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AGRICULTURAL RESEARCH RESOURCE ASSESSMENT  
IN THE SADCC COUNTRIES

VOLUME II  
COUNTRY REPORT: TANZANIA

Submitted by

Mrs. V. F. Malima  
National Coordinator  
Acting Director of Research  
Ministry of Agriculture and Livestock Development

Dr. Francis M. Shao  
Country Researcher  
Director of Research  
Ilonga Agricultural Research Station  
Ministry of Agriculture and Livestock Development  
United Republic of Tanzania

Dr. Franco Turchi  
Senior Research Specialist for Tanzania  
Istituto Agronomico per L'Oltremare  
Ministry of Foreign Affairs of Italy

and

Dr. Domenico Sorrenti  
Senior Research Specialist for Tanzania  
Ministry of Agriculture of Italy

SOUTHERN AFRICAN  
DEVELOPMENT COORDINATION CONFERENCE  
Consultative Technical Committee  
for Agricultural Research

Private Bag 0033  
Gaborone, Botswana  
Telephone: 52318  
Cable: RESAGRIC

DIPARTIMENTO COOPERAZIONE  
ALLO SVILUPPO

Ministero Affari Esteri  
Italia

DEVRES, INC.

2426 Ontario Road, N.W.  
Washington, D.C. 20009  
Telephone: (202) 797-9610  
Cable: DEVRES  
Telex: 440184

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PREFACE

AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

IN THE SADCC COUNTRIES

This document has been prepared by DEVRES, Inc. in cooperation with the Consultative Technical Committee for Agricultural Research (CTCAR) of the Southern African Development Coordination Conference (SADCC) in accordance with the terms of a contract with the US Agency for International Development.

The national agricultural research resource assessments which provide the necessary background information for this document were conducted by national agricultural research scientists from SADCC countries<sup>1</sup> under the guidance of DEVRES in consultation with the CTCAR. Financial support was provided by the US Agency for International Development (under Contract No. AFR-0435-C-00-2084-00 and Project No. 698-0435 entitled Strengthening African Agricultural Research) on behalf of the member countries of the Cooperation for Development in Africa (CDA).

Discussions concerning this country report were held with the country report authors, responsible officials in the ministries of agriculture, rural development and plan, as well as specialists from international organisations, bilateral donors, and universities. On two occasions, drafts of this final report were examined by SADCC's Consultative Technical Committee for Agricultural Research (CTCAR). Suggestions by its members were incorporated into the report.

The results of the assessment are contained in the following reports:

Volume I - Regional Analysis, Strategy, Programmes and Summaries of Country Reports

Volume II - Country Reports:<sup>2</sup>

Botswana  
Lesotho  
Malawi  
Mozambique<sup>3</sup>  
Swaziland  
Tanzania<sup>3</sup>  
Zambia  
Zimbabwe

These reports are available in English and in microfiche or printed form at a cost determined by document size at the address below. The Regional Analysis and Strategy and the Mozambique country report are also available in Portuguese in the same forms.

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<sup>1</sup>SADCC member countries are Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia and Zimbabwe. Angola, however, did not participate in this study.

<sup>2</sup>Each country is printed separately.

<sup>3</sup>Italy provided technical advisors for the preparation of the Tanzania national report and France provided an advisor to help in the preparation of the Mozambique country report.

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### The Tanzania ARRA Team

Mrs. V. Malima	National Coordinator
Dr. F. Shao	Country Researcher
Dr. F. Turchi	Senior Research Specialist
Dr. D. Sorrenti	Senior Research Specialist
Miss C. Kuwite	Research Assistant

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## LIST OF ACRONYMS AND ABBREVIATIONS

AID	Agency for International Development (United States)
ARI	Agricultural Research Institute
ARRA	Agricultural Research Resource Assessment
BOT	Bank of Tanzania
BRALUP	Bureau of Resources Assessment and Land Use Planning
BSc	Bachelor of Science degree
CATA	Cashewnut Authority of Tanzania
CCM	Chama Cha Mapinduzi
CDA	Cooperation for Development in Africa
CIAT	International Centre for Tropical Agriculture
CIDA	Canadian International Development Agency
CIMMYT	International Centre for Maize and Wheat Improvement
CIP	International Potato Centre
CMEWP	Crop Monitoring and Early Warning Project
CTCAR	Consultative Technical Committee for Agricultural Research
DADO	District Agricultural Development Officer
DANIDA	Danish International Development Agency
DAPUS	Directorate of Animal Production and Veterinary Services
DAR	Directorate of Agricultural Research
DART	Directorate of Agricultural Research and Training
DEF	Directorate of Extension for Fisheries
DETS	Directorate of Extension and Technical Services
DLDO	District Livestock Development Officer
DMDA	Director of Manpower Development and Administration
DPRK	Democratic People s Republic of Korea
DSc	Doctor of Science degree
ECCA	Eastern Cotton Growing Area
EEC	European Economic Community
FAO	Food and Agriculture Organization of the United Nations
FRG	Federal Republic of Germany
FTC	Farmer Training Centre
FTE	Full Time Equivalent
GAPEX	General Agricultural Products Export Corporation
GDP	Gross Domestic Product
GOT	Government of Tanzania
HORTI	Horticultural Research Training Institute
IAEA	International Atomic Energy Agency
IARC	International Agricultural Research Centre
IBRD	International Bank for Reconstruction and Development (World Bank)
ICIPE	International Centre for Insect Physiology and Ecology

ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IDRC	International Development Research Centre (Canada)
IFS	International Fund for Science (Sweden)
IITA	International Institute for Tropical Agriculture
ILCA	International Livestock Centre for Africa
ILO	International Labour Organisation (United Nations)
ILRAD	International Laboratory for Research on Animal Diseases
IRRI	International Rice Research Institute
ISNAR	International Service for National Agricultural Research
LITI	Livestock Training Institute
LRC	Livestock Research Centre
MATI	Ministry of Agriculture Training Institute
MDB	Marketing Development Bureau
MEP	Ministry of Economic Planning
MLNRT	Ministry of Lands, National Resources and Tourism
MOALD	Ministry of Agriculture and Livestock Development
MOE	Ministry of Education
MSc	Master of Science degree
NAFCO	National Agricultural and Food Corporation
NBC	National Bank of Commerce
NCDP	National Coconut Development Programme
NFPC	Nyanza Fishing and Processing Company
NMC	National Milling Corporation
NORAD	Norwegian Agency for International Development
NORDIC	Norway, Denmark, Iceland, Finland, Sweden Project
OAU	Organization of African Unity
ODA	Overseas Development Agency (United Kingdom)
PhD	Doctor of Philosophy degree
PMO	Prime Minister's Office
PPMB	Project Preparation and Monitoring Bureau
PQLI	Physical Quality of Life Index
RADO	Regional Agricultural Development Officer
RFO	Regional Fisheries Officer or Regional Forestry Officer
RIDEP	Rural Integrated Development Programme
RLDO	Regional Livestock Development Officer
SACCAR	Southern African Centre for Cooperation in Agricultural Research
SADCC	Southern African Development Coordination Conference
SAREC	Swedish Agency for Research Cooperation with Developing Countries
SIDA	Swedish International Development Agency
SUDECO	Sugar Development Corporation

TAFICO	Tanzania Fisheries Corporation
TAFIRI	Tanzania Fisheries Research Institute
TAFORI	Tanzania Forestry Research Institute
TALIRO	Tanzania Livestock Research Organization
TANSEED	Tanzania Seed Company
TARO	Tanzania Agricultural Research Organization
TAT	Tobacco Authority of Tanzania
TCA	Tanzania Coffee Authority
TDRI	Tropical Development Research Institute
TFNC	Tanzania Food and Nutrition Centre
TIB	Tanzania Investment Bank
TLS	Tanzania Library Services
TNSRC	Tanzania National Scientific Research Council
TPB	Tanzania Pyrethrum Board
TPRI	Tropical Pesticides Research Institute
TRDB	Tanzania Rural Development Bank
TSA	Tanzania Sisal Authority
T.Sh.	Tanzania Shilling
TTA	Tanzania Tea Authority
UAC	Uyole Agricultural Centre
UDSM	University of Dar es Salaam
UK	United Kingdom
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations International Children's Emergency Fund
UNIDO	United Nations Industrial Development Organisation
US	United States
USAID	United States Agency for International Development
VFS	Village Forestry Section
VIC	Veterinary Investigation Centre
WCGA	Western Cotton Growing Area
WHO	World Health Organisation
WFP	World Food Programme

## CURRENCY EQUIVALENTS

(December 31, 1983)

Currency unit	=	Tanzania shilling (T.sh.)
US\$ 1.00	=	T.sh. 12.5
T.sh. 1	=	US\$ 0.08
T.sh. 1	=	100 cents

## WEIGHTS AND MEASURES

1 hectare (ha)	=	10,000 m <sup>2</sup>
	=	2.471 acres
100 hectares (ha)	=	1 km <sup>2</sup>
1 acre	=	0.405 ha
1 kilogram (kg)	=	2.204 pounds
1 metric ton (MT)	=	1,000 kg
		2,204 pounds
1 square kilometer (km <sup>2</sup> )	=	100 ha
1 kilometer (km)	=	0.621 miles
1 mile	=	1.609 km
1 liter	=	1.066 quarts
1 quart	=	0.9464 liters

GOVERNMENT OF TANZANIA FISCAL YEAR

July 1 to June 30

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## EXECUTIVE SUMMARY

### A. Background

#### 1. Country description and economic overview

Tanzania, with an area of 939,701 km<sup>2</sup>, is situated just south of the equator. Most of the country except for the coastal region lies between the altitudes of 1,000 and 1,500 m. Tanzania is rich in surface waters which are potentially valuable for both agriculture and energy development. Soils vary from the rich, productive volcanic slopes to the good soils of the river valleys to the moderately productive soils that characterise the majority of the land area. Tanzania has a tropical, semiarid climate mitigated by altitude variations which influence rainfall and temperature. In general, rainfall varies between 250 and 1,500 mm in different parts of the country and is highly erratic in timing and amount.

There are 21 million people in Tanzania, which has a population growth rate of 3.2 percent per year. The population density is highest in the coastal region. About 80 percent of the people live in rural areas and most are employed in agriculture. More than half (52 percent) of Tanzania's GDP derives from agriculture.

Per capita GDP in Tanzania is US\$ 230, reflecting a decline since 1978 as economic conditions have worsened. This is due largely to a sharp decline in the balance of payments, as a result of decreased production of exportable crops such as cotton, sisal, tobacco and cashew nuts because of low prices, and of the lack of foreign exchange to buy basic inputs. Tanzania received US\$ 143.56 million in development assistance in 1981-82, of which 55 percent was in the form of grants. Food aid received in 1983-84 included maize, rice and wheat.

Agriculture is a top priority in Tanzanian development policies, and maximum emphasis is given to development of cooperative and communal lands. The marketing system is government-regulated; there are fixed prices for agricultural output and inputs which are purchased and distributed through parastatal organisations. A parallel market has arisen where prices are often significantly higher than official ones.

#### 2. Agriculture in Tanzania

Only 9 percent of the total arable land of 48.7 million ha is currently under cultivation. Traditional agricultural production by individual households based on rotational bush fallow predominates, although some areas are cultivated more intensively. All land is publicly-owned; use rights are assigned on the basis of customary or communal land tenure, leasehold or rights of occupancy.

The major cash crops grown are coffee, cotton, sisal, tobacco, tea, cashew nuts, pyrethrum and cloves. Coffee is the major export. Cotton used to be a major export crop, but now it is in decline as are the other cash crops. Maize is the most important staple food and is produced by more than 50 percent of the smallholders. Other important food crops are sorghum and millet, rice, legumes, cassava, wheat and sugarcane. Sorghum, millet and cassava are grown by smallholders in drought-prone areas. Wheat is produced mainly on commercial farms but the crop is in decline.

There are 12.9 million cattle in the country, most of which are owned by smallholders, but livestock are held for other than commercial purposes. The annual beef production of 180,000 T is inadequate to meet demand. Other livestock holdings include goats, sheep and poultry. The available fishing resources are exploited only to a limited extent.

There are five principal agricultural production systems. The first consists of peasant farmers with up to 10 ha, who engage in subsistence farming using family labour. Medium-scale commercial farmers with up to 100 ha and large-scale commercial farmers with over 100 ha make up the second and third, employing hired labour and purchased inputs; this group, however, is in decline as a result of the government's policies. The fourth system is comprised of private estates, which grow tea and sisal, and the fifth of public estates, which grow wheat, rice, sugar and sisal; both types of estates are largely mechanised.

Agricultural marketing is entirely the responsibility of parastatals that buy, process, distribute, import and export products and inputs, although a share of the food is sold locally outside the regulated structure. Input usage is limited by the foreign exchange crisis. Credit for small farmers is provided through the Tanzania Rural Development Bank, but widespread loan defaults have led to severe restrictions on credit. The National Bank of Commerce provides credit for crop financing.

## B. Agricultural Institutions

### 1. Research

Agricultural research in Tanzania is accomplished by one government research institution and six research parastatals funded by the government. These institutions employ 353 professionals (20 percent expatriates; 18 percent female) and had a budget of US\$ 12.9 million in 1983-84.

#### a. The Directorate of Agricultural Research

The Directorate of Agricultural Research (DAR) of the Ministry of Agriculture and Livestock Development (MOALD) coordinates research policy and the activities of the various

ministries and research organisations. There are three research stations associated with the DAR which focus on rice, horticulture and coconuts. The DAR's staff consists of 181 people including 51 professionals, of whom 29 are expatriates. There were 48 vacant professional positions in 1983-84 and no nationals in training. The Directorate's facilities include 935 ha of land, a few buildings, staff housing at the stations and one laboratory for coconut research. The rice and coconut research stations are under construction. The DAR's staff use the MOA library which has 30,000 books and receives ten periodicals. The 1983-84 operating budget was US\$ 2.64 million, of which 25 percent was spent on research programmes and the rest on wages and maintenance.

b. The Tanzania Agricultural Research Organisation

The Tanzania Agricultural Research Organisation (TARO) is a semi-autonomous institution established to conduct and coordinate all crop research in Tanzania. It does this both at its headquarters in Dar es Salaam and at 12 research stations. Its emphasis is on the major food and cash crops, with 19 research programmes in commodities, soils and farming systems each headed by a national coordinator. There are 1,934 people on the research staff, about half of all staff working on agricultural research in Tanzania. Of the 139 professionals, 46 are expatriates. There were 51 people in training in 1983-84. TARO has a five-year plan to train more professionals and technicians.

The land available at the stations varies, amounting to a total of 8,356 ha of which half is cultivated. Commercial production accounts for two-thirds of the cultivated land; the remaining third is used for experimental plots and seed multiplication. Facilities at most of the stations are good and include offices, laboratories, meeting rooms, staff houses and maintenance workshops. None of the stations has expensive equipment; only one has an Apple II computer. A documentation and publication section is being developed at headquarters to coordinate journal and book purchases for the stations' libraries, which currently hold 6,000 books. TARO also has access to other libraries within and outside the country. Its linkages with other research and extension agencies are through representation on coordinating committees and through informal cooperation with extension workers in establishing on-farm trials. In 1983-1984, TARO's operating budget was US\$ 3.6 million.

c. The Tanzania Livestock Research Organisation

The Tanzania Livestock Research Organisation (TALIRO) is a semi-autonomous institution that directs livestock research under its Director General who reports to the Minister of Agriculture and Livestock. TALIRO's headquarters are at Dar es Salaam; there are three research stations and additional substations. The focus is on applied livestock research to help develop Tanzania's livestock industry. Its programmes include livestock breeding, range and

pasture development, animal nutrition, vaccine production, and pest and disease control.

TALIRO is the second largest research institution in the country. Its 820 staff members include 60 professionals, of whom only one is an expatriate. There were only two vacancies at the professional level in 1983-84 and 15 professionals in training. TALIRO has a total of 10,043 ha of pasture land at all three stations. Office facilities are limited, but there are laboratories for toxicology, nutrition and Foot and Mouth Disease, as well as stores, workshops and livestock facilities. Its specialised equipment includes an atomic absorption spectrometer. The research staff have access to the MOA Library. Formal and informal linkages exist with other research and extension agencies, and TALIRO cooperates in the Sokoine Agricultural University's training of advanced degree students. The operating budget for 1983-84 was US\$ 2.7 million.

d. The Uyole Agricultural Centre

The Uyole Agricultural Centre (UAC) is a research and training institution focussed on the agricultural and livestock production problems of the southern highlands. Its headquarters are at Uyole, and there are eight subcentres with applied research programmes in crop and livestock production and in soils.

The staff of 357 includes 39 professionals, one of whom is an expatriate. Eleven people were in training in 1983-84; the UAC has a five-year plan to train more. The UAC has 4,095 ha of land in four different agro-ecological zones. About a fifth of the land is cultivated; a tenth of this is for experimental plots and the rest is for seed multiplication or commercial production. Two-fifths is pasture or rangeland. Facilities for offices, laboratories, greenhouses and workshops are adequate; the library at the main centre has 3,000 books and 40 periodical titles.

The UAC is the only research institution with an extension section and an extension specialist who cooperates with the regional extension services in organising meetings, demonstrations and on-farm trials. Linkages also exist with other institutions. In 1983-84 operating expenses were US\$ 2.3 million, of which one-third went into the research programmes. About 30 percent of revenues come from outside agencies; the rest was drawn from the government and the institution's own earnings.

e. The Tropical Pesticides Research Institute

The Tropical Pesticides Research Institute (TPRI) is a specialised organisation for pesticides research, with a main station at Arusha and two substations for mosquito and tsetse research. Its 14 research programmes include research on entomology, plant quarantine services and pesticide regulation. The TPRI's total research personnel number 296, of whom 32 are professionals. Eight

staff members are in training. Since field research is limited, the TPRI has only 23.5 ha of land, but it has modern research buildings, laboratories and greenhouses as well as specialised field and laboratory equipment. The library at the main station has 750 books and 100 periodical titles. The TPRI cooperates with the bird and pest control units and with other agencies both inside and outside the country. The 1983-84 operating budget was just under US\$ 1 million.

f. Other research institutes

The Tanzania Fisheries Research Institute (TAFIRI) has three freshwater research stations and one marine research station in Dar es Salaam. They all have programmes in stock assessment, statistics and biology; the marine station also does research in aquaculture. There are 12 professionals among the total staff of 136, and four professionals are in training. TAFIRI has 20 offices, a meeting room, a laboratory, shops, fish processing facilities, and libraries at all stations with a total of 1,000 books. It also has boats, cold rooms and vehicles. It collaborates with the fisheries extension staff, and with agricultural education institutions in training students. The 1983-84 operating budget amounted to US\$ 320,000.

The Tanzania Forest Research Institute (TAFORI) has its headquarters in Dar es Salaam and two stations for research in silviculture and utilisation. It has 13 programmes and a research staff of 20 professionals. TAFORI's land holdings are limited, as is its office space. Its equipment includes deep freezers for seed storage, timber testing equipment and vehicles. The libraries at the stations have 1,000 books. The operating budget for 1983-84 was US\$ 345,000.

TAFIRI and TAFORI are semi-autonomous research institutes in the Ministry of Lands, Natural Resources and Tourism (MLNRT).

2. Training

Technical agricultural and veterinary training are the responsibility of the Directorate of Training of the MOALD; technical training in fisheries and forestry are the responsibility of respective directorates in MLNRT; degree-level training is done at the Sokoine University of Agriculture which falls under the aegis of the Ministry of Education. These institutions employ 256 professional staff, about 25 percent of whom are expatriates and ten percent females.

a. The Directorate of Training

Technical training is provided through the Directorate's nine Ministry of Agriculture Training Institutes (MATIs) and five Livestock Training Institutes (LITIs). The MATIs offer certificate courses in general agriculture and specialised diploma

courses in a variety of fields; the LITIs offer certificates in veterinary and dairy science and diplomas in various fields of animal production. Both certificate and diploma courses last two years, but their admission requirements differ. Between 1980-82 the average numbers of certificate graduates were 392 in agriculture and 221 in livestock; diploma graduates averaged 333 in agriculture and 143 in livestock. The Directorate had 108 professionals of the total training staff of 1,076 and 36 vacant professional positions.

Land available for training at the Institutes amounts to 3.563 ha. There are ten office blocks, with conference rooms, meeting rooms, lecture rooms, teaching laboratories and student hostels. Other facilities include workshops, dairy units, and poultry and pig units. The Institutes have their own libraries, as well as access to the MOA Library. The MATI and TARO, and the LITI and TALIRO facilities often share the same locations which encourages cooperation between them. The Institutes give courses for the extension staff, and their students obtain practical experience by working with the extension units. The operating expenses amounted to US\$ 310,176 in 1983-84.

#### b. The Directorate of Fisheries

Diploma- and certificate-level training is provided by the Directorate's Training Section which has a main campus at Dar es Salaam and two other campuses. The certificate course is in general fisheries, and lasts two years. The diploma course lasts three years and offers specialisation in boat building, marine engineering, nautical science and fish processing. In 1980, 48 diplomas were awarded. The average number of graduates obtaining certificates in general fisheries between 1980 and 1982 was 55.

The fisheries training staff numbers 150 people with 22 professionals. Facilities include 29 offices, three assembly halls, eight classrooms, five laboratories, shops and workshops. There are also specialised facilities for fisheries such as cold rooms, a processing room and field equipment such as boats. The libraries have 3,000 books and five periodicals. The Directorate collaborates with TAFIRI on marine resources assessments, with the extension services for student practicals, and with other agencies. The operating budget for 1983-84 was US\$ 1.5 million, of which 64 percent was from NORAD.

#### c. The Directorate of Forestry

The Directorate gives training in forestry at two campuses (Olmotonyi and Moshi) and has its headquarters in Dar es Salaam. There are two diploma courses, one of which is for in-service training. Certificate-level courses are also offered, as well as short courses in subjects like logging, carpentry, and wood-based panels. The Olmotonyi campus graduated 90 certificate-holders and 19 diplomates in 1982. The Moshi campus has enrolled 64 students each year since 1980. The training staff consists of 46 people, including

17 professional Forestry Officers. There are two expatriates, one each in the professional and technical categories. Student practical training is conducted on 180 ha of forests. Other facilities consist of 13 offices, one conference room, seven classrooms, one laboratory, a shop and one library at Olmotonyi Institute that has 10,000 books and 100 periodicals. The Directorate collaborates with TAFORI and with the Village Forestry Extension Services. The operating budget for 1983-84 was US\$ 520,000, a third of which was contributed by SIDA.

d. The Sokoine University of Agriculture

The Sokoine University of Agriculture started as the Faculty of Agriculture in the University of Dar es Salaam to give degree-level training in agriculture. Divisions of Forestry and Veterinary Science were added later; in 1983-84 the Faculty was given the status of a university and renamed Sokoine University of Agriculture. Bachelor's degree courses lasting three years are offered in agriculture, forestry and veterinary science. Master's and doctoral degrees are offered in the same fields. In 1982, the University graduated one PhD, 12 master's and 105 bachelor's degree students.

The staff consists of 163 people, with 119 professionals including 37 expatriates. Thirty-nine professionals were in training; long-term plans exist for additional training for the staff at all levels. The University has 2,300 ha of land which are used for food grains production, horticulture, pasture, forests, and experimental plots. Buildings include offices, a conference room, classrooms, 14 laboratories, three greenhouses, workshops and hostels. There are also facilities for livestock and dairying, as well as a forest nursery and a crop museum. The library has 44,000 books and 1,000 periodicals. The University collaborates with research institutions and seed farms, and individual professors conduct joint research with scientists from other institutions. The operating budget in 1983-84 was US\$ 3.4 million, of which US\$ 3.2 million was allocated by the government and the rest contributed by donor agencies like IDRC, SAREC, and the Ford Foundation.

3. Extension

a. The Directorate of Extension and Technical Services

The Directorate of Extension and Technical Services (DETS) of MOALD has two divisions: Agricultural Extension Services and Agricultural Technical Services. The Extension Service introduces farmers to improved methods, particularly through the fertiliser and seed multiplication programmes. Technical Services focusses on plant and crop protection services through programmes that include pest control measures and produce inspection. There are 20 regional offices throughout the country, each headed by a Regional Agricultural Development officer.

The DETS' staff consists of 5,678 people, including 147 professionals of whom 28 are expatriates. Currently, 96 people are in training; there is a six-year training programme. Building facilities include administrative offices at headquarters and regional and district offices. The DETS also has some seed multiplication farms and nurseries, vehicles, equipment and access to the MOA Library. It publishes a monthly extension magazine. The DETS collaborates with TARO, TALIRO, UAC and TPRI to organise field days, on-farm demonstrations and farming systems research. It also exchanges extension information with other developing countries such as India and China. In 1983-84 the operating budget was US\$ 12.84 million.

b. Other extension institutions

Livestock extension is provided by the Directorate of Animal Production and Veterinary Services of MOALD through Development Officers at the regional and district levels, and by specialists in activities such as artificial insemination, meat hygiene, range management, dairy development and disease control.

The Directorate of Extension for Fisheries (DEF) provides traditional fishermen with information to help increase their catch. There are offices in each of the 20 regions with programmes in marine and freshwater fisheries, as well as one regional programme in small-scale fish farming. The extension staff numbers 1,415. The DEF has an established training programme, through which 58 people were trained in 1983-84. Facilities include offices at headquarters in Dar es Salaam and in the regions and districts, and libraries at the head office and in three regions. Publications include extension reports and monographs. The DEF has close linkages in Tanzania with TAFIRI and with the training institutions and externally with FAO, DANIDA and NORAD. The operating budget for the last financial year was US\$ 0.98 million.

The Directorate of Extension's Village Forestry Service (VFS) does extension at the village level by establishing forest nurseries, transporting planting materials and establishing forests in cooperation with the villagers through an agro-forestry programme. The extension staff numbers 927. Facilities include nurseries and offices in each of the regions, and visual aid equipment; however, VFS has no library. There is close collaboration with TAFORI in the establishment of seed nurseries, with TARO and TALIRO in agro-forestry and farming systems, and with Sokoine University. The operating budget last year was US\$ 3.6 million.

c. Constraints to Agricultural Production and Production Potential

1. Food crops

Maize is grown almost entirely by smallholders and is often intercropped with legumes, cassava and vegetables. Production and marketing are greatly affected by government policy which aims to keep

consumer prices low. This results in very unattractive prices for farmers who often sell in the unofficial market and compel the government to make up its shortfall through imports. Besides price policies, the other constraints to greater production are the lack of suitable drought- and streak-resistant varieties for low- and medium-altitude areas, large post-harvest losses from inadequate storage, lack of credit and poor input supply.

Current yields of sorghum and millet are 700 kg/ha. They could be as high as 3,000 to 3,500 kg/ha with the proper management and input usage. The main constraints to improved production are losses due to birds, lack of high-yield varieties that are also bird- and drought-resistant, and poor storage facilities. Most rice is grown by smallholders for consumption in urban areas. Small farm yields are 900 to 1,000 kg/ha; with the application of improved technological packages, however, yields could be as high as 4,000 kg/ha. The chief constraints to increased production are lack of high yielding varieties and irrigation and the unavailability of good seeds and fertilisers.

Legumes such as beans, cowpeas, and pigeon peas are grown by smallholders whose yields average 500 kg/ha. Demand for legumes, especially in urban areas, is high. There is great potential to increase productivity with improved research in breeding short-cycle and disease-resistant varieties and by identifying optimal intercropping patterns. Cassava is the most important root crop grown by smallholders; it is intercropped with cereals and legumes. Constraints to production include the lack of pest/disease-resistant and more palatable varieties.

## 2. Commercial crops

Coffee is grown mostly by smallholders whose average yields are 250 kg/ha. Recently, production and quality have declined, farmers being constrained by unattractive producer prices, poor extension services, inadequate disease and pest control, lack of machinery and spare parts on estates, poor management of the nationalised estates, and inadequate processing and marketing facilities. Cotton production is also in decline, due to the combination of low producer prices and better prices for food crops sold in the open market, poor rainfall, and the lack of innovative, labour-saving technological packages.

## 3. Livestock and livestock products

Despite having the largest livestock herds in Africa, Tanzania does not produce enough animal products to meet domestic demand. Both transhumance and sedentary cattle-raising are practiced by smallholders, but the distribution of the cattle population is uneven. Thus, some areas are overgrazed while others are underutilised or not utilised at all because of tsetse infestation. Another main constraint to increased beef and milk production is that cattle traditionally have not been held for producing income.

Similarly, little attention is paid to developing meat and milk products from goats, sheep and pigs. Although it is common for people to have poultry, and demand is high, there are constraints to increased poultry production such as poor cost/quality ratios of balanced feeds and shortages of day-old chicks of improved breeds. The communal land tenure system also acts as a constraint that operates to prevent individual farmers from adopting improved management practices. The lack of availability of consumer goods and agricultural inputs also may be factors reducing incentives for increased production.

#### D. Staff Assessment of Institutions

The main institutional constraints identified were shortages of recurrent budgets, foreign exchange difficulties, lack of training opportunities for staff, inadequacy of laboratory equipment, lack of transportation, staff dissatisfaction with housing facilities, and the lack of opportunities for just rewards and promotions. The training institution staff were particularly concerned with the lack of laboratories and equipment, transport, libraries and offices. Among extension staff the main concern is with inadequate transport facilities and the lack of recognition and appropriate rewards for work done in remote locations.

