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Reforming Agricultural Research Funding in Tanzania: Toward a Demand-Driven Agenda

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Acronyms

AAS	African Academy of Science
AAT	Agrochemical Association of Tanzania
ACs	Assistant Commissioners
ADB	African Development Bank
ADRI	Animal Disease Research Institute (in Tanzania)
AFRNET	African Feed Resources Network
ARF	Agricultural Research Fund
ARI	Agricultural Research Institute
ASARECA	Association for the Strengthening of Agricultural Research in Southern and Central Africa
BADC	Belgian Agency for Development Cooperation
CAO	Chief Administrative Officer
CASEC	Community Aid Small Enterprises Consultancy
CIAT	Centro International de Agricultural Tropical
CIDA	Canadian International Development Agency
CIFOR	Centre for International Forestry Research
COR	Client Oriented Research
COSTECH	Tanzania Commission for Science and Technology
CRT	Commissioner for Research & Training
CSIRO	Commonwealth Scientific Industrial and Research Organization of Australia
DAAD	Germany Academic Exchange Service
DANIDA	Danish International Development Agency
DFID	Department for International Development of UK
DRD	Directorate of Research and Development
DRT	Department of Research and Training
EAC	East African Community
EAFRO	East African Agriculture and Forestry Research Organization
ECEP	Environmental Capacity Enhancement Project
ELCT	Evangelical Lutheran Church of Tanzania
ENRECA	Enhancement of Research Capacity in Developing Countries
EU	European Union
FAO	Food and Agricultural Organization of the United Nations
FARMESA	Farm Level Applied Research Methods for East and Southern Africa
FFACF	French Food Aid Counterpart Fund (French Embassy, DSM)
FINNIDA	Finnish International Development Agency
FO	Farmer Organisation
FSR	Farming Systems Research
GoT	Government of Tanzania
IAEA	International Atomic Energy Agency
IARC	International Agricultural Research Center
IBSRAM	International Board for Soil Research and Management
ICRAF	International Research Centre for Agroforestry
ICRSAT	International Crop Research Institute for Semi-Arid Tropics
IDA	International Development Agency
IDRC	International Development Research Centre
IFS	International Foundation of Science
IFUW	International Federation of University Women
ILRI	International Livestock Research Institute
IRN	Institute of Natural Resources
ISNAR	International Service for National Agricultural Research

JICA	Japanese International Cooperation Agency
M & E	Management and Evaluation
MAFS	Ministry of Agriculture and Food Security (formerly MOAC, Tanzania)
MALD	Ministry of Agriculture and Livestock Development
MOAC	Ministry of Agriculture and Cooperatives (later MAFS; Tanzania)
MT	Management Team
NALRM	National Agricultural and Livestock Research Masterplan
NALRP	National Agricultural and Livestock Research Project
NARC	National Agricultural Research Council
NARF	National Agricultural Research Fund
NARI	National Agricultural Research Institute
NARS	National Agricultural Research System
NCA	Ngorongoro Conservation Authority
NGO	Non-Governmental Organization
NIRP	Netherlands Israel Research Development Programme
NORAD	Norwegian Agency for Development Cooperation
NORAGRIC	Norwegian Centre for International Agric. Development
NRI	Natural Resources Institute, UK
NRS	Norwegian Research Council
NUFU	Norwegian Council of Universities for Development, Research and Education
ODA	Overseas Development Administration, UK
OSSREA	Organization for Social Science Research in Eastern Africa
PI s	Principal Investigators
PIP	Project Implementation Plan
PRSP	Poverty Reduction Strategy Paper
REPOA	Research on Poverty Alleviation
SACCAR	Southern African Center for Cooperation in Agricultural Research and Training
SADC	Southern African Development Community
SARI	Selian Agricultural Institute
SARRNET	Southern Africa Regional Rootcrop Network
SASAKAWA	SASAKAWA Global 2000
SIDA	Swedish International Development Agency
SPAAR	Special Program for African Agricultural Research
SUA	Sokoine University of Agriculture
TAFORI	Tanzania Forestry Research Institute
TALIRO	Tanzania Livestock Research Organisation
TARO	Tanzania Agricultural Research Organisation
TARP II	Tanzania Agricultural Research Project - Phase II
TCMB	Tanzanian Coffee Marketing Board
TPRI	Tropical Pesticides Research Institute
TRIT	Tea Research Institute of Tanzania
Tshs	Tanzania Shillings
TTA	Tanzania Tea Authority
UAC	Uyole Agricultural Center
UDSM	University of Dar es Salaam (Tanzania)
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
VLIR	Flemish Inter University Council
WFP	World Food Programme
ZARF	Zonal Agricultural Research Fund
ZEC	Zonal Executive Committee
ZDRT	Zonal Department for Research and Training
ZTC	Zonal Technical Committee

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Executive Summary

In keeping with the liberalization and structural adjustment of the Tanzanian economy that started in the mid-1980s, the Government of Tanzania reviewed and redesigned its national agricultural research system (NARS). In 1989 the highly centralized system was restructured to devolve a certain degree of autonomy to the seven zonal headquarters, reflecting the agro-ecological variation in the country. Following a two-year process of consultations, the National Agricultural and Livestock Research Masterplan was launched in 1992. Drawing on the input of national research scientists and managers as well as representatives of the international community, the master plan set out a strategy that included closing more than half of the nation's 56 research stations. Priorities were set for individual crop and livestock activities. Research responsibility for Tanzania's traditional export crops was either entirely privatized (tea and eventually coffee and tobacco) or devolved to semipublic commodity boards with a significant amount of financial and administrative autonomy (e.g., cashew, cotton, and sugar). Recognizing the essential public nature of smallholder agriculture, the government maintained responsibility for the food, livestock and factor programs.

In rapid succession, the government took steps to further decentralize agricultural research. In early 1995, Ministry of Agriculture staff from headquarters and the zonal stations worked with other stakeholders (e.g., NGOs, commodity board representatives) to develop zonal agricultural research priorities. This was accompanied by legislation that permitted zonal research stations to retain revenue from their own commercial activities and allow donors to negotiate directly with local districts. An increasing share of revenues collected by already-existing commodity cesses was devoted to agricultural research. For the most part, those revenues were channeled through a wide variety of newly formed agricultural research funds with mandates ranging from type of commodity to region of relevance. Most of the new funds had guidelines providing for stakeholder steering committees and competitive grant making. As these reforms were occurring domestically, Tanzania's agricultural research managers maintained contact in various fora with international experts on the policy and financing of agricultural from organizations like the International Service for National Agricultural Research (ISNAR) and the World Bank.

The reorganization and accompanying policies to support these changes occurred recently and rapidly. Although the bureaucracy moved somewhat slower, many of these innovations were in place by FY1999/2000. The objective of this study is to document and assess the initial impact of these new financial mechanisms on the levels, sustainability and impact of funding for agricultural research in the United Republic of Tanzania. The team conducted desk reviews of the available documentation and interviews with the research institution managers, scientists and ministry officials that make up the National Agricultural Research System (NARS). The study was carried out both in the capital of Dar-es-Salaam and at several zonal research centers. Because the World Bank is playing a particularly important role in the funding and restructuring of several of these institutes, specialists from that organization were also interviewed.

This report is part of a larger study of innovative financing initiatives being employed to fund agricultural research in several countries and regional organizations across Africa. Abt Associates Inc. under the Sustainable Financing Initiative conducted the study with financing from USAID.

The Major Findings

Ministry officials, research managers, scientists and representatives of commodity boards in Tanzania have demonstrated an impressive commitment to the often-painful process of streamlining and rationalizing research policies and activities. They evidence a solid understanding of the appropriate role of the public and private sectors in the funding and management of agricultural research and endorse efforts to provide research institutions with greater autonomy and flexibility, both by zone and by function. In spite of a recent ministerial reorganization that separates crop from livestock activities, researchers remain committed to a farming systems approach to research in smallholder agriculture.

There are impressive attempts to expand potential sources of funds to agricultural research institutions while making research more demand-driven and client oriented.

- Cesses on major commodity crops make a substantial contribution to the research budget for Tanzania's major export crops – on the order of 12 percent. In some cases, the research has been privatized, and thus the cess constitutes the major source of funding (tea, coffee very recently, and tobacco eventually). In others, the government continues to cover staff salaries and basic facilities (cashew, cotton, sisal). In the case of cashew, the sums are particularly impressive and arrangements have been made for these funds to be used by researchers of non-cashew crops in the cashew based farming system.
- Agricultural research institutes are permitted to retain and manage internally generated revenues. Funds from these "self help" activities are relatively small. In gross terms, they run around seven percent of total resources; net of related expenditures, the actual share is likely to be less than half that amount. The challenge is to make such activities truly profitable without diverting attention from research priorities.
- Officials from the Ministry of Agriculture and Food Security are actively encouraging local governments to contribute to the research priorities in their zones. Some of the District Councils have responded by allocating scare resources to contribute to research pertaining to their smallholder constituents. To date, however, the response to this new initiative is tentative and still monetarily insignificant.
- Certainly for cash crops but in many instances for food crops, representatives of producer, processing and marketing groups are included in varying degrees on the steering committees that review and approve research proposals. Links are being built to small-scale producers of food and livestock crops as well.
- Efforts to make research more demand-driven should help further allay the creators, the disseminators, and the users of research results. In at least one agricultural research institute, "liaison officers" are rewarded when a researchable problem they have identified with farmers evolves into a funded research project. For some of the cash crops, incentive schemes link exports to researcher salaries. Although not yet widespread, researchers are starting to include costs for research materials and overheads in their proposal budgets.
- Agricultural research funds have been set up at the zonal level to attract donors to finance locally-vetted priorities. Under its current agricultural research project (TARP II), the World Bank will use IDA funds to match contributions secured by zonal research fund managers (up to $200,000/year), further amplifying the push towards demand-driven research in Tanzania.

In spite of these efforts to attract funding to a demand-driven agenda, pitiful funding levels are strangling agricultural research in Tanzania. With the exception of the cesses, most of these

innovations have little impact on the research budget. At many public and semi-autonomous institutions, there is little funding beyond the salaries provided by government and even those are at abysmally low levels.

Researchers are often distracted. At an institutional level, much time is spent looking for funds, either for agricultural research (through contracts or grants) or for a series of non-research – and sometimes even non-agricultural activities - such as leasing out office space or lands, selling research by-products or selling other products created using station resources. Without a steady research budget, scientists lack vehicles, per diems and staff to permit them to run field trials. The lack of funds for computers, working telephone lines, internet connections, library materials, and workshops means researchers are unable to maintain links to the greater scientific community.

At an individual level, the staff responsible for creating and disseminating technology receive extremely low civil servant salaries with minimal additional incentives. Researchers are often driven to pursue income-generating activities outside of agricultural research in order to feed their families. The dramatic variability in compensation between those researchers working on government stations (generally focused on small-holder food and livestock issues) and those working at stations funded either wholly or in part by the private sector causes resentment and discouragement.

Figure 1: Organization of Agricultural Research in Tanzania

Source: World Bank 1997.

1. Introduction and Background

Over the past several years, some African national agricultural research systems (NARSs) have begun experimenting with new financial mechanisms, and have undertaken institutional reforms to restructure and revitalize. The Special Program for African Agricultural Research (SPAAR) recently conducted a ten-country survey to determine progress with these experiments, and found examples of efforts to involve the private sector through export commodity taxation and to move towards performance-based funding through competitive agricultural research funds and contract research. However, beyond the SPAAR study and some informal canvassing, little is known about the incidence, nature and success of financial mechanisms and plans for mobilizing and allocating funds for agricultural research and technology transfer activities in Africa. Even less is known about the institutional and policy factors conditioning their success or the influence these innovations may be having on the agricultural research agenda.

To fill this knowledge gap, the Sustainable Financing Initiative (SFI), in collaboration with its African partners and with funding from USAID, undertook a series of country case studies to assess selected experience. SFI, through working to strengthen African agricultural research institutes, has found that financial sustainability is determined by three major factors: 1) available mechanisms for resource mobilization and allocation, 2) their institutional and organizational components and 3) the policy environment in which they operate (Bingen and Brinkerhoff, 2000). These case studies are expected to yield the following:

1. Documentation of what funding mechanisms and institutional reforms have been undertaken in the countries studied.

2. Description and analysis of the funding "picture" of selected institutions in the study countries, with an assessment of trends and patterns.

3. Identification and assessment of the policy context in which the institutions operate in terms of impacts on effective functioning.

4. Analysis of experience in terms of links to the private sector, success/failure in achieving results, contributing/impeding factors, lessons learned, and options for sustainable financing.

1.1. Methodology

The present document highlights the policy and financing of agricultural research in the United Republic of Tanzania. The mission mainly consisted of desk reviews of the available documentation and interviews with the research institution managers, scientists and Ministry officials that make up the NARS of Tanzania. The study was carried out both in the capital of Dar-es-Salaam and at several zonal research centers. Because the World Bank is playing a particularly important role in the funding and restructuring of several of these institutes, World Bank specialists were interviewed. Interviews were used to arrive at a detailed description of their sustainable financing mechanisms and accompanying policy issues.

1.2. The Tanzanian Context

Like many countries in sub-Saharan Africa, the Republic of Tanzania has experienced slow economic growth in recent decades. During the 1990s, gross domestic product (GDP) grew at an average annual rate of 2.8 percent, not quite keeping up with the country's rapid population growth of 2.9 percent during that same period (World Bank, 2001a & 2001b).

The agricultural sector constitutes nearly half of the value of the Tanzanian economy (GDP) and slightly more than half of the country's export revenues. Growth in this important sector, which is provides livelihoods for approximately 70 percent of the population, was 3.6 percent annually during the 1990s, considerably better than overall GDP. The largest gains were in the livestock sector, which comprises about 30 percent of the agricultural GDP. Production increased about 18 percent over the decade. The crop sector as a whole stagnated, and food production increased about six percent (relative to a 25 percent increase in the food production index for sub-Saharan Africa). With an average contribution of $188 in valued added per agricultural worker in 1997-99 in Tanzania as compared with $380 for Sub-Saharan Africa as a whole, agricultural productivity remains very low.

The low productivity of agriculture reflects the predominantly subsistence nature of the sector. Production is dominated by the country's nearly four million smallholders with an average holding of about one hectare per household (Newafrica.com, 2001a, Semboja et al, 1998). According to the 1994 agricultural census, most of Tanzania's agriculture is low input. Only 30 percent of all landholders used improved seeds, 20 percent used chemical fertilizers, and 10 percent used plows. Cultivation is primarily done by hand with hoes; mechanical traction is extremely rare (Limbu, 1999).

Investments in the agricultural sector have been meager. Domestic lending to the agricultural sector by commercial banks averaged 7 percent of a total Tshs 202 billion ($340 million) average annual lending from June 1994-June 1998 (IMF 1999, Table 25). Similarly, public investment in agriculture has been low. According to Economic Survey 2000, published by the Planning Commission in June 2001, agricultural expenditure as a share of the total expenditure was 1.4 percent, 2.2 percent, 2.1 percent and 1.7 percent for the years 1997/98 to 2000/01, respectively (GoT, 2001a).

Since the mid-1980s, the GoT has pursued policies to adjust the macro economy and liberalize markets (Delgado and Minot, 2000). During the last 15 years, the Government has consistently moved to dismantle the post-independence socialist structures. The reforms have been far-reaching: parastatal organizations and large monopolies were privatized, newly private banks were licensed, price controls were lifted, import and export trade was liberalized, exchange rates were freed and currency hold restrictions were lifted, monetary policies were established, the tax structure continues to be reformed, and at present, the civil service is being streamlined (IMF, 2000b).

This economic transformation has fundamentally altered the relationship between the private and public sectors. In terms of agriculture, the private sector now controls most functions related to production, processing and marketing while the GoT retains control over regulatory functions. The Ministry of Agriculture and Food Security continues to be responsible for setting policies, providing information, regulating sanitary and quality standards, as well as most, but not all, research, extension and training (GOT, 2001b).

Agriculture has become a priority sector in Tanzania. Following the adoption of the National Poverty Eradication Strategy in 1997, the GoT identified priority sectors for public expenditure, one of which is agriculture.[1] Recognizing the importance of agriculture to eradicating poverty, the Poverty Reduction Strategy Paper (PRSP) prepared by the Tanzanian authorities proposes to accelerate agricultural growth rates during the three years from 2000-2003 from 3.6 percent to five percent in the hopes of attaining 6 percent annual GDP growth. To meet this goal, the GoT plans to "intensify the implementation of reforms aimed at bolstering market efficiency, notably in agriculture, and raising factor productivity" (GoT, 2000f, p. 14). Specific actions cited in the PRSP logical framework include improving access to agricultural research and extension as well as preparing and adopting a private sector development strategy to ensure coordination between government and donor initiatives.[2]

Taken together, public spending on the priority sectors accounted for 4.8 percent of GDP in 1999/2000, with 0.3 percent for agriculture (IMF 2000b). The vast majority of the agricultural funds are for agricultural research and extension (85 percent). However, those funds have not been generous and in recent years, the push for structural adjustment and privatization has caused massive and ongoing reorganizations of the agricultural research system.

