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Statistical Brief on the National Agricultural Research System

of

SOUTH AFRICA

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ISNAR INDICATOR SERIES PROJECT: PHASE II
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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.

These statistical briefs are not official ISNAR publications; they are not edited or reviewed by ISNAR. The information and data presented have been collected and compiled with due care and all reasonable efforts have been made to ensure their accuracy. Comments, corrections, and additions to the material reported in this brief are welcomed. These briefs may be cited with due acknowledgment.

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Acronyms

ADB	Agricultural Development Branch	IAPI	Irene Animal Production Institute
ADC	Agricultural Development Centre	ICFR	Institute for Commercial Forestry Research
ADI	Agricultural Development Institute	ISCW	Institute for Soil, Climate and Water
AMI	Agrimetrics Institute	ISNAR	International Service for National Agricultural Research
ARC	Agricultural Research Council	ITSC	Institute for Tropical and Subtropical Crops
ARDI	Agricultural and Rural Development Institute	MUSA	Medical University of South Africa
CGIAR	Consultative Group on International Agri-cultural Research	NARS	National Agricultural Research System
CSIR	Council for Scientific and Industrial Research	NBI	National Botanical Institute
DACL	Department of Agricultural Credit and Lands	NIVO	Nietvoorbij Institute for Viticulture and Oenology
DAD	Department of Agricultural Development	NTRI	National Timber Research Institute
DAE	Directorate of Agricultural Economics	OECD	Organization of Economic Cooperation and Development
DAEM	Department of Agricultural Economics and Marketing	ORI	Oceanographic Research Institute
DAF	Department of Agriculture and Fisheries	OVI	Onderstepoort Veterinary Institute
DAFS	Directorate of Agricultural Field Services	PPRI	Plant Protection Research Institute
DAM	Directorate of Agricultural Mechanization	PPP	Purchasing Power Parity
DAR	Directorate of Agricultural Research	RGI	Roodeplaat Grassland Institute
DATS	Department of Agricultural Technical Services	SAFRI	South African Forestry Research Institute
DAWS	Department of Agriculture and Water Supply	SASA	South African Sugar Association
DEA	Department of Environmental Affairs	SFI	Sea Fisheries Institute
DF	Department/Directorate of Forestry	SFRI	Sea Fisheries Research Institute
DIE	Directorate of Irrigation Engineering	SIFT	Stellenbosch Institute for Fruit Technology
DM	Directorate of Marketing	TCRI	Tobacco and Cotton Research Institute
DOA	Department of Agriculture	UB	University of Bophuthatswana
DSCDS	Directorate of Soil Conservation and Drilling Services	UFH	University of Fort Hare
DSF	Division of Sea Fisheries	UNA	University of Natal
FA	Faculty of Agriculture	UNO	University of the North
FAS	Faculty of Agricultural Sciences	UOFS	University of the Orange Free State
FFOR	Faculty of Forestry	UP	University of Pretoria
FORESTE	Division of Forest Science and Technology / CSIR	US	University of Stellenbosch
FRD	Forestry Research Division	VOPI	Vegetable and Ornamental Plant Institute
FTE	Full-Time Equivalent	WRI	Wattle Research Institute
FVS	Faculty of Veterinary Sciences		
GCI	Grain Crops Institute		

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 South Africa. 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 South African NARS. Most importantly, these data are assembled and reported in a way that makes them directly comparable with 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 administrated 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 a disaggregated fashion. For general background information and statistics on South Africa we refer to appendix 1.

2. Agricultural Research Institutions

2.1 Historical Evolution¹

The Union of South Africa was established in 1910 from the former two Boer Republics, encompassing the Transvaal and Orange Free State areas, and the two former British colonies, Natal and the Cape Colony. Although the early history of agricultural research in South Africa precedes the establishment of the union,² agricultural research really began to take shape after 1910. To a very large extent the history of agricultural research throughout the 20th century is the history of the Department of Agriculture. Consequently this section provides an overview of this broader history, but where possible also includes details about specific developments regarding agricultural research.

Department of Agriculture: 1910-1958

The commissions appointed under the South Africa Act of 1910 recommended that public interventions in agriculture be the province of the central government. One year later the Department of Agriculture of the Union of South Africa was formed. At its inception the department consisted of 18 divisions, namely: The Secretariat, Veterinary Services, Veterinary Research, Sheep and Wool, Dairying, Entomology, Grasses and Botany, Plant Pathology and Mycology, Tobacco and Cotton, Horticulture, Oenology, Chemistry, Publications, Co-operative Associations, Brand Marks and Fencing, Dryland Farming, Grain Inspection, and Guano Islands.

In 1913, the administration of agricultural education, including the agricultural colleges at Elsenburg, Cedara, Potchefstroom and Grootfontein (and Glen in 1919), was transferred from the Department of Education to the Department of Agriculture (DOA).

Based on an investigation into the work of the 18 divisions and the 5 agricultural colleges in 1920, it was decided to gradually transfer all extension activities to the agricultural colleges. In that same year administrative responsibility for the Faculty of Agriculture at the University of Stellenbosch was transferred from the Department of Education to the Department of Agriculture. The Faculties of Agriculture at the Universities of Pretoria and Natal followed the same course in 1940 and 1948, respectively. Local training for veterinarians was made possible by the establishment of a Faculty of Veterinary Science within the University of Pretoria in 1922.

During the first 12 years of its existence, an expanding DOA gave increasing emphasis to agricultural education. Beginning in 1924, however, the emphasis shifted to providing more extension services. In that year a new Extension Division was established in an effort to develop stronger links with the farming community as well as to coordinate the extension effort between the colleges and the various divisions within DOA.

In 1924 a new Division of Animal Husbandry and Agronomy was also established, which assumed some of the responsibilities of the Sheep and Wool Division. In addition, it was

1 This section is largely based on information provided in annual reports of the different research entities, and in particular source 1508.

2 For example, in Transvaal a division of agricultural chemistry was established within the Department of Agriculture in 1902 and the Onderstepoort Veterinary Institute in 1908.

decided that the five agricultural colleges should concentrate their efforts on the principal farming enterprises in their respective regions. For example, Elsenburg was to focus on winter grains and horticulture and Potchefstroom more on summer grains and slaughter cattle.

The late 1920s saw a major reorganization of the Department. A new Division of Economics and Markets was established in 1925. In 1926, the colleges were transferred to the Extension Division, which was then reconstituted as the Division of Agricultural Education and Extension, incorporating the Publications Division. In 1927, the divisions of Veterinary Research and Veterinary Services were amalgamated, and a year later the functions of the Animal Husbandry and Agronomy Division were split between the new and larger Division of Veterinary Service and Livestock Industry and a new Division of Botany.

The restructuring of departmental services continued throughout the 1930s and 1940s. During 1935, Animal Husbandry was again split from Veterinary Services and amalgamated with the Division of Agricultural Education and Extension. In 1939, the Division of Plant Science was split into three new divisions: Horticulture, Entomology, and Botany and Plant Pathology. In the same year the Division of Agricultural Education made way for a new Division of Animal Husbandry and Agronomy, which included education and extension.

Another radical change followed in 1944, when extension was amalgamated with the Division of Soil and Veld Conservation to form the Division of Soil Conservation and Extension. At the same time pasture research was transferred to the Division of Animal Husbandry and Agronomy. This division was then reorganized as the Division of Agricultural Education and Research.

The dynamic nature of the country's agricultural economy, and the far reaching technological developments that occurred after World War II, caused continuing rounds of reorganization within DOA to ensure that it adapted to these changes. The first post-war reorganization took place in 1952/53, when Technical Services (responsible for most of DOA's research) was organized into three main branches: 10 national divisions (an additional one was added in 1960), three special institutes (a fourth added in 1956), and six agroecological entities (increased to seven in 1961). A director of Technical Services was appointed to assist the head of DOA with the coordination and implementation of policy.

Department of Agricultural Technical Services: 1958-1984

In 1958 the Department of Agriculture was split in two full government departments, namely the Department of Agricultural Technical Services (DATS) and the Department of Agricultural Economics and Marketing (DAEM). DATS focused largely on production issues and provided services such as agricultural research, education and extension, and regulatory and control services. DAEM was responsible for developing and administering agricultural economic policy, the orderly marketing of agricultural products, determining government controlled prices, overseeing cooperatives, undertaking commodity inspections, conducting economic surveys of agricultural conditions, collecting statistics, and engaging in marketing research.

In 1962, DATS was reorganized following the recommendations of a committee chaired by Professor C.H. Rautenbach. This reorganization provided for the establishment of two Directorates, namely the Directorate of Agricultural Research (DAR) and the Directorate of Agricultural Field Services (DAFS). DAR was given responsibility for 10 research institutes³ and DAFS for three service divisions.⁴ The Regional Services were not affected by this reorganization and continued to control the agricultural experiment stations and colleges located throughout seven agroecological regions.⁵ Agricultural research at the regional level continued to be strongly linked to extension and education, and was more adaptive in character, while agricultural research at the national level under DAR did more upstream research. Links between the two levels of research were maintained, among other things, by outposting researchers from national research institutes to the regional experiment stations.

In 1968 South-West Africa (today's Namibia) was integrated administratively into South Africa's government structure. For DATS this meant having to manage an additional agroecological region, including agencies that undertook some research. However, the integration never fully came into being and ceased in 1978. The annual reports for DATS during these years include a separate report on South-West Africa.

A number of further changes were introduced in 1970 of which the following were the most important: the appointment of a Senior Deputy Secretary, amalgamation of the two directorates to form one single Directorate of Agricultural Technical Services, the number of Chief Directors was increased to six, and the heads of all regional agencies, institutes, and divisions were upgraded to the rank of Director. The number of national divisions was increased from four to six, adding a Soil Protection Division and an Agricultural Information Division. Another research institute, the Institute for Crops and Pastures, was established about this time to bring the total number of research institutes to eleven. However, it never developed into a full-fledged institute (the number of researchers fluctuated between five and seven during its 10 years of existence) and closed in 1981. In that same year, the Grain Crops Research Institute was established at Potchefstroom. It took over the operation of several research units that had developed at the regional level during the 1970s such as the Small Grain Research Centre at Bethlehem (Highveld), the Summer Grain Research Centre at Potchefstroom (Highveld), and the Summer Grain Research Centre at Pietermaritzburg (Natal).

Another significant change that took place in the early 1970s was the transfer of administrative responsibility for the faculties of agriculture and veterinary sciences to the Ministry of Education. Nevertheless, DATS continued to finance agricultural research at the universities and supported a substantial but declining number of research positions at the various faculties of agriculture and veterinary sciences.

3 The Plant Protection Research Institute, the Animal and Dairy Science Research Institute, the Tobacco Research Institute, the Soil and Irrigation Research Institute, the Horticultural Research Institute, the Citrus and Subtropical Research Institute, the Fruit and Food Technology Research Institute, the Botanical Research Institute, the Research Institute for Oenology and Viticulture, and the Veterinary Research Institute.

4 Veterinary Field Services, Plant and Seed Control, and Agricultural Engineering Services. In 1966 the Plant and Seed Control Division was split into the Plant Pest Control Division and the Seed Control Division.

5 Transvaal, Natal, Winter Rainfall, Karoo, Highveld, Orange Free State, and Cape East.

With its establishment in 1958, DAEM consisted of a Directorate of Economic Services, the National Marketing Council, and three divisions, namely Economics and Markets, Commodity Services, and the Registrar of Cooperative Societies. In 1967 the Division of Economics and Markets was split in two separate divisions: Agricultural Production Economics and Agricultural Market Research. The Division of Agricultural Production Economics was made responsible for research on farm problems and farm enterprise studies, while the principal task of the Division of Agricultural Marketing Research was to study the production and consumption of commodities that were not directly subject to government controls.

The Agricultural Credit Act of 1966 led to the establishment of the Department of Agricultural Credit and Lands (DACL). The Surveyor General and all deeds offices became part of this department. Control over all government owned land was also vested in this department.

In 1980 DATS, DAEM, and DAEL were amalgated into one Department of Agriculture and Fisheries (DAF) in an effort to rationalize the public service. Also the Institute for Sea Fisheries was initially placed under the control of DAF but was transferred to the Department of Environmental Affairs (DEA) in August 1982. At that same time DAF was renamed the Department of Agriculture and Water Supply (DAWS).

During the three years of its existence DAF/DAWS also went through a number of reorganizations. Cotton research was transferred to the Tobacco Research Institute at Rustenburg, the Inspection Services Division was renamed the Division of Agricultural Product Standards, the Division of Agricultural Marketing Research became the Division of Economic Services, the Financial Assistance branch became a fully fledged division as did the sub-division Biometric and Datametric Services.

Less visible than all these organizational changes, but important nonetheless, was the formulation and implementation of the policy of “optimal agricultural development” during a period of 15 years between 1968 and 1983. The stated goals of this policy were to make “optimal” productive use of the country’s agricultural resources in harmony with environmental factors as well as stabilize agricultural markets by means of “orderly marketing” and “price stabilization” measures.

Department of Agricultural Development: 1985-1992

In 1984 the so-called tricameral constitutional dispensation was introduced. As a consequence, the administrative agencies responsible for agriculture were divided into various “own” affairs and “general” affairs departments. In accordance with this policy of racial segregation, separate own departments of agriculture were created for each racial group represented in parliament under the new dispensation. In addition to the departments of agriculture within the administrations of each of the ten homelands and self-governing territories, a separate Department of Agriculture was formed for each of the administrations of the House of Representatives (Coloreds), Delegates (Asians), and Assembly (Whites). DAWS was split into a “white own affairs” department (the Department of Agricultural Development) and a “general affairs” department (the Department of Agriculture). The latter was responsible for agricultural issues that were deemed to span racial barriers, and performed functions such as regulatory measures, agricultural marketing, product standards, meat hygiene, and so on.

The Department of Agricultural Development (DAD) operated in a fashion similar to the old DAWS, concentrating mainly on agricultural production, research, and extension, and continued directing its services to the white farming community. It basically took over all the

research activities formerly under DAWS, including the 11 research institutes, the seven regional organizations, and all eight directorates of which some conducted research. The other 13 Departments of Agriculture did not support or supervise any substantial research capacity. This meant that as practical matter nearly all of South Africa's agricultural research was now explicitly targeted toward the problems confronting "white commercial agriculture." A possible exception to this was some of the agricultural research conducted at the universities.

In 1987, two research centers were added to the 11 research institutes operating under DAD, namely the Grassland Research Centre and the Plant Biotechnology Research Centre, thereby increasing the number of research entities to 13. In 1988 the Botanical Research Institute was transferred to the Department of Environmental Affairs, reducing the number of research entities administered by DAD to 12.

As a result of extensive deregulation and efforts to privatize hitherto publicly provided services within DAD (as well as more generally within South Africa's bureaucracy), most of the agricultural research activities under DAD were transferred to the newly established Agricultural Research Council (ARC) in April 1992. Many of the agricultural research activities at the regional level, however, remained within DAD. These regional research activities were consolidated into seven Agricultural Development Institutes (ADIs), which now provide an integrated program of agricultural research, extension, training, and other services. DAD also retained several directorates with research responsibilities such as agricultural mechanization, irrigation engineering, soil conservation and drilling services, and agricultural economics.

With the creation of ARC, the Grassland Research Centre was transformed into the Roodeplaat Grassland Institute, the Plant Biotechnology Research was closed, while the Directorate of Biometric and Datametric Services was transformed into the Agrimetrics Institute. Not all researchers previously employed by the Directorate of Biometric and Datametric Services, however, were transferred to the Agrimetrics Institute. A substantial number remained within the ADIs.

Perhaps more important than the reorganization itself was that a new, business-like management style was introduced into the ARC institutes. The Council has embarked upon a more aggressive cost recovery program by introducing a "users pay" principle. This has induced a stronger client orientation than was hitherto the case. Targets were set to rapidly increase external funding, with the goal of recovering 30% of total expenditures from the commercial agricultural sector by 1995. Additional details about ARC are provided in section 2.2.

Forestry Research

The Department of Forestry (DF) has been responsible for a substantial share of South Africa's forestry research for many years. DF established a research section as early as 1912. This was followed by the establishment of a Forest Product Institute by DF in 1919. This institute conducted research on wood technology. In 1956 both entities were amalgated to form the Forestry Research Division (FRD) of DF with headquarters at the Forest Research Station in Pretoria.

In April 1980, as a result of a major reorganization throughout the public service, the Department of Forestry became the Directorate of Forestry (DF) of the Department of Water Affairs, Forestry, and Environmental Conservation. After another reorganization in 1982, this department was renamed the Department of Environmental Affairs. Until 1982, research within

the Research Division of DF focused on silviculture and wood technology. Beginning in 1982, the Division also conducted conservation research. In 1984, the Division's wood technology research activities were transferred to the - already existing - National Timber Research Institute (NTRI) under the Council of Scientific and Industrial Research (CSIR). The remaining research activities of DF were consolidated into the South African Forestry Research Institute (SAFRI).

CSIR's involvement in forestry research dates from 1955 when, in collaboration with the forest industry, it began offering research fellowships for specific timber-utilization studies. In 1960, CSIR established a timber unit, which in 1966 was granted administrative independence and renamed the Timber Research Unit and later the National Timber Research Institute (NTRI). NTRI provides specialized research and technical services to the suppliers and users of timber products. In 1990, SAFRI was incorporated into CSIR. Together with NTRI it forms the new Division of Forestry Science and Technology (FORESTEK) of CSIR.

The Wattle Research Institute (WRI) was established by the University of Natal in Pietermaritzburg in 1947. The institute was financially supported by the Wattle Growers' Union as well as the Department of Forestry. Initially WRI's research only focused on wattle trees, but in 1969 its research program broadened to include silvicultural studies. Since then the institute has further broadened its scope of research. Reflecting this change, WRI was renamed the Institute for Commercial Forestry Research (ICFR) in 1984. ICFR is now largely funded by contributions from the forestry industry.

Forestry research at Stellenbosch began in 1932 in the Faculty of Agriculture. It became a faculty in its own right in 1956. It is the only Faculty of Forestry in South Africa and includes the departments of forestry science, wood science, timber harvesting, nature conservation, and recreation. The faculty receives research grants from the Directorate of Forestry.

Fisheries Research

Sea fisheries research originated in 1895, when the Cape Provincial Administration began fishery investigations. The Division of (Sea) Fisheries (DSF) was established in 1929 as part of the Department of Mines and Industries and subsequently the Department of Commerce and Industries, and then the Department of Industries. Research has been an important activity of DSF from its earliest days. Other activities carried out by DSF included the inspection of fish catches, the management of harbors, and the enforcement of fishing regulations.

In 1969 DSF assumed responsibility for the management and control of sea fisheries in the territory of South-West Africa (today's Namibia). The South-West African Fisheries Research Laboratory at Walvis Bay as well as the Coastal Station at Lüderitz were brought under DSF's supervision and integrated into DSF's research program. In 1978 control over sea fisheries in South-West Africa was transferred from South Africa's Department of Industries to the Office of the Administrator-General in Windhoek. In spite of this change, DSF and its successors continued to oversee sea fisheries research in South-West Africa until 1989.

After a reorganization in 1972 DSF became the Sea Fisheries Branch (SFB) of the Department of Industry. In 1980 SFB became the Sea Fisheries Institute (SFI) and was transferred to the new Department of Agriculture and Fisheries. Two years later, SFI was transferred to the Department of Environmental Affairs (DEA) and attached to the Marine Development Branch. Under the country's new constitution of 1984, DEA was reorganized into two Branches, one was Forestry and the other was Environmental Conservation and Marine Development. Within

the latter Branch, marine fisheries issues were delegated to the Chief Directorate Marine Development.

In addition to SFI, there are several universities, in particular departments of zoology, or university-related institutes that conduct marine research that is of possible relevance to sea fisheries production. For example, since 1959 the South African Association for Marine Biological Research operates an Oceanographic Research Institute (ORI) at Durban. The Association also runs an aquarium and dolphinarium at the same location that generates some income to support its broader set of activities. ORI is formally linked to the University of Natal. In 1985 the University of Cape Town established a Marine Biological Research Institute in order to integrate the various research activities conducted in this area by the Faculty of Life Sciences. Also linked to the University of Cape Town is the Fishing Industry Research Institute which was established in 1956. This institute, which receives funds from the government (CSIR) as well as the fishing industry, focuses mainly on fish processing issues.

University Research

Compared with other African countries South Africa has a relatively long tradition of university education in the agricultural and veterinary sciences. Faculties in these sciences were established at the Universities of Stellenbosch (agriculture) and Pretoria (agriculture and veterinary) in the late 1910s. Additional faculties of agriculture were established at the Universities of Orange Free State and Natal in the late 1940s. A faculty of forestry was established at the University of Stellenbosch in 1956. These faculties were administratively linked to the Department of Agriculture and the Department of Forestry until 1972/73. In that year responsibility for these faculties was transferred to the Department of Education. Both departments, however, continued to finance some research (positions) at the respective faculties.

In addition to these traditionally white universities, university training in the agricultural sciences is also offered at the following, traditionally non-white, universities: University of the North (est. 1970), University of Fort Hare (est. 1970), University of Zululand (est. 1970), and University of Venda (est. 1982). In addition, the Medical University of Southern Africa (est. 1976) offers university training in the veterinary sciences.

2.2 Present Structure

The present structure of the South African NARS consists of the following components: agricultural research institutes operating under ARC, departmental research entities within the Department of Agriculture, institutes under the Department of Environmental Affairs, research entities operating under CSIR, some semi-public research agencies supported by the industry, and faculties of agriculture, forestry, and veterinary sciences.

Agricultural Research Council (ARC)

ARC is the principal agricultural research entity in the country (table 2). It oversees 12 agricultural research institutes that involves a network of experimental farms, modern equipment, and a staff of approximately 4,160 persons (including 672 professional researchers). This infrastructure is deployed throughout the entire country and, with the exception of sugarcane, supports all the major agricultural commodities in South Africa.

Table 2: Overview of the Present Structure of the South African NARS (1993)

Institutional category	Executing agency				Staffed research sites ^a	Number of researchers	
	Supervising agency	Name	Acronym	Research focus		Total	FTEs
Government	Agricultural Research Council	Grain Crops Institute	GCI	groundnuts, sunflower, soybeans, dry beans, lupines and cowpeas	2 (2)	84	84.0
		Vegetable and Ornamental Plant Institute	VOPI	vegetables and ornamental plants	1 (1)	55	55.0
		Rooielaat Grassland Institute	RGI	grassland and forage	1 (1)	40	40.0
		Agrimetries Institute	AMI	biometrics	1 (1)	30	30.0
		Onderstepoort Veterinary Institute	OVI	animal health	1 (1)	78	78.0
		Irene Animal Production Institute	IAPI	animal production and improvement, diary and meat	1 (1) ^b	94	94.0
		Institute for Tropical and Subtropical Crops	ITSC	tropical and subtropical fruits	9 (6)	41	41.0
		Plant Protection Institute	PPRI	plant protection	1 (1) ^b	85	85.0
		Stellenbosch Institute for Fruit Technology	SIFT	breeding, physiology horticulture, soil science, pests, biotechnology, post-harvest & processing	3 (3)	48	48.0
		Tobacco and Cotton Research Institute	TCRI	tobacco and cotton	1 (1)	25	25.0
		Institute for Soil, Climate and Water	ISCW	soil, climate, and water	1 (1) ^b	61	61.0
		Nietvoorbij Institute for Viticulture and Oenology	NIVO	viticulture and oenology	1 (1)	31	31.0
		Government	Department of Agriculture Economics	Directorate of Agricultural Economics	DAE	agricultural economics	1 (1) ^b
Directorate of Marketing	DM			marketing research	1 (1)	23	23.0
Directorate of Agricultural Mechanization	DAM			agricultural mechanization	1 (1) ^b	28	14.0 ^c

Table 2: Overview of Present Structure of NARS, 1993 (contd.)