#### E. Conclusions and Recommendations

##### 1. Agricultural institutions

The strategies recommended to improve agricultural research institutions include the following:

- o Development of programmes, based on the major agro-ecological zones of the country, which are closely related to the technical and socioeconomic problems confronting farmers. For the agro-ecological zone approach to be successful, the number of research institutes should be reduced and efforts concentrated in a few well-equipped institutions. Improved coordination resulting from such unification is likely to attract increased international collaboration and support;
- o Increased budgetary allocations;
- o Improved linkages between research and extension, and better coordination at the international and national levels;
- o Establishment of a library and publications service, and initiation of a national agronomy journal; and
- o Establishment of a data base of agricultural research information at the central library and publication unit.

The training provided at Sokoine University is very good; however, its current capacity is insufficient to meet the need for more trained graduates, since only 100 students per year are admitted to its programmes. The MATIs and the LITIs which offer diploma- and certificate-level training have a larger capacity, but their standards are not as high, the chief constraints being shortage of funds, a lack of specialised facilities and poorly-qualified staff. It is recommended that efforts be concentrated in fewer, more efficient units.

The performance of agricultural extension services is very poor. The decentralisation policy introduced in 1972 resulted in disorganisation, misallocation of manpower, inadequate personnel training, lack of transportation and absence of effective linkages with research agencies. Following recentralisation in 1983, the focus should be on staff training and transportation improvements.

## 2. Agricultural productivity

Strategies proposed to reduce production constraints include the following:

- o Marketing and price policies: Low purchase prices paid to commercial crop producers should be adjusted to give them better returns. The Marketing Development Bureau recommendations should be given greater attention. The policy of consumer price subsidies on food should be reviewed. In order to prevent losses incurred by parastatals on the costs of transporting food commodities between regions, consumption should be encouraged in the areas where the goods are produced;
- o Processing and storage: Processing and storage facilities are needed in areas of agricultural production to reduce losses and lower transport costs for farmers;
- o Roads and transport: The development of an effective road network is vital, not only to agriculture for improved input and output marketing, but also for general development;
- o Land tenure: The lack of a clear land tenure system is a serious hindrance to land use planning and management. The emphasis should be on developing policies that will provide farmers with title deeds guaranteeing the use of the land for long periods;
- o Irrigation: Tanzania's large water resources offer a vast potential for development of irrigation systems, which would help improve agricultural production by making farmers less dependent upon the erratic rainfall;
- o Poultry industry: Poultry production in Tanzania is low, while demand and price are high, and development of the

industry offers a means to rapidly increase animal protein availability. Cooperatives could be established to centralise services for hatcheries and procure nucleus feed for small farmer poultry production development. Research could be focussed on developing better local breeds and improving the feed industry; and

- o Input allocation: Agriculture provides most of the hard currency that enters the country, but a very small share is returned to agriculture in the form of inputs. The result has been poor performance in the agricultural sector and lower-quality export production. It is important that export-oriented farms be allocated machinery, spare parts, chemicals and fuel in proportion to their sales and without discrimination between the public, private and cooperative sectors.

## I. INTRODUCTION

### A. Background

This Agricultural Research Resource Assessment (ARRA) was conducted from July 1983 through August 1984 in the following countries of the Southern African Development Coordination Conference (SADCC): Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia and Zimbabwe. The ARRA was initiated as a result of discussions between the SADCC Consultative Technical Committee for Agricultural Research (CTCAR) and representatives of the Cooperation for Development in Africa (CDA). The CDA is an informal association of donors including Belgium, Canada, France, Italy, West Germany, the United Kingdom and the United States.

The inventory and assessment were carried out within the framework of the high priority accorded by the CDA to developing and strengthening agricultural research capability in Africa. The United States, assisted by other CDA donors, was assigned the specific responsibility for coordinating the development of CDA-supported agricultural research programmes in the Southern African and Sahelian regions. The ARRA inventory reports were financed by the United States Agency for International Development (AID) for CDA, and were carried out with the full collaboration and support of SADCC through the CTCAR. DEVRES, Inc., a U.S. private consulting firm based in Washington, DC, was engaged by AID to implement the ARRA together with senior agricultural research personnel from the SADCC countries and to prepare a SADCC regional report. Two other CDA donor countries, Italy and France, also provided technical experts and other assistance for some of the SADCC countries' reports.

The CDA members recognise that the African nations have established Africa-wide and regional institutions, such as SADCC, and that the heads of African states have given unanimous support to the Organization of African Unity's Lagos Plan of Action which emphasises the development of a strong capability to increase agricultural productivity. The donors have, therefore, joined with the African countries and their regional organisations--SADCC in Southern Africa and the Institute du Sahel in the Sahel--to develop country-specific and regional analyses of existing resources and of the medium- to long-term needs and opportunities in agricultural research that will lead to increased agricultural productivity.

The World Bank, in its 1983 report entitled Sub-Saharan Africa: Progress Report on Development Prospects and Programs, reiterated its emphasis on the high priority which governments and donors should give to agricultural research. More specifically the report noted:

Even within the present state of technical knowledge, improved incentives and marketing arrangements would permit very large increases in agricultural output. However, for the longer term, increased output will depend on the development of effective technical packages, pest and disease control and developments in animal husbandry. . . In a situation of budgetary stringency and of immediate crisis, expenditure on research having a possible, but uncertain, payoff ten years or more in the future is frequently seen as dispensable. This danger is increased when research programmes are manifestly weak and unfocussed. It is, therefore, essential that these programmes be formulated and implemented in ways which will enable them to contribute more effectively to the process of development. . . 1

The ARRA reports, and the recommended research priorities, programmes, and projects within them, are set in a 20 to 25 year time-frame. This long-term perspective permitted the flexibility to make recommendations which are more carefully adapted to the needs of agricultural research. Individual country research staff in charge of country reports, assisted by technical experts provided through the CDA have endeavoured to be sensitive and responsive to the severe budgetary constraints in SADCC countries. The reports confirm that, even when a high priority is given to research, the SADCC country governments initially will not be able to meet all of the recurrent costs of certain research projects. Donors, therefore, will need to provide for some of these costs.

## B. Methodology

This study was carried out with the full participation of African professional agricultural researchers and agriculturalists. It was agreed that such participation was of central importance for all phases of the activity--the design of the questionnaires, the data collection process, the analysis, the assessments of research programmes and direction, the actual preparation of the country reports, and the development and review of a regional agricultural research strategy. DEVRES provided a group of technical experts who had wide African and other international experience to assist the country researchers, to contribute to the analysis of the country reports, and to prepare a SADCC regional report. Italy and France also provided technical experts to assist country researchers in Mozambique and Tanzania, respectively.

The ARRA was initiated with a pilot study performed collaboratively with the SADCC member states of Botswana, Malawi and Swaziland. Following review of this pilot report by both SADCC and CDA members, the ARRA was expanded to include additional SADCC countries: Lesotho, Mozambique, Tanzania, Zambia and Zimbabwe. At the time these countries were added, the pilot country reports were updated and a regional analysis was prepared.

Senior researchers from the SADCC countries were designated as National Coordinators. Each Coordinator provided overall direction and support for the ARRA in her/his country. In turn, each Coordinator nominated researchers to be in charge of completing the questionnaires and preparing the national reports for their respective countries. The Country Researchers also used other experienced researchers for short periods to help complete questionnaires on specific subjects. The scope of the questionnaires included not only the research institutions, but also training institutions and extension institutions which provide links between research professionals and the farmers who are intended to utilise research results.

The expanded ARRA was prepared from July to September 1984 by the Country Researchers in cooperation with the DEVRES staff. A regional report, including summaries of the national reports, was prepared by DEVRES in consultation with the CTCAR members and the Country Researchers. The regional report was based on a regionally-oriented analysis of programmes and national reports, on the answers to the questionnaires, on contacts with international research organisations and national and international donors, and on other available information.

During the course of the ARRA, DEVRES provided assistance in the development of a computerised data bank to process ARRA data and to assist the SADCC countries in meeting their future needs for research which, when combined with other available information, can provide a foundation of practical, useful data that can be continuously updated. The data bank can be a valuable tool for use by those designing programmes and projects in agricultural research. It will remain with the Southern African Centre for Cooperation in Agricultural Research (SACCAR) which will update the data bank, as well as ARRA, in the future.

In preparing recommendations for programmes and projects, the National Coordinators, Country Researchers and DEVRES staff took into account research work already proposed or underway. New ideas were also included in this country report and in the regional report as well. One of the principal objectives of the analysis was to build on existing national research, analyses, conclusions and recommendations in a manner which will strengthen these research activities. A concerted effort was made to place recommendations in a wider context, involving not only the research institutions, but also the training of researchers, the use of research results by the farmers, and the linkages with other SADCC member institutions or other international research institutions.

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<sup>1</sup>The World Bank, Sub-Saharan Africa: Progress Report on Development Prospects and Programmes (Washington, D.C.: The World Bank, 1983).

## II. GENERAL INFORMATION ON TANZANIA

### A. Description of the Country

#### 1. Geography

The United Republic of Tanzania, with an area of 939,701 km<sup>2</sup>, is situated just south of the equator between latitudes 2° and 13° South and between longitudes 30° and 40° East. It is bordered on the north by Kenya and Uganda, on the west by Rwanda, Burundi and Zaire, on the southwest by Zambia, on the south by Malawi and Mozambique, and on the east by the Indian Ocean. It has 800 km of Indian Ocean shoreline. Off the coast lie the islands of Zanzibar, Pemba, and Mafia, which together with the mainland comprise the United Republic of Tanzania. (See Figure 1.) Most of the country, with the exception of the coastal belt, is situated in the Central African plateau with altitudes ranging from 1,000 to 1,500m.

#### 2. Agro-ecological zones

Owing to its size and great variations in altitude, rainfall and soil types, Tanzania has been divided into agro-ecological zones in various ways.

The country may be divided by climate and topography into the following regions:

- o The hot, humid coastal plains;
- o The hot, arid central plateau;
- o The moist and high lake regions in the west; and
- o The temperate highland areas in the north and the south.

#### 3. Natural environment

Tanzania is very rich in surface waters which have great potential for both agriculture and energy development. The inland waters include the great lakes of central Africa, Lake Victoria, Lake Tanganyika, Lake Malawi, and Lake Rukwa and rivers which flow into the Indian Ocean (Rufiji, Ruvuma and Pangani) and others which drain into internal basins (Kagera). Apart from a narrow coastal strip and parts of some river basins, the country's elevation is above sea level.

There are four main mountain systems with high elevations (including Mount Kilimanjaro at 5,895 m and Mount Meru at 4,566 m) and three main plateaus (the Southeastern Plateau, the Masai Plateau and the Great Central Plateau) which cover approximately one-third of the country's surface area. Another distinctive feature of Tanzania is



the eastern and western Rift valleys; these are deep depressions in the land which are often filled with lakes and which traverse the country from north to south.

The soils vary in fertility. The slopes of the volcanic mountains of Kilimanjaro and Meru have rich productive soils, as do the volcanic areas of the Mbeya region. Good soils are also found in the river valleys such as the Pangani, Rufiji, and Kilombero valleys. However, the largest part of Tanzania is characterised by low- to moderately-productive soils, with the cotton-growing areas of Sukumaland representing the higher end of the continuum and Masailand, Dodoma, and Singida the lower. Soil erosion is quite serious in many parts of the country, particularly in the dry interior and on steep slopes. As much as 50 percent of Tanzania's soils are subject to erosion.

#### 4. Climate

Tanzania's climate varies from tropical to semiarid to temperate, and is mitigated by variations in altitude which influence both rainfall and temperature. From December to March, southern Tanzania has rain while the northern part remains dry. The main rainfall season in north and central Tanzania is from March to mid-May. From June to September, there is very little or no rain. From October to November there may be short, erratic rainfall in parts of the country, especially in the north. The mean annual rainfall is shown in Figure 2.

Based on rainfall patterns, Tanzania may be divided into three climatic belts:

- o A northern coastal belt (about 180 km wide from Dar es Salam to the Kenya border), with two rainy seasons and yearly average rainfall of from 1,000 to 1,500 mm;
- o A 90 km wide area bordering Lake Victoria, with an annual rainfall of 750-1000 mm well distributed throughout the year; and
- o A broad area, including the southeastern coastal belt, the greater interior plateau and the northern and southern highlands, where the main rainfall occurs between December and April. In the highlands the rainfall ranges from 750 to 1,250 mm, whereas on the plateau and southeastern coastal region it ranges from 250 to 750 mm per year.

Although these are the general patterns, rainfall is highly erratic, in regard to both timing and amount, in most of the country.



As in most tropical countries, Tanzania's temperature is largely uniform both within the day and within the year. However, average daily and annual temperatures vary with altitude and, thus, are lower on the plateau and highlands than along the coast. The mean temperature decreases, on the average, 0.6° C per every 100 m increase in elevation. The coolest month throughout Tanzania is July, while the warmest months are October and November in southern Tanzania and February and March along the coast and in central and northern Tanzania.

## B. The People

### 1. Population

The population of Tanzania is estimated to be 21 million people. The average population density is 22.3 inhabitants per km<sup>2</sup>; the highest density is in Zanzibar and Pemba with over 600 inhabitants per km<sup>2</sup>, on the shores of Lake Victoria, and in the Arusha region. In contrast, the vast area of the central plateau may number less than five inhabitants per km<sup>2</sup>. The population growth rate is high, averaging about 3.2 percent per year.

With approximately 88 percent of the population in rural areas, Tanzania is one of the least urbanised countries in the world. Half of the people who live in urban areas live in the capital. The largest towns are: Dar es Salaam with 1,207,500 inhabitants, Mwanza with 130,500 inhabitants, Tanga with 121,300, Mbeya with 93,100, Tabora with 87,300, and Morogoro with 72,200 inhabitants.

About 46 percent of the population is under 15 years of age, 49.8 percent between 15 and 64, and only 4.4 percent 65 years or over. The average life expectancy in Tanzania is 52 years.

### 2. Occupational patterns

The vast majority of the working population, 80.4 percent, is engaged in agriculture. Of the 676,000 persons in the wage labour force, 34 percent are in community and rural services, 20 percent in agriculture, 17 percent in manufacturing, 9 percent in transport and communications, 8 percent in construction, 6 percent in commerce and trade, 3 percent in electricity and water, and 3 percent in financial and business services and 1 percent in mining and quarrying.

### 3. Language and ethnic groups

Within the country there are more than 120 ethnic or tribal groups, none of which dominates, either numerically or politically. Only one, the Sukuma, has more than a million members, and they constitute less than 13 percent of the population. Other groups are the Makonde, the Chagga, the Nyamwezi, and the Haya. The majority of Tanzanians are of Bantu origin; groups of Nilotic origin include the nombadic Masai and Luo tribes. There are about 75,000 Asians, living

predominantly in urban centres and about an equal number of Arabs. While the ethnic groups each have a distinct language, the official language is Swahili, a Bantu-based language with strong arabic influence.

#### 4. Religion

Roughly one-third of the population is Christian, and another third is Muslim. However, Islam is the dominant religion in Zanzibar. The remaining third adhere to indigenous religions.

#### 5. Educational system

A high priority is given to education by the government. Government expenditure on education and training is estimated to be 16.6 percent of all government expenditures in 1983/84. The numbers of students enrolled in the various levels of educational institutions in 1982 are shown in Table 1.

In addition to these students, 30,000 were enrolled in post-primary vocational courses and 1,538 were enrolled in agricultural training programmes.

Since Independence, adult education has received top priority among the educational programmes and the adult literacy rate, which was only about 10 percent in 1960, rose to 79 percent in 1980.

### C. Government and Political Framework

The United Republic of Tanzania is a Democratic Socialist Republic that came into being on April 26th, 1964 with the signing of the Articles of Union linking the Republic of Tanzania and the People's Republic of Zanzibar. Tanganyika gained independence in 1961 and Zanzibar in 1963. Its President is Mwalimu Julius K. Nyerere, one of the most charismatic African leaders, who has headed the country uninterruptedly since Independence.

#### 1. Structure of government

The executive branch consists of the President, Vice President, Prime Minister and Cabinet which is presided over by the President. Three of the 17 ministries, the Ministry of Development and Planning, the Ministry of Finance, and the Ministry of Manpower, have functions of coordination. A large proportion of the public sector decisionmaking, however, is given to regional, district and village bodies under the policy of decentralisation which is an important political characteristic of Tanzania.

TANZANIA: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

Table 1: Enrollment in Educational Institutions, 1982

<u>Level</u>	<u>Number Enrolled</u>
Primary Education Standards 1-7	3,512,799
Secondary Education	69,145
(Forms I-IV)	(64,835)
(Forms V-VI)	( 4,310)
Technical Colleges	1,409
Teacher Training College	8,101
University of Dar es Salaam	3,835

Source: Data collected from the DEVRES/SADCC Agricultural Research Resource Assessment, 1984.

The legislative branch is represented by the unicameral National Assembly which consists of 234 members: 99 of these are elected by popular ballot from the mainland, while the rest are ex-officio members (e.g., the Regional Commissioners, Members of the Zanzibar Revolutionary Council), or are appointed by the President.

The judicial system is headed by the Minister of Justice who is also the Attorney General. Directly under the Minister of Justice are the Chief Parliamentary Draftsman (who interprets the constitution), the Director of Public Prosecution and the Administrator General. The Chief Justice who heads all the courts, including the lower courts, High Court and the Court of Appeals, works for the most part semi-autonomously, although he serves under the Minister of Justice.

## 2. Political parties

A major role in the Tanzanian political structure is played by the Chama Cha Mapinduzi (CCM), or Revolutionary Party, the country's only political party. CCM was founded in 1977 by the merger of the Tanzanika African National Union (TANU) and the Afro-Shirazi Party (ASP) of Zanzibar. The CCM has three million members. Its power, according to the Constitution, surpasses that of the National Assembly and is exerted at all levels, from the Cabinet to the village level. The Chairman and Vice-Chairman of the CCM are the President and Vice-President of the country, respectively.

## 3. National budget

The national budget consists of the recurrent budget, administered by the Ministry of Finance, and the development budget, administered by the Ministry of Economics and Development Planning. The fiscal year runs from July 1st to June 30th. Both budgets are presented concurrently to Parliament on an annual basis by the Minister of Finance. The development budget and five-year plans or projections for most programmes and projects are also presented at this time.

The main sources of revenue are taxes on goods, property, services and income. Other sources of revenue for this recurrent budget include taxes on international trade and transactions, and parastatal dividends.

Development budget financing depends on bank borrowing (deficit financing), transfers from the consolidated revenue fund, and loans and grants from foreign donors.

#### 4. Government policies regarding agriculture

Agriculture is one of three principles on which Tanzania's development strategy is based. In the Arusha Declaration of 1967, President Nyerere articulated development goals of the nation, committing it to socialism based on communal living, rural development and self-reliance.

Agriculture, thus, has received a top priority in Tanzanian life, and a large number of development projects are devoted to agriculture and agricultural research.

In accordance with the social theory guiding the country, privately-owned farms have been reduced to negligible importance, and maximum emphasis and government assistance are given to cooperatives and communal forms of cultivation and management of the land. Another very strong influence of government policy on agriculture is evidenced in the marketing system. Prices of agricultural goods and agricultural inputs are fixed by the government which assumes responsibility for their purchase and distribution through parastatal organisations. This system, often unsatisfactory for the farmers, has resulted in a widespread parallel market where prices are often higher than the official ones.

Research has also been accorded very special attention. A large number of institutions throughout the country deal with research on crops, livestock, forestry, and fisheries. In all, there are about 70 research stations and substations.

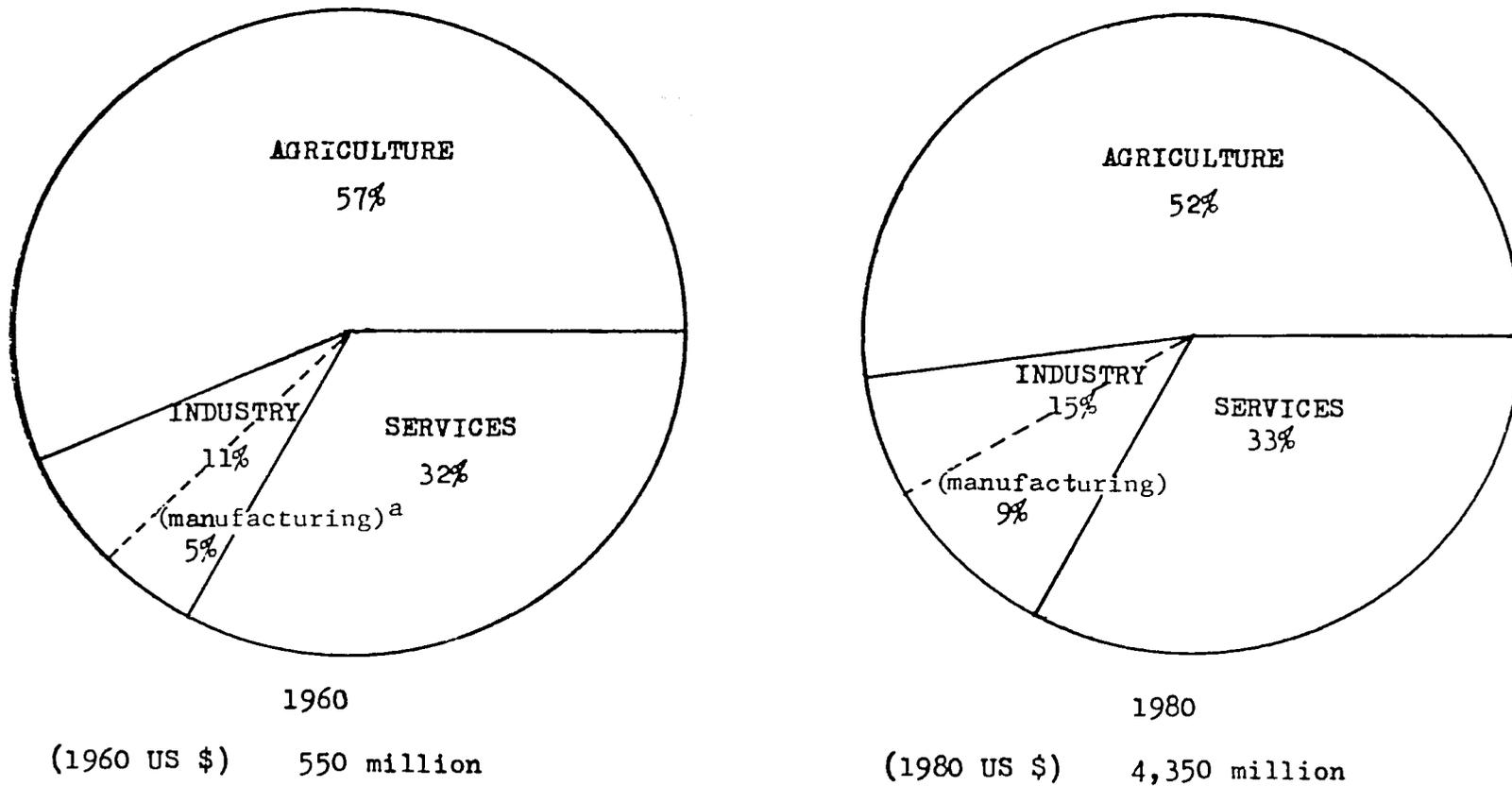
#### 5. Membership in international organisations

Tanzania is full member of many international organisations, including the UN and its specialised agencies (FAO, UNESCO, WHO, ILO, UNIDO, UNEP, and UNICEF), the Commonwealth of Nations, INTELSAT, the Non-aligned movement and the Group of 77. It is also a member of associations of African nations, including the Organization of African Unity (OAU) and SADCC.

#### D. Economic Overview

##### 1. General indicators

With a per capita GDP of US\$ 230, Tanzania is one of the poorest of the low-income countries. Its economy is largely dependent on agriculture and its principal exports are primary agricultural products. Over half of its GDP, 52 percent, is derived from agriculture, down only 5 percent in twenty years. (See Figure 3.) The service sector contributes 33 percent of the GDP and industry, 15 percent.



<sup>a</sup> Manufacturing is a part of the industrial sector, but it is shown separately since it often is the most dynamic part of the industrial sector.

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Figure 3: GDP by Source, 1960 and 1980

Source: IBRD/World Bank, World Development Report 1983, (New York: Oxford University Press, 1983).

From Independence until 1974 its economy grew at a satisfactory rate, due to steady increases in agricultural production and a satisfactory price situation. In spite of oil price increases, the economy continued to improve until 1978 when per capita GDP was estimated at US\$ 270.

Since then the situation has increasingly worsened, as a result both of the Uganda war of 1978 and of the sharp deterioration in the balance of payments. As an exporter of agricultural goods whose prices have increased at much slower rates than those of imports, Tanzania must constantly increase production of exportable products just to maintain the same level of imports. However, in recent years there has been a general decline in production of exportable crops such as cotton, sisal, tobacco and cashew nuts. This has resulted from a combination of low prices and lack of hard currency needed to buy basic inputs such as fertilisers, farm machinery, spare parts, pesticides and, most importantly, fuel. The situation has been alleviated only in part by international aid and cooperation.

The main social and economic indicators of development are listed in Table 2.

## 2. International trade

Coffee is Tanzania's leading foreign exchange earner. Coffee exports earned US\$ 145 million in 1982 or about 33 percent of the total value of all exports. The national coffee development programme, supported by the EEC, is expected to increase coffee production through technical support and strengthen research and extension services in the coffee-growing areas.

Cotton is the second major foreign exchange earner, in addition to supplying local textile and oil mills with basic raw materials. Exports of sisal are expected to fall sharply in 1983-84 due to the fall in volume of demand, low world market prices and subsequent diversification to other crops on the sisal estates. Tanzania's other major export commodities are cloves, tobacco, tea, diamonds, and industrial and oil products.

The total value of all exports in 1982 was T.sh. 4,230 million; in 1983-84 it is expected to be T.sh. 4,048 million (US\$ 324 million).

Imports are categorised into consumer goods, intermediate goods and capital goods. Since 1975 there has been a decline in imports of intermediate and capital goods. This reflects the impact of the unfavourable economic climate which forced the government to curtail imports, therefore suspending the implementation of some programmes.

The total value of all imports in 1982 was T.sh. 10,519 million, and in 1983/84 is expected to be T.sh. 8,547 million (US\$ 684 million).

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Table 2: Social and Economic Indicators of Development

<u>Indicator</u>	<u>Average Annual Growth Rate</u> (percent)	<u>Comment</u>
Total Population a,b		
1984      21,000,000	3.2	IBRD projections estimate that the population will approach 26 million in 1990 and 36 million by 2000, based on an average growth rate of 3.5 percent between 1981 and 2000.
1978      17,528,000		
1967      12,313,000		
Percent of Total Population Living in Rural Areas <sup>a</sup>	2.5	Urban population growth rate is approximately 8.6 percent per annum.
1981              88%		
Percent of Labour Force Involved in Agriculture		
1981              80.4%		
1980              84.0%		
1970              86.2%		
Percent of Population Under 15 years of Age <sup>c</sup>		
1978              46.1%		
Percent of GDP Attributable to Agri- culture <sup>d</sup>		
1982              50.4%		
1980              52.0%		
1970              41.0%		
Per Capita GDP <sup>e</sup>		
1982              US \$230		
1980              US \$289		
Physical Quality of Life Index (PQLI) <sup>b,c</sup>		This figure is significantly higher than that of many African countries, even those having higher GDP per capita. The tremendous increase in PQLI is mainly due to the increase in literacy from 10 to 60 percent in the period considered.
1978              50		
1960              20		
Literacy Rate <sup>a</sup>		
1980              79%		
1960              10%		

TANZANIA: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

Table 2: Social and Economic Indicators of Development (cont.)

Indicator	Average Annual Growth Rate (percent)	Comment
Life Expectancy at Birth <sup>a</sup>		
1981	52 years	
1960	42 years	
Infant Mortality Age 0-1 <sup>d</sup>		
1981	101	
1960	152	
Volume of Agricultural Production 1969-71 to 1977-79 <sup>d</sup>		According to the 1983 FAO Statistical Yearbook for the years 1977-81 the figures were: Food 1.2, Non-Food -0.1, Total 1.1 <sup>f</sup>
Food	1.9	
Non-Food <sup>e</sup>	-0.5	
Total Agricultural Production per capita		On a per capita basis, food production has not kept pace with the population. According to FAO the figures for 1977-81 were Food -1.9, Total -2.0 <sup>f</sup>
Food	-1.5	
Non-Food	-3.9	
Food Self Sufficiency Ratios <sup>d,g</sup>		
1978-80	93	
1964-66	96	

<sup>a</sup>IBRD/The World Bank, World Development Report 1983 (New York: Oxford University Press, 1983).

<sup>b</sup>Tanzania Population Census 1978.

<sup>c</sup>IDP Clark University, Eastern Africa Country Profiles: Tanzania, 1982.

<sup>d</sup>Singh, Sub-Saharan Agriculture - Synthesis and Trade Prospects, World Bank working paper Number 608 (World Bank, 1983).

<sup>e</sup>UNESCO Technical/Vocational and Agricultural Education and Training in Tanzania, 1984 EFM 126.

<sup>f</sup>FAO, Statistical Yearbook 1983.

<sup>g</sup>Ratio =  $\frac{\text{Production of cereals}}{\text{Production} = \text{imports} - \text{exports of cereals}} \times 100$ . Formula and statistics from Singh, Sub-Saharan Agriculture-Synthesis and Trade Prospects, World Bank Working Paper Number 608 (World Bank, 1983).

The most important market for Tanzania's exports are the Commonwealth countries, which purchased 30 percent of total exports in 1982. The other major importers were the EEC countries, which received 28.7 percent (excluding Britain, which received 14.6 percent), and African countries (principally Kenya and Uganda), which received 12.7 percent.