Thus agriculture is a critical but underperforming sector in the Tanzanian economy. It is key to producing the food, incomes and jobs needed to lessen poverty and sustain broad-based economic growth. In the context of efforts by the GoT and donors to rejuvenate Tanzanian agriculture, there has been a great push to reorganize and refinance the country's agricultural research system. In this report we focus on the nature and effects of those reforms and provide suggestions for ways to improve the viability of Tanzania's agriculture research.

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1 The other sectors are health, education, water, judiciary and roads.

2 Other measures to support agriculture include facilitating access to micro-finance/agricultural credit; promoting rural finance, improving trading/marketing of output and inputs, and removing administrative fiat; promoting exportation of agricultural products as well as agro-processed commodities; promoting community based irrigation; distributing land suitable for irrigation in favor of the poor; and ensuring the enabling environment for micro, small and medium enterprises and informal sector activities.

2. The Evolution and Structure of Agricultural Research in Tanzania

Agricultural research in Tanzania has gone through many institutional changes in the years since independence. Driven by shifts in the political climate, the system has continually re-invented itself in an attempt to deliver agricultural technologies and attract funding. Debate persists about how much to centralize varying research activities as the system strives to support profitable export crops while meeting the food and income needs of subsistence farmers operating in diverse agro-ecological zones. Since independence, the pendulum has twice swung from free-standing ARIs with a specialized mandate towards a national system covering a broad array of functions. Tanzania's highly skilled scientists and research managers have worked energetically to motivate and accommodate these changes. Policy makers have taken many of the steps necessary for the ARIs to attract and use funds from private sector sources. However, the struggle to reorganize and fund the agricultural research institutions of Tanzania continues to this day.

2.1. The Evolution of the NARS

During the colonial era, the focus of agricultural research in Tanzania was on the major export crops: coffee, cotton, sisal, tea and tobacco. Funding sources varied by crop. Research on coffee, cotton, and sisal was funded by the British Colonial Government and managed by the private sector: the Empire Cotton Corporation and coffee and sisal growers associations. The British Colonial Government also funded the Tea Research Institute of East Africa that was based in Kenya but maintained a substation in Tanga. Industry funds from the East African Tobacco Company and British American Tobacco were used to fund tobacco research.

2.1.1. Rearranging the Pieces

At independence, the focus of agricultural research was directed to the food crops and livestock produced by smallholder farmers. Networks of publicly funded research stations and substations were established in the major agro-ecological zones under the Department of Research of the Ministry of Agriculture and Livestock Development (MALD).[3] Research on certain commodities and disciplines such as maize, sorghum and millet, sugarcane and animal diseases was undertaken at a regional level by the East African Agriculture and Forestry Research Organization (EAFRO) of the East African Community (EAC).

By the mid 70s, researchers grew dissatisfied with the civil service procedures of recruitment, promotion, procurement of goods and services etc. Coinciding with the collapse of the EAC, pressure mounted for institutional reform. Between 1976 and 1980, the GoT reorganized the research department of the MALD into four semi autonomous research parastatals:

- The Uyole Agricultural Center (UAC) in 1976.
- The Tropical Pesticides Research Institute (TPRI) in 1979.
- The Tanzania Agricultural Research Organization (TARO) in 1980.

[3] The Ministry of Agriculture was called the Ministry of Agriculture and Livestock Development (MALD) up to 1989. In 1989 it was restructured as the Ministry of Agriculture and Cooperatives (MAC). In October 2000 it was again restructured as the Ministry of Agriculture and Food Security (MAFS).

- The Tanzania Livestock Research Organization (TALIRO) in 1980.

A few years later in 1984 Sokoine University of Agriculture (SUA) was founded from the former faculty of Agriculture, Forestry and Veterinary Science of the University of Dar es Salaam.

During the 1980s, efforts to strengthen the national agricultural research system continued. Among them were the National Agricultural Policy 1982, the Tanzania Agricultural Research Resource Assessment 1985 and UNDP/FAO and World Bank Mission reports and aide memoires 1982 to 1988. Noting overlapping mandates of the four research parastatals and poor linkages between research, extension and training, these stakeholders recommended consolidating crop and livestock research, moving to system based on agro-ecological zones, improving links between research, extension and farmers, and adapting a farming systems approach.

As a result of recommendations by the World Bank, the Special Programme for African Agricultural Research (SPAAR) initiative, various donors and consultancy reports, the GoT undertook a substantial reorganization of the agricultural research system starting in 1989. TARO and TALIRO were dissolved; agriculture and livestock research was returned to the MALD as a Department of Research and Training (DRT). The newly reconstituted DRT had over 50 research institutes, stations, centers and substations. Inadequate facilities and fuzzy research priorities hindered the ability to deliver research results and attract funding. In an attempt to attract government and donor funds, research priorities were honed, the research network was rationalized and priority stations were rehabilitated.

In fiscal year 1989/90, a team of national research scientists, senior managers, and international consultants, embarked on a priority-setting exercise. Supported by funds and international consultants from the United Kingdom, Federal Republic of Germany and the Netherlands, the resulting National Agricultural and Livestock Research Masterplan (NALRM) was launched in 1992. The NALRM team developed a three-tier priority program:

Priority one: Coffee, cotton, tea, rice, animal health/livestock diseases, ruminant meat/milk, soil and water management, agroforestry, farming systems research and agricultural economics.

Priority two: Maize, roots/tubers, phaseolus beans, grain legumes, vegetables and oil seeds.

Priority three: Sugarcane, cashew, sisal, sorghum/millets, coconuts, bananas, pyrethrum, poultry, wheat/barley, tobacco, agricultural engineering and others.

The number of research institutes, stations and centers was cut from 56 to 22; eight priority stations were recommended for immediate rehabilitation under the World Bank funded National Agricultural and Livestock Research Project (NALRP, 1989/90 to 1996/97).[4] During the same period, the National Agricultural Research Council was set up with representatives from MAC and non-MAC agricultural research institutes as well as stakeholders from marketing boards, producers associations, and the private sector (Africa.com, 2001).

[4] The selected stations were ADRI Temeke (livestock research), Ifakara (rice), Kifyulilo (tea), Lyamungo (coffee), Mlingano (soil/water management), Mpwapwa (ruminant meat and milk), Tumbi (agroforestryand and Ukiriguru (cotton, roots/tubers).

2.1.2. Devolving Responsibility for Agricultural Research

By the mid-1990s, structural adjustment and macro-economic liberalization forced a redefinition of the role the national government vis-à-vis the private sector and local governments. In the realm of agricultural research, responsibility for setting and funding the research agenda was devolved to the primary beneficiaries of research results. This push gained momentum during the preparation of a second World Bank project supporting agricultural research and put into action with that project's implementation in 1998.

The devolution in responsibility for agriculture research occurred in a number of ways. First, research responsibilities for export crops were partially delegated to the private sector. Second, administrative control of research was decentralized to the zones and districts. Third, the emphasis on demand-driven, client-oriented research deepened and spread. Fourth, several important innovations in mechanisms to mobilize and allocate funds were instituted or expanded.

Partnerships with the Private Sector

With liberalization, most agricultural production, processing and marketing functions were assigned to the private sector. The Ministry of Agriculture and Cooperatives (MAC) retained public sector support functions such as research, extension, training, policy formulation, information services, and regulatory functions related to sanitary and quality control. Research responsibility for Tanzania's traditional export crops was either entirely privatized (tea, coffee and eventually tobacco) or devolved to semi-autonomous commodity boards with a significant degree of financial and administrative control (e.g., cashew, cotton, and sugar). Recognizing the essential public nature of smallholder agriculture, the government maintained responsibility for the food, livestock and factor programs.

Decentralization

Like many countries in Africa, Tanzania's government gradually shifted power from the center to the regions during the 1990s. The beginnings of Tanzania's agro-ecological – or zonal – approach to research were initiated in early 1990. In 1994/95 the previously semi-autonomous Uyole Agricultural Center was reabsorbed into the DRT to serve as a zonal center. In response to donor apathy for the national priorities DRT organized zonal priority-setting workshops in all seven agro-ecological zones between October 1994 and January 1995. The aim was to establish a few well-focused and cost-effective priority research programs and researchable topics whose results could have immediate impact on farm productivity. Farmers, extension, agro-industries, NGOs and researchers worked together to develop the zone-specific research priorities listed in Appendix Table 2.

In 1998, the World Bank renewed its support for Tanzanian agricultural research with the Tanzania Agricultural Research Project (TARP II, 1998/99-2002/03). The project emphasized client-oriented, demand-driven applied and adaptive research (World Bank, 1997 a&b). Under that project, the seven zonal centers for research under Research and Development Division (DRD) were given greater autonomy to plan and implement research. Specific budgets were allocated to each institute and responsibility for managing those funds was accorded to the Zonal Directors of Research and Development (ZDRDs).

Under decentralization, the proposal review process was modified to ensure that research be locally adapted, demand-driven and in line with the prevailing zonal socio-economic environment. First,

zonal scientists submit their proposal to the Zonal Research Coordinator for the annual Internal Programme Review (IPR). The approved proposals are forwarded to the Zonal Technical Committee (ZTC) for review and approval under the chairmanship of the Zonal Director of Research and Development. Those that pass this hurdle are then sent on for final approval by the Zonal Executive Committee (ZEC) under the chairmanship of one of the Regional Administrative Secretaries in the zone. As described in the World Bank's project appraisal document, the newly empowered ZECs "approve the zonal research agenda, sanction expenditure proposals, recommend the annual budget to the MOA, and make required operational decisions" (1997a, p. 4). ZECs draw their members from the research zones and local government, regional administration and other relevant stakeholders to ensure close follow up of technical information development and dissemination. Under this process, DRD and TARP II management adhere to ZEC decisions in disbursing funds to the zones.

Parallel to the transfer of power from the DRD to the zonal agricultural research centers, the Local Government Reform Program paved the way for decentralizing administrative responsibilities to local democratic institutions.[5] District Councils were given autonomy to plan and implement their own activities in their districts, including providing input and funds for the agricultural research agenda. Representatives of local governments sit on the Zonal Technical Committees and Zonal Executive Committees and in 2000/2001 some District Councils invested scarce funds in agricultural research projects carried out at the zonal research centers (see Section 3).

Despite decentralization, the central government continues to play an important role in research. The DRD of MAFS is responsible for ensuring that all agricultural research is planned and carried out efficiently in accordance with national agricultural policy priorities and that research results are translated into practical technological packages for the end user.

Demand-Driven Research

The devolution of power for setting and funding the agricultural research agenda towards the end-users served to greatly heighten the emphasis for demand-driven research. Since the early 1980s, Tanzanian researchers had used the farming systems research (FSR) approach to link researchers with extension workers and farmers to identify, prioritize, test and evaluate agricultural research. This approach had been supported by a series of projects and activities from 1983 through 1998, including the formation of a FSR section within the DRT. Starting in 1997, the centralized FSR program was redesigned for implementation at the zonal level. Pilot programs for the renamed Client-Oriented Research (COR) programs were initiated in the Lake Zone (1997) and Northern Zone (1998). In general the two COR pilot programs focused on better understanding (and mapping) the local agro-ecology, stakeholder needs, and available research information. Following guidelines set out under TARP II, both the Northern and Lake Zones have established an agricultural research fund to fund competitive grants (see below). To improve the link between researchers and farmers, they have appointed Liaison Officers who work on commission to identify researchable farmer priorities that end up in funded proposals.[6]

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[5] Under the Regional Administration Act No. 19 of 1997.

[6] In the Northern Zone, for example, the overhead portion of research grants are disbursed 60 percent to the investigator, 30 percent to the research center's administration and 10 percent to the liaison officer.

Financial Innovations

Efforts to make research more privatized, decentralized and client-oriented can only work if they successfully mobilize and allocate funds. In order to improve the ability of Tanzania's agricultural research institutes to meet client needs for improved agricultural productivity, TARP II took the two pronged approach of "support[ing] privatiz[ation] of research where appropriate while encouraging initiatives for raising extra-budgetary resources for research" (World Bank, 1997b, p. 2). The push was to draw on private sector sources of funds for research on industrial/commercial commodities to the extent possible, either by privatizing entire institutes or by working in private/public partnerships.

The Government already had in place two important means for encouraging the flow of private sector funds into the agricultural research institutions:

- Commodity cesses/levies. Commodity levies/cesses were instituted under NALRP (1989/90-1996/97); the Minister of Agriculture approves the cess once the relevant commodity board has agreed on the level of the tax. These funds are used for research conducted by private and public institutions (see Section 3 for a fuller description).

- ARI Retained revenue scheme. In 1995, the Ministry of Finance granted approval for ARIs to retain and control revenues earned through their own commercial activities. (See Section 3, Self Help Funds).

Other vehicles for individual ARIs to attract funds include:

- Directly from donors instead of going through DRD headquarters. In 1997, policies were changed to permit donors to negotiate directly with Districts, including the funding of agricultural research at zonal stations.

- By providing services, such as soil and water analysis and veterinary services, on a cost recovery basis, including up to a maximum of 20 percent overhead.

- By the sale of breeder's seed for hybrids (usually in wheat but new maize varieties have attracted interest from Pioneer Zimbabwe.

In addition to the right to raise funds through various private sector mechanisms, the newly empowered research organizations were encouraged by the World Bank and bilateral donors to establish agricultural research funds (ARFs). The National Agricultural Research Fund (NARF) was established under NARPL in 1991, followed by pilot Zonal Agricultural Research Funds (ZARFs) in the Lake and Northern Zones under TARP II. At this early stage, no particular enabling legislation has been required, although the increased involvement of District Councils and Commodity Boards may become necessary. These funds are described in much greater detail in Section 0.

2.2. Current NARS Structure

As a result of the last decade of priority setting, restructuring, station closings, decentralization, privatization, client-oriented approaches and increased avenues for private sector funds, the Tanzanian agricultural research system is quite complicated. The present structure, depicted in

Appendix Table 1, comprises public research, public sector semi-autonomous research, academic semi-autonomous research and private sector research.

2.2.1. Public Sector Research

The Division of Research and Development (DRD) of the MAFS is the largest component of the NARS in Tanzania. It controls 22 research institutes and centers organized under seven lead institutes in each of the seven agro-ecological zones (Appendix Table 1). The DRD is staffed by a total of 348 researchers.[7] Its mandate is to plan and execute public sector agricultural research and disseminate findings to the farming community through the extension services. It is responsible for coordinating the development of appropriate technologies that contribute to the conservation of the natural resource base and enhance sustainable agricultural production systems. The research is funded by a combination of sources: government, multilateral and bilateral donors, public and private sector institutions and regional and international networks (see Section 3).

Research on export crops such as cashew, sisal and cotton is conducted in the DRD public zonal research institutions funded by the GoT in partnership with parastatal commodity boards. Staff assigned to these ARIs work under the civil service structure and compensation levels, although depending on their sources of external funding, they may receive salary supplements.

2.2.2. Public Semi-Autonomous Research

The GoT also works in partnership with several semi-autonomous institutes to deliver agricultural research. The semi-autonomous ARIs have a governing body and process that determines the research agenda and, to varying degrees, outside sources of funds. The government contributes the basic facilities and staff. However, the institute's Board of Directors approves the scheme of service for the staff of these institutions.

The Sokoine University of Agriculture (SUA) is the second largest component of the NARS, undertaking agricultural research with about 236 staff of whom about 72 are full time equivalents on research and development. Research at SUA draws together academic staff, postgraduate and undergraduate students from four faculties under the coordination of the Department of Research and PostGraduate Studies. SUA research priorities aim at augmenting the national priorities in agriculture, natural resources, health, nutrition and environment. There are collaborative research programs with national and international research institutions. The major sources of funding for SUA are government and donor funds. Under TARP II, SUA is coordinating a collaborative research program on Food Security and Household Income for small holder farmers in Tanzania. This is a collaborative effort between SUA, DRD/MAFS and Norway, funded by NORAD.

The Tropical Pesticides Research Institute (TPRI) is a semiautonomous research parastatal under MAFS. Its mandate covers conducting plant protection research and providing technical services such as registering pesticides and supervising plant quarantine services. TPRI has a scientific and technical staff of about 37 scientists.

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[7] At the time of this study (February 2001), a decision was made to remove livestock activities from the MAFS and put them in a newly created Ministry of Water and Livestock Development. It is anticipated that livestock research activities will also be reassigned to the new ministry, thereby decreasing the number of research institutes and researchers directly under MAFS/DRD.

The Tanzania Forestry Research Institute (TAFORI) and the Tanzania Fisheries Research Institute (TAFIRI) – formed under the Ministry of Natural Resources and Tourism in 1980 – still operate as semi-autonomous parastatal institutions. Their main sources of funding are from government and donors. This study did not look into the funding sources of these ARIs.