Institutional category	Executing agency		Research focus	Staffed research sites ^a	Number of researchers		
	Supervising agency	Name			Acronym	Total	FTEs
Government	Department of Agriculture	Directorate of Irrigation Engineering	DIE	irrigation	1 (1) ^b	31	15.5 ^c
		Directorate of Soil Conservation and Borehole Services	DSCDS	soil conservation	1 (1) ^b	17	8.5 ^c
		Dohne ADI (Eastern Cape)	ADI	crops, livestock, natural resources	1 (1)	26	26.0
		Glen ADI (Free State)	ADI	crops, livestock, natural resources	7 (3)	26	26.0
		Potchefstroom ADI (Highveld)	ADI	crops, livestock, natural resources	1 (1)	41	41.0
		Grootfontein ADI (Karoo)	ADI	crops, livestock, natural resources	1 (1)	23	23.0
		Cedara ADI (Natal)	ADI	crops, livestock, natural resources	4 (3)	18	18.0
		Transvaal ADI	ADI	crops, livestock, natural resources	5 (5)	23	23.0
		Eisenburg ADI (Winter Rainfall Region)	ADI	crops, livestock, natural resources	1 (1)	31	31.0
		Government	Department of Environmental Affairs	National Institute	NBI	botany	5 (5)
Sea Fisheries Research Institute	SFRPI			sea fisheries	6 (1)	56	56.0
Division of Forest Science and Technology	FORESTEK			forestry and forestry products	1 (1)	115	115.0
Semi-public	Council of Scientific and Industrial Research	Institute for Commercial Forestry Research	ICFR	forestry	1 (1)	24	24
		SASA Experiment Station	SASA	sugar	1 (1)	33	33

Table 2: Overview of Present Structure of NARS, 1993 (contd.)

Institutional category	Executing agency				Staffed research sites ^a	Number of researchers	
	Supervising agency	Name	Acronym	Research focus		Total	FTEs
Academic ^d	University of Stellenbosch	Faculty of Agriculture	US/FA	agriculture	1 (1)	67	26.8
		Faculty of Forestry	US/FFOR	forestry	1 (1)	28	11.2
	University of Pretoria	Faculty of Agricultural Sciences	UP/FAS	agriculture	1 (1)	59	18.3
		Faculty of Veterinary Science	UP/FVS	animal health	1 (1)	77	23.9
	University of Natal	Faculty of Agriculture	UNA/FA	agriculture	1 (1)	72	25.9
	University of the North	Faculty of Agriculture	UNO/FA	agriculture	1 (1)	14	1.4
	University of Orange Free State	Faculty of Agriculture	UOFS/FA	agriculture	1 (1)	52	15.6
	Medical University of South Africa	Faculty of Veterinary Science	MUSA/FVS	animal health	1 (1)	46	4.6
	University of Fort Hare	Faculty of Agriculture & Agricultural and Rural Development Institute	UFH/FA	agriculture	1 (1)	37	3.7
	University of Bophuthatswana	School of Agriculture	UB/SA	agriculture	1 (1)	22	2.2
	University of Zululand	School of Agriculture	UZ/SA	agriculture	1 (1)	6	0.0
	University of Venda	School of Agriculture	UV/SA	agriculture	1 (1)	7	0.0
<i>Total</i>				74 (61)	1794	1394.6	

Source: 0999, 1246, and 1387.

^a Staffed with researchers and/or technicians. Bracketed sites are permanently staffed with researchers.

^b Several institutes do not have (sub)-stations of their own but make use of the facilities of other research institutes as well as those of the regional ADIs and have research staff permanently based at these locations. For example, most of the research staff of the different directorates of the Department of Agricultural Development are based at the regional ADIs.

^c It is assumed that scientific staff at these directorates spent 50% of their time on research.

^d Sixteen universities who participated in some form of research on fish resources were also identified. In most cases this research is done in the respective Departments of Zoology and cannot readily be distinguished from other research activities.

ARC institutes have relatively little autonomy. Decisions about research priorities are taken at the Council level. Funding for each institute comes via the central administration of ARC. In addition to a government grant, other sources of income such as royalties, interest on investments, donations, product sales, and contract research have become increasingly important in recent years.

In the past ARC institutes focused exclusively on white commercial agriculture. The mandate given to ARC, however, is to service the whole population, including black subsistence farmers in the former homelands and “emerging” farmers. In order to implement its new mandate, ARC will need to broaden and reorient its research into areas that have been neglected until recently.

Although the creation of ARC has been regarded as a positive development in many respects, its formation has, to some extent, also disrupted the links that existed in the past between research conducted by the various (national) institutes and the applied research and extension activities that took place at the regional level. For example, the number of ARC researchers outposted to the ADIs and ADCs has significantly decreased since the restructuring that took place in 1992.

Department of Agriculture

As a consequence of the dismantling of the apartheid structures in recent years, the “general affairs” and three “own affairs” departments of agriculture were amalgated into one national Department of Agriculture (DOA) in 1993. Because of the political changes, however, DOA’s structure has yet to be formalized and is still in a state of flux. The proposed interim organization of DOA consists of two branches, the Economics Branch and the Agricultural Development Branch, and a Chief Directorate of Administrative and Financial Services reporting directly to the Director General (see appendix 3 for organigram).

In addition to the national Department of Agriculture, there are now also nine provincial Departments of Agriculture. These provincial departments have in part succeeded the departments of agriculture of the former ten homelands and self-governing areas. Under the new constitution, agricultural functions also fall within the competence of the provincial governments though there will be distinctions between national and provincial responsibilities towards agriculture (Corbett and Coulter, March 1995). But the division of responsibilities (and the assignment of staff and facilities) have yet to be resolved. To date, almost all agricultural research is still administered and organized at the national level, but it is expected that at least some of the agricultural research will be transferred to the provincial agencies in the future.

The Economics Branch of DOA comprises three chief directorates: marketing, economics, and resource development. The Chief Directorates of Marketing and Economics both conduct some research. The Directorate of Agricultural Economics (under the Chief Directorate of Economics) has a head office as well as a number of units that are attached to each of the ADIs.

The Agricultural Development Branch of DOA consists of three chief directorates (farming development, agricultural engineering services, and veterinary and animal science services) and the Directorate of Agricultural Information. The Chief Directorates of Farming Development and Agricultural Engineering Services both conduct research.

The Chief Directorate of Farming Development supervises the seven ADIs previously attached to DAD. They are located within seven agroecological regions, one institute for each region. The institutes provide soil conservation, extension, and training services (both formal and informal), as well as undertake adaptive research. In addition, they provide an operational base

for staff of other DOA directorates such as agricultural economics and agricultural mechanization.

Specific areas within each region are served by Agricultural Development Centers (ADCs). These ADCs are centers of expertise serving an area that is relatively homogenous in terms of its agricultural resource base. Information pertaining to natural resources, climate, production potential, farm size, farm number, and so on, is compiled and used to formulate technology packages targeted to the needs of the local community.

Technology acquired from sources located outside a region (e.g., from the ARC institutes) is first tested on experimental farms or private properties before being adapted to suit the requirements of the region and the local community. When a multidisciplinary team of experts in the fields of crop production, animal production, pasture science, soil science, and economics, are satisfied that the technology complies with the stated needs they assist extension officers in packaging the technology to enhance its acceptability to the target client groups.

Furthermore, ADCs liaise between the farming community and the research institutes, bringing to the attention of researchers the needs of farmers as jointly identified by the community and their extension officers. They can also arrange *ad hoc* short courses in response to demand and assist with the provision of in-service training for personnel.

At present, communication and linkage between research and extension consists of informal visits and discussions, scientific and popular articles, radio talks, leaflets, farmers' days, short courses, and so on. There is also joint representation on advisory/liaison committees and at the meetings of the top levels of management from the different institutions within a region. The intent of these management meetings is to forge a working alliance between research, technology transfer, and extension to ensure a functioning line of communication between researchers and farmers. But in practice the extension officer is often the direct client for research results, which then get passed on to his client, the farmer.

The Chief Directorate of Agricultural Engineering Services comprises three directorates (soil protection and borehole services, irrigation services, and agricultural mechanization) as well as a Subdirectorate of Research Coordination. All three directorates have branch offices attached to the seven ADIs and most researchers are located in the regions.

Department of Environmental Affairs

The Department of Environmental Affairs supervises the Sea Fisheries Research Institute (SFRI) and the National Botanical Institute (NBI). SFRI's main aim is to conduct research into the living resources of the sea in order to assure an optimal, sustainable yield, and to ensure rational utilization. The institute maintains laboratories for planktology, fisheries biology, physical and chemical oceanography, marine environmental pollution, marine mammals, and for seaweed research. It has field laboratories at five locations as well as a fleet of five research vessels.

In 1988 the Botanical Research Institute was transferred from DAD to DEA and renamed NBI. Its research activities include plant identification and taxonomy, plant structure and function, ecology, plant exploration, propagation biology of threatened and economically important plants, and horticulture.

Council for Scientific and Industrial Research (CSIR)

Forestry research is executed by the Division of Forest Science and Technology (FORESTEK) of CSIR. This division was established in 1990 and assumed the research activities and facilities of SAFRI and NTRI.

In 1990, CSIR was transformed from a coordinating and funding agency into a research executing agency. All research institutes under CSIR's aegis were merged into various thematic divisions. Several of these divisions conduct research that is of (in)direct relevance to agriculture, such as the Division of Earth, Marine and Atmospheric Science and Technology (environmental research), the Division of Food Science and Technology (research on post-harvest storage and food processing), and the Division of Water Technology (research on efficient water use). These latter entities are not included in the statistics presented in this brief.

Universities

The university component of the NARS comprises six faculties of agriculture, three schools of agriculture, one faculty of forestry, and two faculties of veterinary science. The former white universities (Pretoria, Stellenbosch, Natal, and Free State) all offer graduate and postgraduate training, while among the former black universities (North, Fort Hare, Bophuthatswana, Zululand, Venda, and MUSA) only Fort Hare has a postgraduate program of some significance. Research executed by these faculties and schools covers a wide variety of disciplines and issues. The schools of agriculture at the Universities of Zululand and Venda are still very much in their infancy and are yet to make much of a contribution to the country's agricultural research effort.

In addition to the above mentioned university entities, there are several other university departments and institutes which conduct research that is of (in)direct relevance to agriculture. These include the departments of botany and zoology as well as the natural resources research institutes. Because of insufficient information about these entities they are not included in the statistics presented in this brief.

Other Research Agencies

In addition to the government and university agricultural research entities, there are quite a number of non-governmental research agencies operating in South Africa. Some of them are not exclusively linked to a particular company but rather serve a group of producers and are classified here as semi-public agencies. Examples include the experiment station of the South African Sugar Association and the Institute for Commercial Forestry Research. Funding for these institutes is largely derived from (self-imposed) cesses on sales, although in some instances they also receive some support from the government.

In addition, there are several agricultural research entities that are owned by government parastatals operating essentially as private firms. Examples are the Outspan Citrus Center and the Outspan Laboratories that are managed by the Citrus Board and the Unifruco Research Services (Pty) Ltd. that is managed by the Deciduous Fruit Board. There are also some privately owned and managed research activities such as the Engineering and Research Division of Fedmech Holdings Ltd and the Research and Development Department of Mondi Timber Products. These parastatals and private-for-profit research entities are not included in the statistics reported here because of the difficulty of obtaining information.

Table 2 summarizes the above information and provides an indication of the number of research staff employed by the respective institutes. Organizational charts of most of the institutes can be found in appendix 3.

3. NARS Statistics and Trends

To compile data on the development of South Africa's agricultural research system during the past 30 years a large number of published and unpublished sources were consulted. In addition, many problems regarding the interpretation of the data reported therein had to be resolved. The more important data sources and interpretation problems are discussed here briefly.

With regard to the agricultural research entities related to the Department of Agriculture (i.e., regional units, research institutes, and a few directorates), two major sources of information have been used extensively, namely (a) the *Official List of Professional and Research Workers, Lecturing Staff, Extension and Other Workers in the Agricultural Field* and (b) *Estimate of the Expenditure to be defrayed from State Revenue Account*.

The 1973, 1978, 1980, 1982, 1985-86, 1988-91, and 1993 editions of the *Official List* as well as the 1959 edition of the *List of Research Workers in Agriculture, Animal Health and Forestry in the British Commonwealth, the Republic of Sudan and the Republic of Ireland* were used to compile data on research staff in South Africa. Most of the pre-1973 data regarding research staff were constructed by interpolation. In a few cases, where a 1959 observation was missing, we used the trend in the corresponding expenditure series as a basis for extrapolating the research staff data. Recent editions of the personnel listings increasingly include research technicians (identifiable by their job designations) in their professional staff compilations. Care was taken to exclude these technicians when compiling the counts of researchers (even when they hold a BSc degree) to ensure comparability in the research staff series over time.

Most expenditure data have been taken from the government expenditure yearbooks. During the years 1961-75 the yearbooks reported expenditure data by research entity. Beginning in 1976, however, expenditure budgets are reported in a more aggregated form which made it virtually impossible to directly relate budget items to specific research entities. Because of the centralized, departmental accounting system, not all agricultural research expenditures were identified as such and may have been recorded as "administrative" or "general services" expenses (e.g., maintenance and computer services). These "overhead expenditures" vary markedly from year to year, suggesting that such expenditures have not been attributed to the various activities of the department in a uniform way over time. In order to address this problem, we opted to include a proportional share of administrative and general services expenditures in the research expenditure series reported here. However, our series still fails to include the costs of land purchases and the construction of buildings, which are administered by the Department of Public Works.

Some entities, such as DOA's regional offices and the Directorate of Agricultural Engineering, have a mandate that goes beyond agricultural research. It was therefore necessary in several instances to arbitrarily estimate the share of resources used for research. Appendix 6 provides more detail about these estimates.

In the case of faculties of agriculture, forestry, and veterinary sciences, we made some informed estimates of the time faculty spend doing research (appendix 5a). Because research expenditures by universities are extremely difficult to estimate directly, we thought it a

reasonable approximation to assume that expenditure per full-time equivalent university researcher equaled the corresponding spending ratio for those researchers employed by the research institutes.

3.1 Long-term development

During the past 30 years, the South African NARS has grown at the moderate but steady rate of about 2% per annum in terms of FTE research staff as well as real research expenditures (table 3). Although expenditures per researcher have fluctuated from year to year, they remained fairly stable over the longer run in real terms.

Table 3: *NARS Researcher and Expenditure Series, 1961-92*

	'61-65	'66-70	'71-75	'76-80	'81-85	'86-90	1991	1992	growth rate ^a %
Researchers (FTEs)	768	879	953	1013	1206	1281	1339	1373	2.0
Expenditures (million 1985 Rands per year)	79.7	105.7	114.7	109.0	129.5	142.0	148.3	169.8	2.0
Expenditures (million 1985 PPP dollars per year) ^b	88.1	116.9	126.8	120.5	143.2	157.0	163.9	187.7	2.0
Expenditures per FTE researcher (thousands 1985 PPP dollars per year) ^b	114	133	133	119	119	123	122	137	0.0
Number of econ. act. agr. population (millions)	2.1	2.6	2.5	1.9	1.7	1.8	1.8	1.8	-1.1
Researchers per million econ. act. agr. population	371	339	378	529	714	696	732	746	3.2
AgGDP (million 1985 PPP dollars) ^c	4350	5080	5727	6517	6633	8256	8689	6499	2.2
Expenditures as a % of AgGDP	1.39	1.62	1.54	1.61	2.00	2.07	2.55	3.68	2.0

Source: See appendices 5 and 6.

^a Least squares growth rate for the period 1961-1992.

^b For information about "PPP dollars" see appendix 2.

^c Deflated with the AgGDP deflator.

South Africa's research intensities have been - and continue to be - relatively high, especially when compared with the ratios that prevail in other African countries. The sub-Saharan African average (excluding South Africa) was about 15 researchers per million economically active agricultural population compared with 371 in South Africa in the early 1960s. During the past 30 years this intensity ratio nearly doubled for South Africa, while more than quadrupling for the rest of Africa. However, with about 746 researchers per million economically active agricultural population, the South African intensity ratio is still many times higher than the corresponding ratio for the rest of Africa. This in part reflects the relatively small proportion of South Africa's population that is employed in agriculture.

In terms of research expenditures expressed as a percentage of AgGDP, South Africa has also experienced a much more favorable level of investment than most other African countries. A noteworthy feature of agriculture in South Africa is the relatively high year-to-year fluctuation in AgGDP. This is caused mainly by the rather low and irregular pattern of rainfall that occurs

across significant areas of the country. As a consequence, South Africa's agricultural research expenditures expressed as a percentage of AgGDP is quite unstable although the five-year averages in table 3 belie this year-to-year instability. The high intensity ratio in 1992, for example, coincides with an abnormally low AgGDP in that year due to widespread and severe droughts.

3.2 Human resources

Degree and Nationality Status

Table 4 summarizes the qualification profile of researchers for various groupings of institutes. Research technicians and other support staff with university degrees are excluded from these figures. Some publications include such support staff in their estimates of the number of professional staff and so the unthinking use of such data would lead to a substantially higher number of qualified researchers than we report here.

The establishment of the Grain Crops Institute (GCI) in 1981 resulted in the transfer of a substantial number of researchers from the regional entities to GCI. We see this in our data represented by a decline in the number of researchers at the regional entities (ADIs) and a corresponding increase at the research institutes.

The qualification profile of researchers in the different components of the NARS is quite distinctive. The directorates of the Department of Agriculture that conduct economic and engineering research are mainly staffed with BSc-level researchers. A significant share of the researchers at the ADIs, ARC research institutes, and the universities hold postgraduate degrees and that share increases as one proceeds from the ADIs, through the ARC, to the universities. In 1992, 14% of the researchers at the ADIs held a PhD compared with 50% at the universities. This reflects the fact that the ADIs focus more on applied and development research, while the universities do more basic research.

The numbers of researchers reported in table 4 are count data, not estimates of full-time equivalent (FTE) researchers. The university sector certainly represents a significant share of the total number of staff in the South African NARS with a PhD in the agricultural or related sciences. But when measured in FTE terms, the university sector is considerably less dominant.

Across all sectors of the system, except for economic research, the qualification profile of researchers improved slightly during the past 30 years. This contrasts sharply with other African countries where large changes in the composition of the research staff occurred. But compared with most other African countries, South Africa already had a reasonably well-developed agricultural research system in place by the early 1960s, including a substantial capacity to train its own researchers. It is noteworthy, however, that at that time many students still went overseas for postgraduate training in the agricultural sciences. This has declined to negligible numbers in more recent years.

Because of South Africa's distinctive history compared with the rest of Africa, the dependency on expatriate researchers has always been insignificant. Only the universities employ an appreciable number of expatriates (about 8%, on average, in 1992). Those expatriates work largely in the historically black universities (the University of the North (14%), the University of Bophuthatswana (39%), the University of Fort Hare (11%), and the Medical University of South Africa (19%).

Table 4: *Educational Status of Researchers*

ARC Research Institutes								
	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90	1991	1992
<i>(total number of researchers)</i>								
PhD	88.2	90.1	95.2	117.1	148.3	158.4	168.4	172.4
MSc	91.6	122.4	148.4	142.0	166.7	205.1	239.3	260.8
BSc	163.4	165.6	162.8	167.8	296.1	308.8	294.4	237.8
<i>Total</i>	<i>343.2</i>	<i>378.1</i>	<i>406.4</i>	<i>426.9</i>	<i>611.1</i>	<i>672.3</i>	<i>702.0</i>	<i>671.0</i>
Agricultural Development Institutes								
	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90	1991	1992
<i>(total number of researchers)</i>								
PhD	39.9	33.4	27.8	29.4	23.1	26.0	24.0	24.0
MSc	83.3	103.6	120.7	111.5	70.9	58.8	72.0	80.0
BSc	127.7	112.4	97.2	100.6	94.5	70.3	65.0	66.0
<i>Total</i>	<i>250.9</i>	<i>249.4</i>	<i>245.7</i>	<i>241.5</i>	<i>188.5</i>	<i>155.1</i>	<i>161.0</i>	<i>170.0</i>
Agricultural production economics and marketing research								
	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90	1991	1992
<i>(total number of researchers)</i>								
PhD	2.1	1.1	0.1	0.0	0.0	0.0	0.0	0.5
MSc	12.7	18.5	20.1	12.7	6.3	9.1	13.0	15.5
BSc	11.4	25.4	35.7	39.8	46.3	48.0	42.0	50.5
<i>Total</i>	<i>23.4</i>	<i>38.5</i>	<i>47.0</i>	<i>48.0</i>	<i>52.4</i>	<i>57.1</i>	<i>55.0</i>	<i>66.5</i>
Agricultural engineering research								
	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90	1991	1992
<i>(total number of researchers)</i>								
PhD	NA	NA	1.1	1.0	1.4	1.6	1.0	1.0
MSc	NA	NA	4.6	4.3	5.9	9.4	16.0	12.5
BSc	NA	NA	52.7	51.2	51.0	72.0	66.0	66.0
<i>Total</i>	<i>7.0</i>	<i>29.4</i>	<i>58.4</i>	<i>56.5</i>	<i>58.3</i>	<i>83.0</i>	<i>83.0</i>	<i>79.5</i>
Faculties of Agriculture, Forestry, and Veterinary Sciences								
	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90	1991	1992
<i>(total number of researchers)</i>								
PhD	85.8	116.9	130.3	145.9	180.3	195.4	199.5	228.5
MSc	40.4	57.1	63.8	65.1	90.5	119.9	131.2	124.5
BSc	50.4	47.6	45.2	65.1	88.3	101.6	101.3	99.5
<i>Total</i>	<i>176.6</i>	<i>221.6</i>	<i>239.2</i>	<i>276.1</i>	<i>359.1</i>	<i>417.0</i>	<i>432.0</i>	<i>452.5</i>

Sources: See appendix 6.

^a Total number of researchers, not FTE equivalents.

