily available.

It must be emphasized that the program budgeting system is a key management tool but only a tool. It does not in itself improve the quality and the relevance of the research program, but it makes clear to everyone concerned what choices of activities, experiments, and research studies have been made each year, and that component activities and supporting services have been duly costed in terms of manpower and financial resources.

If IAR decides to introduce a program budgeting system it could facilitate its implementation through a workshop on the subject. ISNAR's management could be approached to seek its cooperation in conducting such a workshop for IAR staff.

3.3 Program Management

Program management is a continuation of the program formulation process, and it is through effective management that research results in keeping with the program are achieved. It involves program implementation, monitoring, budget control, evaluation and documentation of reporting. Each of these elements requires management by the individual scientists conducting the research and also by those having supervisory or program leadership responsibility. Throughout the process

of program management there must be a constant awareness of how the research results are expected to be used, by whom and under what social, economic and agronomic conditions.

The research objectives must be clearly indentified and stated at the time the research program is formulated in order to monitor and evaluate the research. The present project statements which are prepared when research (experiment) is proposed could be improved by more precise statements of objectives. Also, continuing experiments need more discussion and review each year than they appear to be receiving, and evaluation by means of a peer review should be increased. The present system of progress reports by the scientists for research activities do not go far enough to provide a real evaluation. This leaves too much to individual observations and judgement: a broader review and analysis could provide more productive results and in a number of cases could serve to terminate unproductive research.

The ISNAR team recommends that IAR give increased attention to the evaluation of the conclusions from research experiments. In addition to the progress reports used at present, the team recommends that a system of peer review be introduced at the center and division level to assure that all projects (groups of experiments) are regularly evaluated in a peer review process. Such a review will also help to integrate the research activities between sections, divisions and throughout centers or commodities.

3.4 Administrative Support

An effective research program requires good administrative support. This support should assure that administrative policies and procedures facilitate the work of the scientists through the timely flow of resources, supplies and equipment, transport, maintenance and communication.

At IAR the Deputy Director for Business and Development has been recruited and a number of the staff positions under the Deputy Director have been filled. Position descriptions for staff and operating procedures for administration have been developed. However, the administrative division does not yet appear to be operating as an effective support unit. Most of the staff are new graduates who have yet to learn their own responsibilities and how they are to provide the essential administrative support to the organization.

Important items of building and equipment maintenance, transport, supply and maintenance, availability of scientific supplies, and purchasing, all appear to have considerable room for improvement.

In order to support and strengthen the administration within IAR the ISNAR team has the following recommendations:

1) that IAR recruit a consultant to assist the Deputy General Manager for Business and Development in a review of the division and the formulation of a plan to increase the support which the division can provide to IAR;

2) that IAR provide a series of management training workshops for staff in administration to help improve their management skills;

3) that IAR arrange for the more senior staff in the administration to visit and observe management practices in some of the best research institutes in Africa and Asia.

3.5 Financial Management and Budget

The budget process for IAR is unusual in that it is prepared separately from the research program. This means that management of the budget in relation to the research program is very difficult. As has been recommended under section 3.2, the introduction of a program budgeting system should bring more effective use of resources. At the present time it appears that local finance is not a problem but this will not always be the case. Therefore, the introduction of sound budgeting and financial management is very important for IAR.

There is a certain amount of inconsistency in the information given the team on the issue of finances. It appears that each year IAR is returning a considerable amount of unexpended funds to the Government due, in particular, to shortage of well-qualified manpower to fill many vacant positions. It was stated that IAR has a great deal of flexibility in the use of its funds. Yet, while returning funds each year, it appears to be short of funds for maintenance, transport and stocking of supplies.

The ISNAR team's only clear recommendation concerns the introduction of a system of program budgeting. However, the team believes that IAR management should seek ways to use available funds to purchase and store supplies to have a ready stock on hand to meet immediate needs, to increase transport facilities for staff and to improve maintenance.

3.6 Staffing and Personnel Management

The most difficult problem for IAR is staffing: that is, to recruit the number of staff who are well-qualified to fill the available positions. The staff for IAR is much too small for a large country like Ethiopia, particularly in terms of experienced research officers (RO), to meet the demand to rapidly expand its research program. The competition among ministries for university graduates and the system of allocation of staff by ONCCP to government organizations limit what IAR can do to meet its staffing needs. Another important factor which limits IAR's ability to recruit is its relatively low salary scale and the lack of provision of incentives for work in isolated locations. Even with considerable government control over the allocation of staff, it appears that an incentive system is important and can positively affect staff recruitment and retention.

The new proposed career structure for IAR and the proposed salary and benefit structure have been well prepared and present a very reasonable approach by the IAR Board of Directors and management to meet the needs of IAR staff. The implementation of the career structure and proposed salary and benefits should do much to raise staff morale and to attract

and retain staff. The ISNAR team highly commends the IAR Board of Directors and management for preparation of these proposals and strongly supports their implementation.

3.7 Number and Location of Centers and Test Sites

In its first 20 years, IAR developed seven main research centers, several sub-centers and many trial sites. It is now proposed that the number of main centers be doubled in the present ten-year-plan period which ends in 1993/94. At the same time it is proposed to increase the number of sub-centers to 43 and the number of main trial sites outside the main and sub-centers to at least 25 (see Annex D for listing of centers and trial sites).

The ISNAR team, after visiting most of the main research centers and a number of the sub-centers, believes that in the long run 14 main research centers is a reasonable number to meet the needs of Ethiopia. These 14 centers would be composed of eight zonal research centers, five commodity centers, and Holetta, which the team recommends should be considered a national center to provide leadership in research disciplines. The team believes this is necessary at present and will continue to be for several years in order to provide the leadership required to give overall guidance to young and inexperienced staff who are in the majority at other research centers. It is noted at several points in this report that the team is very concerned with the timing of the implementation of additional centers, given the very acute shortage of manpower. Too rapid expansion could easily distort IAR's research program due to a shortage of senior and experienced research officers to give leadership to the new centers. Too rapid expansion which would require shifting of senior staff could adversely affect some of the priority commodity programs which are essential to provide the base for production increases to achieve self sufficiency in food grains by 1993/94. The team strongly recommends that the new stations be added only as additional Ethiopian manpower becomes available to staff and provide research program leadership for them and the area they serve. It may be possible to recruit some experienced and well-qualified expatriate staff to supplement the staffing for new stations, particularly for the high-priority new settlement areas.

In one or two zones, it may be convenient to designate a center both as a commodity research center and a zonal research center. The team sees no inconsistency in this, but would stress that such a center would require almost the same number of staff as two separate centers, as the work tasks (measured in man weeks) would not be much reduced from that of 2 separate centers.

While the ISNAR team supports the establishment of 14 main research centers in Ethiopia within a time frame that permits adequate staffing and maintenance of a well-balanced research program, it questions the need for 43 sub-centers. It is the view of the team that many of these sub-centers could better be classified as Trial Sites and could be handled in collaboration with the Ministry of Agriculture, and the facilities would have to be expanded to match (see also 4.3.2).

Chapter 4

IAR'S LINKAGES WITH EXTENSION, DEVELOPMENT, RESEARCH, AND TEACHING INSTITUTIONS

4.1 Introduction

Institutional linkages are necessary and desirable for a number of reasons. For an institution like IAR, engaged solely in research, it has to relate its activities closely to extension and development agencies in order to evolve coherent approaches to solving problems of agricultural productivity at the grassroots level. Constrained by its limited scientific manpower and other resources, IAR must seek every opportunity to collaborate with other institutions similarly engaged in research, not only to avoid duplication, but to share responsibilities in covering important problems, thereby promoting the effective use of scarce resources. Teaching institutions are not only partners in research but also essential sources of trained manpower. Linkages with external organizations and the international scientific community will enable IAR to generate supplementary resources and to tap information and technology available elsewhere which are applicable to Ethiopia's conditions.

IAR through the years has developed working relationships with a number of institutions within and outside Ethiopia. Many of these linkages are functioning well and deserve no further comment other than a word of praise. However, a few of these institutional linkages require special attention from management and have particular bearing on manpower planning in IAR.

4.2 Linkages with the Office of the National Committee for Central Planning

Public policy on prices, credit, subsidies, infrastructures, marketing, settlements, etc. can have as much impact on agricultural productivity as new technology and extension delivery systems. These policies also influence the directions, priorities and resource allocations for agricultural research. The IAR therefore needs to have a close and detailed understanding of ONCCP argument and decisions.

IAR also has a unique viewpoint and contribution to make on technical opportunities for agricultural development in the policy planning process, and should strive to make this contribution through the appropriate branches of the ONCCP. As mentioned earlier in 1.3.3, IAR would be able to play its part more effectively with a better in-house capacity to engage in policy research. The team recommends that IAR broaden the scope of its socio-economics department to include research in macro-economics and public policy as they relate to agriculture and to research.

Linkage with the International Food Policy Research Institute in Washington and the economics faculties at Addis Ababa and Alem Maya would be beneficial in this respect.

4.3 Linkages with the Ministry of Agriculture

Without doubt, the Ministry of Agriculture is IAR's most important partner. The Ministry is eager for new improved technology and advice from IAR, and it is through the Ministry's extension service that most of IAR's contributions will reach the farmers. Meanwhile, IAR needs the Ministry's guidance to direct research into the most urgent and relevant constraints to productivity.

The weakness of the linkage between research and extension has, however, been cited repeatedly as one of the major causes of underdevelopment in Ethiopian agriculture. Significant attempts have been made recently to improve linkages between IAR and MOA, including establishing a Research Extension Liaison division in IAR and Research and Extension Liaison Committees in each Agricultural Development Zone, and instituting joint field trials. The ISNAR team believes that sufficient technology and information have been generated by IAR during the past twenty years to make a substantial impact on productivity in some areas at least, and recommends that IAR management give highest priority to ensuring that the new means of linkages be fully exploited towards realizing the potential of improved technology and information that have been accumulated so far.

4.3.1 Research and Extension Liaison Committees (RELCs)

The position of the Minister of Agriculture as Chairman of the IAR Board is crucial as far as broad policy guidance is concerned. However, potentially the most effective formal operational linkages at levels below the very top, is in the RELCs established in each of the new ADCs. The importance the new MOA strategy attaches to the RELCs can be clearly appreciated from the functions assigned to them:

"The primary functions of the RELCs are:

a. to provide overall policy direction;

b. to approve extension recommendations; and

c. to review the operation of research extension linkages in the zone.

Their more specific functions include:

a. reviewing annual extension recommendations by IAR staff and approving them for inclusion in the extension program;

b. defining the broad line of multilocational trials and farm survey programs for the zone, to ensure that they are relevant to the farmers in the area;

c. participating in annual IAR research reviews, giving the opportunity to comment on and making proposals on the lines of research carried out at IAR stations in the zone; and

d. determining the MOA staff training needs and how they can best be met by zonal MOA subject-matter specialists and IAR staff and reviewing their effectiveness.

These point to the major joint activities anticipated in the ADZs: the national field trials, and the training of extension staff, as well as a measure of guidance to the research station program. The RELCs offer a very promising mechanism for stimulating cooperation and mutual understanding: IAR management should take steps to encourage efficient operation of the less formal component linkage mechanisms supporting the RELC, the most important of which are the national field trials.

4.3.2 National Field Trials

The national field trails network can be seen as a vital linking step between the operations of researchers carrying out applied research at research stations, and the multiple demonstrations in farmers' fields carried out by extension agencies. They are the concern of both research and extension, and are important for translating research results into production packages tested and validated under farmers' conditions.

There have been a number of series of field trials of varying success, and recognizing the need to work closer together, ADD and IAR established in 1981 a network of joint IAR/ADD trial sites, in 11 locations, where new varieties, fertilizer treatments and other agronomic practices were to be tested for applicability under different growing conditions.

More recently MOA initiated a new set of 2.5-hectare field trials to be located in the priority agro ecological zones (AEZ) and major soil types in each of the eight zones. The new network is envisaged to include at least 56 trial sites.

This new network has wider coverage than the present IAR/ADD sites and has the added advantage of involving the Extension Department and the new Zonal Administrations as additional partners to ADD and IAR.

The ISNAR team sees no essential difference in the nature of these series of field trials and recommends that IAR and MOA integrate the IAR/ADD trials with the new Field Trials Network, phasing out any IAR/ADD sites that do not represent the highest priority AEZ/soil environments.

These field trials fit into the sequence of research activities from national commodity research centers to zonal research centers supported by a network of sub-stations, field-trial sites, on-farm trials, and demonstration plots, to facilitate the flow of improved technology, seeds, and information from research laboratories to farmers' fields.

Jurisdiction and administrative responsibility for operations will pass from the IAR at one end to the Extension Department of the Agricultural Zonal Office at the other. The transition of responsibility from one to the other will probably be at the field-trial site, but could well be uneven, to match convenience, with field-trial sites at or near commodity research centers or substations being staffed and administered by IAR, and others, the majority, by MOA. It is already resolved that the field-trials program and design will be determined jointly.

The flow of information and technology in the new Field Trials Network is shown schematically in Figure 1. (The flow is in both directions.) The main research stations ideally should be located in the

Figure 1: Sequence and Location of Research Trials

National Commodity Research Centers

Main Zonal Research Centers	-	located in a priority AEZ with major soil type(s) in the Zone.
Zonal Sub-Centers	-	located in 2-3 other priority AEZ and soil types in the Zone.
Field Trials	-	some conducted in the IAR main and sub-centers.
	-	rest located in the remaining priority AEZ's and soil types in the Zone.
	-	farming systems research coupled with Field Trials.
On-Farm Trials	-	conducted on all AEZs and all soil types in the Zone.
Farmer Demonstration Plots	-	established at a large number of locations all over the Zone.

most important AEZ/soil type environments in the ADZ. The sub-stations in turn should be located in the next 2-3 priority AEZ/soil type environments. Since there are at least 6-8 major AEZ/soil environments in each ADZ, the rest will have to be covered by the field-trial sites.