The major source of Tanzania's imports is the EEC countries. In 1982 they contributed 28.9 percent of all imports, followed by the Commonwealth countries which contributed 26 percent. During the same period, Uganda contributed 16.7 percent, Great Britain 14.4 percent followed by Japan, India, and the U.S. Trade with Kenya deteriorated after the closure of the border with Tanzania in 1977. With the reopening of the border at the end of 1983, trade between the two countries is expected to increase appreciably.

### 3. Financial system

The Ministry of Finance heads the Bank of Tanzania (the central bank) and the National Bank of Commerce. The Bank of Tanzania issues currencies, stores foreign reserves and revenue, and lends to the government. The National Bank of Commerce serves as a banker to the country's financial institutions.

The major financial institutions include the Tanzania Investment Bank, the Tanzania Housing Bank, the National Insurance Corporation, the National Provident Fund, the Karadha (Credit) Company, the Tanzania Rural Development Bank, the Tanganyika Post Office Savings Bank, the Tanganyika Development Finance Company Limited and the State Lotteries.

The currency unit is the shilling, with 100 cents equalling one shilling. The exchange rate in December 1982 was US\$ 1.00 = T.sh. 9.57; in August 1984 it was US\$ 1.00 = T.sh. 17.38.

### 4. External aid

Most external aid is in form of bilateral or multilateral loans and grants. The total value of external resources for development projects in 1981/82 was T.sh. 1,794.5 million, over half of which (55 percent) was in the form of grants, and T.sh. 1,802.2 million in 1982/83.

### 5. Food aid

The major grains received as aid by Tanzania in 1983-84 were maize, rice and wheat. A total of 65,624 MT of maize, 56,159 MT of rice and 42,902 MT of wheat were received. The donors were Australian, Japan, Zimbabwe, the US, Canada, the Federal Republic of Germany, France, EEC, Austria, Belgium and the FAO World Food Programme. (See Table 3.)

TANZANIA: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

Table 3: Food Aid Received in 1983/84

<u>Donor</u>	<u>Commodities</u>		
	<u>Maize</u>	<u>Rice</u>	<u>Wheat</u>
Australia	19,500	4,138	24,000
EEC/FRG/WFP	8,360	-	-
Zimbabwe	24,064	-	-
EEC	2,700	-	-
FRG	10,000	-	-
WFP	1,000	-	-
Japan	-	34,694	-
Austria	-	2,000	-
USAID	-	15,327	-
France	-	-	3,723
Belgium	-	-	1,829 <sup>a</sup>
Canada	-	-	13,350
TOTAL AID	<u>65,624</u> =====	<u>56,159</u> =====	<u>42,902</u> =====

<sup>a</sup>Wheat flour.

Source: Crop Monitoring and Early Warning Project FAO/Kilimo,  
Dar es Salaam, Tanzania, 1984.

## E. Agriculture

### 1. Land use

While Tanzania has over 48.7 million ha of potentially arable land, only 9 percent of it is presently being cultivated, and only 5 percent of the total land area is cultivated. (See Table 4.)

The quality of land also varies. (See Figure 4.) Sixty-seven percent of the population live in the mountain and highland areas. Though agricultural expansion from these areas is possible, it will involve the use of less fertile and semiarid lands and will require significant amounts of inputs to conserve and to increase soil productivity. Another severe constraint is the infestation of large sections of these areas by the tsetse fly.

Only about 1 percent of the land is occupied by large estates. The predominant form of agricultural production is by individual peasants; every household is entitled to have at least five acres of land for cultivation. A small number of households, especially those involved in cash crop production, have much larger holdings.

The predominant form of agriculture is traditional agriculture, with rotational planting and bush fallow. However, intensive agriculture is practised in several areas using modern techniques, as in the cotton-maize cultivation in Sukumaland, along with traditional methods.

Intensive agriculture has been growing in importance with the settlement of Tanzania peasants in ujamaa villages. The country depends largely on the smallholders, who produce 75 percent of the exported produce and 80 percent of the total staple cereal crops.

### 2. Land tenure

All land in Tanzania is publicly-owned and vested in the state. However, land improvement and proper land maintenance in practice give the user rights equivalent to those of property title. This principle applies equally to the peasant farmer, the village community and the private or public commercial farmer.

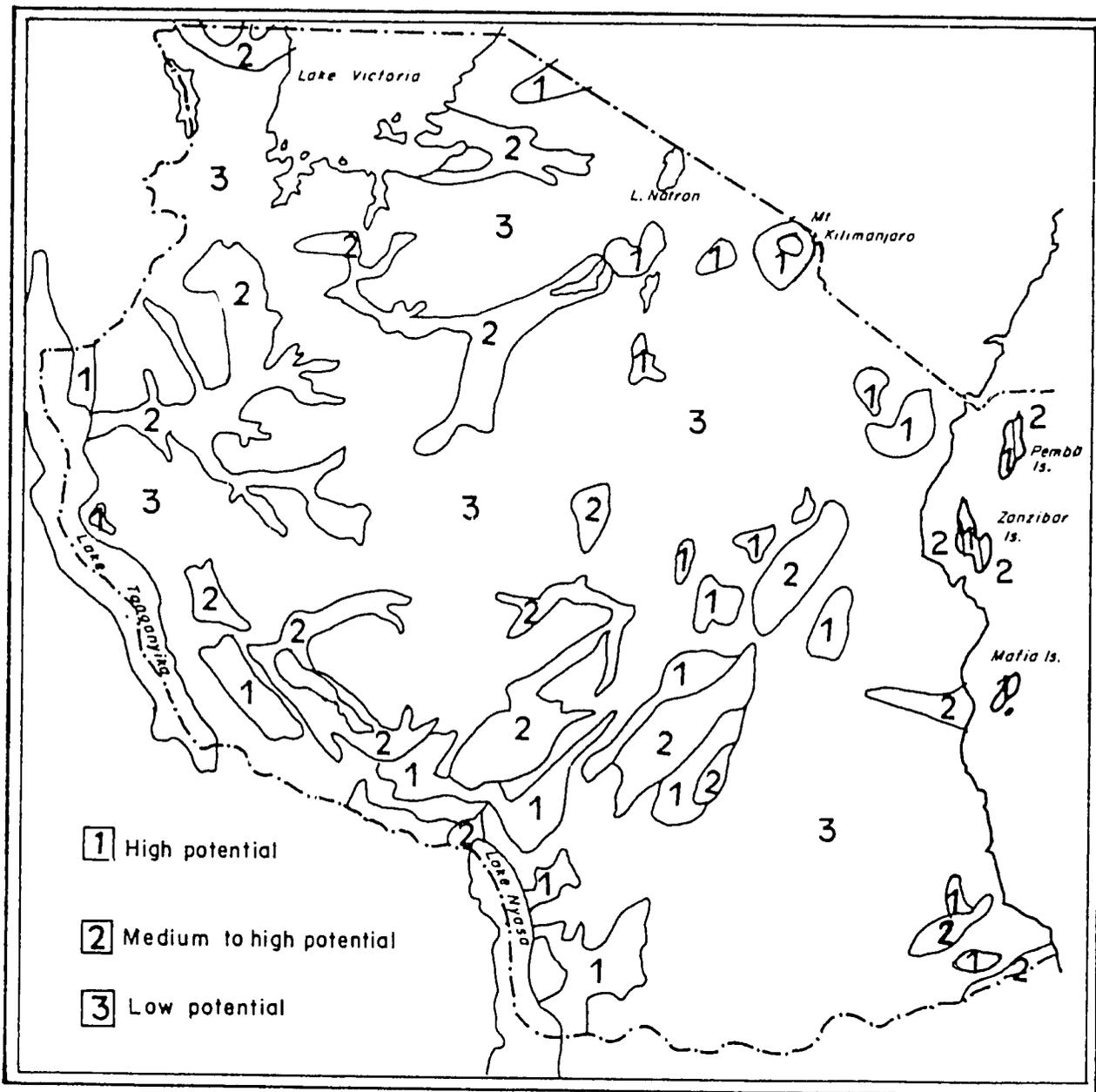
The main forms of land tenure are customary land tenure, communal land tenure, leasehold and rights of occupancy. In practice, most agricultural land is held under the customary and communal systems; most of it is not properly surveyed or mapped.

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Table 4: Land Use

<u>Land Use Category</u>	<u>Area</u> (000 ha)	<u>Percent of Total Area</u>
Cultivated Land	4,465	5.1
Smallholders	(3,880)	(4.4)
Large holders	(585)	(0.7)
Grazing	44,245	50.1
Forest/Woodland	38,050	43.0
Urban, Swamps	1,600	1.8
TOTAL	<u>88,360</u> =====	<u>100.0</u> =====

Source: Data collected from the DEVRES/SADCC Agricultural Research Resource Assessment, 1984.



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Figure 4: Land Use Potential

Source: Data collected from the DEVRES/SADCC Agricultural Research Resource Assessment, 1984.

### 3. Principal crops

A list of the major crops with area cultivated, total production and yield per ha for the last year is in Table 5. The main cash crops are coffee, cotton, sisal, tobacco, tea, cashew nut, pyrethrum and cloves. The main food crops are maize, sorghum and millet, rice, grain legumes, cassava, wheat, and sugarcane. The location of the main crop-producing areas is shown in Figure 5.

Coffee is grown mainly by smallholders in the Arusha-Kilimanjaro area. Cotton is grown primarily in northwestern Tanzania. While in the past, cotton was an export earner, its production is presently in sharp decline. Sisal is grown primarily on large estates in the northeastern regions. Tanzania is the third largest grower of sisal in the world, although it is facing a severe crisis in this sector. Tobacco is cultivated mainly in Tabora and Iringa regions, but its production is also declining. As with coffee, cotton and tea, tobacco production is suffering from a deterioration of quality which reduces its competitiveness in foreign markets. Tea is grown in the highlands of Tanga, Mbeya, Iringa, and Bukoba regions. Only a quarter of the output is produced by smallholders; the remainder is produced on large estates.

Cashew nuts are grown in smallholdings in the coastal areas, especially in the Mtwara and Lindi regions. Since the peak cashew nut production of 113,400 MT in 1973-74, when Tanzania was the second largest world producer, production has declined to about 48,300 MT in 1983-84.

Pyrethrum is grown primarily in the highlands of the Mbeya-Iringa regions. Tanzania is the second largest producer of pyrethrum in the world.

Cloves are the principal exports of Zanzibar and Pemba, accounting for about 9 to 10 percent of Tanzania's total export earnings. Satisfactory price levels have stimulated a steadily increasing clove production which reached over 7,000 MT in 1983.

Among the food crops, maize plays the major role. Maize is by far the most important staple food and is produced by smallholders all over the country. More than half of Tanzanian farmers grow maize. In general, farmers are able to produce enough maize for home consumption and a surplus for sale.

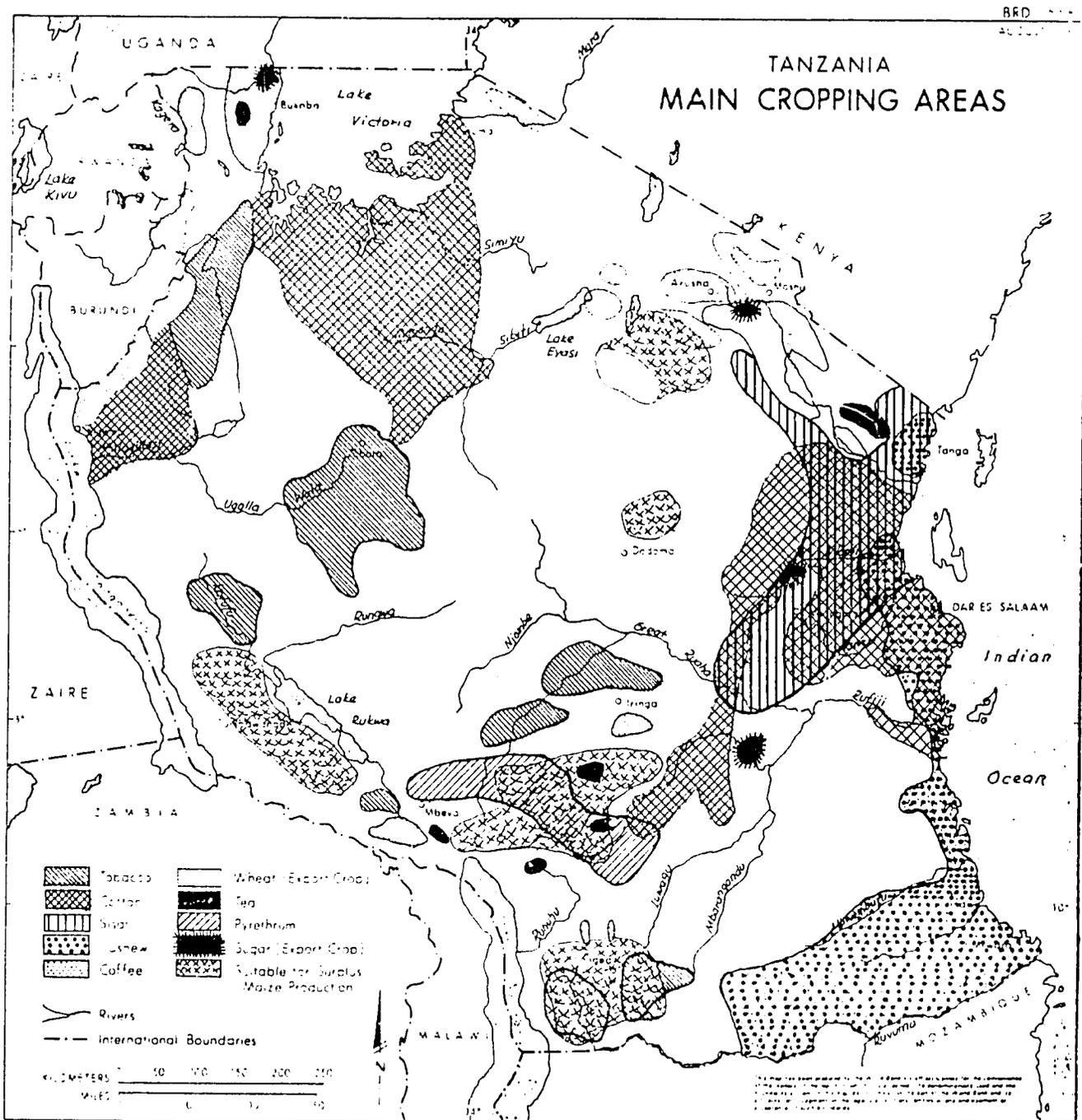
Wheat is grown mainly on large-scale, mechanised commercial farms, especially in the Arusha-Kilimanjaro, Ruvuma, Mbeya and Kagera regions. Its total production and yields are in sharp decline, due to the inability to obtain imported inputs required for its production.

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Table 5: Area Planted, Production and Average Yields of Major Crops, 1983/84

	<u>Area Planted</u> (ha)	<u>Production</u> (MT)	<u>Average Yields</u> (kg/ha)
Maize	1,920,000	1,920,000	1,000
Sorghum & Millets	1,000,000	700,000	700
Rice	285,000	360,000	1,265
Grain Legumes	478,000	239,000	500
Root Crops	903,000	1,589,000	1,760
Wheat	58,600	71,500	1,220
Coffee	220,000	55,000	250
Cotton	450,000	148,500	330
Tobacco	23,347	14,100	604
Tea	18,548	15,195	819
Sisal	56,043	46,187	824
Cashewnuts	-	48,340	-
Pyrethrum	-	1,705	-

Sources: Estimates obtained from personnel in the Crop Monitoring and Early Warning Project, the European Economic Community, the Project Preparation and Monitoring Bureau, and the Government of Tanzania Ministry of Agriculture, Planning and Marketing Division.



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Figure 5: Main Cropping Areas

Source: World Bank, 1982

Sorghum and millet are widely grown in drought-susceptible areas, including the Dodoma, Singida, Mwanza, Shinyanga, Mtwara and Lindi regions. They are grown exclusively by smallholders, as is cassava, which is grown as a famine relief crop. Rice is also grown mostly by smallholders; and its production is at present in decline.

Sugar, on the other hand, is produced on large government estates and private farms. The average yearly production is about 120,000 MT.

#### 4. Principal livestock and animal products

Tanzania has a large population of cattle, goats, sheep, pigs, and poultry. Estimates of the livestock population in 1981 were as follows: 12.9 million cattle, 5.9 million goats, 3.7 million sheep and 23 million poultry.

Nearly all cattle are owned by smallholders and kept in traditional herds averaging 20 to 30 animals per herd. Most cattle are kept for reasons other than commercial production. Current annual beef production is estimated at 180,000 MT and mutton at 25,000 MT, and is insufficient to meet demand. Annual poultry production is estimated at 16,000 to 17,000 MT. Milk sold through official channels accounts for about 50,000 litres.

#### 5. Fisheries and forestry

##### a. Fisheries

With over 800 km of seashore and about 58,000 km<sup>2</sup> of inland waters, Tanzania has great fishing resources which are exploited only to a limited extent. Nearly 95 percent of the catch is by traditional fishermen, the remaining 5 percent by two companies: Tanzania Fisheries Corporation (TAFICO), and the private Nyanza Fishing and Processing Company (NFPC). TAFICO principally fishes for prawns for export; NFPC operates on Lake Victoria to catch small pelagic fishes and processes them into animal feed.

Owing to lack of adequate storage and transport facilities, the bulk of the fishing catch is either consumed fresh or preserved by being either smoked or sundried.

Annual per capita fish consumption in Tanzania is around 15 kg of fresh fish. About 80 percent of the output comes from freshwater and 20 percent from the ocean.

The figures for fish production are as follows: in 1981, 49,366 fishermen caught 231,334 MT; in 1982, 50,133 fishermen caught 224,410 MT and in 1983, 47,455 fishermen caught 272,498 MT.

Fishing is recognised as an activity of great importance in Tanzania for its potential to provide both protein and foreign exchange; there are several projects in operation throughout the

country partly supported by bilateral and multilateral aid. There are also three training centres, in Kunduchi, Nyegezi, and Mbegani, which give certificates and diplomas in fishery production.

#### b. Forestry

Tanzania is dominated by savannah woodlands: forests and forested land occupy about 45 percent (more than 440,000 km<sup>2</sup>) of the total land area. However, the legally reserved forests account for only about 13.4 million ha, or 15 percent of the total land area, and are classified as follows: miombo woodland (11.4 million ha, or 85 percent of the reserved forest area); closed forests (952,000 ha, or 7 percent); grassland/mbuga areas (946,000 ha, or 7 percent); and Mangrove forest (82,000 ha, or .6 percent).

Most of the reserved forests are productive; there are 15 plantations scattered throughout the country. Only 12 percent are used for watershed management. Because of environmental difficulties as well as the inherent characteristics of the species involved, natural regeneration is often slow and difficult. Mean annual increments of 1-2 m<sup>3</sup>/ha are not uncommon in the miombo woodlands. The main species are Pinus patula, Pinus elliotii, Pinus caribaea, Cupressus lusitanica and Tectona grandis. Planting of indigenous species on a larger scale is still at the experimental stage. To date the total area under plantation is 70,000 ha; the annual planting target for the next five years is 7,000 to 8,000 ha.

#### 6. Principal agricultural production systems

Tanzania's agricultural production units can be classified into the following five categories:

- o Peasant farmers (up to 10 ha). The peasant farmers' primary objective is subsistence; a secondary objective is to earn cash by selling surplus food or export crops. While peasant farmers generally utilise family labour and traditional techniques, they also may employ limited casual labour, utilise oxen and buy some inputs. They produce the majority of the agricultural output of Tanzania;
- o Medium scale-commercial farmers (up to 100 ha). Medium-scale commercial farmers employ hired labour and adopt improved farming techniques, including imported inputs, and oxen and tractor power. They account for a limited share of agricultural output;

- o Large-scale commercial farmers (over 100 ha). These farmers use even more imported inputs and tractor power. Due to the government policy of encouraging smallholdings and cooperatives, there are fewer farmers in this and in the preceding category than before;
- o Private estates. Private estates are mechanised and utilise large amounts of agricultural inputs. They engage mostly in tea and sisal production; and
- o Public estates. The public estates are also mechanised and use modern inputs. They grow wheat, rice, sugar and sisal.

Table 6 summarises the distribution of crop production by type of farming unit, as a percentage of the total crop marketed through official channels.

## 7. Agricultural marketing and credit

### a. Marketing

The purchase and sale prices of agricultural products are fixed annually by the Economic Committee following the recommendations of the Marketing Development Bureau of the Ministry of Agriculture. Marketing is officially committed to the following parastatals which are responsible for buying, processing, distributing, exporting and importing all agricultural products:

- o National Milling Corporation (NMC), food grains;
- o Sugar Development Corporation (SUDECO), sugar;
- o Tanzania Coffee Authority (TCA), coffee;
- o Tanzania Pyrethrum Board (TPB), pyrethrum;
- o Tobacco Authority of Tanzania (TAT), tobacco;
- o Tanzania Tea Authority (TTA), tea;
- o Tanzania Sisal Authority (TSA), sisal;
- o Cashewnut Authority of Tanzania (CATA); cashew nuts; and
- o General Agricultural Products Export Corporation (GAPEX), for oilseeds and other minor crops.

Food crop retailing is organised by the Regional Trading Corporations and transport services by Regional Transport Companies.

TANZANIA: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

Table 6: Percentage of Crops Produced by Type of Farming Unit

<u>Commodity</u>	Peasant Farm (under 10 ha)	<u>Commercial Farm</u>		<u>Estates</u>	
		<u>Medium</u> (10-100 ha)	<u>Large</u> (100 ha)	<u>Private</u>	<u>Public</u>
Maize	85	10	5	-	-
Rice	50	-	-	-	50
Wheat	-	-	3.5	2.5	95
Cassava	95	5	-	-	-
Sugar	15	-	-	-	85
Legumes	90	5	5	-	-
Coffee	85	-	-	10	5
Cotton	95	5	-	-	-
Sisal	-	-	-	50	50
Cashew	100	-	-	-	-
Tobacco	90	5	-	5	-
Tea	25	-	-	75	5
Pyrethrum	100	-	-	-	-
Seed beans	-	-	50	50	-

Source: Data collected from the DEVRES/SADCC Agricultural Research Resource Assessment, 1984.

While all cash crops are marketed by the parastatals, a significant share of food crops, especially maize, cassava, rice and sorghum, are locally marketed through the parallel market, or free market, where the prices are higher than the official ones. This system varies in importance from region to region.

b. Inputs and credit

The level of agricultural input requirements varies greatly with the type and size of farm. A few simple tools, jembes and pangas, may suffice for shifting cultivation, while a broad range of items including tractors, fertilisers, and pesticides are required for large-scale farmers and estates.

The utilisation of improved grain seed, while still limited, is on the increase. Use of fertilisers has not grown since 1978-1981 when it was about 100,000 MT per year; pesticide and machinery purchases are still declining. The situation probably will not improve as long as the present foreign exchange crisis lasts.

The following parastatals are in charge of providing agricultural inputs:

- o Agricultural, Industrial and Supplies Company is the sole importer of agricultural inputs and equipment;
- o Tanzania Fertilizer Company is responsible for production and marketing of fertilisers;
- o Tanzania Seed Company (TANSEED) is responsible for production and marketing of seeds; and
- o State Motor Corporation has exclusive right to import vehicles and spare parts.

Three institutions are at present providing credit to the agricultural sector: the Tanzania Rural Development Bank, (TRDB), The Investment Bank (TIB) and the National Bank of Commerce (NBC). The TRDB is committed to lending money to villages, cooperative societies and to individual peasant farmers; TIB provides credit to large-scale farmers; and NBC provides credit for crop financing to commercial farmers.

Currently, the credit sector suffers from severe restrictions following widespread loan defaults which rose to alarming levels by the mid 1970s. As a result of heavy cuts in lending programmes, the utilisation of modern inputs declined.

## 8. Ministries responsible for agriculture

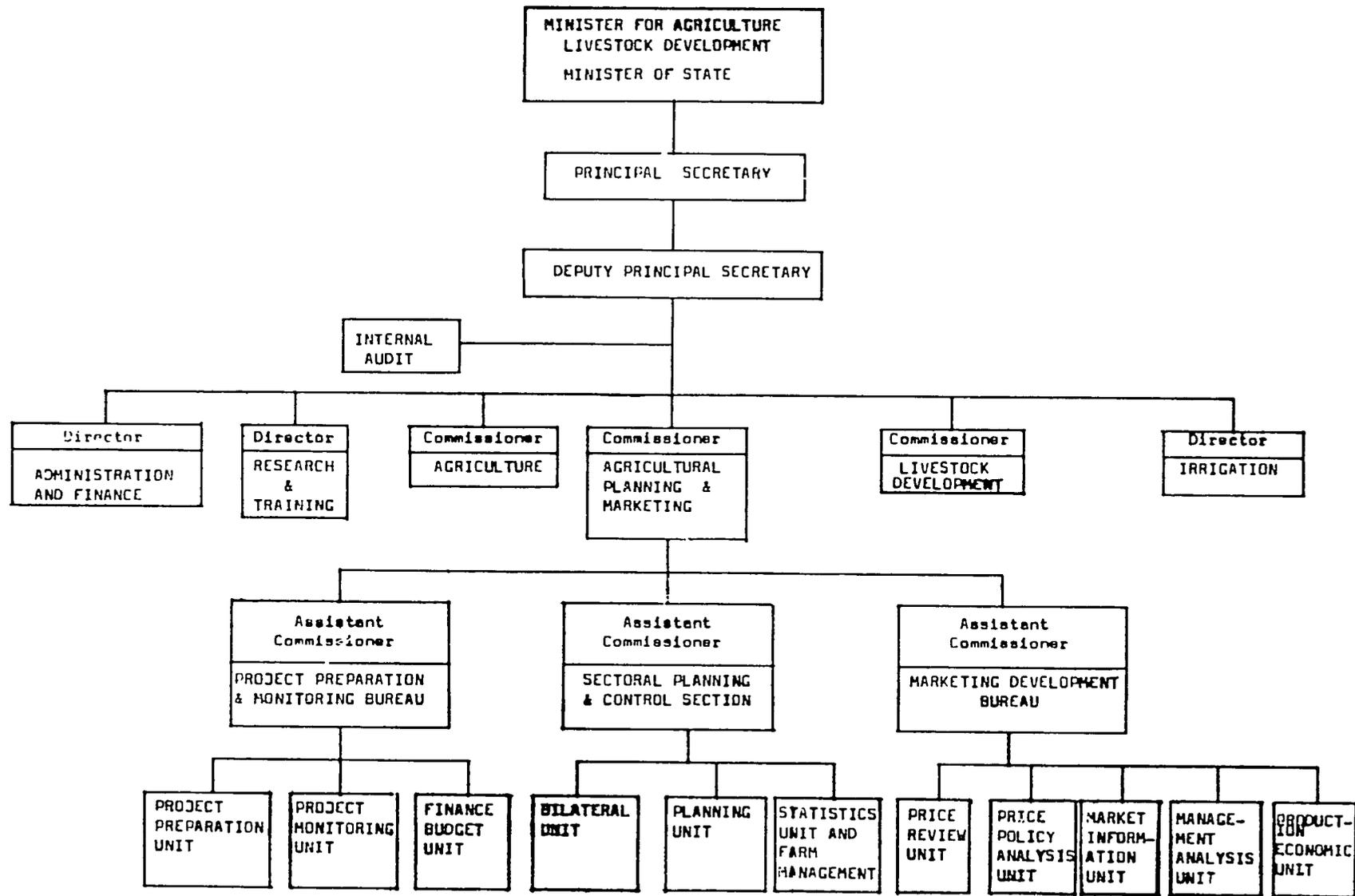
Four Ministries deal with different aspects of agriculture: the Ministry of Agriculture and Livestock Development (MOALD), the Ministry of Lands and Natural Resources and Tourism (MLNRT), the Ministry of Education (MOE), and the Ministry of Economic Planning (MEP).

The Ministry of Agriculture and Livestock Development is concerned with all aspects of crop and livestock development, including: manpower development, planning and marketing, extension, research, training and irrigation. See Figure 6 for the proposed organisational structure of this ministry.

The MLNRT is in charge of the development of fisheries and forestry, and carries out related research, extension and training programmes.

The MOE is concerned with agriculture in that it is responsible for degree-level agricultural training. The Sokoine Agricultural University (formerly the Faculty of Agriculture of Dar es Salaam University) also conducts some crop and livestock research.

The MEP has an indirect impact on agriculture through the Tanzanian National Scientific Research Council (TNSRC), which coordinates the research aspects of all the Ministries.



TANZANIA: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

Figure 6: Proposed Organisation Chart of the Ministry of Agriculture and Livestock Development

Source: Data collected from the Government of Tanzania, Ministry of Agriculture and Livestock Development.

### III. AGRICULTURAL RESEARCH INSTITUTIONS

#### A. Overview of Agricultural Research in Tanzania

Agricultural research in Tanzania is conducted by the Directorate of Agricultural Research of the Ministry of Agriculture and Livestock Development (MOALD), and by four research parastatals which relate to MOALD: the Tanzania Agricultural Research Organisation (TARO), the Tanzania Livestock Research Organisation (TALIRO), Uyole Agricultural Center (UAC) and the Tropical Pesticides Research Institute (TPRI). Forestry research is conducted by the Tanzania Forestry Research Institute (TAFORI) and fisheries research by the Tanzania Fisheries Research Institute (TAFIRI). These two research parastatals are under the aegis of the Ministry of Lands, Natural Resources and Tourism (MLNRT). Figure 7 shows the relationship of the research institutions to the two Ministries and to the Tanzania National Scientific Research Council (TNSRC). These research institutions' funding, location, major research activities, and numbers of staff are summarised in Table 7.