The low percentage of expatriate research staff suggests that in many respects South Africa has been relatively self sufficient with regard to training qualified research staff. It perhaps also reflects in part the isolation experienced by South Africa as a result of the economic and cultural boycott by the international community because of the apartheid system that prevailed until recently.

Race

As a consequence of the past policies of apartheid, very few black South Africans currently hold research positions within the NARS. Those that do are mainly employed by the former black universities. As part of the recent democratization process, agricultural research agencies (in line with all other government agencies) are required to substantially increase the number of black professionals they employ. Because of the limited access to higher and academic education afforded the black population in the past, there is a rather limited pool of suitably qualified persons from which to draw. Of the 820 students who graduated in agriculture in 1990, 174 (21%) graduated from the five black universities. Postgraduate degrees in the agricultural sciences were obtained in that year by 239 students of whom 56 (23%) were from the five black universities (van Rooyen and Barnard 1995). Since the former white universities have now been opened to black students, the racial composition of the student population has changed dramatically. For example, the postgraduate School of Agriculture and Rural Development, which was established at the University of Pretoria in 1992, enrolled 160 students in 1995, of whom 139 were black (van Rooyen and Barnard 1995).

Gender

Based on a sample of 8 ARC institutes, about 37% of the researchers in 1992 were women. However, virtually no women were appointed to senior managerial positions. Information for two of the seven ADIs, indicates that the share of female researchers is substantially lower at these entities (12% and 22% respectively). At the universities the share of female faculty is a lowly 4%, which is in sharp contrast with other parts of the NARS.

Staffing composition

Table 5 provides an overview of the composition of total permanent staff. Support staff ratios range from about two per researcher to 12 per researcher. This variation hinges largely on the variation in the number of other support staff, which in turn depends largely on the size of the farm operations operated by the respective agricultural research agencies. The ratio of technical support staff per researcher ranges from 0.7 to 1.9.

Table 5: *Staffing Structure, 1992*

Staff category	ARC	Highveld ADI	Elsenburg ADI	SFRI	SASA	ICFR
	<i>(total numbers)</i>					
Researchers	671	27	25	56	43	24
Support staff						
Technical	663	50	26	58	83	16
Administrative	778	20	18	35	42	9
Other	2075	45	200	107	393	20
Subtotal	3516	115	244	200	518	45
<i>Total</i>	<i>4187</i>	<i>142</i>	<i>269</i>	<i>256</i>	<i>561</i>	<i>69</i>
Technician / researcher	1.0	1.9	1.0	1.0	1.9	0.7
Support / researcher	5.2	4.3	9.8	3.6	12.0	1.9

Source: 0999 and 1529.

3.3 Financial Resources

Expenditures

During the past three decades agricultural research has primarily been executed by the Department of Agriculture (table 6). However, its share of total expenditures dropped from 80% in the early 1960s to about 70% in recent years. At the same time forestry, sea fisheries, and sugarcane research gained somewhat in relative importance, as did research executed by the universities.

Table 6: *Agricultural Research Expenditures by Institutional Category*

Institutional category	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90	1991	1992
	<i>(percentages)</i>							
Government	87.3	87.4	87.4	85.1	85.7	84.7	84.3	84.8
DOA ^a	80.3	79.1	76.1	71.8	69.2	69.7	70.8	71.7
Other government ^b	7.0	8.3	11.3	13.3	16.5	15.0	13.5	13.0
Semi-public	5.0	4.1	4.5	6.5	5.7	6.0	6.6	5.9
Universities	7.7	8.5	8.1	8.4	8.6	9.3	9.1	9.3
<i>Total</i>	<i>100</i>	<i>100</i>	<i>100</i>	<i>100</i>	<i>100</i>	<i>100</i>	<i>100</i>	<i>100</i>

^a Includes ARC.

^b Includes sea fisheries research by the Department of Sea Fisheries, forestry research by the Department of Forestry and CSIR, and botanical research by the National Botanical Institute. Although this latter institute was attached to DOA until 1988, it has been reported here under "other government" for the whole period.

In the early 1960s, 52% of the agricultural research expenditures by DOA were spent by ARC institutes (or their predecessors), 43% by the ADIs (or their predecessors), and 5% by the directorates of agricultural production economics, marketing, engineering, and biometric and datametric services (table 7). Over time, the ARC institutes increased their expenditure shares to reach about 75% in recent years, while the ADIs share dropped to about 20%. The share of total expenditures accounted for by the directorates peaked in the early seventies as a result of the abnormally large expenditures on agricultural engineering during those years.

Table 7: *Agricultural Research Expenditures by the Department of Agriculture*

Institutional category	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90	1991	1992
	<i>(percentages)</i>							
ARC Institutes	51.7	51.3	52.8	59.9	70.9	75.7	75.9	75.5
ADIs	43.3	41.7	36.0	34.2	23.0	18.6	18.8	20.7
Directorates	5.0	7.0	11.3	5.9	6.0	5.6	5.3	3.8
<i>Total</i>	<i>100</i>	<i>100</i>	<i>100</i>	<i>100</i>	<i>100</i>	<i>100</i>	<i>100</i>	<i>100</i>

Note: With the establishment of GCI in 1981, a substantial number of researchers at the regional offices of DOA were transferred to GCI.

Factor Mix

Only a few research entities provided any breakdown of their expenditures by salaries, operating, and capital costs. On average, salaries account for about 67% of total expenditures, operating expenditures for about 25%, and capital for the remaining 8% (table 8). Compared with most other African countries, the share of capital expenditures is relatively low. In part, this is because the reported capital expenditures by the ARC institutes do not include purchases of land and the construction of new buildings. However, relatively little new construction has taken place in recent years. South Africa's low capital share is similar to that of most developed countries where most of the capital costs are incurred in replacing and renovating existing capital stock, not in adding to it.

Table 8: *Expenditures by Cost Category, 1992*

Cost category	AMI	GCI	IAPI	ISCW	ITSC	OVI	RGI	SIFT	TCRI	ARC		
										Average ^a	Total	SASA
										%	%	%
										<i>(percentages)</i>		
Salaries	92.1	54.4	67.3	67.2	72.7	72.1	73.0	63.3	73.9	66.4	64.1	67.1
Operating	4.0	21.4	30.3	22.0	24.5	24.0	22.5	29.0	23.3	24.4	28.7	21.5
Capital	3.9	24.2	2.4	10.8	2.8	3.9	4.5	7.7	2.8	9.2	7.2	11.4
Total	100	100	100	100	100	100	100	100	100	100	100	100

Source: 0999 and 1529.

^a Average for the nine ARC institutes for which institutional level data were provided.

A few institutes (namely AMI and GCI) have exceptional expenditure profiles compared with most of the other institutes. AMI was only established in 1992 and functions as a service to the other ARC institutes which perhaps cover much of its operating costs. In the case of GCI, the expenditure profile differs because of an abnormally large expenditure on capital items in 1992.

Sources of Funds

Funding for agricultural research comes mainly from general government revenues. Until recently, research by the Department of Agriculture relied almost exclusively on government funding. With the establishment of ARC in 1992, however, efforts have begun to diversify the funding base of the ARC institutes. The reported share of government funding for ARC dropped from 90.5% in 1992, to 83.9% in 1993, and to 82.6% in 1994 (table 9). The target is to reduce the share of government funding to 70% in 2000. Contract research executed by ARC increased from 5.1% in 1992, to 7.6% in 1993, and to 12.7% in 1994. However, many of these contracts are with public (e.g., government parastatals), not private clients so the share of contract research overstates the degree to which government has gotten out of the business of financing agricultural research. But at a minimum this contract-client arrangement has sought to establish a market for R&D goods and services that, in principle at least, can increase the degree to which this public system becomes more demand driven if not privately funded. Income from the sale of produce, royalties, and interest account for the remaining 4-5% of income.

Table 9: *Sources of Funding ARC*

	1992	1993	1994
	<i>(percentages)</i>		
Government	90.4	83.9	82.6
Contracts	5.1	7.6	12.7
Produce	0.1	2.1	1.2
Royalties	0.1	0.1	0.5
Donations	0.0	0.0	0.0
Other	4.3	6.4	2.9
<i>Total</i>	<i>100</i>	<i>100</i>	<i>100</i>

Source: 1529.

Both forestry and sea fisheries research have a substantially longer tradition of mobilizing resources from the industry for which they work. For example, the National Timber Research Institute (NTRI), which merged with SAFRI to form FORESTEK/CSIR in 1990, received about a third to one half of its resources directly from the forestry industry. ICFR is even more dependant on contributions from the forestry industry. The involvement of the forestry industry in forestry research is also reflected in the existence of a Forestry Research Advisory Committee within the Forestry Council. This committee seeks to coordinate the different forestry research activities in the country and administers the resources collected by the industry for research. The Forestry Council, including its research funding, is financed through a levy on forestry production.

Sea fisheries research also receives substantial support from the sea fisheries industry through its Sea Fisheries Research Fund. This fund collects a levy based on fish catchments. In 1992, funds from this source accounted for about 28% of the research expenditures by the Sea Fisheries Institute.

Funding for agricultural research at the universities comes from many different sources (table 10). For the Faculty of Agricultural Sciences at the University of Pretoria and the Faculty of Agriculture at the University of Stellenbosch, a breakdown by source of funding was obtained only for the operating expenditure component committed to research. Funding for salaries, maintenance, and capital expenditures came from general university funds (i.e., the Department of Education). However, the sources of funds used to support operating costs gives some insight into the relative importance of contract research and donor funding in the research agenda of the faculties.

Table 10: Sources of Funding of Faculties of Agriculture (operating funds only)

	Faculty of Agriculture, University of Stellenbosch			
	1990	1991	1992	1993
	<i>(percentages)</i>			
Government	8.0	9.5	3.3	2.2
Sales of goods and services	29.4	34.9	40.4	43.2
Contracts	25.9	24.4	40.8	30.7
Donor contributions	34.8	28.2	9.2	15.3
Other	1.8	3.0	6.3	8.7
<i>Total</i>	<i>100</i>	<i>100</i>	<i>100</i>	<i>100</i>
	Faculty of Agricultural Sciences, University of Pretoria			
	1990	1991	1992	1993
	<i>(percentages)</i>			
Government	6.9	7.2	8.3	7.8
Sales of goods and services	12.4	14.6	15.6	13.8
Contracts	48.8	46.2	51.9	43.1
Donor contributions	27.0	31.9	22.3	31.5
Other	4.9	0.1	2.0	3.8
<i>Total</i>	<i>100</i>	<i>100</i>	<i>100</i>	<i>100</i>

Source: 0999

Note: Expenditures only relate to the operating costs and exclude salaries, maintenance of buildings, and capital investments. This latter group of expenditures, which can easily account for 60-70% of total research costs, depend largely on government funding.

3.4 Research focus

Table 11 provides an overview of the research focus of the South African NARS in 1993. Crop, livestock, forestry, and fisheries research accounted for 33%, 26%, 11%, and 4%, respectively, of the FTE research capacity. Research on soil, land use, and water (natural resources research) that is not crop specific represented 8% of the FTE research capacity, while the remaining 18% of the researchers focused on other topics such as agricultural economics, mechanization, botany, biometrics, and biotechnology. The faculties of agriculture engage in quite a deal of biotechnology research.

Table 11: *Research Focus (1993)*

Institute	Crops	Livestock	Forestry	Fisheries	Nat. res.	Other	Total
<i>(full-time equivalents)</i>							
DAE/DOA						55.0	55.0
DM/DOA						23.0	23.0
DAM/DOA						14.0	14.0
DIE/DOA					15.5		15.5
DSCDS/DOA					8.5		8.5
ADIs/DOA	33.1	106.8			16.0	32.0	188.0
SFRI/DEA				56.0			56.0
NBI/DEA						65.0	65.0
AMI/ARC						30.0	30.0
GCI/ARC	84.0						84.0
ISCW/ARC					61.0		61.0
ITSC/ARC	41.0						41.0
IAPI/ARC		94.0					94.0
NIVO/ARC	31.0						31.0
OVI/ARC		78.0					78.0
PPRI/ARC	85.0						85.0
RGI/ARC		40.0					40.0
SIFT/ARC	40.0						40.0
TCRI/ARC	25.0						25.0
VOPI/ARC	55.0						55.0
FORESTEK			115.0				115.0
SASA	33.0						33.0
ICFR			24.0				24.0
UP/FAS	7.2	3.1			1.7	6.4	18.3
UP/FVS		23.9					23.9
US/FA	6.5	5.5			1.4	13.4	26.8
US/FFOR			11.2				11.2
UNA/FA	7.7	3.1			1.7	6.4	18.3
UNO/FA	0.4	0.5			0.5	0.1	1.4
UB/SA	0.4	0.9			0.1	0.8	2.2
UOFS/FA	4.8	4.1			2.4	4.3	15.6
MUSA/FVS		4.6					4.6
<i>Total (FTEs)</i>	<i>455.1</i>	<i>367.1</i>	<i>150.2</i>	<i>56.0</i>	<i>112.1</i>	<i>254.1</i>	<i>1394.6</i>
<i>Total (%)</i>	<i>32.6</i>	<i>26.3</i>	<i>10.8</i>	<i>4.0</i>	<i>8.0</i>	<i>18.2</i>	<i>100</i>

Source: 0999, 1246, and 1387.

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

^a Livestock research includes pasture and grassland research.

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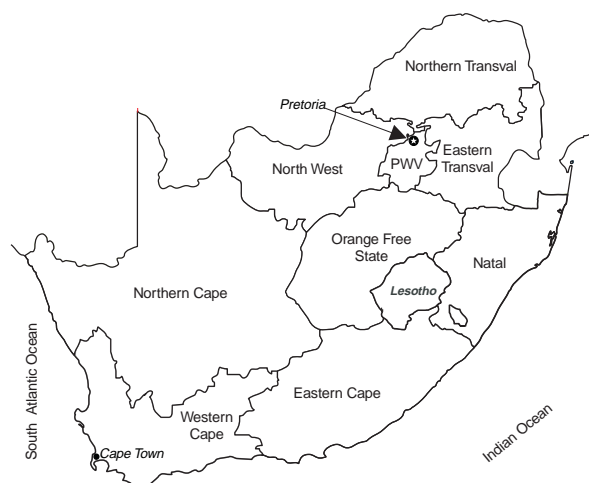
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Annex 1: Country background information



Geography

Area: 122.1 million ha

Location: South Africa is bordered by Namibia in the northwest, Botswana and Zimbabwe in the north, and Mozambique and Swaziland in the northeast. In the southeast and south the country is bordered by the Indian Ocean, and in the southwest by the Atlantic Ocean. The country entirely surrounds the fully independent state Lesotho.

Agroecological features: South Africa can be divided into three main physiographic zones: the broad interior plateau, the surrounding, mountainous Great Escarpment, and a narrow belt of coastal plain. The main rivers are the Orange and the Limpopo. The country is richly endowed with natural mineral resources (e.g., coal, asbestos, copper, gold, diamonds, manganese, and natural gas). South Africa has a temperate subtropical climate with an average annual rainfall of about 485 mm. Natural vegetation varies from Mediterranean shrub type in the Cape Province to the drought resistant bush type in the semi-desert western half of the country. Forests are found in the south and grassland covers the rest of the area.

Population

Total (1991): 38.9 million
 Annual growth rate (1981-90)^a: 2.5%
 Literacy (1980): 76.2%
 Life expectancy (1991): 62 years

Economy (values reported in 1985 PPP dollars)

Gross Domestic Product (1990): 131,811 million dollars
 Per capita GDP (1990): 3,472 dollars

Agricultural GDP (1990): 8,230 million dollars
 Share of agriculture in GDP (1990): 5.0%

Annual growth rates (1981-90)^a

GDP: 0.8%
 GDP per capita: -1.7%
 AgGDP: 3.4%

Trade (values reported in current dollars)

Net surplus total trade (1991): 7,135 million dollars
 Net surplus agricultural trade (1991): 939 million dollars
 Percentage of agricultural imports in total imports: 7.5%

Percentage of agricultural exports in total exports: 9.1%

Major agricultural import commodities (1991)^b: forestry products (22%), rice (11%), fishery products (10%), wheat (8%), tobacco (6%).

Major agricultural export commodities (1991)^b: forestry products (28%), raw sugar (13%), fishery products (8%), greasy wool (7%), apples (7%), oranges (7%).

Agriculture

Agricultural land (1990): 94.6 million ha
 Annual growth rate (1981-90)^a: -0.003%

Percentage arable: 13.1%
 Percentage permanent crop: 0.1%
 Percentage permanent pastures: 86.1%

Percentage irrigated arable and permanent cropland: 8.6%

Economically active agricultural population (1990): 1.8 million

Annual growth rate (1981-90)^a: 1.1%
 Percentage in total economically active population: 13.6%

Fertilizer use per ha arable land (1990): 6.3 kg
 Annual growth rate (1981-90)^a: -4.9%

Major agricultural commodities (in order of importance): maize, poultry, cattle, deciduous and other fruit, hay, dairy, sugar cane.

Sources: Europa Publications (1992), FAO (1993), World Bank (1992), and Directorate of Agricultural Information (1993).

^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 and appropriate, 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).

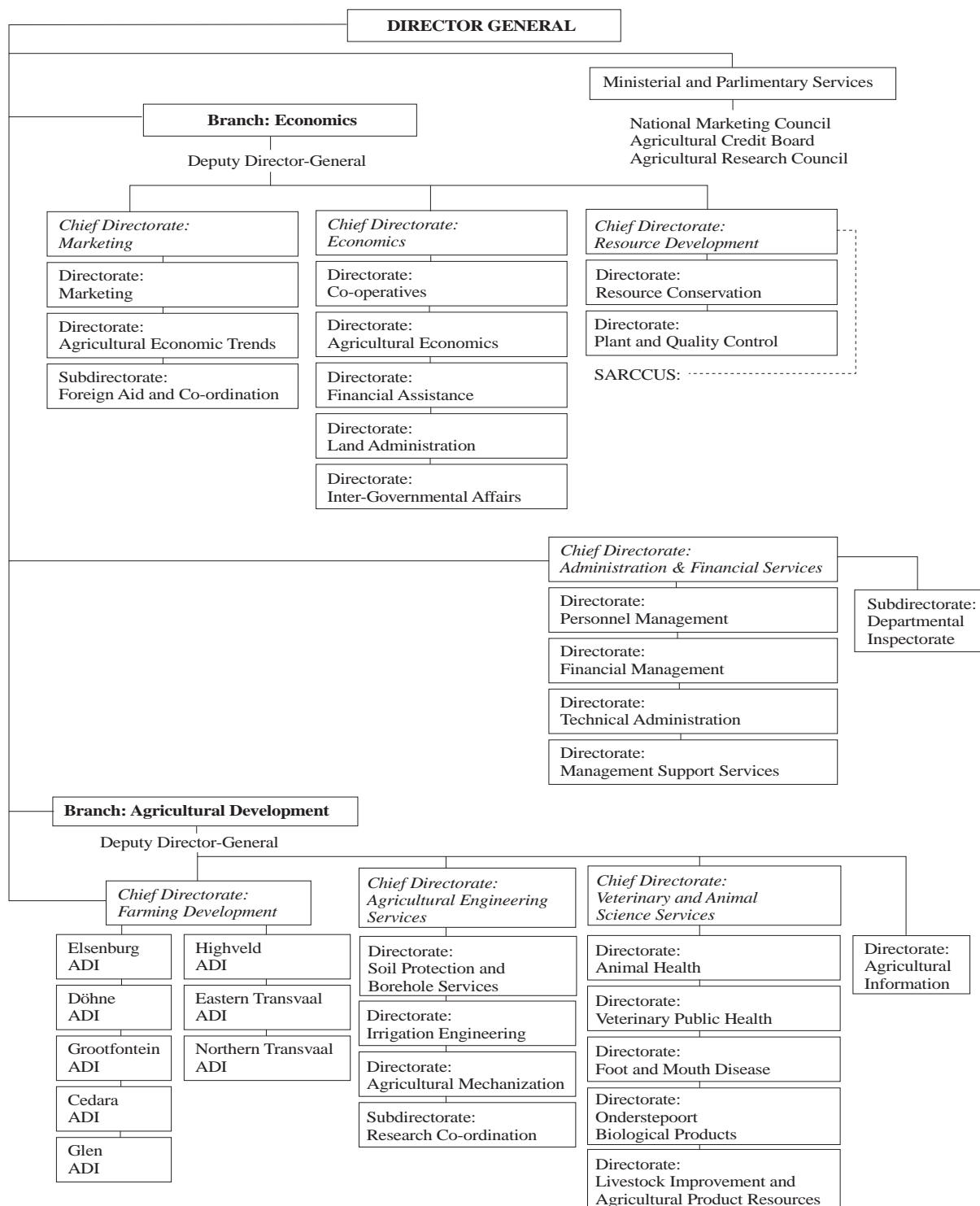
Nomenclature for tables in text

A zero indicates an actual observation of zero, a dash indicates that 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.

