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Statistical Brief on the National Agricultural Research System

of

ETHIOPIA

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ISNAR INDICATOR SERIES PROJECT: PHASE II

International Service for National Agricultural Research

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ISNAR INDICATOR SERIES PROJECT PHASE II

Decision making in the agricultural research policy area in either domestic, regional, or international fora can only be aided by access to reliable and comprehensive data on these systems. It is for this reason that ISNAR initiated its Indicator Series Project in 1986. The major objective of this project is to collect, process, and analyze reliable and comprehensive time-series data on national agricultural research systems (NARSs) throughout the world in order to identify and report on major trends and emerging policy issues with regard to the development of NARSs. To this end a database has been developed that contains time-series data on agricultural research expenditures and personnel for more than 150 developing and developed countries. These data provide a quantitative basis for more in-depth research policy studies by ISNAR and others.

During the first phase of the project (1986-91), the Indicator Series project team produced two major publications published by Cambridge University Press, namely:

Pardey, P.G., and J. Roseboom. (1989) *ISNAR Agricultural Research Indicator Series: A Global Data Base on National Agricultural Research Systems*, 547 pp.; and

Pardey, P.G., J. Roseboom, and J.R. Anderson, eds. (1991) *Agricultural Research Policy: International Quantitative Perspectives*, 462 pp..

The first publication is a statistical reference volume that provides system-level data on agricultural research personnel and expenditures for 154 countries. The second publication draws on the database to report on the major policy dimensions of agricultural research, with a primary focus on less-developed countries.

Phase II of the Indicator Series Project was initiated in 1992 and seeks to update the database and the policy analyses that accompany it. New ISNAR survey data are being used in conjunction with a large variety of published and "informal" reports in order to produce reliable as well as up-to-date information and statistics about the NARSs.

The country-level data are being published in a series of NARS Statistical Briefs. These briefs include more detailed descriptive information about the institutional structure of the NARS as well as a more comprehensive set of statistics than were reported in the 1989 Indicator Series volume. It is envisaged the country-level data will be assembled and analyzed in a series of regional research reports.

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Acronyms

AAU	Addis Ababa University
ACA	Awassa College of Agriculture
ARDU	Arsi Regional Development Unit
AUA	Alemaya University of Agriculture
CADU	Chilalo Agricultural Development Unit
CGIAR	Consultative Group on International Agricultural Research
CIAT	Centro Internacional de Agricultura Tropical
CIMMYT	Centro Internacional de Mejoramiento de Maíz y Trigo
CIP	Centro Internacional de Papa
DB	Department of Biology
DMBF	Department of Marine Biology and Fisheries
DTRC	Demographic Training and Research Centre
DZARC	Debre Zeit Agricultural Research Centre
EEC	European Economic Community
ESTC	Ethiopian Science and Technology Commission
FAO	Food and Agricultural Organization
FAZA	Faculty of Arid Zone Agriculture
FBRC	Fish Breeding and Research Centre
FRC	Forestry Research Centre
FTE	Full-Time Equivalent
FVM	Faculty of Veterinary Medicine
GDP	Gross Domestic Product
IAR	Institute of Agricultural Research
ICARDA	International Center for Agricultural Research in Dry Areas
ICRAF	International Centre for Research in Agroforestry
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IDA	International Development Agency
IDR	Institute of Development Research
IDRC	International Development Research Centre
IEMVT	Institut d'Elevage et Médecine Vétérinaire des Pays Tropicaux
IITA	International Institute of Tropical Agriculture
ILCA	International Livestock Centre for Africa
IMS	Institute of Marine Sciences
ISNAR	International Service for National Agricultural Research
MOA	Ministry of Agriculture
MSF	Ministry of State Farms
NARS	National Agricultural Research System
NTTIC	National Tse-tse and Trypanosomiasis Investigation Centre
NVI	National Veterinary Institute
PGRC	Plant Genetic Resources Centre / Ethiopia
PPRC	Plant Protection Research Centre
RAD	Research and Advisory Department
SDR	Special Drawing Rights
SPL	Soviet Phytopathological Laboratory
UNDP	United Nations Development Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
WURC	Wood Utilization and Research Centre

1. Introduction

The primary purpose of this brief is to provide various statistical and institutional details on the development and current status of the public agricultural research system in Ethiopia. This information has been collected and presented in a systematic way in order to inform and thereby improve research policy formulation with regard to the Ethiopian NARS. Most importantly, these data are assembled and reported in a way that makes them directly comparable with the data presented in the other country briefs in this series. And because institutions take time to develop and there are often considerable lags in the agricultural research process, it is necessary for many analytical and policy purposes to have access to longer-run series of data.

NARSs vary markedly in their institutional structure and these institutional aspects can have a substantial and direct effect on their research performance. To provide a basis for analysis and cross-country, over-time comparisons, the various research agencies in a country have been grouped into five general categories; government, semi-public, private, academic, and supranational. A description of these categories is provided in table 1.

Table 1: *Institutional Categories*

Category	Description	Examples
Government	Agencies directly administered by government.	Research department within a ministry
Semi-public	Agencies not directly controlled by government and with no explicit profit making objective.	Research institute under a commodity board
Private	Agencies whose primary activity is the production of goods and services for profit.	Agricultural machinery or chemical company
Academic	Agencies that combine university-level education with research.	Faculty of agriculture
Supranational	Agencies whose mandate covers more than one country.	CGIAR institutes

Note: Adapted from OECD (1981).

The concept of a NARS used throughout this report includes only those institutes that can be classified as government, semi-public, and academic agencies. Where it is useful to do so, private and supranational research agencies have been discussed, but for reasons of comparability they are not included in the NARS data reported here. More detailed information on the definitions and concepts used in this brief is provided in appendix 2.

Section 2 provides a brief description of the institutional development and current structure of the NARS. Section 3 presents a statistical overview of the longer-run investment trends in agricultural research along with a more detailed look at contemporary investment orientations. The appendices provide further descriptive details and present the basic research personnel and expenditure data in disaggregated fashion. For general background information and statistics on Ethiopia we refer to appendix 1.

2. Agricultural Research Institutions

2.1 Historical Evolution[1]

Ethiopia is one of the few countries in Africa that has largely avoided being colonized by the European powers. Only Eritrea, the northern part of the country along the Red Sea, was occupied and colonized by the Italians in 1890. And in 1935-6, the rest of the country was invaded by Italy but restored to national sovereignty with the help of the British and their allies in 1941. But, as a result of World War II, Italy relinquished control over its colonies and occupied territories and Eritrea temporarily fell under the joint control of Great Britain, France, USA, and USSR. Under UN auspices it was eventually decided that Eritrea be federated with Ethiopia under the Ethiopian crown. This came into effect in September 1952. Complete unification took place in November 1962 with the abolition of the federal structure. This triggered off a long rebellion against the central government in Addis Ababa by Eritrean factions. After nearly 30 years of fighting all central government officials were expelled from Eritrea in 1991 and the province was effectively brought under the control of an Eritrean government which declared autonomy in May 1991. In a referendum, held in April 1993, the people of Eritrea decided that their autonomous region should become an independent state. This came into effect in May 1993. Since this brief is concerned mainly with developments during the period prior to Eritrea's independence, we have included Eritrea in this overview but indicate, where possible, which agricultural research entities have recently been taken over by Eritrea.

By African standards, agricultural research came late to Ethiopia, reflecting the limited influence European colonizers had on the affairs of the country. Aside from some explorative studies by the Italians in the late 1930s, the formal beginnings of public-sector agricultural research in Ethiopia can be traced to the establishment of several agricultural schools during the late 1940s and early 1950s. These included the Ambo Agricultural School (1947), the Jimma Agricultural and Technical School (1952), and the Alemaya College of Agriculture (1956).[2] The latter two institutions received substantial external assistance from Oklahoma State University under a contract with USAID during 1952-68.

Alemaya College was modeled after the US land grant college system, combining agricultural training, research, and extension in one institution. In addition to research facilities at Jimma and Alemaya, a research station was established at Debre Zeit in 1955. The staff located at this station focused exclusively on research. In 1963, the college became part of the Haile Selassie I University (now Addis Ababa University). At the same time the mandate for nation-wide extension was transferred from the college to the Ministry of Agriculture.

Alemaya College of Agriculture remained the major public institution conducting agricultural research until 1966 when the Institute of Agricultural Research (IAR) was established by the Ministry of Agriculture (MOA). The few scattered research activities within the MOA that preceded the establishment of IAR were subsumed within IAR. Major support to develop IAR

1. The material presented in this section draws largely from Bunting (1963), FAO (1982), Nichola (1985), ISNAR (1986), ISNAR (1987), Nichola (1988), Price and Evans (1989), Bhagavan (1989), and Europa Publications (1992).

2. Originally named the Imperial Ethiopian College of Agriculture and Mechanical Arts. While awaiting the completion of new college buildings at Alemaya, the college began operating in 1953 in Jimma and then moved to Aleymaya in 1956.

was provided by FAO and UNDP. After its establishment, IAR rapidly took over from Alemaya College as the country's leading agricultural research institute.

In 1974 the government of Emperor Haile Selassie was overthrown by a marxist military regime. This revolution led to major changes in the structure of the country's agricultural sector. Prior to the revolution, the agricultural sector was dominated by a large, landowning aristocracy. With the land reform measures of March 1975, former tenants were initially granted ownership of land up to a maximum of 10 hectares, but subsequently individual land titles were withdrawn and vested in state-controlled cooperatives. Many of the more advanced, privately owned estates became state farms.