Three supplementary comments should be made:

First, there is an urgency about the supply of new opportunities and improved technology to producers. Promising lines and techniques should be moved to field-trial sites at an early stage of testing, long before they are confirmed on the station, or on their way to recommendation and release. This can cut years off the time producers have to wait to get the chance of better material; alternatively, it can cut years off the delay in feedback to researchers at the center of news that the promising technology did not hold up on a widespread multi-locational basis, and needed adaptation to different physical or biological environments.

Second, it is equally important to have very early feedback to researchers about whether a promising line or technique can fit into farmers' operational capabilities, or socio-economic environment. On-farm trials after verification in national field trials is years too late. (They are, however, very appropriate for guiding how extension staff can best formulate their dissemination messages.) But the main commodity and zonal research centers must conduct their own on-farm trials, on a small scale, testing promising technology at an early stage to get rapid feedback about the feasibility of acceptance into farmers' systems. These trails should be carried out before, or at least at the same time, as substation or national field trials. Ideally, by the time techniques and varieties are confirmed in national field trials, the research center should have firm information on compatibility with its local farmers' system at least.

Third, considerable stress was laid previously on the need for research on appropriate cropping patterns. As soon as information becomes available from such on-station studies, attempts should be made to incorporate promising cropping practices into the field trials network. This may require some ingenuity and careful design.

It should be clear that for speedy delivery of improved technology to producers, extension staff of MOA must be involved in the testing and evaluation process long before the technology is released with formal recommendations.

The ISNAR team recommends that the closest collaboration between research and extension continue to be encouraged by IAR management.

Sub-centers: The plans for expansion of IAR stations include the development of 43 sub-centers. It has been mentioned previously that some sub-centers in new settlement areas, for livestock research and other special cases, require permanent resident research staff at RO and ARO level. Chapter 5 will indicate that there will probably be a scarcity of scientific manpower for some time ahead, and the ISNAR team recommends strongly that the initial concentration of research manpower should be devoted to the upgrading of the five commodity research centers, Holetta, the eight zonal research centers and, the few strategic sub-centers. Many proposed sub-center sites will have to be treated for

the duration of the Plan period, at least, as little more than the 2.5 ha Field Trial Network sites, i.e., a fenced tract of land with minimal infrastructure and TAs as the only permanent staff.

It is therefore recommended that the plans for development of sub-centers be combined as far as possible with those for the Field Trials Network of 56 sites. Quantitatively, if there were 2-3 sub-centers to each of 8 zonal centers, the 5 commodity centers and Holetta served as zonal sub-centers, and 10 to 18 sub-centers in time came under IAR administration and supervision, then 24 to 32 field trial sites would be under MOA administration. Some field trial sites could be bigger than average to accomodate additional trials appropriate to sub-center objectives and functions. Joint planning for programming and supervision of trial sites will demand time and collaborative organization, but should strengthen linkages considerably.

4.3.3 Farming System Research and On-Farm Trials

As mentioned previously in 4.3.2, two sets of on-farm trials are required, one set essentially for quick feedback of monitoring information to main station researchers, and the other mainly for information to extension staff to help in packaging messages to pass to farmers. The former set, combined with broader farming systems surveys and reviews, would be largely under IAR control, the latter under extension control. However, full exchange of information and mutual involvement in the on-farm trials should be encouraged.

4.3.4 Review of Recommendations for Agricultural Development Zones

As a basis for future collaborative effort, it is suggested that senior IAR staff conduct a quick but thorough review of all research and relevant development experiences during the past 10 to 15 years, followed by a synthesis of the information leading to a set of interim recommendations, where justified, for each of the eight zones.

4.3.5 Joint Technical Committees with MOA Main Departments

The preceding discussion related mainly to crop production. There has been relatively much less contact between IAR and the other main departments. Considering the changes in program balance and direction being suggested by the team as far as livestock and natural resources research are concerned, it would be an opportune time for IAR to establish small joint technical committees with the Animal and Fisheries Resources Development Main Department and the National Resources Conservation and Development Main Department, and a third joint technical committee with the Rural Infrastructure Development Main Department would also be valuable for research in irrigation, farm implements, and storage structures. These joint technical committees would help to coordinate the activities of IAR with all departments and encourage more extensive formal and informal linkages at lower levels, and in zonal operations.

4.4 Linkages with the Ministry of State Farms and Ministry of Coffee and Tea Development

IAR formally considers peasant farmers as its primary responsibility. Consequently, the Ministry of State Farms was constrained to create its own Research and Advisory Services Unit, which

currently has 29 professional staff in Addis Ababa, and each enterprise or state farm has a research coordinator and a very limited number of research staff to meet their respective needs.

In practice, many of IAR's research products are equally applicable to peasant farms and state farms, and close cooperation is called for. Moreover, in many cases promising technology can be adequately tested under field conditions very rapidly and effectively by state farm personnel.

Formal linkages are quite good. At the policy level, the Minister of State Farms sits on the Board of IAR. At the operational level, IAR staff are invited to the annual seminar of the MSF, where research results are discussed, problems are identified, priorities set and annual plans made. Likewise, some MSF staff are members of the IAR commodity committees. Informal linkages between research centers and state farms are also good. Indeed, IAR management should maintain a check on how far the amount of research time at centers devoted to specifically state farm problems is in keeping with its declared policy of focussing on peasant farmer problems. MSF, with its own research staff, has the competence to adapt research results into commercial practice with minimum assistance from IAR.

The relationship between IAR and the Ministry of Coffee and Tea Development is more straightforward, as IAR's research on coffee is concentrated in one station, at Jimma. However, with the recent decision to transfer the responsibility for coffee extension from the Ministry of Coffee and Tea Development to the Ministry of Agriculture there are now three actors rather than two. The previous comments on the need to link research with extension and development apply as well to coffee production. A mechanism like a 3-way RELC should be explored.

4.5 Linkages with the National Teaching Institutions

Historically, the agricultural colleges at Alemaya, Awassa, and Debre Zeit had been active in agricultural research. Alemaya serves as a research station for the highlands in Hararge region. Awassa is a major research center for maize, while Debre Zeit continues to be an important station for tef, durum wheat, and highland pulses research. Some of the faculty of these colleges have served in the national commodity teams organized by IAR. On the part of IAR, a number of senior staff have served as lecturers and advisors to masters' degree students at Alemaya. However, the collaboration between IAR and the colleges has waned considerably in recent years.

In recognition of the potentials of Alemaya and Debre Zeit to continue contributing positively to the national agricultural research effort, the World Bank agricultural research project provided for certain inputs to strengthen the two units. Hopefully this new effort will provide a basis for renewing the previously strong research ties between them and IAR.

In addition to the research potential, the Universities are extremely important to IAR for the supply of good-quality graduate recruits and for postgraduate training in staff development plans. The discussion on linkages is therefore deferred until Chapter 5, as this is concerned with manpower planning.

However, the team cannot overemphasize the very important link between IAR and the teaching institutions of the country. Management should explore every possible means to keep this mutually reinforcing linkage vigorous and permanent.

4.6 Linkages with the IARCs

One of the strategies under the National Ten-Year Plan for agricultural research is "to establish strong contact and relations with international research organizations to gain relevant scientific information and knowledge". This strategy reinforces the strong emphasis IAR has placed in developing its linkages with international centers, particularly those in the CGIAR.

At present IAR has working relationships with ICARDA on pulses, barley and durum wheat; with CIAT on beans; with ICRISAT on sorghum; with CIP on potatoes; with CIMMYT on wheat and maize; with ILCA on livestock and pastures; with IITA on cowpeas; and approaches have been made to IBSRAM. There are other centers, both within and affiliated with the CGIAR, such as IFPRI, ILRAD, IRRI and AVRDC, with whom fruitful collaboration could be established. However, not all technologies and services on offer are useful to Ethiopia, so IAR must exercise good judgement in selecting those phases of those institutions' activities appropriate to Ethiopia's needs.

Considering the importance of livestock in Ethiopia's economy and the need to expand considerably IAR's efforts in livestock research, a case should be made for a special relationship to be developed with ILCA. As the host country and as the country with the largest livestock population in the whole of Africa, the fruits of ILCA's research activities should have their initial and greatest impact in Ethiopia. Moreover, ILCA's innovative work on the use of oxen and local equipment to develop efficient drainage systems on black soils is of great significance to IAR, and deserves a greater input of research manpower from IAR into the joint project. The team urges IAR management to discuss with ILCA how such a special relationship could be developed as soon as possible.

4.7 Linkages with Donor Organizations

IAR has maintained many fruitful linkages with donor agents and has received generous donor support during its twenty years of existence, principally from UNDP/FAO and more recently through an IDA loan. In addition, the Federal Republic of Germany, with the support of IBPGR, assisted Ethiopia in the establishment of the Genetic Resources Center. IDRC is providing support to the oilcrops and farming systems research projects. EEC is putting up the facilities for the new stations at Adet and Sinana. Sweden built up the research facilities at the Kulumsa station, which will soon form part of the IAR network. The Soviet Union helped establish the Scientific Phytopathology Laboratory, which is administratively attached to the Ethiopian Science and Technology Commission. And many other countries have contributed significantly.

Considering Ethiopia's needs, the donor community, both bilateral and multilateral, will continue to look with favor at proposals designed to help the country solve its many agricultural problems.

IAR should strive to produce a detailed long-term plan and strategy for research, the components and phases of which may then be developed into packages for donor funding. A manpower development plan is an important part of such a long-term plan.

Chapter 5

MANPOWER PLANNING

5.1 Determinants for Manpower for Agricultural Research

IAR is a young and rapidly growing organization. The research staff has more than doubled in the past six years. The urgent need for well-informed technical advice for agricultural development and improved technology for increased productivity is maintaining a pressure to expand research services. A manpower plan for IAR in the future must take due account of this demand but also must consider the likely rate of supply of trained manpower, and must formulate priority research programs and station development in accordance with the expected rate of increase in trained research staff, which is currently the key limiting resource for the scope and pace of the research program. Some of the factors that affect the balance of demand and supply are reviewed below.

5.1.1 Demand-Related Determinants

The most significant factors which influence the demand for agricultural research manpower, both quantitatively and qualitatively, are: the importance and rate of growth of the agricultural sector; development policies; research needed to solve problems; level of investment in research; and the general organization of agricultural research institutions.

These major factors have been reviewed in Chapters 1 and 3. The demand on research is more than is likely to be met in the near future. Current investment in agricultural research as a percent of AGDP is estimated to be about 0.6% annually. This is much less than would normally be expected in a country with such a heavy reliance on agriculture: 1.0% rising to 1.5% would be more reasonable. The Government has recognized the need to invest more in research and appears to be ready to support a major expansion of facilities, manpower and effort.

The organization of research has a lot of influence on the numbers and kinds of persons employed. The proposed significant increase in stations, sub-stations and trial sites is estimated by IAR to require a doubling of staff in the next 9 years. The detailed requirements of commodity research teams, discipline-oriented divisions, zonal centers and appropriate programs will have a major impact on the kinds of research staff required to service the agricultural sector.

5.1.2 Supply-Related Determinants

The most critical factor relating to supply of manpower is the current and projected pipeline of agriculture students within Ethiopia. The country currently depends on one degree and three diploma-granting institutions in agriculture, and on one degree and one diploma-granting institution in veterinary science. The agricultural degree-granting

institution, Alemaya University, has also awarded a limited number of MSc degrees in the past 7 years. Staff development is an important supplementary factor with respect to future increases in numbers and quality of postgraduate degrees from Alemaya. Along with Alemaya, three other institutions offer diplomas in agriculture--Awassa, Ambo, and Jimma Junior Colleges. The Commission on Higher Education is currently discussing an education loan with the World Bank which would significantly increase the output of the Junior Colleges and strengthen MSc and BSc programs at Alemaya.

Veterinarians follow a six-year course at the Faculty of Veterinary Science of the University of Addis Ababa at Debre Zeit. The target of 40 admissions per year has not yet been attained. A two-year diploma course for Animal Health Assistants is offered at the Animal Health Training Institute, which shares the same campus and many of the facilities of the Faculty of Veterinary Science. The Institute has a capacity of 90 students per year.

In the past 10 years, foreign scholarships for postgraduate degrees have resulted in a net annual addition to IAR staff of about 10 MSc and PhD degree holders. The future number of scholarships will depend on the results of discussions with the World Bank and the emphasis on scholarships in current and future research projects funded from other external sources.

A second major factor relating to supply of manpower to IAR is competition from other organizations within the country and abroad. Currently, the ONCCP Manpower Division has authority to allocate and assign diploma and degree recipients to government agencies in response to requests and within the constraints of available manpower.

Third, the net supply of staff for IAR must take account of attrition. Opportunities for postgraduate studies come through the employing institutions, and recipients normally return to those institutions. There has been significant attrition with respect to those studying abroad in the past, and some staff have left to take assignments elsewhere.

Data and analysis. It should be noted that the data used were the best available in the time available. There are small inconsistencies between tables that could not be resolved. The information and analysis are indicative and illustrative only. Most important, the thoughts on future programs are bare guidelines, and a more detailed research plan prepared by a broad group of senior national scientists is an essential prerequisite of a definitive manpower plan. However, despite the limitations, some broad conclusions can be reached, and inferences drawn, to guide further considerations.

The remainder of the chapter provides information and recommendations about the current manpower situation, the demand for expansion, the likely rate of supply, and possible ways of meeting needs.

5.2 Past and Present Manpower Situation in IAR

Research staff are organized by discipline-oriented divisions within centers of IAR. The main divisions are organized into departments at the national level. In addition, many staff are organized into commodity

teams. Accordingly, researchers report to three different administrators or coordinators for different purposes. A review of changes in manpower by position and the current distribution of manpower in IAR by center and division follows.

5.2.1 Manpower Distribution by Position

Researchers are organized in two main categories--Research Officers (RO) and Assistant Research Officers (ARO), with sub-categories in each. In general, RO staff are those with MSc and PhDs and ARO staff have BSc degrees. Primary technical support for researchers comes from Technical Assistants (TA) who generally have diplomas and Field Assistants (FA), most of whom have certificates.