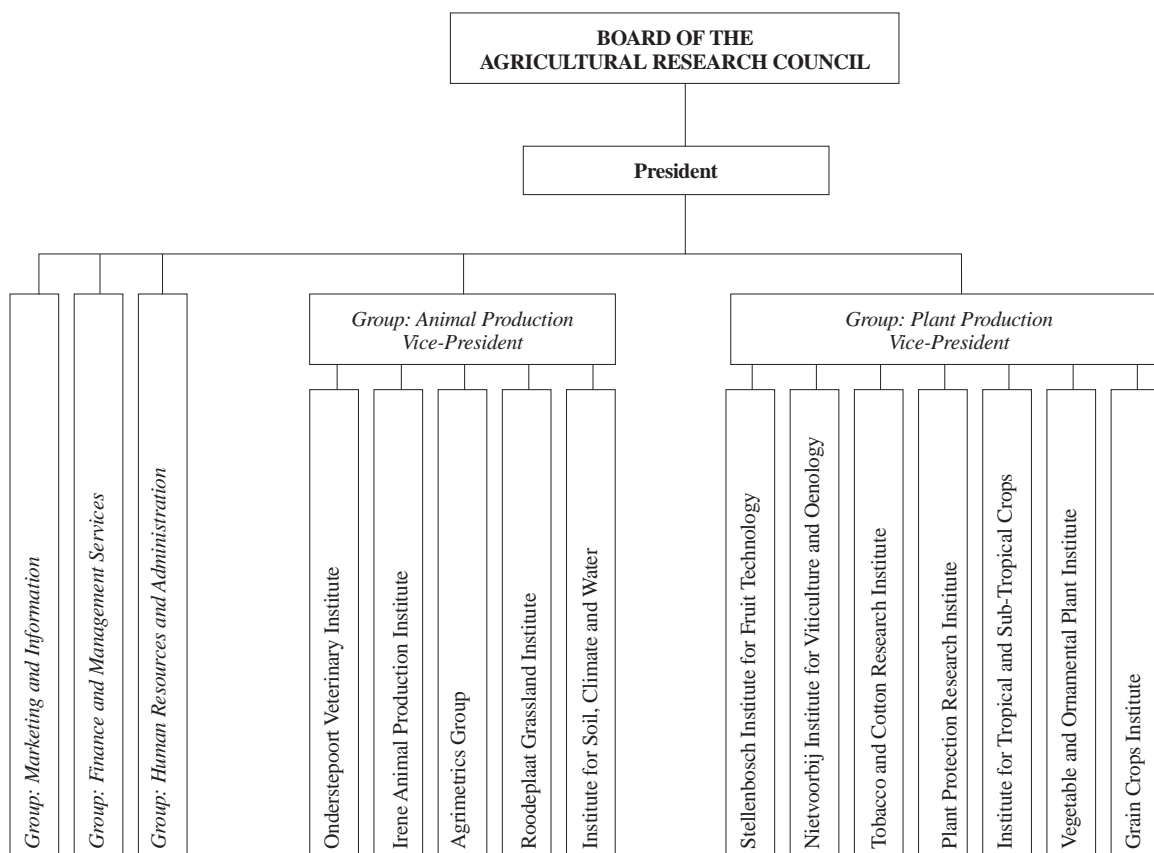
Appendix 3: Organizational charts of the agricultural research institutes

Department of Agricultural (proposed interim organization — 1994)

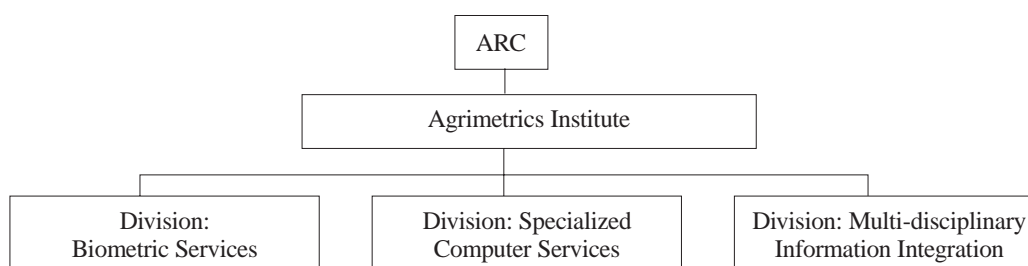


Appendix 3: Organizational charts of the agricultural research institutes (contd.)

Agricultural Research Council (1994)

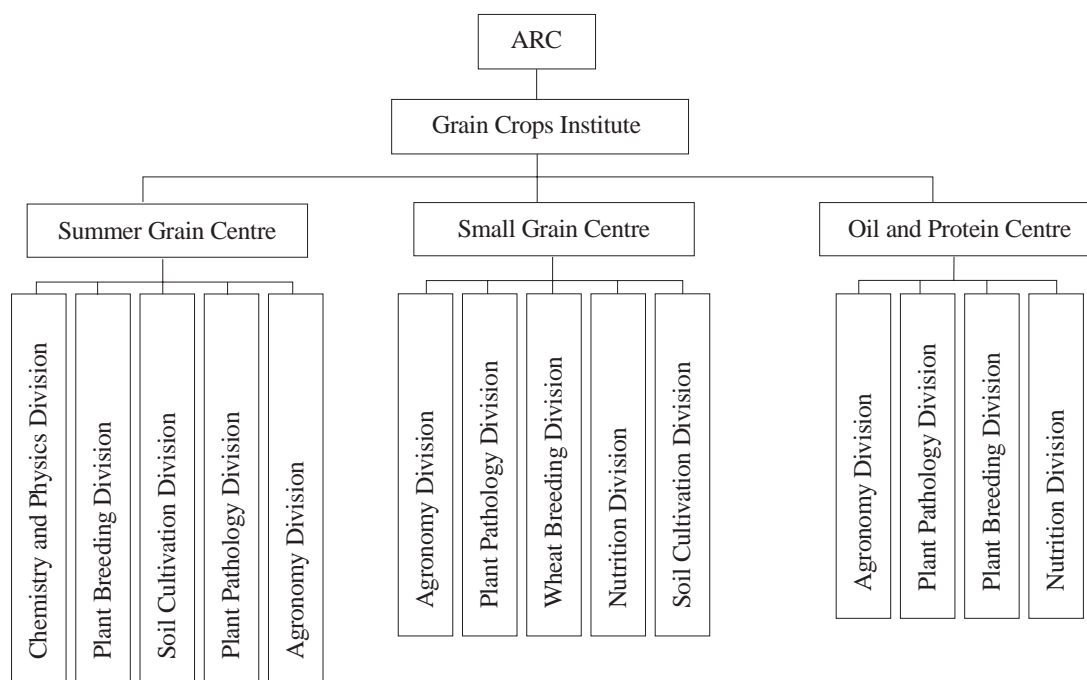


Agrimetrics Institute (1993)

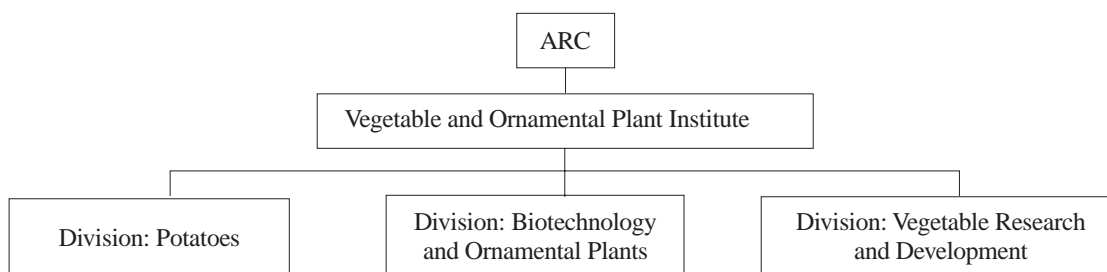


Appendix 3: Organizational charts of the agricultural research institutes (contd.)

Grain Crops Institute (1993)

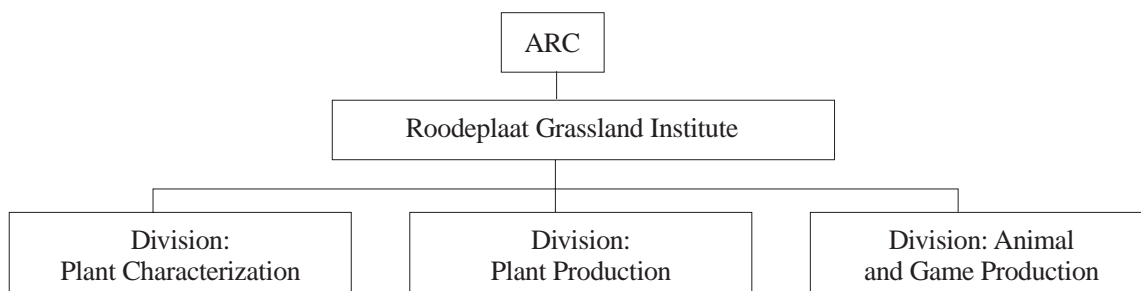


Vegetable and Ornamental Plant Institute (1993)

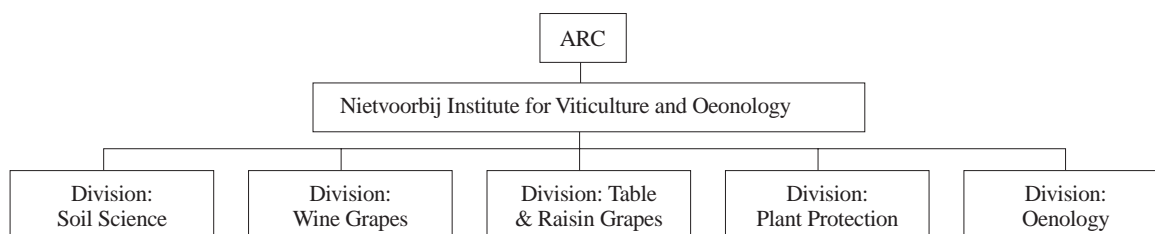


Appendix 3: Organizational charts of the agricultural research institutes (contd.)

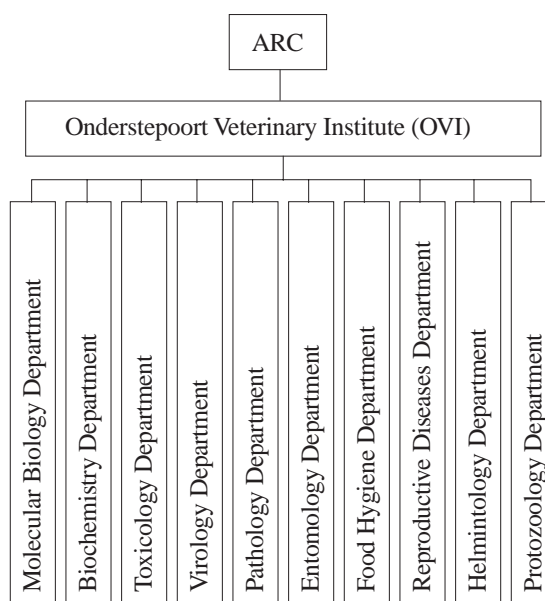
Roodeplaats Grassland Institute (1993)



Nietvoorbij Institute for Viticulture and Oenology (1993)

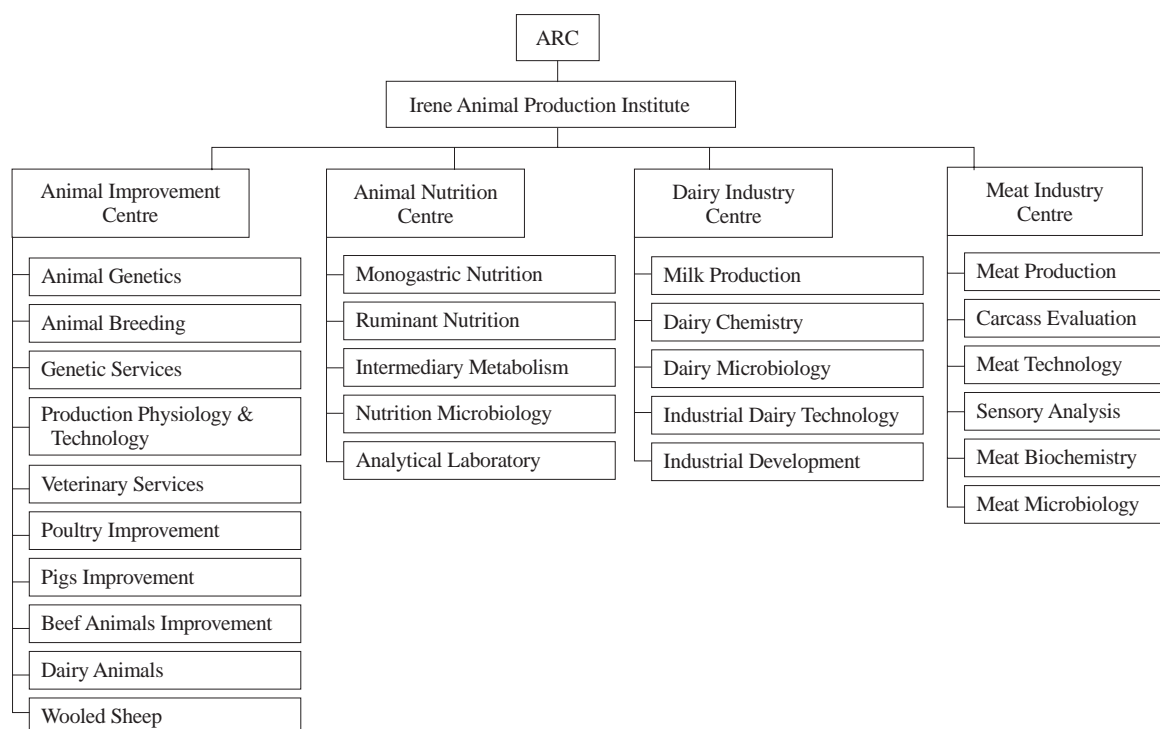


Onderstepoort Veterinary Institute (1993)

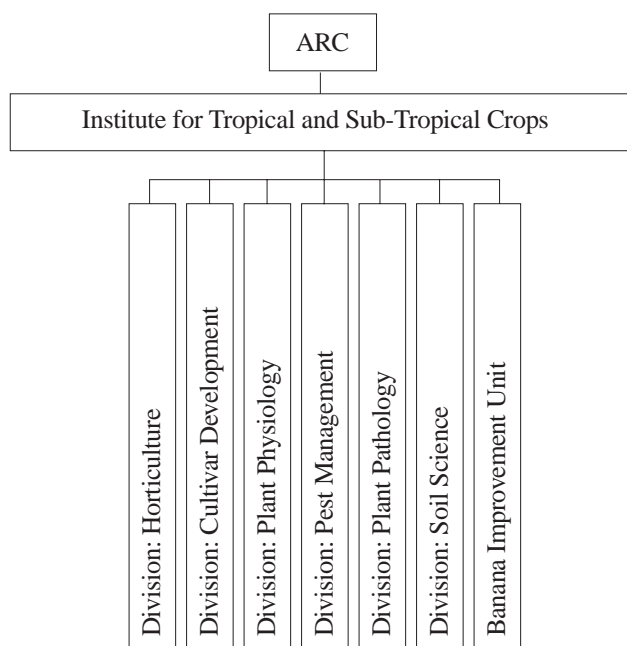


Appendix 3: Organizational charts of the agricultural research institutes (contd.)

Irene Animal Production Institute (1993)

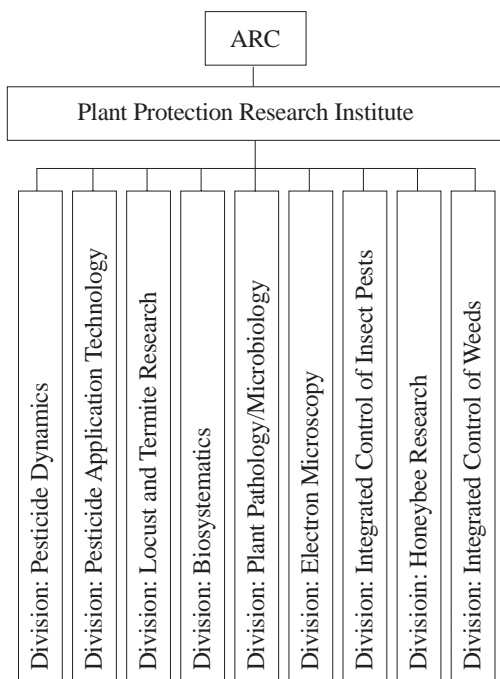


Institute of Tropical and Subtropical Crops (1993)

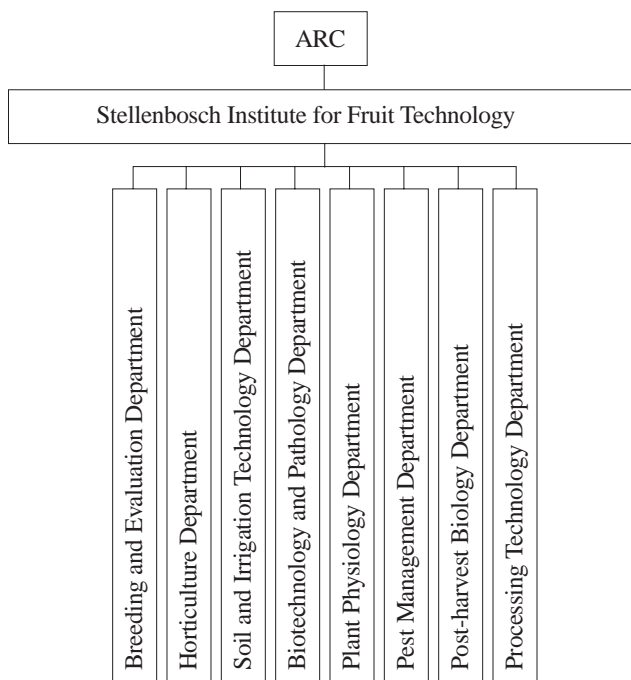


Appendix 3: Organizational charts of the agricultural research institutes (contd.)

Plant Protection Institute (1993)

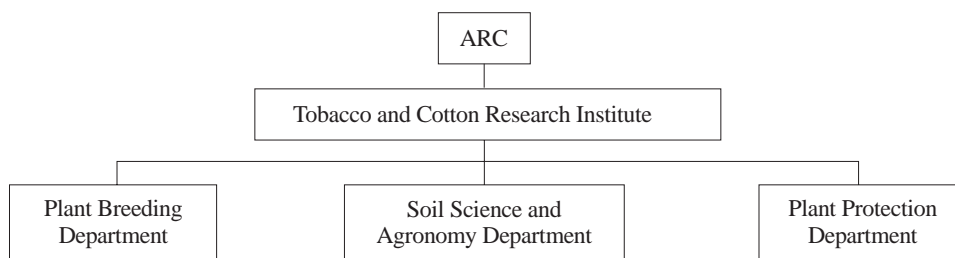


Stellenbosch Institute for Fruit Technology (1993)

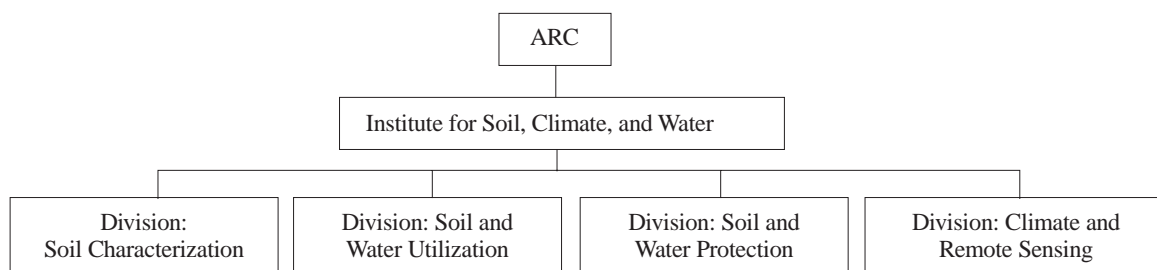


Appendix 3: Organizational charts of the agricultural research institutes (contd.)

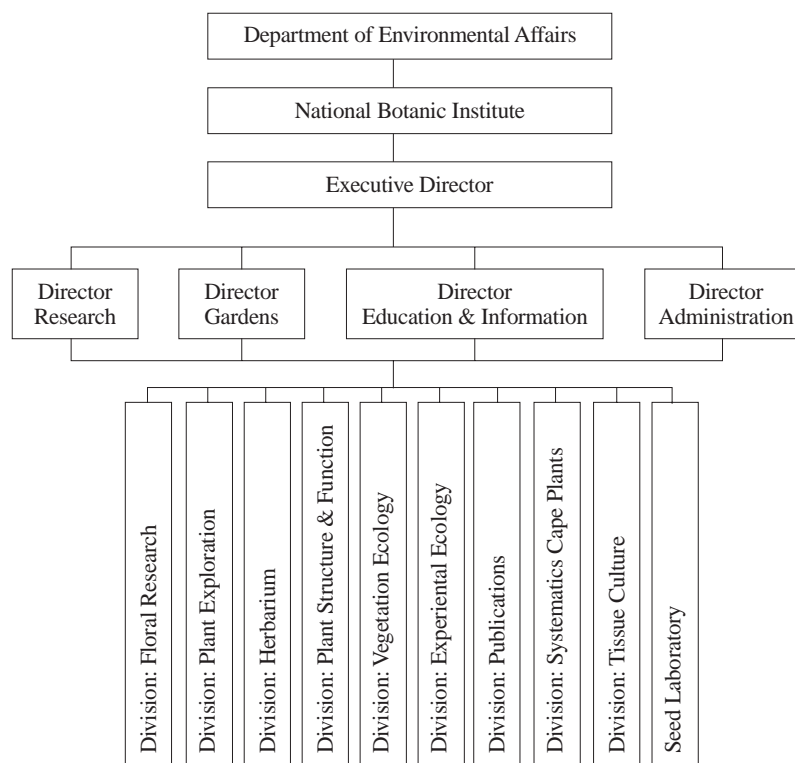
Tobacco and Cotton Research Institute (1993)



Institute for Soil, Climate and Water (1993)

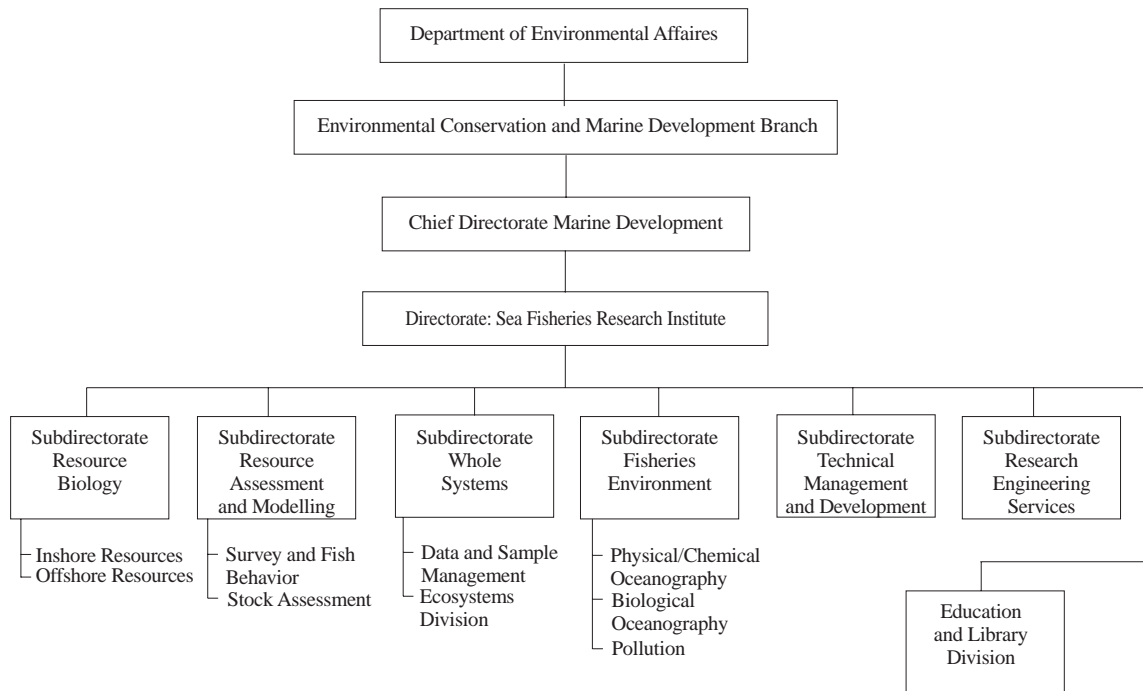


National Botanical Institute (1992)

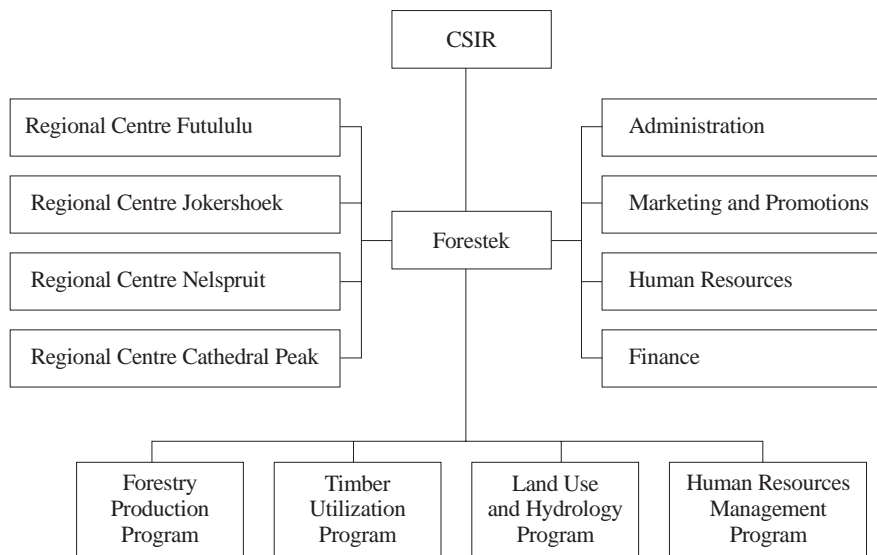


Appendix 3: Organizational charts of the agricultural research institutes (contd.)