IAR became an autonomous institute governed by a board in 1977. The board is chaired by the Minister of Agriculture. Other ministries and organizations that are represented on IAR's board of directors include the Ministry of State Farms, the Ministry of Coffee and Tea Development, the Relief and Rehabilitation Commission, the Ethiopian Science and Technology Commission (ESTC), and the National Committee for National Planning.

IAR's research programs were radically restructured in 1977. Prior to that date, the programs were conducted on a station basis and planned and managed by the officer-in-charge of the station. As part of the reorganization IAR was given a departmental structure. Research staff were grouped into subject-matter departments (field crops, horticulture, coffee, crop protection, animal science, soil science, agricultural engineering, and socioeconomics), each led by a departmental coordinator. These coordinators directed the (departmental) research programs, while the duties of the officer-in-charge of a station were focused on station administration. In addition, multidiscipline, commodity-improvement teams were formed in 1979 in an effort to make more effective use of IAR's relatively few research specialists. Each team was led by a coordinator reporting to the head of the Field Crops Department or the Horticulture Department. The teams were staffed with specialists from different departments. These specialists received technical guidance from their respective department heads but were responsible to the team coordinators for the implementation of their work.

In the mid-1980s, IAR was once again reorganized. In its new organizational structure more emphasis was placed on regional research. In each Regional Development Zone, as identified in the country's Agricultural Development Plan, a research institution was designated as the regional research center and given the task of coordinating IAR's research activities in that particular region. This regional approach sought to improve the link between IAR's research and the local development and extension activities of the Ministry of Agriculture. In addition, some research centers were designated as national commodity research centers and function as the headquarters for a national commodity improvement team. IAR's eight departments have been reorganized into some 15 divisions, which apparently have much less control over their divisional research programs than did the former departments.

The Plant Genetic Resource Center/Ethiopia (PGRC/E) is one of an international network of centers set up to collect and preserve indigenous crops. PGRC/E was established with support from the German Agency for Technical Cooperation (GTZ) in 1975 and was initially administered by IAR. The center was brought under the direct administration of the Natural Resources Conservation and Development Main Department of the Ministry of Agriculture in 1991.

The Soviet Phytopathological Laboratory (SPL) was established by the USSR at Ambo in 1976-77 to conduct research on crop protection, especially with regard to cereal rust as well as pest and weed control. Although close collaboration with IAR was reported in the early 1980s (Shawel and Negewo 1984), SPL did not become part of IAR but has instead evolved into the Plant Protection Research Centre (PPRC) which is administered by ESTC.

In addition to the research work done by IAR, some adaptive research was initiated by the Ministry of Agriculture during the late 1960s and 1970s through so-called "comprehensive integrated package projects." These projects were specifically targeted to the problems facing small farmers. In total, six of these projects were initiated in different regions but only the Chilalo Agricultural Development Unit (CADU) developed a long-standing research program of any consequence. CADU was established in 1967 with support from the Swedish International Development Agency and over the years it has tested and released many wheat and barley varieties. It has also conducted research on farm implements, oil crops, and horticulture. CADU was renamed the Arsi Regional Development Unit (ARDU) in the early 1980s.

With the creation of the state farms in 1975, an agronomic research coordination unit was established within the State Farms Development Authority under the Ministry of Agriculture. In 1979 this Authority became the Ministry of State Farms (MSF). The Research and Advisory Department of MSF field tests the research products developed by IAR and Alemaya University of Agriculture to establish their suitability for large-scale agricultural production by the state farms. MSF also undertakes applied research in some areas, e.g., horticulture, where IAR or the Alemaya University of Agriculture have no active program.

The Animal and Fisheries Resources Development Main Department of the Ministry of Agriculture is responsible for the veterinary research conducted by the National Veterinary Institute (NVI) and the National Tse-tse and Trypanosomiasis Investigation Center (NTTIC), whereas livestock production research is carried out by IAR and AUA. NVI, established in 1964, has been assisted for many years by a French Veterinary Mission of the Institut d'Elevage et Médecine Vétérinaire des Pays Tropicaux (IEMVT). NVI's primary task is the production of vaccines. The limited research that it does focuses exclusively on the development of improved vaccines.

The Fisheries Resources Development Department of the Ministry of Agriculture is responsible for fisheries research in Ethiopia. A Fish Breeding and Research Center was established in 1974 but its activities have so far been limited to extension, fish propagation, surveying natural and man-made water bodies, and the restocking of inland water systems. It has been unable to initiate any research due to a lack of adequate skilled staff, equipment, and financial resources.

Forestry research is carried out by the Forestry Research Center (FRC) (previously the Silvicultural Research Center) and the Wood Utilization and Research Center (WURC) established in 1979. Both fall under the auspices of the Natural Resources Conservation and Development Main Department of the Ministry of Agriculture.

The research endeavors at Alemaya College of Agriculture (including the Debre Zeit Research Centre) appear to have made good progress until 1974, but for several reasons began to weaken thereafter. On-going research and academic programs were heavily disrupted when staff and students were mobilized for mass rural education programs in 1974-75 and 1975-76. Research staff at Debre Zeit, however, were exempted from the rural education campaign. Academic

programs resumed at Alemaya in September 1976 but, for security reasons, the campus was evacuated in the course of the academic year and all instructional activities were transferred temporarily to other places. The college restarted at Alemaya in 1978-79, although the buildings, equipment, laboratories, workshops and several other facilities had been badly damaged. In addition, the college had a high turnover of staff during this period.

In 1978, the Debre Zeit Agricultural Research Centre (DZARC) was reassigned from Alemaya College to Addis Ababa University. With this change of status, teaching responsibilities were added to the center and it was renamed Debre Zeit Agricultural Junior College and Research Centre. As a consequence of these changes, the staff time devoted to research was severely curtailed. But in 1983-84 the teaching functions reverted back to Alemaya College and the center returned to an exclusively research mandate. However, the center was severely weakened as most of the staff were transferred to Alemaya College along with the teaching program, while the facilities of Debre Zeit College, including the research laboratories and offices, were taken over by the newly established Management Institute. DZARC's position became even more tenuous in 1985 when the Alemaya College of Agriculture was separated from the Addis Ababa University (AAU) and transformed into the Alemaya University of Agriculture (AUA). Initially DZARC remained with AAU, but was finally transferred to AUA in 1987.

Agriculturally related research at Addis Ababa University (AAU) is conducted by the Awassa College of Agriculture (ACA), the Faculty of Veterinary Medicine (FVM), the Institute of Development Research (IDR), and the Department of Biology of the Faculty of Sciences.

The Awassa Junior Agricultural College became the Awassa College of Agriculture around 1990. Research was apparently first undertaken by ACA after AAU separated from and AUA in 1985. FVM was established in 1979 and is located at Debre Zeit. Although some consideration has been given to transferring FVM to AUA this has not yet taken place. IDR was established in 1972; its main task is to identify and analyze the socioeconomic constraints to development within the country. After the famine in 1984-85, IDR was reorganized into the following agencies: the Food and Famine Research Unit, the Development Research Unit, and the Demographic Training and Research Center (DTRC). In 1990 IDR was again reorganized. This restructuring did not affect DTRC but the two research units were reconstituted into three research and training units focusing on rural development, social development, and macroeconomic issues, respectively. In addition, a Women's Centre was created within IDR. The Department of Biology of the Faculty of Sciences conducts some fisheries research.

Asmara College was set up by the Italian missionary society "Pie Madri della Nigrizia" in 1958. In 1968, it became the Asmara University. Agricultural research at the Asmara University is conducted by the Faculty of Arid Zone Agriculture, established in 1986-87. In addition, the Departments of Biology and Marine Biology & Fisheries of the Faculty of Science conduct some agriculturally related research. Establishment dates for the two departments are 1968 and (it seems) 1979, respectively. The Asmara University is located in Eritrea.

2.2 Present Structure

The structure of the national agricultural research system of Ethiopia summarized in table 2 describes the situation as of 1991-92. Since then Eritrea has become an independent nation. This had only a minor effect on the overall structure of the country's agricultural research system, with some research institutes having to relinquish stations located in Eritrea.

Table 2: Overview of Present Structure of NARS, 1991-92

Institutional category	Supervising agency	Executing agency		Research focus	Staffed research sites[a]	Number of researchers			
		Name	Acronym			National	Expats	Total	FTEs
Government	Ministry of Agriculture	Institute of Agricultural Research	IAR	crops, livestock, irrigation, socio-economics	24 (24)	272	16	288	288
		Arsi Regional Development Unit	ARDU	food crops, livestock, forestry	na	na	na	8	8
	MOA - Natural Resour-ces Conservation and Development Main Department b	Forestry Research Centre	FRC	forestry	na	na	na	8	8
		Wood Utilization and Research Centre	WURC	forestry	1 (1)	7	0	7	7
		Plant Genetic Resources Centre / Ethiopia	PGRC/E	genetic resources	1 (1)	na	na	na	na
	MOA - Animal and Fisheries Resources Development Main Department	National Veterinary Institute	NVI	animal health	1 (1)	8	1	9	2.7
		National Tse-tse and Trypanosomiasis Investigation Centre	NTTIC	animal health	1 (1)	na	na	na	na
		Fish Breeding and Research Center	FBRC	fisheries	1 (1)	na	na	na	0
	Ethiopian Science and Technology Commission	Plant Protection Research Center	PPRC	plant protection	1 (1)	na	na	na	na
	Ministry of State Farms	Research and Advisory Department	RAD	crop and livestock	na	23	1	26	26.0