Using the CGIAR Impact Study (1984)*, it appears that the number of ROs has increased two-and-one-half times, while the number of AROs has nearly doubled in the past six years. Data concerning research staff in the past four years show a doubling of ROs in levels III and I and nearly constant numbers in level II. Over the four years, ROs and AROs have increased by nearly two thirds, thus maintaining a ratio of 1 RO to 1.9 ARO (see Table 1).

In 1985/86, the ratio of researchers (ROs and AROs) to technicians (TAs and FAs) was 1 to 1.8. TAs, who have diploma-level training in agriculture, are available at an average of 1.1 per researcher. ROs, who are trained as researchers, have an average of about 2 AROs to work with in their programs. Variability is quite wide across divisions and centers.

5.2.2 Manpower Distribution by Education Level, Center, and Division

In October 1986, IAR had 17 PhD, 60 MSc, 153 BSc and 279 diploma level staff (see Table 2). The increases over 1985/86 came primarily from allocations of the ONCCP Manpower Division of 26 BSc degree holders from Alemaya and 33 diploma holders, primarily from Awassa Junior College. Returnees from study abroad raised the number of ROs by 4 in the previous few months. The distribution of staff at the centers generally relates to the nature of the center. The main reference research center at Holetta has half of the PhD degree staff and a fifth of the MSc staff to man the station programs as well as to provide leadership for the IAR departments. It is significant that there are currently no ROs at the new centers and existing sub-centers which have recently been staffed by IAR. While not all AROs and TAs have yet arrived, these centers currently have an average of 4 AROs and 6 TAs assigned to them. A total of 10 expatriates complement the staff at 4 centers, with half located at Holetta.

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* The impact of the collaboration between international agricultural research systems and the NARS in Ethiopia. Hailu Shawel and Akalu Negewo, December, 1984

TABLE 1

IAR Research Staff* by Position
1982/83 to 1985/86

	1982/83	1983/84	1984/85	1985/86
Research Officer III	7	11	16	13
II	15	17	17	16
I	22	28	39	44
Total Research Officers	44	56	72	73
Assistant Research Officers	80	87	105	139
Total Researchers	124	143	177	212
RO/ARO Ratio	1:1.8	1:1.5	1:1.5	1:1.9

* Figures do not include staff in degree training

TABLE 2

IAR Manpower Distribution by Center and Educational Level
October, 1986

Research Center	Education									Total
	PhD	MSc MA	BSc BA DVM	Diploma	Expatriates	Certificate Tech. Supp.	Certificate Admi. Supp.	Others Tech. Supp.	Others Admi. Supp.	
Existing Centers										
Awassa	2	7	11	20	-	24	6	48	28	146
Bako	1	6	17	27	2	8	9	115	145	330
Debre Zeit	1	-	1	1	-	-	-	-	-	3
Holetta	8	12	24	44	5	39	10	82	126	350
Jimma	1	6	12	25	-	9	9	349	26	437
Mekele	-	3	4	8	-	8	4	13	17	57
Melka Werer	-	5	21	31	1	22	7	195	127	409
Nazreth	1	11	17	44	2	24	10	107	76	292
Plant Genetics	2	7	3	14	-	12	10	10	19	77
Head Office	1	3	16	25	-	-	49	-	58	152
All Existing Centers	17	60	126	239	10	146	114	919	622	2253
Sub-Centers										
Adami Tulu	-	-	5	6	-	1	2	14	20	48
Asossa	-	-	4	5	-	-	2	-	1	12
Pawe	-	-	5	6	-	-	2	1	2	16
All Sub-Centers			14	17		1	6	15	23	76
New Centers										
Abobo	-	-	4	4	-	-	-	9	3	20
Adet	-	-	4	6	-	-	6	1	3	20
Kobo	-	-	3	7	-	3	2	2	10	27
Sinana	-	-	2	6	-	-	1	-	1	10
All New Centers			13	23		3	9	12	17	77
ALL CENTERS	17	60	153	279	10	150	129	946	662	2406

IAR Manpower by Division and Educational Level
October, 1986

Divisions	Education									Total
	PhD	MSc MA	BSc BA DVM	Diploma	Expatriates	Certificate Tech. Supp.	Certificate Admi. Supp.	Others Tech. Supp.	Others Admi. Supp.	
Research Divisions										
Agricultural Engineering	-	-	3	-	-	-	-	-	-	3
Agronomy	1	5	6	11	1	11	-	22	-	57
Animal Feeds & Nutrition	-	2	6	15	1	2	-	23	7	56
Animal Health	-	-	3	5	1	-	-	-	-	9
Animal Production	1	5	13	12	-	6	-	67	173	277
Crop Protection	2	6	16	23	2	25	-	48	2	124
Coffee & Other Stimulant Crops	1	3	6	13	-	8	-	305	2	338
Farm Implements	-	2	2	6	1	6	-	-	2	19
Field Crops	7	11	34	56	1	35	-	85	6	235
Food Science	-	-	1	3	-	-	-	1	-	5
Horticulture	-	2	12	24	2	14	-	129	8	191
Irrigation	-	-	2	3	-	2	-	26	3	36
Meteorology	-	-	-	-	-	3	-	1	-	4
Plant Genetics Resources Center	1	7	2	13	-	11	-	10	-	44*
Power & Energy	-	1	-	1	-	-	-	2	-	4
Sericulture	-	-	-	2	-	1	-	5	-	8
Socio-Economics	-	2	12	11	-	3	-	1	-	29
Soil Science & Water Management	2	8	9	23	1	16	1	26	1	87
Sub Total	15	54	126	221	10	143	1	751	204	1525
Support Divisions										
Administration & Finance	2	-	18	34	-	-	125	2	430	611
Building Construction & Maintenance	-	-	-	4	-	-	1	-	1	6
Farm Management	-	-	-	7	-	5	1	193	23	229
Planning & Project	-	1	5	1	-	-	-	-	-	7
Publication & Documentation	-	-	2	4	-	-	1	-	4	11
Research Centers Development Coordinator	-	-	-	1	-	-	-	-	-	1
Research Extension & Coordination	-	5	1	7	-	2	-	-	-	15
Training & Manpower Development Service	-	-	1	-	-	-	-	-	-	1
Sub Total	2	6	27	58	-	7	128	195	458	881
GRAND TOTAL	17	60	153	279	10	150	129	946	662	2406

* Excluding Coffee Protection & Research

TABLE 4

Average Staff Tenure *
IAR - October, 1986

Existing Centers	PhD	MSc	BSc	Total
Awassa	-	6.8	3.0	4.4
Bako	9.0	6.8	5.8	6.2
Holletta	14.7	9.9	4.5	7.9
Jimma	16.0	6.3	2.3	4.5
Mekele	-	6.7	4.0	5.3
Melkawerer	-	10.5	3.4	5.2
Nazreth	3.0	7.2	2.9	4.7
Plant Genetics	15.5	4.7	2.7	6.0
Head Office	2.0	9.0	-	5.5
All Existing Centers	12.9(15)	7.5(57)	3.8(100)	5.8(172)
Sub-Centers				
Adami Tulu	-	-	.8	.8
Asossa	-	-	1.0	1.0
Pawe	-	-	.8	.8
All Sub-Centers	-	-	.9(14)	.9(14)
New Centers				
Abobo	-	-	1.0	1.0
Adet	-	-	.3	.3
Kobo	-	-	1.7	1.7
Sinana	-	-	.3	.3
All New Centers	-	-	.8(14)	.8(14)
ALL CENTERS	12.9(15)	7.5(57)	3.2(128)	5.1(200)

* Average years includes study leaves.

( ) = number of staff

TABLE 5

New Staff* IAR, 1986

Degree Level	Requested	Allocated	Deficit
BSc Degree			
Alemaya College			
Agricultural Economics	2	2	-
Agricultural Engineering	1	1	-
Animal Science	4	2	2
Plant Science	36	21	15
Total BSc Degree	43	26(60%)	17
Diploma			
Awassa Junior College			
Animal Science	5	5	-
Home Economics	1	1	-
Plant Science	53	24	29
Total	59	30(51%)	29
Debre Zeit Animal Health Training Institute			
Vet. Assistant	1	1	-
Jimma Junior College			
General Agriculture	1	1	-
Total Diploma	61	32(52%)	29
Total All Degree & Diploma Levels	104	58(56%)	46

* ONCCP also provided IAR with 22 of 64 requested degree and diploma staff with non-agricultural degrees and diplomas.

( ) = percent of IAR request allocated to IAR

Source: ONCCP Manpower Division

A researcher's position (JRO, ARO and RO I-III) relates closely with education level. Therefore, promotions of researchers come primarily through the awarding of fellowships for postgraduate studies. In fact, several persons at the upper levels moved there from lower levels through receiving both MSc and PhD degrees while with IAR. In general, mobility for researchers within IAR is good.

Technical assistants, the primary technically trained support staff for researchers, are generally not able to move upward in the organization because IAR does not generally award fellowships for BSc degree study.

IAR has recently developed and received Board approval for a new career structure and salary scale (yet to receive approval from Government). The proposed new titles are: Graduate Research Assistant, Assistant Researcher, Researcher I-III, Assistant Research Scientist I-III, Associate Research Scientist I-III, and Research Scientist I-II. The more highly differentiated structure offers mobility related directly to research performance, with salaries to match. The ISNAR team commends the new proposals most strongly.

5.3 Manpower Needs Assessment

While it was not possible to conduct a thorough analysis of either program or manpower of IAR, the ISNAR team indicated some program areas which appeared to require strengthening in the future in light of a changing research environment. The combination of redirection of effort and the planned growth of IAR will place increasing stress on existing staff and will require a high rate of infusion of new staff at the researcher levels over the next nine years.

5.3.1 Program Recommendations

The implications of possible future research programs and center development for the expansion and distribution of research staff in IAR have been discussed in Chapter 2. The broad conclusions were:

* A wider approach to overcoming constraints in the full farming system should be adopted, which would mean a higher proportion of agronomists and livestock specialists.

* More attention should be given to interfacing with the new description of natural resources, and to conservation-oriented cropping systems, which would mean more natural resources scientists and agronomists.

* Research programs to meet the differing functions of the new commodity research centers, zonal research centers, and sub-centers would require multidisciplinary teams of different composition and focus, and a considerable increase in research staff.

* A strong support group in special disciplines and services, such as biometrics, would have to be maintained in a reference center.

A quantitative illustration of some implications for staffing patterns of research staff at different centers and sub-centers at the end of the planned expansion period is given in Annex F.

5.3.2 Requirements by Position

The Government has recently made a decision to expand in the next nine years the number of centers from the current 11 (of which 4 were established this year) to 14 and the number of sub-centers from 5 (of which only 3 have recently received research staff) to 43. IAR responded with a study of manpower requirements which showed the need for a doubling of total manpower over the next nine years (see Table 6).

The projections show a greater increase in research and research support staff than in other support staff. Both ROs and AROs would more than double (111% increase) from current October 1986 figures shown in Table 2. Technical Assistants would double, while Field Assistants would increase six-fold. In general, the current ratios of RO to ARO (1:2), RO and ARO to TA (1:1.2) and RO to ARO to TA (1:2:3.6) would remain about the same, which means that there would continue to be sufficient room for staff mobility. However, there should always be scope for upgrading of staff by level of education within positions. The ISNAR team recommends that IAR adopt as a matter of policy a deliberate, steady growth in the qualifications of staff assigned to positions. In the new career structure, for example, IAR should strive for increasing the proportion of those trained at higher levels within each of the ranks above assistant researcher.

While it is possible to prescribe staff ratios on an institution-wide basis, these should not be applied uniformly to each research division, center or commodity team per se. What is needed for a livestock program may be quite different from a national soils program or a cotton program at a station. For the institution as a whole, and considering the recommended policy of upgrading within rank, the current ratio of 1 RO to 2 AROs may be satisfactory during a period of expansion. The number of TAs in relation to ROs and AROs could be increased slightly to effect a 1:2:4 ratio of RO:ARO:TA.

5.3.3 Requirements by Education Level

IAR has generally equated position level to education level, although the new career structure allows more latitude within rank. The ISNAR team endorses IAR's resolution to aim at having persons trained to do research (MSc and PhD) to make the decisions on research studies, evaluating materials and results, make recommendations, etc. Those with a new BSc degree have a background in science, but must be taught research methodology through experience and/or further systematic training to become researchers.

If the projections of IAR by position are translated to degree level, IAR will need at the beginning of 1994/95 40 PhD, 125 MSc, 321 BSc and 560 diploma-level staff (see Table 7). This means an effective increase of about 3 PhD, 7 MSc, 21 BSc and 35 diploma-level staff each year.