Table 1: Overview of Present NARS Structure 1999/2000

Institutional Category	Institution	Supervising Agency	Research focus	Research Institutes and Centers	No. of Researchers
Public	Division of Research and Development (DRD)	Ministry of Agriculture and Food Security	Crops, livestock, soil and water management, agroforestry, agricultural engineering, socio-economics.	23	348
Semi-autonomous	Sokoine University of Agriculture (Directorate of Research and Postgraduate Studies). (SUA DR-PS)	Ministry of Science Technology and Higher Education and a Governing Council	Agriculture, livestock, fisheries, forestry and environmental studies.	8	72 (FTE)
	Tanzania Fisheries Research Institute (TAFIRI)	Ministry of Natural Resources and Tourism	Fisheries research and environment	4	32
	Tanzania Forestry Research Organization (TAFORI)	Ministry of Natural Resources and Tourism	Forestry research and environment	2	22
	Tropical Pesticides Research Institute (TPRI)	Ministry of Agriculture and Food Security and TPRI Board of Directors.	Plant protection, chemical and physical behavior of pesticides, livestock and human vectors programmes, plant quarantine services, Herbarium and Gene Bank.	2	37
Private	Tea Research Institute of Tanzania (TRIT)	TRIT Board of Directors	Large and small-holder tea	2	10
	Tanzania Coffee Research Institute (TACRI)	TACRI Board of Directors	Coffee research	3	30 proposed

2.2.3. Private Sector Research

By the end of 2001, research had been privatized for only two commodities. The Tea Research Institute of Tanzania (TRIT) was established in 1996 by merging two public research programs (at Kifyulilo and Marikitanda) with a private tea research institute (at Ngwazi). TRIT"s mandate is to support large and small-scale tea producers with appropriate high quality, cost effective research and technology transfer. Its small staff of ten researchers is highly motivated, working in well-maintained facilities on very generous salaries relative to scientists in other ARIs in Tanzania. TRIT is funded primarily by the tea industry by means of a cess: 1.5 percent of the net proceeds from the sale of tea is levied for tea research. Donor funds are used to support research on smallholder problems. The institute is governed by aBoard of Directors comprising two representatives from the MAFS, four from the tea industry, one from the Tea Board of Tanzania and the Executive Director from Cranfield University. The Institute is headed by a Research Director and assisted by an Executive Secretary. It has two research stations, namely Ngwazi in the Southern Highlands and Marikitanda in the Northern Highlands and collaborates with Kifyulilo research station.

The Tanzania Coffee Research Institute (TACRI) was registered in October 2000 with members from the Ministry of Agriculture and Food Security, grower members (cooperatives), individual members, coffee buyers and coffee processors. TACRI was launched in March 2001 with the GoT contributing the existing assets at Lyamungu, Ugano and Maruku research stations. As the GoT will no longer contribute staff, the newly appointed Chief Executive Director faces the prospect of determining which staff to retain going forward. The most recent proposal is for 30 researchers. The pre-existing cess of 0.25 percent levied on coffee sales will likely be greatly inadequate to fund coffee research.

Tobacco Research at Tumbi research station came to a stand still since 1995 due to lack of funding. In 1996 the tobacco industry agreed to take over tobacco research. The Tobacco Research Institute of Tanzania (TORITA) was registered in August 2000 with members from Tanzania Tobacco Cooperative Apex (TTCA), Southern Highlands Tobacco Growers Association (SHTGA), Songea Tobacco Processor Ltd (SONTOP). The Tanzania Tobacco Board and Sokoine University of Agriculture are associates. As of October 2001, TORITA had not yet been offically set up as a private entity.

Funding tobacco research remains a problem. The current cess of 2 Tshs per kilogram of green leaf tobacco (or $2.50/ton) netted about 52 million Tshs ($65,000) in 1998/99. As this level is too low to run a viable research institute, the Tanzania Tobacco Council is considering increasing the cess. TORITA also hopes that establish a partnership with MAFS so that the Ministry continues to second staff to the institute.

2.2.4. Others

Other agricultural research in Tanzania includes:

- International and regional programs, such as the International Center for Research in Agroforestry (ICRAF) Southern Africa program based at Tumbi in Tabora, and the ASARECA Phaseolus Bean and Soil and Water Management Networks based at Selian Center (of DRD) and SUA respectively.
- The Animal Disease Research Institute (ADRI) recently moved under the Ministry of Water and Livestock Development, based in Dar es Salaam with a mandate to cover all seven agro-climatic zones.

- The Tsetse and Trypanosomiasis Research Institute (TTRI) located in Tanga region in the Eastern zone. It comes under ADRI as far as animal diseases and pests are concerned.
- The Horticulture Research Institute Tengeru is located in the Northern zone with a mandate for Horticultural Research.
- The Viticulture Research and Training Centre Makutopora is located in the Central zone with a mandate for Viticulture Research and Training.
- The Chollima Agro-Scientific Research Centre is located in the Eastern zone and it is currently used as a trial site for rice, maize and vegetable research.
- The Center for Agricultural Mechanization and Rural Development (CAMARTEC) is a semi-autonomous parastatal under the Ministry of Industries and Trade with some collaborative activities with the MAFS.
- Some private and public sector bodies and some NGOs also conduct research, mainly adaptive trials, in collaboration with DRD institutes.

2.3. Institutional Issues

The last 40 years have been marked by the constant re-inventing of the Tanzanian agricultural research system. Recent years have seen a trend towards greater decentralization of the priorities, management and funding of research. In spite of a great institutional and individual flexibility to adapt to evolving conditions, the system continues to struggle with a core of persistent challenges:

- *Institutional upheaval*: Recent re-organization of Government Ministries following the last elections has taken away Livestock and Cooperatives from the former Ministry of Agriculture and Cooperatives (MAC) and established Ministries of Agriculture and Food Security, Water and Livestock and Marketing and Cooperatives. This will affect the organization of public sector research under the former MAC.
- *Ongoing need to integrate research with extension and farmers.* The client-oriented programs piloted in the Lake and Northern Zones need to become sustainable and extended to other zones if they are to have an impact on rural development. The TARP II mid-term review (1998/1999-2000/2001) that took place in February 2001 recommended scaling up their implementation in Western, Southern, Southern Highlands and Central zones. Some funds were set aside for this purpose and the DRD Agricultural Economics Unit was assigned the coordinating role. Ireland AID supports the Eastern zone under the eastern zone client-oriented research and extension program (EZCORE).

3. Sources of Funding

It is difficult to provide a comprehensive map of funding to agricultural research in Tanzania for several reasons. First, the frequent changes in research administration outlined in section 2 have been accompanied by a certain degree of financial upheaval. Further, Tanzania's success in decentralizing and in some cases privatizing the management and financing of agricultural research makes it difficult to assemble a comprehensive historical data set of research funding. Before the 1997 Regional Administration Act that made the districts the operational centers for rural development, line ministries conducted developmental planning, monitoring and evaluation centrally. Funding from all sources was reflected in the annual government budget and collection of financial allocation as well as expenditure data was relatively easy. With decentralization, district and zonal offices and projects now control those resources they solicit or raise. Proper accounting methods lag behind. Many districts are only now becoming equipped to process budget data. It will take some time before the full national financial dimensions of agricultural research and development can be aggregated from district data.

Even where partial data are available, there is inconsistency between budget appropriations by Parliament and actual disbursements by Treasury. Distinctions are blurred between the sums allocated, disbursed and received. It is also difficult to identify the true source of funds, as donor funds are often routed through intermediaries such as international networks, NGOs or district councils.

NARS funding is typically allocated to development (investments) or recurrent (operations) expenses. Historically, donors funded the development portion of the research budget, not the recurrent costs. But in the past decade, as economies in sub-Saharan Africa have experienced varying degrees of decline, some donors have directly or indirectly funded recurrent activities. Until the reporting systems function better, the breakdown between the use of agricultural research funds for recurrent versus development expenditures remains elusive.

The study team was thus unable to compile an internally consistent comprehensive picture of funding agricultural research at the national level. Furthermore, the autonomous and semi-autonomous research institutes are reluctant to be transparent about research funds. The focus of this chapter is therefore on the ARIs that comprise the DRD. The semi-autonomous institutes are not included (TRIT, SUA, TAFIRI, TAFORI and TPRI). Coffee research is included because it was not yet privatized at the time of the study team's visit.

Historic series for some of the components of research funding were available, such as GoT appropriations, cess revenues, and to a lesser extent, internally generated revenues and donor contributions at selected research centers. The discussion below traces these components (Sections 0 to 0) and provides a very rough view of the aggregate (Section 0). The main funding issues are summarized in Section 0.

3.1. Government Funding

In Tanzania, government funding of research comes through annual Parliamentary allocations to the various agricultural research institutes (ARIs) and - to a very minor degree - from local district authorities. In addition, World Bank support of agricultural research is counted as part of the GoT allocation because, strictly speaking, it is a loan to the national government.

3.1.1. National Government

The most complete set of historical budgetary data was available for the period covered by the successive World Bank projects (NALRP and TARP II). Because the various versions of the budget did not always agree, reliance was placed on the Appropriation Accounts for the Ministry of Agriculture, which provided certified figures.

Actual expenditures to the NARS are presented in Figure 2; the data are included in the Appendix Table 4. The GoT data are broken out by recurrent and development expenses. Recurrent includes personal emoluments (primarily salaries), operations and training; development includes capital works, equipment and vehicles. Although the World Bank credits under the NALRP and TARP II projects are included in the GoT accounts, it is unclear the extent to which donations by other donors are tracked at the central level. Note that disaggregated data for recurrent expenses were not available for 1995/96.

Several important issues emerge.

1. Government funding is highly variable, with more than a five-fold swing over the course of the five years presented. The 1997/98 value - for which the authors could find no explanation - is so peculiar as to cast doubt over the entire series.
   - There is some evidence of an upward trend in the last three years even if the aberrant 1997/98 figure is ignored. This upward drift is primarily due to the increase in World Bank's commitment to the development portion of the total budget (and - as a loan - is not strictly speaking sustainable). The basic GoT commitment to research (recurrent plus the GoT portion of development) hovers around Tshs 1.5 billion (US$ 2.3 million).
   - This upward increase is attenuated when considered in real terms. Although the inflation rate has fallen very rapidly in recent times, it averaged over 18 percent per annum during this period.[8] The value of the Tanzania shilling has declined about 38 percent relative to the US dollar over this same period.
   - Actual disbursements differ from appropriations in each year (Figure 3). In three of the last four years actual disbursements have actually exceeded approved. The recurrent portion (contributed by GoT) fluctuates somewhat more than the development portion (contributed primarily by the World Bank).

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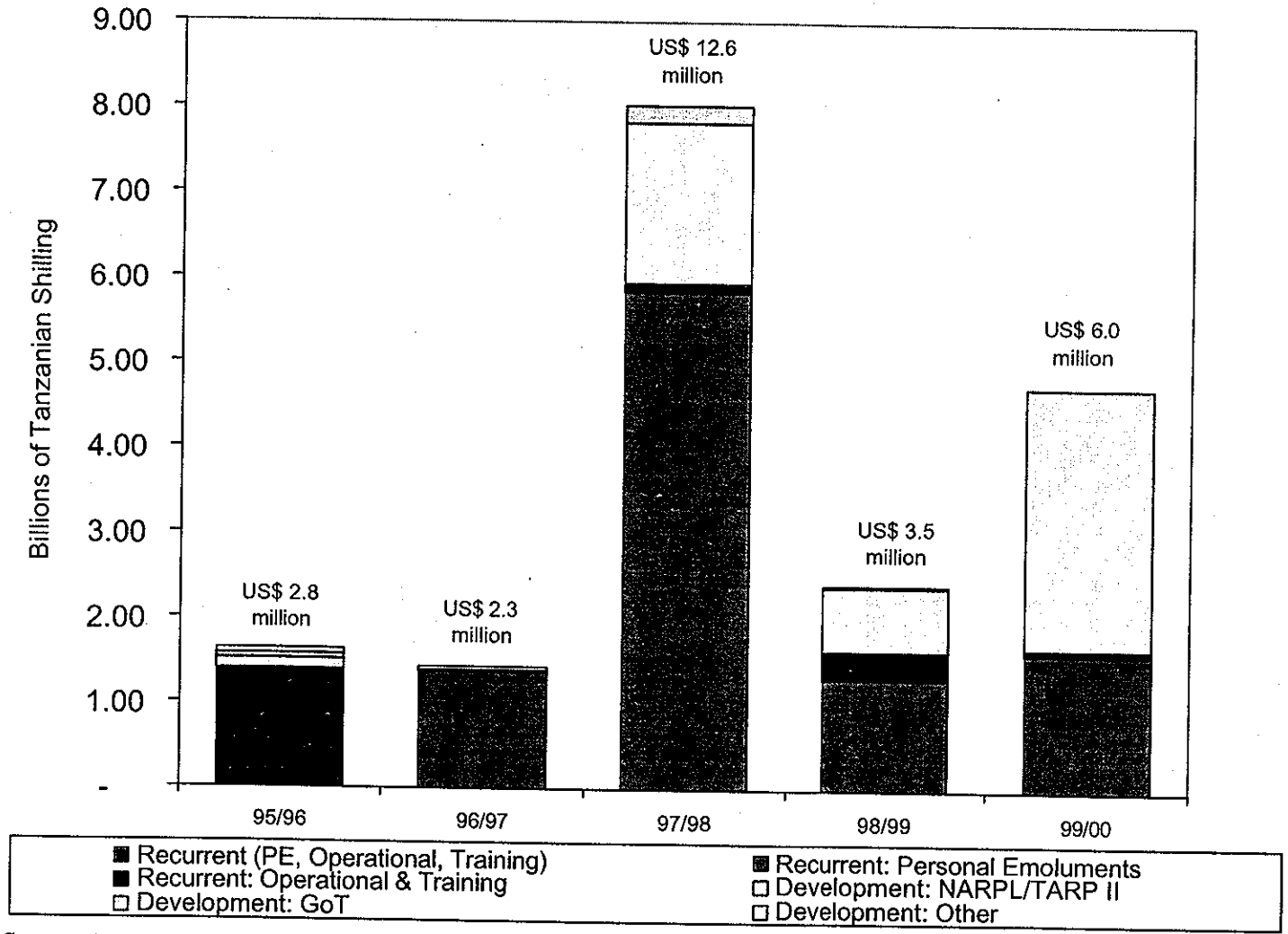
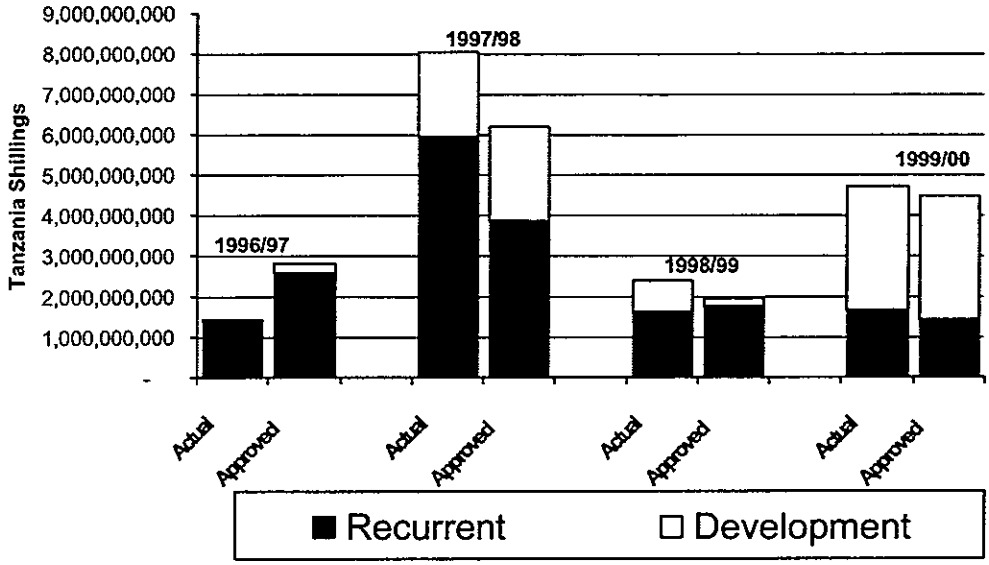
[8] According to World Bank data based on the GDP deflator, the annual rate of inflation in Tanzania in the years from 1995 to 2000 was 6.9 percent, 19.3 percent, 20.6 percent, 16.7 percent, and 9.1 percent, respectively. (Extracted from the World Bank Query function at http://www.worldbank.org/data/dataquery.html).

Figure 2: Government Expenditures for Agricultural Research



Source: Appropriations Accounts, Ministry of Agriculture and Food Security

Figure 3: Actual versus Approved Government Expenditures for Agricultural Research



Source: Appropriation Accounts, Ministry of Agriculture and Food Security

2. Recurrent costs constitute two thirds of the actual budget in the last five years (Figure 2, dark colors).
   - The bulk of all recurrent costs is devoted to personal emoluments, which accounted for more than 90 percent on average over this period.
   - Personal emoluments, however, are very small per person. Although data were not available for the total number of people employed, there were approximately 320-350 BA, MSc and PhD researchers on staff during these years. Personal emoluments per researcher averaged Tshs 7.3 million per year (US$ 11,097/year) over the period. Although not shown directly here, these figures suggest that even under the most optimistic assumptions, individual compensation packages are very small. (The issue of staff compensation is covered in depth in Section 0).
   - The operations and training budget is also extremely small, effectively stranding researchers without the complementary inputs needed to conduct research. The budget included an average of Tshs 320,504/year/researcher (US$ 543) during this period. Informal interviews with researchers suggest they require more than Tshs 10 million (US$12,500) in operational funds per researcher per year.
3. The development budget averages about a third of the total budget (Figure 2, light colors). The vast majority of this comes from the World Bank (NARPL/TARP II projects) as soft loans. The GoT investment in the development portion of the agricultural research budget is negligible and usually at the insistence by lenders that GoT shows commitment to projects by providing counterpart funds. The fact that GoT contribution is required before such funds are released has meant that there have been times when, due to various national constraints, TARP II funds could

not be accessed as has happened for prolonged periods during the past 2 years (not shown in figure).[9]

4. ARI stations have little control over the quantity and disposition of funds they receive. In the case of donor funds, they are making efforts to make sure salaries and operating costs are being covered. GoT recurrent funds primarily cover civil service salaries and benefits. These funds are paid directly to staff, often by direct deposit into personal bank accounts. The balance is allocated to ARIs directly for maintenance purposes. The centers do not prepare budget requests for this money. Usually the GoT portion of development funds is either for predetermined capital works or equipment. It is not for allocation to scientists. The donor component is often also for capital works and equipment/vehicles but a large proportion of it is for operational research. It is generally allocated to ARIs in accordance with program budgets. Except salaries, the budget includes all items necessary for a station and on farm research. The practice in the past was not to include overhead because the GoT would take care of that. Increasingly, it is now accepted that government sources are inadequate to pay for utilities and telecommunications. Overheads are therefore being included in budgets for those donors who subscribe to the idea. Accepting that salary revisions are unlikely in the foreseeable future and that current incomes are one quarter or less of what is required to live on, discussions are planned with donors to charge a fee for fieldwork. This would be analogous to what is being charged for consultancies. The purpose will be to provide an incentive for keeping scientists on the job.