#### B. Agricultural Research Institutions

##### 1. Directorate of Agricultural Research

##### a. Organisational structure and purpose

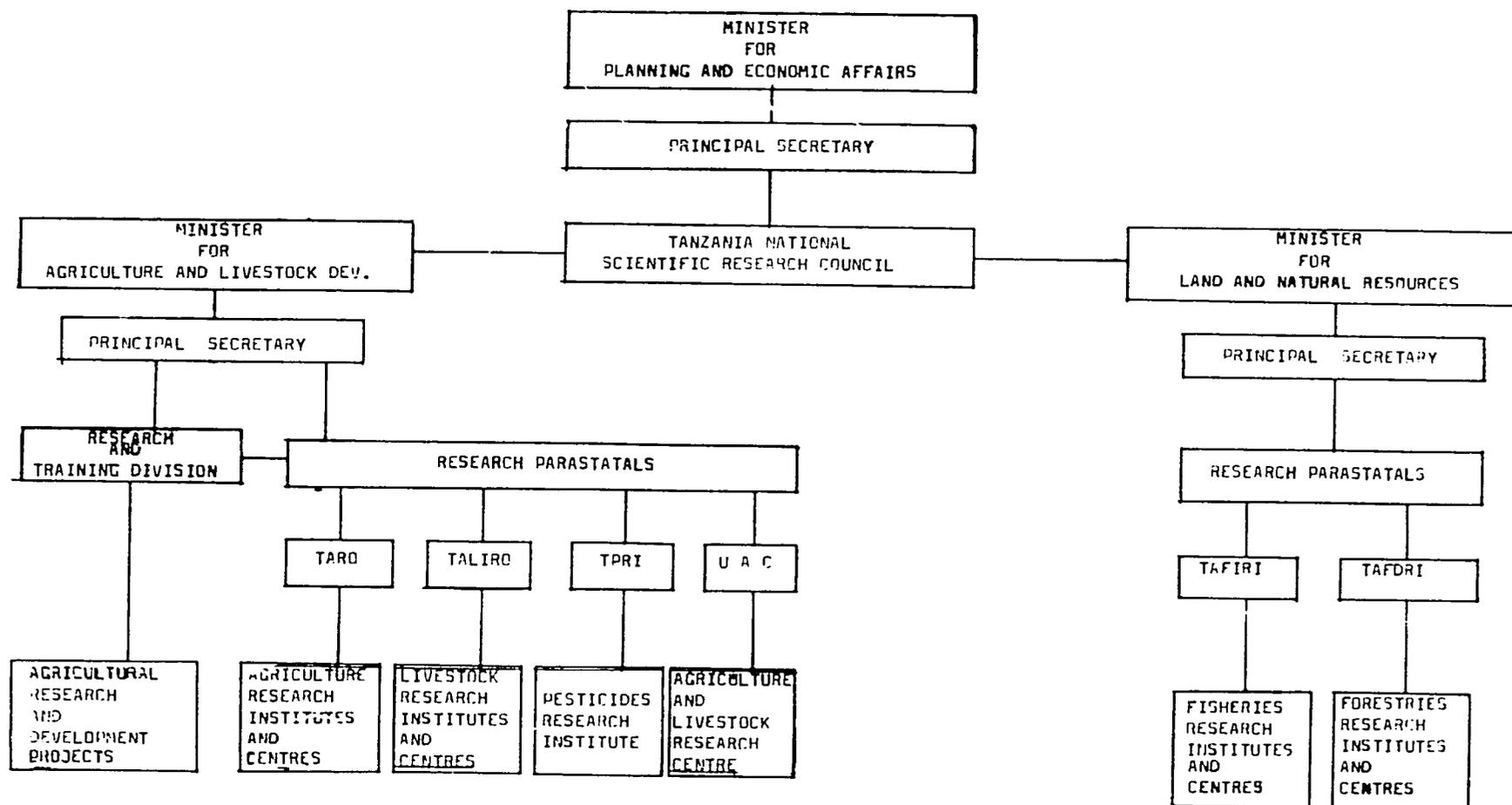
The Directorate of Agricultural Research (DAR) of the MOALD is headed by a Director who reports directly to the Principal Secretary of the Ministry. Before the establishment of TARO, this directorate was responsible for undertaking all agricultural research in the country, with authority over twelve research institutes and centres. After the establishment of TARO, the DAR has been responsible mainly for coordinating overall ministerial research policy. It also serves as liaison between the Ministry, the councils of the research organisations and other scientific bodies outside the Ministry, such as the University, the Tanzania National Scientific Research Council and international research organisations.

The proposed reorganisation of the MOALD is likely to create a Directorate of Agricultural Research and Training (DART) in place of the present DAR.

The Directorate is also directly responsible for three research stations which do not fall under TARO's jurisdiction.

##### b. Research programmes

The DAR directs three research programmes: rice research at the Dakawa Agro-scientific Research Center, horticultural research at the Tengeru Research and Training Institute, and coconut research under the National Coconut Development Programme (NCDP).



TANZANIA: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

Figure 7: Organisation Chart of Agricultural Research Institutions

Source: Data collected from the DEVRES/SADCC Agricultural Research Resource Assessment, 1984.

TANZANIA: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

Table 7: Agricultural Research Institutions: Funding, Location, Activities and Staff, 1984

<u>Institution</u>	<u>Funding</u>		<u>Location of Headquarters</u>	<u>Principal Research Activities</u>	<u>Number of Staff</u>				
	<u>Source</u>	<u>Amount (US\$)</u>			<u>Profes- sional</u>	<u>Adminis- trative</u>	<u>Technical<sup>a</sup></u>	<u>Support Services</u>	<u>Total</u>
Directorate of Agric. Research, Ministry of Agriculture	GOT FRG DPRK Netherlands	2,028,680 300,080 196,080 111,600	Dar es Salaam	Administration, rice, coconut and horticultural research.	51	19	40	71	181
Tanzania Agric. Research Organization (TARO)	GOT	3,600,020	Dar es Salaam	Research on major food and cash crops and soils.	139	283	440	1,072	1,934
35 Tanzania Livestock Res. Organization (TALIRO)	GOT Own revenue	2,433,843 240,196	Dar es Salaam (Temeke)	Livestock pasture and veterinary research.	60	411	137	214	822
Uyole Agric. Center (UAC)	GOT Own revenue	1,520,000 800,000	Uyole Mbeya	Crop and live- stock research.	39	3	94	221	357
Tropical Pesticides Research Inst. (TPRI)	GOT	987,760	Arusha	Agricultural, veterinary and medical pesti- cides research.	32	41	12	211	296

TANZANIA: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

Table 7: Agricultural Research Institutions: Funding, Location, Activities and Staff, 1984 (cont.)

<u>Institution</u>	<u>Funding</u>		<u>Location of Headquarters</u>	<u>Principal Research Activities</u>	<u>Number of Staff</u>				
	<u>Source</u>	<u>Amount (US\$)</u>			<u>Profes-sional</u>	<u>Adminis-trative</u>	<u>Technical<sup>a</sup></u>	<u>Support Services</u>	<u>Total</u>
Tanzania Forestry Res. Institute (TAFORI)	GOT	344,800	Dar es Salaam (Kibaha)	Silvicultural and utilization research.	20	32	65	165	282
Tanzania Fisheries Res. Inst. (TAFIRI)	GOT	320,000	Dar es Salaam	Fresh water and marine fisheries research.	12	49	6	69	136
TOTAL		<u>12,938,059</u>			<u>353</u>	<u>838</u>	<u>794</u>	<u>2,023</u>	<u>4,008</u>

<sup>a</sup>Technical = diplomate.

Source: Data collected from the DEVRES/SADCC Agricultural Research Resource Assessment, 1984.

As the ministerial research policy formulator, the DAR has formal linkages with the Directorate of Extension and Technical Services (DETS). Both directorates are involved in ministerial policy meetings regarding agricultural research. A national agricultural conference involving all divisions of the Ministry, including the research, training and agricultural extension sections, is also held biennially. The DAR's three research stations collaborate with extension on on-farm research and on preparation of packages of recommendations and their transfer to farmers.

The DAR has linkages with the parastatal research institutions (TARO, IAC, TPRI and TALIRO), through the Director's membership on their boards and councils; it also has links with other scientific bodies outside the Ministry.

The DAR research stations collaborate with TARO, IAC and TPRI on related research programmes. However, there currently is no formal system of technical feedback to the DAR from the parastatal research institutions.

c. Human resources

The DAR has a total staff of 181. This includes senior technical, administrative, technical, and support staff. (See Table 7.) There are a total of 51 professionals in the institution, of whom 24 FTEs (45 percent) are involved in coconut research, 18 FTEs (34 percent) in rice research and 8 FTEs (15 percent) in horticultural research. There are 29 expatriate professional researchers in the DAR, accounting for 57 percent of the professional staff.

In Tanzania, the technical staff who are directly involved in agricultural research fall into three categories: Research Officers with a minimum of a BSc degree, Field Officers with diplomas, and Agricultural Field Assistants, who hold certificates in agriculture.

In 1983-84 the DAR had 48 vacant professional posts. It had no nationals in training as of June 30th, 1984, and no established plan to train additional personnel.

d. Research facilities

(1) Land

The DAR has a total of 935 ha of land, shared among its three research programmes.

The coconut research programme has the largest area with 800 ha of land. Of this, 498 ha are cultivated: 219 ha are used for experimental purposes, 150 ha for seed multiplication and 129 ha for on-farm research. All of this land is in the coastal belt where soils are of low fertility and rainfall ranges from 600 to 1000 mm per year.

The rice research programme has a total of 100 ha of land which are located in an area of medium altitude, with 600 mm rainfall a year and soils of alluvial origin. All the cultivated land is under irrigation: it is used for experimental plots and seed multiplication (13.5 ha.), commercial production (84.5 ha) and green manure production (2.0 ha).

The horticultural research programme, located in a high-altitude and high-rainfall area, has only 35 ha of land. The land is used for research, training and horticultural production. About 11 ha are under overhead irrigation.

### (2) Buildings

The DAR has a limited number of buildings. The DAR headquarters is located in seven offices in the Tanzania Cotton Authority building which also accommodates the rest of the MOALD. Both the rice and the coconut research stations are under construction. There are limited administrative and scientific office facilities at the stations. Staff housing is provided at the research stations. The coconut research programme has one laboratory for plant pathological/entomological studies. The DAR has no conference or greenhouse facilities. The DAR does not possess any field or laboratory equipment with a replacement value of US\$ 5,000 or more.

### (3) Library and publications

The DAR uses the MOALD's libraries which are located at the Ministry headquarters in Dar es Salaam and at the Tengeru Research and Training Institute. These libraries have a total of about 30,000 books and acquire about 150 books annually. They also receive about 10 periodicals and scientific journals, and have access to the Tropical Development Research Institute and the Commonwealth Agricultural Bureau in the UK. In the absence of an agricultural journal, the only published information from the DAR is contained in annual reports, research monographs and extension bulletins.

#### e. Financial resources

In the current fiscal year, the DAR has a total recurrent (operating) budget of US\$ 2.64 million. About a quarter of this is spent on the three research programmes; the rest is for personnel emoluments, maintenance of stations, and utilities. Coconut research receives about 41 percent, rice research 39 percent and horticultural research only about 8 percent of the total recurrent budget. The balance is for administrative costs at headquarters.

The DAR has linkages with the donor agencies including the International Development Agency and the German Agency for Technical Cooperation.

## 2. Tanzania Agricultural Research Organisation

### a. Organisational structure and purpose

The Tanzania Agricultural Research Organisation (TARO) was established by an act of Parliament in 1980 as a semi-autonomous research organisation to undertake and coordinate all crop research in the United Republic of Tanzania. It is headed by a Director General who reports to the Minister of Agriculture through the board of directors. TARO is headquartered in Dar es Salaam and has twelve research stations. At headquarters, there are financial, administrative and scientific divisions, each headed by a director. Each research station runs at least one research programme and is managed by a station director. The research stations have substations in different locations within their areas of jurisdiction. Figure 8 shows the geographical distribution of TARO/DAR/TPRI/UAC research stations and substations (crop research). Each research station has its own budget controlled by the station director.

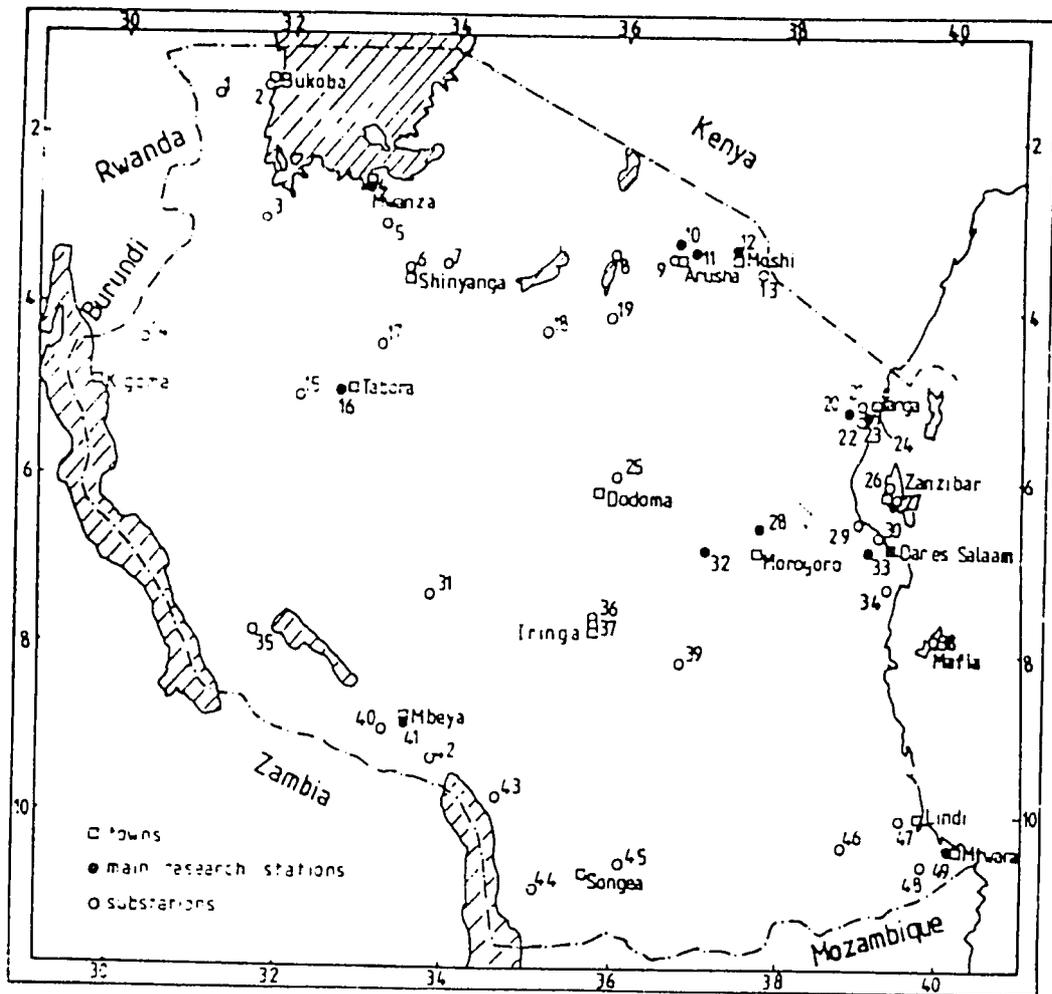
### b. Research programmes

The focus of TARO's agricultural research activities is on major food and cash crops, including maize, sorghum, millet, grain legumes, phaseolus beans, rice, wheat, root and tuber crops, oilseeds, cashew nuts, sugarcane, cotton, coffee, sisal, tea, tobacco, bananas, soils, and farming systems research. A total of 19 research programmes are conducted by TARO. About 40 percent of all professionals working at research institutions in Tanzania work for TARO.

Each commodity group and programme is headed by a national coordinator. A crop research programme coordinating committee, consisting of at least 12 agriculturists who are conversant with the crop programme, is responsible for planning the research projects, as well as for monitoring the performance and evaluating the effectiveness of the programmes.

Research and extension staff participate on a number of committees, including the crop research coordinating committees and the crop variety release committee. There is also informal collaboration and cooperation between TARO researchers and extension staff in establishing on-farm village trials. At TARO headquarters, the Chief of Research-Extension Liaison is supposed to establish linkages with extension. Under the farming systems research programme, regional and district teams consisting of research and extension staff work on on-farm adaptive research.

As the major undertaker and coordinator of crop research in the country, TARO has established informal linkages with the Sokoine University of Agriculture, the Tanzania National Scientific Research Council (TNSRC), UAC, Dakawa Agro-scientific Research and TPRI. Representatives of all these institutions participate in crop research coordinating committee meetings organised by TARO. TARO



- |                      |                    |                |
|----------------------|--------------------|----------------|
| 1. Kituntu           | 17. Mwanhala       | 33. Kibaha     |
| 2. Maruku            | 18. Hanang Complex | 34. Mkuranga   |
| 3. Bwanga            | 19. Magugu         | 35. Nkundi     |
| 4. Ukiriguru         | 20. Marikitanda    | 36. Ismani     |
| 5. Mwabagole         | 21. Maramba        | 37. Iringa     |
| 6. Mabuki            | 22. Muhera         | 38. Kilombero  |
| 7. Lubaga            | 23. Zigi           | 39. Ifakara    |
| 8. Mwamali           | 24. Kizugu         | 40. TAC site   |
| 9. Mto wa Wao        | 25. Mlingano       | 41. Mbimba     |
| 10. Arusha           | 26. LBS Tanga      | 42. Uyoie      |
| 11. TPRI             | 27. Hombolo        | 43. Mitulula   |
| 12. Tengete          | 28. Selem          | 44. Igeri      |
| 13. Lyamungu         | 29. Bambi          | 45. Ndengo     |
| 14. Lambo Estate     | 30. Dakawa         | 46. Suluti     |
| 15. Mtwaleni         | 31. Chambezi       | 47. Nachingwea |
| 16. Kasulu           | 32. Mpiji          | 48. Nj'apa     |
| 17. Urambo Seed Farm | 33. Chunya         | 49. M'pwa      |
| 18. Tumbi            | 34. Iflonga        | 50. Nalindede  |

TANZANIA: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

Figure 8: Locations of Agricultural Research Stations

Source: Ministry of Agriculture and Livestock Development, Government of Tanzania, 1984.

collaborates with IAC on crop research, especially on maize, phaseolus beans, rice, farming systems research and soils, and with Dakawa Agro-scientific Research on rice. TARO collaborates with TPRI on pesticides research and with NAFCO, TANSEED, TOSCA, and TANWAT on seed production and quality.

TARO has bilateral relationships with various international research centres and organisations like USAID, Italy, ODA, CIDA, IITA, CIMMYT, and ICRISAT.

c. Human resources

TARO is the largest research institution in Tanzania, with a total staff of 1,934. The cadres involved, the categories of professional and technical staff, are similar to those in the DAR. However, TARO classifies researchers with a minimum of a bachelor's degree as Scientific Officers rather than as Research Officers.

In 1983-84 TARO had 139 professional staff, of whom 46 (33 percent) were expatriates. Female professionals accounted for about 19 percent of the staff. The major disciplines covered are crop breeding (32), agronomy (40), soils (23), pathology (17), entomology (12), agricultural economics (6), and engineering (6).

The number of nationals in training in 1983-84 was 51. Five were studying for doctorates, 21 for master's degrees, 18 for bachelor's degrees and seven for diplomas. TARO has a five-year plan for training additional professionals, which includes 15 for doctorates, 30 for master's and 80 for bachelor's degrees. About 400 technicians are also to be trained within this period.

d. Research facilities

(1) Land

TARO has twelve research stations and twelve substations conducting crop research in different agro-ecological zones. The stations' sizes vary according to the availability of land. The largest station, including substations, is at Tumbi, and has about 160 ha of land. The total land area of all the stations is 8,356 ha, of which about half is left idle and half is cultivated. Of the cultivated land, only 140 ha are irrigated. Two-thirds of the cultivated land are used for commercial production and a third is used for experimental plots and seed multiplication.

(2) Buildings

Most of the TARO research stations are well established, some dating back as far as the late 1930s. These stations are adequately supplied with administrative and scientific offices, laboratories, meeting rooms and staff houses, all in fair condition. There are about 47 administrative offices with a capacity

of 100 people, and scientific offices with a capacity for 255 people. The stations also have ten meeting rooms with a capacity of about 20 people each.

Laboratories for soil science, entomology and plant pathology research are also available at Mlingano, Lyamungu, Ukiriguru, Ilonga, Naliendele and Katrin; they have a total area of 290 m<sup>2</sup>.

The stations also have plant and vehicle maintenance workshops with a total space of about 300 m<sup>2</sup>.

### (3) Equipment

None of the TARO stations' equipment has a replacement value of US\$ 5,000 except for their tractors and motor vehicles.

Individual crop scientists have programmable Texas Instruments or Hewlett-Packard calculators.

There is an Apple II micro-computer located at the Ilonga research station.

### (4) Library and publications

Before the establishment of TARO when all the TARO research stations were under the DAR, they shared the central library at the Ministry headquarters. Some of the stations (Ilonga, Katrin, Ukiriguru, Mlingano, Naliendele and Lyamungu) maintained small libraries which were supplied with books and journals from the central library.

TARO is developing a documentation and publication section at the headquarters as part of its library services. This section will coordinate purchases of journals and books with the institute libraries. It is estimated that the institute libraries have a total of 6,000 books and about 100 acquisitions per year.

While plans to establish the Tanzania Journal of Agronomy are underway, the only publications available at present are research reports and monographs. Scientists are also free to publish in international journals.

TARO has access to library facilities of the Sokoine Agriculture University, the MOALD and the Tanzania National Scientific Council in the country, and to the international agricultural research institute libraries (e.g., IRRI, IITA, ICRISAT, CIMMYT and TDRI) outside the country.

#### e. Financial resources

In the 1983-84 fiscal year, TARO had an operating budget of US\$ 3.6 million, of which only about US\$ 1.0 million was

spent on the research programmes. About half of this amount is spent on food crops and farming systems and the rest on soils and cash crops.

### 3. Tanzania Livestock Research Organisation

#### a. Organisational structure and purpose

The Tanzania Livestock Research Organisation (TALIRO), like TARO, was established by an act of Parliament in 1980 as a semi-autonomous research organisation to direct and manage all livestock research for the country. It is headed by a Director General who reports to the MOALD's Minister through the board of directors. The TALIRO's headquarters are at Temeke, Dar es Salaam; it has three research stations. Its research and training activities formerly were to be coordinated and monitored by the research and training division of the Ministry of Livestock Development. This Ministry has now merged with the Ministry of Agriculture to become the Ministry of Agriculture and Livestock Development. With the merger of the two ministries it is anticipated that the two directorates of research and training and, possibly, TARO and TALIRO, will also merge into one agency.

The Livestock research stations have substations and are headed by station directors who administer the station budgets.

#### b. Research programmes

The emphasis in TALIRO is on applied livestock research activities around the country. The programmes aim at identifying solutions to constraints which limit the development of the livestock industry. There are five main programme areas: breeding of various classes of livestock, range and pasture development, animal nutrition, vaccine production, and pest and disease control.

TALIRO formulates its research plans based on the priorities indicated by the MOALD's directorates of research, training and extension services. There is, therefore, a formal linkage between TALIRO and these directorates of the Ministry.

At the field level, the extension service provides an informal link between the livestock researchers and farmers.

TALIRO has informal linkages with the Sokoine Agricultural University in their training programme by providing research facilities for advanced-degree students and by supervising them. They also collaborate in research. It has been suggested that areas of technical collaboration between TARO and TALIRO be identified. There could be joint council meetings and joint project preparation, especially for programmes like farming systems research. The Tanzania National Scientific Research Council (TNSRC) coordinates the

two research organisations; it has been recommended that the TNRC take the above initiative.

TALIRO has bilateral cooperation with a number of international and regional centres and organisations, including SAREC, ILCA, FAO, IAEA, IDRC, ICIPE, ISNAR and SADCC.

c. Human resources

TALIRO is the second largest research institution in Tanzania, with a total research staff of 820, including senior technical, administrative, technical and support staff. The distribution of the staff into the various cadres is shown in Table 7. Only one of the 60 professionals is an expatriate.

The technical staff who are directly involved in research fall into three categories: the professional cadre, who are BSc degree-holders; Field Officers, who are diplomates, and the Field Assistants, who are certificate-holders.

In 1983-84, this institution had two vacant posts in the professional cadre and 23 in administration. It had a total of 15 professionals in training, including two for doctorates, five for master's degrees and eight for bachelor's degrees as of June 30th, 1984. In addition, 27 technicians, three with specialised skills, were in training.

TALIRO has a five-year plan for training additional personnel including 10 for doctorates, 25 for master's degrees, 19 for bachelor's degrees and 90 technicians at the diploma and certificate levels.

d. Research facilities

(1) Land

TALIRO has a total of 10,043 ha of pasture land at its three stations. Most of the land (9,811 ha) is at the Livestock Production Research Institute at Mpwapwa; 200 ha are at the Animal Disease Research Institute at Temeke, Dar es Salaam. The Tsetse-Trypanosomiasis Research Institute in Tanga has only 32 ha of land. Some land is also available at the Livestock Research Centres (LRCs) in Tanga, Malva and West Kilimanjaro, and at the Veterinary Investigation Centres (VICs) in Mtwara, Iringa, Arusha, Mpwapwa and Mwanza.

(2) Buildings

TALIRO has very limited office facilities with a total of about 85 offices. It has laboratory facilities for toxicology, nutrition and Foot and Mouth Disease at the the different research stations with 800 m<sup>2</sup> of floor space.

Other facilities include stores, workshops, carpentry shades and a dispensary. Livestock facilities consist of one godown, one shade for young calves, three cattle dips, one milking parlour, a hide shed and a haybarn. Specialised equipment includes an atomic absorption spectrometer and irradiation source.

### (3) Library and publications

No information was provided on library facilities within the institution. However, TALIRO has access to MOALD's library and to the Sokoine Agricultural University library. They also have access to OAI and IBAR scientific abstracts.

There is no official livestock journal in Tanzania. The only available publications on livestock research are the research reports, research monographs and extension-related publications. A very comprehensive monograph on the genotypic and phenotypic characterisation of the Mpwapa breed of cattle was prepared in 1983. An extension publication, "The Progressive Stockman," was also prepared.

#### e. Financial resources

In 1983-84 TALIRO had a total recurrent budget of US\$ 2.729 million. This covers the research programmes, wages and salaries, maintenance and upkeep of stations, and utilities.

### 4. Uyole Agricultural Centre

#### a. Organisational structure and purpose

The Uyole Agricultural Centre (UAC) is a semi-autonomous regional agricultural research and training centre, established by an act of Parliament. It has the responsibility for research, training and extension related to improving crop and livestock production in the southern highlands, consisting of four regions: Mbeya, Iringa, Ruvuma and Rukwa. It is headed by a Director who reports to the MOALD through the board of directors.

The UAC has its central headquarters at Uyole in Mbeya and eight branches at various localities in the regions.

#### b. Research programmes

The UAC conducts applied research on crop and livestock production. It has a total of 10 research programmes, of which seven deal with crops, two with livestock and one with soils. The UAC's professional effort is allocated to the various research programmes in the following manner: 18 FTEs (50 percent) in crops; 8 FTEs (22.2 percent) in livestock; and 10 FTEs (27.8 percent) in multidisciplinary programmes.

The crop research programmes include maize, rice, phaseolus beans, potatoes, wheat/triticale, fruits and vegetables. These cover breeding, agronomy, crop protection and on-farm research in the southern highlands.

The livestock programmes concentrate on pasture development and pasture nutritive value studies for dairy cattle.

The soils programme and soils survey include soil mapping and classification and soil micronutrient studies.

The UAC is the only research institution with an extension section and an extension specialist. This specialist relates to regional extension services, and organises meetings, demonstrations and on-farm trials with the regional extension services. The institution produces a number of extension leaflets.

The UAC collaborates with TARO, TALIRO and TPRI in related research activities. All four institutions participate in the crop research coordinating committee.

The UAC collaborates with training institutions in matters relating to training, field practicals and the teaching of special courses.

The UAC has established linkages with donor countries and international organisations such as the Nordic countries, CIMMYT, ICRISAT, CIAT and IIP. These involve short training courses, exchange of research materials and nurseries, conferences, workshops and seminars.

c. Human resources

The UAC had a total staff of 357 as of June 30th, 1984. Of these, 39 were professional research officers, including one expatriate. Thirty-six of the professional staff were engaged in full-time research. There were 17 vacant posts, three of them in the professional cadre.

The institution has an established plan to develop research manpower. There were 11 staff in training; four of them were professionals, including one for a master's and three for bachelor's degrees. A five-year training plan for additional personnel includes five for doctorates, seven for master's degrees, seven for bachelor's degrees and ten for diplomas.

d. Research facilities

(1) Land

Including its centre, eight subcentres and branches, the UAC has a total of 4,095 ha of land in four different agro-ecological zones in the southern highlands. Most of the land (3,351 ha) is in the high-rainfall (over 1000 mm) and high-altitude agro-ecological zones. The main station and five subcentres are located in this category. The main centre has 2000 ha of land. The rest of the land is at two subcentres in low- and medium-altitude areas, where average rainfall is in the 600 to 1000 mm range.