The levels of training and recruitment required to meet this annual growth rate must take into consideration the replacement of staff sent for postgraduate degree training, normal staff attrition, attrition among trainees, and the length of time in training. For illustration, in Table 7, it was assumed that there is a 5% attrition of staff each year and a 20% attrition among those on long-term postgraduate training. Time

TABLE 6

IAR Staff by Position

	ACTUAL October 1986 NO.	PROJECTED 1994/95 NO.	% INCREASE
Research Staff			
Research Officer	77	165	114 %
Assistant Research Officer	153	321	110 %
Total	230	486	111 %
Research Support Staff			
Technical Assistants	279	560	101 %
Field Assistants	150	871	480 %
Total	429	1431	234 %
Other Support Staff			
Administrative & Clerical	791	1157	
Laborers and Others	946	1563	
Total	1737	2720	
Expatriates	10	-	
GRAND TOTAL	2406	4680	
Ratios			
RO:ARO	1:2	1:1.9	
RO+ARO:TA	1:1.2	1:1.2	
RO:ARO:TA	1:2:3.6	1:1.9:3.4	
RO+ARO:TA+FA	1:1.8	1:2.9	

TABLE 7

IAR Staff Projections for Research Centers and Sub-Centers
1985/86 to 1994/95

	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	RATIOS
Research Staff											
PhD (RO)	17	17[1]	18[1]	20[1]	22[1]	26[1]	31	34	37	40	
MSc (RO)	60	67[1]	64[1]	72[1]	81	90	99	108	117	125	1.0
BSc (ARO)	129	153[1]	174	195	216	237	258	279	300	321	2.0
Total	206	219	256	287	319	353	388	421	454	486	
Research Support Staff											
Diploma (TA)	248	283	317	352	386	421	455	490	525	560	3.4
TOTALS	454	502	573	639	705	774	843	911	979	1046	

IAR Training and Recruitment Requirements
1985/86 to 1994/95

	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95
Scholarships										
PhD	2[2]	6[2]	8	6	6	6	-	-	-	-
MSc	6[2]	7[2]	22	22	23[3]	23[3]	24[3]	23[3]	-	-
Total Scholarships	8[2]	13[2]	30	28	29	29	24	24	-	-
Recruitment										
BSc	?	26[4]	52	53	55	56	58	58	59[3]	60[3]
Diploma	?	32[4]	50	53	53	56	57	60	61	63
Total Recruitment	?	-	102	106	108	112	115	118	120	123

[1] Predetermined by current pipeline and attrition for training
[2] Already sent for training
[3] Assumes continued replacement of PhD and MSc candidates for training
[4] Already obtained

NOTE: Training requirements include calculations of 5% staff attrition each year, 20% attrition of trainees, and replacements for those in training. Length of training shown as 4 years for PhD and 2 for MSc.

away is estimated at 4 years for a PhD and 2 years for a MSc. The resulting illustrative data show the need for about 6 PhD fellowships per year up through 1990/91, and 23 MSc fellowships per year to 1992/93. Annual recruitment levels for BSc and diploma entrants to IAR would be about 50 to 60 of each. (These figures are, of course, sensitive to the assumptions made; however, reducing attrition to an improbable 1% per year, and on long-term training to 10%, reduced BSc recruitment rates only to about 40 per year.)

5.3.4 Requirements by Discipline and Center

A detailed analysis of requirements by discipline and center is not possible at this stage. Broad indications have been discussed in Chapter 2, and a quantitative illustration given in Annex F.

As a general comment, it should be noted that there are important trade-offs among the number of research staff in a discipline, the number of research centers, the kinds of program that can be attempted, and the resources allocated, especially for transport and communication. The range of disciplines at a center required for only a moderately full research program is considerable (as can be seen in Annex F). Many centers rapidly multiply the number of staff required. Given adequate transport for frequent visits between centers, it is not imperative that a complete range be located at each center; some specialists and specialized equipment at one center can serve a wide area and contribute to many programs, when full-time attention is not required. However, each major center should have a minimum of disciplines to meet its program objectives, as many programs need such frequent attention from individual scientists that intermittent visits are not sufficient. In general, IAR should ensure that enough transport and communication is available to make the best use of experienced specialists and avoid the expensive need to duplicate staff in positions where none of them are efficiently employed.

5.3.5 Program Implications

The manpower needs identified by IAR and commented upon here have implications for center development, staff development, staff benefits, financial support and political support for research.

The commitment to 14 centers and 43 sub-centers will be difficult to achieve unless most of the sub-centers remain essentially unstaffed at the researcher levels. This will be necessary in order to have well-developed and responsive centers and a few strategic sub-centers.

The staff development envisaged will require a much-increased rate of fellowships and recruitment of BSc graduates. Current pipeline estimates indicate that the projected rate of growth at the MSc level will fall far short in the next two years and will require that more than 20 MSc scholarships be made available this year for study next year (mostly abroad). Numbers of PhD-level staff will essentially remain the same for the next year or two, but 8 scholarships for PhDs abroad will need to be obtained this year for study next year. BSc recruitment next year will need to be double the amount received this year to maintain the pace of staffing required by the beginning of 1994/95.

Financial support for recurrent costs of the increased staff will be necessary. In 1986/87 operational budget (covering salaries and operating costs, but not capital investment) was Br 24.8 million (from Government allocation, loan, and aid), supporting about 210 scientists (RO and ARO), giving an average operational expenditure per scientist of about Br 118,000. This is in line with expenditure rates in many African countries, all of which are rather low compared to those in the most effective countries. To sustain this level of funding at the target research total of 486 in 1984 will require a recurrent budget, in 1986 terms, of Br 57.3 million. As indicated in 5.1.1, this is not an unreasonable rate of investment in agricultural research operations in a country so heavily dependent on agriculture. Political support and commitments must be maintained over a sustained period in order to have a responsive, growing research system.

5.4 Supply of Manpower

Access to manpower by IAR at the entry level (TA and ARO) comes through assignment by the ONCCP Manpower Division. The number of new staff available to IAR in any one year is a function of the number of graduates in the field and the demand for the graduates from other organizations. Access to postgraduate degree trained staff by IAR comes primarily through fellowships (mostly foreign) for existing staff in IAR. A few staff have joined IAR with MSc degrees, mostly from USSR and Eastern European universities. Most IAR staff on fellowships are committed to return to IAR upon completion of their studies. Critical factors for the growth of IAR, therefore, are access to quality staff from local institutions who can serve IAR, and development of the BSc trained staff who form the pool from which to offer postgraduate training.

5.4.1 Local Institutions

5.4.1.1 Graduate level

Currently, Alemaya University is the only institution in Ethiopia which offers MSc and BSc degrees in agriculture. The Faculty of Veterinary Science of AAU offers DVM degrees. Addis Ababa University offers MSc and BSc degrees in disciplines other than agriculture, some of which may be relevant to IAR.

Alemaya University became such in 1985 after a 33-year history as the College of Agriculture at Alemaya, first within the Ministry of Agriculture and then within the Addis Ababa University. The institution began granting MSc degrees in 1980. Currently, Alemaya offers the BSc degree in Agricultural Economics, Agricultural Engineering, Animal Science, and Plant Science, and the MSc is offered in all of these except Agricultural Engineering. The University has a mandate for teaching, research and extension and has activities in all three areas.

The number of faculty involved on campus in the past several years has been just under 100, with about 20% being expatriates. The number of staff at the MSc level has steadily increased while those at the PhD and BSc levels have varied considerably. Faculty/student ratios have ranged from 1:10 in 1983/84 to 1:18 in 1986/87, thus reducing the amount of time available for research in recent years (see Table 8). Alemaya currently

TABLE 8

Academic Staff Qualifications*
Alemaya University
1979 to 1986

	1982/83	1983/84	1984/85	1985/86	1986/87
PhD	23(17)	16(11)	15(6)	28(14)	23(13)
MSc	19(6)	33(7)	43(9)	47(7)	47(6)
BSc	29(2)	45(-)	44(3)	18(2)	24(-)
Total	71(25)	94(18)	102(18)	93(23)	[illegible](19)
Students	876	967	1325**	1394**	1670**
Ratio	1:12	1:10	1:13	1:15	1:18

* Staff in post first semester excluding those on study leave

** Includes diploma students

( ) = Number of which are expatriates

Source: Commission on Higher Education

has 160 academic staff (BSc and above), of which 66 are on study leave (mostly out of the country) and 19 are expatriates. Of the 160, only 29 have professional rank, which reflects the low average age of the academic staff. The greatest number and most senior staff are in the plant sciences (see Table 9).

Enrollments for the MSc have been consistently around an average of 36 students, and graduates have averaged 12 per year. BSc enrollments over the past 8 years have gone from 762 to 1413, with an average of 938. The numbers of BSc graduates over this period have been extremely variable, but have averaged 191 per year (see Table 10). Current enrollment is 42 MSc students and 1413 BSc students; fourth-year enrollments, the pool from which IAR will draw its new ARO staff, total 248, with 68 in the plant sciences, 66 in agricultural economics, 60 in agricultural engineering and 54 in animal science (see Table 11).

Last year, IAR received 26 or 12% of the 211 graduates available from Alemaya. The Ministry of Agriculture received 51%, and other government agencies and colleges received the remaining 37%. IAR has the unique privilege of selecting research staff from Alemaya once the University has retained those needed for new academic staff. Last year, IAR was assigned all those it had selected on the basis of eligibility for subsequent registration for an MSc degree, even though twice as many were needed and requested (see Table 12).

Alemaya University is involved in research funded primarily through the Commission on Higher Education, other government agencies and external sources. While research at Alemaya is not determined by IAR, Alemaya staff participate in the National Crop Improvement Conference (NCIC) and serve on IAR commodity teams. Assignment of Alemaya to be responsible for agricultural research in the highlands of Hareree is under active discussion.

Alemaya has a substantial staff capability for agricultural research and, for the sake of quality of IAR recruits, and relevance of teaching for new ARO staff, it is important that significant research be conducted there by the academic staff. However, given the heavy teaching loads at Alemaya and the young staff there now, it is not likely that they will be in a strong position to expand their MSc program in the near future, nor can the University be depended upon for substantial research output for some years. The ISNAR team recommends that IAR work closely with Alemaya University to encourage the strengthening of the research and education programs there through external assistance and internal funding.

5.4.1.2 Diploma level

The Junior College at Awassa provides most of the manpower required by IAR at the diploma level (TAs). Other sources are the Junior Colleges at Jimma and Ambo which provide diplomas in general agriculture and the Animal Health Training Institute at Debre Zeit, which provides diplomas for veterinary assistants. The Junior College at Debre Zeit was moved to Alemaya in 1983. Awassa College and the diploma program now at Alemaya provide differentiated diplomas: Awassa in Agricultural Engineering, Animal Science, Home Science, and Plant Science; and Alemaya in Agricultural Economics, Animal Science and Plant Science. The Animal Health Training Institute provides diplomas in Animal Health and Animal Science.

TABLE 9

Academic Staff Alemaya University
October 1986

DEGREE LEVEL	AGR. ECON.	AGR. ENG.	AN. SCI.	PL. SCI.	NAT'L & SOC. SCI.	TOTAL	STUDY LEAVE	NET STAFF
PhD	5	3	4	12	1	25	2	23(13)
MSc/MA	11	3	13	29	16	72	25	47(6)
BSc	16	4	10	21	10	63	39	24
TOTAL	32	10	27	62	27	160	66	94(19)
DIPLOMA	1	2	7	8	7	25	-	25
TOTAL	33	12	34	70	34	185	66	119
ACADEMIC RANK								
PROFESSOR	1	-	-	-	-	1		
ASSOC. PROFESSOR	-	-	3	9	1	13		
ASST. PROFESSOR	4	3	3	4	1	15		
LECTURER	11	3	12	28	16	70		
ASST. LECTURER	11	2	8	12	8	42		
GRAD. ASSISTANT	5	2	1	9	1	19		
TOTAL	32	10	27	62	27	160		

( ) = Number of which are expatriate

Source: Alemaya University

Enrollments & Graduates, Alemaya University
1979/80 to 1986/87

GRADUATE LEVEL	1979/80	1980/81	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87	Total	Ave/Yr
MSc ENROLLMENT	30	39	39	41	35	32	35	42		36
MSc GRADUATES	1	13(4)	17(4)	9	12	17(1)	2(1)	-	71	12**
BSc ENROLLMENT	762	704	772	835	932	948	1138	1413		938
BSc GRADUATES	93	305	226	107	257	135	211	-	1334	191
DIPLOMA ENROLLMENT*	-	-	-	-	-	345	221	215		781
DIPLOMA GRADUATES*	-	-	-	-	-	225	98	-	323	162

* Diploma program transferred from Debre Zeit

** Excluding year 1

( ) = number of which are now IAR employees

Source: Commission on higher education and Alemaya University

TABLE 11

Enrollment Alemaya Unive sity
1986/87

DEPARTMENT	MSc TOTAL	BSc 1st YR	2nd YR	3rd YR	4th YR	TOTAL
AGR ECON	11	-	-	60	66	-
AGR ENG	-	-	-	61	60	-
AN SCI	13	-	-	60	54	-
PL SCI	18	-	-	113	68	-
TOTAL	42	519	352	294	248	1413

Source: Alemaya University

TABLE 12

Employers of BSc Degree Awardees
Alemaya University, 1986

	IAR	MOA	Other*	Total
Agricultural Economics	2	34	23	59
Agricultural Engineering	1	12	17	30
Animal Science	2	35	10	47
Plant Science	21	27	27	75
Total	26	108	77	211
Percent	12%	51%	37%	100%

*Includes Commission on Higher Education

Source: ONCCP Manpower Division

Last year, IAR received 30 of the 61 diploma-level students requested, and all but two were from Awassa. This College consistently graduates about 260 students each year, mostly in the plant and animal sciences. It would appear that the pool of graduates from junior colleges are in demand by a number of Government agencies (see Table 13).

5.4.1.3 Other sources

IAR has recruited DVMs from Addis Ababa University but from no other disciplines, but many others could be suitable. The team recommends that students from Addis Ababa University who are trained in the basic sciences, (e.g., biology, physics, and chemistry) the socio-economic disciplines, and statistics be considered for entry positions with IAR. This would expand the sources of staff and diversify skills available to IAR which are necessary for a well-developed agricultural research organization. It may be necessary to ensure that some overseas postgraduate training institutions will accept basic scientists for master's degrees in agriculturally related fields.

5.4.2 Postgraduate Training of IAR Staff

Since Alemaya is not currently a major source of training for IAR staff to postgraduate levels, IAR must continue to depend upon MSc and PhD degree training abroad. Therefore, the pace of staff development at RO levels will continue to depend upon the number of fellowships awarded to IAR for postgraduate degrees, mainly from external sources. The 31 IAR staff currently abroad will return at a rate of about 10 per year. In order to achieve the pace of growth planned by IAR, about 30 staff will need to go abroad for advanced degrees in each of the next several years (see Table 7).

Short-term training opportunities also have been used to upgrade existing RO staff. The ISNAR team recommends that IAR continue to seek opportunities for involvement of staff in short-term, structured training courses, particularly those offered by the international agricultural research centers, where relevance to Ethiopia's problems is more assured. Efforts should be made to include training of IAR staff in agreements with the IARCs for collaborative research.