Sea Fisheries Research Institute (1994)

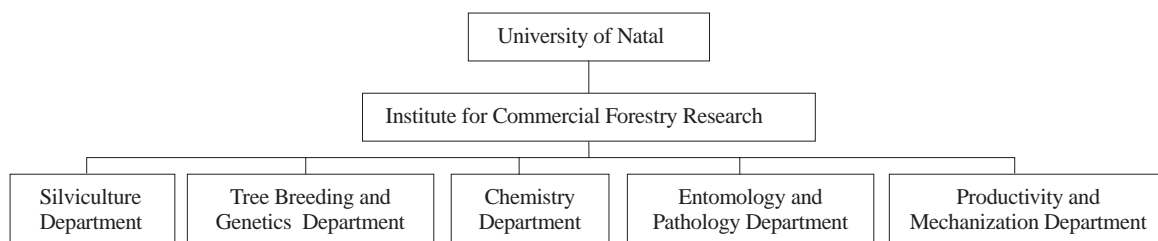


Division of Forestry Science and Technology (FORESTEK), CSIR (1993)

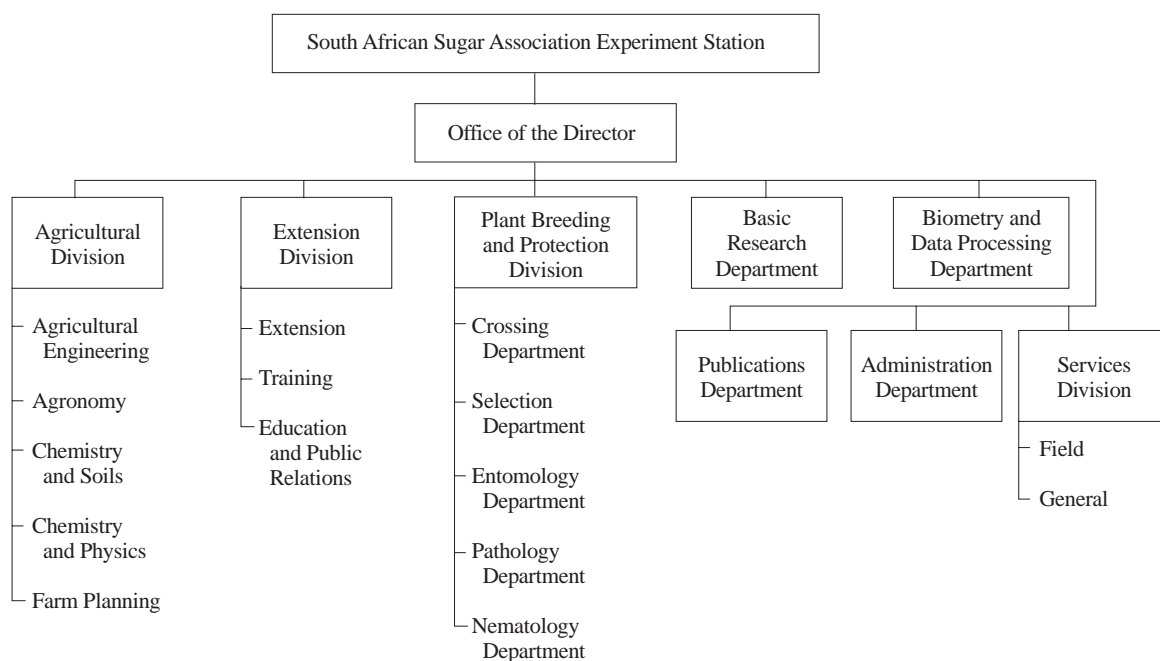


Appendix 3: Organizational charts of the agricultural research institutes (contd.)

Institute for Commercial Forestry Research (1994)

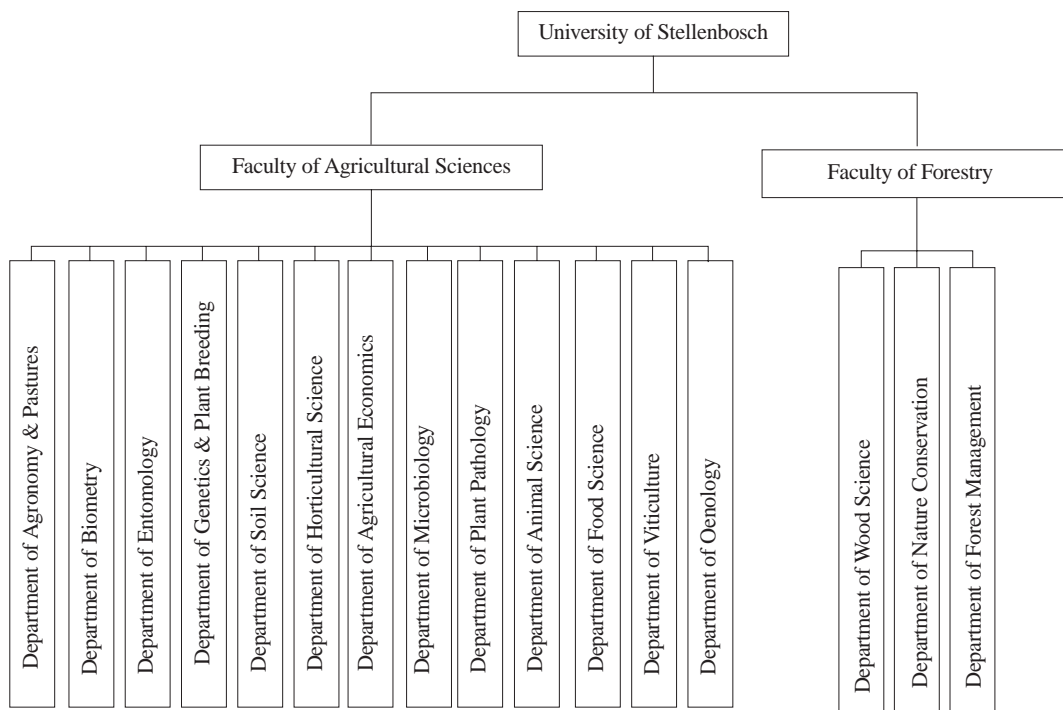


South Africa Sugar Association Experiment Station (1993)

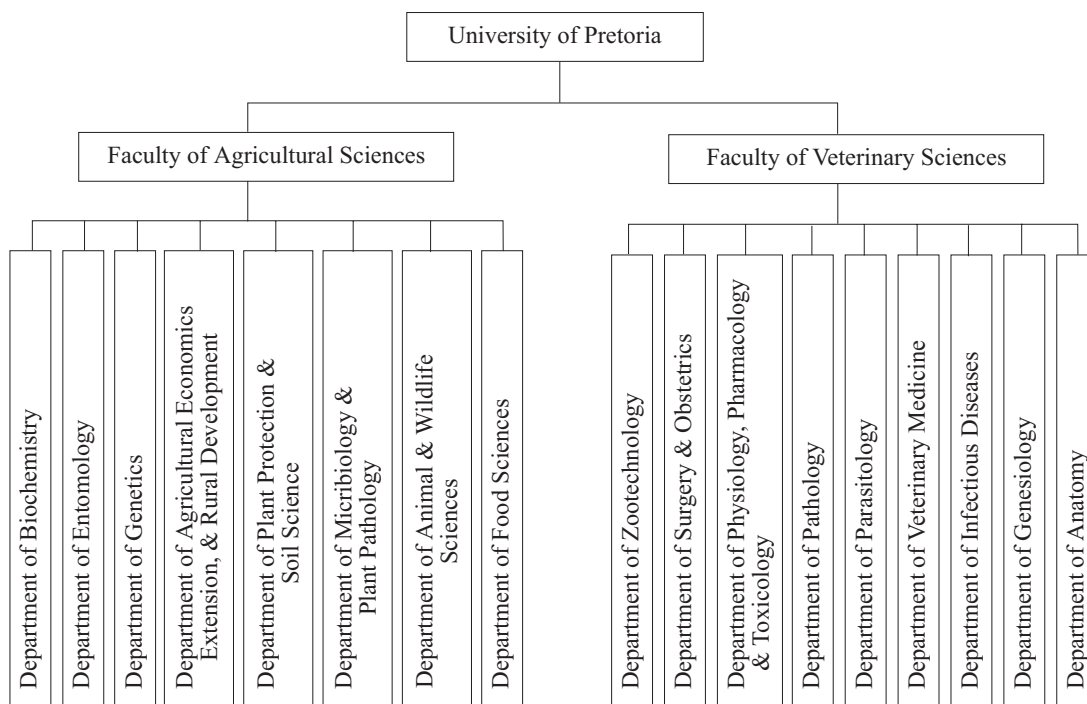


Appendix 3: Organizational charts of the agricultural research institutes (contd.)

University of Stellenbosch (1993)



University of Pretoria (1993)

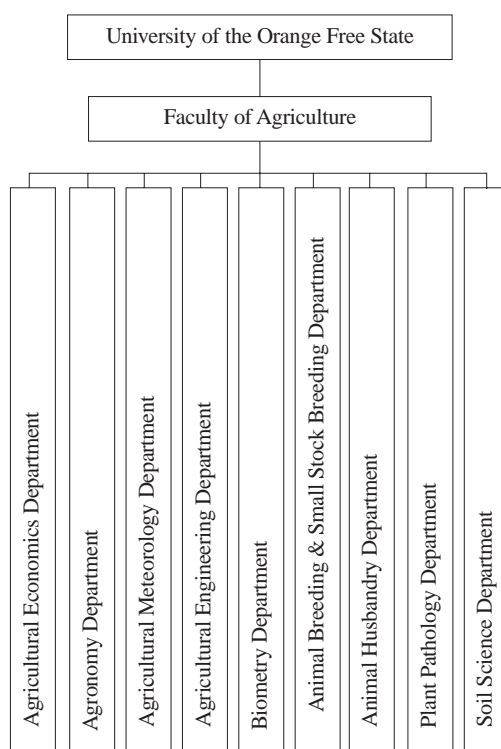


Appendix 3: Organizational charts of the agricultural research institutes (contd.)

University of Natal (1993)

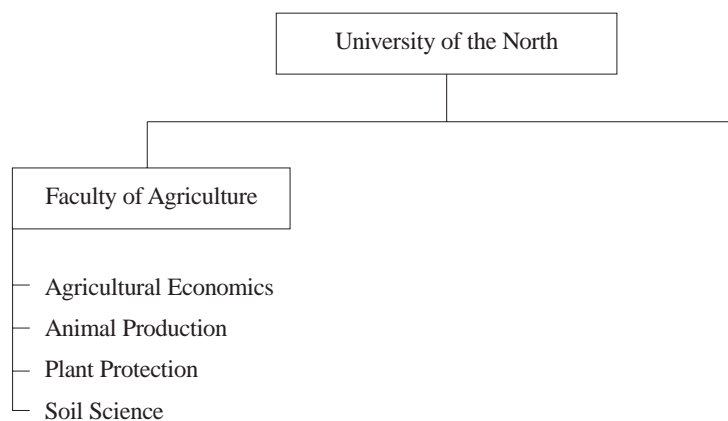


University of the Orange Free State (1993)

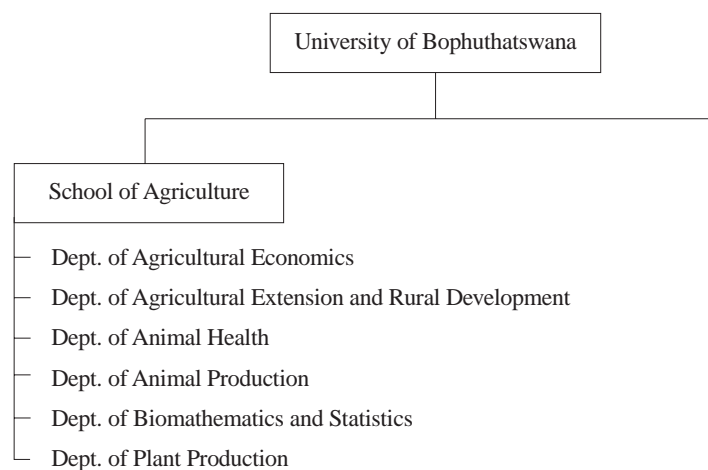


Appendix 3: Organizational charts of the agricultural research institutes (contd.)

University of the North (1993)

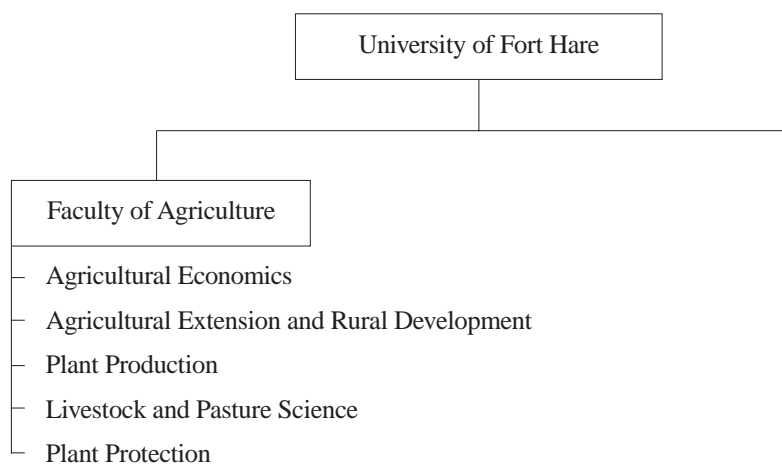


University of Bophuthatswana (1993)



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

University of Fort Hare (1993)



Medical University of South Africa (1993)



Appendix 4: Addresses of the agricultural research institutes

Department of Agriculture

Agricultural Economics Directorate
Private Bag X416
Pretoria 0001
Marketing Directorate
Private Bag X250
Pretoria 0001

Agricultural Mechanisation Directorate
Private Bag X515
Silverton 0127

Irrigation Engineering Directorate
Private Bag X515
Silverton 0127

Soil Conservation and Drilling Services Directorate
Private Bag X515
Silverton 0127

Cedara Agricultural Development Institute
Private Bag X9059
Pietermaritzburg 3200

Döhne Agricultural Development Institute
Private Bag X15
Stutterheim 4930

Elsenburg Agricultural Development Institute
Private Bag
Elsenburg 7607

Glen Agricultural Development Institute
Private Bag X01
Glen 9360

Grootfontein Agricultural Development Institute
Private Bag X529
Middelburg Cape 5900

Highveld Region Agricultural Development Institute
Private Bag X804
Potchefstroom 2520

Transvaal Agricultural Development Institute
Private Bag X180
Pretoria 0001

Agricultural Research Council

Agricultural Research Council
P.O. Box 8783
Pretoria 0001

Agrimetrics Institute
P/Bag X640
Pretoria 0001

Grain Crops Institute
P/Bag X1251
Potchefstroom 2520

Irene Animal Production Institute
P/Bag X2
Irene 1675

Institute for Soil, Climate & Water
P/Bag X79
Pretoria 0001

Institute for Tropical and Subtropical Crops
P/Bag X11208
Nelspruit 1200

Nietvoorbij Institute for Viticulture and Oenology
P/Bag X5026
Stellenbosch 7600

Onderstepoort Veterinary Institute
Private Bag X05
Onderstepoort 0110

Plant Protection Research Institute
P/Bag X134
Pretoria 0001

Roodeplaat Grassland Institute
P/Bag X05
Lynn East
Pretoria 0039

Stellenbosch Institute for Fruit Technology
P/Bag X5013
Stellenbosch 7600

Tobacco and Cotton Research Institute
P/Bag X82075
Rustenburg 0300

Vegetable and Ornamental Plant Institute
P/Bag X293
Pretoria 0001

Department of Environmental Affairs

Sea Fisheries Research Institute
Beach Road, Sea Point
Cape Town 8060

National Botanical Institute
Private Bag X101
Pretoria 0001

Council for Scientific and Industrial Research

CSIR Headquarters
P.O. Box 395
Pretoria 0001

FORESTEK
CSIR
P.O. Box 395
Pretoria 0001

Division of Earth, Marine and Atmospheric Science
and Technology
CSIR
P.O. Box 395
Pretoria 0001

Division of Food Science and Technology
CSIR
P.O. Box 395
Pretoria 0001

Division of Water Technology
CSIR
P.O. Box 395
Pretoria 0001

Academic Institutions

Faculty of Agricultural Sciences
University of Stellenbosch
P/Bag X5018

Stellenbosch 7600
Faculty of Agricultural Sciences
University of Pretoria
Pretoria 0002

Faculty of Agricultural Sciences
University of the North
P/Bag X1106
Sovenga 0727

Faculty of Agriculture
University of Natal
P.O. Box 375
Pietermaritzburg 3200

Faculty of Agriculture
University of the Orange Free State
P.O. Box 339
Bloemfontein 9300

School of Agriculture
University of Bophuthatswana
P/Bag X2046
Mafikeng 8670

Faculty of Agriculture
University of Fort Hare
P/Bag X1314
Alice 5700

Agricultural and Rural Development Research Institute
University of Fort Hare
P/Bag X1314
Alice 5700

Faculty of Veterinary Science
Medical University of South Africa
P.O. Box Medunsa 0204 or
P.O. Box 157
Pretoria 0001

Faculty of Veterinary Science
University of Pretoria
P/Bag X04
Onderstepoort 0110

Faculty of Forestry
University of Stellenbosch
Stellenbosch 7600

Other research agencies

Institute for Commercial Forestry Research
University of Natal
P.O. Box 375
Pietermaritzburg 3200

South African Sugar Association
Experiment Station
Private Bag X02
Mount Edgecombe 4300

SA Association for Marine Biological Research
P.O. Box 10712
Marine Parade
Durban 4056

Oceanographic Research Institute
P.O. Box 736
Durban 4000

Institute of Natural Resources
University of Natal
Box 375
Pietermaritzburg 3200

Sugar Milling Research Institute
University of Durban
King George V Avenue
Durban 4001

Fishing Industry Research Institute
University of Cape Town
Lower Hope Street
Rosebank 7700

Institute for Coastal Research
University of Port Elizabeth
P.O. Box 1600
Port Elizabeth 6000

Institute of Environmental Science
University of Orange Free State
P.O. Box 339
Bloemfontein 9300

SAPPI Forests - Research
P.O. Bix 473
Howick 3290

Appendix 5a: Total number of FTE researchers

Institute	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
AMU	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
GCI	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
IAPI	31.7	34.6	37.4	40.3	43.1	46.0	48.9	51.7	54.6	57.4	60.3	63.1	66	68.6	71.2	73.8	76.4
ICP	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ISCV	40.9	37.1	37.2	38.2	40.9	45.9	49.0	49.9	43.5	47.2	46.9	46.0	45	44.4	43.8	43.2	42.6
ITSTC	20.7	21.1	21.4	21.8	22.1	22.5	22.9	23.2	23.6	23.9	24.3	24.6	25	25.8	26.6	27.4	28.2
NBI	20.0	21.0	22.0	23.0	24.0	25.0	26.0	27.0	28.0	29.0	30.0	31.0	32	33.6	35.2	36.8	38.4
NIVO	10.0	14.5	15.4	15.3	17.8	19.1	20.3	21.1	23.0	24.7	29.0	26.3	26	27.0	28.0	29.0	30.0
OVI	63.4	63.6	63.9	64.1	64.3	64.5	64.7	64.9	65.1	65.4	65.6	65.8	66	67.0	68.0	69.0	70.0
PBRC	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
PPRI	61.9	62.8	63.7	64.6	65.6	66.5	67.4	68.4	69.3	70.2	71.1	72.1	73	72.6	72.2	71.8	71.4
RGI	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
SIFT	59.6	58.9	58.1	57.4	56.7	56.0	55.3	54.6	53.9	53.1	52.4	51.7	51	49.4	47.8	46.2	44.6
TORI	20.4	20.1	19.9	19.6	19.3	19.0	18.7	18.4	18.1	17.9	17.6	17.3	17	15.8	14.6	13.4	12.2
VOPI	24.1	24.7	25.3	25.9	26.4	27.0	27.6	28.1	28.7	29.3	29.9	30.4	31	31.2	31.4	31.6	31.8
Agr. Prod. Economics	21.7	22.6	23.4	24.3	25.1	26.0	26.9	27.7	28.6	29.4	30.3	31.1	32	32.7	33.3	34.0	34.7
Marketing Research	—	—	—	—	—	—	13.3	18.8	17.2	17.2	19.4	18.4	16	15.3	14.7	14.0	13.3
Agr. Engineering	0.3	3.7	4.1	4.5	4.9	4.8	12.8	15.5	17.5	22.8	33.5	33.0	25.5	26.5	27.5	28.5	29.5
Bio- and Datametric Services	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ADI Eastern Cape	9.4	10.1	10.9	11.6	12.3	13.0	13.7	14.4	15.1	15.9	16.6	17.3	18	17.2	16.4	15.6	14.8
ADI Free State	38.0	37.5	37.0	36.5	36.0	35.5	35.0	34.5	34.0	33.5	33.0	32.5	32	30.4	28.8	27.2	25.6
ADI Highveld	45.7	45.6	45.4	45.3	45.1	45.0	44.9	44.7	44.6	44.4	44.3	44.1	44	46.0	50.0	50.0	52.0
ADI Karoo	32.4	31.1	29.9	28.6	27.3	26.0	24.7	23.4	22.1	20.9	19.6	18.3	17	17.0	17.0	17.0	17.0
ADI Natal	31.3	32.4	33.6	34.7	35.9	37.0	38.1	39.3	40.4	41.6	42.7	43.9	45	44.0	43.0	42.0	41.0
ADI Transvaal	23.4	25.1	26.9	28.6	30.3	32.0	33.7	35.4	37.1	38.9	40.6	42.3	44	42.8	41.6	40.4	39.2
ADI Winter Rainfall	71.1	69.2	67.3	65.4	63.4	61.5	59.6	57.6	55.7	53.8	51.9	49.9	48	46.4	44.8	43.2	41.6
SFRI	18	18.6	19.2	19.8	20.4	21	25	24	29	31.9	32.5	35.5	36.3	37.0	39.6	41.0	43.7
NBI	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
FRD	17.6	18.9	20.2	21.5	22.8	24.1	25.4	26.7	28.0	29.3	30.7	32.0	33.3	34.6	35.9	37.2	38.5
NTRI/CSIR	—	—	—	—	—	6.9	7.9	8.0	9.9	12.5	16.4	16.1	15.1	15.3	21.7	22.3	20.8
FORESTEK/CSIR	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal government	661.8	673.3	682.1	690.9	703.8	724.4	761.8	777.5	787.1	810.1	843.6	849.4	845.1	847.4	857.7	861.0	863.4
SASA	14.0	16	18.0	20.0	22.0	24	23.3	22.7	22	21.0	20.0	19.0	18	19.8	21.5	23.2	25
ICFR	8.3	7.7	7	8	8.0	8	8	9.5	11	10	10	8.5	7	6	8	8.3	8.7
Subtotal semi-public	22.3	23.7	25.0	28.0	30.0	32.0	31.3	32.2	33.0	31.0	30.0	27.5	25.0	25.8	29.5	31.6	33.7
FA+ARD/UFH	—	—	—	—	—	—	—	—	—	1.0	1.0	1.1	1.2	1.3	1.4	1.5	1.6
FAUOFS	9.3	6.9	8.4	8.7	8.7	8.7	8.7	8.7	10.2	11.1	12.0	11.0	9.9	11.1	7.2	8.0	8.7
FA/UNO	—	—	—	—	—	—	—	—	—	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.2
SA/UB	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
FA/UNA	11.3	12.2	13.0	13.8	14.6	15.4	16.2	15.8	15.5	15.8	16.2	16.0	15.8	17.6	16.9	15.1	13.3
FA/US	8.3	10.2	12.2	14.2	16.1	18.0	20.0	19.8	19.6	20.8	22.0	21.4	20.8	22.0	23.2	23.2	23.2
FFOR/US	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.6	3.6	3.6	4.0	3.8	3.6	4.0	4.0	4.2	4.0
FA/UP	12.1	12.7	13.3	13.6	14.0	14.3	12.7	13.8	14.9	14.6	14.3	12.6	10.8	9.9	9.0	12.1	12.1
FVS/UP	9.3	9.7	10.1	10.5	11.0	11.4	11.8	12.1	12.4	12.6	12.7	11.2	9.6	10.4	11.2	13.0	14.9
FVSM/USA	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal universities	52.7	54.3	59.8	63.8	67.5	71.2	73.0	73.8	76.2	80.7	83.2	78.0	72.9	77.4	74.4	78.2	79.9
TOTAL	736.8	751.3	767.0	782.7	801.3	827.6	868.1	883.5	896.3	921.8	956.8	955.0	943.0	950.6	961.5	970.8	977.0

Appendix 5a: Total number of FTE researchers (contd.)