Table 2: *Overview of Present Structure of NARS, 1991-92 (Contd.)*

Institutional category	Supervising agency	Executing agency		Research focus	Staffed research sites[a]	Number of researchers			
		Name	Acronym			National	Expats	Total	FTEs
Government	Ministry of State Farms	Research and Advisory Department	RAD	crops and livestock	na	25	1	26	26.0
Academic	Alemaya University of Agriculture	Alemaya University of Agriculture	AUA	crops, livestock, forest-ry, farming systems, ag. engineering, ag. economics	7 (2)	174	1	175	32.5
	Addis Ababa University	Faculty of Veterinary Medicine	FVM	animal health	1 (1)	na	na	41	4.1
		Department of Biology, Faculty of Science		fisheries	1 (1)	na	na	na	na
		Institute of Development Research	IDR	socio-economics	1 (1)	14	0	14	3.0
		Awassa College of Agriculture	ACA	crops and livestock	1 (1)	na	na	44	4.4
	Asmara University	Faculty of Arid Zone Agriculture	FAZA	crops and livestock	1 (1)	na	na	15	0.8
		Department of Marine Biology and Fisheries, Faculty of Science	DMBF/FS	fisheries	1 (1)	na	na	12	1.2
		Department of Biology, Faculty of Science	DB/FS	biology	1 (1)	na	na	11.3	1.1
Total					*na (na)*	*na*	*na*	*658.3*	*386.8*

Note: Most information in this table refers to 1991.
[a] Staffed with researchers and/or technicians. Bracketed sites are permanently staffed with researchers. [b] Became a separate ministry in 1993.

IAR is by far the largest and most important agricultural research agency in Ethiopia with about three quarters of the country's total number of FTE researchers. Its research mandate covers a comprehensive range of crop and livestock production issues, although most of its staff time (i.e., 75%) is spent on crop improvement research.

IAR has 15 research divisions, ranging from agricultural economics to soil science and water management. The physical infrastructure of IAR includes headquarters at Addis Ababa and 24 staffed research stations of which 19 are classified as regional research (sub-) centers and 5 as national commodity research centers. These national commodity research stations focus on coffee, cotton, wheat, sorghum/farm implements, and maize. In addition, IAR has a large number of test sites located in various agroecological zones throughout the country. The few agricultural research stations that IAR once had in Eritrea were closed during the period of intensified rebellion against the central government in the 1980s. Consequently the independence of Eritrea in May 1993 did not materially affect IAR's existing network of research stations.

At the regional level IAR's research is complemented by some testing activities done by the Regional Development Units of the Ministry of Agriculture. The Arsi Regional Development Unit (ARDU) is the only regional agency to have an on-going program of research and is therefore also included in this quantitative review of the Ethiopian NARS.

Not all agricultural research within the Ministry of Agriculture is undertaken by IAR. Forestry and fishery research fall outside IAR's mandate and are the responsibility of various other agencies within MOA. In addition, IAR's research in areas such as animal health and crop protection is complemented by the research done by other agencies within MOA.

Another government agency involved in agricultural research is the Ministry of State Farms through its Research and Advisory Department. Its clients are the large, rather technically advanced, state farms.

The academic sector of the Ethiopian NARS consists of the Alemaya University of Agriculture and the Addis Ababa University comprising the Awassa College of Agriculture, the Faculty of Veterinary Medicine, and the Institute of Development Research. There is also the Asmara University (located in Eritrea), which includes the Faculty of Arid Zone Agriculture and the Departments of Biology and Marine Biology & Fisheries.

Not included in this overview are the regional and international agricultural research organizations that are headquartered in Ethiopia, such as ILCA, or have operations based in the country like CIMMYT, ICARDA, ICRISAT, IITA, CIAT, CIP, and ICRAF.

Most recently, that is after 1992, ESTC has assumed a more dominant role in the coordination and policy formulation of agricultural research in Ethiopia. It is expected that a National Agricultural Research Council will be re-established in the near future and that the Department of Food, Agriculture and Environment of ESTC will be its secretariat.

The present organizational structure of several institutes are provided in diagrammatic form in appendix 3. The organizational structure of IAR is presently in a state of flux and no current organizational chart could be obtained.

3. NARS Statistics

Questionnaire responses were received from IAR, NVI, WURC, and FBRC. In addition, many secondary sources were consulted when compiling these figures and they are cited at the conclusion of this report. PGRC/E, NTTIC, PPRC, and the Department of Biology of Addis Ababa University have not been included in these NARS statistics in the absence of any reliable quantitative data. FBRC has also been omitted because it does not conduct research due, apparently, to a lack of funds and trained staff. More detailed institutional level data are provided in appendices 5 and 6.

The expenditure data presented in this brief are based on the actual expenditures as reported by the various institutes. However, institutes systematically underestimate the degree of donor support because they often only have information about the donor support that is channeled through their accounting system. Most importantly they often under-report or fail to report the salaries and supplements paid directly to expatriate researchers by the donors. To correct for this problem in the Ethiopian data, we constructed an implicit cost series for expatriate researchers (see appendix 2) and where necessary added this to the expenditures reported by the various institutes.

3.1 Long-term development

The development of a national agricultural research system in Ethiopia is a more recent phenomenon when compared with other African countries whose research activities date back to the colonial period at the beginning of this century. The first initiatives to develop an agricultural research system in Ethiopia date back to the early 1950s. Even by the early 1960s, with only two researchers per million farmers (table 3) compared with a regional average of 15 (Pardey, Roseboom, and Anderson 1991), the Ethiopian NARS was still very much in an embryonic stage.

From a small base in the early 1960s, the Ethiopian NARS grew in terms of researchers by 11.0% per annum and in terms of expenditures by 10.4% during the past three decades (table 3). This has been well above the corresponding regional average growth rates of 6.8% and 4.7% per annum, respectively, for the period 1961-85 (Pardey, Roseboom, and Anderson 1991). The 1970s stands out as a period during which agricultural research in Ethiopia developed relatively slowly compared with developments in the 1960s and 1980s.

In most African countries research staff grew considerably faster than the corresponding expenditures, which consistently led to a decline of the ratio of expenditures per researcher over time. Ethiopia exhibits a similar pattern although the rate of decline in spending per scientist is much more modest than in most other African countries.

In spite of its rapid growth over the past 30 years, the agricultural research system in Ethiopia is still small in relation to the number of economically active agricultural population it has to serve. Between 1961-65 and 1981-85, the number of researchers per million economically active agricultural population increased from two to 14. This latter number was still only a third of the corresponding 1981-85 regional average of 42. By 1991, the Ethiopian ratio had increased to 24.7, which is still only a quarter of the 100 researchers per million farmers to be found in neighboring Kenya.

Agricultural research expenditures as a percentage of AgGDP have increased significantly since the early 1960s. The sharp increase of this intensity ratio during the latter part of the 1980s

Table 3: *NARS Researcher and Expenditure Series, 1961-91*

	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90	1991	annual growth rate[a]
								%
Researchers (FTEs)	21.0	47.6	73.4	93.9	202.7	326.9	386.8	11.0
Expenditures (millions 1985 Birr per year)	2.037	5.648	8.347	12.267	16.595	33.721	28.148	10.4
Expenditures (millions 1985 PPP dollars per year)	2.832	7.851	11.603	17.053	23.070	46.879	40.522	10.4
Expenditures per researcher (1985 PPP dollars per year)	134,700	165,500	158,100	191,300	115,700	142,700	104,800	-0.6
Number of econ. act. agr. population (millions)	10.7	11.8	12.8	13.7	14.4	15.1	15.7	1.4
Researchers per million econ. act. agr. population	2.0	4.0	5.8	6.8	14.1	21.7	24.7	9.5
AgGDP (million 1985 PPP dollars)	5206	5811	6337	6508	6605	6666	7439	1.0
Expenditures as a % of AgGDP	0.06	0.16	0.21	0.28	0.38	0.77	0.58	9.0

Source: See appendices 5 and 6.
Note: Includes IAR, ARDU, FRC, WURC, NVI, RAD, AUA, ACA, FVM, IDR, FAZA, DMBF, and DB.
[a] Least squares growth rate for the 1961-91 period.

reflects an injection of World Bank/IDA monies into agricultural research as well as a stagnant agricultural sector. However, compared with other African countries expenditures as a percentage of AgGDP, are still rather modest.

3.2 Human Resources

Degree and Nationality Status of Researchers

Table 4 presents a fairly detailed, long-run overview of developments concerning the country's agricultural research staff. In the early 1960s, the few agricultural researchers in Ethiopia were mainly expatriates. The number of expatriate researchers peaked in the early 1970s to total about 30, and represented nearly half the country's agricultural research staff at that time. Since then, the relative importance of expatriate researchers has declined sharply to around 6% of the national total in 1991.

During the earliest period for which a breakdown of national research staff by degree status is available (i.e., 1971-75), the percentage of postgraduate degree-holders was already 48%. But over time this ratio declined to 37% by 1991, reflecting a rapid growth in the total number of research staff as well as difficulties in retaining staff with postgraduate qualifications.