5.4.3 Expatriate Staff

IAR currently has 10 expatriate staff in its service. By contrast, Alemaya University has 19. In view of the current shortage of senior staff and the critical need to train the younger staff, the team recommends that IAR seek to complement its senior core with an additional 10-15 PhD-level expatriates. As expatriates are likely to be short-term, they could well be assigned to short-term emergency programs.

5.4.4 Future Supply of Manpower in Ethiopia

The current demand for agriculturally trained manpower from government agencies appears to be much higher than the supply of available graduates. At the BSc level, the 211 graduates placed by ONCCP Manpower Division in 1986 represented 53% of those requested. IAR took only 12% of those available, representing those it felt would be adequately qualified for research. While the pipeline will assure a

TABLE 13

Diploma Graduates in Agriculture
1979/80 to 1985/86

	1979/80	1980/81	1981/82	1982/83	1983/84	1984/85	1985/86	Ave/Yr
Awassa Junior College								
Agricultural Engineering	-	39	43	40	38	41	47	
Animal Science	-	82	87	80	86	83	65	
Home Science	-	23	25	19	27	31	25	
Plant Science	-	93	98	103	100	116	70	
General Agriculture	-	-	-	-	-	-	59	
Total	336	237	253	242	251	271	265	265
Debre Zeit Junior College*								
Animal Production	-	51	52	38	52	59	24	
Crop Production and Protection	-	100	105	68	82	84	28	
Rural Economy	-	72	81	66	76	82	46	
Total	212	223	238	172	210	225	98	197
Ambo Junior College	68	84	106	76	110	77	118	91
Jimma Junior College	90	146	110	124	218	93	266	150
School of Animal Health at Debre Zeit	64	69	60	76	60	78	70	68
TOTALS	770	759	767	690	849	744	817	771

* Students graduated from Alemaya since 1984/85

similar total number of graduates next year, IAR will need to be assured of twice the number of new staff from Alemaya to maintain its planned pace of development. Competition from other sources and the quality of staff required may make this goal difficult. After 1987 the Commission of Higher Education plans to expand the program of Alemaya to include new BSc programs in Forestry, Crop Protection and Veterinary Medicine (relocated) and expand the offerings at the MSc level to include Agricultural Marketing, Agricultural Engineering, and Crop Protection. It is understood that the program at Awassa may be expanded in the near future to include a BSc degree. Quality of BSc graduates may be the critical factor for meeting IAR staff needs in the next several years.

The situation at the diploma level is more encouraging. The total of 778 graduates were placed in government agencies by ONCCP Manpower Division, representing 80% of those requested. IAR received 32 of the 61 requested. To improve the situation at the diploma level, the Commission of Higher Education is planning to double enrollments by expanding Ambo and Jimma, developing a new Junior College in Gojam Province and phasing out the diploma program at Alemaya. Since the turnover is every two years, IAR may not have substantial difficulties in obtaining diploma-trained staff in the near future (see Table 14).

5.5 Meeting Manpower Needs

It is generally recognized that the numbers and overall levels of experience of IAR staff fall short of that which is required to respond to Ethiopia's current and future needs. In view of the planned growth of IAR, great emphasis on manpower issues is critical.

5.5.1 Manpower Plans and Program Development

Manpower plans per se must be developed internally within IAR. Once decisions are made on programs and activities within them, only IAR can make a realistic assessment of current staff qualifications, allocations of staff to activities and the potential for short-term growth through recruitment and those returning from study abroad. Once broad program decisions are made on a long-term basis, IAR can project staff needs and plan for staff degree training accordingly. Because of the long-term perspective needed, the team recommends that manpower planning be done on a 10-year rolling basis.

Constant adjustments will be required in response to external forces beyond the direct control of IAR, such as a deficit in numbers of staff allocated by ONCCP or a lack of scholarships in key program areas. This may require IAR to make critical decisions about the development of new centers. While it is clear that the centers will have to be phased in as external and local resources are identified, the team recommends that IAR phase center development in relation to the availability of ROs and AROs required for the centers' programs. The kinds of projects and programs possible are closely related to the quality of staff available.

Since it will be difficult for IAR to meet its immediate needs for staff for short-term research programs, alternative sources of staff must be considered. It may be necessary to obtain increased numbers of expatriates in the near term. They should be experienced researchers and

TABLE 14

Supply and Demand - Agricultural Manpower by Degree, Institution, and Discipline, 1986

Degree Level	Requested	Available Graduates*	Deficit (Surplus)
BSc Degree			
Alemaya College			
Agricultural Economics	142	59	83
Agricultural Engineering	68	30	38
Animal Science	58	47	11
Plant Science	132	75	57
Total BSc Degree	400	211(53%)	189
Diploma			
Awassa Junior College			
Agricultural Engineering	64	48	16
Animal Science	64	65	(1)
General Agriculture	32	58	(26)
Home Economics	28	25	3
Plant Science	136	70	66
Total	324	266(82%)	58
Debre Zeit Junior College			
Animal Husbandry**	42	24	18
Plant Protection**	41	28	13
Rural Econ. & Social Dev.**	72	46	26
Vet. Assistant	76	70	6
Total	231	168(73%)	63
Ambo Junior College			
General Agriculture	288	118	170
Jimma Junior College			
General Agriculture	127	226	(99)
Total Diploma	970	778(80%)	192
Total All Degree Levels	1370	989(72%)	381

* All placed by ONCCP Manpower Division.
** Currently at Alemaya University
( ) = percent of request available and allocated to government agencies including IAR

Source: ONCCP Manpower Division

be distributed in such a way as to have an impact on the in-service training of younger staff of IAR. Another option for meeting more immediate program demands is to exploit other organizations and thus reduce the need for added manpower, particularly where these organizations have a comparative advantage over IAR in specific areas. This can be accomplished by expanded collaborative efforts such as are now underway with some of the IARCs; through the funding of student and faculty research consistent with IAR established priorities; and by contracting with other local organizations for services (such as the state-of-the-art study by AAU on agricultural research/extension in Ethiopia).

On the longer term, as mentioned previously, the opportunity of recruiting basic science and social science graduates from AAU should be explored.

5.5.2 Training Requirements, Strategies and Plans

IAR currently has 33 RO and ARO staff away for training and about 230 in service. In any one year in the future, IAR will need to have as many as 60-70 away for training in order to meet its planned targets in the next 9 years. An outcome will be a sharp increase in recruitment, particularly at the BSc level, and the concommitant lowering of the average age and experience of AROs. To respond to this new situation, IAR will need to develop all possible training strategies and plans for staff development that are reasonably compatible with program management.

All modes of in-service, formal and informal training of inexperienced staff should be considered. Possibilities should be explored for the development of regularized, in-service training using in-house staff, university professors, and staff of international organizations in Ethiopia. The occasional opportunity for young staff to participate in internationally sponsored, short-term training in Ethiopia should be seized, but not relied on for staff development. Further, staff assignments should be made so that experienced staff can be used for informal training of new staff. Opportunities should be sought for mid-level staff (minimum of MSc) to receive specialized short-term training abroad of from one to four months in duration. Emphasis, however, should be given to degree training in the next several years.

As Alemaya has the only capacity in Ethiopia to offer MScs in agriculture, the team reinforces the recommendation that IAR give full consideration to ways in which it can strengthen Alemaya to serve IAR's needs for trained staff. Some possibilities are: support and encouragement of student and faculty involvement in research and support for fund-raising activities for this; defining specific research responsibilities of Alemaya and Awassa with respect to commodities and/or regions (under active discussion now); and active, selective involvement of IAR staff in educational activities at Alemaya and Awassa.

Considerable degree training abroad will continue to be necessary to develop research manpower in the next several years, and every effort must be made to secure fellowships. A recently declared policy that all those sent abroad must conduct their thesis research in Ethiopia is commendable, but some flexibility should be retained. In particular, for MSc degree programs, it should be sufficient to require that thesis

research be related to problems of Ethiopia. Research in Ethiopia by MSc candidates could lengthen the program excessively. For PhD degree programs, thesis research in Ethiopia is much more practical, but there are situations when relationship of the thesis research to Ethiopia's agricultural problems again should be sufficient.

5.5.3 Organizing for Manpower Planning and Development

IAR currently has a Promotion Committee at the national level and a BSc degree level staff person responsible for manpower training at all levels. Given the immediate and substantial task ahead to increase the pace of recruitment and training, both in-country and overseas, the team recommends that a formal Manpower Development Unit be established. The main tasks of this unit would be to: review future program and center manpower needs; organize in-service training; evaluate local educational institutions and assist them to meet IAR staff needs; and actively seek fellowships for non-degree training and MSc and PhD degrees abroad in relation to long-term program needs.

Chapter 6

CONCLUSIONS AND RECOMMENDATIONS

(Recommendations are recorded throughout the preceding chapters at appropriate points in the text; not all of them are included in this recapitulation.)

The Institute of Agricultural Research in Ethiopia has a sound basic structure and organization with a semi-autonomous status and a strong Board of Directors responsible for policy, whose membership links IAR firmly to its client development ministries. IAR has a reasonably well distributed set of research stations, which is currently being improved and expanded. In the current agricultural research development project, the research facilities and quality of equipment at some research stations are being improved, but further development will be necessary in due course. The recent reorganization at headquarters and in research centers is commendable, although the rate of development of the new research centers will be limited by the supply of trained research staff. The research staff themselves appeared vigorous, enthusiastic, in good morale, and of high promise. However, many are relatively young and need the guidance of the senior group of competent experienced scientists in addition to formal postgraduate training.

The ISNAR team principally addressed the issues of programming and future manpower planning. While finding a great deal in the system that was commendable, there were some procedures and planning perspectives that merit strengthening. (The following review changes the order of the presentation from that in the Terms of Reference and the main text, in starting with organization and management.)

6.1 Organization and Management

There are three major stages in program formulation: determination of policy and priorities; within priorities, identifying the main constraints and opportunities and determining the long-term program guidelines and future staff requirements; and annual program formulation at centers, based on available staff and facilities. The component parts of the annual program are then aggregated and reviewed in reverse order to check correspondence with long-term guidelines, budget allocation by priorities, and overall policy, before approval.

1. The Board of Directors is well placed to determine policy and priorities, although the team recommends that a technical secretariat in cooperation with the General Manager be given formal responsibility for providing position papers to the Board, and that IAR develop a competence in macro-economic research for policy analysis to assist in this and in communication with ONCCP.

2. There is no formal body responsible for the second stage in program formulation. The team strongly recommends that the General Manager appoint a small group from senior Division Heads and Commodity

Coordinators to serve as a technical advisory committee to the General Manager on long-term program planning and preparing medium-term program guidelines for research centers.

3. Program formulation at centers has a very commendable "bottom-up" orientation and is beginning to accomodate socio-economic criteria in choice of experiments. However, the team recommends the development of medium-term program guidelines (not narrow prescriptions) by the above technical advisory committee; and that formal multi-disciplinary program committees be established at centers to consider initial proposals, rather than mono-disciplinary groups.

4. Current program formulation is not linked quantitatively with either budget or the time allocation of research manpower. It is strongly recommended that a program budgeting system be introduced for realistic program definition in terms of staff time, budget preparation, and subsequent review and evaluation. Preferably this system should be computerized to provide a more flexible and valuable tool for management.

5. The team endorses the new scheme of service for research staff, and strongly recommends its adoption.

6. The team endorses the recent reorganization in headquarters and recommends that the position of Deputy General Manager (Research) be filled as soon as possible. The recent improvement in staffing of the Business and Development branch should be reinforced by providing a series of management training workshops, training visits to the best research institutes in Africa and Asia, and by recruiting a consultant to assist in drawing up an improved operational plan for administrative services in IAR.

6.2 Research Centers

In all agricultural research systems a balance has to be struck between maintaining an effective "critical mass" of research scientists at viable research stations, and having research stations in many ecological zones in the country. The balance can often be moved towards fewer stations by good transport and communication facilities.

1. The team strongly endorses the plan to establish eight zonal research stations and five national commodity research centers, but recommends strongly that the new stations be added only as Ethiopian and/or expatriate manpower becomes available to staff and provide program leadership for them (see 3.7).

2. The team recommends that the remaining main center at Holetta be retained as a center of disciplinary experience and specialist advice, with a mandate to include helping young research groups in other centers in the formulation and review of good quality experiments. (The responsibility for relevance of the experiments rests with the particular center management (see 2.3.2.3).)

3. The team recognizes the urgent need for sub-centers in new settlement areas and special circumstances, with immediate research objectives that cannot wait for the development of experience in new

recruits. It recommends that experienced expatriate staff be recruited, together with AROs, for these urgently need programs at sub-centers, with visits from senior national research officers to confirm relevance of the experimental programs.

4. However, the team questions the need for IAR to have all 43 sub-centers, most of which could be little better than field-trial sites. It recommends that plans for the development of sub-centers be combined with those of the Ministry of Agriculture for a Field-Trials Network of 56 sites with collaborative management by IAR and MOA (see also 6.4).

6.3 Research Program

Any research program is made up of urgent short-term, medium-term, and long-term elements. It is the needs of medium- and long-term programs that guide the recruitment and manpower development plans, which are necessarily long-term investments. Medium- and long-term program plans must take account of changes in the dynamic research environment. Recent changes include the demand from the new agricultural development zones for information related to the new natural resource base; the demand for conservation-oriented farming systems; the opportunities from opening up new agricultural areas; and new insight from socio-economic research into constraints of farming systems. They point to more intensive research on farming systems, especially cropping systems, in relation to the natural resource base, and a consequent increase in the proportion of agronomists, livestock scientists, and natural resources researchers in the total research effort. The staffing for the expanding network of research stations must take these and other identified factors into account. However, urgent short-term problems must also be attacked.

1. The team recommends that IAR reach decisions on major short-term, medium-term, and long-term research objectives, and determine the balance of research resources to be allocated among this set of objectives (see 6.1, numbers 2, 3, and 4).