3.1.2. District Councils

The Permanent Secretary (PS) in the Ministry of Agriculture and Food Security has spearheaded a recent effort to persuade local authorities (District Councils) to contribute to agricultural research. Starting late in 1999, Ministry representatives visited numerous local authorities to urge them to put tax revenues into the Zonal Agricultural Research Funds (ZARFs) in order to boost agricultural productivity. (For more information about ZARFs, see Section 0).

At the time of the fieldwork for this study in February 2001, only a few districts in the Central and Southern Zones had actually contributed funds to research. In meetings with the PS, each district pledged between Tshs 3.0 to 3.5 million; payments, however have been slow. In the Central Zone, only three of nine districts had actually disbursed funds, and even then at a level much lower than they had committed (Table 2). In the Southern Zone, the number of contributing districts was higher, but the actual sums very modest. Central Zone districts contributed a total of Tshs 5.0 million ($US 6,219) and Southern Zone districts contributed Tshs 12.5 million ($US 15,547).

An important byproduct of this impressive show of contributions by local authorities is the message sent to other potential donors. In the Central Zone, the apparent commitment of local authorities has attracted ZARF funding directly from SIDA (Tshs 7 million) and indirectly through NGO projects (Dodoma micro-project Tshs 22 million and the Dairy Goat Project Tshs 81 million over two years).

Ministry visits to districts were interrupted by the national elections in October 2000 and set to start up again in late February 2001. Lake Zone visits had already started at the time of this study. Stakeholder workshops are scheduled for November 2001, December 2001 and January 20002 for

[9] Beginning in FY 2000/01 and continuing at least into the first half of FY 2001/02, fund releases from Treasury have greatly improved (personal communication, Dr. George Sempeho, Project Manager, TARP II).

Western, Eastern and Southern Highlands zones, respectively. Although there has been a tendency for districts to make uniform pledges, more effort will be needed to convince districts to contribute enough from their own sources to make a significant impact on research.

Table 2: Funding Research by Districts in the Central and Southern Zones

District	Contribution
Central Zone	***5,000,000***
Dodoma Rural	0
Dodoma Urban	0
Irambo	0
Kongwa	0
Kondoa	1,000,000
Manyoni	3,000,000
Mpwapwa	1,000,000
Singida Rural	0
Singida Urban	0
Southern Zone	***12,500,000***
Kilwa	0
Lindi Rural	0
Lindi Urban	0
Liwale	0
Mtwara Urban	1,500,000
Mtwara Rural	1,000,000
Masasi	1,500,000
Nachingwea	2,000,000
Newala	1,500,000
Ruangwa	1,500,000
T/Himba	2,000,000
Tunduru	1,500,000
Grand Total	***17,500,000***

Source: Figures for Central Zone as of February 15, 2001 provided by the Zonal Director of Research and Development. Figures for Southern Zone as of January 31, 2001 from Naliendele ARI.

Exchange rate estimated as Tshs 805 = USS 1.

3.2. Commodity-Based Funding

The Tanzanian agricultural research system has enjoyed an impressive infusion of funding from industry in the form of cesses and levies on a broad range of agricultural commodities. With general economic liberalization in the early 1990s, commodity parastatals withdrew from directly marketing crops and turned their focus primarily to promoting their respective commodities and regulating trade. Agricultural research was seen as a major way of promoting commodity development. The GoT has engaged in a public-private partnership with the commodity boards whereby the government provides base salaries and research infrastructure for commodity research while the industry finances operational costs and other necessary resources. To varying degrees, this has included incentives to raise scientists' civil-servant incomes to levels closer to those in the private sector. The major commodities included under this partnership arrangement are cashew, coffee, cotton, and sugarcane, although others have been covered from time to time.[10]

The money is collected from levies and cesses set by the government, whose amount and method of collection differs for each commodity. Collection and disbursement is the responsibility of commodity boards. A set amount or proportion is supposed to be allocated to the commodity research centers. To-date, there has been no mechanism to ensure that the boards regularly remit the amount agreed. Although in some cases research funds have been established into which research money is deposited, the ARI management usually does not have signature authority on the fund. Only for cashew is there an exclusive research fund for which the center has responsibility.

3.2.1. Aggregate Cess Funding

Commodity-based cesses are an extremely important component of Tanzania's agricultural research financing (Figure 4). Aggregate research revenues derived from cesses have increased more than fivefold since the mid-1990s, fueled in great measure by revenues from the cashew cess.[11] In the last two years (1998/99 and 1999/00), cess revenues have averaged 60 percent of the total GoT contribution to agricultural research (excluding the World Bank loan).[12]

This share is far greater when viewed in relation to the particular commodities served by the cesses. Because most cess revenues are directed to research on the particular crop upon which they were levied, there is significant variation between crops. Averaged over the last three years shown in Figure 4, cess revenues per cashew scientist were a heady Tshs 31 million ($692,000), versus Tshs 16 million ($257,000) for coffee, Tshs 15 million ($254,000) for cotton and Tshs 2 million ($34,000) for sugarcane scientists.[13]

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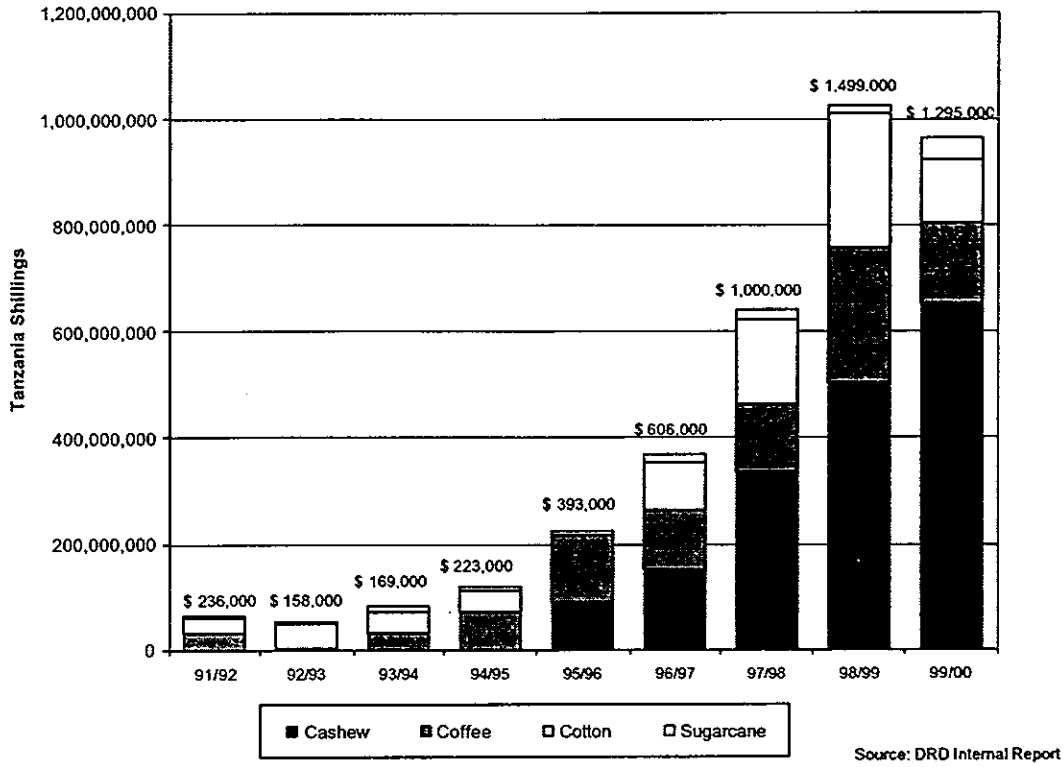
[10] This analysis of cess revenues for research does not include the small and erratic sums set aside for barley, sisal and tobacco previous to 1995/96.

[11] The decision to establish a cess for funding cashew research was not made until 1993 and actual funding did not start immediately.

[12] These figures do not include the research portion of the tea cess, cited as approximately $400,000 in 1999/00 by Mr. Michael Carr, Executive Director of TRIT. An historic series for this privatized research institution was not available at the time of the study team's visit.

[13] Based on an estimated 19 cashew scientists, 11 coffee, 12 cotton, and 12 sugarcane scientists.

Figure 4: Research Funding from Commodity Cesses



These are staggering figures in comparison with the Tshs 6.1 million/year/researcher (US$ 8,667) combined budget for operations, training and development covered by the GoT budget allocation. Of course the cess research funds have to cover additional expenses not accrued at DRD institutions, such as meetings of the steering committees that determine research priorities. Members of the steering committee managing the Cashew Research Fund, for example spend a considerable amount of cashew funds for their very frequent (quarterly) meetings (see below). Additionally, there can be a sizeable discrepancy between the official cess figures and the funding received by scientists; coffee researchers were not convinced that they had received funding remotely comparable to the official figures. Furthermore, the funds can be used to fund other needs at the research centers where these commodity researchers work; for example, revenues from the cashew research cess are used to supplement research funds for other crops in the Naliendele Institute in the main cashew-growing zone. Nevertheless, scientists conducting research on these exportable crops receive far greater financial support than do those researching basic food crops or livestock (for which no cesses or levies for research currently exist).

3.2.2. The Cashew Cess

The cashew funding system is the best developed and, although still evolving, could serve as a model for the others. Well funded, there is talk of setting up a revolving fund to smooth interannual fluctuations thereby improving programming. Because the cashew cess funds not only cashews, but also research on other aspects of the cashew-based farming system, its success would provide a unique funding model.

The Cashew Crop in Brief

Cashew is an extremely important export crop for Tanzania, accounting in 1998 and 1999 for about a third of the country's export earnings from the major export crops and about 20 percent of the export earnings across all principal exports (IMF, 2000a. Table 20). Cashew is widely cultivated by smallholders primarily along the coast (Mtwara, Lindi, Coast, Tanga, Dar es Salaam and Ruvuma).

Tanzania's cashew crop is also very important in world terms, with production of raw cashews usually ranking forth internationally in recent years, after India, Brazil and Mozambique (*The Cadju*, http://www.tradenetsl.lk/hot/cadju21.htm; NewAfrica, 2001b). Around 80 percent of the raw nut production is exported to India (The Cadju, 2001) but the quality of the crop is considered fairly poor (Sampat, 2001).

Cashew production has more than doubled since 1995, encouraged by improved price signals and market liberalization. Domestic markets were opened to private traders in 1991 and export markets followed in 1992; prices were deregulated in 1994 (Day-Robinson, 2001). Under the liberalized marketing system, cashew farmers are supposed to - and usually do - receive a producer price equal to 60 percent of the FOB price. However farmers are not always satisfied with the fixed prices offered by traders in the villages and have at times withheld their product from the market (NewAfrica, 2001b). According to the Bank of Tanzania, export volumes declined 62 percent in October 2000 (from 2,100 to 800 tons) following "reluctance by farmers to sell their nuts to private buyers who were offering lower prices than the ones set by the Cashew Nuts Board of Tanzania" (Mwamunyange, 2001). As a result, overall cashew exports took a sharp downturn in 2000, decreasing the stream of cess revenues available for research.

Genesis of Cess for Cashew Research

The Cashew Board of Tanzania (CBT) changed from a trading to a regulatory body in 1993, and was permitted to establish a levy to both enable it to function and to promote the cashew industry. The cess was set at three percent of FOB value of exported raw or processed nuts. Out of the cess, the CBT was to keep a third (or one percent of FOB value) for its own operations. The remaining two-thirds (two percent of FOB) were credited to the Cashew Industry Development Fund (CIDEF) to promote cashew development, extension and research. Whereas cashew research had previously been financed on an *ad hoc* basis, under the new system, 0.5 percent of the FOB value was reserved specifically for cashew research. This constitutes a quarter of the CIDEF revenues and one sixth of the value of total cess receipts on cashew.

However, during the several years that CIDEF was the conduit for research funds, disbursement was not always regular or timely. In 1996, GoT directed that the money be paid directly to a Cashew Research Fund (CRF) under the management of a steering committee. Following a stakeholders' workshop in Dodoma in August 1998, it was observed that the majority of farmers in the ARI Naliendele mandate area (about 70 percent) grow cashew. But as they also engage in other agricultural practices, including livestock, the cashew fund was directed to all priority agricultural research in the area. In order to fulfil the expanded mandate, it was recommended and subsequently agreed to double the proportion of cess going to research from 0.5 percent to 1.0 percent and to channel the funds directly to the Cashew Research Fund bank account. This was to be done on a monthly basis as the cess was collected, as opposed to annually or quarterly, as is often the practice. That system came into operation late in the 1999/2000 financial year. Although credited into the CRF

monthly, the funds are only disbursed in accordance with the approved annual research proposals and budgets.

To administer the Cashew Research Fund, a steering committee was set up under the chairmanship of the CBT Chairman. Its membership currently consists of six researchers, one representative CIDEF and three from major cooperative unions in the zone.[14] The committee meets quarterly to receive technical and financial reports from research. Once a year, a quarterly meeting also receives and approves the budget for the succeeding year.

With the fund now supporting a broader research agenda, revenue from all other sources is being credited into the account as well. This includes proceeds from sales of Naliendele's own cashew crop, consultancies, and overheads charged for hosting other projects. There is no element of competition for these funds. The Cashew Research Fund does, however, allocate 20 percent of the money it receives for research to a ZARF account to be competed for once that fund becomes operational later this year.

Amounts Credited to the CRF

Although the disbursement of cashew cess revenues has many positive attributes, there is still a lack of transparency concerning the actual sums collected. A comparison of official revenues (shown in Figure 4 and Appendix Table 4) with potential data computed from export data and actual disbursement data underscores significant discrepancies. Time-series FOB data were extracted from a public commodities exports publication for 1991/92 to 1998/99. The potential disbursement was calculated using a formula of 0.5 percent for 1996/7, and one percent for subsequent years. Another set of secondary data offers a perspective on the sums actually received by the individual ARIs (Shekidele 2000, Attachment 6 - Southern Zone).

Table 3: Potential and Real Inflows into the Cashew Research Fund

Year	1996/97	1997/98	1998/99
Potential, based on FOB Export values[15]	474,000,000	447,000,000	229,000,000
Official DRD Data	150,000,000	335,000,000	500,000,000
Actual Disbursements (Shekidele, 2000)	164,260,000	191,500,000	229,000,000

The comparison shown in Table 3 indicates that the theoretical amount (based on reported export values) fails to match DRD data, which in turn do not match the actual receipts reported by the Naliendele ARI. The errors go in both directions. Note, however, that potential and actual disbursements into the fund are equal for 1998/99 and correspond to the Tshs 289,176,000 allocated by the CRF Board in 2000/2001 (Table 4). The recent decision of CBT to disburse cess funds

[14] Chairman of the CBT, A representative from CIDEF, Zonal Director of Research and Development, Cashew Research Coordinator, Zonal Research Coordinator, one representative each from the Cooperative Unions of Mtwara, Newala and Lindi (Ilulu), Director of ARI Mikocheni, Director Research and Development, Assistant Director of Research and Development responsible for crops.

[15] Personal communication, Naliendele Agricultural Research Institute.

monthly to the CRF as they are collected but not to use them until the research agenda and budget has been approved, points to the potential for establishing an endowment fund over time.

The approved budget for the year 2000/01 has the components indicated in Table 4. The use of cess funds to provide staff incentives on top of government salaries has the effect of increasing the compensation package nearly 250 percent. At Tshs 17.28 million per scientist per year, the level of support for cashew researchers is the highest of all commodities except tea.

Table 4: Approved Budget for ARI Naliendele for 2000/01

Budget Items	Year 2000/2001
Incentives-salaries	88,200,000
GoT Salaries	34,056,000
Operations &Training	131,720,000
Research Steering Committee	35,200,000
Total Budget	289,176,000

3.2.3. The Cotton Cess

Cotton is grown in the east, west and northern areas of Tanzania and provides incomes to about 40 percent of the country's population. It is the second most important agricultural export. The cotton industry has been controlled by at least five parastatal boards for the last half century, each with a different mandate and varying responsibilities for research.