About one-fifth of the total area is cultivated dryland. The amount of irrigated land is negligible. About one-tenth of the cultivated land is for experimental plots; the rest is for seed multiplication and commercial production. About two-fifths of the total is pasture/range land, and two-fifths is idle.

(2) Buildings

The UAC is well supplied with research and training offices, laboratories, greenhouses, workshops and livestock facilities.

It has a research block, consisting of 50 rooms with a capacity of 70 people, a small meeting room with a capacity of 30 people, and five research laboratories with a total floor space of 800 m<sup>2</sup>. There are also three greenhouses for pathological and entomological studies and 10 cold chambers for seed storage. A workshop with 1,200 m<sup>2</sup> of floor space is available for the repair and maintenance of vehicles and equipment.

Livestock facilities include a livestock research building, milking parlour, livestock shades, hatchery and paddocks.

The only data processing equipment available are four programmable Texas Instruments T-57s.

(3) Library and publications

The UAC has a library at the main centre with approximately 3,000 books: it acquires about 100 more per year. It receives about 40 periodicals and scientific journals per year.

The UAC research staff have access to information from Sokoine Agricultural University, TNSRC, TPRI, TARO and TLS within the country, as well as from NORDIC, CIAT, CIMMYT, and CIP outside the country.

The only published information from the institution is contained in research reports and extension-related publications.

e. Financial resources

The operating budget of the IAC in 1983-84 was US\$ 3.3 million. About 46 percent of this was direct government allocation; 24 percent came from the institutions' own revenue and the rest came from outside donors, mainly the Nordic countries.

Most of the funds allocated from the Treasury are expended on wages and salaries, station upkeep and utilities. The research programmes receive about one-third of the operating budget: about 70 percent of this comes from outside donors.

5. Tropical Pesticides Research Institute

a. Organisational structure and purpose

The Tropical Pesticides Research Institute (TPRI), formerly a regional centre under the East African Community, was established by an act of Parliament as a semi-autonomous, specialised institute for pesticides research. It is headed by a Director who reports to the MOALD through the board of directors of the institute. TPRI's main station is Arusha; it has two field substations for mosquito and tsetse research at Magugu and Mto wa Mbu, both also in the Arusha Region.

h. Research programmes

TPRI responsibilities include: research on pesticides behaviour; entomology of mosquitoes, tsetse, ticks and crop pests; service functions related to plant quarantine and the national herbarium; and regulatory functions with respect to pesticide registration and control. The Institute conducts 14 research programmes within these broad areas.

TPRI collaborates regularly with the bird and pest control units of the MOALD in its research activities in these fields.

TPRI scientists collaborate very closely with Sokoine Agricultural University, TARO, UAC and TALIRO in related disciplines. They also attend the crop research coordinating committee meetings.

TPRI has bilateral relations with several international research institutions. These include: the Istituto di Biologia Vegetale, University of Pisa, Italy; the International Laboratories Research on Animal Diseases; the Tropical Development Research Institute (TDRI) in the UK; and the ICIPE.

c. Human resources

In 1983-84 TPRI had a total of 296 staff, of whom 32 were professional research officers and 12 were technical staff, all nationals. There were 31 vacant posts, including two for professionals and 24 for technical staff.

The Institute had eight staff in training: three professionals, one technician and five in management administration. It has a plan (1981-82 to 1985-86) to develop additional personnel. Seventy-eight staff are supposed to be trained within this time, including seven for doctorates, 11 for master's degrees, and two for bachelor's degrees. In addition, 30 technicians and 19 others will be trained in specialised fields.

d. Research facilities

(1) Land

Since TPRI has very limited field research, only a small amount of land is allocated for its use. Situated in the northern fertile volcanic ashes (eutric nitosols) averaging 600 to 1000 mm of rain per year, the Institute has a total of 23.5 ha, of which 21.5 ha are cultivated and 2 ha are idle. Of the cultivated land, 9.5 ha are used for experimental plots and 12 ha for commercial production of food crops.

(2) Buildings

TPRI is well supplied with very modern buildings. The administrative, research and technical buildings consist of 83 rooms with a capacity of about 135 people, all of which are in very good condition. There is one conference room with a capacity of 300 people, used mainly for scientific conferences and staff meetings. The buildings somewhat exceed the actual requirements of TPRI, since they were designed for a regional institute.

The Institute is also well-equipped with laboratories and greenhouses. These include: two chemistry laboratories, with a total floor space of 1,650 m<sup>2</sup>; a physics and an engineering laboratory, with a floor space of 30 m<sup>2</sup> each; 10 agricultural research laboratories, with 200 m<sup>2</sup> of floor space; and one medical/veterinary laboratory, with 400 m<sup>2</sup> of floor space. Two greenhouses, with a total floor space of 65 m<sup>2</sup>, are used for botany and plant pathology.

Other service facilities include a hostel, stores, a shop, four workshops, a fuel storage tank and an aircraft hangar. There are also some specialised facilities, such as houses for small animals (rabbits and guinea pigs) and insect/vector colonies' houses.

### (3) Equipment

The institute has some specialised field and laboratory equipment, including: two gas liquid chromatographs, six spectrophotometers and two climatic chambers. A significant part of the laboratory equipment, however, is obsolete.

Field equipment includes one Cessna spray aircraft and a number of trucks and vehicles.

### (4) Library and publications

TPRI has a library at the main station with an estimated total of 750 books and about 50 acquisitions per year. It receives about 100 periodicals and scientific journals and 6,000 reprints annually.

It has access to the libraries of TLS, TARO, TALIRO, TNSRC and Sokoine Agricultural University.

Information sources outside the country include the British Council, ILRAD and ICIPE in Nairobi, and the National Agricultural Research Center in Beltsville, Maryland, US.

The only publications available from the Institute are research reports and monographs.

#### e. Financial resources

In 1983-84 TPRI had a recurrent (operating) budget of US\$ 0.988 million. Most of this money comes from direct government allocation and a very small portion from the Institute's own revenue. The majority of the operating budget is allocated for personnel emoluments and station upkeep. Only about one-quarter of the budget is spent directly on research programmes.

## 6. Tanzania Fisheries Research Institute

### a. Organisational structure and purpose

The Tanzania Fisheries Research Institute (TAFIRI) is a semi-autonomous research institution in the Ministry of Land, Natural Resources and Tourism, with the responsibility for conducting fisheries research in the United Republic of Tanzania. It is headed by a Director General who reports to the Ministry through the board of directors.

TAFIRI's headquarters is at Dar es Salaam; it has four research stations. Three research stations, at Kigoma, Mwanza, and Kyela, conduct freshwater fisheries research; and the one at Dar es Salaam conducts marine fisheries research. The main research station is at Kigoma.

b. Research programmes

TAFIRI has three main research programmes: Inland Fisheries, which involves fish stock assessment, statistics and fisheries biology; Marine Fisheries, with the objective of researching abundance, distribution, fishery potential and biology; and Aquaculture, which investigates the culture of freshwater and marine fish and methods to improve the fish culture species.

TAFIRI collaborates with fisheries extension staff in training and library matters. They hold joint seminars and meetings to approve and monitor research projects.

TAFIRI collaborates with training staff on student matters, and assists in the teaching of special courses. They collaborate with TAFICO, TNSRC, the Bureau of Resources Assessment and Land Use Planning (BRALUP), and the University of Dar es Salaam, as well as with the Dutch and SADC regional programmes.

c. Human resources

In 1983-84, TAFIRI had a total of 136 staff including 12 research professionals and six technicians, all of whom are nationals. There are 54 vacant posts including three for professionals and two for technicians.

Of the 12 professional research scientists, nine are involved in inland fisheries, two in marine fisheries and one in aquaculture.

The Institute has a training programme to develop additional personnel, especially of the professional cadre. In 1983-84 they had seven staff members in training, including four professionals and three technicians. The Institute intends to train 36 staff, including four for PhDs, five for master's degrees, two for bachelor's degrees, fifteen to be technical staff and ten in specialised fields.

d. Research facilities

(1) Buildings

TAFIRI has about 20 offices for administrative staff, with a capacity of 29 people, a meeting room with a capacity of 60 people, and a general laboratory with floor space of 200 m<sup>2</sup>. Other specialised facilities include two shops with a total floor space of 32 m<sup>2</sup> and fish processing facilities in good condition.

(2) Equipment

The Institute owns three boats and four cold rooms, each with a replacement value of more than US\$ 5,000. It also has seven Land Rovers and two Volkswagens. There is one Hewlett Packard (HP 21) programmable calculator.

### (3) Library and publications

TAFIRI has libraries at all the stations, with a total number of about 1,000 books and 50 new acquisitions per year. The only published information from the Institute are annual research reports and research project reports.

#### e. Financial resources

In 1983-84, TAFIRI had a recurrent (operating) budget of US\$ 0.32 million, drawn entirely from the Government of Tanzania.

### 7. Tanzania Forestry Research Institute

#### a. Organisational structure and purpose

The Tanzania Forestry Research Institute (TAFORI) is a semi-autonomous research institute in the Ministry of Lands, Natural Resources and Tourism, which is responsible for conducting forestry research in the United Republic of Tanzania. It is headed by a Director General who reports to the Ministry through the board of directors.

TAFORI has its headquarters at Kibaha in Dar es Salaam. In addition, it has two research stations: a silvicultural research station in Lushoto and a utilisation research station in Moshi.

#### b. Research programmes

TAFORI conducts 13 research programmes in different aspects of forestry. These include: seeds and nurseries; forest protection; plantation management; ecology; natural and artificial regeneration; tending, growth and yield of indigenous forests; wood preservation; soils and ecological studies; wood energy; tree improvements; dry area afforestation; timber seasoning; botany and herbarium; physical and mechanical properties of wood products; and wood structure and anatomy.

#### c. Human resources

In 1983-84 TAFORI had a total staff of 282, including 20 professional Research Officers and 65 technical staff, all nationals. There were three professionals and three technical staff in training. However, the Institute has no plan to train additional personnel.

d. Research facilities

(1) Land

The Institute has a total of 20 ha of land at the Lushoto silvicultural research station. The research station in Moshi has only 0.25 ha of land for the utilisation machinery for timber processing.

(2) Buildings

The Institute has only 16 offices with a capacity for 20 people. These are very small offices, all in fair condition. Two laboratories, with a total of 25 m<sup>2</sup> of floor space, are also available.

(3) Equipment

The only valuable equipment possessed by the Institute are deep freezers for seed storage, timber testing equipment and some Land Rovers and tractors.

(4) Library and publications

TAFORI has libraries at the silvicultural research station in Lushoto and at the utilisation station in Moshi, with a total number of about 1,000 books and 25 new acquisitions per year. The libraries receive approximately 50 periodicals and scientific journals annually.

The Institute has access to inter-library loans from the TLS and Sokoine Agricultural University within the country and from international information centres outside the country.

The only published information from the Institute is in the form of annual research reports and research project reports.

e. Financial resources

In 1983-84, TAFORI's total recurrent (operating) budget was US\$ 0.345 million. All of these funds were from the Government of Tanzania.

C. Total Human Resources Available for Research in Tanzania

1. Staffing patterns

The total number of staff of the seven research institutions surveyed in this chapter is 4,008. (See Table 8.) This includes 838 administrative staff, 353 professional staff, 794 technical staff (diplomates) and 2,023 support staff.

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Table 8: Total Agricultural Research Staff, 1984

	<u>Administrative</u>	<u>Professional<sup>a</sup></u>	<u>Technical<sup>b</sup></u>	<u>Support Staff</u>	<u>Total</u>
<u>Total Authorised Posts</u>	951	376	908	2,132	4,367
<u>Positions Vacant</u>	106	58	52	126	342
<u>Nationals (Citizens)</u>					
Staff in training <sup>c</sup>	9	46	68	3	126
Staff on long-term leave <sup>d</sup>	-	1	1	-	2
Number of nationals currently in posts	837	276	793	2,003	3,909
Expressed as a percent of authorised posts	88	73	88	94	90
<u>Expatriates</u>					
Serving in authorised posts <sup>e</sup>	1	4	-	-	5
Expressed as a percent of authorised posts	.1	1	-	-	.1
Not in authorised posts	-	73	1	20	94
Total number of expatriates	1	77	1	20	99
<u>Total Number of Staff</u>	<u>838</u>	<u>353</u>	<u>794</u>	<u>2,023</u>	<u>4,008</u>

<sup>a</sup>Professional = BSc or above.

<sup>b</sup>Technical = diplomate.

<sup>c</sup>In some cases staff in training are also counted in authorised posts.

<sup>d</sup>Long-term leave is leave of three months or more.

<sup>e</sup>Irrespective of source of funds.

Source: Data collected from the DEVRES/SADCC Agricultural Research Resource Assessment, 1984.

About 20 percent of the professional staff, those with BSc degrees or above, are expatriates, a lower percentage than in other SADCC countries.

The programme focus of the professional research staff effort is shown in Table 9. Nearly one-third of the professional effort is directed to food crops research, 16 percent to livestock/pasture research and less than 8 percent to commercial crops.

The academic training of the professionals engaged in research, shown in relation to programme area research currently being conducted, is shown in Table 10. Table 11 classifies the research professionals by the academic disciplines of the highest degree held by each.

Of the 237 professional researchers who were Tanzanians, 120 held BSc degrees, 98 held Master's and 19 held PhDs. Of the 78 expatriates, 30 held BScs, 20 held MScs and 18 held PhDs. (See Table 10.)

The vast majority (64 percent) held degrees in plant/soil sciences: only 12 percent held degrees in Animal or Veterinary Sciences. (See Table 11.)

An examination of Table 11 shows there are 64 female agricultural research professionals in Tanzania, representing 18 percent of the total; of these, 48 have BSc degrees and 16 have MScs. There are no women with PhDs.

## 2. Staff training

The staff training plans, and the numbers of those currently in training, have already been discussed for each of the seven institutions. Table 12 represents the summation of these plans.

## D. Total Financial Resources Available for Research in Tanzania

The budgets for each of the research institutions and their funding source has been shown in Table 7 and discussed in the section on financial resources of each institution. Overall, US\$ 12.3 million was allocated to the seven institutions this year from GOT and programme income.

An indication of which programme areas have been supported by the various donors can be seen in Table 9.

TANZANIA: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

Table 9: Summary of Professional Staff Effort and Source of Funds by Programme Area of Agricultural Research, 1984<sup>a</sup>

<u>Commodity-Related Programme Area</u>	<u>FTE<sup>b</sup></u>	<u>Source of Funds</u>	<u>Percentage of National Research Effort</u>
<u>Food Crops</u>			
Rice	25	GOT, DPRK	8.2
Maize	14	GOT, USAID	4.6
Sorghum	5	GOT	1.6
Millet	2	GOT	0.6
Pulses	18	GOT, NORDIC, USAID	5.9
Fruit/vegetables	11	GOT, Netherlands	3.6
Oilseeds	10	GOT, UK	3.3
Root and tuber	3	GOT, NORDIC	1.0
Wheat	9	GOT, CTDA, NORDIC	2.9
Barley	1	GOT	1.0
Subtotal, Food Crops	<u>98</u>		<u>32.7</u>
<u>Commercial Crops</u>			
Cotton	9	GOT	2.9
Sugarcane	6	GOT	2.0
Coffee	10	GOT, EEC	3.3
Tobacco	9	GOT	2.9
Cashew nuts	6	GOT, Italy	2.0
Tea	2	GOT	0.6
Pyrethrum	2	GOT	0.6
Coconut	24	GOT, FRG	7.8
Sisal	4	GOT	1.3
Vines	2	GOT, Bulgaria	0.6
Subtotal, Commercial Crops	<u>74</u>		<u>24.0</u>
<u>Forestry and Fisheries</u>			
Inland fisheries	9	GOT	2.9
Marine fisheries	2	GOT	0.6
Aquaculture	1	GOT	0.3
Forestry	12	GOT, Danida, IDRC	3.9
Subtotal, Forestry and Fisheries	<u>24</u>		<u>7.7</u>

Table 9: Summary of Professional Staff Effort and Source of Funds by Programme Area of Agricultural Research, 1984<sup>a</sup> (cont.)

<u>Commodity-Related Programme Area</u>	<u>FTE<sup>b</sup></u>	<u>Source of Funds</u>	<u>Percentage of National Research Effort</u>
<u>Livestock/Pasture</u>			
Beef cattle	8	GOT	2.6
Dairy cattle	5	NORDIC	1.6
Sheep	2	GOT	0.6
Goats	3	GOT	1.0
Pasture management	10	GOT	3.3
Swine	2	GOT	0.6
Veterinary	<u>19</u>	GOT	<u>6.2</u>
Subtotal, Livestock/Pasture	<u>49</u>		<u>15.9</u>
<u>Other Programme Areas</u>			
Farming systems	11	GOT, USAID, NORDIC	3.6
Land/water conservation	17	GOT, Netherlands	5.6
Farm storage	3	GOT	1.0
Rural technology	1	GOT	0.3
Agricultural pesticide research	10	GOT	3.3
MED/Vet pesticide research	7	GOT, WHO	2.3
Chem/Physical pesticide research	<u>11</u>	GOT, IAEA	<u>3.6</u>
Subtotal, Other Programme Areas	<u>60</u>		<u>19.7</u>
TOTAL	<u>305</u>		<u>100.0</u>

<sup>a</sup> Professional staff are those with a BSc degree or above.

<sup>b</sup> FTE = Full Time Equivalent.

Source: Data collected from the DEVRES/SADCC Agricultural Research Resource Assessment, 1984.

## TANZANIA: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

Table 10: Disciplines of Professional Staff Related to Agricultural Research Programme Area, 1984

<u>Programme Area</u>	<u>Discipline Areas</u>	<u>Number of Professionals<sup>a</sup></u>						<u>Total</u>
		<u>Nationals</u>			<u>Expatriates</u>			
		<u>BSc</u>	<u>MSc</u>	<u>PhD</u>	<u>BSc</u>	<u>MSc</u>	<u>PhD</u>	
<u>Food Crops</u>								
Rice	Crop science-breeding, agronomy, pest and disease control and weed control. Farming systems research, and irrigation development and water management.	5	4	1	14	1	-	25
Maize	Crop science-breeding, agronomy/soil fertility, plant protection and farm research.	5	6	1	1	-	1	14
Sorghum	Crop science-breeding, agronomy, pest and disease control and on-farm research.	2	1	1	-	-	1	5
Millet	Crop science-selection, breeding, agronomy and on-farm research.	1	1	-	-	-	-	2
Pulses (bean cowpeas)	Crop science-breeding, agronomy, pathology, entomology and on-farm testing.	5	11	2	-	-	-	18

TANZANIA: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

Table 10: Disciplines of Professional Staff Related to Agricultural Research Programme Area, 1984 (cont.)

<u>Programme Area</u>	<u>Discipline Areas</u>	<u>Number of Professionals<sup>a</sup></u>						<u>Total</u>
		<u>Nationals</u>			<u>Expatriates</u>			
		<u>BSc</u>	<u>MSc</u>	<u>PhD</u>	<u>BSc</u>	<u>MSc</u>	<u>PhD</u>	
<u>Food Crops (cont.)</u>								
Fruit and Vegetables	Crop science-clonal and seed selection and pest and disease control.	7	3	-	1	-	-	11
Oilseeds (groundnuts, sesame, sunflower)	Crop science-breeding, agronomy and crop protection.	5	1	-	2	1	1	10
Root and tuber (cassava and potatoes)	Crop science-breeding, (clonal/cultival selection), agronomy, crop protection and on-farm testing.	1	1	1	-	-	-	3
Wheat and barley	Crop science, germplasm evaluation and selection, agronomy, crop protection. Soil and water management and agro-mechanization.	2	1	1	2	2	2	10
		—	—	—	—	—	—	—
Subtotal, Food Crops		<u>33</u>	<u>29</u>	<u>7</u>	<u>20</u>	<u>4</u>	<u>5</u>	<u>98</u>

TANZANIA: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

Table 10: Disciplines of Professional Staff Related to Agricultural Research Programme Area, 1984 (cont.)

<u>Programme Area</u>	<u>Discipline Areas</u>	Number of Professionals <sup>a</sup>						<u>Total</u>
		<u>Nationals</u>			<u>Expatriates</u>			
		<u>BSc</u>	<u>MSc</u>	<u>PhD</u>	<u>BSc</u>	<u>MSc</u>	<u>PhD</u>	
<u>Commercial Crops</u>								
Cotton	Crop science-breeding, agronomy/soil fertility, pathology, entomology and fibre testing.	4	5	-	-	-	-	9
Coffee	Crop science-breeding, agronomy, pathology, entomology and agricultural chemistry.	2	3	1	2	1	1	10
Sugarcane	Crop science-breeding, agronomy, pathology and agro-mechanization.	4	2	-	-	-	-	6
Cashew nuts	Crop science-breeding, agronomy, crop protection and soil studies.	1	1	-	1	-	3	6
Tobacco	Crop science-breeding, agronomy and plant protection.	5	3	-	-	-	1	9

## TANZANIA: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

Table 10: Disciplines of Professional Staff Related to Agricultural Research Programme Area, 1984 (cont.)

Programme Area	Discipline Areas	Number of Professionals <sup>a</sup>						Total
		Nationals			Expatriates			
		BSc	MSc	PhD	BSc	MSc	PhD	
<u>Commercial Crops (cont.)</u>								
Tea	Crop science (botany and agronomy), crop environment and chemistry.	-	2	-	-	-	-	2
Pyrethrum	Crop science, selection, breeding (meristem tip culture), agronomy and protection.	-	1	-	-	-	1	2
19 Coconut	Crop science-breeding and seed multiplication, agronomy (plantation management) and pest and disease control.	5	4	1	5	8	1	24
Sisal	Crop science-breeding, agronomy, pathology, entomology, soil management and fibre technology.	3	-	1	-	-	-	4
Grape vines	Crop science-breeding, propagation, agronomy and pathology.	1	-	-	-	1	-	2
Subtotal, Commercial Crops		<u>25</u>	<u>21</u>	<u>3</u>	<u>8</u>	<u>10</u>	<u>7</u>	<u>74</u>

TANZANIA: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

Table 10: Disciplines of Professional Staff Related to Agricultural Research Programme Area, 1984 (cont.)

<u>Programme Area</u>	<u>Discipline Areas</u>	<u>Number of Professionals<sup>a</sup></u>						<u>Total</u>
		<u>Nationals</u>			<u>Expatriates</u>			
		<u>BSc</u>	<u>MSc</u>	<u>PhD</u>	<u>BSc</u>	<u>MSc</u>	<u>PhD</u>	
<u>Livestock/Pasture</u>								
Cattle	Animal science, breeding, nutrition, physiology and production of dairy and beef.	4	7	2	-	-	-	13
Small ruminants, (goats and sheep)	Animal science, breeding, nutrition, physiology and production.	3	2	-	-	-	-	5
Swine	Animal science, nutrition and protection.	1	1	-	-	-	-	2
Range/Pasture management	Ecology, agronomy and management.	6	4	-	-	-	-	10
Veterinary	Animal protection, pathology, entomology and epidemiology.	12	6	-	-	1	-	19
		—	—	—	—	—	—	—
Subtotal, Livestock/ Pasture		<u>26</u>	<u>20</u>	<u>2</u>	<u>-</u>	<u>1</u>	<u>-</u>	<u>49</u>

TANZANIA: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

Table 10: Disciplines of Professional Staff Related to Agricultural Research Programme Area, 1984 (cont.)

<u>Programme Area</u>	<u>Discipline Areas</u>	<u>Number of Professionals<sup>a</sup></u>						<u>Total</u>
		<u>Nationals</u>			<u>Expatriates</u>			
		<u>BSc</u>	<u>MSc</u>	<u>PhD</u>	<u>BSc</u>	<u>MSc</u>	<u>PhD</u>	
<u>Forestry &amp; Fisheries</u>								
Forestry	Seed nursery, botany and herbarium establishment, management, protection and improvement. Soils and ecological studies and wood/timber utilization.	7	4	1	-	-	-	12
Fisheries	Inland, marine and aquaculture.	5	5	2	-	-	-	12
Subtotal, Forestry & Fisheries		<u>12</u>	<u>9</u>	<u>3</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>24</u>
<u>Other Programme Areas</u>								
Farming systems research	Farm surveys and on-farm research.	3	3	-	-	-	5	11
Land and water conservation	Soil survey, soil mapping/classification and soil testing and fertility.	4	3	2	2	5	1	17
Farm storage	Crop science, post harvest pathology and entomology.	-	3	-	-	-	-	3
Rural technology	Agricultural extension.	1	-	-	-	-	-	1

TANZANIA: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

Table 10: Disciplines of Professional Staff Related to Agricultural Research Programme Area, 1984 (cont.)

<u>Programme Area</u>	<u>Discipline Areas</u>	<u>Number of Professionals<sup>a</sup></u>						<u>Total</u>
		<u>Nationals</u>			<u>Expatriates</u>			
		<u>BSc</u>	<u>MSc</u>	<u>PhD</u>	<u>BSc</u>	<u>MSc</u>	<u>PhD</u>	
<u>Other Programme Areas (cont.)</u>								
Agricultural pesticides research	Entomology, pathology, herbicide, and bird and rodent research and plant quarantine.	5	4	1	-	-	-	10
Medical/Veterinary research	Malacology, mosquito and acaricide research.	6	1	-	-	-	-	7
Chemistry pesticides	Chemistry, ecology, spraying techniques and chemical registration.	5	5	1	-	-	-	11
Subtotal, Other Programme Areas		<u>24</u>	<u>19</u>	<u>4</u>	<u>2</u>	<u>5</u>	<u>6</u>	<u>60</u>
TOTAL		<u>120</u>	<u>98</u>	<u>19</u>	<u>30</u>	<u>20</u>	<u>18</u>	<u>305</u>

<sup>a</sup>The total number of professionals does not include professionals assigned to administrative and other duties.

Source: Data collected from the DEVRES/SADCC Agricultural Research Resource Assessment, 1984.

TANZANIA: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

Table 11: Summary of Technical Skills of Agricultural Research Professionals by Degree Held, 1984

<u>Discipline Area</u>	<u>Nationals &amp; Expatriates</u>						<u>Total Professionals</u>		<u>Total</u>	<u>Total Expatriates</u>
	<u>BSc</u>		<u>MSc</u>		<u>PhD</u>		<u>F</u>	<u>M</u>		
	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>				
<u>Plant/Soil Science</u>										
General agriculture	4	12	-	4	-	1	4	17	21	2
Crop science	-	1	-	-	-	-	-	1	1	1
Crop breeding	7	7	5	18	-	10	12	35	47	16
Agronomy	4	21	3	26	-	4	7	51	58	21
Entomology	3	7	1	7	-	5	4	19	23	8
Pathology	6	9	2	10	-	3	8	22	30	7
Horticulture	1	3	1	-	-	-	2	3	5	2
Crop physiology	-	-	-	-	-	1	-	1	1	-
Nematology	-	-	-	1	-	-	-	1	1	-
Soils	4	12	1	14	-	1	5	27	32	16
Range ecology/pasture	-	3	-	2	-	-	-	5	5	-
Subtotal, Plant/Soil Science	<u>29</u>	<u>75</u>	<u>13</u>	<u>82</u>	<u>-</u>	<u>25</u>	<u>42</u>	<u>182</u>	<u>224</u>	<u>73</u>
<u>Animal Sciences</u>										
Animal sciences, general	-	1	-	1	-	-	-	2	2	-
Animal breeding	-	1	1	2	-	1	1	4	5	-
Animal nutrition	1	-	-	3	-	1	1	4	5	-
Animal pathology	-	1	-	-	-	-	-	1	1	-
Animal production	-	2	2	-	-	-	2	2	4	-
Subtotal, Animal Sciences	<u>1</u>	<u>5</u>	<u>3</u>	<u>6</u>	<u>-</u>	<u>2</u>	<u>4</u>	<u>13</u>	<u>17</u>	<u>-</u>

TANZANIA: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

Table 11: Summary of Technical Skills of Agricultural Research Professionals by Degree Held, 1984 (cont.)

Discipline Area	Nationals & Expatriates						Total Professionals		Total	Total Expatriates
	BSc		MSc		PhD		F	M		
	F	M	F	M	F	M				
<u>Other Disciplines/Fields</u>										
Veterinary science	2	16	-	8	-	-	2	24	26	1
Forestry	-	11	-	8	-	1	-	20	20	-
Fisheries	3	2	-	5	-	2	3	9	12	-
Agric. engineering	-	3	-	6	-	-	-	9	9	-
Agric. economics	2	5	-	4	-	-	2	9	11	-
Extension specialist	-	1	-	3	-	-	-	4	4	2
Statistics	-	1	-	-	-	-	-	1	1	-
Food science	-	1	-	-	-	-	-	1	1	-
General degree	4	3	-	3	-	-	4	6	10	-
Chemistry	3	2	-	3	-	1	3	6	9	-
Zoology	3	1	-	1	-	-	3	2	5	-
Botany	1	1	-	1	-	-	1	2	3	-
Physics	-	-	-	1	-	-	-	1	1	-
Subtotal, Other Disciplines/Fields	<u>18</u>	<u>47</u>	<u>-</u>	<u>43</u>	<u>-</u>	<u>4</u>	<u>18</u>	<u>94</u>	<u>112</u>	<u>3</u>
TOTAL	<u>48</u>	<u>127</u>	<u>16</u>	<u>131</u>	<u>-</u>	<u>31</u>	<u>64</u>	<u>289</u>	<u>353</u>	<u>76</u>

Source: Data collected from the DEVRES/SADCC Agricultural Research Resource Assessment, 1984.