Gender

Ethiopia has relatively few female researchers. At IAR, the major agricultural research institute in the country, only 3.3% of the researchers were female in 1991. Institutes like NVI and WURC score considerably higher, with 20% and 10% respectively, but represent only minor components of the overall system. At the Alemaya University of Agriculture about 5% of the

Table 4: *Educational and Nationality Status of Researchers*

Institutional category	Researcher status	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90	1991
				(full-time equivalents)				
Government	PhD	na	na	4.1	5.5	15.4	19.7	22.4
	MSc	na	na	8.5	19.1	56.4	85.7	87.3
	BSc	na	na	17.9	38.0	100.8	164.2	211.6
	Subtotal	2.4	13.2	30.5	62.7	172.6	269.5	320.8
	Expat	14.2	22.6	30.2	21.4	8.8	15.0	18.9
	Total	*16.6*	*35.8*	*60.7*	*84.0*	*181.4*	*284.5*	*339.7*
Academic	PhD	na	na	3.1	3.1	3.7	5.9	5.7
	MSc	na	na	3.9	3.0	7.6	20.3	18.8
	BSc	na	na	3.1	3.0	6.2	11.8	12.7
	Subtotal	na	na	10.1	9.1	17.4	37.9	37.1
	Expat	na	na	2.6	0.8	3.9	4.5	4.0
	Total	*4.4*	*11.8*	*12.7*	*9.9*	*21.3*	*42.4*	*41.2*
Total	PhD	na	na	7.2	8.7	19.1	25.6	28.9
	MSc	na	na	12.4	22.1	64.0	105.9	108.8
	BSc	na	na	21.0	41.0	107.0	176.0	225.6
	Subtotal	na	na	40.6	71.7	190.1	307.5	363.3
	Expat	na	na	32.8	22.2	12.7	19.4	23.5
	Total	*21.0*	*47.6*	*73.4*	*93.9*	*202.7*	*326.9*	*386.8*

Source: See appendix 6.
Note: The breakdown of research staff by degree and nationality status is based on IAR data in the case of the government institutes and on AUA and IDR data in the case of the academic institutes. Since these institutes represent a majority of the researchers in their respective institutional categories, we have applied their proportional breakdown to the total number of researchers in each category.

faculty and 3% of the students were female in 1985-86 (Price and Evans 1989). In 1988-89, 9% of the students studying at AUA were female (International Association of Universities 1990).

Staff Composition

Table 5 provides a detailed breakdown of the total permanent staff of IAR. During the past six years, the number of support staff per researcher dropped from 13.3 in 1986 to 9.7 in 1992. During that same period the number of technical support staff per researcher declined from 2.7 to 2.0. The most significant decline took place in the administrative support staff category after 1989.

Table 5: *Staffing Structure, IAR*

Staff category	1986	1987	1988	1989	1990	1991	1992
				(number of personnel)			
Research	184	231	255	249	266	288	281
Support							
Technical	489	556	543	539	562	573	555
Administrative	488	514	507	519	476	437	359
Other	1470	1583	1692	1686	1665	1620	1709
Subtotal	2447	2653	2742	2744	2703	2630	2623
Total	*2631*	*2884*	*2997*	*2993*	*2969*	*2918*	*2904*

Source: 0999.

3.3 Financial Resources

Expenditures

Table 6 reports agricultural research expenditures according to various institutional categories. The academic sector played an important role in the development of agricultural research in Ethiopia in the 1950s and early 1960s. With nearly 25% of the agricultural research expenditures spent by the academic sector in the early 1960s, Ethiopia represented an unusual case by contemporary African standards. However, with the establishment of IAR in 1966 the academic sector's share of total expenditures on agricultural research declined to less than 10% by the late 1970s and has fluctuated between 10% and 15% ever since.

Table 6: *Agricultural Research Expenditures*

Institutional category	1961-65	1971-75	1981-85	1986	1987	1988	1989	1990	1991
				(millions 1985 PPP dollars per year)					
Government	2.174	9.777	20.046	27.926	43.970	47.383	41.817	42.462	33.105
Academic	0.658	1.826	3.024	4.389	6.032	6.624	6.855	6.938	7.417
Total	*2.832*	*11.603*	*23.070*	*32.315*	*50.002*	*54.007*	*48.672*	*49.399*	*40.522*

Source: See appendix 6.

The hike in expenditures in 1987 was due to increased disbursements under the National Agricultural Research Project. This project, which is financed through an IDA credit (in total SDR 18.1 million), was initiated in March 1985 for an initial period of six years. Due to civil war, political unrest, and disturbances in the country the implementation of the project was significantly delayed, and so the duration of the project has been extended.

Factor Mix

An overview of how institutes spent their financial resources on salaries, operating costs, and capital is provided in table 7. All three institutes for which data are available report substantial expenditures on capital. Expenditures on operating costs relative to salaries have been fairly stable in the case of IAR but rather unstable for NVI and WURC.

Table 7: *Cost Categories*

Institute	Cost category	1985	1986	1987	1988	1989	1990	1991
					(percentages)			
IAR	Salaries	na	50.8	43.8	45.3	46.4	44.0	48.8
	Operating	na	33.0	28.8	20.8	25.7	28.3	27.9
	Capital	na	16.2	27.4	33.9	27.9	27.7	23.2
	Total	*na*	*100*	*100*	*100*	*100*	*100*	*100*
NVI	Salaries	66.4	70.6	51.1	46.6	38.7	47.5	32.5
	Operating	23.2	16.6	20.6	20.6	7.4	11.9	6.4
	Capital	10.4	12.8	28.4	32.5	54.0	40.6	61.1
	Total	*100*	*100*	*100*	*100*	*100*	*100*	*100*
WURC	Salaries	na	na	na	24.5	32.8	36.3	58.8
	Operating	na	na	na	24.5	35.0	21.6	24.3
	Capital	na	na	na	51.0	32.2	42.1	17.0
	Total	*na*	*na*	*na*	*100*	*100*	*100*	*100*

Source: 0999.

Source of Funds

During the period 1986-91, the Government of Ethiopia accounted for 50-60% of IAR's total expenditures and the World Bank, along with several other donors, the remaining 40-50%. Other institutes, such as IDR and WURC, report similar levels of donor support. The establishment and subsequent development of IAR has been supported by UNDP/FAO over the past 28 years, spending in total about US$ 17.5 million. Other important donors are IDRC and the EEC.

3.4 Research Focus

In 1991 nearly two thirds of the country's agricultural researchers focused on crop production, 18% on livestock production, 5% on forestry production, and a negligible 0.3% on fisheries research (table 8). The remaining 13% conduct research that is not directly commodity oriented. About half of them conduct research on natural resources such as soil

and water. The academic sector appears to pay relatively more attention to research areas that fall within the "other category", such as socio-economics and agricultural mechanization, than the government sector.

Table 8: *Research Focus, 1991*

Institute	Research orientation						Total
	Crops	Livestock	Forestry	Fisheries	Natural resources	Other	
	(full-time equivalents)						
IAR	200.4	43.5			27.1	17.0	288.0
NVI		2.7					2.7
ARDU	4.0	4.0					8.0
FRC			8.0				8.0
WURC			7.0				7.0
RAD	18.0	8.0					26.0
AUA	20.8	6.3	2.5			3.0	32.5
FVM		4.1					4.1
IDR						3.0	3.0
ACA	2.9	1.5					4.4
FAZA	0.3	0.3			0.2		0.8
DB	0.5	0.2	0.2		0.2		1.1
DMBF				1.2			1.2
Total (FTEs)	246.9	70.5	17.7	1.2	27.5	23.0	386.8
Total (%)	*63.8*	*18.2*	*4.6*	*0.3*	*7.1*	*5.9*	*100*

Source: 0999 and 0930.
Note: The "natural resources" and "other" categories include research that could not otherwise be allocated to a specific commodity or commodity group. The natural resources category refers to unallocatable soils, land use, and water research.

Bibliography

This bibliography comprises three different sets of references. The "references" section relates to references cited in the text, the "data sources" to references from which data have been extracted to construct the time series (see appendix 5 and 6), and "other references" to references that have been consulted in the process of data collection but not used.

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Appendix I: Country background information

Note: The country background information provided in this section reflects the situation before Eritrea became an independent nation in May 1993.

Geography

Area: 122.2 million ha.
Location: East Africa, with a ca. 1000 km long coastline along the Red Sea in the North, sharing a common border with Somalia in the Ogaden desert in the East, with Kenya in the South and with Sudan in the West.

Agroecological features: Crop and livestock production is concentrated on the Highland Plateau, a 50 million ha mountainous area at an altitude generally over 1500 m. The Great Rift Valley running in a northeast-southwest direction divides the highland complex in two. In the north and northwest parts of the Plateau, precipitation is low and unreliable, and soils are degenerated. The southwest part of the country receives the most rainfall, 1400 mm annually, mainly from June to September. Here, soils are mostly of volcanic origin, and vary from red loams in hilly regions to heavy black clays in valleys and flat lands. Toward the northeast, precipitation declines to an annual average of about 50 mm in the hot lowlands.

Population

Total (1991): 52.8 million
Annual growth rate (1981-90)[a]: 3.2%
Literacy (1990): 66%
Life expectancy (1991): 48 years

Economy *(values reported in 1985 PPP dollars)*

Gross Domestic Product (1991): 16,241 million dollars
Per capita GDP (1991): 308 dollars
Agricultural GDP (1991): 7,439 million dollars
Share of agriculture in GDP (1991): 45.8%
Annual growth rates (1981-90)[a]
GDP: 1.9%
GDP per capita: -1.2%
AgGDP: -0.1%

Trade *(values reported in current dollars)*

Net surplus total trade (1991): -290 million dollars
Net surplus agricultural trade (1991): -27 million dollars
Percentage of agricultural imports in total imports: 41.8%
Percentage of agricultural exports in total exports: 84.6%
Major agricultural import commodities (1991)[b]: wheat (60%), vegetable oils (16%), pulses (4%)
Major agricultural export commodities (1991)[b]: coffee (88%), cattle (3%), sheep & goats (3%), sesame seed (3%)

Agriculture

Agricultural land (1990): 58.8 million ha
Annual growth rate (1981-90)[a]: -0.1%
Percentage arable: 22.4%
Percentage permanent crop: 1.2%
Percentage permanent pastures: 76.3%
Percentage irrigated arable and permanent cropland: 1.2%
Economically active agricultural population (1991): 15.7 million
Annual growth rate (1981-90)[a]: 0.9%
Percentage in total economically active population: 74.0%
Fertilizer use per ha arable land (1990): 8.0 kg
Annual growth rate (1981-90)[a]: 12.1%
Major crops (in decreasing order of value of production): coffee, maize, sorghum, wheat, barley, chick peas

Source: Europa Publications (1992), FAO (1993), and World Bank (1992).
[a]Least squares growth rate.
[b]Bracketed percentages represent value share of the respective total.