The Ukiriguru ARI was established in 1930 to conduct cotton research. The British Empire Cotton Corporation established the Lint and Seed Marketing Board in 1952, at which time research funding was done on an ad hoc basis. In 1973, the Tanzania Cotton Authority was formed to promote development and improvement of the cotton industry. In 1976, TCA's mandate expanded to include production, marketing, processing, extension, and research. The Tanzanian Cotton Marketing Board replaced the TCA in 1984/85; its mandate did not include cotton research (NewAfrica.com, 2001c).

In 1993, the Tanzanian Cotton Lint and Seed Board (TCLSB) replaced the TCMB. The cess on the FOB price of seed cotton imposed to fund activities to promote and regulate the industry had no provision for research. In 1996, 45c/kg of the cess revenues was set aside specifically to support research. During 1997/98, it was raised to 50c/kg. In 1997/98 the value base for the cess was changed from seed cotton to cotton lint with the cess set at Tshs 1.20 per kg of lint.

In 1998/99, a Cotton Development Fund (CDF) was established into which three percent of the FOB value of exported cotton lint was to be deposited. Fifty percent of the cess is supposed to be used for research but figures available from the Zonal Centre at Ukiriguru indicate that what goes to research is closer to 20 percent. The balance of the money from the CDF goes to input subsidies, extension and market information in the 13 administrative regions where cotton is an important crop. An additional one percent of the FOB values goes to the Tanzania Cotton Lint Seed Board for its operations.
To secure the research allocation, researchers at the two cotton research stations (ARI Ukiriguru and ARI Ilonga) prepare their budgets and have them passed by their respective centers and the Cotton Research Coordinating Committee, through the Zonal Internal Programme Review and Technical

Committees and finally approved by the Zonal Executive Committee. After this process, the budget is presented to the Cotton Development Fund. In deciding what it can afford to fund, the fund committee takes into consideration the likely earnings from the year's cotton crop. The ratio used to apportion funds for the two main cotton research ARIs was, respectively, 3:7 for the Eastern (Ilonga ARI) and Lake (Ukiriguru ARI). As far as could be determined, there is no specific cotton research fund and no mechanism to ensure that the agreed level of disbursement is followed or money intended for research is made available for research now or is available in future should inflows from exports diminish. Cotton researchers interviewed stated that there was much variation in the disbursements. What was agreed to by the steering committee was not always what was received. To avoid disruptions in planned research program will require systems to ensure that funds earmarked for research are dedicated to that purpose.

The levels of funding from the cotton cess are indicated in Figure 4 and in Appendix Table 6. At approximately Tshs 13.9 million ($17,300) per scientist per year, support to cotton research is much better than what is available to sugarcane researchers and comparable to funding in coffee research. Figures from various sources on how much was disbursed to research from the cotton cess did not always agree.

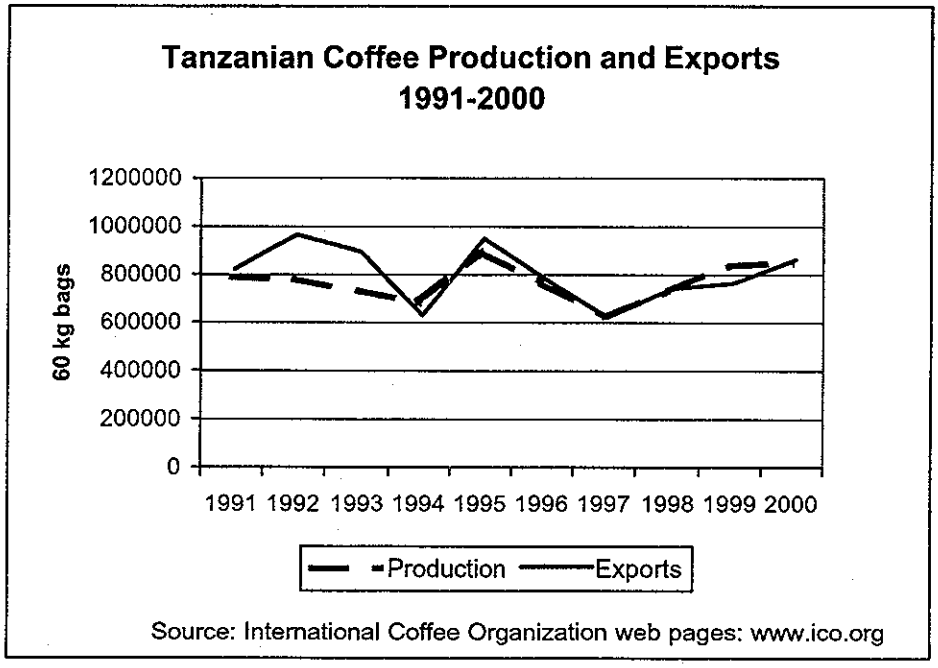
3.2.4. The Coffee Cess

Coffee is a major export for Tanzania, accounting for 13 percent of total export revenues in 1999/00 (Bank of Tanzania, 2001). Production and exports vary considerably from year to year, fluctuating around a long-term mean of 800,000 bags/per year (**Error! Reference source not found.**). In 2000, Tanzania produced 850,000 bags (51,000 metric tons) of green coffee. It exported nearly that same amount, accounting for less than one percent of the world market in terms of volume (ICO, 2001). World prices for coffee are even more volatile than production and in 2000 were at the lowest levels in seven years (Appendix Table 7). As a result, export revenues in 1999/00 were 19 percent lower than in the previous year (Bank of Tanzania, 2001). Such a decline hits the 450,000 smallholder and estate farmers who account for 80 percent and (20 percent) of production respectively (NewAfrica.com, 2001d).

Historically, the coffee industry has been controlled by the GoT through a series of boards and agencies including the Coffee Authority of Tanzania (1976 - 1984), the Tanzania Coffee Marketing Board (1984 - 1990); and Tanzania Coffee Marketing Board (NewAfrica.com, 2001d). The Tanzanian Coffee Board (TCB) was established in 1993 to regulate and supervise the coffee industry. Amongst other responsibilities, it is charged with coordinating coffee research in the country. It also conducts weekly coffee auctions. In addition to a value added tax of 1.5 percent, a levy of 1.5 percent is imposed at the point of sale to fund TCB activities and another 0.25 percent is imposed to fund research.

The cess on coffee was started in 1994/95 to act as a matching fund for an expected input of two million ECU (US $2.5 million). This support was to last six years. The EU project started in 1996 with a nominal termination date of January 2002. But after only the first of two annual tranches of Tshs 62 million was provided, further disbursements were stopped because the donor felt that coffee research needed to be "directly accountable to the stakeholder" (i.e. privatized) before resumption of

Figure 5: Tanzanian Coffee Production and Exports



disbursements would be considered. The initial cess (1994/95) of 0.125 percent was increased to 0.25 percent in 1997/98 to compensate for the withdrawal of EU support. The amount of money to be disbursed to research was not enforceable by law.

The primary center for coffee research is at Lyamungu in Moshi, with staff at Maruku in Lake Zone, Uyole and Ugano in the Southern Highlands. The total number of scientists working on coffee is 17, of whom 11 are in Lyamungu ARI itself. Ten have post-graduate qualifications. There is no socio-economist in coffee research.

Management of the Cess

The Lyamungo ARI makes an annual budget on behalf of all coffee research and presents this to the Coffee Research Steering Committee, which is supposed to meet twice per year. The first meeting is intended to receive progress reports while the second decides on how much to allocate based on anticipated receipts from exports. Because sometimes the amount of cess is insufficient to cover the budget, the Tanzania Coffee Board occasionally extends a "loan" to the ARI.

The Coffee Research Steering Committee is comprised of two representatives of the TCB (one of whom chairs the committee) as well as representatives of coffee estates, smallholder growers, buyers, processors, Ministry HQ, researchers and finally, an observer from the EU (which is interested in supporting coffee research as a private, industry-managed organization).[16]

[16] In more detail: Chairman of TCB, Director Research and Development in the TCB, Representative of the Coffee Growers' Association (Estates), Representative of the Kilimanjaro Native Cooperative Union (smallholders), Representative of the Buyers, Coffee Management Unit Ministry headquarters (responsible

Meetings are usually well attended but after the last meeting, members were informed that the committee was holding its last meeting before privatization (*i.e.* becoming the Tanzania Coffee Research Institute -TACRI). The future management structure remains unclear.

Coffee Research Funding

There are several sources of funding for coffee research: government, cess revenues, pesticide testing fees, self-help funds, and special projects. None but the first two make a significant contribution to the program (Table 5). The Government has been making regular contributions to coffee research, primarily to cover costs associated with staff (personal emoluments). The GoT share constitutes slightly less than 30 percent of the total.

Cess revenues for research make up the remaining 70 percent. As with the other cesses, it is difficult to determine the amount of revenue collected for, allocated to and received by the research station. The Lyamungu figures are what were reported during the team's visit to the Center while the indicated "official figures" are what were received from the ministry headquarters (and taken as the definitive source in this report). There is a substantial difference between the two series, with Lyamungu receipts usually - but not always - less than indicated in the official record.

Regardless of which series is used for cess data, coffee research seems significantly underfunded. According to staff from Lyamungu, the ARI requested Tshs 478 million ($603,000) in 1999/00, but got only Tshs 180 million ($223,000), or 37 percent. At the time of the study team's visit, the main coffee station at Lyamungu lacked working computers, telephones and even electricity. Researchers reported having given up all research in substations or farmers' fields due to a lack of resources. At the main station in Lyamungu, about 60 of their 80 hectares is devoted to coffee production, leaving only 20 for research.

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for the EU Stabex fund), Bukoba Processing Factory, Director, Lyamungu ARI, and Representative of the EU (observer).

Table 5: Funding of Coffee Research

	Government Funding			Cess Funding		Total GoT & Cess			
Financial Year	Salaries	Operational Funds	Total GoT	According to DRD Figures	According to TCB Figures	GoT/DRD	GoT/ Lyamungu	GoT/DRD	GoT/ Lyamungu
	(Tsh)	(Tsh)	(Tsh)	(Tsh)	(Tsh)	(Tsh)	(Tsh)	(US $)	(US $)
1994/95	25,057,430	32,520,381	57,577,811	72,600,000	87,822,786	130,177,811	145,400,597	241,088	269,281
1995/96	34,980,986	3,000,620	37,981,606	126,000,000	79,527,509	163,981,606	117,509,115	286,596	205,374
1996/97	57,232,629	0	57,232,629	113,000,000	154,858,066	170,232,629	212,090,695	280,854	349,912
1997/98	59,390,192	0	59,390,192	130,000,000	163,175,908	189,390,192	222,566,100	296,528	348,472
1998/99	52,933,893	2,900,000	55,833,893	255,000,000	143,756,247	310,833,893	199,590,140	455,070	292,206
1999/00	61,312,728	0	61,312,728	155,000,000	147,834,380	216,312,728	209,147,108	272,699	263,666

Privatization

Following the suspension of EU funding in 1996 for failing to meet criteria for adequate accounting and research management system (above), a Coopers and Lybrand study in 1997 recommended, among other suggestions, that coffee research be privatized. The newly privatized Tanzania Coffee Research Institute (TACRI) was launched at the end of February 2001 (after this study team's visit). It faces tremendous challenges. Under the plan, the government contribution for staff salaries is slated to evaporate. Although cess revenues are seen as inadequate, the proposal to increase them from 0.25 percent to 0.5 percent, is likely to meet resistance from the industry which is already burdened by numerous other taxes already on this crop. The newly formed TACRI board will need to restructure research and priorities in order to keep coffee research afloat.

3.2.5. The Sugarcane Cess

The study team was unable to collect in-depth information on sugarcane research. In brief, sugarcane research was funded historically by the industry through the Sugar Development Cooperation (SUDECO). Currently, the level of cess is Tshs 2 for each kilogram of sugar produced, of which half is intended for sugarcane research. A Research Steering Committee in which DRD is represented was established and money is supposed to be deposited into the research account regularly. However no mechanism exists for stopping the research funds being put to alternative use. It is evident from Figure 4 that the sugar industry has provided consistent but low level funding to sugarcane research for almost a decade, The amount has risen significantly since 1995/96. Nevertheless, sugarcane research scientists are funded poorly compared to those of the other major commodities.

3.2.6. Other Cesses

There are several other small cesses for agricultural research in Tanzania. In 2000, the Tanzania Pyrethrum Council started to formally fund pyrethrum research. Up to that time, it was providing donations to research on an ad hoc basis. The funds will come from a cess of Tshs 5, which the Council collects for each kg of flower purchased. The actual mechanism to be used for supporting research (partnership or privatization) is still to be worked out.

The tobacco industry through the Tobacco Marketing Board (TMB) has been funding tobacco research on *ad hoc* basis. However, the Tobacco Research Institute of Tanzania (TORITA) was registered in August 2000 and intends to take responsibility for tobacco research, presumably as a private institute. This will be clearer when the institute is formally launched, presumably, later this year.

The sisal industry was informally financing sisal research through the Sisal Association of Tanzania (SAT) until 1994/95 at which time, because of the depressed global market for fiber, it stopped. No funding was received from then until 1999/2000. Tanzania Sisal Board (TSB) was established in 1998 and took over the role of funding research. It formed a Sisal Steering Committee to evaluate how this could be done. An initial pledge of US$ 30,000 annually was made to support sisal research starting from year 2000. However, this has not yet been realized reportedly because of low sisal fiber prices. The actual mechanism on how funds will flow after the situation improves has not been worked out.

3.2.7. Lessons from Cess Funds

In this subsection, the lessons learned from the system used for each commodity, the commitment of the Boards and the underlying GoT policy is discussed. The cashew cess is used as an example of a well developed but still evolving system.

Cashew research has the key attributes of a good model for private-public partnership. The commodity board, Cashew Board of Tanzania (CBT), appears genuinely convinced that research is in the best interest of the commodity and deserves support. The GoT support for cashew research is demonstrated by its policies, which 1) established a special fund (the Cashew Research Fund) and steering committee to manage it, 2) give a decisive voice to researchers in how the fund is utilized by ensuring they constitute a majority in the research management board, 3) increased the cess to a level adequate to cover food and other priority agricultural research in the zone's farming system and 4) promote efficient and transparent access to cess funds by supporting direct monthly payment to the CRF.

It would have been instructive to learn how much money has now accumulated in the cess fund and the rate of growth. This might have given an indication of what potentia l exists for this growing into an endowment fund in time.

Coffee research faces problems. The Board appeared to be investing substantially in research. While available funding per coffee scientist was roughly on par with that for cashew scientists, receipts on the ground were far inferior. By most accounts, coffee research appears significantly under funded. That ARI requires periodic "loans" to maintain its program, suggesting possible inefficiencies in the research enterprise or that coffee research genuinely requires a far greater investment than cashew. With the recent privatization of this industry, the ARI will lose its salary payments from government. Urgent attention will be needed to issues of staff numbers and performance while at the same time redefining the research focus.

Cotton researchers enjoy a Board interested in - and willing to fund - research. However GoT policy is still tentative with respect to setting up a dedicated research fund, ensuring that the Board remits the agreed upon levels in a timely manner to the fund, and providing researchers and farmers an important say in how the fund is utilized.

Overall, the GoT has set up partnership with the private sector that channels a stream of revenues to key export commodities. There is a need, however, for the GoT to more closely regulate the management of the funds and to consider issues of cross-commodity comparability.

3.3. Internally Generated Funds

The Tanzanian government allows ARIs to retain funds raised from sales of produce and services, user fees, asset rentals, and consultancy contracts. ARIs are now collecting such funds, known in country as self help funds (SHF). Most of the money raised is used to maintain plant and machinery and to purchase inputs. A recent study was commissioned by the Ministry of Agriculture to determine current practices and explore the full potential of revenue generation from research centers with 210 of the 348 DRD scientists (Shekidele, 2000). Sufficient analyzable data were obtained from eight

centers representing 193 scientists, a little more than half of the DRD total (Table 6). The majority of these centers studied had a complete set of data for the three-year period 1996/97 to 1998/99.