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Table 12: Training Plans for Staff of Research Institutions, 1984

<u>Level</u>	<u>Crop Science</u>	<u>Animal Science</u>	<u>Veterinary</u>	<u>Fisheries</u>	<u>Agric. Pesticides Science</u>	<u>Med/Vet. Pesticides Sciences</u>	<u>Chemical/ Physical Pesticides Science</u>	<u>Others<sup>a</sup></u>	<u>Total</u>
Doctorate	13	8	3	4	2	2	3	3	38
Masters	28	19	8	5	4	3	4	8	79
Bachelors	68	15	20	2	1	1	-	17	107
Diploma	101	7	9	5	4	3	7	26	162
Certificate	272	21	-	10	8	6	8	68	393
Other Specialized Short courses	12	-	-	10	-	1	-	3	26

<sup>a</sup> Includes farming systems research economist, agricultural and irrigation engineers and soil, land and water conservation specialists.

Source: Manpower development projections by the various research institutions.

## IV. AGRICULTURAL TRAINING INSTITUTIONS

### A. Overview of Agricultural Training in Tanzania

In the United Republic of Tanzania, technical agricultural and veterinary training are undertaken by the Directorate of Training of the MOALD, fisheries training is undertaken by the Training Section of the Directorate of Fisheries, and forestry training is done by the Training Section of the Directorate of Forestry. The latter two are directorates of the Ministry of Lands, Natural Resources and Tourism. Degree-level training in agriculture, forestry and veterinary medicine is provided by the Sokoine University of Agriculture, which falls under the aegis of the Ministry of Education. Figure 9 is an organogram of these training institutions, showing their relationships to the Ministries. The degrees, diplomas and certificates offered by the various training institutions, and the numbers of staff and students enrolled in each programme, are shown in Table 13.

### B. Agricultural Training Institutions

#### 1. Directorate of Training of the Ministry of Agriculture and Livestock Development

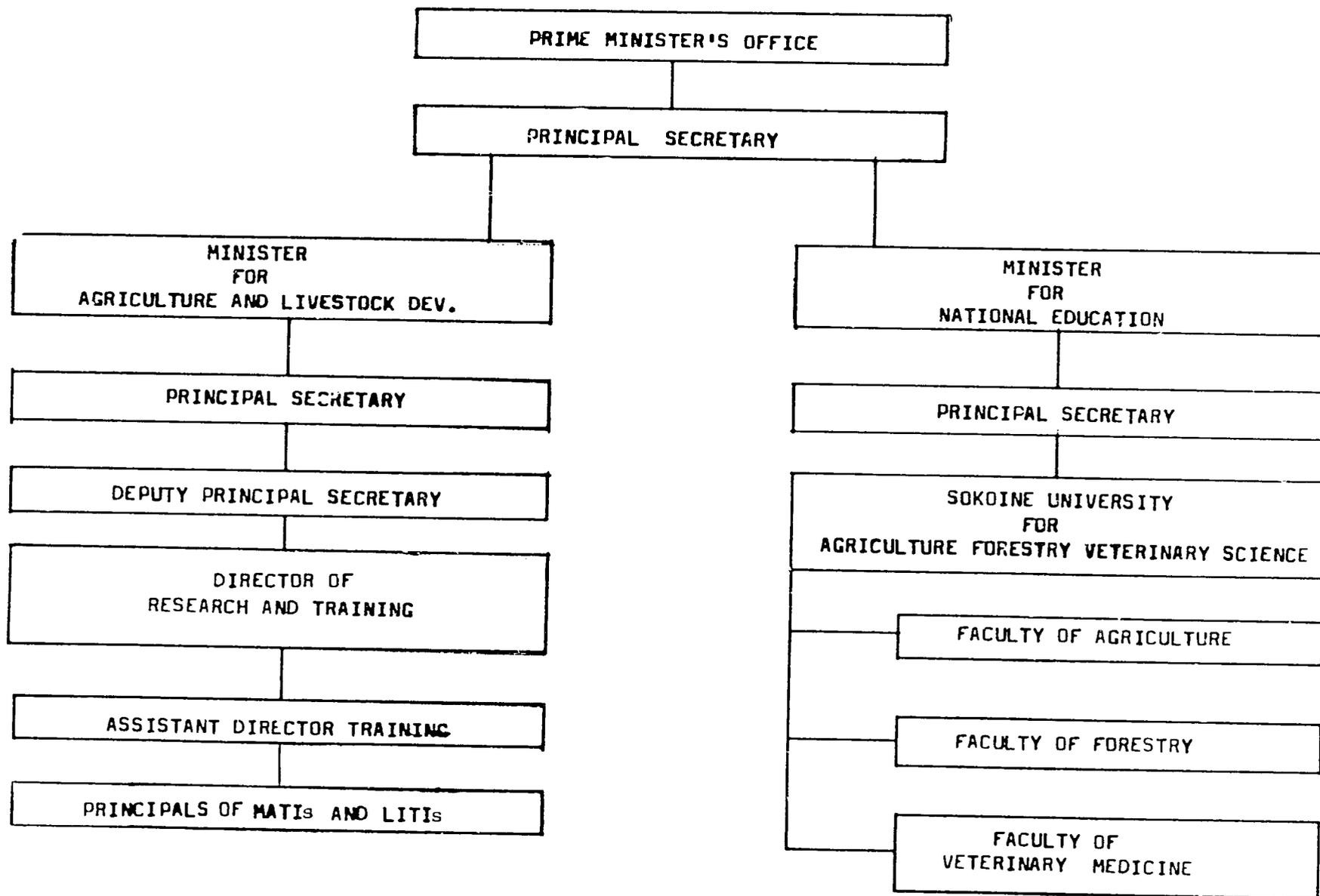
##### a. Organisational structure and purpose

The Directorate of Training of the MOALD undertakes technical (diploma and certificate) training in agriculture and livestock production. It is administrated by the Director of Manpower Development and Administration (DMDA) stationed at the headquarters in Dar es Salaam. He reports directly to the Principal Secretary of the Ministry. The Chief Training Officer is the technical director.

Agricultural training is done by the Ministry of Agriculture Training Institutes (MATIs). Training in livestock production is undertaken by the Livestock Training Institutes (LITIs). There is a total of nine MATIs and five LITIs, each headed by a principal who reports to the DMDA. In addition, the UAC training wing offers both crop and livestock courses. At the UAC, the Principal reports to the DMDA through the director of the centre and the board of directors.

##### b. Training programmes

Until 1967, technical agricultural training was limited to certificate-level training for agricultural and veterinary assistants at two training institutes: Tengeru near Arusha, and Nyegezi near Mwanza. In 1969 it was decided to increase the number of certificate courses, and to introduce diploma training programmes at some of the existing and planned training institutes. In 1970 an in-service horticultural diploma programme was started at Olmotonyi Forestry School (since moved to Tengeru) as well as a farm management diploma programme at Mlingano. By mid-1972 there were seven training



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Figure 9: Organisation Chart of Agricultural Training Institutions

Source: Data collected from the DEVRES/SADCC Agricultural Research Resource Assessment, 1984.

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Table 13: Agricultural Training Institutions: Degrees Offered, Number of Staff and Students, 1982

<u>Name of Institution</u>	<u>Degrees, Diplomas or Certificates Offered</u>	<u>Number of Staff<sup>a</sup></u>	<u>Enrollment</u>		
			<u>F</u>	<u>M</u>	<u>Total</u>
Directorate of Training, MOA	Diploma in Agriculture	389 <sup>b</sup>	86	307	393
	Diploma in Livestock	389	31	198	229
	Certificate in Agriculture	389	43	267	310
	Certificate in Livestock	389	36	169	205
Directorate of Training, Fisheries	Diploma in Fisheries, general	42 <sup>c</sup>	1	24	25
	Diploma in Boat Building <sup>d</sup>	42	--	4	4
	Diploma in Marine Engine <sup>d</sup>	42	--	4	4
	Diploma in Nautical Science <sup>d</sup>	42	--	4	4
	Diploma in Fish Processing <sup>d</sup>	42	--	4	4
	Certificate in Fisheries, general	42	4	30	34
	Certificate in Boat Building <sup>e</sup>	42	--	4	4
	Certificate in Marine Mechanics <sup>e</sup>	42	--	6	6
	Certificate in Nautical Science <sup>e</sup>	42	--	6	6
Certificate in Fish Processing <sup>e</sup>	42	--	6	6	
Directorate of Training, Forestry	Diploma in Forestry	33 <sup>c</sup>	2	33	35
	Certificate in Forestry	33	5	92	97
	Other short courses	33	--	64	64

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Table 13: Agricultural Training Institutions: Degrees Offered, Number of Staff and Students, 1982 (cont.)

<u>Name of Institution</u>	<u>Degrees, Diplomas or Certificates Offered</u>	<u>Number of Staff<sup>a</sup></u>	<u>Enrollment</u>		
			<u>F</u>	<u>M</u>	<u>Total</u>
Sokoine Agricultural University	BSc in Agriculture	137 <sup>f</sup>	22	150	172
	BSc in Forestry	137	1	70	71
	BSc in Veterinary Medicine	137	9	58	67
	MSc, PhD in Agriculture, Forestry and Veterinary Medicine	--	--	--	80 <sup>g</sup>
TOTAL		<u>601</u>	<u>240</u>	<u>1,478</u>	<u>1,798</u>

<sup>a</sup>Degree and diploma holders.

<sup>b</sup>Common teaching staff for both diploma and degree students.

<sup>c</sup>Common teaching staff for both diploma and certificate.

<sup>d</sup>Enrollment every third year - figure represents yearly average.

<sup>e</sup>Started in July 1984 with enrollments scheduled every second year. Figures are projected yearly averages and are not included in total.

<sup>f</sup>Common teaching staff for Agriculture, Forestry and Veterinary Medicine.

<sup>g</sup>Enrollment in MSc and PhD programs are not differentiated among fields of study.

Source: Data collected from the DEVRES/SADCC Agricultural Research Resource Assessment, 1984.

institutes providing certificate courses in agriculture and livestock production: Nyegezi and Ukiriguru in general agriculture; Maruke in general agriculture, emphasising tea; Tumbi in general agriculture, emphasising tobacco; Ilonga in food science and nutrition; Mpwapwa in veterinary and animal husbandry; and Tengeru in dairy science.

There currently are nine MATIs which offer certificate courses in general agriculture and specialised diploma courses in various fields of agriculture. The five LITIs offer certificate courses in veterinary and dairy science, and diplomas in various fields of animal production. The UAC offers a certificate course in general agriculture, and has diploma programmes in crop production, home economics and animal production. There are a few other specialised agricultural diploma programmes being offered at various institutes, including: agro-mechanisation, irrigation and land use planning at MATI/Nyegezi; farm management and agro-mechanisation at MATI/Mlingano; animal health at LITI/Mpwapwa; range management at LITI/Morogoro; and veterinary laboratory technology at LITI/Temeke.

Between 1980 and 1982, an annual average of 392 and 221 certificates were granted in agriculture and livestock, respectively; 333 and 143 diplomas were awarded in agriculture and livestock, respectively.

The diploma and certificate courses are both two-year programmes, differing only in admission requirements. For diploma courses an advanced-level certificate of education (Form IV) and two principal passes in science subjects, or an ordinary-level certificate (Form IV) and an in-service agricultural certificate, are required for admission.

For certificate courses, an ordinary-level certificate of education (Form IV secondary education) and two credit passes in science subjects (agricultural biology, chemistry, or physics) are required. Most certificate-level students come from rural areas.

Due to the low demand for diplomates in home economics and food science and nutrition, there are plans to phase out these two training programmes.

The Directorate collaborates with extension in several ways. Its MATIs and LITIs offer refresher courses for extension staff at the MATIs and LITIs; MATI and LITI students undertake their field practicals with extension workers.

MATI and LITI tutors go to the University for short courses in specialised fields.

c. Human resources

In 1983 to 1984, the Directorate of Training had a total of 1,076 training staff. This included 108 professional training officers, 281 technicians (diplomates and certificate-holders) and 80 administrators. The remaining 612 were support staff. There were 45 vacant posts (36 professional, five administrative and four technical posts). Of the 123 people in training, five were professionals, 49 were technicians and 69 were support staff. The Directorate has no long-term training programme. The professional staff's areas of training included: agronomy (18); extension (13), agricultural engineering (10), general agriculture (19), veterinary science (9), agricultural economics (8), home economics/nutrition (7), food science (7), horticulture (7), others include animal science (5), animal production (4), range ecology (2), irrigation (2), soils (3), dairy husbandry (1) and geology (1). Thirteen professionals were expatriates, accounting for 12 percent of the total.

d. Training facilities

The total land area available to the MATIs and LITIs for training and production purposes was estimated to be 3,563 ha; of this, 420 ha are for demonstration plots, 1,242 ha are for productive farms, 1,301 ha are for pasture and 600 ha are forests and idle land.

The Directorate of Training has its headquarters at Dar es Salaam. It also has 15 training institutes scattered throughout the country, including the training section of the UAC. All courses are residential. The institutes are supplied with offices, classrooms, conference rooms, hostels, laboratories, workshops and livestock facilities.

The Directorate has a total of 10 office blocks used for training and administrative staff with a total capacity of 600 people, as well as five conference and meeting rooms with a capacity of 2,500 people. The institutes have 43 lecture rooms with a capacity of 2,860 students, and nine teaching laboratories with a capacity of 990 students. There is also a screen house with 360 m<sup>2</sup> of floor space. Student hostels and kitchen/dining facilities, with a total area of 10,260 m<sup>2</sup>, are available for students.

Other service facilities include workshops for machinery and vehicle maintenance.

The Directorate's livestock facilities include eight dairy units, five sheep/goat units, four poultry units and five pig units.

The Directorate has one Apple II mini-computer for data processing. It also has some visual aid equipment, including five overhead projectors, six slide projectors, three movie projectors and six tape recorders.

In addition to the Ministry of Agriculture library, most of the institutes have their own libraries. The Directorate is estimated to have a total of 80,000 books in its various institute libraries and an annual acquisition of about 200 books and 20 periodicals and scientific journals.

The institution has access to library facilities of the Tanzania Library Services (TLS) and the Sokoine University of Agriculture. The major sources of information from outside the country are the British Council and the United States Information Services.

The only published information from the institution are annual institutional reports and crop and livestock teaching manuals.

The MATIs and TARO research institutes and the LITIs and TALIRO research institutes are in most cases located in the same areas and share compounds. This arrangement is ideal for maximum collaboration. The institutions share library facilities and exchange staff, special courses and/or research projects. Student demonstrations and field practicals can also be organised in the research institutes.

e. Financial resources

In 1983-84, the Directorate was allocated a total of US\$ 320,576. Of this, US\$ 310,176 was a direct government allocation; the remainder came from external donors. About 43 percent of the total budget was expended on wages and salaries.

2. Training Section of the Directorate of Fisheries

a. Organisational structure and purpose

The Training Section of the Directorate of Fisheries provides technical training in fisheries at the diploma and certificate levels. The training section is headed by a senior Fisheries Officer who reports to the Director of Fisheries of the Ministry of Lands, Natural Resources and Tourism.

The institution's headquarters is in Dar es Salaam, and the main campus is in Mbegani-Bagamoyo. There are two other campuses: Kunduchi in Dar es Salaam and Nyegezi near Mwanza. The training institutes are headed by a Principal, who reports to the Director of Fisheries through the senior officer in charge of training.

b. Training programmes

The training programmes at Mbegani consist of two-year certificate courses in general fisheries and three-year specialised diploma courses in boat building, marine engineering, nautical science and fish processing. Students are admitted every third year. Nyegezi offers a two-year certificate programme in general fisheries;

Kunduchi offers a two-year diploma course in general fisheries. From 1980 to 1982 the average number of graduates in general fisheries was 31 with certificates from Nyegezi, and 24 with diplomas from Kunduchi. In 1980, Mbegani granted specialised diplomas in: boat building (13), marine engineering (12), nautical science (12) and fish processing (11). These courses, however, were discontinued in 1981. Most of the students come from rural areas. Students admitted to the certificate courses are Form IV graduates with a science background; those admitted to the diploma course are Form IV leavers with certificates in fisheries, or Form VI graduates with a science background.

The Training Section collaborates with TAFIRI in marine resource assessments, and with extension services for student practicals. It also maintains linkages with the National Cold Chain Operation, TAFICO and the National Fish Processing Company; these provide facilities for practical training for students in fish processing.

c. Human resources

The section had a total of 150 fisheries training staff in 1983-84. These included 22 professional fisheries officers, 20 technicians, and three administrators; the rest were support staff. There were 14 vacant posts, including seven for professionals and four for administrators. Nine personnel were in training, consisting of four professionals and five technicians. There were no expatriate staff. The section has no long-term training plan to develop additional personnel.

d. Training facilities

The section has 29 offices for administrative and technical staff with a total capacity of 57 people. It also has three assembly halls with a capacity of 600 people for meetings, eight classrooms with a capacity for 240 for lectures, and two chemistry, one biology and two microbiology laboratories with a capacity of 65 people. Other service facilities include three shops, canteens and workshops.

Its specialised facilities for fisheries consist of fishing boats, three marine engineering workshops for training, two fish processing halls for training, one workshop (300 m<sup>2</sup>) for boat-building training, five cold rooms (5 x 10 T), and one cold room for fish storage.

The field equipment includes two fishing boats and visual aids, consisting of five overhead projectors, three slide projectors, one movie projector and two tape recorders.

The institution has libraries at Mbegani, Kunduchi and Nyegezi, with a total of about 3,000 books and an annual acquisition of 50 books and five periodicals and scientific journals. Its outside information sources include TLS in Dar es Salaam and Mwanza, the University library, the FAO library in Dar es Salaam and the British Council.

Published information in 1983 was contained in three institute annual reports.

e. Financial resources

The institution received a recurrent (operating) budget of US\$ 1,507 million in 1983-84. About 36 percent of this amount was drawn directly from the Tanzanian government; the rest came from NORAD. About 30 percent of the government allocation was spent on wages and salaries and 16 percent on facility maintenance.

3. Training Section of the Directorate of Forestry

a. Organisational structure and purpose

The Training Section of the Directorate of Forestry provides technical training in forestry at the diploma and certificate levels. Its headquarters is located in Dar es Salaam. The main training campus in forestry is at Olmotonyi in Arusha; another campus, the Forest Industries Training Institute, is in Moshi. The section is headed by a Senior Forestry Officer (Training) who reports to the Director of Forestry. The Olmotonyi Forestry Training Institute is headed by a Principal, who reports to the Director of Forestry through the Senior Forestry Officer (Training).

b. Training programmes

Olmotonyi offers certificate and diploma programmes in forestry. Two diploma courses are offered, one for in-service training and the other for pre-service training. From 1980 to 1982, the institute produced an average of 84 certificate graduates, 22 in-service diploma graduates, and 17 pre-service diploma graduates. In 1982 there were 90 certificate graduates and 19 diploma graduates.

The Forest Industries Training Institute in Moshi offers short courses in logging, carpentry, wood-based panels, saw-doctoring, saw milling and mechanics. The Forest Industries Institute in Moshi also offers practical training in word processing. From 1980 to 1982, it accepted 64 students per year. Most of the students for the above training programmes come from the rural areas, with 62 percent coming from traditional agricultural areas and 33 percent from commercial agricultural areas. The Institute also takes students from other

African countries, namely Rwanda, Lesotho and Botswana. Its admission requirements are the "O"- level certificate of education for the certificate in forestry, and the "A"- level certificate of education for the diploma (pre-service) and certificate in forestry; the in-service training requires an additional three years' experience.

The institution collaborates with TAFORI in training students in research methodologies, and with the Village Forestry Extension Services to introduce students to tree planting in the villages and to other extension methods.

c. Human resources

The Section had a total of 46 training staff in 1983-84. There were 17 professional Forestry Officers, 18 technicians and administrators, and 16 support staff. There were ten vacant posts, all for support staff. Five people were in training, including one professional, one administrator, and three technicians. The section had two expatriates, one each in the professional and technical cadres.

The Section has a training plan for 1980-85 to develop additional personnel, by training 30 diplomates and 50 certificate-holders within the five-year period.

d. Training facilities

The Training Institute has about 180 ha of forests for students' practical training and demonstrations.

The institution has 13 offices, for administrative and technical staff, with a combined capacity of 30 people, one conference room with a capacity of 200 people, seven classrooms with a capacity of 300 students, and one laboratory which can accommodate 20 students. Service facilities include a shop for domestic requirements.

There is a library at the Olmotonyi Forestry Training Institute with an estimated total of 10,000 books and an annual acquisition of 100 books and 100 periodicals and scientific journals.

The Institute also has access to library information at the Sokoine Agricultural University and the British Council.

Published information from the Institute includes three annual institutional reports and three instructional monographs on mensuration, management and road engineering.

e. Financial resources

In 1983-84, the Training Section had a recurrent (operating) budget of US\$ 0.52 million. Of this, US\$ 0.352 million came directly from the GOT; the remainder was from SIDA. About 23 percent of the total budget was expended on wages and salaries.

4. Sokoine University of Agriculture

a. Organisational structure and purpose

The Sokoine University of Agriculture provides degree-level training in agriculture. In 1969 the Government of Tanzania decided to establish a Faculty of Agriculture in the University of Dar es Salaam, utilising the facilities of the former Morogoro College of Agriculture for the programme, and to phase out the diploma programme then offered by the College. In 1972, the Faculty of Agriculture graduated its first 16 students. The Faculty was initially constituted to train only general agriculturists, and offered only a BSc degree in general agriculture. Over a period of time, however, the need for specialisation became apparent. The BSc degree, began to be offered with options to specialise in crop science and production or animal science and production. Other departments were formed, in agricultural chemistry and soil science, agricultural engineering and land planning, rural economy and agricultural education and extension, and food science and technology. After the divisions of forestry and veterinary sciences were added, the Faculty was renamed the Faculty of Agriculture, Forestry and Veterinary Science. The Dean of the Faculty reported to the Vice Chancellor of the University of Dar es Salaam and each division had its own head.

This year the faculty was given the status of a full University and remained Sokoine University of Agriculture. It is headed by a Vice Chancellor and Deputy Vice Chancellor who report directly to the Ministry of Education. Each division is now becomes a faculty headed by a Dean who reports to the Vice Chancellor.

b. Training programmes

The University offers BSc degree courses in agriculture, forestry and veterinary science. The courses are extended over a period of not less than three academic years, each year consisting of 40 weeks divided into four terms.

The facilities exist to offer students courses leading to Sc degrees in agriculture, agricultural engineering, agricultural economics, and forestry, as well as PhD and Doctor of Science degrees in agriculture and forestry (DSc).

Entry requirements for the bachelor's degree in agriculture, forestry and veterinary sciences are:

- o Passes in Chemistry, Biology and Geography/Physics or Mathematics:
- o Passes in Chemistry, Botany or Zoology (of these, at least two must be offered at Principal level in the Tanzania National Form VI Examination or the East African Certificate of Education [Advanced Level] or its equivalent); or
- o An outstanding diploma/certificate, from an agricultural/forestry institution.

In 1983 the University graduated two persons with PhDs, 12 with master's degrees and 105 with bachelor's degrees. Most of the students come from the rural areas and are government-supported.

The University collaborates with research institutions and seed farms to provide research and production experiences for students. Furthermore, individual professors conduct joint research programmes with scientists from the research institutes. They also collaborate with extension institutions, providing field experience for students.

The University conducts a number of seminars for extension personnel and for MATI and LITI staff.

c. Human resources

In 1983-84 the University had a total staff of 163. There were 119 training professionals, 18 technicians, 17 administrators and nine support staff. Of these, 40 were expatriates, 37 were professionals and three were technicians. There were 108 vacant posts, including 84 professional, 12 technician, eight administrative and four support posts. There were 46 personnel in training: 39 professionals, four technicians, two support staff and one administrator. Of the professionals in training, seven were studying for PhDs and 32 for master's degrees. The training professionals in post consisted of: 47 with doctorates, three of whom were female; 39 with master's degrees, four of whom were female; and 30 with bachelor's degrees, three of whom were female.

The institution has a long-term training programme to develop additional personnel. It plans to train 25 people to the doctoral, 69 to the master's, 150 to the bachelor's, five to the diploma and ten to the certificate for a total of 259 newly-trained personnel.

d. Training facilities

The University has a total of 2,300 ha of land. Of this, 1,560 ha is idle; 450 ha is used for production of food grains and horticulture, 100 ha for pasture, 100 ha for forestry, 50 ha for experimental plots and 40 ha for demonstration purposes.

Its buildings include an office block with 12 rooms available for 24 personnel; a centre for continuing education with a capacity of 125 people for conferences, seminars and meetings; ten lecture theatres and classrooms with a capacity of 340 students; 14 laboratories with a capacity of 35 students each; three greenhouses with a total size of 216 m<sup>2</sup>; one shade house (100 m<sup>2</sup>); and cold rooms (40 m<sup>2</sup>).

Other service facilities include a workshop of 100 m<sup>2</sup> and a multi-purpose hall with 4,000 m<sup>2</sup>. Because all courses are residential, there are also hostels and dormitories for students, and a guest wing for visitors and staff recreation. Some staff housing is provided.

The University's livestock facilities include an animal barn, milking parlour with milking machines, and an animal diseases clinic. Its forestry facilities include an experimental forest nursery and a crop museum. The available equipment includes atomic absorption spectrometers, microscopes, tractors and Caterpillars. The University also has four programmable calculators and an Apple II mini-computer for data processing.

The library at the University has a total of 44,000 books and annually acquires 2,000 books and 1,000 periodicals and scientific journals.

Inter-library loans are available from the British Council library, IDRC Documentation Center and USDA library.

Publications from the University in 1983 include the annual report, extension manuals, a forestry research report and rural economy records. A textbook on "Measuring Trees in the Tropics" and one extension publication on "Improved Cultivation of Field Beans in Tanzania" have also been published.

e. Financial resources

In 1983-84 the institution received US\$ 3.367 million as its total recurrent (operating) budget. Of this, US\$ 3.2 million was a direct government allocation. The rest came from donor agencies, including IDRC, SAREC, the Ford Foundation and IFS. About 75 percent of the total government allocation is spent on wages and salaries and 18.5 percent on housing allowances and facility maintenance. The rest is expended on transportation, utilities and travel allowances.

## C. Total Human Resources Available for Training in Tanzania

### 1. Staffing patterns

The total number of staff for the four training institutions surveyed and discussed in this chapter is 1,307. (See Table 14.) This includes 102 administrative staff, 256 professional staff, 286 technical staff (with diplomas or certificates) and 663 support staff.

About 25 percent of the professional staff, those with BSc degrees or above, are expatriates.

The academic disciplines of the professional staff, based on the highest degree held, are shown in Table 15. Nearly 30 percent, or 73 persons, have degrees in plant/soil sciences; 10 percent, or 26 persons, have degrees in animal science, and another 9 percent, or 24 persons, have degrees in veterinary science.

There were 26 female professionals, or about 10 percent of the total number of professional staff, a smaller percentage than that of the professional research staff.

### 2. Staff training

The numbers of staff currently in training and the staff training plans of each institution have already been discussed and are summarised in Table 16, which shows the five year plan of Sokoine University to train degree-level staff.

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Table 14: Total Agricultural Training Staff, 1984

	<u>Administrative</u>	<u>Professional<sup>a</sup></u>	<u>Technical<sup>b</sup></u>	<u>Support Staff</u>	<u>Total</u>
<u>Total Authorized Posts</u>	121	374	359	748	1,602
<u>Positions Vacant</u>	17	127	16	14	174
<u>Nationals (Citizens)</u>					
Staff in training	2	49	61	71	183
Staff on long-term leave <sup>c</sup>	1	6	-	-	7
Number of nationals currently in posts	101	192	282	663	1,238
Expressed as a percent of authorized posts	83	51	79	89	77
<u>Expatriates</u>					
Serving in authorized posts <sup>d</sup>	-	40	3	-	43
Expressed as a percent of authorized posts	-	11	1	-	3
Not in authorized posts	1	24	1	-	26
Total number of expatriates	1	64	4	-	69
<u>Total Number of Staff</u>	<u>102</u>	<u>256</u>	<u>286</u>	<u>663</u>	<u>1,307</u>

<sup>a</sup>Professional = BSc or above.

<sup>b</sup>Technical = diplomate and certificate.

<sup>c</sup>Long-term leave is leave of three months or more.

<sup>d</sup>Irrespective of source of funds.

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Table 15: Disciplines of Teaching Professionals, 1984<sup>a</sup>

<u>Discipline Area</u>	<u>Nationals &amp; Expatriates</u>						<u>Total Professionals</u>		<u>Total</u>
	<u>BSc</u>		<u>MSc</u>		<u>PhD</u>		<u>F</u>	<u>M</u>	
	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>			
<u>Plant/Soil Science</u>									
General agriculture	4	6	1	-	-	-	5	6	11
Crop breeding	-	2	1	1	-	2	1	5	6
Agronomy	2	4	2	12	-	1	4	17	21
Crop physiology	-	1	-	1	-	1	-	3	3
Entomology	-	1	1	-	-	3	1	4	5
Horticulture	1	5	-	2	-	1	1	8	9
Microbiology	-	-	-	1	-	2	-	3	3
Pathology	-	1	-	-	-	2	-	3	3
Range/Pasture ecology	-	1	-	1	-	1	-	3	3
Soil & water management	-	4	-	2	-	3	-	9	9
	<u>7</u>	<u>25</u>	<u>5</u>	<u>21</u>	<u>-</u>	<u>16</u>	<u>12</u>	<u>61</u>	<u>73</u>
Subtotal, Plant/Soil Science									
<u>Animal Science</u>									
Animal science, general	1	4	-	-	-	-	1	4	5
Animal breeding	-	1	-	1	-	2	-	4	4
Animal nutrition	-	1	-	2	-	1	-	4	4
Animal pathology	-	-	-	1	-	1	-	2	2
Animal physiology	-	1	-	1	-	-	-	2	2
Animal production	-	3	2	2	-	1	2	6	8
Dairy husbandry	-	1	-	-	-	-	-	1	1
	<u>1</u>	<u>11</u>	<u>2</u>	<u>7</u>	<u>-</u>	<u>5</u>	<u>3</u>	<u>23</u>	<u>26</u>
Subtotal, Animal Science									

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Table 15: Disciplines of Teaching Professionals, 1984<sup>a</sup> (cont.)