Appendix 2: Definitions and concepts

NARS

The construction of quantitative and internationally comparable expenditure, personnel, and related measures of a national agricultural research system (NARS) requires a precise idea of what, in fact, is being measured. Since the term NARS is subject to a variety of interpretations, it is necessary to define rather precisely the NARS concept used here. Our approach adheres, wherever possible, to the internationally accepted statistical procedures and definitions developed by the OECD and UNESCO for compiling R&D statistics (OECD 1981 and UNESCO 1984). For statistical purposes a NARS is defined in terms of the following characteristics:

(a) *National*. The concept of a "national" system used in this report refers to domestically targeted research activities funded and/or executed by the *public* sector of a particular country. A relatively broad concept of the public sector is taken to include government, semi-public, and academic research institutes. However, private, for-profit research as well as the research activities of supranational research agencies that are not executed through national institutes are excluded. Also excluded is research undertaken by short-term development projects.

(b) *Agricultural*. Agricultural research, as defined here, includes crop, livestock, forestry, and fisheries research, as well as research on agricultural inputs, the natural resource base, and socio-economic aspects of primary agricultural production. It excludes, where possible, research concerning the off-farm storage and processing of agricultural products, commonly referred to as post-harvest research and food-processing research. This delineation corresponds with the national accounts definition of the agricultural sector.

(c) *Research*. Research is often performed in conjunction with other activities such as extension, education, and production. To the extent possible, research activities (in terms of expenditures and staff) are differentiated from these other activities. However, if non-research activities were an integral part of an institute's research activities and accounted for less than 20% of the resources of the institute, it was expedient to classify all the activities of the institute as being research-related.

Full-Time Equivalent (FTE)

A full-time equivalent researcher year is taken to be a person who holds a full-time position as a researcher during the whole year. Adjustments to full-time equivalents have only been made when: (a) a research position was part-time; (b) a research position was not filled for the whole year; or (c) if the position explicitly involved tasks other than agricultural research. In the latter case an estimate was made of the time spent on agricultural research. No adjustments were made, however, for vacation or sick leave nor for time spent on administration, meetings, travel or other activities that form part of the normal duties required to support a research endeavor. Following this line of reasoning, professional staff in management positions were classified as researchers.

The degree status of researchers is determined on the following basis: 3-4 years full-time university education (BSc), 5-6 years (MSc), and more than 6 years plus doctorate thesis (PhD).

Expatriate Researcher Costs

Many expatriate researchers working on donor-supported projects in NARSs are paid their salaries and living expenses directly by the donor agency. All (or some substantial fraction) of these costs do not get included in the financial reports of the agricultural research organizations. To calculate these *implicit* costs we took the average cost per researcher in 1985 to be 120,000 "1985 PPP dollars" and backcast this figure using the rate of change in real personnel costs per FTE researcher in the US state agricultural experiment station system. This extrapolation procedure makes the assumption that the personnel-cost trend for US researchers is a reasonable proxy of the trend in real costs of internationally recruited staff working in NARSs. Unless otherwise stated, FTE expatriate researchers were costed at $80,000 "1985 PPP dollars" per researcher for the 1961-65 period, $85,000 per researcher for 1966-70, $90,000 per researcher for 1971-75, $110,000 per researcher for 1976-80, and $120,000 per researcher for 1981-91.

Deflators and Exchange Rates

All expenditure figures were first compiled in current local currency units (appendix 5). In order to facilitate comparisons over time and across countries these figures are deflated with a local GDP deflator to base year 1985, and then converted to a common currency (US dollars) using the 1985 purchasing power parity (PPP) over GDP. PPPs are synthetic exchange rates that attempt to reflect the purchasing power of a country's currency. The PPPs used here are derived from the Penn World Table (Mark 5), which is based on the benchmark studies of the International Comparison Project (Summers and Heston 1991). For additional information on currency conversion methods in this context see Pardey, Roseboom, and Craig (1992).

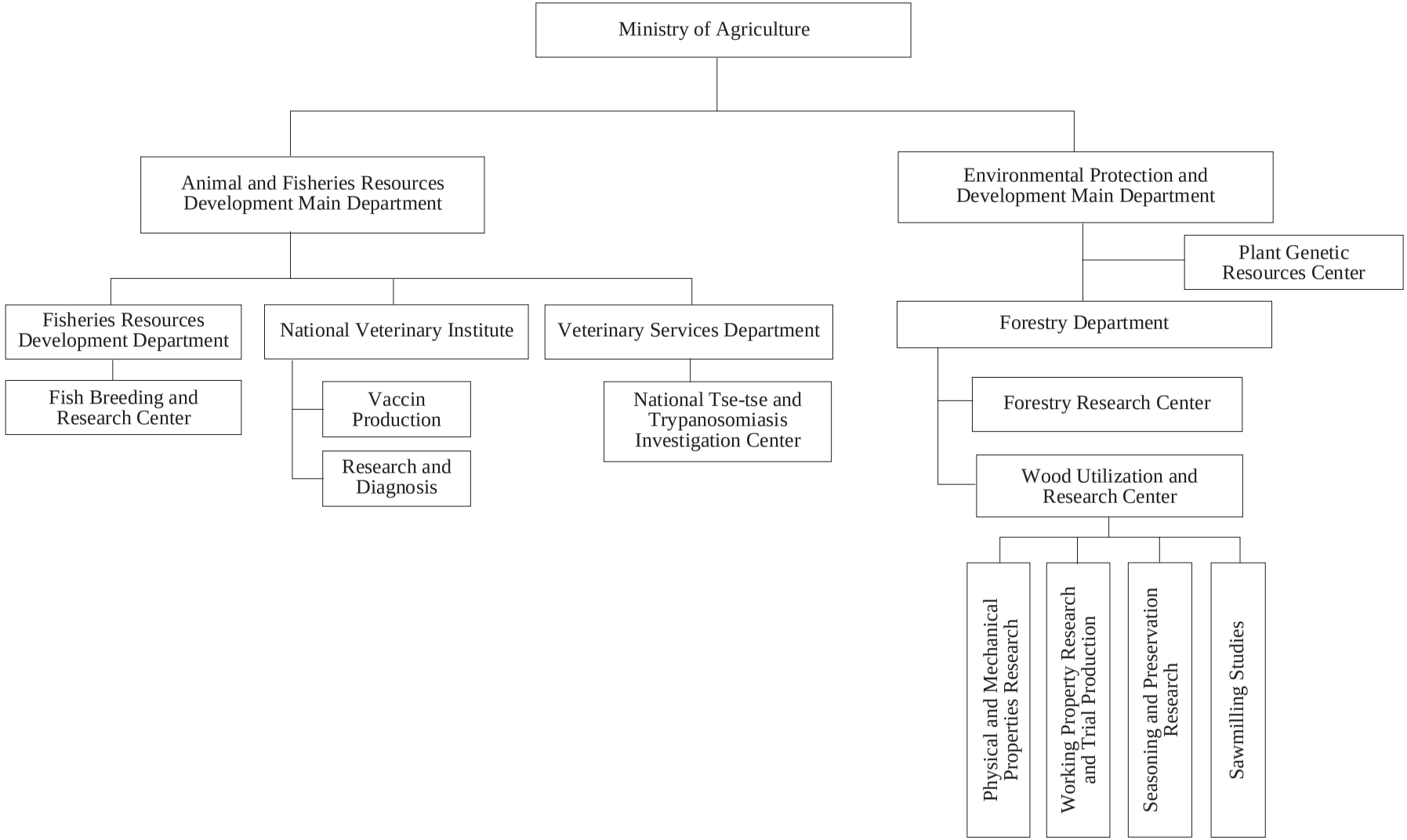
Nomenclature for tables in text

A zero indicates an actual observation of zero, a dash indicates an observation is not relevant (due to institutional mergers, closures, and so on), while "na" indicates an observation that is not available.

In the text we note any marked deviations from these data compilation norms and include points of clarification if warranted.