2. The team endorses the crop improvement program and the operation of a national coordinated network of tests, but recommends that breeding work should be concentrated on a very few major crops in addition to the five main commodities, in order to maintain a better chance of impact. The team recommends that a broader farming system be considered, to include constraints in natural resources (including water), cropping systems, livestock interactions, and farmers' operational constraints, in addition to those of yield potential, pests, diseases, and plant nutrition currently taken into account.

3. The team considers that the livestock research program has grown seriously out of internal balance in relation to the national need. The team recommends that the cross-breeding element be reduced drastically, and resources diverted to higher-priority research. Nevertheless, the proportion of resources allocated to livestock research among main research sub-sectors should be increased to reflect the relative importance of livestock in the farming systems in Ethiopia's agriculture.

4. The five designated crops deserve high priority: the team recommends that the national commodity research centers be allocated full interdisciplinary research teams to work on improvement of the "priority crop" based farming system as top priority for additional staff.

5. Zonal research centers will be more concerned with testing materials from commodity centers, developing local production practices and advisory and training services. The team recommends that the pattern of staffing be built up to match these requirements, with initial emphasis on agronomists. The team sees no difficulty in one station serving as both national commodity and zonal research centers, provided it is recognized that adequate research manpower is allocated to each role.

6. As IAR expands into more research stations, there will be an increasing need for central support services. The team recommends that central analytical services and biometrics and data processing services be built up at Holetta. Also, there is a need to make improved presentations of research results to users.

6.4 Linkages with other Institutions

IAR has developed many efficient and fruitful linkages over the years with different institutions, national and international. In changing circumstances some linkages should be strengthened.

1. The Ministry of Agriculture is IAR's most important partner. The move to Agricultural Development Zonal Offices and to zonal research centers offers an excellent opportunity for closer linkages between IAR and extension and development departments. The team recommends that increased support be given to Research Extension Liaison Committees to encourage them to develop into the desired strong and effective instruments.

2. The continuous sequence of operations in technology generation and transfer from commodity research center, to zonal research center, to field trials, to on-farm trials, to farmers' demonstration plots moves from IAR through to Extension services. Responsibilities overlap at the stage of field trials. The team strongly recommends that the plans for development of IAR sub centers and MOA Field-Trials Network be treated as a collaborative program, to develop the strongest of linkages at this stage.

3. IAR linkages with the Cooperative Promotion and Agricultural Development Main Department are building up, especially through REILCs. The team recommends that equivalent formal joint technical committees be established with the Animal and Fisheries Resources Main Department, the Natural Resources Conservation and Development Main Department, and the Rural Infrastructure Development Main Department.

4. The development of Alemaya University of Agriculture is an integral part of the development of agricultural support services, including research and extension, and deserves strong support. In particular, Alemaya is critical for supplying high-quality recruits to IAR and, potentially, for in-service training to MSc level. It is also an important reserve of well-trained research capacity. The team

recommends that IAR encourage and support research activities by University staff in every way in order to improve the quality and relevance of the educational program, and to incorporate more of the research capacity of the University into the national research program.

5. The team recommends that stronger linkages should be developed between IAR and ILCA, particularly at this stage of development of the IAR livestock research program, and also with respect to the promising technology for draining the extensive vertisols.

6.5 Manpower Planning

A plan for future research manpower requirements must take into account the future research program needs for progress in development; the resources likely to be available for research; the likely supply of recruits; and the possibilities of postgraduate staff development. Following policy and priority guidelines from the Board, it is the senior staff at IAR that must make the decisions about the future research program and the specialized training required. Meanwhile, it was possible to attempt an indicative analysis of the prospects, based on the preliminary estimates of growth in research strength in the Plan period.

To reach the planned target in 1994 of 486 research staff (40 PhD, 125 MSc, 321 BSc) and 560 diploma-level support staff, with steady growth from the present base, requires an annual recruitment rate of about 50 to 60, both of BSc and diploma level personnel. To achieve the educational levels planned would require about 23 MSc fellowships and 6 to 8 PhD followships per year. It seems likely that the supply of diploma-level personnel will be able to meet this demand, but there is likely to be a shortfall in the supply of BSc recruits of academic quality likely to be acceptable for subsequent MSc enrollment, unless the standards of graduates from Alemaya improve, or competition for such graduates declines.

To find sufficient candidates in IAR for postgraduate training will be no problem; to secure sufficient fellowships for overseas training will be very challenging but not impossible, given a clear and well-argued plan. A successful program would mean about 60 to 70 IAR staff on postgraduate training for most of the period to 1994.

1. The ISNAR team considers the target total of 486 research staff quite reasonable for an agricultural country of about 54 million people in 1994, but questions whether the supply of graduate recruits will be adequate, and recommends that every step be taken to ensure an adequate supply of high-quality recruits, including:

a) recruitment of outstanding graduates in natural sciences and social sciences from Addis Ababa University;

b) increasing the number of expatriate staff for short-term research objectives;

c) contracting out some research tasks to other competent groups, such as the Institute of Development Research, AAU, and Alemaya University of Agriculture;

d) assisting Alemaya University to improve the number of high-quality graduates, e.g., by allowing staff to give seminars at Alemaya and supervising MSc thesis work.

2. While there is a deficit in the number of national research staff needed for proposed programs, the team strongly recommends that the bulk of national MScs and PhDs be maintained at the 14 main stations, and that strategic sub-centers be staffed by expatriates and AROs in the near future.

3. It is important to continue to develop staff as rapidly as possible through training in research methodology, and the team recommends that the postgraduate training program be geared to maintain or increase the proportion of ROs to AROs.

4. In light of the substantial recruitment and training program envisaged, the team recommends that a small manpower development unit be established (see 5.5.3).

5. While a long-term perspective must be maintained for manpower development, it is also necessary to maintain flexibility to allow for unforeseen opportunities or unavoidable difficulties, and the team recommends that a future program, staffing, and training plan be maintained on a 10-year rolling basis.

ANNEXES

Annex A

Brief Resumés of the ISNAR Team Members

MATTHEW DAGG

Matthew Dagg came to ISNAR as a senior research officer from New Delhi, where he was a program officer for the Ford Foundation and liaison scientist between IRRI and ICAR. Earlier, he had been Director of the Institute for Agricultural Research and Professor of Agricultural Science at Ahmadu Bello University in Nigeria. Before that he had been Head of the Physics Division at the East African Agriculture and Forestry Research Organization in Kenya.

Dagg is a native of the United Kingdom, where he earned B.Sc. (1952) and Ph.D. (1956) degrees at the University of Manchester. He became a Fellow of the Institute of Physics in 1970. Dagg has published papers on catchment-area research in East Africa, evaporation and water-balance of crops, and matching crops to environments in East and West Africa.

From 1971 to 1974 he was a member of the National Academy of Sciences committee on African agricultural research capabilities. He served on the Board of Trustees of the International Center for Tropical Agriculture (CIAT) in Colombia from 1975 to 1981.

At ISNAR, Dagg has participated in review missions in Africa, Asia, and the South Pacific.

WILLIAM K. GAMBLE

William Gamble was the first Director General of ISNAR, from September 1980 to November 1985

Author of several articles or presentations on tropical agriculture and co-author of a book on Mexico's agricultural development, he began his work in international development in 1952 in Burma as an agricultural advisor for the forerunner of USAID. In 1955 he joined the Ford Foundation in Burma and served there until he was transferred to Mexico in 1963. During the period 1963-70 he served as program advisor for agriculture and representative of the Ford Foundation for Mexico, Central America, and the Caribbean. He served in a similar capacity in Colombia and Venezuela, 1970-72, and in West Africa, 1972-75. In 1975 he became the Director General of the International Institute of Tropical Agriculture (IITA), a post he held until 1980.

Gamble is a native of the United States and earned his university degrees there. He obtained his B.S. degree (1948) in agricultural education and the M.S. (1949) in agricultural education and agronomy from Iowa State University and his Ph.D. (1961) in agricultural extension and agricultural economics from Cornell University.

As Director General, he played the key role in the consultative negotiations by which officials of the national systems and ISNAR established a working relationship. He also took an active part in all phases of the ISNAR program: he served as leader or team member on several country reviews, was closely involved in development efforts in individual countries, and presented lead papers at several major ISNAR conferences.

WILLIAM J.A. PAYNE

Dr. Payne has had wide experience in animal husbandry and forage research and research management in tropical countries. He has an MA from Cambridge and a doctorate in animal husbandry from the University of Glasgow. Following early research in Fiji, he was Head of the Animal Husbandry Division and Deputy Director at the East African Agriculture and Forestry Research Organization, Muguga, Kenya (1958-63), then Project Manager (UNDP/FAO) of the Dairy Training and Research Institute, Philippines (1963-68). Subsequently he has carried out many consultancies on livestock research and production in tropical countries for UNDP, FAO, Hunting Services, IBRD, CDC, ISNAR, and other agencies. He has served as Visiting Professor on Tropical Animal Science in the Univesity of the Philippines (1963-68) and the University of Florida (1970-75). He is author of two standard books on animal production in the tropics, and since 1970 has been general editor for the Longman Group of the "Intermediate Tropical Agricultural Series".

EMIL JAVIER

Emil Javier completed graduate studies in agronomy at the University of Illinois and in plant breeding at Cornell University. His major professional interests are forage and pasture crops breeding, agronomy and utilization, and integrated crop-livestock farming systems. He has been involved in rice, maize, sorghum, coconut, and fiber Musa breeding.

Dr. Javier has served as Chancellor of the University of the Philippines at Los Baños. He was Minister of Science and Technology of his country from 1981 to 1986. As Minister, he was also Chairman of the Governing Board of the Philippines Council for Agriculture and Resources Research and Development (PCARRD).

He was also the founding Director of the Institute of Plant Breeding and of the National Institute of Biotechnology and Applied Microbiology, both in the Philippines.

Javier was on the Technical Advisory Committee of the Consultative Group for International Agricultural Research for six years. He joined ISNAR in September 1986 as a Senior Research Fellow.

LARRY W. ZUIDEMA

Larry W. Zuidema is Associate Director, International Agriculture Program, Cornell University. He has degrees in agricultural economics and public adminstration from the University of Georgia and Cornell University. He is currently chairman of Northeast Council for International Development, and has been chairman of Farming Systems Support Project Advisory Council; Committee on Training of USDA/University International Science and Education Council; Association of U.S. University Directors of International Agricultural Programs; and National Conference on International Agricultural Training.

Recent consulting assignments include: development and supervision of agricultural manpower survey in Cameroon in 1979; organizational review and manpower development assessment of PCARRD in the Philippines in 1980 and 1984; preparation of comprehensive training plan for agricultural research and extension workers in Panama in 1983; agricultural research/extension consultant for FAO highlands agriculture development project preparation mission in the Philippines in 1984; and preparation of training needs assessment for farming systems research in the Philippines in 1985.

Annex B

Itinerary of ISNAR Team

DATE

October:

20		Matthew Dagg arrived in Addis Ababa Preliminary planning with Head, Department of Agriculture, Economic and Farming Systems Research - Mr. Mulugeta Mekuria Head, Department of Crop Improvement - Dr. Hiruy Belayneh
21		W.K. Gamble, E. Javier, W.J.A. Payne, and L.W. Zuidema arrived in Addis Ababa. Discussions with Mr. Mulugeta
22	a.m.	Briefing of team by General Manager, IAR - Dr. Semi Debela
	p.m.	Addis Ababa University (MD, EJ, LWZ, MM) Director of Research
23	a.m.	(1) Vice Minister for Cooperation, Promotion and Agricultural Development Main Department (All team) Head, Agricultural Extension Department Head, Agricultural Development Department (2) Head, Land Use Planning and Regulatory Department (MD)
	p.m.	(1) Head of Planning and Programming Department (All team) (2) ILCA, Director General and staff (All Team)
24		WKG, EJ, LWZ, MM to Dire Dawa Alemaya University of Agriculture
	p.m.	Vice President for Academic Affairs and Heads of Departments
		MD, WJAP, HB to Holetta Research Center: Co-Director, Scientific Phytopathology Laboratory Ambo: Dr. Taye
25		WKG, LWZ, MM: Alemaya University of Agriculture
		MD, WJAP, HB to Bako Research Center
26		WKG, LWZ, MM to Mieso Research Sub-Center and Melka-Werer Research Center

October:

	MD, WJAP, HB to Dedessa State Farm and Jimma
27	WKG, LWZ, MM at Melka-Werer, to Denbi Research Sub-Center, to Addis Ababa
	MD, WJAP, HB at Jimma Research Center
28	WKG, LWZ, MM to: (1) Ministry of State Farms, Director of Research (2) UNDP, Department Research Development (3) Commissioner for Higher Education
	MD, WJAP, MM to Addis Ababa
29	All team: (1) FAO: Resident Representative (2) EEC: Agriculture Advisor to Commission Delegate (3) World Bank: Resident Representative
30	WKG, WJAP, MM to: Nazreth Research Center Kolumsa Research Center (South Eastern Development Unit)
	MD, LWZ, HB to Bahir Dar: Adet Research Center Commissioner for Economic Planning
31	WKG, WJAP, MM to: Sinana Research Center Gobe Ranch
	MD, LWZ, HB to: Injibara National Field Trial Pawe Research Sub-Center Agronomy Group of Salini Construction Project

November:

1	WKG, WJAP, MM to: Awassa Research Center Adami-Tulu Research Sub-Center and to Addis Ababa
	MD, LWZ, HB to: Birr State Farm Bure Research Trial Site and to Addis Ababa
2	Writing and team discussion

November:

3 MD, EJ, WJAP, HB to:
Holetta Research Center

LWZ, WKG to IAR HQ: Manpower data

4 (1) WKG, EJ to IAR HQ: Administration and financial management
LWZ to Addis Ababa University: Institute of Development Research
(2) All team to Office of National Committee for Central Planning: Head of Manpower Planning Division in Department of Agriculture
(3) LWZ to Head of Extension Department, MOA
WJAP to Vice Minister for Animal and Fisheries Resources Development Main Department