Institute	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
AWI	—	—	—	—	—	—	—	—	—	—	—	—	—	—	30	—
GCI	—	—	—	—	87	91.7	96.3	101	95	90.0	85	76	76	80	82.0	84
IAPI	79	83.0	87	91.0	95	98.0	101.0	104	100	106.0	112	104	99	98	96.0	94
ICP	6	5.5	5	5.0	—	—	—	—	—	—	—	—	—	—	—	—
ISCW	42	42.0	42	49.0	56	55.0	54.0	53	56	56.0	56	56	58	41	57	61
ITSTC	29	30.5	32	36.0	40	39.7	39.3	39	33	34.5	36	28	35	34	37.5	41
NBI	40	42.5	45	43.5	42	41.3	40.7	40	45	43.0	41	41.0	—	—	—	—
NIVO	31	32.5	34	37.0	40	42.7	45.3	48	44	45	38	34	37	37	30	31
OVI	71	72.0	73	73.0	73	76.3	79.7	83	77	77.5	78	72	76	83	80.5	78
PBRC	—	—	—	—	—	—	—	—	—	7.0	8	9	11	19	—	—
PPRI	71	77.0	83	83.5	84	87.7	91.3	95	93	93.0	93	79	93	89	87.0	85
RGI	—	—	—	—	—	—	—	—	—	22.0	22	34	36	42	42	40
SIFT	43	42.0	41	47.5	54	54.0	54.0	54	52	50.5	49	49	48	55	51.5	48
TCRI	11	11.5	12	14.5	17	19.0	21.0	23	24	24.5	25	24	28	26	27	25
VOPI	32	32.0	32	36.5	41	41.0	41.0	41	43	41.5	40	40	46	46	50.5	55
Agr. Prod. Economics	36.3	36.0	36.7	37.3	38	40.7	43.3	46	46	44.0	42	47	44	43	49.0	55
Marketing Research	12.7	12.0	11.3	10.7	10	11.0	12.0	13	13	11.5	10	15	13	12	17.5	23
Agr. Engineering	30.5	27.8	25.0	21.8	18.5	26.8	35.2	43.5	44.0	43.5	43.0	36.5	40.5	41.5	39.8	38.0
Bio- and Datametric Services	9	8.5	8	16.5	25	26.7	28.3	30	38	40.0	42	37	52	52	0	0
ADI Eastern Cape	14	15.0	16	16.0	16	15.7	15.3	15	15	16.5	18	19	18	15	20.5	26
ADI Free State	24	24.5	25	27.0	29	28.7	28.3	28	23	23.0	23	19	18	20	23.0	26
ADI Highveld	52	69.5	87	87.0	19	21.7	24.3	27	27	27.0	27	23	27	27	34.0	41
ADI Karoo	17	19.5	22	21.5	21	19.3	17.7	16	15	14.0	13	17	19	19	21.0	23
ADI Natal	40	39.5	39	39.0	26	26.3	26.7	27	23	22.5	22	20	21	21	19.5	18
ADI Transvaal	38	40.0	42	42.0	32	28.7	25.3	22	29	29.0	21	24	29	29	26.0	23
ADI Winter Raintail	40	39.0	38	38.0	27	28.3	29.7	31	30	29.5	29	27	31	30	30.5	31
SFRI	44.5	44.6	45.4	49.6	53.3	55.6	56.5	56	61	58.5	56	53.5	51	53.5	56	56.0
NBI	—	—	—	—	—	—	—	—	—	—	—	—	49.0	57.0	65	65.0
SAFRI	40	45	43	43	45	46	51	52	55	55	56	55	—	—	—	—
INTRI/CSIR	19.7	18.3	21.7	27.0	30	31.0	32	34	34.0	34.0	34.0	34.0	—	—	—	—
FORESTEK/CSIR	—	—	—	—	—	—	—	—	—	—	—	—	—	92.6	115	115.0
Subtotal government	871.7	909.7	946.1	992.9	1018.8	1052.8	1089.4	1121.5	1109.0	1131.5	1119.0	1073.0	1146.1	1163.0	1187.8	1212.0
SASA	28.2	31.5	34.8	38	36.3	34.7	33	31.0	29	31	30	27	29	31.0	33	33.0
ICFR	9	10.0	11.0	12	11	13.0	15	13	14	19	17.5	16	19.5	23	24	16
Subtotal semi-public	37.2	41.5	45.8	50.0	47.3	47.7	48.0	44.0	43.0	50.0	47.5	43.0	48.5	54.0	57.0	49.0
FA+ARD/UJFH	1.7	1.8	2.0	2.3	2.6	2.7	2.7	2.8	3.0	3.1	3.1	3.1	3.0	3.1	3.3	3.7
FAUOFS	10.2	9.6	12.0	12.8	13.5	13.8	14.1	14.4	13.8	14.6	15.3	16.5	16.5	15.0	15.3	15.6
FAUNO	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.5	1.3	1.3	1.3	1.4	1.3	1.1	1.2	1.4
SAUJB	—	—	1.0	1.2	1.4	1.7	1.9	2.1	2.2	1.8	1.5	1.2	1.0	1.7	2.0	2.2
FAUNA	15.5	17.1	18.7	18.7	18.7	18.7	18.7	18.7	22.7	23.0	23.4	18.7	19.8	19.4	22.7	25.9
FAUS	21.6	23.2	21.6	21.2	20.8	20.9	21.1	21.2	21.6	21.8	22.0	22.4	23.6	23.2	25.0	26.8
FORUS	4.2	4.4	5.1	5.8	6.6	7.3	8.0	8.4	8.8	9.2	9.6	10.0	10.4	10.8	11.2	11.2
FFAUP	12.1	12.7	12.7	14.3	15.8	16.4	17.0	17.7	18.3	19.1	19.8	21.1	20.5	20.5	19.4	18.3
FVS/UP	18.3	18.0	15.2	17.5	19.8	19.2	19.5	19.8	21.4	22.2	22.9	19.8	18.6	22.9	23.4	23.9
FVSMUSA	1.2	1.4	1.5	1.7	1.9	2.0	2.2	2.4	3.4	3.5	3.6	3.5	3.9	4.4	4.5	4.6
Subtotal Universities	85.9	89.4	91.1	96.7	102.4	104.0	106.6	109.0	116.5	119.5	122.6	117.7	118.6	122.1	128.0	133.6
TOTAL	994.9	1040.5	1082.9	1139.7	1168.5	1204.5	1244.0	1274.5	1268.5	1301.0	1289.1	1233.7	1313.2	1339.1	1372.7	1394.6

Appendix 5b: Expenditures in current LCU

Institute	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
AWI	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
GCI	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
IAPI	0.399	0.441	0.578	0.713	0.848	0.927	0.984	1.154	1.260	1.483	1.776	1.792	1.852	2.467	2.780	0.000	0.000
ICP	—	—	—	—	—	—	—	—	—	—	0.049	0.068	0.075	0.107	0.096	0.000	0.000
ISCW	0.373	0.349	0.370	0.386	0.420	0.486	0.546	0.554	0.519	0.583	0.610	0.662	0.717	0.853	1.065	0.000	0.000
ITSTC	0.218	0.243	0.258	0.265	0.298	0.334	0.348	0.411	0.467	0.617	0.725	0.826	0.861	1.003	1.192	0.000	0.000
NIVO	0.109	0.164	0.183	0.185	0.219	0.243	0.271	0.280	0.329	0.366	0.452	0.453	0.508	0.653	0.763	0.000	0.000
OVI	0.851	0.900	0.927	1.038	1.183	1.241	1.293	1.373	1.509	1.549	1.785	1.586	1.620	1.972	2.137	1.829	2.416
PPRI	0.241	0.224	0.247	0.334	0.411	0.530	0.535	0.593	0.657	0.790	0.869	0.894	0.965	1.253	1.715	1.976	2.200
RGI	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
SIFT	0.541	0.603	0.685	0.711	0.778	0.831	0.805	0.832	0.885	0.931	1.149	1.038	1.026	1.209	1.274	0.000	0.000
TCRI	0.212	0.230	0.272	0.277	0.325	0.309	0.331	0.322	0.359	0.452	0.451	0.460	0.465	0.517	0.562	0.000	0.000
VOPI	0.396	0.476	0.314	0.256	0.307	0.330	0.344	0.315	0.371	0.438	0.454	0.509	0.536	0.658	0.745	0.000	0.000
Agr. Prod. Economics	0.236	0.263	0.296	0.363	0.350	0.361	0.209	0.188	0.249	0.316	0.378	0.420	0.417	0.557	0.531	0.535	0.513
Marketing Research	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Agr. Engineering	0.007	0.082	0.098	0.108	0.118	0.121	0.336	0.406	0.485	0.665	1.016	1.099	1.280	1.479	1.585	0.467	0.513
Bio- and Datametric Services	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ADI Eastern Cape	0.163	0.256	0.274	0.427	0.451	0.509	0.486	0.518	0.548	0.589	0.643	0.621	0.652	0.756	0.817	0.000	0.000
ADI Free State	0.367	0.394	0.409	0.490	0.553	0.569	0.622	0.653	0.696	0.739	0.818	0.918	0.953	1.039	1.189	0.000	0.000
ADI Highveld	0.506	0.590	0.646	0.768	0.823	0.859	0.877	0.860	0.873	0.974	1.028	0.982	0.987	1.156	1.258	0.000	0.000
ADI Karoo	0.370	0.468	0.519	0.577	0.599	0.641	0.597	0.568	0.600	0.665	0.718	0.674	0.706	0.783	0.847	0.000	0.000
ADI Natal	0.325	0.348	0.414	0.497	0.573	0.647	0.665	0.693	0.730	0.758	0.841	0.895	0.947	1.091	1.242	0.000	0.000
ADI Transvaal	0.415	0.486	0.537	0.579	0.679	0.757	0.837	0.819	0.811	0.900	0.965	0.986	0.965	1.187	1.272	0.000	0.000
ADI Winter Rainfall	0.370	0.395	0.415	0.478	0.531	0.593	0.628	0.651	0.662	0.698	0.810	0.824	0.866	1.061	1.157	0.000	0.000
Crop research	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6.896	8.046
Livestock research	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5.333	5.556
Pasture utilization research	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.415	1.557
Resource classification research	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.526	1.785
Resource utilization research	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Soil conservation research	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Molecular biological research	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.123
Adm factor	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	3.394	4.190
Subtotal Department of Agriculture	6.098	6.911	7.441	8.452	9.467	10.288	10.886	11.413	12.229	13.738	15.806	15.992	16.685	20.152	22.548	23.811	27.372
ARC	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
SFRI	0.212	0.271	0.239	0.220	0.415	0.432	0.457	0.485	0.667	0.595	0.749	0.812	0.919	1.239	3.651	2.521	3.156
NBI/DEA	0.197	0.199	0.241	0.228	0.265	0.286	0.305	0.312	0.335	0.383	0.457	0.489	0.471	0.550	0.643	0.860	0.976
FRD	0.156	0.161	0.175	0.188	0.167	0.176	0.205	0.218	0.237	0.352	0.427	0.429	0.418	0.462	0.475	0.587	0.868
NTRI/CSIR	—	—	—	—	—	—	—	0.120	0.160	0.210	0.290	0.315	0.350	0.415	0.650	0.735	0.760
FORESTK/CSIR	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal government	6.664	7.542	8.095	9.088	10.314	11.282	11.973	12.548	13.629	15.278	17.729	18.037	18.843	22.818	27.967	28.514	33.132
SASA	0.281	0.331	0.394	0.544	0.456	0.479	0.493	0.486	0.470	0.515	0.567	0.649	0.872	1.291	1.268	1.750	2.416
ICFR	0.076	0.072	0.069	0.082	0.085	0.089	0.095	0.115	0.145	0.139	0.155	0.154	0.158	0.151	0.213	0.233	0.256
Subtotal semi-public	0.357	0.403	0.463	0.626	0.541	0.568	0.589	0.601	0.615	0.654	0.721	0.802	1.030	1.442	1.481	1.983	2.672
Subtotal universities	0.540	0.618	0.723	0.861	0.997	1.114	1.155	1.199	1.323	1.528	1.758	1.676	1.664	2.151	2.469	2.672	3.191
Total (million rand)	7.560	8.564	9.281	10.575	11.852	12.964	13.717	14.348	15.567	17.460	20.208	20.515	21.537	26.411	31.917	33.169	38.995
Total (million 1985 rand)	67.753	74.372	76.277	85.634	94.415	100.048	100.797	105.638	106.683	115.524	127.051	116.530	103.045	108.286	118.468	111.968	118.566
Total (million 1985 PPP\$)	74.911	82.230	84.336	94.681	104.390	110.619	111.447	116.799	117.954	127.729	140.474	128.842	113.932	119.727	130.985	123.798	131.093

Appendix 5b: Expenditures in current LCU (contd.)

Institute	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
AMM	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.000
GCI	—	—	—	—	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
IAPI	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
ICP	0.000	0.000	0.000	0.000	—	—	—	—	—	—	—	—	—	—	—
ISCW	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
ITSTC	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
NIVO	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
OVI	3.467	3.680	4.541	4.394	5.261	5.995	7.617	8.505	9.953	10.319	12.276	16.754	18.733	21.358	0.000
PPRI	2.521	2.037	2.827	3.891	4.883	5.221	6.526	6.690	8.081	8.730	9.523	12.506	13.157	14.925	0.000
RGI	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.000
SIFT	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
TCRI	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
VOPH	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
Agri. Prod. Economics	0.596	0.623	0.709	0.864	1.099	1.092	1.025	1.783	1.463	1.839	1.934	2.502	2.668	2.796	3.357
Marketing Research	0.348	0.380	0.486	0.598	0.563	0.613	0.765	1.596	1.757	1.633	1.839	2.170	2.563	2.872	4.244
Agri. Engineering	0.618	0.412	0.380	0.506	0.670	1.073	1.873	2.806	3.362	3.541	1.583	1.857	1.529	2.456	2.326
Bio- and Dalametric Services	0.500	0.471	0.461	0.487	1.042	0.974	1.157	1.430	1.912	1.882	2.069	2.384	3.773	4.380	1.704
ADI Eastern Cape	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
ADI Free State	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
ADI Highveld	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
ADI Karoo	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
ADI Natal	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
ADI Transvaal	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
ADI Winter Rainfall	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
Crop research	8.367	9.246	10.256	13.570	16.688	19.193	23.640	25.988	30.784	32.021	34.513	34.513	42.099	57.922	0.000
Livestock research	6.151	6.329	7.146	8.596	10.829	12.457	9.557	13.039	16.348	16.389	17.661	17.661	21.283	27.692	0.000
Pasture utilization research	1.636	1.761	1.830	2.111	2.554	3.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Resource classification research	1.805	2.227	2.596	3.229	3.732	4.378	5.666	7.505	8.474	9.111	10.545	13.680	13.640	19.368	10.433
Resource utilization research	—	—	—	—	—	—	11.226	13.035	16.948	19.158	21.990	30.024	29.005	39.043	39.455
Molecular biological research	0.176	0.180	0.899	0.811	0.452	0.517	0.659	0.694	0.730	0.765	0.344	0.432	0.348	0.452	0.972
Adm factor	4.519	3.309	5.065	7.440	10.309	10.606	12.949	18.309	19.579	21.195	24.031	47.780	47.350	39.807	12.614
Subtotal Department of Agriculture	30.703	30.657	36.995	46.498	58.083	65.135	82.660	101.381	119.390	125.108	138.975	182.881	197.334	235.422	75.106
ARC	—	—	—	—	—	—	—	—	—	—	—	—	—	—	231.195
SFRI	3.763	1.852	2.316	12.864	6.057	7.283	8.334	9.009	10.845	12.863	14.833	18.500	21.186	23.712	27.120
NB/DEA	0.874	0.828	1.041	1.277	1.815	1.749	2.385	2.860	3.187	3.339	3.872	4.461	5.960	7.848	10.038
SAFRI	1.060	1.122	1.263	1.080	1.995	2.599	3.356	4.741	5.692	6.933	7.966	9.171	—	—	—
NTRI/CSIR	0.805	0.860	1.260	1.760	2.222	2.825	3.435	3.800	4.641	5.268	6.081	7.006	—	—	—
FORESTEK/CSIR	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal government	37.205	35.319	42.875	63.479	70.173	79.591	100.170	121.792	143.756	153.512	171.727	222.019	236.223	280.333	361.974
SASA	2.416	2.298	3.253	3.970	4.163	4.832	5.113	6.613	7.095	9.318	10.066	12.396	13.911	16.904	19.467
ICFR	0.282	0.342	0.440	0.549	0.546	0.710	0.868	1.255	1.560	2.403	2.555	2.691	3.730	4.980	5.828
Subtotal semi-public	2.698	2.640	3.693	4.519	4.709	5.542	5.981	7.868	8.655	11.721	12.621	15.087	17.641	21.884	25.295
Subtotal universities	3.772	3.582	4.279	6.303	7.192	8.060	10.011	12.203	15.414	16.665	19.335	24.944	25.195	30.331	39.811
Total (million rand)	43.676	41.541	50.846	74.301	82.075	93.193	116.161	141.863	167.825	181.898	203.683	262.050	279.059	332.549	427.080
Total (million 1985 rand)	118.933	98.229	97.109	126.773	123.088	120.823	135.007	141.863	145.397	138.834	134.686	150.402	140.842	148.263	169.778
Total (million 1985 PPP\$)	131.499	108.607	107.369	140.166	136.092	133.588	149.270	156.851	160.759	153.502	148.915	166.292	155.723	163.927	187.716

Appendix 6: Research staff development by institute

Institute: Agrimetrics Institute (AMI)																	
	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																	
PhD																	
MSc																	
BSc																	
Total																	
Source																	
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Nationals																	
PhD															2	2	
MSc															10	7	
BSc															18	21	
Total															30	30	
Source															999	1498	

Note: Established in 1992. Succeeded partially the Directorate of Biometric and Datametric Services.

Institute: Grain Crops Institute (GCI)																	
	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																	
PhD																	
MSc																	
BSc																	
Total																	
Source																	
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Nationals																	
PhD					14	18.0	22.0	26	23	23.0	23	18	19	20	21.5	23	
MSc					20	19.7	19.3	19	20	23.0	26	26	28	36	35.0	34	
BSc					43	47.3	51.7	56	52	44.0	36	32	29	24	25.5	27	
Total					87	91.7	96.3	101	95	90.0	85	76	76	80	82.0	84	
Source					1502			719	1497		1385	1384	1386	1387		1498	

Note: Established in 1982. Grain Crops Institute's research staff located at the University of Natal and the Cedara College of Agriculture were listed separately but included here.