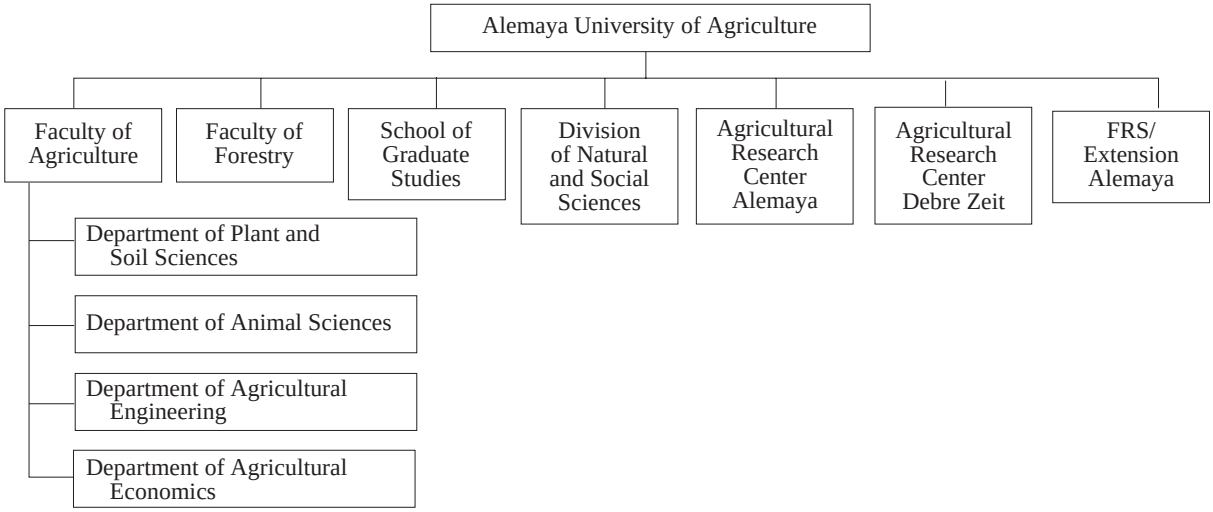
Appendix 3: Organizational charts of the agricultural research institutes

Institutes within the Ministry of Agriculture

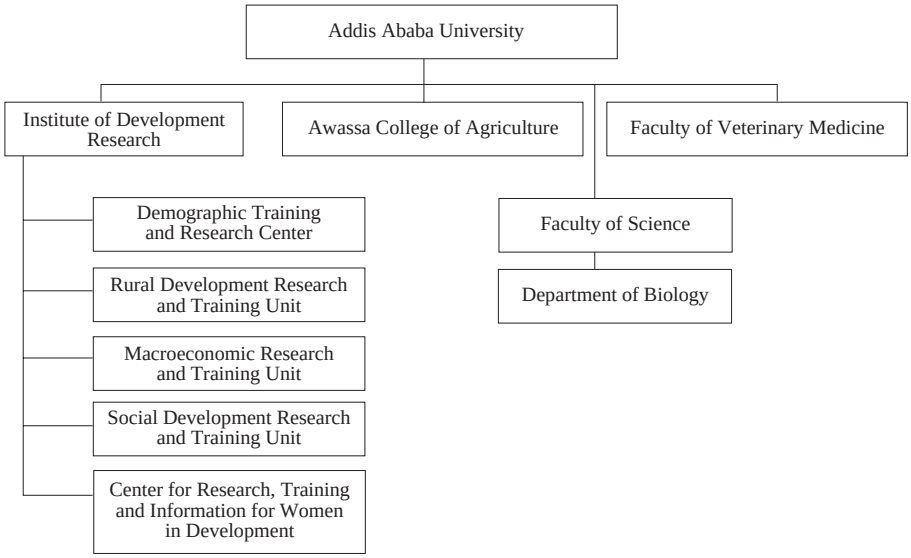


Appendix 3: Organizational charts of the agricultural research institutes (contd.)

Alemaya University of Agriculture

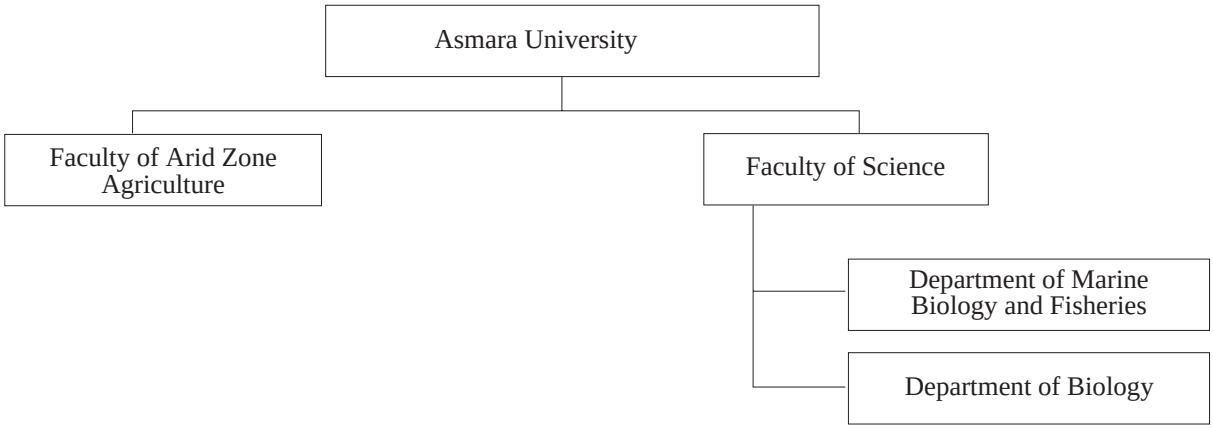


Addis Ababa University



Appendix 3: Organizational charts of the agricultural research institutes (contd.)

Asmara University



Appendix 4: Addresses of the agricultural research institutes

Institute of Agricultural Research
P.O. Box 2003
ADDIS ABABA

Arsi Regional Development Unit
Ministry of Agriculture
P.O. Box 7
ASELA

Forestry Research Centre
Ministry of Agriculture
P.O. Box 1034
ADDIS ABABA

Wood Utilization Research Centre
Ministry of Agriculture
P.O. Box 2322
ADDIS ABABA

Veterinary Services Department
Ministry of Agriculture
P.O. Box 3216
ADDIS ABABA

National Tse-tse and Trypanosomiasis Investigation Centre
Ministry of Agriculture
P.O. Box 15
BEDELLE

National Veterinary Institute
Ministry of Agriculture
P.O. Box 19
DEBRE-ZEIT

Fisheries Resources Development Department
Ministry of Agriculture
P.O. Box 62347
ADDIS ABABA

Research and Advisory Department
Ministry of State Farms
P.O. Box 5294 or P.O. Box 5765
ADDIS ABABA

Relief and Rehabilitation Commission
P.O. Box 22616
ADDIS ABABA

Department of Biology
Faculty of Sciences
Addis Ababa University
P.O. Box 1176
ADDIS ABABA

IDR
Addis Ababa University
P.O. Box 1176
ADDIS ABABA

College of Veterinary Medicine
Addis Ababa University
P.O. Box 34
Debre Zeit
SHOA

Awassa College of Agriculture
Addis Ababa University
P.O. Box 5
Awassa
SIDAMO

Alemaya University of Agriculture
P.O. Box 138
DIRE DAWA

Agricultural Research Centre
Alemaya University of Agriculture
P.O. Box 32
DEBRE ZEIT

Plant Genetic Resources Centre / Ethiopia
P.O. Box 30726
ADDIS ABABA

Ministry of State Farms
P.O. Box 1223
ADDIS ABABA

Ministry of Coffee and Tea Development
P.O. Box 3222
ADDIS ABABA

Asmara University
P.O. Box 1220
ASMARA

Ethiopian Science and Technology Commission
P.O. Box 2490
ADDIS ABABA

Plant Protection Research Center
(address not known)

Appendix 5a: Researcher totals, 1961-91

Total Number of FTE Researchers

Category	Name institute	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Government	IAR	10	14	16	20	22	26	28	30	42	40	47	56	57	59	48	47
	ARDU								2	2	2	4	4	4	6	6	6
	FRC																
	WURC																
	PGRC/E															na	na
	NVI	0	0	0	0.6	0.6	1.2	0.9	1.5	1.8	1.5	1.8	2.1	2.7	2.7	3.3	3.3
	NTTIC	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	FBRC														0	0	0
	PPRC																
	RAD																1
Government subtotal		10.0	14.0	16.0	20.6	22.6	27.2	28.9	33.5	45.8	43.5	52.8	62.1	63.7	67.7	57.3	57.3
Academic	AUA	4.0	4.0	4.0	4.0	5.9	7.9	9.8	11.7	13.7	15.6	12.9	10.2	11.0	11.8	3.0	3.0
	ACA																
	FVM																
	IDR												1.0	2.0	4.0	6.0	6.4
	FAZA																
	DMBF																
	DB								0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.5
Academic subtotal		4.0	4.0	4.0	4.0	5.9	7.9	9.8	11.8	13.8	15.8	13.1	11.5	13.3	16.2	9.4	9.8
TOTAL		14.0	18.0	20.0	24.6	28.5	35.1	38.7	45.3	59.6	59.3	65.9	73.6	77.0	83.9	66.7	67.1
Source		10			888		10		10	175	772 888	772	772 935	772	772 888	772	772

Appendix 5a: Researcher totals, 1961-91 (contd.)