5 a.m. MD, WJAP to ILCA: vertisol management project
WKG, EJ, LWZ to IAR HQ

p.m. MD to Land Use Planning and Regulatory Department
EJ, WJAP, LWZ to Agricultural Development Department, MOA
Discussion on National Field Trials Network

6 All team at HQ:
Discussion with Heads of Divisions from IAR Research Centers on findings and clarification of issues

7 (1) All team:
Office of National Committee for Central Planning
Head, Department of Agriculture
(2) MD, EJ, HB to:
Debre Zeit Experiment Station (Alamaya University of Agriculture)
ILCA Debre Zeit Sub-Station

8 Writing and team discussion

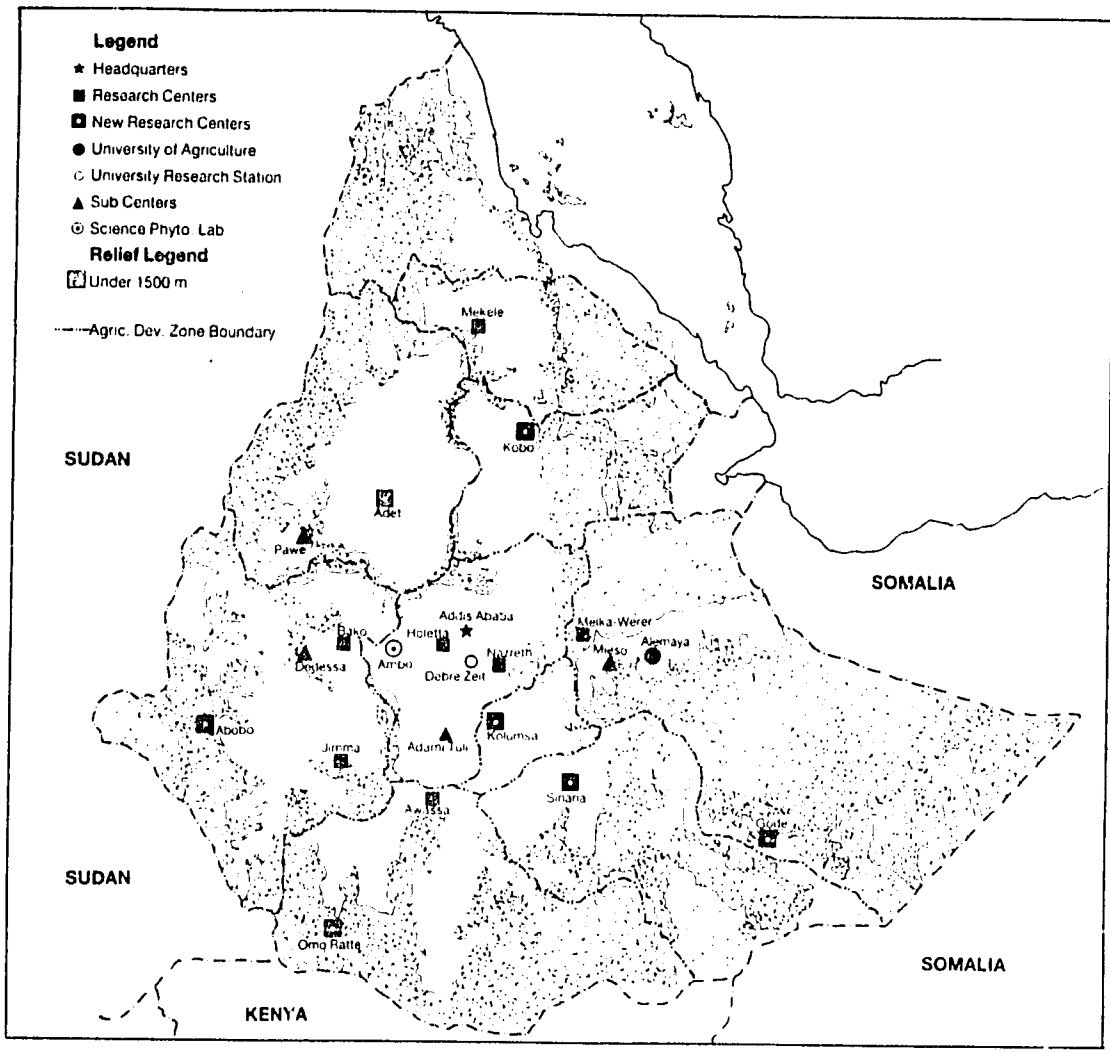
9 Writing and team discussion

10 a.m. MD preliminary discussion of findings with General Manager, IAR

p.m. MD, WKG to:
EEC Commission Delegate

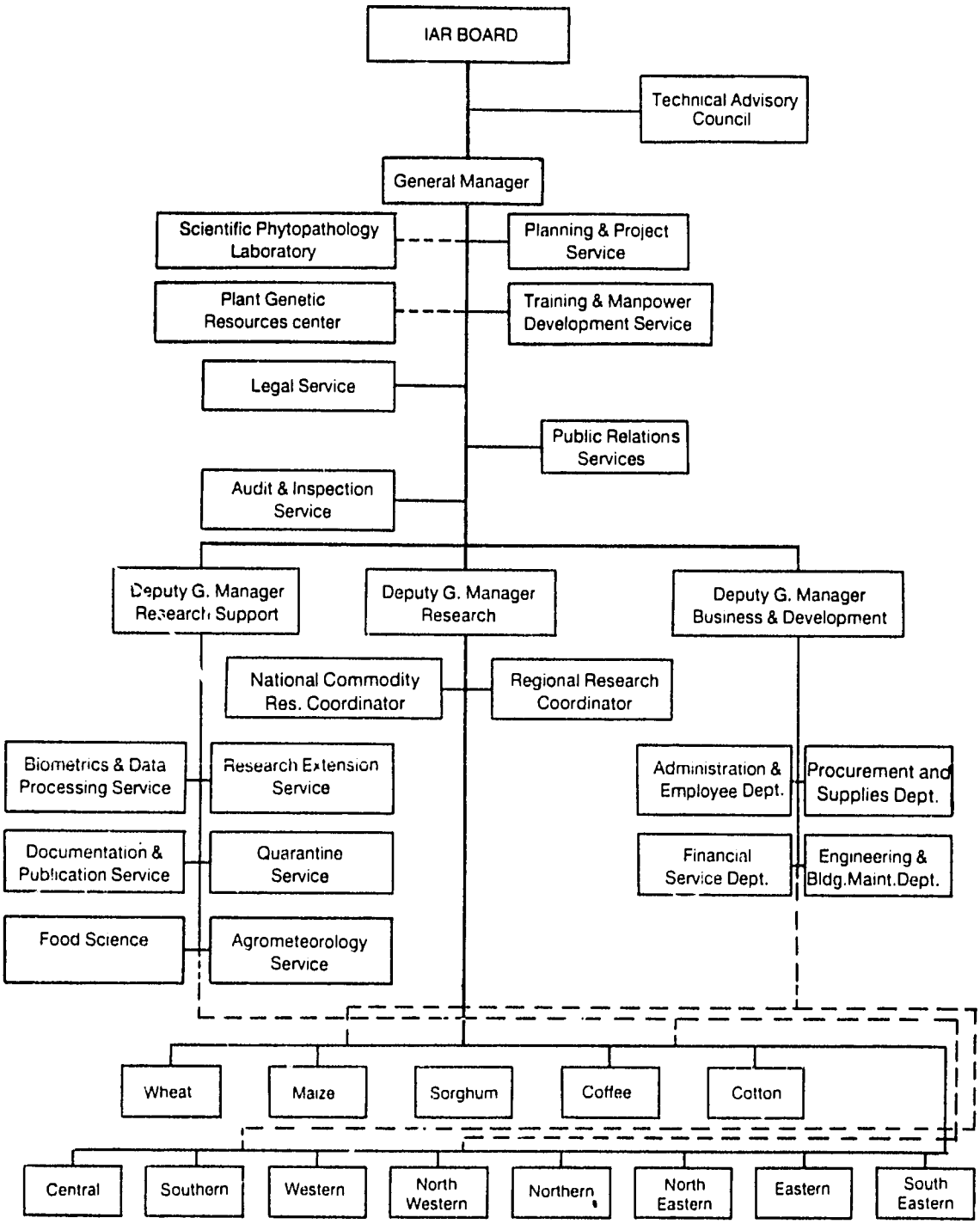
11 Final review session with General Manager and senior staff of IAR

Team departed for Netherlands.


Legend
Headquarters
Research Centers
New Research Centers
University of Agriculture
University Research Station
Sub Centers
Science Phyto Lab
Relief Legend
Under 1500 m
Agric. Dev. Zone Boundary
SUDAN
SOMALIA
KENYA
Mekele
Kobo
Adet
Pawe
Addis Ababa
Holetta
Bako
Ambo
Debre Zeit
Nazreth
Meiko-Werer
Mieso
Alemaya
Deglessa
Abobo
Jimma
Adami Tuli
Kolumsa
Sinana
Asella
Gode
Omo Ratta

Annex C

INSTITUTE OF AGRICULTURAL RESEARCH (I.A.R.) ORGANIZATIONAL STRUCTURE



Annex D

Current and Proposed Research Centers and Trial Sites Under IAR

Agricultural Development Zone	Main Centers	Sub-Centers	Trial Sites
Central	Holetta, Nazreth	Sheno, Adami-Tulu, Mehal-Meda	Ginchi, Bede, Arsi, Shashemene, Goha-Tsion, Enewari, Tefki
Southern	Awassa, Omo-Rate	Areka, Yavelo, Mega, Wonago, Neghele, Moyale, Mitata, Jinka	Gumaide, Jinka
South-Eastern	Sinana, Kulumsa	Diksis, Bekoji, Ardaita, Harewa, Dinik, Medawolabu	
Eastern	Melka-Werer, Gode	Babile, Meisso, Mechara, Pik, Jijiga, Degehbur	Wacho
North-Eastern	Kobo	Woldia, Dubti, Wegel-tena, Bati	Harbu, Woldia
Northern	Mekele	Adewa, Shire, Asmara, Barentu, Akordat, Alal	Kuwhia, Mai-Mekeden
North-Western	Adet	Pawe, Andossa, Debre-Tabor, Metema	Dabat, Bichena, Mota, Bure
Western	Jimma, Abobo, Bako	Guraferda, Gera Bedele, Dedo, Assossa, Menesibu	Gomma, Anfilo, Harru, Shambu, Hurumu, Tepi Motta

Note:- The underlined research centers at Bako, Jimma, Kulumsa, Meisso and Melka Werer are designated as national centers for maize, coffee, wheat, sorghum, and cotton respectively.

Annex E

Allocation of Research Time by Research Staff at IAR

Individual Research Officers and Assistant Research Officers were requested to complete a questionnaire on "task analysis", (Figure E.1). The questionnaire was designed to yield information on how the researcher's time was divided among the major responsibilities of:

* research and supervision
* administration
* extension
* training

Furthermore, the researcher was asked to estimate the time spent on research as proportioned among different commodities, and non-crop-specific disciplinary or departmental work.

Completed returns were received from 132 research staff (in the short time available), and estimates were possible in the case of a further 37 staff based on supplementary information. No information was available on the remainder, about 40 research staff.

The sample is substantial, but incomplete. Moreover, and perhaps more significant, the researchers had little warning about the exercise, and their estimates could well be inaccurate. A repeat analysis a year later, after staff were alerted to the need to make better estimates, would certainly have more reliability. However, this analysis is the result of the first impressions of the researchers themselves, which is probably more reliable than an outsiders' or even supervisor's estimate.

With these provisos, the attached tables give the results of the survey. Time allocations are expressed in man (person) years per year. Table E.1.a) gives a summary of researcher time allocated by crop in the country (where it is possible - some returns were undifferentiated within cereals, pulses, etc.).

Table E.1.b) aggregates the information further into main commodity groups (and topics).

The aggregation helps appreciation of the broad allocation of research manpower resource by commodity group, but it loses valuable detail in terms of appreciation of the adequacy of time allocation to each crop, as each crop has its own set of distinctive problems.

Furthermore, not all research on a crop is consolidated at one station.

Table E.2 therefore disaggregates the information further into time contributions to research on commodities by station but only for the 132 staff who completed returns. (The rounding of small parts of numbers causes appreciable departures from whole numbers on addition.) The Table is more difficult to comprehend, but does show how scattered manpower resources are on vital crops, and hence how essential it is to arrange for research groups to come together frequently. The establishment of national commodity research centers will be a big step in pulling together a critical mass of scientists working on one crop (or "major crop-based system").

Figure E.1: Questionnaire on Task Analysis

INSTITUTE OF AGRICULTURAL RESEARCH

Questionnaire on time allocation of research staff to different responsibilities and research effort on commodities & disciplines.