<u>Discipline Area</u>	<u>Nationals &amp; Expatriates</u>						<u>Total Professionals</u>		<u>Total</u>
	<u>BSc</u>		<u>MSc</u>		<u>PhD</u>		<u>F</u>	<u>M</u>	
	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>			
<u>Other Discipline Areas</u>									
Agricultural biochemistry	-	1	-	-	-	2	-	3	3
Agricultural economics	-	8	1	6	-	3	1	17	18
Agric./civil engineering	-	10	-	4	1	2	1	16	17
Extension specialist	-	9	-	9	-	4	-	22	22
Food science	2	6	3	9	1	2	6	16	22
Veterinary science	1	10	1	7	1	4	3	21	24
Forestry	-	14	-	9	-	6	-	29	29
Fisheries	-	18	-	4	-	-	-	22	22
Subtotal, Other Discipline Areas	<u>3</u>	<u>76</u>	<u>5</u>	<u>47</u>	<u>3</u>	<u>23</u>	<u>11</u>	<u>146</u>	<u>157</u>
TOTAL	<u>11</u>	<u>112</u>	<u>12</u>	<u>74</u>	<u>3</u>	<u>44</u>	<u>26</u>	<u>230</u>	<u>256</u>

<sup>a</sup>This table excludes diplomates and certificate holders who are also involved in certificate teaching.

Source: Data collected from the DEVRES/SADCC Agricultural Research Resource Assessment, 1984.

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Table 16: Training Plans for Staff of the Training Institutions, 1984<sup>a</sup>

<u>Level</u>	<u>Crop Science</u>		<u>Animal Science</u>		<u>Forestry</u>		<u>Other<sup>b</sup></u>		<u>Total</u>	
	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>
Doctorate	1	7	-	6	-	4	1	6	2	23
Masters	6	17	2	15	1	9	1	18	10	59
Bachelors	8	42	5	34	2	18	4	37	19	131

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<sup>a</sup>Based on Sokoine University of Agriculture five year plan.

<sup>b</sup>Includes Agricultural Economics, Agricultural Engineering, Extension Specialists and Food Scientists.

Source: Data collected from the DEVRES/SADCC Agricultural Research Resource Assessment, 1984.

## V. AGRICULTURAL EXTENSION INSTITUTIONS

### A. Overview of Agricultural Extension in Tanzania

Crop and livestock extension in Tanzania are provided by the Directorate of Extension and Technical Services (DETS) and the Directorate of Animal Production and Veterinary Services (DAPVS) of the MOALD. The Directorate of Extension-Fisheries and the Directorate of Extension-Village Forestry Section provide similar services in the Fisheries and Forestry Divisions of the Ministry of Lands, Natural Resources and Tourism.

An organisational chart of the two extension services in the MOALD is shown in Figure 10. The location and staff of three of the four institutions is shown in Table 17.

### B. Agricultural Extension Institutions

#### 1. Directorate of Extension and Technical Services

##### a. Organisational structure and purpose

The Tanzania Directorate of Extension and Technical Services consists of two main divisions: Agricultural Extension Services and Agricultural Technical Services.

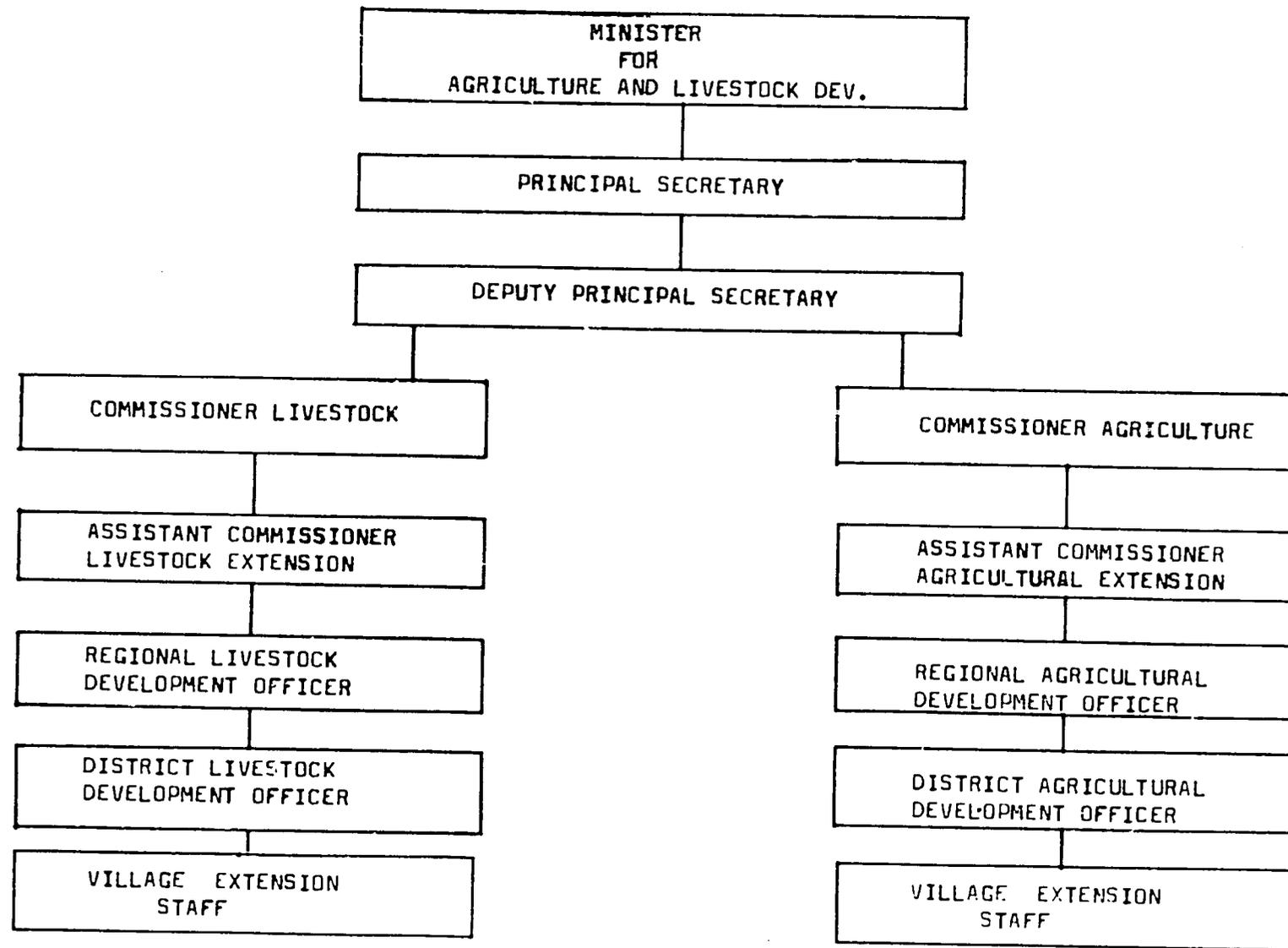
Agricultural Extension Services is responsible for the dissemination to farmers of improved methods of agriculture to help increase their production and productivity.

Agricultural Technical Services are responsible for providing those plant and crop protection services which are too expensive for farmers and require direct government intervention. In Tanzania, they include bird control, army worm control, rodent control, locust control, vermin control, produce inspection and phytosanitary services.

The DETS is headed by a Director who reports directly to the Principal Secretary of the MOALD. It is organised into the two divisions at the headquarters in Dar es Salaam and the 20 regional offices in each of the regions in mainland Tanzania. Each region is headed by a Regional Agricultural Development Officer (RADO), who reports directly to the DETS.

##### b. Extension programmes

The major programme of the DETS is Agricultural Extension Services. This involves the RADOs in all 20 regions and is taken to the village level. The major units in this programme are general extension services, crop monitoring, horticulture, seed multiplication, farm management and irrigation, nutrition/home



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Figure 10: Organisation Chart of Extension Services in the Ministry of Agriculture and Livestock Development

Source: Data collected from the Government of Tanzania, Ministry of Agriculture and Livestock Development, 1984.

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Table 17: Agricultural Extension Institutions: Location and Staff, 1984<sup>a</sup>

<u>Institution</u>	<u>Location of District Regional Offices</u>	<u>Administrative</u>	<u>Professionals<sup>b</sup></u>		<u>Technical<sup>c</sup></u>
			<u>Nationals</u>	<u>Expatriates</u>	
Directorate of Extension and Technical Services (MOALD)	Headquarters in Dar es Salaam and 20 regional offices.	24	119	28	5,063
Directorate of Extension- Village Forestry Section	Headquarters in Dar es Salaam and 20 regional offices.	--	21	--	306
Directorate of Extension Fisheries	Headquarters in Dar es Salaam and 20 regional offices.	24	31	3	494
TOTAL		<u>48</u>	<u>171</u>	<u>31</u>	<u>5,863</u>

<sup>a</sup>Information from the Directorate of Animal Production and Veterinary Services of the Ministry of Agriculture and Livestock Development was unavailable.

<sup>b</sup>Academic degree holders, BSc or above.

<sup>c</sup>Technical includes diplomate and certificate.

Source: Data collected from the DEVRES/SADCC Agricultural Research Resource Assessment, 1984.

economics, agricultural information and farmer training. There are three specific projects in this programme: the FAO/MOALD Fertilizer Programme, which is aimed at assisting smallholder farmers to increase food production through the application of fertilisers and other inputs; the NCDP Extension and Field Services; and the Seed Multiplication Programme of Improved Cereal Crops which work to ensure small farmers' access to improved seed.

The Agricultural Technical Services has five plant and crop protection programmes: bird control, designed to reduce damage to smallholder cereal grains; army worm control, aimed at eventual army worm eradication; rodent control, focussed on minimising loss of crops in the field; large grain borer (Prostephanus truncatus horn) control, designed to minimise post-harvest storage losses; and Banana Weevil/Nematode Complex Control.

The DETS collaborates with TARO, TALIRO, UAC and TPRI in organisation of field days, on-farm demonstrations and on-farm research under the Farming Systems research programme. Extension officers are members of the crop research coordinating committee and seeds/variety release committee.

DETS collaborate with training institutions such as MATIs/LITIs and Sokoine Agricultural University in organising short courses for extension staff. They also collaborate with other organisations dealing with crop and livestock production such as TANSEED, NAFCO and the different crop authorities.

DETS exchanges extension information with other developing countries including India and China, and with other countries such as Germany, Korea and the Netherlands.

#### c. Human resources

The DETS had a total of 5,678 staff in 1983-84. Out of these, 24 were administrators, 147 were professional Agricultural Officers (AO), including 28 expatriates, and 5,063 were technical staff (with diplomas and certificates). (See Table 17.)

There were 96 people in training: four for a master's degree, four for a bachelor's, 86 for diplomas and two in specialised skills. A six-year training programme for the directorate involves persons in training for an additional five master's and 20 bachelor's degrees.

#### d. Extension facilities

##### (1) Buildings

The DETS building consists mainly of administrative offices at the headquarters and regional and district offices. At the headquarters there are ten offices, with a capacity of

30 staff. At the regional level there are 90 offices, with a capacity of 270 staff; at the district level there are 170 offices, with a capacity of 510 staff.

## (2) Land

The land which belongs to the DETS is used for seed multiplication farms and some nurseries. The Directorate has five national foundation seed farms, with an estimated area of about 2,000 ha. There are also about 10 regional seed farms under the RADOs with a total area of about 1,000 ha.

## (3) Equipment

The Directorate's major field equipment consists of motor vehicles, motorcycles and survey equipment.

DETS has two Hewlett Packard mini-computers used by the Early Warning/Crop Monitoring Programme.

## (4) Library and publications

The DETS is the major user of the MOA Library, which is estimated to have 30,000 books and an annual acquisition of 150 books and 120 periodicals and specific journals.

DETS also has access to the TLS, Sokoine Agricultural University, TFNC, BRALUP, TISCO and MATI libraries, as well as to the libraries of the FAO, British Council, World Bank and other international organisations.

The Directorate's major publications are extension monographs and a monthly magazine (Modern Farming), produced at the rate of 145,000 copies per month.

### e. Financial resources

In 1983-84 the DETS had a recurrent (operating) budget of US\$ 12.84 million: 89 percent of this was spent on wages and salaries, 11 percent on transportation and fuel. These figures do not include most of the specific extension and technical services programmes, which are funded directly by donors and other government sources.

## 2. Directorate of Animal Production and Veterinary Services<sup>1</sup>

Livestock extension services are coordinated and managed by the Directorate of Animal Production and Veterinary Services. The Directorate is headed by a Director at the national level, by Regional Livestock Development Officers (RLDOs) at the regional level, and by District Livestock Development Officers (DLDOs) at the district level.

At all levels, livestock specialists coordinate and supervise work in specialised fields such as artificial insemination, meat hygiene, range management, dairy development and pest and disease control.

### 3. Directorate of Extension for Fisheries

#### a. Organisational structure and purpose

The Directorate of Extension for Fisheries (DEF) is responsible for disseminating information and techniques which will enable traditional fishermen to increase their catch and, hence, their incomes and protein for food. The Directorate is headed by a Director who reports directly to the Principal Secretary of the MLNRT. The Directorate is organised into a headquarters office in Dar es Salaam and regional offices in each of the 20 regions of mainland Tanzania, each of which is headed by a Regional Fisheries Officer (RFO).

#### b. Extension programmes

There are two main fisheries extension programmes: inland fisheries extension and marine fisheries extension. Those regions which are near the sea, e.g., Dar es Salaam, Tanga, Coast, Lindi and Mtwara have marine programmes, while those inland have freshwater programmes. Inland fisheries extension programmes take 18 FTEs or about 54 percent of the total FTE; marine fisheries extension account for 16 FTEs or 46 percent of the total.

The DEF has close links with TAFIRI. They hold seminars and planning meetings together, exchange staff, and share libraries and training facilities.

The DEF is fully involved with the training institutions. They have common admissions and sit on the examination committees. They also collaborate closely with TAFICO.

The DEF has bilateral relationships with FAO, DANIDA and NORAD. They hold joint workshops and seminars, and obtain donations and sponsorships for scholarships from these organisations.

#### c. Human resources

In 1983-84, the Directorate of Extension-Fisheries had a total of 1,415 extension staff, including 34 professional fisheries officers, of whom three were expatriates, 494 technical staff, 863 support staff and 24 administrative staff. There were 264 vacant posts, including 16 for professionals and 98 for technicians.

The DEF has an established training programme. In 1983-84, there were 58 people in training, including 15 professionals and 45 technicians. A long-term training programme is also available, involving 105 professionals, (3 PhD, 20 MSc and 82 BSc degree-holders) and 234 technicians, making a total of 339 trainees.

d. Extension facilities

The DEF does not have any land facilities. Marine and freshwater sites are its main work facilities.

It has a number of buildings for offices and libraries. At DEF headquarters there are eight offices, with a capacity for 10 staff persons, and one library: in the regions and districts, there is a total of about 200 offices.

The Directorate owns some visual aids and other field equipment. Visual aids include three flip charts, five overhead projectors, one movie and three slide projectors, and two tape recorders. The DEF also has four motor boats.

There is one library at the head office and three others in the regions. DEF staff have access to other libraries in the country, such as the TLS libraries in Dar es Salaam and Mwanza and the University of Dar es Salaam library.

They also have access to materials from outside the country, including FAO publications, Fishing News International, British Council Library and NORAD publications.

Published information from the Directorate consists mainly of annual extension reports, extension monographs and other special programme reports like the Mtwara/Lindi RIDEP report.

e. Financial resources

In the last financial year, the DEF had a total recurrent operating budget of US\$ 0.987 million, all directly allocated from the Government. About 52 percent of budget was spent on wages and salaries, 39 percent on training. The rest was expended on upkeep, maintenance and transport. The British Government also allocated US\$ 0.08 million which was spent on special projects.

4. Directorate of Extension-Village Forestry Section

a. Organisational structure and purpose

The Village Forestry Section (VFS) of the Directorate of Extension is responsible for forestry extension services at the village level. The VFS establishes forest nurseries at suitable locations, transports the planting material to nearby villages and establishes village forests in conjunction with the villagers. Unlike

agricultural extension, forestry extension is conducted through the planting of forests. In the 1983-84 season, about 14,000 ha of forests were planted in villages.

The director of the VFS reports to the Director of Extension. The section is organised into a head office in Dar es Salaam and regional offices in each of the 20 regions in mainland Tanzania, each headed by a Regional Forestry Officer (RFO).

b. Extension programmes

The major VFS programme is Village Agro-Forestry, which consists of organising the establishment of small plots planted with forest trees on the village farms. There are 20 professional FTEs involved in this programme.

The VFS maintains close links with TAFORI in seed nursery establishment and with TARO and TALIRO in agro-forestry and farming systems.

The VFS collaborates with most of the training institutions, including Sokoine University of Agriculture, and with Farmers Training Centres in conducting seminars for extension staff and farmers.

The VFS also collaborates with a few outside organisations, such as FAO and ICRAF.

c. Human resources

In 1983-84, the VFS had a total of 927 extension staff which included 21 professional Forestry Officers and 306 technicians. The section had no vacant posts and no staff in training. There were no expatriate staff.

The section plans to train 33 additional personnel in five years, including three to the PhD ten to the MSc, and 20 to the BSc level.

d. Extension facilities

The section has nursery facilities in the regions and districts, amounting to about four ha in each of the 20 regions and two ha in each of the 150 districts.

The section has about 25 offices, located mainly in the regions, with a capacity of 50 people.

e. Financial resources

The VFS had a total recurrent (operating) budget of US\$ 3.648 million in the last financial year. Of this, US\$ 2.9 million was a direct government allocation and the rest was from SIDA.

## C. Total Human Resources Available for Extension in Tanzania

### 1. Staffing patterns

The total number of staff for three of the four institutions discussed in this chapter is 8,114. (See Table 18.) This total excludes the extension staff of the Directorate of Animal Production and Veterinary Services. Of the total, 48 are administrators, 202 are professionals, 5,863 are technical staff (holding either a diploma or a certificate) and 2,001 are support staff.

Only 31 of the 202 professional staff are expatriates--about 15 percent.

The programme focus of the professional extension staff effort is shown in Table 19. About 70 percent is directed to food crops in general, 12 percent to forestry and 17 percent to fisheries.

### 2. Staff training

The numbers of staff in training and the staff training plans of each institution have already been discussed. They are summarised in Table 20.

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<sup>1</sup>The Directorate of Animal Production and Veterinary Service failed to provide the necessary information to be included in the ARRA report, hence this brief description.

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Table 18: Total Agricultural Extension Staff, 1984<sup>a</sup>

	<u>Administrative</u>	<u>Professional<sup>b</sup></u>	<u>Technical<sup>c</sup></u>	<u>Support</u>	<u>Total</u>
<u>Total Authorized Posts</u>	64	192	6,004	2,341	8,601
<u>Positions Vacant</u>	16	21	141	340	518
<u>Nationals (Citizens)</u>					
Staff in training <sup>d</sup>	2	23	135	-	160
Staff on long-term leave <sup>e</sup>	-	1	4	-	5
Number of nationals currently in posts	48	171	5,863	2,001	8,083
Expressed as a percent of authorized posts	100	51	88	-	87
<u>Expatriates</u>					
Serving in authorized posts <sup>f</sup>	-	-	-	-	-
Expressed as a percent of authorized posts	-	44	-	-	.3
Not in authorized posts	-	-	-	-	-
Total number of expatriates	-	31	-	-	31
<u>Total Number of Staff</u>	<u>48</u>	<u>202</u>	<u>5,863</u>	<u>2,001</u>	<u>8,114</u>

<sup>a</sup>These numbers exclude staff of the Directorate of Animal Production and Veterinary Services of the Ministry of Agriculture and Livestock Development since this information was not available.

<sup>b</sup>Professional = BSc or above.

<sup>c</sup>Technical = diplomate and certificate.

<sup>d</sup>Staff in training continue to hold authorized posts.

<sup>e</sup>Long-term leave is leave of three months or more.

<sup>f</sup>Irrespective of source of funds.

Source: Data collected from the DEVRES/SADCC Agricultural Research Resource Assessment, 1984.

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Table 19: Summary of Professional Extension Staff Effort and Source of Funds Related to Programme Area, 1984

<u>Programme Area</u>	<u>Funding Source and Percentage</u>		<u>FTE<sup>a</sup></u>	<u>Percentage of Total Staff Time<sup>b</sup></u>
	<u>Government</u>	<u>Donor</u>		
<u>Crops</u>				
Crops, general	100	-	93	49
Crop monitoring	100	-	3	1
Crop protection	45	55 <sup>c</sup>	20	10
Coconut (NCDP)	42	58 <sup>d</sup>	3	1
Seed multiplication	100	-	12	6
Fertilizer programme	<u>30</u>	<u>70<sup>c</sup></u>	<u>7</u>	<u>4</u>
Subtotal, Crops			<u>138</u>	<u>71.5</u>
<u>Forestry/Fisheries</u>				
Agro-forestry	62	38 <sup>e</sup>	21	12
Inland fisheries	100	-	18	9
Marine fisheries	<u>100</u>	<u>-</u>	<u>16</u>	<u>8</u>
Subtotal, Forestry/Fisheries			<u>55</u>	<u>29</u>
TOTAL			<u>193</u>	<u>100</u>

<sup>a</sup>FTE = Full Time Equivalent.

<sup>b</sup>Discrepancies between individual and subtotal percentages are due to rounding.

<sup>c</sup>FAO.

<sup>d</sup>Federal Republic of Germany

<sup>e</sup>SIDA.

Source: Data collected from the DEVRES/SADCC Agricultural Research Resource Assessment, 1984.

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Table 20: Training Plans for Staff of Extension Institutions, 1984

<u>Level</u>	<u>Number</u>	
	<u>In country</u>	<u>Outside Africa</u>
<u>Current Situation</u>		
Masters	3	4
Bachelors	21	2
Diploma	30	34
Certificate	11	-
<u>Future Plans</u>		
Doctorate	-	3
Masters	14	11
Bachelors	92	10
Diploma	84	20
Certificate	130	-

Source: Data collected from the DEVRES/SADCC Agricultural Research Resource Assessment, 1984.

## VI. CONSTRAINTS TO AND POTENTIAL FOR INCREASED PRODUCTIVITY

During the course of the ARRA, eight to ten persons knowledgeable about each of the major crops and livestock produced in Tanzania were interviewed. Each respondent was asked to complete a questionnaire ranking the severity of the major constraints to increased agricultural productivity on a scale of 1 to 5, with 5 representing the most serious constraint. The responses are shown in Table 21.

In this chapter, discussion of the perceived constraints will follow an analysis of the current and potential yields of the major crops and livestock.

### A. Food Crops

#### 1. Maize

Maize is Tanzania's major staple food, providing over 60 percent of the rural population's daily caloric intake and over half of that of the urban population. It is grown throughout the country, from sea level to elevations over 2000 m, and in areas with average annual rainfall ranging from 600 to 1500 mm. In drier areas it is replaced by sorghum and millet. In the high-potential areas of the southern highlands the most popular maize hybrids are H614 and H6302. In the medium and low elevations, composites UCA and IC (Ukiriguru Composite and Ilonga Composite) are widely cultivated, together with traditional varieties. Two new varieties, Kilimo and Staha, have been released for the medium- and low-altitude areas. They are higher-yielding and have better tolerance to streak than do UAC and IC.

Maize is grown almost entirely by smallholders (98 percent of the total area planted), often intercropped with other crops like grain legumes, cassava and vegetables. The area currently under maize cultivation is estimated at 1,900,000 ha. About 80 percent of total production is consumed on-farm; only one-fourth of the marketed surplus is sold on the official market. Based on the assumption of average yields of 1,000 kg/ha (600 in low-potential areas and 1,100 to 1,200 in high-potential areas), the total output is estimated to be 1,900,000 MT.

Maize production and marketing is affected by the government policy that keeps prices of this basic commodity as low as possible in order to protect the ability of the low-income classes, especially those living in urban areas, to purchase maize. The National Milling Corporation (NMC) thus offers farmers very unattractive prices. As a result, most farmers sell their maize surpluses on the unofficial market, where the price may be twice the legal one. At the same time, NMC is forced to import maize (about 180,000 MT in 1983) to comply with its social and urban commitments.

When maize is sold at the official price, the net return on farm labour is estimated to be 10 to 20 T.sh. per day (US\$ 0.57 to US\$ 1.14) for

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Table 21: Perceptions of Severity of Constraints to Achieving Higher Crop Yields<sup>a</sup>

Constraints	Maize	Sorghum/ Millet	Grain/ Legumes	Root Crops	Rice	Wheat	Coffee	Cotton	Average
<u>Physical/Biological</u>									
Climate	4.2	3.4	3.0	2.1	3.6	3.2	3.6	3.8	3.3
Annual rainfall	4.1	3.9	3.4	2.9	4.4	3.4	3.4	3.6	3.7
Rain distribution	5.0	4.2	3.6	3.1	4.5	3.7	4.1	4.8	4.1
Soil suitability	3.7	3.2	3.0	2.1	3.5	3.7	3.0	2.9	3.3
Soil degradation	3.6	3.1	2.9	2.8	3.4	3.8	3.9	4.8	3.3
Soil topography	3.2	2.9	3.0	2.9	3.1	3.1	2.8	2.7	3.1
Weeds	4.6	4.0	4.0	4.2	4.4	3.3	3.3	4.7	4.1
Plant diseases	3.3	3.6	4.2	3.4	2.1	3.0	5.0	3.6	3.3
Pests/Insects	3.9	4.0	4.1	3.2	2.2	3.0	4.1	3.8	3.5
Predators	2.3	3.1	2.4	3.6	3.4	2.7	2.1	2.7	3.0
Varieties/Species	4.1	4.1	3.6	3.4	4.0	3.8	4.0	4.0	3.9
Human power	4.1	3.4	3.0	3.5	4.3	3.4	3.6	3.8	3.7
Animal power	4.0	3.1	3.1	2.6	3.6	3.0	2.1	4.1	3.3
<u>Economic/Policy</u>									
Prices	4.4	4.0	3.5	3.6	4.2	4.0	4.5	4.4	4.0
Marketing	3.4	3.0	2.9	3.5	4.1	3.7	3.8	3.8	3.5
Short-Term credit	3.4	2.6	2.6	2.6	3.0	3.4	3.5	3.6	3.0
Long-Term credit	3.7	2.0	2.4	2.5	2.8	3.8	2.8	3.0	2.9
Government subsidy	3.3	2.2	2.2	2.9	2.9	3.7	2.5	3.6	2.9
Import policies	2.9	1.6	1.5	1.8	2.5	2.5	3.9	3.4	2.2
<u>Traditional</u>									
Land tenure	3.0	3.1	2.4	1.6	3.0	4.1	2.0	2.8	2.9
Farm size	3.6	3.4	3.5	2.9	4.0	4.4	3.5	4.0	3.7
Farm labor	4.0	3.8	4.4	3.6	4.2	3.1	4.1	4.8	3.9
Education	3.6	3.5	3.4	3.4	3.6	4.1	3.8	4.0	3.7
Role of women	4.1	3.5	3.8	3.6	4.1	3.1	3.6	3.9	3.8
<u>Institutional</u>									
Research	4.1	3.5	3.4	3.4	4.1	4.0	4.6	4.4	3.8
Training	4.1	3.6	3.6	3.6	4.0	4.0	4.2	3.9	3.9
Extension	4.4	4.2	4.6	3.4	4.4	4.1	4.6	4.4	4.4
Overall Average	3.8	3.4	3.3	3.1	3.7	3.6	3.6	3.9	3.5

<sup>a</sup>Weighted average of respondent rankings: 1 Not serious, 5 = Very serious. Number of respondents varied by crop from 8 to 9.

Source: Data collected from the DEVRES/SADCC Agricultural Research Resource Assessment, 1984.

high- and low-potential areas, respectively. When sold on the parallel market, irrespective of the area, it is about 28 to 29 T.sh. per day. This figure may raise to 44 T.sh. per day if improved methods are used.

Research on maize, especially on breeding, is very active in the country. By using improved varieties and proper technology, research station yields of 6,000 kg/ha and on-farm yields of 4,000 kg/ha for pure stands are common.

The major constraints to increased maize production include: poor distribution of rainfall; unattractive producer prices; lack of suitable varieties which are resistant to drought and streak in low- and medium-altitude areas; large post-harvest losses, owing to inadequate storage facilities; poor extension services; lack of sufficient farm power and labour; lack of credit; and poor supply of inputs.

It is generally estimated that if these constraints could be overcome, yields of 4,000 kg/ha might be achieved.