Total Number of FTE Researchers

Category	Name institute	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Government	IAR	41	79	77	75	99	121	132	156	173	184	231	255	249	266	288	281
	ARDU	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	
	FRC	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	
	WURC			1	1.3	1.7	2.0	2.3	2.7	3	3	2	2	4	6	7	
	PGRC/E	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	
	NVI	3.9	3.6	2.7	3.3	2.7	3.0	2.7	2.7	2.7	3.0	4.2	4.5	4.5	3.3	2.7	2.7
	NTTIC	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	
	FBRC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	PPRC	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	
	RAD	1	6.5	12.0	17.5	23.0	28.5	34	30.0	26	26.0	26.0	26.0	26.0	26.0	26.0	
Government subtotal		54.9	98.1	102.7	107.1	137.4	165.5	183.0	203.4	217.7	229.0	277.2	301.5	298.5	316.3	339.7	
Academic	AUA	3.0	3.0	3.4	7.6	8.8	9.6	14.4	17.5	17.6	19.4	29.2	30.3	31.4	32.5	32.5	
	ACA								0.0	0.0	2.8	3.4	3.9	4.4	4.4	4.4	
	FVM				1.0	1.5	1.6	1.7	2.1	2.5	2.9	3.3	3.7	4.1	4.1	4.1	
	IRD	5.2	4.8	4.3	3.9	3.5	3.7	3.8	4.0	5.0	5.0	4.0	4.0	4.0	3.0	3.0	
	FAZA											0	0.3	0.4	0.6	0.8	
	DMBF			0.5	0.8	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	
	DB	0.5	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.9	0.9	1.0	1.0	1.0	1.1	1.1	
Academic subtotal		8.6	8.2	8.8	14.0	15.6	16.7	21.8	25.5	27.0	32.3	42.0	44.4	46.6	46.9	47.1	
TOTAL		63.5	106.4	111.5	121.1	153.0	182.2	204.9	228.8	244.7	261.3	319.2	345.9	345.1	363.2	386.8	
Source		772	772	772	772	772	772	772	772	772	999	999	999	999	999	999	999
		95	95		934	888	383	383	383	383	383	931	931	888	888		
								979	1116	999	976						
								17	931	1117							

Note: Italicized figures represent data that are either constructed or interpolated.

Appendix 5b: Expenditure totals, 1961-91

Total Research Expenditures — Currency: million Birr

Category	Name institute	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Government	IAR	*0.454*	*0.634*	*0.727*	*0.941*	*1.052*	1.289	*1.742*	3.230	*2.524*	2.565	2.783	4.015	3.421	4.631	4.077	6.091
	ARDU								*0.085*	*0.087*	*0.090*	*0.183*	*0.175*	*0.179*	*0.294*	*0.294*	*0.309*
	FRC																
	WURC																
	PGRC/E															na	na
	NVI				0.036	0.040	0.070	0.151	0.168	0.154	0.231	0.179	0.205	0.227	0.382	0.437	0.352
	NTTIC	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	FBRC														0.000	0.000	0.000
	PPRC																
	RAD															*0.214*	*0.225*
Government subtotal		0.454	0.634	0.727	0.977	1.091	1.359	1.892	3.483	2.765	2.887	3.145	4.396	3.826	5.307	5.021	6.977
Academic	AUA	*0.210*	*0.209*	*0.210*	*0.217*	*0.327*	*0.449*	*0.569*	*0.716*	*0.852*	*1.005*	*0.842*	*0.638*	*0.703*	*0.826*	*0.206*	*0.217*
	ACA																
	FVM																
	IDR												*0.050*	*0.102*	*0.224*	*0.336*	*0.377*
	FAZA																
	DMBF																
	DB	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.006*	*0.009*	*0.012*	*0.015*	*0.018*	*0.021*	*0.026*	*0.029*	*0.034*
Academic subtotal		0.210	0.209	0.210	0.217	0.327	0.449	0.569	0.722	0.861	1.018	0.858	0.706	0.826	1.076	0.571	0.628
Total (current Birr)		0.664	0.843	0.937	1.194	1.418	1.808	2.461	4.205	3.627	3.904	4.002	5.101	4.653	6.384	5.592	7.605
GDP Deflator (1985=100)		48.60	48.40	48.58	50.29	51.12	52.91	53.81	56.55	57.80	59.73	60.52	57.98	59.24	64.89	64.79	68.13
Total (constant 1985 Birr)		1.367	1.741	1.928	2.374	2.775	3.417	4.574	7.436	6.275	6.536	6.614	8.798	7.854	9.837	8.631	11.162
Total (constant 1985 PPP $)		1.900	2.420	2.680	3.300	3.858	4.750	6.359	10.337	8.723	9.087	9.194	12.231	10.918	13.675	11.998	15.518
Source					999	999	589	999	175	999	772	772	772	772	772	772	772

Appendix 5b: Expenditure totals, 1961-91 (contd.)

Total Research Expenditures — Currency: million Birr

Category	Name institute	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Public	IAR	6.751	8.115	8.176	8.078	9.085	9.094	8.329	10.577	11.952	16.998	26.961	30.054	26.931	27.947	23.183	
	ARDU	*0.458*	0.493	*0.507*	*0.518*	*0.531*	*0.538*	*0.560*	*0.571*	*0.605*	*0.626*	*0.598*	*0.610*	*0.629*	*0.640*	*0.708*	
	FRC	*0.082*	*0.088*	*0.181*	*0.185*	*0.284*	*0.288*	*0.400*	*0.407*	*0.539*	*0.559*	*0.641*	*0.653*	*0.786*	*0.799*	*1.010*	
	WURC			*0.148*	*0.190*	*0.243*	*0.288*	*0.343*	*0.394*	*0.464*	*0.391*	0.820	0.744	0.473	0.598	0.377	
	PGRC/E	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	
	NVI	*0.347*	*0.423*	*0.387*	*0.455*	*0.390*	*0.629*	*0.345*	*0.704*	*0.303*	*0.329*	*0.462*	*0.476*	*0.564*	*0.395*	*0.444*	
	NTTIC	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	
	FBRC	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
	PPRC	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	
	RAD	0.250	*0.367*	*0.698*	*1.040*	*1.407*	*1.767*	*2.196*	*1.982*	*1.832*	*1.897*	*1.813*	*1.848*	*1.905*	*1.938*	*2.144*	
Government subtotal		7.888	9.486	10.098	10.464	11.940	12.605	12.173	14.635	15.695	20.799	31.295	34.386	31.287	32.317	27.865	
Academic	AUA	*0.241*	*0.260*	*0.306*	*0.702*	*0.837*	*0.925*	*1.442*	*1.778*	*1.897*	*2.172*	*3.117*	*3.298*	*3.524*	*3.710*	*4.103*	
	ACA								*0.000*	*0.000*	*0.317*	*0.359*	*0.422*	*0.494*	*0.502*	*0.556*	
	FVM				*0.092*	*0.142*	*0.154*	*0.170*	*0.214*	*0.270*	*0.324*	*0.352*	*0.403*	*0.460*	*0.468*	*0.518*	
	IDR	*0.338*	*0.334*	*0.314*	*0.289*	*0.265*	*0.282*	*0.307*	*0.326*	0.227	0.220	0.235	0.412	0.349	0.270	0.677	
	FAZA												*0.033*	*0.051*	*0.068*	*0.095*	
	DMBF			*0.045*	*0.074*	*0.104*	*0.106*	*0.110*	*0.112*	*0.119*	*0.134*	*0.128*	*0.131*	*0.135*	*0.137*	*0.152*	
	DB	*0.041*	*0.048*	*0.054*	*0.059*	*0.065*	*0.070*	*0.078*	*0.083*	*0.093*	*0.102*	*0.102*	*0.109*	*0.117*	*0.124*	*0.143*	
Academic subtotal		0.621	0.643	0.719	1.217	1.414	1.536	2.106	2.513	2.605	3.269	4.293	4.807	5.129	5.280	6.243	
Total (current Birr)		8.509	10.128	10.816	11.681	13.354	14.140	14.280	17.148	18.300	24.067	35.588	39.193	36.416	37.598	34.107	
GDP Deflator (1985=100)		75.81	81.58	83.93	85.62	87.81	89.01	92.68	94.36	100.00	103.54	98.94	100.89	104.01	105.81	117.01	
Total (constant 1985 Birr)		11.224	12.416	12.887	13.644	15.207	15.887	15.407	18.172	18.300	23.245	35.968	38.849	35.011	35.534	29.148	
Total (constant 1985 PPP $)		15.603	17.260	17.916	18.968	21.141	22.085	21.419	25.263	25.441	32.315	50.002	54.007	48.672	49.399	40.522	
Source		772	772	772	772	772	772	772	772	772	999	999	999	999	999	999	
		999	999	999	999	999	999	999	999	999							
		95	95														

Note: Italicized figures are either constructed or interpolated.

Appendix 6: Research staff development by institute

Institute for Agricultural Research (IAR)

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Nationals																
PhD										1	1	4	4	5	4	3
MSc										6	5	4	6	9	13	7
BSc										10	15	20	19	16	9	18
Subtotal	*0*	*2*	*2*	*4*	*4*	*6*	*8*	*10*	20	17	21	28	29	30	26	28
Expatriates	*10*	*12*	*14*	*16*	*18*	*20*	*20*	*20*	22	23	26	28	28	29	22	19
Total	10	*14*	*16*	*20*	*22*	26	*28*	30	42	40	47	56	57	59	48	47
Source	10					10		10	175	772	772	772	772	772	772	772
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Nationals																
PhD	3	5	5	5	7	9	12	15	15	13	15	18	18	18	19	19
MSc	4	19	20	22	26	35	44	52	55	53	74	77	70	83	74	79
BSc	25	33	37	31	51	65	74	87	102	103	126	149	150	156	179	173
Subtotal	32	57	62	58	84	109	130	154	172	169	215	244	238	257	272	271
Expatriates	9	22	15	17	15	12	2	2	1	15	16	11	11	9	16	10
Total	41	79	77	75	99	121	132	156	173	184	231	255	249	266	288	281
Source	772	772	772	772	772	772	772	772	772	999	999	999	999	999	999	999

Note: The pre-1966 data refer to some adhoc research activities by the ministry of agriculture that preceded the establishment of IAR.

Arusi Rural Development Unit (ARDU), Ministry of Agriculture

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Nationals																
PhD																
MSc																
BSc																
Subtotal																
Expatriates																
Total								*2*	*2*	*2*	*4*	*4*	*4*	*6*	*6*	*6*
Sources:																
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Nationals																
PhD																
MSc																
BSc																
Subtotal		6														
Expatriates		2														
Total	*8*	8	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	
Sources:		95														

Appendix 6: Research staff development by institute (contd.)