Several trends emerge from Table 6 as well as the underlying reports (Shekidele, 2000) and field interviews:

1. There is a general upward trend in the funds centers are generating. There was nearly a 60 percent increase in total SHF across the three years (1996/97 to 1998/99) for which there is a complete set of data on these eight ARIs. The increase over the last six years is even greater, reaching about 363 percent. (Some of this increase may be due more to missing data than actual increases in revenues).
2. ARIs do not have an equal capacity for generating funds. The Naliendele station alone has brought in about a quarter of the total SHF generated by these stations in this period (1996/97 to 1998/99). Uyole, Tanga and Ukiriguru are also relatively large generators of internal funding. Conversely, Ilonga has had very little success in this regard.
3. While the overall trend is increasing, some ARIs have very erratic success raising SHFs (e.g., Mlingano, Mpwapwa).
4. The types of activities used to raise funds varied greatly between ARIs. Those located in rural areas often used GoT-owned assets to generate revenues, either by renting out land, buildings, and machinery or by selling crop and livestock products and byproducts (e.g. hay), as well as water and electricity on local markets. SHFs also include laboratory fees, trespassing fees and for some innovative centers, the overheads charged on collaborative research projects. In urban areas with more vibrant markets, the study team found government office space rented out to private sector businesses such as copy centers, travel agents and beauty shops.
5. The possibility of retaining revenues has given rise to incentives to assess overheads and finder's fees on research projects. In some centers, researchers have commission agents to look for research business from prosperous farmers or farmer groups. The attraction in this is that the center hires out the vehicles used to transport researchers to the farms and gets an overhead from the fee scientists charge. For every successful research contract, there is a budget indicating the personnel to be involved, consultancy fee and per diem for each as well as transport and input costs. Sometimes a considerable amount of negotiations is necessary as the client tries to bring the cost down. Occasionally, clients have advertised for services more widely and contracted with scientists outside the zone or even the country.
6. The attraction to the scientist is the fee, usually about $50 per day. The researcher keeps about 60 percent of this, while the rest goes as overhead to the station. Of this, a proportion would go to the scientists' program while the rest could go to the SHF. Where commission agents are used, a portion of the overhead is paid to them. DRD staff are considered to be on official duty when out on contract or consultancy business. They are therefore entitled to government per diems. This makes these operations very popular with all categories of involved staff.
7. In the Shekidele report (2000), ARIs typically reported gross rather than net revenues from self help activities (not shown on table). In the few instances where information on the revenues spent to raise these funds was available, the actual profits margins were very small and in some instances even negative. Most likely, receipts from SHFs are just enough to the maintain plant and machinery used to generate them and for purchasing agricultural inputs.
8. In real terms, SHFs are making a modest contribution to the research budget. Total funds across these reporting centers over the three year period averaged Tshs 184.2 million (US $284,860) or an average of Tshs 23 million ($35,000) per ARI. If one assumes that centers raise roughly equal funds per scientist and that these data represent 55 percent of the scientists in the DRD, then the gross revenues from SHFs would be roughly twice these figures, or roughly 11 percent of the GoT allocation to agricultural research.

9. On a per scientist basis, SHFs add about Tshs 954,462 (US $1,476) to the budget.

In sum, the basic policy is in place to allow ARIs to raise funds from private sector activities. However the current sums are very meager and the systems are not yet in place to manage this resource effectively. The primary challenge will be to balance income-generating activities against the effort required to maintain the research program. On one hand, ARIs are struggling to use the SHF mechanism to generate funds for research. On the other hand, many of these activities are unprofitable and off-mandate, thus risking in the long run cannibalizing the meager resources of the research stations. In the absence of significant inflows from internal GoT sources, flagging donor interest in supporting research could lead to an expansion of SHF activities to the possible detriment of meaningful research.

The World Bank/IDA through TARP II has commissioned a study that will draw recommendations on how to optimize revenue generation in the DRD research network. Hopefully the results of that study, once operationalized by the DRD institutions, will lead to a significant – and rational - inflow of self-help funds to the system.

Table 6: Gross Revenues from Self Help Activities

Ag. Research Center /Station	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00	Average per ARI 1996/97 to 1998/99	# of Scientists	Avg per Scientist
Values in Tsh									
Ilonga			3,682,958	7,171,131	7,970,923		6,275,004	22	285,227
LRC Tanga		35,433,085	34,852,580	23,876,347	33,950,058	17,710,000	30,892,995	6	5,148,833
Naliendele		11,841,349	19,440,930	44,532,905	62,404,741	85,426,327	42,126,192	19	2,217,168
Mlingano		7,987,409	9,077,742	16,970,110	7,067,494	9,735,670	11,038,449	30	367,948
Mpwapwa/Kongwa	3,360,762	21,330,043	11,059,996	17,429,940	5,577,576	6,198,201	11,355,837	15	757,056
Selian	11,752,317	13,120,000	16,307,926	18,151,500	14,656,740		16,372,055	26	629,694
Ukiriguru			19,769,955	28,794,077	36,960,880		28,508,304	28	1,018,154
Uyole	43,403,902	46,515,685	23,236,809	39,541,888	50,148,077	152,364,410	37,642,258	47	800,899
Total for reporting centers (Tsh)	**58,516,981**	**136,227,571**	**137,428,896**	**196,467,898**	**218,736,489**	**271,434,608**	**184,211,094**	**193**	**954,462**
Values in US Dollars $									
Ilonga			6,076	11,228	11,670		9,658	22	439
LRC Tanga		61,928	57,501	37,383	49,704	22,326	48,196	6	8,033
Naliendele		20,696	32,074	69,725	91,362	107,694	64,387	19	3,389
Mlingano		13,960	14,977	26,570	10,347	12,273	17,298	30	577
Mpwapwa/Kongwa	6,224	37,279	18,247	27,290	8,166	7,814	17,901	15	1,193
Selian	21,765	22,930	26,905	28,420	21,458	0	25,594	26	984
Ukiriguru			32,617	45,083	54,112		43,937	28	1,569
Uyole	80,384	81,297	38,337	61,911	73,418	192,081	57,889	47	1,232
Total for reporting centers (US$)	**108,373**	**238,089**	**226,734**	**307,610**	**320,237**	**342,190**	**284,860**	**193**	**1,476**

Source: Shekidele, 2000. Figures exclude funds from collaborative partnerships.

3.4. Collaborative Research Networks Funding

In order to encourage a greater degree of collaboration with NARS and also to ensure greater relevance of research to smallholders, many of the major donors to the International Agricultural Research Centers (IARCS) are providing special funds for networking. This is making it possible for NARS scientists to develop joint projects with IARC researchers on major crops and livestock. There are networks on agroforestry with ICRAF, animal production and health with ILRI, maize with CMMYT, rice with IRRI, roots and tubers with CIP and IITA, beans with CIAT, pigeon peas with ICRISAT, etc. The procedure for setting up these collaborative arrangements is often through memoranda of understanding (MOUs) between the IARC and NARS. The individual research projects are however developed jointly between the scientists involved. The projects on a given commodity are coordinated in a regional research network. Responsibility for coordinating these networks has been given to regional bodies. Tanzania belongs to two such networks, namely, SACCAR and ASARECA. Responsibility for coordinating these networks has been given to regional research organizations. The regional research coordinating centers also receive funds directly from donors for networked projects outside the IARCs.

Funding goes directly to the national collaborating scientist through the ARI. Usually there are mechanisms to ensure that these funds cannot be diverted to other uses or be disbursed without the express authority of the scientist. It is increasingly accepted that an overhead is charged. This is determined by the ARI but is usually about 10 percent of the value of the project budget. The overhead goes to the SHF.

A major disappointment of this study was the team's inability to access a set of historic data on external receipts that officials in the Ministry of Agriculture could be comfortable with apart from those from the two World Bank assisted projects (NALRP and TARP II). Nevertheless, some data adapted from the Shikedele study (2000) and other sources give an indication of the level of funding from collaborative research between ARIs and IARCs, NGOs, and bilateral donors.

The means in Table 7 are taken across those years for which each center reported data on collaborative funds. Even though staff at DRD ARIs draw government salaries, in at least one case (Tumbi), the report suggested some of these funds covered salaries and allowances; thus one cannot assume that these sums solely cover operational expenses.

Table 7: Mean Collaborative/Donor Funds 1995/6 to 1998/9

	Per Center per year		Per Scientist per year	
	Tsh Millions	$US	Tsh Millions	US$
Ilonga	29	46,198	1.3	2,100
TangaLRC	11	17,090	1.8	2,848
Ukiriguru	235	271,925	8.3	9,712
Mpwapwa	37	59,349	2.6	4,239
Tumbi	118	187,994	8.4	13,428
Mikocheni	206	258,279	11.5	14,349

Source: Shekidele, 2000.

It is evident that where available, external funding sources often add significantly to the Center's financial health. They are especially vital in ARIs that are mainly engaged in food commodity research.

This represents direct or indirect donor funding and its sustainability can therefore be called into question. In so far as a good proportion of these funds is part of the new donor strategy for funding IARCs, support from that portion is as sustainable as that of the IARCs themselves. IARCs funds managed through regional centers are particularly attractive to scientists wishing to pursue postgraduate training. They might be less attractive for more senior scientists because they have traditionally not carried personal income incentives.

There are just over 100 scientists in the centers receiving collaborative research funding, either from donors or regional networks. Most of those who benefit are food crop or livestock scientists. The interest of donors in concentrating their resources in limited areas of the country and the decision of the GoT to decentralize development to the districts might favor an expansion of this type of donor assistance. If the current experimentation in factoring scientists' incentives into collaborative and donor-assisted projects succeeds, enthusiasm among scientists will also grow. However, the life of these projects is often quite short. For this to remain a reliable funding source, scientists must learn and continually exercise good proposal-writing skills.

It was stated earlier that there are ongoing discussions between donors and GoT on an agreeable system for capturing donor inputs in a structured way. When this succeeds, it will make it easier to get a more accurate assessment of the overall level of donor funding to research in Tanzania.

3.5. The Whole and the Parts

As stated in the introduction to Section 3, the team was unable to assemble a comprehensive and internally consistent set of figures to capture aggregate funding of agricultural research in Tanzania. Likewise, it was not possible to form a picture of the total funding going to any particular research institute or the distribution of funds among research institutes. An attempt will be made here to piece together a picture of aggregate and regional resources for agricultural research subject to the disclaimer that these are best guesses that can be used to illustrate trends and issues.

3.5.1. The Whole

Table 8 gives a rough indication of the relative magnitude of funding levels from government and World Bank, cesses, self-help initiatives, and collaborations for the three years for which recent information was available. Figure 6 displays this information in percentage terms.

Table 8: Sources of Research Funds for DRD 1996/97 though 1998/99

	1996/97	1997/98	1998/99
Tanzania Shillings	**2,602,216,857**	**9,579,696,541**	**4,372,051,370**
Government	1,391,760,236	6,149,026,771	1,632,818,554
World Bank	20,000,000	1,886,653,695	771,479,000
Cesses	367,400,000	638,900,000	1,023,800,000
Self Help Funds	247,799,253	354,252,997	394,405,690
Collaborative (Donor, NGO, networks)	575,257,368	550,863,078	549,548,126
US Dollars	$4,293,202	$14,998,938	$6,400,817
Government	$2,296,160	$9,627,536	$2,390,496
World Bank	$32,996	$2,953,935	$1,129,469
Cesses	$606,146	$1,000,326	$1,498,875
Self Help Funds	$408,825	$554,654	$577,422
Collaborative (Donor, NGO, networks)	$949,074	$862,487	$804,555

Note: Total Self-Help Funds (or internally generated resources) are estimated as twice the total gross revenues indicated in Table 6 based on the assumption that the figures in that table represented funds for approximately half the scientists in the DRD and that the remaining scientists have access to a roughly equal share of funds.

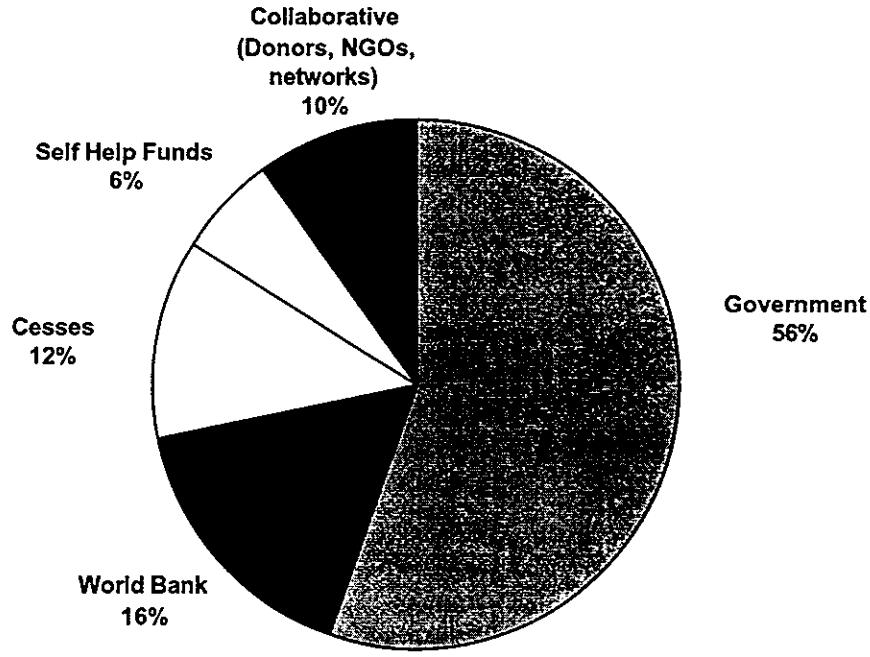
Overall, the GoT remains the main funding source for most agricultural research in Tanzania, even without including the World Bank IDA loans.[17] Together these two sources account for 72 percent of the average funding level for the three years from 1996/97 through 1998/99. As indicated in Section 0, recurrent costs comprise the majority of these expenditures, and those in turn primarily cover personal emoluments for the 348 scientists of the DRD research system at very low salary levels. In the last few years (not shown on the table), the World Bank loans have bolstered the development portions of the budget.

The remaining resources come from cesses (12 percent), collaborative partnerships (10 percent) and internally generated resources (or self help funds, 6 percent). Cess revenues have been rising sharply in recent years. The series on self help and collaborative funding are too abridged and inconsistent to make a clear determination of their trends.

All of these numbers should be treated with caution. Alternative, but also incomplete and internally inconsistent, figures are available from TARP II. Data for 1998/99 provide substantively different base figures and shares. Budget shares in those data are GoT (20 percent), WB loans (21 percent), Cesses (21 percent) Collaborative (28 percent), Self Help (10 percent).

[17] Note that there are several agricultural research institutes outside the DRD umbrella and not included in these figures such as the semi-autonomous TRIT, SUA, TPRI, TAFIRI, TAFORI.

Figure 6 : Funding Agricultural Research in Tanzania: Institutes of the DRD



3.5.2. The Parts

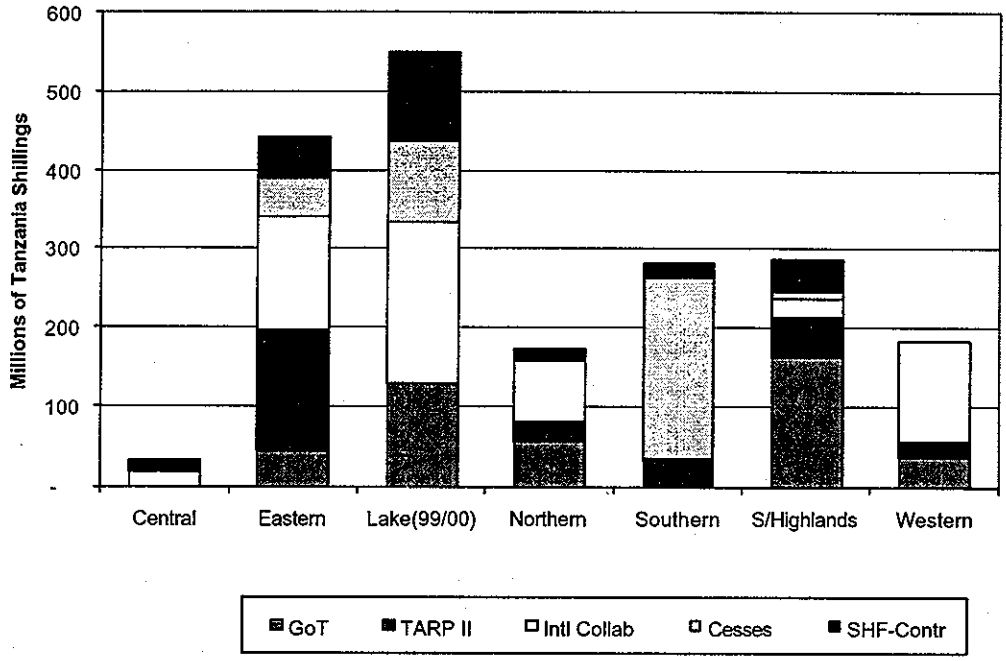
No reliable historical allocation data were available for the individual ARIs. Partial data were available from the TARP II office for only one year (1998/99). Figure 7 presents approximate funding for selected centers by source: GoT, TARP II, international collaborative programs, cesses/levies and self-help funds. The figures are extremely sketchy and must be interpreted only loosely. Nevertheless, the data suggest:

1. *There is a wide discrepancy in the funding received by the different research centers and stations in the seven agricultural zones of Tanzania.* Central zone, which produces primarily staple food crops, feed crops and livestock, receives considerably less funding than any of the other zones.
2. *No one single factor accounts for the differences in total funding between zones.* Each zone has a very different ability to attract or generate funding from TARP II, donors, cesses, and internally generated sources.
3. *Government funds are seemingly not allocated to smooth out these inter-zonal differences.* According to these data, two zones received no GoT funding beyond basic salaries (which are not included). GoT funds were disproportionately directed to the better endowed Lake and Eastern Zones, while Central and Western Zones remained starved for funds. Researchers stated that decisions regarding the allocation of the limited government funds are made at the headquarters of the Directorate of Research and Development (DRD) and that the individual ARIs do not submit requests. It was not however clear what caused the large discrepancies in the level of government funds disbursement.

4. *Some ARIs received neither GoT nor TARP II funding*. Access to TARP II funds requires that individual scientists actively seek them through the preparation of a clear proposal addressing the priority national or zonal needs of smallholders. Inability to secure TARP II funding might be due to inability of scientists to fulfill the required conditions.