## 2. Sorghum and millet

Sorghum and millet are grown mainly in the dry areas of central and southeastern Tanzania, where yearly rainfall ranges from 400 to 800 mm. The estimated area under cultivation is 1 million ha; the average yield is 700 kg/ha, and the estimated total production is 700,000 MT. Sorghum and millet, which are produced only by smallholders, are marketed to a very limited extent and are consumed principally in rural areas. A large share of the production of sorghum is utilised for local brewing.

In addition to traditional varieties, two improved varieties, the brown-seeded Serena and the white-seeded Lulu, have been adopted in some areas. The former is higher-yielding and more resistant to birds, but is not well accepted by consumers because of its bitterness: the latter is more palatable but is susceptible to grain moulds and bird damage. A third, white-seeded variety, Tegemeo, has been released which is more resistant to grain moulds and is higher-yielding.

While the return per labour/day to the farmer is rather poor, amounting to about 10 T.sh., in the drier areas there are few more rewarding crops.

The major constraints to increased sorghum and millet production include: inadequate rain distribution; the losses due to birds (quelea quelea); the lack of varieties coupling bird- and drought-resistance with palatability; and poor storage facilities. As with maize production, low prices are a major constraint to motivating farmers to increase production. Furthermore, there is a shortage of labour, especially at certain times, and weeds are a major problem.

With proper management and inputs, yields of 3,000-3,500 kg/ha could be attained.

### 3. Rice

Rice supplies about 10 percent of the national caloric intake and 25 percent of the calories consumed in urban areas. Over 280,000 ha are estimated to be under paddy cultivation, 80-90 percent of which are on smallholder plots and 10-20 percent on large state-farms. NAFCO is engaged in three large-scale rice production schemes. These schemes, in Mbarali, Dakawa and Ruvu, are the NMC's largest rice suppliers.

The average yields range from 900 to 1000 kg/ha on small farms to 2500 kg/ha on state farms. Estimated production for 1984 is 360,000 MT. Most of the smallholder paddies are rainfed, and the level of technology is usually low, the main input being human labour.

Lowland rainfed paddies are generally inundated by temporary floodings, but the devices for water control are very poor. Lowland rice is usually grown in pure stands, while upland rice is often intercropped with cassava.

The principal varieties adopted are the local Supa, Kihogo, and Afaa Mwanza 1/159, which are medium-maturing and subject to shattering. Rice growers face problems of pricing and marketing similar to those of maize growers. About 50 percent of the production is consumed on-farm; most of the balance (80 percent) is sold through unofficial channels.

The estimated return per labour day for sales on the open market is about 15 T.sh. (US\$ .85), or about 30 T.sh./day when good seed or irrigation are utilised. When fertilisers are used in conjunction with improved seeds, the return to labour may reach 44 T.sh./day. It is estimated that with a sound technological package, smallholders could obtain yields in the range of 4,000 kg/ha.

The main constraints to rice development are considered to be: the lack of high-yielding varieties adapted to the local environment; poor development of irrigation; and scarcity of inputs, especially good seeds and fertilisers.

As with the other food crops, inadequate rainfall, weeds, labour shortages, pricing policy and marketing systems are seen as major constraints to increased production of rice. In addition, the small farm size of traditional farmers often prevent them from cultivating rice.

### 4. Grain legumes

Grain legumes, such as beans, cowpeas, pigeon peas and other minor crops, are common in all areas of the country and are a major

source of protein. They are grown entirely by smallholders and are intercropped with cereals and cassava. The total area cultivated with grain legumes is estimated at about 480,000 ha. The average yield is 500 kg/ha; total production is about 240,000 MT. Most is not marketed, and the demand is especially high in urban areas since few can afford to buy meat.

There is a great need to strengthen research on grain legumes, for both high-potential areas (beans) and medium- to low-potential areas (cowpeas, pigeon peas and green-grams). The major emphases should be on breeding, to select short-cycle, disease-resistant varieties, and on farming systems research, to identify optimal patterns of intercropping, especially where the distribution of rainfall is bimodal. With good husbandry and suitable varieties average yields could reach 2,000 kg/ha.

Respondents identified rain distribution, weeds, diseases and, especially, traditional farm labour patterns and inadequate extension services as serious constraints to increased production.

## 5. Root crops

The root crops grown in Tanzania include cassava, sweet potatoes and Irish potatoes. Of these, cassava is by far the most important, providing more than 10 percent of the average caloric intake in Tanzania. The estimated area under root crops is about 900,000 ha; the average yield is 1,750 kg/ha (dry equivalent), and total production is about 1,600,000 MT. Cassava is grown entirely by smallholders, intercropped with cereals and grain legumes. It is considered a famine remedy crop, because it tolerates poor soils and low rainfall and can conveniently exploit many low-potential areas at low and medium elevations. The main areas of cultivation are the dry southeast and northwest regions of the country. The return for labour averages about 12 T.sh./day (US\$ 0.68); this could rise to 30 T.sh./day with proper husbandry (a yield of 5,000 kg/ha dry equivalent). In developing cassava varieties, the main emphasis should be on breeding ones which are pest/disease resistant and more palatable. Weeds were considered the major constraint to increased production by the respondents.

## B. Commercial Crops

### 1. Coffee

Coffee is the most important export product of the country. It accounts for 33 percent of Tanzanian exports by value, or about US\$ 145 million. The area devoted to the crop is about 220,000 ha; total production is estimated at 55,000 MT. The average yield is 250 kg/ha (clean equivalent). The bulk of the production is by smallholders, who farm about 90-95 percent of the total area devoted to coffee, often intercropping coffee with bananas.

Tanzania produces mild arabica, hard arabica and robusta coffees. Mild arabica, accounting for about three-fourths of all coffee production, is grown in the northern and the southern highlands; hard arabica and robusta are grown primarily in the Kagera Region near Lake Victoria.

The coffee industry is affected by several constraints that have sharply decreased total output and lowered quality. The most important of these constraints are:

- o Inadequate control of pests and diseases;
- o Unattractive producer prices;
- o Poor extension services;
- o Poor rain distribution;
- o Soil degradation;
- o Lack of machinery and spare parts on estates;
- o Poor management on the nationalized estates; and
- o Inadequate processing facilities, marketing systems and import policies.

Owing to coffee's importance in the country's economy, an extensive programme to rehabilitate this industry has been started with the support of the EEC. Average yields of 400 kg/ha might be achieved, if the rehabilitation programmes are successful and the above constraints overcome.

## 2. Cotton

Cotton used to be one of the most extensively cultivated crops. In the past it contributed considerably to Tanzania's foreign exchange earnings. At present production is greatly reduced, due to the decline in the real value of the producer price, poor rainfall in recent years, and the higher returns obtainable from selling food crops on the open market. Cotton is typically grown by smallholders in two principal areas: the Western Cotton Growing Area (WCGA) and the Eastern Cotton Growing Area (ECGA). Annual rainfall ranges from 750 to 1200 mm; distribution is bimodal in WCGA and unimodal in ECGA. It is estimated that the area devoted to cotton is 450,000 ha, the average yield is 330 kg/ha of raw cotton, and total production is 148,000 MT of raw cotton or 50,000MT of lint (270,000 bales). In 1972-73, when the peak production was achieved, the output was 423,982 bales.

The major constraints affecting cotton production include the above-mentioned scarcity of rains over the past years, unattractive

prices coupled with frequent delays in payments by the TCA, and the lack of innovative, labour-saving packages of technology with particular emphases on plant protection and harvesting. Soil degradation and farm size were also seen as constraints by respondents to the questionnaire.

Most of the officers interviewed stressed the need for a price readjustment to eliminate the actual imbalance in favour of food crops.

### C. Livestock

Tanzania has one of the largest livestock herds in Africa. The country's total is estimated to consist of the following: 12.9 million cattle, 5.9 million goats, 3.7 million sheep, 23 million chickens, and about 40,000 pigs. This great resource, however, is not managed so as to fully exploit its potential to produce enough animal products for internal consumption and for export.

The major constraints to increased livestock production, as perceived by the respondents to the ARRA questionnaire, are shown in Table 22.

#### 1. Cattle

There have been large increases in the number of cattle, growing from an estimated 8.4 million in 1965 to 10 million in 1976. Nearly all cattle are held in traditional herds, averaging 20 to 30 cattle each. Transhumance is common in the driest spells, especially in the Masai areas, but in higher potential areas cattle-raising is sedentary and often coupled with farming. The distribution of cattle over the country is uneven and does not correspond with the concentration of the population: some areas are overgrazed while others are underutilised or not utilised because of tsetse fly infestation. According to government estimates, the cattle population might be doubled if tsetse flies were kept under control and increased up to 30 million head if good management practices were undertaken.<sup>1</sup>

The estimated meat production is about 180,000 MT and milk production is about 400,000 MT. These production figures are very low, if compared with the number of heads. This shows that cattle-raising is not geared towards maximising the provision of food and income, but rather is largely oriented to other purposes, such as food security reserve and social promotion.

The respondents to the questionnaire identified the following as major constraints to increased production of cattle: poor range and herd management; lack of disease and insect control, which principally refers to the tsetse fly; the present land tenure system; uneven rain distribution; and the unavailability of long-term credit.

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Table 22: Perceptions of Severity of Constraints to Achieving Higher Livestock Productivity<sup>a</sup>

Constraints	Beef Cattle	Goats/ Sheep	Pigs	Poultry	Average
<u>Physical/Biological</u>					
Climate	3.0	3.6	2.6	3.1	3.1
Annual rainfall	2.5	3.1	2.8	2.6	2.8
Rain distribution	4.0	3.8	2.8	2.7	3.4
Soil suitability	2.4	3.1	2.4	1.6	2.4
Soil degradation	3.2	3.4	2.4	2.4	2.9
Soil topography	2.2	2.9	2.1	2.1	2.4
Natural forage supply	3.8	4.1	2.4	2.4	3.2
Fodder supply	3.5	3.2	2.6	2.3	3.0
Other fodder supply	3.2	2.7	3.3	2.3	2.9
Water supply	3.4	4.0	3.6	4.3	3.9
Water access	4.1	4.1	3.8	3.7	4.0
Disease prevention	4.5	3.9	3.7	4.6	4.2
Curative problems	4.4	4.0	3.7	4.4	4.2
Pests/Insects	4.4	3.6	3.4	3.0	3.7
Predators	3.1	2.5	2.1	3.1	2.8
Species/Breeds	3.6	3.8	4.7	4.1	4.1
<u>Economic/Policy</u>					
Input prices	3.6	3.4	3.9	4.6	3.9
Animal prices	3.4	3.4	3.4	4.0	3.6
Marketing	3.2	3.9	3.4	3.9	3.7
Short-Term credit	3.8	3.0	3.6	3.3	3.5
Long-Term credit	3.9	2.7	3.9	3.1	3.5
Government subsidy	2.9	2.7	2.9	3.6	3.1
Import policy	3.0	2.3	2.9	3.0	2.9
<u>Traditional</u>					
Land tenure	4.1	2.5	4.1	2.1	3.3
Farm size	3.8	3.0	3.8	2.1	3.2
Farm labor	2.8	2.8	2.8	3.1	2.9
Education	3.8	3.3	2.8	3.4	3.4
Role of women	2.5	2.3	1.0	3.3	2.3
<u>Management Factors</u>					
Herd management	4.6	4.4	4.7	4.1	4.5
Range management	4.9	4.5	2.4	2.4	3.6
Health management	4.1	4.0	4.4	4.4	4.3
Overall Average	3.6	3.4	3.2	3.2	3.4

<sup>a</sup>Weighted average of respondent rankings: 1 = Not serious. 5 = Very serious. Number of respondents varied by type of livestock from 7 to 8.

Source: Data collected from the DEVRES/SADCC Agricultural Research Resource Assessment, 1984.

## 2. Small ruminants

Goats and sheep are found all over Tanzania, but they are especially common in drier and low-potential areas. So far very little attention has been paid to the potential of these animals to provide meat and milk for local consumption and skins for export. Greater attention should be given in both research and extension to small ruminants.

The major constraints to increased productivity identified by the respondents were:

- o Poor range and herd management;
- o Lack of access to water;
- o Shortage of natural forage supply;
- o Diseases; and
- o Marketing problems.

## 3. Poultry

Poultry are reared everywhere in Tanzania, mostly as backyard stock. Most of the commercial enterprises are located near or in the urban centres, especially Dar es Salaam, where the demand is very high. The prices of poultry products, especially meat, are very high, and are beyond the means of the poor and middle classes. Estimated national production is about 16-17,000 MT of meat and 4-5,000 MT of eggs per year. These figures could be increased if steps were undertaken to remove the constraints that affect this promising industry. These constraints include the scarcity and the poor cost/quality ratio of balanced feeds, as well as the lack of one-day-old chicks of improved breeds.

The constraints considered most serious by the respondents to the questionnaire were:

- o Prices of inputs;
- o Poor disease and health management;
- o Lack of access to adequate water supplies;
- o Poor-quality species; and
- o Prices and marketing policies.

The prospect exists of rehabilitating some old facilities in order to relaunch this promising sector. Rural women are very interested in such proposed programmes.

#### 4. Pigs

Pig raising is done mostly by smallholders who allow their pigs to scavenge, but breeding is also conducted in intensive units located near urban areas. The estimated production is 5,000 to 7,000 MT of meat per year.

Little research has been conducted so far on pigs, especially with regard to improved breeds and nutrition.

Respondents to the questionnaire considered the following as very serious constraints:

- o Poor quality of available species;
- o Poor herd and health management;
- o Existing land tenure system;
- o Unavailability of long-term credit; and
- o Prices of inputs.

#### 5. Summary of constraints to increased livestock production

The main constraints to increased livestock production in Tanzania may be summarised as follows:

- o Inadequate livestock management practices, including poor management of grazing areas;
- o Insufficient control of diseases (the inadequacy of veterinary services and controls also affects Tanzania's ability to export fresh meat);
- o Scarcity of improved breeds;
- o Insufficient and imbalanced nutrition resources, especially during the dry seasons, and insufficient access to water;
- o High prices of inputs and low prices for animals; and
- o Inadequate marketing systems, including poor transport facilities and equipment.

Some of these constraints are largely the result of the land tenure system. Since grazing areas are communal, the progressive farmer is prevented from conducting such necessary management practices as improving pastures, keeping a reasonable number of head on the land, planning matings and controlling the spread of diseases.

Another important constraint which prevents farmers from striving for increased productivity, is the lack of consumer goods on the market, especially in rural areas. Farmers and livestock raisers have few incentives to produce surpluses if the outcome is little more than satisfying their basic needs. An original proposal, suggested by a young extension officer, is that farmers might be paid in part with agricultural inputs for the sale of their surplus products.

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<sup>1</sup>Ministry of Agriculture of Tanzania/Task Force on National Policy, The Tanzani National Agricultural Policy (Final Report) (Dar es Salaam: Government of Tanzania, 1982).

## VII. STAFF ASSESSMENT OF INSTITUTIONS

During the course of the ARRA, 46 junior and senior staff members of agricultural research, extension and training institutions were interviewed. They also were asked to complete a questionnaire ranking their perceptions of the severity of constraints hampering their institutions' effectiveness

In general, there was a good deal of uniformity in the responses of the different categories of respondents. The responses are summarised in Table 23.

### A. Agricultural Research

The 16 persons interviewed with respect to agricultural research worked for different public and parastatal research institutions. All respondents agreed that limited funds for research prevent their efforts from achieving their objectives. There was general agreement that limited foreign exchange, especially for purchases of equipment, poses a major constraint.

The major common concern regarding the quality of the staff was the lack of opportunities for additional training. Since each of the institutions surveyed had a number of persons in training, this complaint may refer to the quite limited opportunities for training abroad.

In terms of physical facilities and equipment, there was agreement that the number of offices and laboratories are sufficient; however, the inadequacy of the research equipment, being either obsolete or poorly maintained, is a very serious constraint. Transport was another area in which there was general agreement: there were too few vehicles, existing vehicles were poorly maintained and not available to staff.

With regard to terms of services and benefits, the respondents regarded the lack of adequate housing facilities, the lack of a fair evaluation and promotion system rewarding superior service, and low salaries as serious problems. In fact, staff of parastatals, which were well-represented in the interviews, receive better salaries than those of other institutions; furthermore, the alternatives for better employment in the private sector are limited.

### B. Agricultural Training

The 15 training staff members interviewed agreed that the recurrent budget is generally insufficient and that the lack of foreign exchange, especially for the purchase of, needed equipment, books, journals and parts, is a very serious constraint at all levels of training.

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Table 23: Staff Assessment of Research, Training, and Extension Institutions<sup>a</sup>

Problems/Criteria	Research	Training	Extension	Overall Average	Number of Respondents		
					Research	Training	Extension
<b>Budget:</b>							
Consistency of support	4.0	3.6	4.6	4.1	16	15	15
Level of funding	4.6	4.2	4.5	4.4	16	14	14
Release of funds	3.6	3.0	4.0	3.5	16	14	14
<b>Foreign Exchange Difficulties:</b>							
For purchase of parts	4.6	4.6	4.9	4.7	16	15	15
For purchase of equipment	4.8	4.9	4.8	4.8	16	15	15
For purchase of books/journals	4.5	4.7	3.9	4.4	16	15	15
For purchase of special supplies	4.5	4.2	4.4	4.4	16	15	15
<b>Senior Staff:</b>							
Lack of training opportunities	4.2	4.0	2.7	3.6	16	16	15
Lack of interest in further training	2.1	1.6	2.3	2.0	16	15	15
Lack of experience/background	3.0	2.4	2.8	2.7	16	15	15
Lack of motivation	3.1	3.6	4.0	3.6	16	15	15
Lack of leadership	2.5	2.4	2.8	2.6	16	15	15
<b>Junior Staff:</b>							
Lack of training opportunities	3.6	3.2	3.6	3.5	16	15	16
Lack of interest in further training	2.0	1.7	2.5	2.1	16	15	15
Lack of experience	3.1	3.1	3.1	3.1	16	15	15
Lack of motivation	3.1	3.4	4.2	3.6	16	15	15
<b>Support Staff:</b>							
Lack of training opportunities	3.2	2.8	3.6	3.2	16	15	15
Lack of interest in further training	2.5	2.5	2.4	2.5	16	15	15
Lack of experience	3.0	2.7	3.2	3.0	16	15	15
Lack of motivation	2.8	3.5	3.9	3.4	16	16	15
<b>Conference/Meeting Rooms:</b>							
Number of conference rooms	2.3	2.9	2.5	2.6	16	15	15
Capacity of conference rooms	2.2	2.9	3.3	2.8	16	15	15
Adequacy of conference rooms	2.5	2.5	3.4	2.8	16	15	15
<b>Classrooms/Laboratories</b>							
Number of classrooms/laboratories	2.9	3.8	-	3.4	16	15	-
Capacity of classrooms/laboratories	2.8	3.2	-	3.0	16	15	-
Adequacy of classrooms/laboratories	2.7	3.4	-	3.1	16	15	-

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Table 23: Staff Assessment of Research, Training, and Extension Institutions<sup>a</sup> (cont.)

Problems/Criteria	Research	Training	Extension	Overall Average	Number of Respondents		
					Research	Training	Extension
<b>Offices:</b>							
Number	2.8	3.8	4.1	3.6	16	15	16
Capacity	2.4	3.6	4.2	3.4	16	15	16
Adequacy	2.2	3.6	4.2	3.3	16	15	16
<b>Equipment:</b>							
Insufficient number/Obsolescence	4.0	4.3	4.5	4.3	16	14	15
Lack of repair/maintenance	4.7	4.7	4.7	4.7	16	14	15
Funds for essential equipment	4.5	4.9	4.4	4.6	16	15	15
<b>Transportation:</b>							
Budget for operations	3.7	4.3	4.0	4.0	15	14	15
Availability/Access	3.7	4.4	4.9	4.3	15	15	15
Adequacy of allocation	-	3.1	4.5	3.8	NA <sup>b</sup>	NA	14
Maintenance/Care	3.9	4.1	4.1	4.0	15	13	15
Number of vehicles/bicycles	4.7	4.6	4.9	4.7	15	14	15
<b>Staff Housing:</b>							
Number of houses	4.4	4.6	4.7	4.6	16	15	15
Adequacy of staff housing	3.8	4.0	4.6	4.1	16	15	15
<b>Salary Scales/Levels:</b>							
Not sufficient to hold staff	3.9	4.8	3.3	4.0	16	15	15
No differentiation for remote posts	-	3.6	4.6	4.1	NA	NA	15
Competition from the government sect	2.9	3.9	3.6	3.5	16	15	15
Competition from private sector	3.4	3.9	3.8	3.7	16	15	15
<b>Promotion System:</b>							
Promotion schedule	3.8	3.9	4.5	4.1	16	15	14
Rewards for superior service	4.0	4.2	4.9	4.4	16	15	15
Without higher training certificate	-	-	4.0	4.0	NA	NA	15
Staff evaluation procedure	4.0	4.1	4.1	4.1	16	15	15
<b>Tenure System:</b>							
Tenure security rules	2.7	2.6	3.4	2.9	15	15	15
Tenure for superior young staff	2.9	2.7	-	2.8	15	15	15
<b>Other Benefits:</b>							
Leaves of absence schedule	2.3	2.2	2.4	2.3	16	15	15
Health benefits	2.8	3.5	3.4	3.2	16	15	15
Retirement benefits	3.2	3.6	3.6	3.5	16	15	14

<sup>a</sup>

<sup>b</sup> Key to seriousness of Problems/Criteria: 1 = Not serious, 5 = Very serious.

NA = Not Available, Not Applicable, or No Answer.

Source: Data collected from the DFVRES/SADCC Agricultural Research Resource Assessment.

With respect to quality of staff, as with research staff, the majority of respondents denied that they lack interest in further training. However, they agreed that the opportunities for training, especially for senior staff, are rather scarce and that many have lost interest and motivation in their jobs.

There was general agreement that the inadequacy of facilities and equipment is an especially severe constraint, particularly that of laboratories and laboratory equipment, transport facilities, libraries and offices.

The salary levels were considered by almost all respondents to be clearly insufficient, as were the promotion system and staff housing. Retirement and health benefits were seen as less severe constraints, while tenure and schedules for leaves of absence seem to be minor problems.

### C. Agricultural Extension

In general, the responses of the 15 extension staff interviewed were similar to those for training staff, although they differed in emphasis.

Extension workers saw budgetary and foreign exchange difficulties as major constraints to their work.

Another of the major constraints identified was the almost total inadequacy of the transport facilities which prevents staff from accomplishing their duties. Lack of transport was considered to be extremely frustrating by all respondents. Equally frustrating for many seemed to be the lack of incentives and rewards for services performed, especially in remote postings. Some officers claimed that annual evaluations by their bosses is made without adequate knowledge as to the quality of work performed by the staff; furthermore, promotions do not seem to be possible. Good staff thus often lose motivation and interest in their work. Some also felt that the gap between salaries for officers working in the villages and those working at headquarters or regional offices is too wide. Lack of motivation of staff at all levels was cited as a serious constraint among extension workers, whereas it had not been among research and training staff.

In summary, the main constraints to improvement of the extension services seem to be the following: recurrent budget and foreign exchange difficulties, quality of offices and equipment, quantity and quality of the means of transport, salary levels, staff housing, and opportunities for advancement.

## VIII. CONCLUSIONS AND RECOMMENDATIONS

### A. Strengthening Tanzania's Agricultural Institutions

#### 1. Research institutions

Owing to the lack of a well-designed policy, especially following the collapse of the East African Community, agricultural research has not produced adequate results since the mid-1970s. Some steps have been proposed in recent years to reorganise and rehabilitate research efforts. These include:

- o Research programmes based on the major agro-ecological zones of the country;
- o Research tightly related to the technical and socioeconomic problems facing farmers, with considerable emphasis on on-farm research;
- o Increased emphasis on staff training;
- o Increased budgetary allocation for agricultural research, training, and extension;
- o Improved linkages between research and extension; and
- o Improved coordination at the national and international levels to avoid duplication of research efforts.

These actions must be planned and implemented carefully, particularly the agro-ecological zone approach. Tanzania already has crop-based research programmes, each under a crop research coordinator. In TARO alone, there are 19 research programmes located in 12 research institutes. For the agro-ecological zone approach to be effective, the number of research institutes must be reduced. FAO has recommended that both financial and human resources be concentrated in a few well-equipped research institutes. The agro-ecological zone approach recommended by the task force envisions six zonal centres like UAC. Effectively carried out, this scheme could be a key to avoiding duplication and concentration of scarce resources, especially well-trained staff.

In line with the merger of the Ministry of Agriculture and the Ministry of Livestock Development, a merger of the many research organisations is being considered. This is consistent with World Bank recommendations to economise on administrative duplication and thereby release more senior scientists to conduct research. Unification of the research institutions may also foster better coordination at the national level and attract more international collaboration and donor support.

Other proposed actions will be affected greatly by the manner in which the initial strategy is implemented. However important the agro-ecological zone approach is in effectively deploying resources, the farming system research approach and the improvement of research-extension linkages are key to meeting the needs of small farmers.

Tanzania's research institutions also lack a strong library and publication service. These, if possible, and a national agricultural research journal should be established. A data base of agricultural research information should also be included at the central library and publication unit.

## 2. Training institutions

It is widely accepted that the level of training offered by the Sokoine University of Agriculture is very good. To date, however, Sokoine University cannot provide a sufficient number of higher degrees. The situation is different at the MATIs and LITIs. There are now a total of 15 institutes offering diploma and certificate courses. Some of the diplomas are specialised, but the standard of training, especially for specialised diplomas, needs to be improved. The main limitations are the scarcity of funds and the lack of specialised facilities and qualified staff. The number of institutes and of diplomas and certificates offered should be reduced to concentrate resources on fewer, more efficiently-organised units. If the research units are reorganised into six zonal research centres, then the number of training institutes should be reduced to fit into the centres, as with the UAC.

## 3. Extension institutions

Agricultural extension services have performed very poorly. According to the Final Report on the Tanzania National Agricultural Policy (October 1982), under decentralisation they suffered from a lack of organisation and policy direction, misallocation of manpower, inadequate training of personnel, a lack of transport facilities, and ineffective linkages with research. Due to the vastness of the country and the limited financial resources, it is not easy to define actions that could be effective in the short- to medium-term. Since the extension services were recentralised (1983), the main foci should be on the massive organisation of refresher courses on specialised subject matter and on a serious programme to provide staff with adequate transport.

## B. Dealing with Constraints to Agricultural Productivity

As was discussed in Chapter VI, the main constraints affecting crop development include the lack of high-yielding resistant varieties, storage losses, price policy and lack of inputs. Those affecting livestock development include land tenure, lack of pastures and feeds, and the non-economic approach common in traditional cattle husbandry.

The actions proposed to deal with most of these constraints include general infrastructure policies, socioeconomic policies and, to a lesser extent, technical interventions.

1. Pricing and marketing

Low farm prices primarily affect the growers of commercial crops, as these have very limited opportunities to sell their commodities on the open market. Purchase prices for these items by parastatals should be more consistent with those of food crops. Each year, the MDB produces very accurate analyses and price recommendations for each major crop; greater attention should be paid to these.

In addition, the policy of subsidising consumer prices of food crops should be reviewed and subsidies gradually lifted. Pan-territorial pricing of food commodities should be reconsidered, as it may result in excessive losses for the parastatals bearing the cost of transport of goods from distant areas. The consumption of goods should be encouraged in the zones where they are produced.

2. Processing and storage facilities

Processing of crop and livestock products is extremely important for the development of agriculture. Processing and storage facilities should be located near the agricultural production areas, thus providing additional indirect benefits to the farmers-producers and limiting transport costs and losses.

3. Roads and transport

The road network is seriously deficient at all levels and must be tackled with a vigorous programme of construction and rehabilitation. The improvement of road infrastructure is basic to the general development of the economy and not only of agriculture. Poor roads limit farmers' access to needed inputs and narrow the markets for agricultural goods. Some large areas such as the Mtwara/Lindi regions are cut off from the rest of the country for most of the year, preventing the sound development of agriculture and agro-industry.

4. Allocation of funds

Agriculture provides most of the hard currency entering Tanzania, but too small a share is returned to agriculture in the form of inputs. In the long term, this trend has resulted in the sector's declining performance and its reduced ability to produce high-quality exports. In particular, export-oriented farms should be allocated machinery, spare parts, chemicals and fuel, in proportion to their sales to crop authorities and without discrimination among the public, private and cooperative sectors.

## 5. Land tenure

As shown earlier, the lack of a clear land tenure system is a serious hindrance to land use planning and good management of land for agricultural and livestock activities. Programmes must be fostered for surveying, marketing and mapping the land. These should provide farmers with title deeds guaranteeing the use of the land for long periods, thus encouraging land conservation and improvement. This could also reduce overgrazing and mismanagement of pastures.

## 6. Irrigation

Tanzania is not generally faced with the recurrent droughts affecting many African countries. However, rains are often erratic, and yield levels may vary consistently from year to year. Thanks to ample water resources, the country has tremendous undeveloped potential for irrigation: only about 3 percent of the agricultural land is irrigated at present. A judicious programme establishing small- and medium-scale irrigation schemes along the main river valleys could provide a greater degree of food security, not only for Tanzania, but also for the entire SADCC region.

## 7. Development of the poultry industry

A programme aimed at rapidly increasing the availability of animal proteins can be better based on poultry development than on the development of other types of livestock. Of all livestock, chickens are the most efficient in transforming feed into meat. A poultry industry can be established in a relatively short time. Poultry production in Tanzania is very limited, and demand as well as price is very high. Cooperatives with centralised services for hatcheries and feed procurement could be the pivot of a system based on small production units on members' farms. A research effort to develop better breeds locally and to improve the local feed industry would greatly facilitate this.