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

Institute: Irene Animal Production Institute (I-API) (previously the Animal and Dairy Science Research Institute)																	
	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																	
PhD	8.3	8.4	8.6	8.7	8.9	9.0	9.1	9.3	9.4	9.6	9.7	9.9	10	12.4	14.8	17.2	19.6
MSc	7.6	8.9	10.1	11.4	12.7	14.0	15.3	16.6	17.9	19.1	20.4	21.7	23	24.2	25.4	26.6	27.8
BSc	15.9	17.3	18.7	20.1	21.6	23.0	24.4	25.9	27.3	28.7	30.1	31.6	33	32.0	31.0	30.0	29.0
Total	31.7	34.6	37.4	40.3	43.1	46.0	48.9	51.7	54.6	57.4	60.3	63.1	66	68.6	71.2	73.8	76.4
Source													1455				
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Nationals																	
PhD	22	19.5	17	19.5	22	22.7	23.3	24	21	21.5	22	22	27	24	23.0	22	
MSc	29	28.5	28	25.5	23	25.3	27.7	30	33	35.5	38	35	29	32	32.0	32	
BSc	28	35.0	42	46.0	50	50.0	50.0	50	46	49.0	52	47	43	43	41.5	40	
Total	79	83.0	87	91.0	95	98.0	101.0	104	100	106.0	112	104	99	98	96.0	94	
Source	1500		1501		1502			719	1497		1385	1384	1386	1387		1498	

Note: 1959 observation: 8 PhD, 5 MSc, and 13 BSc (source 287)

Institute: Institute for Crops and Pastures																	
	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																	
PhD													3	3.0	3.0	3.0	3.0
MSc													4	3.8	3.6	3.4	3.2
BSc													0	0.0	0.0	0.0	0.0
Total											5.2	6.6	7	6.8	6.6	6.4	6.2
Source												1455					
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Nationals																	
PhD	3	3.0	3	3.0													
MSc	3	2.5	2	2.0													
BSc	0	0.0	0	0.0													
Total	6	5.5	5	5.0													
Source	1500		1501														

Note: Established in 1971, closed in 1981.

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

Institute: Institute for Soil, Climate and Water (ISCW) (previously the Soil and Irrigation Research Institute)		1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																		
PhD														10	10.0	10.0	10.0	10.0
MSc														18	17.8	17.6	17.4	17.2
BSc														17	16.6	16.2	15.8	15.4
Total	40.9	37.1	37.2	38.2	40.9	45.9	49.0	49.0	49.9	43.5	47.2	46.9	46.0	45	44.4	43.8	43.2	42.6
Source														1455				
Nationals																		
PhD	10	9.5	9	9.0	9	9.0	9.0	9.0	9	11	11.0	11	10	10	11	9	12	
MSc	17	16.5	16	18.5	21	20.0	19.0	19.0	18	19	18.0	17	13	13	13	26	24	
BSc	15	16.0	17	21.5	26	26.0	26.0	26.0	26	26	27.0	28	33	33	27	22	25	
Total	42	42.0	42	49.0	56	55.0	54.0	54.0	53	56	56.0	56	56	58	41	57	61	
Source	1500		1501		1502				719	1497		1385	1384	1386	1387	999	1498	

Note: pre-1973 research staff data estimated by dividing expenditures for these years by an 1973-75 average of expenditures per researcher (\$85,000)

Institute: Institute for Tropical and Subtropical Crops (ITSC) (previously the Citrus and Subtropical Fruit Research Institute)		1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																		
PhD	4.6	4.9	5.1	5.4	5.7	6.0	6.3	6.3	6.6	6.9	7.1	7.4	7.7	8	8.4	8.8	9.2	9.6
MSc	8.1	8.2	8.3	8.4	8.4	8.5	8.6	8.6	8.6	8.7	8.8	8.9	8.9	9	9.2	9.4	9.6	9.8
BSc	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8	8.2	8.4	8.6	8.8
Total	20.7	21.1	21.4	21.8	22.1	22.5	22.9	23.2	23.2	23.6	23.9	24.3	24.6	25	25.8	26.6	27.4	28.2
Source														1455				
Nationals																		
PhD	10	10.0	10	12.0	14	13.3	12.7	12.7	12	11	10.5	10	6	8	8	9.5	11	
MSc	10	8.0	6	7.5	9	9.0	9.0	9.0	9	8	10.0	12	7	7	7	9.0	11	
BSc	9	12.5	16	16.5	17	17.3	17.7	17.7	18	14	14.0	14	15	20	19	19.0	19	
Total	29	30.5	32	36.0	40	39.7	39.3	39.3	39	33	34.5	36	28	35	34	37.5	41	
Source	1500		1501		1502				719	1497		1385	1384	1386	1387		1498	

Note: 1969 observation: 4 PhD, 8 MSc, and 8 BSc (source 287)

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

Institute: National Botanical Institute (NBI)(previously Botanical Research Institute)																	
	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																	
PhD	6.3	6.4	6.6	6.7	6.9	7.0	7.1	7.3	7.4	7.6	7.7	7.9	8	9.2	10.4	11.6	12.8
MSc	9.1	9.7	10.3	10.9	11.4	12.0	12.6	13.1	13.7	14.3	14.9	15.4	16	16.6	17.2	17.8	18.4
BSc	4.6	4.9	5.1	5.4	5.7	6.0	6.3	6.6	6.9	7.1	7.4	7.7	8	7.8	7.6	7.4	7.2
Total	20.0	21.0	22.0	23.0	24.0	25.0	26.0	27.0	28.0	29.0	30.0	31.0	32	33.6	35.2	36.8	38.4
Source												1455					
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Nationals																	
PhD	14	13.5	13	11.5	10	11.0	12.0	13	14	14.0	14	14.0					
MSc	19	19.5	20	18.0	16	16.3	16.7	17	20	19.0	18	18.0					
BSc	7	9.5	12	14.0	16	14.0	12.0	10	11	10.0	9	9.0					
Total	40	42.5	45	43.5	42	41.3	40.7	40	45	43.0	41	41.0	49.0	57.0	65	65.0	
Source	1500		1501		1502			719	1497		1385				1246		

Note: In 1989 the National Botanical Institute was transferred to the Department of Environment Affairs.

Institute: Nietvoorbij Institute for Viticulture and Oenology (NIVO) (previously the Viticulture and Oenological Research Institute)																	
	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																	
PhD													5	4.8	4.6	4.4	4.2
MSc													7	7.6	8.2	8.8	9.4
BSc													14	14.6	15.2	15.8	16.4
Total	10.0	14.5	15.4	15.3	17.8	19.1	20.3	21.1	23.0	24.7	29.0	26.3	26	27.0	28.0	29.0	30.0
Source												1455					
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Nationals																	
PhD	4	4.5	5	5.5	6	6.0	6.0	6	7	6	6	8	9	11	11	12	
MSc	10	11.0	12	13.0	14	15.0	16.0	17	15	18	14	8	11	11	13	9	
BSc	17	17.0	17	18.5	20	21.7	23.3	25	22	21	18	18	17	15	6	10	
Total	31	32.5	34	37.0	40	42.7	45.3	48	44	45	38	34	37	37	30	31	
Source	1500		1501		1502			719	1497	999	1385	1384	1386	1387	999	1498	

Note: Pre-1973 research staff data estimated by dividing the expenditures for these years with the 1973-75 expenditures-per-researcher ratio.

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

Institute: Onderstepoort Veterinary Institute (OVI)		1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																		
PhD	16.9	16.3	15.7	15.1	14.6	14.0	13.4	12.9	12.3	11.7	11.1	10.6	10.6	10	11.4	12.8	14.2	15.6
MSc	9.3	10.4	11.6	12.7	13.9	15.0	16.1	17.3	18.4	19.6	20.7	21.9	21.9	23	21.2	19.4	17.6	15.8
BSc	37.3	36.9	36.6	36.2	35.9	35.5	35.1	34.8	34.4	34.1	33.7	33.4	33.4	33	34.4	35.8	37.2	38.6
Total	63.4	63.6	63.9	64.1	64.3	64.5	64.7	64.9	65.1	65.4	65.6	65.8	65.8	66	67.0	68.0	69.0	70.0
Source													1455					
Nationals	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	
PhD	17	18.0	19	18.5	18	18.3	18.7	19	18	17.5	17	20	21	23	24.0	25		
MSc	14	12.5	11	9.5	8	9.7	11.3	13	13	13.5	14	12	20	20	20.5	21		
BSc	40	41.5	43	45.0	47	48.3	49.7	51	46	46.5	47	51	40	35	40	36.0	32	
Total	71	72.0	73	73.0	73	76.3	79.7	83	77	77.5	78	72	76	83	80.5	78		
Source	1500		1501		1502			719	1497		1385	1384	1386	1387		1498		

Note: 1959 observation: 18 PhD, 7 MSc, and 38 BSc (source 287)

Institute: Plant Biotechnology Research Centre (PBRC)		1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																		
PhD																		
MSc																		
BSc																		
Total																		
Source																		
Nationals	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	
PhD																		
MSc																		
BSc																		
Total																		
Source																		

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

Institute: Roodeplaai Grassland Institute (RGI)		1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																		
PhD																		
MSc																		
BSc																		
Total																		
Source																		
Nationals	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	
PhD											1	5	6	8	12	13		
MSc											10	10	10	18	23	21		
BSc											11	19	20	16	7	6		
Total										22.0	22	34	36	42	42	40		
Source											1385	1384	1386	1387	999	1498		

Institute: Stellenbosch Institute for Fruit Technology (SIFT) (previously the Fruit and Fruit Technology Research Institute)		1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																		
PhD																		
MSc																		
BSc																		
Total																		
Source														1455				
Nationals	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	
PhD	17	16.0	15	15.0	15	14.7	14.3	14	14	14.0	14	12	11	14	14.0	14		
MSc	14	12.5	11	13.0	15	17.0	19.0	21	21	21.0	21	22	29	28	25.0	22		
BSc	12	13.5	15	19.5	24	22.3	20.7	19	17	16.0	15	15	6	13	12.5	12		
Total	43	42.0	41	47.5	54	54.0	54.0	54	52	50.5	49	49	46	55	51.5	48		
Source	1500		1501		1502			719	1497		1385	1384	1386	1387		1498		

Note: 1959 observation: 13 PhD, 18 MSc, 30 BSc (source 287)

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

Institute: Tobacco and Cotton Research Institute (TCRI)		1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																		
PhD		3.7	3.6	3.4	3.3	3.1	3.0	2.9	2.7	2.6	2.4	2.3	2.1	2	2.0	2.0	2.0	2.0
MSc		6.4	6.6	6.9	7.1	7.3	7.5	7.7	7.9	8.1	8.4	8.6	8.8	9	8.2	7.4	6.6	5.8
BSc		10.3	9.9	9.6	9.2	8.9	8.5	8.1	7.8	7.4	7.1	6.7	6.4	6	5.6	5.2	4.8	4.4
Total		20.4	20.1	19.9	19.6	19.3	19.0	18.7	18.4	18.1	17.9	17.6	17.3	17	15.8	14.6	13.4	12.2
Source													1455					
Nationals																		
PhD		1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
MSc		2	2.5	3	3.5	4	4.0	4.0	4	4	4.5	5	4	6	6	6	6	
BSc		5	4.0	3	3.5	4	6.3	8.7	11	12	9.5	7	7	10	8	10	7	
Total		4	5.0	6	7.5	9	8.7	8.3	8	8	10.5	13	13	12	12	11	12	
Source		11	11.5	12	14.5	17	19.0	21.0	23	24	24.5	25	24	28	26	27	25	
Source		1500		1501		1502			719	1497		1385	1384	1386	1387	999	1498	

Note: 1959 observation: 4 PhD, 6 MSc, and 11 BSc (source 287)

Institute: Vegetable and Ornamental Plant Institute (VOPI) (previously the Horticultural Research Institute)		1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																		
PhD		6.1	6.2	6.3	6.4	6.4	6.5	6.6	6.6	6.7	6.8	6.9	6.9	7	6.8	6.6	6.4	6.2
MSc		8.9	9.3	9.7	10.1	10.6	11.0	11.4	11.9	12.3	12.7	13.1	13.6	14	14.0	14.0	14.0	14.0
BSc		9.1	9.2	9.3	9.4	9.4	9.5	9.6	9.6	9.7	9.8	9.9	9.9	10	10.4	10.8	11.2	11.6
Total		24.1	24.7	25.3	25.9	26.4	27.0	27.6	28.1	28.7	29.3	29.9	30.4	31	31.2	31.4	31.6	31.8
Source													30.4	1455				
Nationals																		
PhD		1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
MSc		6	6.0	6	6.5	7	6.3	5.7	5	8	7.5	7	10	10	8	8.0	8	
BSc		14	13.5	13	12.5	12	12.0	12.0	12	12	14.5	17	16	17	20	24.5	29	
Total		12	12.5	13	17.5	22	22.7	23.3	24	23	19.5	16	14	19	18	78.0	18	
Source		32	32.0	32	36.5	41	41.0	41.0	41	43	41.5	40	40	46	46	50.5	55	
Source		1500		1501		1502			719	1497		1385	1384	1386	1387		1498	

Note: 1959 observation: 6 PhD, 8 MSc, and 9 BSc (source 287)

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

Institute: Directorate of Agricultural (Production) Economics, Department of Agricultural Development		1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																		
PhD	2.6	2.4	2.1	1.9	1.7	1.5	1.3	1.1	1.1	0.9	0.6	0.4	0.2	0	0.0	0.0	0.0	0.0
MSc	11.9	12.3	12.7	13.1	13.6	14.0	14.4	14.9	15.3	15.7	16.1	16.6	17	17	15.7	14.3	13.0	11.7
BSc	8.7	10.1	11.4	12.8	14.1	15.5	16.9	18.2	19.6	20.9	20.9	22.3	23.6	25	25.9	26.8	27.7	28.6
Total	21.7	22.6	23.4	24.3	25.1	26.0	26.9	27.7	28.6	29.4	29.4	30.3	31.1	32	32.7	33.3	34.0	34.7
Source														1455				
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	
Nationals																		
PhD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0.0	0	0	0	0	0.0	0	0	0
MSc	10.3	9.0	7.7	6.3	5	5.0	5.0	5	7	7.5	8	8	8	10	11	13.0	15	15
BSc	29.4	30.3	31.2	32.1	33	35.7	38.3	41	39	36.5	34	39	39	34	32	36.0	40	40
Total	35.3	36.0	36.7	37.3	38	40.7	43.3	46	46	44.0	42	47	47	44	43	49.0	55	55
Source					1502			719	1497		1385	1384	1386	1387			1498	

Note: During the years 1961-66 the data also includes marketing research. As of 1967 marketing research is reported separately. Pre-1973 research staff data estimated by dividing the expenditures for these years with the 1973-75 expenditures-per-researcher ratio.

Institute: Directorate of Agricultural Marketing Research		1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																		
PhD							0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
MSc							3.9	5.0	4.5	4.6	4.6	5.1	4.8	4	3.7	3.3	3.0	2.7
BSc							7.7	10.0	9.1	9.2	9.2	10.2	9.6	12	11.7	11.3	11.0	10.7
Total							11.6	15.0	13.6	13.8	13.8	15.3	14.3	16	15.3	14.7	14.0	13.3
Source														1455				
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	
Nationals																		
PhD	0.0	0.0	0.0	0.0	0	0.0	0.0	0	0	0.0	0	0	0	0	0.5	1	1	1
MSc	2.3	2.0	1.7	1.3	1	1.0	1.0	1	1	1.0	1	1	1	1	2	2.5	3	3
BSc	10.3	10.0	9.7	9.3	9	10.0	11.0	12	12	10.5	9	14	14	12	10	14.5	19	19
Total	12.7	12.0	11.3	10.7	10	11.0	12.0	13	13	11.5	10	15	15	13	12	17.5	23	23
Source					1502			719	1497		1385	1384	1386	1387			1498	

Note: During the years 1961-66 marketing research was part of the agricultural (production) economics division. Pre-1973 research staff data estimated by dividing the expenditures for these years with the 1973-75 expenditures-per-researcher ratio.

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

Institute: Agricultural Engineering Services (now: Directorate of Agricultural Mechanisation, Directorate of Irrigation Engineering, and the Directorate of Soil Conservation and Drilling Services)		1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																		
PhD														1	1.0	1.0	1.0	1.0
MSc														4	4.2	4.4	4.6	4.8
BSc														46	47.8	49.6	51.4	53.2
Total		0.6	7.4	8.3	9.1	9.8	9.6	25.6	31.0	34.9	45.6	67.0	66.0	51	53.0	55.0	57.0	59.0
FTE Research		0.3	3.7	4.1	4.5	4.9	4.8	12.8	15.5	17.5	22.8	33.5	35.0	25.5	26.5	27.5	28.5	29.5
Source														1455				
		1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Nationals																		
PhD		1	1.0	1	1.0	1	1.3	1.7	2	2	2.0	2	1	1	1	1.0	1	1
MSc		5	4.0	3	3.5	4	5.7	7.3	9	11	10.0	9	8	9	16	12.5	9	9
BSc		55	50.5	46	39.0	32	46.7	61.3	76	75	75.0	75	64	71	66	66.0	66	66
Total		61	55.5	50	43.5	37	53.7	70.3	87	88	87.0	86	73	81	83	79.5	76	76
FTE Research		30.5	27.8	25.0	21.8	18.5	26.8	35.2	43.5	44.0	43.5	43.0	36.5	40.5	41.5	39.8	38.0	38.0
Source		1500		1501		1502			719	1497		1385	1384	1386	1387		1498	

Note: It is assumed that the agricultural engineering services spent 50% of their time on research throughout the whole period. Pre-1973 research staff data estimated by dividing the expenditures for these years with the 1973-75 expenditures-per-researcher ratio.

Institute: Directorate of Biometric and Datametric Service		1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																		
PhD																		
MSc																		
BSc																		
Total																		
Source																		
		1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Nationals																		
PhD		1	1.5	2	4.0	6	5.3	4.7	4	3	3.0	3	2	2	3			
MSc		6	5.5	5	6.0	7	6.3	5.7	5	4	4.5	5	5	5	7			
BSc		2	1.5	1	6.5	12	16.0	20.0	24	31	32.5	34	30	45	42			
Total		9	8.5	8	16.5	25	26.7	28.3	30	38	40.0	42	37	52	52			
Source		1500		1501		1502			719	1487		1385	1384	1386	1387			

Note: First time biometric unit included in the budget: 1978. In 1992 a large part (about 30) of the directorates research staff was transferred to the newly established Agrimetrics Research Institute.

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

Institute: Dohne Agricultural Development Institute (Eastern Caperegon)																	
	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																	
PhD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0
MSc	7.6	7.9	8.1	8.4	8.7	9.0	9.3	9.6	9.9	10.1	10.4	10.7	11	10.8	10.6	10.4	10.2
BSc	1.9	2.3	2.7	3.1	3.6	4.0	4.4	4.9	5.3	5.7	6.1	6.6	7	6.4	5.8	5.2	4.6
Total	9.4	10.1	10.9	11.6	12.3	13.0	13.7	14.4	15.1	15.9	16.6	17.3	18	17.2	16.4	15.6	14.8
Source												1455					
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Nationals																	
PhD	0	1.0	2	3.0	4	3.7	3.3	3	3	2.5	2	3	3	2	2.0	2	
MSc	10	9.0	8	7.5	7	7.3	7.7	8	6	6.0	6	6	7	7	8.5	10	
BSc	4	5.0	6	5.5	5	4.7	4.3	4	6	8.0	10	10	8	6	10.0	14	
Total	14	15.0	16	16.0	16	15.7	15.3	15	15	16.5	18	19	18	15	20.5	26	
Source	1500		1501		1502			719	1497		1385	1384	1386	1387		1498	

Note: 1959 observation: 0 PhD, 7 MSc, and 1 BSc (source 287)

Institute: Glen Agricultural Development Institute (Free State region)																	
	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																	
PhD	4.7	4.6	4.4	4.3	4.1	4.0	3.9	3.7	3.6	3.4	3.3	3.1	3	3.0	3.0	3.0	3.0
MSc	11.1	11.7	12.3	12.9	13.4	14.0	14.6	15.1	15.7	16.3	16.9	17.4	18	16.6	15.2	13.8	12.4
BSc	22.1	21.2	20.3	19.4	18.4	17.5	16.6	15.6	14.7	13.8	12.9	11.9	11	10.8	10.6	10.4	10.2
Total	38.0	37.5	37.0	36.5	36.0	35.5	35.0	34.5	34.0	33.5	33.0	32.5	32	30.4	28.8	27.2	25.6
Source												1455					
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Nationals																	
PhD	3	4.0	5	3.5	2	2.3	2.7	3	2	3.5	5	4	2	1	1.5	2	
MSc	11	9.0	7	7.0	7	7.3	7.7	8	8	8.5	9	7	7	8	8.0	8	
BSc	10	11.5	13	16.5	20	19.0	18.0	17	13	11.0	9	8	9	11	13.5	16	
Total	24	24.5	25	27.0	29	28.7	28.3	28	23	23.0	23	19	18	20	23.0	26	
Source	1500		1501		1502			719	1497		1385	1384	1386	1387		1498	

Note: 1959 observation: 5 PhD, 10 MSc, and 24 BSc (source: 287)

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

Institute: Potchefstroom Agricultural Development Institute (Highveld region)																	
	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																	
PhD	4.9	4.8	4.7	4.6	4.6	4.5	4.4	4.4	4.3	4.2	4.1	4.1	4	4.2	4.4	4.6	4.8
MSc	16.3	16.9	17.6	18.2	18.9	19.5	20.1	20.8	21.4	22.1	22.7	23.4	24	25.2	26.4	27.6	28.8
BSc	24.6	23.9	23.1	22.4	21.7	21.0	20.3	19.6	18.9	18.1	17.4	16.7	16	16.6	17.2	17.8	18.4
Total	45.7	45.6	45.4	45.3	45.1	45.0	44.9	44.7	44.6	44.4	44.3	44.1	44	46.0	48.0	50.0	52.0
Source													1455				
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Nationals																	
PhD	5	8.5	12	12.0	2	2.7	3.3	4	4	5.5	7	6	3	2	2.0	2	
MSc	28	25.5	23	23.0	8	7.3	6.7	6	6	7.5	9	9	14	14	17.5	21	
BSc	19	35.5	52	52.0	9	11.7	14.3	17	17	14.0	11	8	10	11	14.5	18	
Total	52	69.5	87	87.0	19	21.7	24.3	27	27	27.0	27	23	27	27	34.0	41	
Source	1500		1501		1502			719	1497		1385	1384	1386	1387		1498	

Note: With the establishment of the Grain Crops Institute in 1982 a substantial number of "regional" researchers were taken over by this institute, hence the substantial decline in "regional" researchers.
1959 observation: 5 PhD, 15 MSc, and 26 BSc (source 287)

Institute: Grootfontein Agricultural Development Institute (Karoo region)																	
	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																	
PhD	3.7	3.6	3.4	3.3	3.1	3.0	2.9	2.7	2.6	2.4	2.3	2.1	2	2.0	2.0	2.0	2.0
MSc	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10	9.6	9.2	8.8	8.4
BSc	24.7	23.1	21.4	19.8	18.1	16.5	14.9	13.2	11.6	9.9	8.3	6.6	5	5.4	5.8	6.2	6.6
Total	32.4	31.1	29.9	28.6	27.3	26.0	24.7	23.4	22.1	20.9	19.6	18.3	17	17.0	17.0	17.0	17.0
Source													1455				
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Nationals																	
PhD	2	2.0	2	3.0	4	3.7	3.3	3	2	1.5	1	3	4	4	4.5	5	
MSc	8	7.5	7	8.0	9	8.7	8.3	8	8	7.5	7	6	7	7	10.5	14	
BSc	7	10.0	13	10.5	8	7.0	6.0	5	5	5.0	5	8	8	8	6.0	4	
Total	17	19.5	22	21.5	21	19.3	17.7	16	15	14.0	13	17	19	19	21.0	23	
Source	1500		1501		1502			719	1497		1385	1384	1386	1387		1498	