(To be completed by Assistant Research Officers & Research Officers only)

A) Name _____ Degree _____ Grade _____

B) Research Center _____

C) Dept. _____ Field of Specialization _____

Division _____ Commodity Team _____

D) TIME ALLOCATION

Responsibilities		Commodity	
1. Research & Supervision	____%	1. _____	____%
2. Administration	____%	2. _____	____%
3. Extension	____%	3. _____	____%
4. Training	____%	4. _____	____%
		5. Basic/Departmental	____%

Table E.1: Time allocation of 169 research staff to commodities and other topics in man years

(Based on 132 returns to task analysis questionnaire and supplementary information on 37 staff. 41 research staff not accounted for, including 12 at Plant Genetic Resources Centre; 14 85/86 graduates at new stations; 6 at Holetta, 6 at Mekele, and 3 at Kobo)

Table E.1.a): By Commodity and Topic

CEREALS	3.48
*Wheat	3.32
Oats	.06
*Maize	6.57
Barley	2.54
*Sorghum	5.80
Teff	2.72
OIL SEEDS (Mainly Noug)	5.30
Groundnut	.87
Rape	.08
Sesame	1.18
Sunflower	1.09
Safflower	.29
Castor	.19
PULSES	4.41
Faba bean	1.78
Field peas	.67
Chick peas	.50
Lentils	.09
Haricot	.77
Soybean	1.23
Cow pea	.15
Pigeon pea	.04
HORTICULTURE	3.44
Vegetables	3.76
Fruits & Nuts	2.96
Roots & Tubers	3.72
Sericulture	.65
Spices	.50
AGRICULTURAL ENGINEERING	7.85
Irrigation & Drainage	5.56

*COFFEE	8.11
FIBRES	.19
*Cotton	3.83
Kenaf	1.05
ANIMAL SCIENCE	
Production	11.53
Health	3.14
Feeds & Nutrition	6.94
BASIC/DEPARTMENTAL (mainly soils, pathology, entomology.)	15.29
Research/Extension	4.35
Socio economics/FSR	9.39
ADMINISTRATION	20.19
EXTENSION	6.31
TRAINING	6.17
	169.00

* Designated high priority national commodities

Table E.1.b): Summary by Main Commodity Group

Cereals	24.29
Oilseeds	9.00
Pulses	10.64
Horticulture	15.03
Agric. Eng. Irrigation	13.41
Coffee	8.11
Fibres	5.12
Livestock	21.61
FSR & Research/Extension	13.74
Basic/Departmental	15.29
Administration	20.19
Extension	6.31
Training	6.17
	169.00

Table E.2: Time allocation of 132 research staff to commodities and other topics in man years, by center

	Adet	Awassa	Bako	Holetta	Jimma	Melka Werer	Nazreth	Pawe	H.Q.	TOTAL
CEREALS										
Wheat				.67	.33	.33		.25		1.58
Oats		.44		1.98						2.42
Maize		.06								.06
Barley		1.35	2.29		1.22		.31	.70		5.87
Sorghum		.27		2.33						2.54
Teff		.07	.70		.73		2.70	.50		4.90
		.14	.06	1.89	.43			.20		2.72
OILSEEDS										
Groundnut			.46	2.85		.05	.29	.15		3.80
Rape						.82		.05		.87
Sesame		.08								.08
Sunflower						.93		.25		1.18
Safflower		1.09								1.09
Castor						.29				.29
		.15				.04				.19
PULSES										
Faba bean		.24	.87	.78			1.02	.60		3.51
Field peas		.09		1.69						1.78
Chick peas				.67						.67
Lentils		.04		.46						.50
Haricot beans				.09						.09
Soybean		.25					.52			.77
Cowpea		.83						.40		1.23
Pigeon pea							.15			.15
							.04			.04
HORTICULTURE										
Vegetables			.33	.22			.89			1.44
Fruits & Nuts		.57	1.50	.31	.14	.16	.98	.10		3.76
Roots & Tubers		.18	.61	.51	.24	.42	1.00			2.96
Sericulture		1.43	.54	.71	.21	.04	.79			3.72
Spices							.65			.65
		.14			.36					.50
AGRICULTURAL ENGINEERING										
Irrigation & Drainage						.75	5.10			5.85
							3.36			3.36
COFFEE										
					5.31					5.31
FIBRES										
Cotton			.04					.15		.19
Kenaf						2.58				2.58
						1.05				1.05
Animal Production			2.00	4.88		2.55				9.23
Animal Health			.50	.14						.64
Feeds & Nutrition			1.39	1.88		1.72		.15		5.14
Research/Extension		.50		1.30			.55			2.35
Socio-Economics/FSR	1.00	1.00	.80	1.00			1.59		.20	6.59
Administration		1.30	3.75	3.12	.58	3.91	3.28	.45	.50	16.89
Extension		1.10	.60	.72	.04	1.47	1.13	.05	.10	5.21
Training		.80	.55	1.39	.19	.83	1.70		.20	5.67
Non-crop Basic/Dept.		1.44	2.23	3.41	1.1[illegible]	1.87	2.66			1[illegible].69
	1.00	13.50	19.22	32.80	12.17	19.81	28.65	4.00	1.00	132.15

Annex F

ILLUSTRATIVE QUANTITATIVE APPROACH TO MANPOWER PLAN

Present Status

The existing main research stations have been established to serve the major farming zones, designated broadly by altitude, rainfall, and population. This has implied some specialization on crops and animals at different centers.

The main research thrust has been towards improved crop potential in the environment of the stations and substations, with resistance to pests and diseases; and towards improved livestock potential, with disease resistance through crossing.

The distribution of research staff built up to serve this program in 1986 is given in Table F.1 (approximately): "field crops" has been taken to imply plant breeding and selection. This does not include graduate administrative staff at headquarters.

Changes

Major decisions have been taken recently with respect to research centers and their functions. Five commodity research centers have been designated to concentrate on wheat, maize, sorghum, coffee, and cotton. Eight zonal research centers have been designated to work more closely with and advise the Agricultural Development Zonal Offices. Some potentially large sub-centers have been established to seek urgent short-term solutions to production problems in new lowland settlement areas: they will require research teams in the short term, at least. The functions of these research stations will be significantly different and will require different disciplinary patterns of staffing. Moreover, there are new emphases on the need for research into conservation-oriented cropping practices, and on relating research more closely to the new description of the natural resource base.

Expansion in research staff has been approved, and a target of 486 research staff by 1994 is proposed. This rate of expansion poses heavy demands on the supply of recruits of adequate research quality, and on the capacity for postgraduate training, but for planning purposes the expansion is assumed achievable.

Future Roles

Commodity research centers: Plant breeding will be concentrated at commodity centers and tested in national trials elsewhere with flexible criteria for selection; full disciplinary teams in support will be needed to cover a wide range of constraints to productivity: pests, diseases, nutrition, physical environment, socio-economic environment, conservation requirements of system, livestock and other crop requirements in system. The center targets should be improved "commodity crop"-based farming systems. Most disciplines should ultimately have at least 1 RO, and 1 ARO as an understudy.

For example for maize, a possible target staff distribution might be

3 Breeders (RO + ARO, + RO national trials)
3 Agronomists (RO + ARO - cropping systems/FSR
RO - plant requirements and national trials)
2 Pathologists
2 Entomologists
1 Weed Scientist
2 Soil Fertility Scientists
1 Physiologist
1 Agro-ecologist (natural resources/water balance/erosion)
1 Socio-economist (role of maize)
2 Research/Extension Liaison Scientists
1 Farm Manager/Engineer (RO)

Associated crops and livestock in system

1 Agronomist
1 Livestock Scientist (animal science, draught, forage, FSR)
21

The other commodity research centers would require a similar distribution of disciplines with slight modifications. For instance, wheat might require 3 pathologists and 1 entomologist; sorghum might merit 2 weed scientists; coffee would require 2 processors and 2 liquorers, and perhaps a second physiologist and 1 breeder and 3 agronomists on substations; cotton might require 3 entomologists and 1 pathologist, and 2 irrigation engineers/water management.

All centers would require substantial travel funds if outposting of individual research staff is to be kept to a minimum.

At a total of 21 research staff each, 5 commodity research centers would require a total of 105 ROs and AROs.

Zonal Research Centers

The main role of the zonal research centers would be testing materials and technologies developed on commodity research centers and elsewhere; exploratory testing of other crops of local farmers' systems; specialist advisory services to MOA, research/extension liaison, supervision of field trials, and training of extension staff; testing of cropping systems in local conditions (for conservation merit, better use of growing season, etc.).

A possible target staff distribution might be

2 Breeders (RO + ARO) - assessment all crops
5 Agronomists - field trials, testing cropping systems,
farming system research
2 Horticulturists
2 Entomologists
2 Pathologists
1 Weed Scientist
2 Soil Scientists (1 field, 1 laboratory services)
1 Agro-ecologist (natural resources/water balance/erosion/agro forestry)

2 Socio-economists
2 Research/Extension Liaison Scientists
3 Livestock Scientists (animal science, draught, forage, health, FSR)
1 Farm Manager/Engineer
25

For 8 zonal centers, this would require a total of 200 ROs + AROs.

Holetta research center (including Debre Zeit) is proposed to be maintained as a center of disciplinary experience and central reference station for specialized services. The experienced staff would be expected to spend a significant part of their time advising less experienced staff in other centers on efficient experimental design and research planning. It would be the main center for soil laboratory work, animal nutrition laboratories, crop protection reference services, biometrics (or HQ?).

A possible target for a staffing pattern might be

5 Breeders (residual major crops such as teff, oilseeds, pulses)
2 Physiologists
8 Agronomists
4 Horticulturists
3 Entomologists
3 Pathologists
2 Weed Scientists
5 Soil Scientists (3 field + 2 laboratory)
2 Agro-ecologists (interface with natural resource base/soil physics/ conservation/agro forestry)
2 Socio-economists (or HQ - 1 FSR, 1 Macro-economist for policy research)
2 Research/Extension Liaison Scientists
3 Nutrition
6 Animal Science
3 Health
3 Forage and Nutrition
1 Farm Manager/Engineer
1 Engineer
3 Biometricians
3 Food Science
61

Nazreth. It is anticipated it will be a commodity or zonal research center, but special responsibility for engineering expertise must rest at some center, and Nazreth is a strong candidate for being a base for an extra

9 engineers and
6 food scientists (as a newly developing field)

Plant Genetics Resources Center, currently has 12 research staff and can reasonably expect to retain
12 plant breeders/agronomists.

Substations

Most substations should only be staffed by Technical Assistants, and/or operated under the jurisdiction of the MOA. However, some larger

substations have special importance with regard to providing urgent information for opening up new areas, or as special livestock research stations. Possible targets might be:

Assosa, Abobo, Omo Ratte

1 Breeder
3 Agronomists
1 Crop Protection (Pathologist, or Entomologist, or Weed Scientist)
1 Horticulturist
1 Socio Economist
1 Research/Extension Liaison Scientist
1 Animal Scientist
1 Forage Agronomist
10

Pawe

2 Agronomists
1 Horticulturist
1 Pathologist
1 Socio Economist
5

Adami Tuli, Yavello

4 Animal Scientists
4 Forage and Nutrition
2 Health
10

Sheno

4 Animal Scientists
3 Forage and Nutrition
2 Health
9

Two other centers would likely carry specific livestock programs with 8 extra livestock staff each, a total of 16 research staff.

Discussion

This presentation is meant to be illustrative of what might be possible, taking into account the numbers of centers, the planned staff total, and some indicators of center functions. It is not meant to be prescriptive. Decisions must rest with national scientists. There are powerful arguments for more staff in almost every field. For instance, for maize, a case could be made for five breeders covering:

- lowland maize improvement
- mid- to high-elevation maize improvement
- disease nurseries
- international and national trials
- production and maintenance of breeder and foundation seed

Similarly, five breeders at Holetta are not many for all the other crops when teff, oil seeds, and pulses could readily accommodate three breeders each.

But, to increase in one place needs savings from somewhere else. To have a range of disciplinary competence at many stations imposes severe constraints: it is not really practicable to share staff between centers on major programs (as it is within a center). It would be dangerous to give up the target of 1 RO + 1 ARO combination any further than is already sketched: however, the target of an RO + ARO combination of breeders at zonal centers could be reduced to 1 RO, leaving 8 breeders for distribution elsewhere - in 1994, when the complement is planned to be filled. There are many other areas where discussion could be vigorous. Clearly, flexibility must be retained over the years, even when a guiding plan is agreed and formulated within IAR.

The total requirement of the kind of scenario set out above is indicated in Table F.1. The total target is, of course, arranged to arrive at the proposed total target staff of 486 in 1994. It will not be reached immediately.

If growth to the target total is steady, starting from a base figure of about 202 in 1986, the numbers will grow at about 35 per year, if all goes according to plan.

It will be extremely important to plan the growth of the program in line with the growth of experienced research staff and graduate assistants, and to choose priority growth areas carefully, taking care not to jeopardize viable programs currently with adequate staffing, by launching too many programs so that all are inadequately staffed.

The Table emphasizes the implications of the inferred need for more agronomists: for cropping systems research, for conduct of field trials at zonal centers, and participation in on-farm trials. The extra emphasis given to livestock research is at the zonal centers, reflecting an increased concern for integrated farming research (and FSR) to include the livestock component. If most of the research staff in Field Crops division are indeed devoted to plant introduction, selection, and breeding, then perhaps there is little need in the near future to increase the numbers, but intensive postgraduate training of AROs will be necessary.

The group designated agro-ecologists could be a mixture of disciplines, including soil physics, agro-meteorology, soil chemistry, agro-forestry, etc. They are meant to be the group of professionals focussing on understanding the limitations to crop and animal production posed by natural resources constraints of length of growing season, drought, waterlogging, erosion, etc.

Table F.1: Illustrative target distribution of disciplinary resources in research centers in 1994 compared to 1986

Current Total 1986	Discipline	Commodity Research Centers/ Sub-centers	Zonal Research Centers	Holetta Research Center	Nazreth (extra)	Sub-Centers	PGRC and HQ	Proposed Total 1994
57	Plant Breeding	16	16	5		3	12	52
15	Agronomy	23	40	8		11		82
2	Physiology	6	-	2		-		8
12	Pathology	10	16	3		2		31
14	Entomology	10	16	3		1		30
5	Weed Science	6	8	2		1		17
19	Soil Science	10	16	5		-		31
15	Horticulture	-	16	4		4		24
	Agro-ecology	5	8	2		-		15
13	Socio Economics	5	16	2		4		27
6	Res./Extension	10	16	2				28
14	Animal Science	5	8+8*	6		15		42
10	Forage & Nutrition		8+8*	6		14		36
6	Health	-	8	3		6		17
13	Engineering/ Irrigation	2	-	1	9			12
	Farm Manager/ Engineer	5	8	1				14
	Food Science	-		3	6			9
	Biometrics	2		3				5
	Communications						2	2
	Liquorers	2						2
	Processers	2						2
202		119	216	61	15	61	14	486

* Two special livestock programs at selected centers.