In addition, information from field visits (Mtwara, Mwanza, Arusha and Moshi), from scientists at the DRD headquarters in Dar es Salaam (including representatives from Uyole, Ilonga and Mpwapwa) and from electronic contacts (Tabora), indicated that disbursements are highly variable from year to year. Mpwapwa (Central Zone) reportedly received Tshs 4.5 million in 1998/99, 1.5 million in 1999/2000, and none so far this year (as of March 2001).

Figure 7: Funding by Source for Selected Research Centers 1998/99



Source: Adapted from TARP II and Lake Zone records
Note: data are partial and should be used only as a rough indication of among zone differences.

3.6. Summary

Even with the rough data available on the funding of agricultural research in Tanzania, several observations emerge.

1. ***Good research planning will require better financial information.*** It is extremely difficult to develop an internally consistent, comprehensive picture of funds for agricultural research in Tanzania. To a modest extent, the lack of ready information reflects the privatization of the research agenda. Commodity boards and privatized institutes such as TRIT were reluctant to provide their financial records to the study team. Likewise, the decentralization of budgetary

authority to the zonal centers and the recent upsurge in self-help activities are running ahead of the management and accounting system needed to track those developments. On the income side, the source of funds must be better tracked, with particular reference to the role of (and dependence on) donor funding. On the cost side, detail is required on the breakdown of current and development costs, overhead rates, and the costs associated with generating SHFs. Given the shortage of funding and the GoT's energetic efforts to forge links between agriculture research and private sector concerns, however, it is critical that such accounts be compiled in a regular and transparent manner.

2. ***There is an imbalance between the goals of the research system and the funding available to achieve those goals.*** In spite of the impressive - and repeated - reorganization of the research system, staffing has remained fairly constant while the real value of research dollars has been eroded by inflation and currency depreciation. Most research dollars are devoted simply to supporting current staffing levels. Nevertheless, researchers and managers in DRD institutes complained bitterly about salary levels. In private interviews, some confessed that in order to provide for their families, they were obliged to devote a good part of their workday to non-research activities such as private farming and businesses. In recognition of the compensation problem, some cess revenues are devoted to salary incentives (top-offs) rather than research projects. Several of the research programs are starved of the resources needed to create technologies. Although some ARIs are able to generate funds by commercializing their skills, assets or products (SHF), these activities are often unprofitable, distracting, or worse, detrimental to the ARI's asset base. In sum, there is considerable evidence that the current funding levels are insufficient to cover the costs associated with the current research facilities and staff.

3. ***Funding sources should be seen in terms of portfolio management rather than sustainable income streams.*** The data, as imperfect as they are, show a substantial amount of inter-annual variation for each of the major funding sources reviewed. Government allocations vary year to year, from station to station, from approved to actual. The donor slice of the portfolio is both important and volatile. In addition to bilateral commitments, donor funds flow through NGOs, IARCS, networks and most contracted services. Although our data did not permit an assessment of donor funding, such sources are notoriously erratic and, in recent years, decreasing continent wide. Nor can NARS rely on private sector sources to stabilize the budget. Cess revenues depend on a balance of production, marketing, and international prices; while there has been an upward trend in total cess revenues, each component commodity has evidenced important fluctuations between years. None of these sources is "sustainable" *per se*, if the term is taken to mean reliably generating a fixed revenue stream. Only an endowment invested at a constant rate of return would provide such continuity. To generate the current average annual revenues of $8.3 million[18] available to the ARIs of the DRD would require an endowment of $166 million invested at an annual rate of return of 5 percent. Barring such an endowment, the current funding sources must be managed together as a dynamic portfolio; they must also be invested well in research that increases agricultural value added for both commercial and subsistence farmers and appeals to donors. To the extent that autonomy over research budgets is decentralized to ARIs that rely on multiple funding sources, concepts of portfolio management must take hold at that level as well.

4. ***The Government must continue to make a major commitment to agricultural research.*** DRD will continue to require substantial external support for its programs. Credit sources that require matching funds from GoT, whose irregular availability leads to corresponding swings

[18] Computed from the average of the three years shown in Table 8.

in external support flow, will need to be supplemented with more predictable bilateral and other donor grants.

5. ***Efforts to link ARIs with the private sector are impressive and financially promising.*** While most African NARS delegate only a small portion of their research to private and semi-autonomous institutions (ie, not administered by government and having some autonomous sources of funding), Tanzania has made a big step in that direction. The GoT has privatized both tea and coffee research and provided a resource stream through industry cesses. It has created a handful of semi-autonomous institutions to which it supplies staff and facilities. It has linked private sector funds (cesses and self-help funds) to public sector ARIs. Funds from cesses and internally generated resources are increasing, albeit from a small base. Taken together, they account for about 16 percent of the DRD research budget. Benefiting from the greatest resources, the example set by the Cashew Development Fund is a particularly positive and improving model. There are, however, significant problems of fund management (cesses) and distraction (self-help) lurking behind these figures. Not all of links between the public and private sectors are working smoothly and much of the research agenda remains inadequately funded. Nevertheless, the GoT commitment to tailoring and selling the research agenda to the private sector is impressive. Attention is now required to streamlining the management and flow of such resources.

6. ***Efforts to solicit research funds from local governments are admirable but unlikely to net great revenues in the near future.*** In an effort to improve ARI links to local smallholders, the Ministry of Agriculture is appealing to District Councils, which are now the focus of agricultural development in Tanzania, to fund local priority research projects through the Zonal Agricultural Funds (ZARFs). Councils are beginning to make commitments and contributions. The amounts of money are as yet very low (Tshs 1-2 million per council) and rate of payment is still very slow.

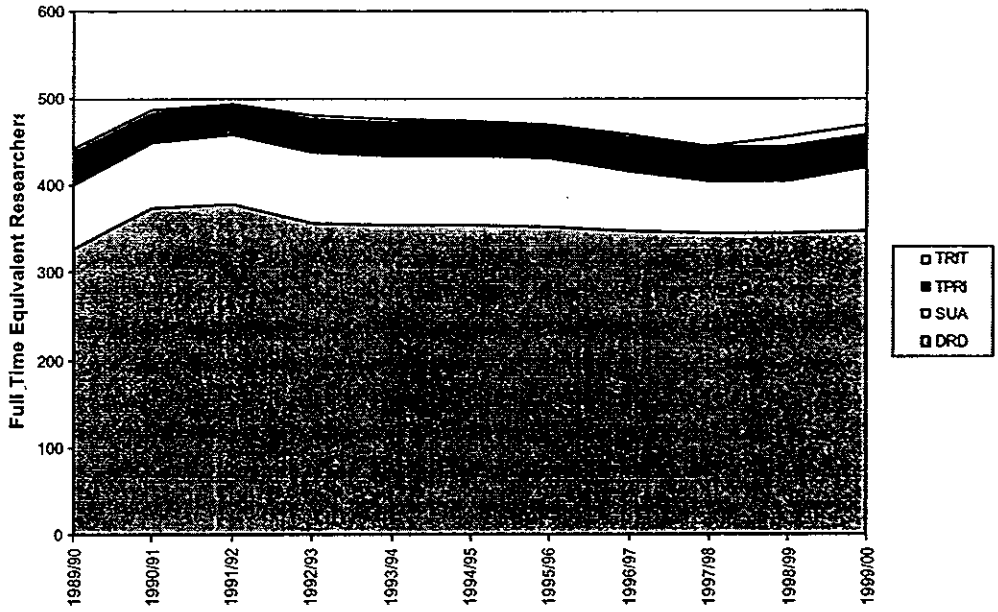
7. ***Demand-driven research requires more than devolving authority; it requires funding smallholder concerns.*** By decentralizing agricultural research and development, the GoT has opened the door to making research more client-oriented. Commodity boards and ZARF steering committees now bring together researchers and their managers with representatives of local producer groups, traders, consumer unions and governments. Although they may sit on steering committees, many of these groups - particularly smallholders - lack the funds to back up their interests. Donors interested in making ARI research better respond to local demand might provide District Councils or producers unions with resources to contract directly with ARIs for particular research products. Ireland Aid, the Irish government's official development cooperation program, is doing this in Kilosa District.

8. ***Self-Help Funds are unlikely to generate sustainable revenues for research in the near future.*** SHF, collection of which is getting much encouragement, was documented in this study for centers with about 60 percent of DRD scientists. For several of the centers, a slight surplus is generated over and above what is spent to generate it. For some, there were losses. Many did not keep records that allowed them to track the net effect of these activities. Even if collections are tripled, the major utility for these funds is still likely to be center upkeep. Furthermore, several of the income-generating activities were significantly off-mandate to cause a diversion of research energies and resources. Thus for the near future, these funds cannot be seen as a major source of funds for agricultural research.

4. Staffing Issues

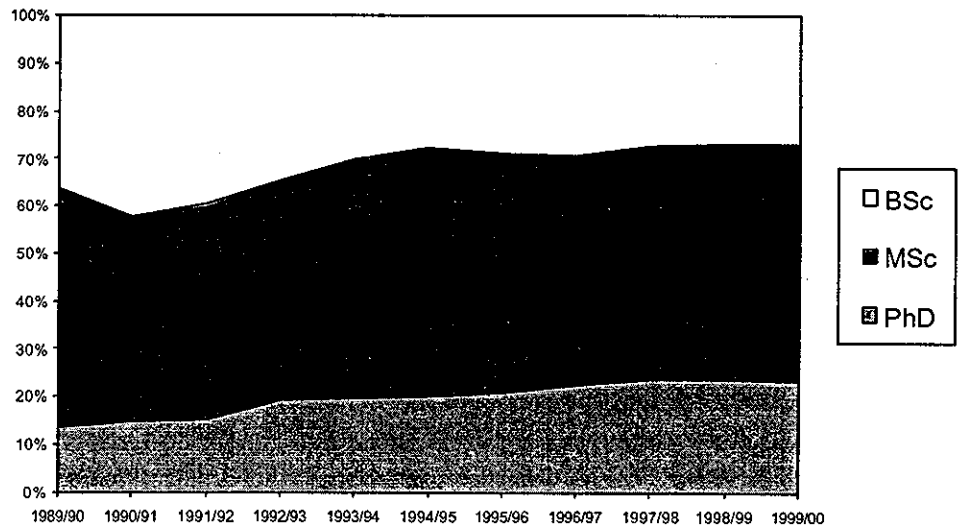
Despite the significant administrative upheaval described in Section 2.1, the number of staff working in agricultural research has remained quite stable over the last decade. Since 1989, the number of researchers at DRD, TRIT, TPRI and SUA has grown about six percent, from 442 to 467 full-time equivalent researchers (Figure 8). In 2000, these ARIs boasted about 109 PhD level scientists, up from 60 in 1989. The research staff are well-trained, with about 30 percent holding Bachelor's degrees, 50 percent holding Master's degrees and 20 percent holding Doctoral degrees (Figure 9). Data at the time of the 1991 Masterplan suggest that for every scientist there were 3.7 other support staff (technicians and assistants) (GoT, 1991).

Figure 8: Number of Researchers at Selected ARIs 1989-2000



Source: DRD/SUA/TPRI/TRIT internal memos.

Figure 9: Education of Researchers at Selected ARIs 1989-2000 (Shares)



Source: DRD/SUA/TPRI/TRIT internal memos

Compensation packages for research staff differ depending on the type of institute (public, semi-autonomous, or autonomous/private) and the opportunities to attract additional revenues that can be partially devoted to salary supplements. Those opportunities vary substantially, depending on the program and particular commodity.

4.1. DRD Researchers in Subsistence Agriculture

Researchers in the public and semi-autonomous institutes receive the standard civil servant compensation packages, which are extremely low. Salaries for DRD researchers range from Tshs 71,020 to 230,900 (US$ 80 to 256) per month for junior and middle level researchers and Tshs 238,250 to 449,100 (US $257 to 499) for senior researchers and research managers. Researchers gave impassioned responses to questions related to their ability to make ends meet on their current wages. Those DRD researchers devoted to improving the productivity of subsistence food crops or livestock systems were the most distraught at the eroded buying power of their salaries (see box). In general, they have the fewest opportunities to generate self-help funds through external contracts or to levy user fees for their services. Furthermore, with the exception of those benefiting from shared cashew revenues, the staple crop and livestock researchers do not currently benefit from cesses/levies.

Unable to Make Ends Meet?

Government paid researchers felt they were receiving, at most, 25 percent of a living wage. In a group meeting at the Selian center, scientists were very clear that the government salaries and the ability of the institute to provide adequate incentives to complement those salaries were grossly inadequate. One Ph.D. scientist said his salary had remained constant in Tanzanian shillings for years. His buying power had decreased to approximately one third of his original salary and was now about US $80/month. In addition he receives a subsidy to cover about 10 percent of his housing costs. There is no stipend for utilities or medical coverage. He estimated his basic living expenses (not including food) at US$8/day. Thus his salary covers one third of the month, if he does not buy food. One of his colleagues claimed that supporting a family at minimal levels required him to cultivate one acre for personal food and ten acres plus a few cows to meet other financial needs.

A DRD staff member in Dar es Salaam considered Tshs 400-800,000 ($500-1,000) per month as a living wage for scientists. He gave his own salary as Tshs 100,000 ($125) per month and spoke of his other income-generating activities. Under the current system, even the Permanent Secretary would attain only the lower end of this range.

DRD staff can and do find ways to use project funding to improve their financial position ever so slightly. As part of the overhead, the ARI levies an institutional fee on ZARF and contract research (but not TARP II funds) that provides a daily subsistence allowance for accommodations and food for each day a researcher stays in the field. Historically, there was a Research and Publications Award that, although earned, was never paid to one of the Selian scientists for her breakthrough related to patchy stunt of wheat. With the end of the Client-Oriented Research project, there are no longer funds to reward publication of leaflets (US$150/leaflet) and field notes (US$200). Researchers plan to start including such fees in their NZARF budgets. As one respondent noted, the current incentives encourage researchers to stay in the field instead of returning to the station to analyze or publish.

The GoT plans to revise the civil service scales upwards under a new civil service plan including the involvement of a donor (possibly DANIDA) to address this situation. The newer rates would be phased in progressively over a three- or four-year period to permit the GoT to take full charge of the higher salary bill.

4.2. DRD Researchers in Cess-Funded Crops

DRD researchers in export commodity programs fare significantly better than their counterparts in subsistence agriculture.

- For cashew, the Tshs 88.2 million (US$ 110,000) in cess funds allocated to salary incentives for Naliendele staff in 2000/01 had the effect of more than doubling their normal GoT salaries. The salary incentives cover everyone working at the institute in all programs and vary from Tshs 20,000 per month (US$ 25) for lowest staff member to Tshs 200,000 (US$250) for the most senior. For those who sit on the quarterly meetings of the CRF research steering committee, further incentives amounting to the equivalent of $250 per day are given, excluding transport expenses and *per diems*. Naliendele was the only ARI in the DRD where scientists seemed genuinely satisfied with the level of

funding for the research program. There was also a general feeling of contentment not encountered elsewhere in the ARIs of DRD. A remuneration of Tshs 250,000 –300,000 per month (a combination of GoT and incentive from the cess) for a mid-career scientist in rural Naliendele is close to a living wage.

- For cotton, cess funds are used to provide an incentive for scientists and support staff. The incentives per month are: Tshs 130,000 ($162) for Zonal Director of Research and Development (ZDRD), Tshs 110,000 ($137) for cotton research coordinator, Tshs 90,000 ($112) for each of the section heads, Tshs 60,000 ($75) for field officers and Tshs 40,000 ($50) for assistant field officers.
- Like their counterparts in cashew and cotton research, coffee researchers are paid monthly incentives. In 1999/00, Research Coordinators received Tshs 180,000 (US$ 227); Section Heads received Tshs 155,000 (US$ 195); Researchers 115,000 (US $145); Senior Field Officers 100,000 (US$ 126); Field Officers 75,000 (US$ 95); and Junior Field Officers 40,000 (US$ 50). To put these figures in perspective, the top salary for a section head runs around Tshs 100,000, or about two thirds of the salary incentive. Similarly, researchers earn between 60,000 and 100,000/month. However the salary top-offs have been lowered for the 2000/01 by 40 percent because cess revenues were low and had not been paid since June 2000. In addition to base and extra salary payments, the GoT pays 90 percent of their rents. Staff pay the additional 10 percent, their utilities and all of their own medical expenses. There is no system of compensation tied to awards or publications. Lyamungu staff report that they earn only 20 percent of what their counterparts hired directly by the TCB are paid.

4.3. Researchers in Semi-Autonomous Institutions

Unlike the DRD, semi-autonomous research institutions, such as TPRI, SUA, TAFORI and TAFIRI, are permitted to negotiate and bargain for their salaries with the support of their councils or boards. Thus they each have their own scheme of service with higher salaries than the DRD. TPRI salaries range between Tshs 88,000 and Tshs 200,000 (US $110 and $250) for junior scientists and from 200,000 to 682,000 (US $250 to $850) for senior scientists and the Director General. The inadequacy of these salaries was so generally acknowledged that interviewees publicly admitted to not fully attending to their jobs so that they could earn income outside the ARI to support their families.

SUA staff are better remunerated and motivated than government or TPRI scientists. In general better qualified, they stand a better chance of mobilizing resources from donors, competitive grants, contracts and projects. University staff in Tanzania recently worked through their governing council to break out of the civil service system pay scales and renegotiate a much more attractive remuneration package. Monthly salaries are now Tshs 400,000 (US$ 500) for lecturers, Tshs 600,000 to 700,000 (US$ 750-800) for associate professors and Tshs 800,000 ($1,000) for full professors. In addition, they receive a housing allowance.