National Veterinary Institute (NVI), Ministry of Agriculture

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Nationals																
PhD																
MSc																
BSc																
Subtotal				1	1	1	1	1	1	1	1	1	2	2	4	4
Expatriates				1	1	3	2	4	5	4	5	6	7	7	7	7
Total				2	2	4	3	5	6	5	6	7	9	9	11	11
FTE Researchers				0.6	0.6	1.2	0.9	1.5	1.8	1.5	1.8	2.1	2.7	2.7	3.3	3.3
Sources:				999	999	999	999	999	999	999	999	999	999	999	999	999
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Nationals																
PhD																
MSc																
BSc																
Subtotal	6	7	4	5	6	6	6	6	5	5	9	11	11	8	8	8
Expatriates	7	5	5	6	3	4	3	3	4	5	5	4	4	3	1	1
Total	13	12	9	11	9	10	9	9	9	10	14	15	15	11	9	9
FTE Researchers	3.9	3.6	2.7	3.3	2.7	3.0	2.7	2.7	2.7	3	4.2	4.5	4.5	3.3	2.7	2.7
Sources:	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999

Note: It is assumed that NVI staff spent 30% of their time on research.

Forestry Research Centre (FRC), Ministry of Agriculture

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Nationals																
PhD										0						
MSc										2						
BSc										3						
Subtotal										5						
Expatriates										0						
Total	*1*	*1*	*2*	*2*	*3*	*3*	*4*	*4*	*5*	5	*6*	*6*	*7*	*7*	*8*	*8*
Sources:										976						

Appendix 6: Research staff development by institute (contd.)

Wood Utilization Research Centre (WURC), Ministry of Agriculture

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Nationals																
PhD									0	0	0	0	0	0	0	
MSc									1	1	1	1	2	3	4	
BSc									0	1	1	1	2	3	3	
Subtotal			*0.0*	*0.2*	*0.3*	*0.5*	*0.7*	*0.8*	1	2	2	2	4	6	7	
Expatriates			*1.0*	*1.2*	*1.3*	*1.5*	*1.7*	*1.8*	2	1	0	0	0	0	0	
Total			*1.0*	*1.3*	*1.7*	*2.0*	*2.3*	*2.7*	3	3	2	2	4	6	7	
Sources:									999	999	999	999	999	999	999	

Research and Advisory Department, Ministry of State Farms

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Nationals																
PhD																
MSc																
BSc																
Subtotal															*1*	*1*
Expatriates															*0*	*0*
Total															*1*	*1*
Source																

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Nationals																
PhD							3		3							
MSc							20		14							
BSc							20		8							
Subtotal	1	*6.3*	*11.7*	*17.0*	*22.3*	*27.7*	33	*29.0*	25	*25.0*	*25.0*	*25.0*	*25.0*	*25.0*	*25.0*	
Expatriates	0	*0.2*	*0.3*	*0.5*	*0.7*	*0.8*	1	*1.0*	1	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	
Total	1	*6.5*	*12.0*	*17.5*	*23.0*	*28.5*	34	*30.0*	26	*26.0*	*26.0*	*26.0*	*26.0*	*26.0*	*26.0*	
Source	95						17		1117							

Appendix 6: Research staff development by institute (contd.)

Alemaya University of Agriculture

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Nationals																
PhD												10				
MSc												15				
BSc												12				
Subtotal												37				
Expatriates												14				
Total	*20*	*20*	*20*	20	*29.7*	*39.3*	*49.0*	*58.7*	*68.3*	78	*64.5*	51	*55.0*	59	*59.0*	*59.0*
FTE Researchers	*4.0*	*4.0*	*4.0*	4.0	*5.9*	*7.9*	*9.8*	*11.7*	*13.7*	15.6	*12.9*	10.2	*11.0*	11.8	*3.0*	*3.0*
Sources:				888						888		935		888		
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Nationals																
PhD				6		6	5	9	14	10	16					
MSc				2		13	26	34	40	41	58					
BSc				55		27	45	41	16	24	42					
Subtotal				63		46	76	84	70	75	116					
Expatriates				13		25	18	18	23	19	14					
Total	*59.0*	*59.0*	*67.5*	76	75	71	94	102	93	94	130	*145*	*160*	175	*175*	
FTE Researchers	*3.0*	*3.0*	*3.4*	7.6	8.8	9.6	14.4	17.5	17.6	19.4	29.2	*30.3*	*31.4*	32.5	*32.5*	
Sources:				934	888	383	383	383	383	383	931			888		

Notes: From 1952-1961: Alemaya College of Agriculture; from 1961-1985: part of the Addis Ababa University; after 1985: Alemaya University of Agriculture. The time spent on research by AUA faculty has been estimated at 20% during the period 1961-74, 5% during the period 1975-79, and 10% in 1980 increasing linearly to 22.5% in 1987. The 1990/91 FTE researchers are constructed assuming that the faculty at the Debre Zeit research station (i.e., 28) spend 75% of their time on research. Of the other faculty only 46 hold a research-teaching position. They spend about 25% of their time on research. The 1988 and 1989 estimates are interpolated.

Faculty of Veterinary Medicine, Addis Ababa University

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Nationals																
PhD							1									
MSc							4									
BSc							1									
Subtotal							6									
Expatriates							11									
Total				10	15	16	17	21	25	29	33	37	41	41	41	
FTE Researchers				1.0	1.5	1.6	1.7	2.1	2.5	2.9	3.3	3.7	4.1	4.1	4.1	
Sources:					888		979						888			

Note: Faculty time spent on research has been estimated at 10%.

Appendix 6: Research staff development by institute (contd.)

Institute of Development Research (IDR), University of Addis Ababa

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Nationals																
PhD																
MSc																
BSc																
Subtotal																
Expatriates																
Total												*2*	*4*	*8*	12	*11.2*
FTE Researchers												*1.0*	*2.0*	*4.0*	*6.0*	*6.4*
Sources:															888	
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Nationals																
PhD								4	3	3	3	3	4	4	4	
MSc								4	9	9	9	9	9	8	8	
BSc								0	0	0	0	0	0	2	2	
Subtotal								8	12	12	12	12	13	14	14	
Expatriates								0	0	0	0	0	0	0	0	
Total	*10.3*	*9.5*	*8.7*	*7.8*	7	*7.3*	*7.7*	8	12	12	12	12	13	14	14	
FTE Researchers	*5.2*	*4.8*	*4.3*	*3.9*	*3.5*	*3.7*	*3.8*	*4.0*	*5.0*	*5.0*	*4.0*	*4.0*	*4.0*	*3.0*	*3.0*	
Sources:					888			1116	999	999	999	999	999	999	999	

Note: IDR's professional staff time spent on agricultural research has been estimated at 50% during the period 1972-84.

Awassa College of Agriculture

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Nationals																
PhD								1								
MSc								17								
BSc								0								
Subtotal								18								
Expatriates								0								
Total								18	*23.2*	*28.4*	*33.6*	*38.8*	44	*44*	*44*	
FTE Researchers								0.0	0.0	2.8	3.4	3.9	4.4	4.4	4.4	
Sources:								931					888			

Note: Previously Awassa Junior Agricultural College. Became Awassa College of Agriculture around 1990. We assumed that research at ACA began in earnest in 1986 and that faculty spend 10% of their time on research.

Appendix 6: Research staff development by institute (contd.)

Faculty of Arid Zone Agriculture, Asmara University

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Nationals																
PhD												0				
MSc												0				
BSc												4				
Subtotal												4				
Expatriates												2				
Total											3	6	9	12	15	
FTE Researchers											0	0.3	0.4	0.6	0.8	
Sources:												931				

Note: Faculty time spent on research has been estimated at 5%.

Department of Marine Biology & Fisheries, Faculty of Science, Asmara University

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Nationals																
PhD												0				
MSc												2				
BSc												5				
Subtotal												7				
Expatriates												5				
Total			*5*	*8*	11	*11*	*11*	*11*	*11*	*12*	*12*	12	*12*	*12*	*12*	
FTE Researchers			*0.5*	*0.8*	*1.1*	*1.1*	*1.1*	*1.1*	*1.1*	*1.2*	*1.2*	*1.2*	*1.2*	*1.2*	*1.2*	
Sources:					888							931				

Note: Faculty time spent on research has been estimated at 10%.

Appendix 6: Research staff development by institute (contd.)

Department of Biology, Faculty of Science, Asmara University

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Nationals																
PhD																
MSc																
BSc																
Subtotal																
Expatriates																
Total								*1.0*	*1.4*	*1.9*	*2.4*	*2.8*	*3.2*	*3.7*	*4.2*	*4.6*
FTE Researchers								*0.1*	*0.1*	*0.2*	*0.2*	*0.3*	*0.3*	*0.4*	*0.4*	*0.5*
Sources:																
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Nationals																
PhD												1				
MSc												3				
BSc												3				
Subtotal												7				
Expatriates												3				
Total	*5.0*	*5.5*	*6.0*	*6.4*	*6.8*	*7.3*	*7.8*	*8.2*	*8.6*	*9.1*	*9.6*	10	*10.5*	*10.9*	*11.4*	
FTE Researchers	*0.5*	*0.6*	*0.6*	*0.6*	*0.7*	*0.7*	*0.8*	*0.8*	*0.9*	*0.9*	*1.0*	*1.0*	*1.0*	*1.1*	*1.1*	
Sources:												931				

Note: Faculty time spent on research has been estimated at 10%.

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