Note: 1959 observation: 4 PhD, 3 MSc, and 28 BSc (source 287)

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

Institute: Cedara Agricultural Development Institute (Natal region)																	
	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																	
PhD	3.6	3.9	4.1	4.4	4.7	5.0	5.3	5.6	5.9	6.1	6.4	6.7	7	7.4	7.8	8.2	8.6
MSc	5.4	6.6	7.9	9.1	10.3	11.5	12.7	13.9	15.1	16.4	17.6	18.8	20	20.2	20.4	20.6	20.8
BSc	22.3	21.9	21.6	21.2	20.9	21.6	20.1	19.8	19.4	19.1	18.7	18.4	18	16.4	14.8	13.2	11.6
Total	31.3	32.4	33.6	34.7	35.9	37.0	38.1	39.3	40.4	41.6	42.7	43.9	45	44.0	43.0	42.0	41.0
Source												1455					
Nationals	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
PhD	9	9.0	9	9.0	2	2.3	2.7	3	4	5.0	6	8	9	8	7.0	6	
MSc	21	19.5	18	18.0	15	13.7	12.3	11	10	9.0	8	7	7	12	11.5	11	
BSc	10	11.0	12	12.0	9	10.3	11.7	13	9	8.5	8	5	5	1	1.0	1	
Total	40	39.5	39	39.0	26	26.3	26.7	27	23	22.5	22	20	21	21	19.5	18	
Source	1500		1501		1502			719	1497		1385	1384	1386	1387		1498	

Note: The drop in regional staff in 1982 is caused by the establishment of the Grain Crops Institute which took over a substantial number of regional researchers. Staff of the Faculty of Agriculture of the University of Natal have not been included in the above research personnel statistics except for regional research staff attached to the university. 1959 observation: 3 PhD, 3 MSc, and 23 BSc (excluding Faculty of Agriculture, UN) (source 287)

Institute: Transvaal Region Agricultural Development Institute																	
	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																	
PhD	7.6	7.4	7.1	6.9	6.7	6.5	6.3	6.1	5.9	5.6	5.4	5.2	5	4.8	4.6	4.4	4.2
MSc	3.3	4.4	5.6	6.7	7.9	9.0	10.1	11.3	12.4	13.6	14.7	15.9	17	16.2	15.4	14.6	13.8
BSc	12.6	13.4	14.1	14.9	15.7	16.5	17.3	18.1	18.9	19.6	20.4	21.2	22	21.8	21.6	21.4	21.2
Total	23.4	25.1	26.9	28.6	30.3	32.0	33.7	35.4	37.1	38.9	40.6	42.3	44	42.8	41.6	40.4	39.2
Source													1455				
Nationals	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
PhD	4	4.0	4	4.0	4	3.7	3.3	3	2	3.0	4	4	5	3	2.5	2	
MSc	13	13.5	14	14.0	11	9.3	7.7	6	6	5.0	4	5	7	10	9.0	8	
BSc	21	22.5	24	24.0	17	15.7	14.3	13	15	14.0	13	15	17	16	14.5	13	
Total	38	40.0	42	42.0	32	28.7	25.3	22	23	22.0	21	24	29	29	26.0	23	
Source	1500		1501		1502			719	1497		1385	1384	1386	1387		1498	

Note: The drop in research staff in 1982 is due to the establishment of the Grain Crops Institute which took over a substantial number of regional researchers.

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

Institute: Eisenburg Agricultural Development Institute (Winter Rainfall region)																	
	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																	
PhD	18.0	17.0	16.0	15.0	14.0	13.0	12.0	11.0	10.0	9.0	8.0	7.0	6	5.6	5.2	4.8	4.4
MSc	27.4	27.1	26.9	26.6	26.3	26.0	25.7	25.4	25.1	24.9	24.6	24.3	24	24.0	24.0	24.0	24.0
BSc	25.7	25.1	24.4	23.8	23.1	22.5	21.9	21.2	20.6	19.9	19.3	18.6	18	16.8	15.6	14.4	13.2
Total	71.1	69.2	67.3	65.4	63.4	61.5	59.6	57.6	55.7	53.8	51.9	49.9	48	46.4	44.8	43.2	41.6
Source												1455					
Nationals	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
PhD	4	2.5	1	1.0	2	1.7	1.3	1	1	2.0	3	3	4	4	4.5	5	
MSc	24	22.5	21	21.0	11	11.7	12.3	13	17	15.5	14	12	16	14	16.0	18	
BSc	12	14.0	16	16.0	14	15.0	16.0	17	12	12.0	12	12	11	12	10.0	8	
Total	40	39.0	38	38.0	27	28.3	29.7	31	30	29.5	29	27	31	30	30.5	31	
Source	1500		1501		1502		719		1497		1385	1384	1386	1387		1498	

Note: With the establishment of the Grain Crops institute in 1982, a substantial number of "regional" researchers were taken over by this institute, hence the substantial decline in regional research staff in 1982. 1959 observation: 20 PhD, 28 MSc, and 27 BSc (source 287)

Institute: Sea Fisheries Research Institute (SFR)/S																	
	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																	
PhD	2																
MSc	5																
BSc	11																
Total	18	18.6	19.2	19.8	20.4	21	25	24	29	31.9	32.5	35.5	36.3	37.0	39.6	41.0	43.7
Source	1511					1511	1511	1511	1511								
Nationals	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
PhD																	
MSc																	
BSc																	
Total	44.5	44.6	45.4	49.6	53.3	55.6	56.5	56	61	58.5	56	53.5	51	53.5	56		
Source								1509	1509		999		999		999		

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

Institute: South African Forestry Research Institute (SAFRI) (previously the Forestry Research Division of the Directorate of Forestry)																	
	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																	
PhD																	
MSc																	
BSc																	
Total	17.6	18.9	20.2	21.5	22.8	24.1	25.4	26.7	28.0	29.3	30.7	32.0	33.3	34.6	35.9	37.2	38.5
Source																	
Nationals																	
PhD																	
MSc																	
BSc																	
Total	40	45	43	43	45	46	51	52	55	55	56	55	—	—	—	—	—
Source	999	999	999	999	27	999	999	999	999	999	999	999	—	—	—	—	—

Note: Taken over by the Division of Forestry Science and Technology of CSIR in 1990.
1959 observation: 1 PhD, 3 MSc, and 11 BSc

Institute: National Timber Research Institute (NTRI), CSIR																	
	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																	
PhD																	
MSc																	
BSc																	
Total	—	—	—	—	—	6.9	7.9	8.0	9.9	12.5	16.4	16.1	15.1	15.3	21.7	22.3	20.8
Source																	
Nationals																	
PhD																	
MSc																	
BSc																	
Total	19.7	18.3	21.7	27.0	30	31.0	32	34	34.0	34.0	34.0	34.0	—	—	—	—	—
Source					27		976	744									

Note: Taken over by the Division of Forestry Science and Technology of CSIR in 1990.

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

Institute: Division of Forestry, Science and Technology, CSIR

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																	
PhD																	
MSc																	
BSc																	
Total																	
Source																	
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Nationals																	
PhD																	
MSc																	
BSc																	
Total												92.6		93	115	115.0	
Source														1446	1396		

Institute: South African Sugar Association Experiment Station

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																	
PhD		3				7			5				5				5
MSc		3				8			7				5				8
BSc		10				9			10				8				12
Total	14.0	16	18.0	20.0	22.0	24	23.3	22.7	22	21.0	20.0	19.0	18	19.8	21.5	23.2	25
Source		1447				1447			1447				1447				1447
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Nationals																	
PhD				9			7		6	7	7	7	8	7.0	6		
MSc				8			5		4	5	6	6	6	7.0	8		
BSc				21			21		19	19	17	14	15	17.0	19		
Total	28.2	31.5	34.8	38	36.3	34.7	33	31.0	29	31	30	27	29	31.0	33		
Source				1447		1447			1447	1447	1447	1447	1447	999	1396		

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

Institute: Institute for Commercial Forestry Research (ICFR), University of Natal (previously the Wattle Research Institute)		1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																		
PhD		3.7	3.3	3	3	3.0	3	1	2.0	3	3	4	3.5	3	2	2	1.7	1.3
MSc		3.0	3	3	3	3.0	3	5	3.5	2	4	3	3.0	3	3	4	4.0	4.0
BSc		1.7	1.3	1	2	2.0	2	2	4.0	6	3	3	2.0	1	1	2	2.7	3.3
Total		8.3	7.7	7	8	8.0	8	8	9.5	11	10	10	8.5	7	6	8	8.3	8.7
Source				1451	1454	1451	1000	1000	1000	1000	1454	1000	1467	1454	1000	1000		
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1994
Nationals																		
PhD		1	1.0	1.0	1		2	3		4	3.5	3	4.0	5		5	5	5
MSc		4	4.7	5.3	6		8	6		5	4.5	4	6.0	8		5	5	7
BSc		4	4.3	4.7	5		5	4		10	9.5	9	9.5	10		6	6	4
Total		9	10.0	11.0	12	11	13.0	13	14	19	17.5	16	19.5	23	24	16	16	16
Source		1454		1454	27		1454	1467	1012	1467	1467	1467	1467	1467	1246	1467	1467	1467

1960 observation: 4 PhD, 3 MSc, and 2 BSc (source 1454)

Institute: School of Agriculture, University of Bophuthatswana (UB/SA)		1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																		
PhD																		
MSc																		
BSc																		
Total																		
FTE Research																		
Source																		
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1994
Nationals																		
PhD								4	3	3.0	3	3	2	4	6.0	8		
MSc								6	10	7.5	5	5	5	6	6.0	6		
BSc								11	9	8.0	7	4	3	7	7.5	8		
Total			10.0	12.2	14.4	16.6	18.8	21	22	18.5	15	12	10	17	19.5	22		
FTE Research			1.0	1.2	1.4	1.7	1.9	2.1	2.2	1.8	1.5	1.2	1.0	1.7	2.0	2.2		
Source								719	1497		1385	1384	1386	1387		1498		

Note: It is assumed that 10% of faculty time is spent on research.

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

Institute: Faculty of Agriculture, University of Fort Hare (UFH/FA) (includes the Agricultural and Rural Development Institute)

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																	
PhD																	
MSc																	
BSc																	
Total										10.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0
FTE Research										1.0	1.0	1.1	1.2	1.3	1.4	1.5	1.6
Source																	
Nationals	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
PhD	9	9.0	9	8.0	7	8.3	9.7	11	11	10.0	9	9	8	10	13	11	
MSc	7	7.5	8	8.5	9	10.0	11.0	12	11	11.5	12	11	13	11	13	17	
BSc	1	2.0	3	6.5	10	8.3	6.7	5	8	9.0	10	11	9	10	7	9	
Total	17	18.5	20	23.0	26	26.7	27.3	28	30	30.5	31	31	30	31	33	37	
FTE Research	1.7	1.8	2.0	2.3	2.6	2.7	2.7	2.8	3.0	3.1	3.1	3.1	3.0	3.1	3.3	3.7	
Source	1500		1501		1502			719	1497		1385	1384	1386	1387	1465	1498	

Note: It is assumed that 10% of faculty time is spent on research.

Institute: Faculty of Agriculture, University of the North (UNO/FA)

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																	
PhD																	
MSc																	
BSc																	
Total										10.0	10.2	10.4	10.6	10.9	11.1	11.3	11.5
FTE Research										1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.2
Source																	
Nationals	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
PhD								4	5	4.0	3	4	3	3	3.0	3	3
MSc								3	2	3.0	4	3	4	3	4.5	6	6
BSc								8	6	6.0	6	7	6	5	5.0	5	5
Total	11.7	11.9	12.1	12.4	12.6	12.8	13	15	13	13.0	13	14	13	11	12.5	14	14
FTE Research	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.5	1.3	1.3	1.3	1.4	1.3	1.1	1.2	1.4	1.4
Source							888	719	1497		1385	1384	1386	1387	1465	1497	999

Note: It is assumed that 10% of faculty time is spent on research.

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

Institute: Faculty of Agriculture, University of Natal (UN/FA)		1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals												34	34					
PhD	13.8	15.6	17.5	19.4	21.2	23.1	25.5	26.5	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	26.0	23
MSc	8.2	8.4	8.5	8.6	8.8	8.9	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	8.5	7
BSc	9.5	9.8	10.0	10.2	10.5	10.8	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	10.5	7
Total	31.5	33.8	36.0	38.2	40.5	42.8	44.0	44.0	44.0	43	44.0	45	44.5	44	49	47	42.0	37
FTE Research	11.3	12.2	13.0	13.8	14.6	15.4	15.8	15.8	15.8	15.5	15.8	16.2	16.0	15.8	17.6	16.9	15.1	13.3
Source							1000	1000	1000	1000	1000	1000	1000	1455	1000	1000		1000
Nationals																		
PhD	24	26.5	29	31.0	33	34.0	35.0	35.0	36	38	38.0	38	31	29	32	38.5	45	
MSc	10	11.5	13	12.0	11	10.0	9.0	8	8	13	13.0	13	12	15	14	15.5	17	
BSc	9	9.5	10	9.0	8	8.0	8.0	8	8	12	13.0	14	9	11	8	9.0	10	
Total	43	47.5	52	52.0	52	52.0	52.0	52	52	63	64.0	65	52	55	54	63.0	72	
FTE Research	15.5	17.1	18.7	18.7	18.7	18.7	18.7	18.7	18.7	22.7	23.0	23.4	18.7	19.8	19.4	22.7	25.9	
Source	1500		1501		1502				719	1497		1385	1384	1386	1387		1498	

Note: It is assumed that 36% of faculty time is spent on research.

Institute: Faculty of Agriculture, University of the Orange Free State (UOFS/FA)		1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																		
PhD									16	17	19.5	22	20.0	18	20	12	12.5	13
MSc									10	14	14.0	14	12.5	11	12	9	9.5	10
BSc									3	3	3.5	4	4.0	4	5	3	4.5	6
Total	31	23	28	29	29	29	29	29	29	34	37.0	40	36.5	33	37	24	26.5	29
FTE Research	9.3	6.9	8.4	8.7	8.7	8.7	8.7	8.7	8.7	10.2	11.1	12.0	11.0	9.9	11.1	7.2	8.0	8.7
Source	1395	1395	1395	1395	1395	1395	1395	1395	1000	1000	1000	1000	1455	1000	1000	1000		1000
Nationals																		
PhD	17	14	20	21.5	23	25.3	27.7	30	30	34	32.0	30	30	28	27	28.5	30	
MSc	12	13	11	11.0	11	10.3	9.7	9	9	6	8.0	10	12	15	15	15.5	16	
BSc	5	5	9	10.0	11	10.3	9.7	9	9	6	8.5	11	13	12	8	7.0	6	
Total	34	32	40	42.5	45	46.0	47.0	48	48	46	48.5	51	55	55	50	51.0	52	
FTE Research	10.2	9.6	12.0	12.8	13.5	13.8	14.1	14.4	14.4	13.8	14.6	15.3	16.5	16.5	15.0	15.3	15.6	
Source	1500	1000	1501		1502				719	1497		1385	1384	1386	1387		1498	

Note: It is assumed that 30% of faculty time is spent on research.

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

Institute: Faculty of Agriculture, University of Pretoria (UP/FAS)		1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																		
PhD	18	19.0	20	21.0	22.0	23	23	22	26.0	30	28.0	26	22.5	19	18.5	18	24	23
MSc	11	11.5	12	13.7	15.3	17	17	10	12.5	15	16.0	17	14.5	12	11.5	11	11	12
BSc	10	10.5	11	9.3	7.7	6	6	9	6.0	3	3.0	3	3.5	4	2.0	0	4	4
Total	39	41.0	43	44.0	45.0	46	46	41	44.5	48	47.0	46	40.5	35	32.0	29	39	39
FTE Research	12.1	12.7	13.3	13.6	14.0	14.3	14.3	12.7	13.8	14.9	14.6	14.3	12.6	10.8	9.9	9.0	12.1	12.1
Source	1452		1452			1452		1000		1452		1000		1452		1000	1452	1000
Nationals																		
PhD	22	24	22	23.5	25	31	31	31.0	31	33	35.5	38	44	43	48	47.5	47	
MSc	10	10	12	13.0	14	12	13.5	15	15	21	22.0	23	20	18	15	12.0	9	
BSc	7	7	7	9.5	12	10	10.5	10.5	11	5	4.0	3	4	5	3	3.0	3	
Total	39	41	41	46.0	51	53	55.0	57	57	59	67.5	64	68	66	66	62.5	59	
FTE Research	12.1	12.7	12.7	14.3	15.8	16.4	17.0	17.0	17.7	18.3	19.1	19.8	21.1	20.5	20.5	19.4	18.3	
Source	1500	1000	1501	1452	1502	1452			719	1497		1385	1384	1386	1387		999/1498	

Note: It is assumed that 31% of faculty time is spent on research.

Institute: Faculty of Veterinary Science, University of Pretoria (UP/FVS)		1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																		
PhD	12	11.8	11.7	11.5	11.3	11.2	11.2	11	12.5	14	11.0	8	10.0	12	11.5	11	12.0	13
MSc	0	0.2	0.3	0.5	0.7	0.8	0.8	1	1.5	2	3.0	4	4.0	4	4.0	4	3.5	3
BSc	18	19.3	20.7	22.0	23.3	24.7	24.7	26	25.0	24	26.5	29	22.0	15	18.0	21	26.5	32
Total	30	31.3	32.7	34.0	35.3	36.7	36.7	38	39.0	40	40.5	41	36.0	31	33.5	36	42.0	48
FTE Research	9.3	9.7	10.1	10.5	11.0	11.4	11.4	11.8	12.1	12.4	12.6	12.7	11.2	9.6	10.4	11.2	13.0	14.9
Source	1452							1000		1452		1000		1452		1000		1000
Nationals																		
PhD	16	18	14	17.5	21	19	19	18.0	17	17	18.0	19	19	15	15	26.0	37	
MSc	8	9	11	12.5	14	16	16	15.5	15	20	22.5	25	24	24	30	21.5	13	
BSc	35	31	24	26.5	29	27	29.5	29.5	32	32	31.0	30	21	21	29	28.0	27	
Total	59	58	49	56.5	64	62	63.0	63.0	64	69	71.5	74	64	60	74	75.5	77	
FTE Research	18.3	18.0	15.2	17.5	19.8	19.2	19.5	19.5	19.8	21.4	22.2	22.9	19.8	18.6	22.9	23.4	23.9	
Source	1000	1452	1501	1502	1502	1452			719	1497		1385	1384	1386	1387		999/1498	

Note: It is assumed that 31% of faculty time is spent on research.

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

Institute: Faculty of Agricultural Sciences, University of Stellenbosch (US/FA)		1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																		
PhD	13.8	16.1	18.5	20.9	23.2	25.6	28	29.5	31	30.5	30	30.5	30.5	31	33.0	35	38.0	41
MSC	6.5	8.8	11.0	13.2	15.5	17.8	20	18.5	17	18.0	19	17.5	17.5	16	15.0	14	12.0	10
BSc	1.0	0.8	1.0	1.2	1.5	1.8	2	1.5	1	3.5	6	5.5	5.5	5	7.0	9	8.0	7
Total	20.8	25.6	30.5	35.4	40.2	45.1	50	49.5	49	52.0	55	53.5	53.5	52	55.0	58	58.0	58
FTE Research	8.3	10.2	12.2	14.2	16.1	18.0	20.0	19.8	19.6	20.8	22.0	21.4	21.4	20.8	22.0	23.2	23.2	23.2
Source							1000		1000			1000		1000		1000		1000
Nationals	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1989	1990	1991	1992	1993	1994
PhD	39	40	37	34.5	32	33.3	34.7	36	37	39.0	41	40	40	42	41	44.5	48	
MSC	11	13	13	14.5	16	15.0	14.0	13	13	12.0	11	13	13	15	15	17.0	19	
BSc	4	5	4	4.0	4	4.0	4.0	4	4	3.5	3	3	3	2	2	1.0	0	
Total	54	58	54	53.0	52	52.3	52.7	53	54	54.5	55	56	56	59	58	62.5	67	
FTE Research	21.6	23.2	21.6	21.2	20.8	20.9	21.1	21.2	21.6	21.8	22.0	22.4	22.4	23.6	23.2	25.0	26.8	
Source	1500	1000	1501		1502			719	1497		1385	1384	1384	1386	1387		1498	

Note: It is assumed that 40% of faculty time is spent on research.

Institute: Faculty of Forestry, University of Stellenbosch (US/FFOR)		1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																		
PhD	3.8	4.1	4.5	4.9	5.2	5.6	6	6.5	7	6.5	7	8.0	8.0	7	7.5	8	7.5	7
MSC	1.8	1.6	1.5	1.4	1.2	1.1	1	1.1	1	1.5	1	1.5	1.5	2	2.5	3	3.0	3
BSc	0.5	0.8	1.0	1.2	1.5	1.8	2	1.8	2	1.0	0	0.0	0.0	0	0.0	0	0.0	0
Total	6.0	6.5	7.0	7.5	8.0	8.5	9	9.0	9	9.0	10	9.5	9.5	9	10.0	11	10.5	10
FTE Research	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.6	3.6	3.6	4.0	3.8	3.8	3.6	4.0	4.4	4.2	4.0
Source							1000		1000			1000		1000		1000		1000
Nationals	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1989	1990	1991	1992	1993	1994
PhD	7.0	7														16		
MSC	2.5	2														6		
BSc	1.0	2														6		
Total	10.5	11	12.8	14.6	16.4	18.2	20	21.0	22.0	23.0	24.0	24.0	25.0	26.0	27.0	28	28	
FTE Research	4.2	4.4	5.1	5.8	6.6	7.3	8.0	8.4	8.8	9.2	9.6	10.0	10.0	10.4	10.8	11.2	11.2	
Source		1000					976		8.8							1466		

Note: It is assumed that 40% of faculty time is spent on research.

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

Faculty of Veterinary Science, Medical University of South Africa (MUSA/FVS)		1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Nationals																		
PhD																		
MSc																		
BSc																		
Total																		10.0
FTE Research																		1.0
Source																		
Nationals		1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
PhD									6	7	7.0	7	5	6	7	5.5	4	
MSc									8	9	10.0	11	12	16	14	13.5	13	
BSc									10	18	18.0	18	18	17	23	26.0	29	
Total	11.8	13.5	15.2	17.0	18.8	22.2	20.5	22.2	24	34	35.0	36	35	39	44	45.0	46	
FTE Researchers	1.2	1.4	1.5	1.7	1.9	2.2	2.1	2.2	2.4	3.4	3.5	3.6	3.5	3.9	4.4	4.5	4.6	
Source									719	1497		1385	1384	1386	1387		999/1498	

Note: It is assumed that 10% of faculty time is spent on research.

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