4.4. Researchers in the Private Institutions

The only ARI fully privatized at the time of this study is the Tea Research Institute of Tanzania. At the time of establishment of TRIT in 1998/99 the proposed salary structure was Tshs 137,500 to 189,063 (US $153 to $210) for the research officers, Tshs 206,250 to 257,813 (US $230 to $300) for senior research officers, Tshs 275,000 to 400,000 (US $350 to $500) for the principal research officer,

and Tshs 400,000 to 600,000 (US $500 to $750) for the research director, These ranges are considerably higher than their counterparts in DRD receive (before top-offs) and even above what Naliendele scientists can earn with that generous cashew cess top-off. Currently, the research director position is filled by the executive director who is a member of the staff of Cranfield University (UK). About a third of the tea cess (equivalent to about Tshs 80 million or US$ 100,000) is paid to Cranfield University annually to cover this and other overhead expenses. This arrangement ends as of this year.

4.5. Observations

In sum, the problem of low salaries is infamous throughout the system. For years, proceedings of meetings concerned with the reform of the Tanzanian NARS have addressed the issue of miserable staff salaries. It is no secret that the DRD is characterized by a large number of demoralized and poorly remunerated research scientists and inadequate funding for research. Researchers, their managers and even the Permanent Secretary for the Ministry of Agriculture and Food Security spoke freely on the topic. There are obvious repercussions from so grossly underpaying most scientists while permitting some to translate their privileged access to export revenues or user fees into personal compensation.

1. ***Scientists are highly distracted.*** They cannot afford to do their jobs if they are to feed, clothe, house, and educate their families.
2. ***ARI resources and agenda will be diverted to short-term activities that permit scientists to earn pocket money.*** On one hand, there is official pressure to exhaust station resources in order to raise self-help funds to cover operating expenses. On the other, there is pressure for individual scientists to use resources such as ARI land or labor for their own personal gain.
3. ***Scientists will avoid sharing consulting revenues with their institutes***. While ARIs are beginning to set up ways to sell research contracts to the private sector, there seems to be tacit agreement that staff can take time away from their government jobs to earn incomes
4. ***Bright, young Tanzanians will not join the national system; experienced ones will leave as soon as they can find alternative opportunities.*** Either way, Tanzanian agriculture loses the very important investment being made in education.
5. ***Gross imbalances in compensation packages between commodities may distort research priorities.*** In particular, no one will want to conduct research on livestock or staple crops.
6. ***Staff performance measures become meaningless.*** As long as the Government and donors do not take researchers seriously, it will be impossible to institute effective measures of staff performance.
7. ***Without control over staff salaries and performance, research managers have little clout over their research program.*** Priority setting exercises, competitive grants, and attempts to forge linkages between researchers and their farmer clients are of limited value if scientists are not actually doing their work.
8. ***Unless the research system can perform, potential donors and private sector clients are unlikely to invest.*** Business development and extension efforts rely on scientists with skills, motives and means to create attractive technologies.
9. ***In spite of 15 years of ongoing reform and upheaval in the NARS, it may still be necessary to radically cut staff in order to support few, better-paid and better-motivated scientists who could be held to high performance standards.*** Efforts are underway to redress the salary crisis in the NARS. It is unclear, however, that there is adequate funding in the national treasury or that those funds will make their way through the system to the research staff in the ARIs. Trimming staff will only work if research directors can retain and reallocate the funds liberated by downsizing.

In sum, until such time as issues related to staff compensation are resolved, scientists will remain unable to make ends meet, unable to obtain their professional goals in spite of high levels of training, and ultimately, unable to generate new technologies.

5. National and Zonal Agricultural Research Funds

The use of competitive funds for agricultural research has been promoted in sub-Saharan Africa in the past decade to enhance both the scientific quality and relevance of research. Initially, the funds were nationally managed. More recently there has been a push for more narrowly focused and locally responsive operations leading to the establishment of sub-national or zonal competitive funds. Tanzania has a national competitive fund (since 1992) and several zonal competitive funds (since 1999). The National Agricultural Research Fund (NARF) was carefully conceptualized and established following rather rigid rules found successful elsewhere in the region, the zonal funds have been learning a great deal from the experiences of the national fund. The NARF was most active between 1993 and 1998. There are now four Zonal Agricultural Research Funds (ZARFs) in the Lake, Northern, Central and Southern Zones at different stages of development. Their operations have followed broad guidelines developed at the headquarters with clear understanding that the management committee for each zone is free to develop approaches that, in their view, respond best to local circumstances. Of the four ZARFs, three have already awarded grants on a competitive basis.

In this chapter, the relatively long experience of the NARF will be given in Section 0. In Section 0, the short history of the ZARFs and the experiences since their evolution started at the end of 1999 will be discussed.

5.1. The National Agricultural Research Fund

The fund was established by agreement between Government of Tanzania (GoT) and donors as a component of the multi-donor project. Other than the internal NARF Constitution (GoT, 1999b), there is no legal or policy framework required for an operation of this kind. The new changes that obligate NARF to operate an account outside the government, probably requires legal authority from the Attorney General.[19]

5.1.1 Purpose

The fund was designed to provide sustainable financing for priority research not covered by the main foreign-assisted projects, particularly NALRP and TARP II. The original concept was to encourage collaboration with non-DRT institutions, particularly Sokoine University of Agriculture (SUA), but also with other agriculturally oriented institutions such as the Tanzania Forestry Research Institute (TAFORI), the Tropical Pesticides Research Institute (TPRI) as well as international and regional agricultural research institutions.

The fund was open to Tanzanian researchers for collaborative and contract research, post-graduate training grants, travel grants for researchers, publication costs, honoraria for visiting scientists and for a research award scheme for outstanding research achievement. In practice, funding was only for research and virtually all principle investigators were scientists within the Department of Research and Training (DRT, later DRD) with collaborators from TAFORI and SUA. Until the concept of zonal research funds emerged, the NARF was intended to serve national as well as regional or zonal needs. Funded projects have generally been for up to three years.

[19] This discussion of the NARF draws primarily from Chema (1999).

5.1.2. Organizational Structure and Procedures

The fund, as originally constituted, was managed by a 12-member board referred to as the Management Team (MT). All but three of the members were public sector representatives, under the chairmanship of the Commissioner for Research and Training. This has now been changed to include members of the Tanzania Chamber of Commerce, Industry and Agriculture, and representatives of farmers, agribusiness and women's groups. In addition, the MT now chooses its chairperson on an annual basis, selection from one of the SUA representatives in order to foster greater collaboration across institutions. Members have an open term of office. The MT meets once per quarter or whenever three or more proposals have been received for consideration.

National and zonal workshops to set priorities for research priorities were held in 1989/90 and 1994/95, respectively. The workshops were largely scientist-driven with limited participation from other stakeholders and were intended to guide decisions concerning research funding. Later, a number of zonal ARIs conducted needs assessment studies in dose association with farmers and extension agents in a process that led directly to defining the research agenda for the Zonal Agricultural Research Funds that were soon to follow.

The procedures for processing funding are set out in a comprehensive manual (GoT, 1999b). Eligibility criteria for collaborative research grants include 1) focusing on some aspect of the set national priorities, being part of a specified network of institutions, and possessing the requisite technical qualifications.[20] Researchers are not required to be Tanzanian.

Until recently, advertising about the fund has been primarily left to zonal directors. Consideration is now being given to establishing an application calendar publicized through the media. Once a proposal is received, the NARF Secretariat, consisting of a Chief Administrative Officer (CAO), a secretary and accountant, pre-screens it to ensure compliance with specifications set out in the fund's applications manual; the Deputy Directors of the research programs do preliminary scientific screening. Pre-screening comments are sent back as necessary to applicants. The draft is then sent to three peer reviewers. After passing through all pre-screenings and reviews, the proposals are sent to the MT for final adjudication. In deciding final awards, the full board considers a variety of factors including peer review scores, availability of funds and equity (ensuring that there is an equitable funding between disciplines and to some extent, national distribution of grants). Despite intentions of speedy processing of applications, by the beginning of TARP II, the mean delay for projects submitted since March 1996 was 17 months.

Responsibility for monitoring and evaluating the funded projects was initially vested in the Fund's CAO assisted by a number of external experts as needed. The main monitoring is through two sets of quarterly reports, one financial, and the other technical. In addition, the CAO is mandated to organize an annual monitoring and evaluation visit to projects. Besides the project accountant, other experts used to be part of the review team. The expense for such a team to cover all NARF projects was

[20] "...Collaborative Research is defined as the cooperation of one or more institutions with the Department of Research and Training in order to support the execution of priority research programmes.." (GoT 1999b, p. 9). The qualifying collaborating institutions include universities, regionally based research institutes, commodity-based parastatals and private sector organizations; these institutes are not necessary restricted to Tanzania's borders.

considerable. The monitoring and evaluation process has therefore been reviewed and a ceiling of 10 percent of the project budget set. Although there is a time limit of three years for finishing research projects, only one of all projects approved since 1993 had been completed and written up to by July 1998. By the end of 1999, three-quarters of completed projects had done so.

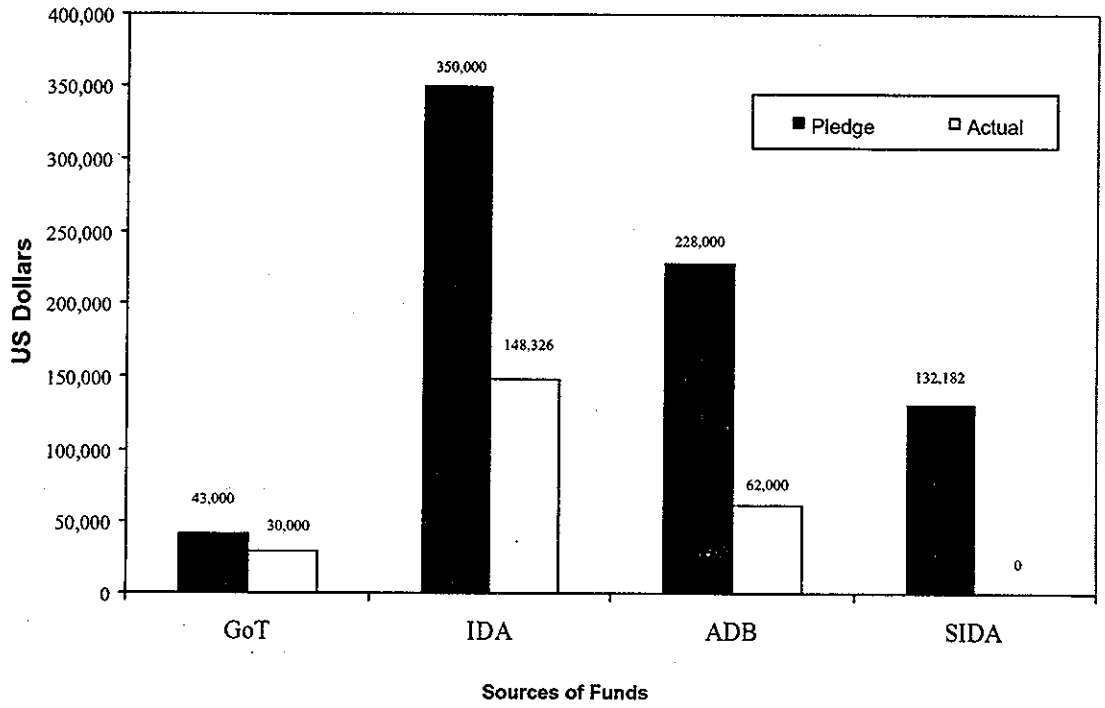
5.1.3. Sources and Disbursement of Funds

At the time NARF was initiated in 1993, there were pledges from four sources. Actual payments did not match these pledges. By the end of NALRP, the effective disbursement was only 32 percent, largely because the main credit providers to the fund, IDA and ADB, withheld funding. SIDA, although it gave its full pledge, specified that its contribution should go to the Northern and Central Zones (Figure 10).

There have been over 100 applications for NARF funding, of which 19 have been accepted. As the NARF does not provide funds to cover concept papers or grants to cover proposal writing, all the more than 80 unfunded applications were full proposals. A total of $240,326 has been disbursed to those 19 scientists, which corresponds to a mean funding level of just over $21,000. At inception in 1993, the maximum grant permitted was $30,000. With TARP II, the maximum award amount was decreased to $10,000 so that the fund might benefit more scientists. Even $10,000 would substantially supplement existing per scientist research budgets, second only to certain commodity levies. Under more favorable conditions it would therefore have been a good additional source of funding for more DRD scientists. Unfortunately, there have only been a few additional awards at the new level as the fund awaits a demonstration of new interest from potential donors.

Virtually all the grants were for food commodity-related research in either crops or livestock although one grant went to resource-rich Naliendele for cashew research. By broad discipline, the 63 percent of the awards were for crop research, 26 percent for livestock research, and 11 percent for soils research. (For a complete listing, see Appendix Table 8).

Figure 10: Pledges and Disbursements to the NARF 1993-98



Source: Chema (1999)

Not only were available NARF funds well below target, but they have not been efficiently disbursed. Extreme caution to minimize fraud contributed to delaying the smooth flow of funds. The aim was to have projects funded and ready to start within six months from the date of application and, in any case, to have all projects well underway within a year. This proved very difficult due to delays in the application processing procedures, which in turn led to loss of interest by scientists in the fund. The non-responsiveness (or apathy) of principal investigators was cited in the survey as the second most important cause of inefficiency in NARF operations (Table 9).

Table 9: Ranking of Reasons for Processing Delays

Reason	Contribution to delay
Slow Project Review Process	57 percent
Unresponsive Principal Investigators	22 percent
Policy Changes* (Decision not to fund surveys)	9 percent
ARF Secretariat	4 percent
Unexplained	4 percent
Peer Reviewers	2 percent
Improperly Completed Application	2 percent
Total	**100 percent**

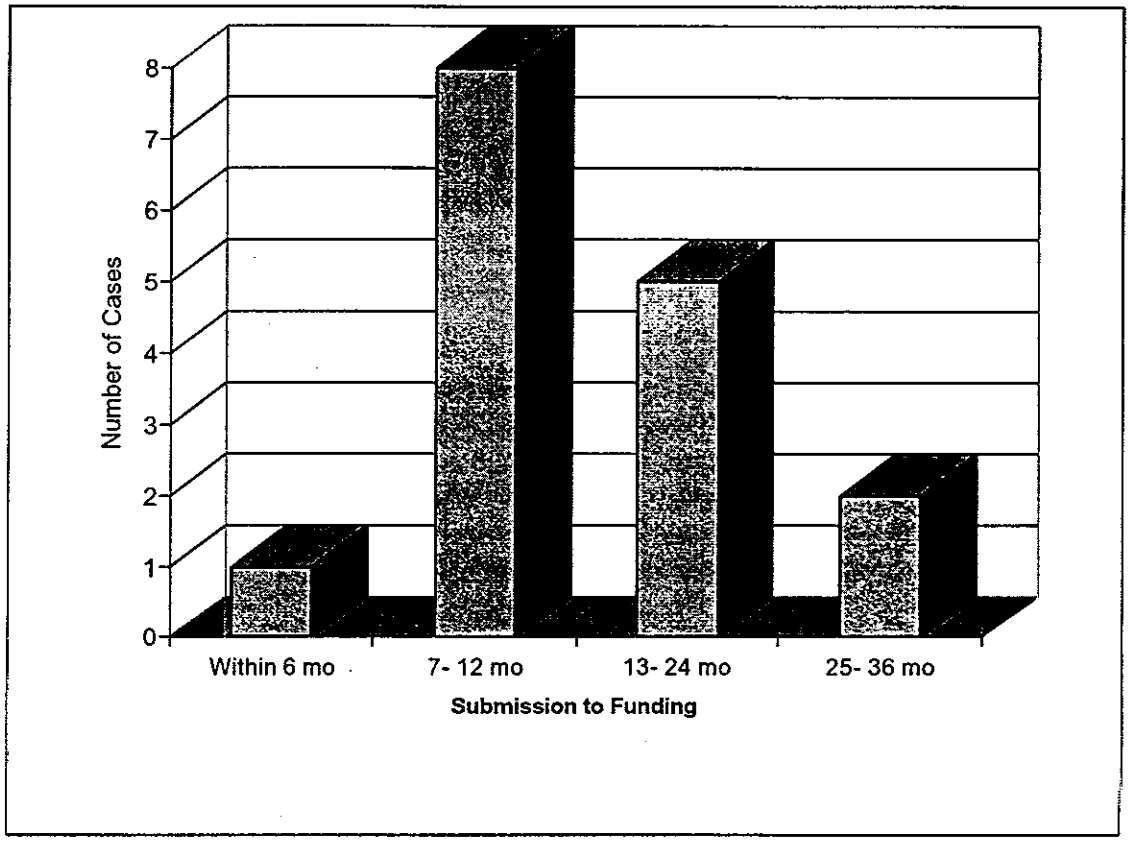
Source: Chema (1999)

Compared to contract research from farmer groups as was taking place in both the (Lake and Northern Zones) and salary top-ups from cashew and export crop researchers, the NARF was

considered to be a poor and frustrating source of funding. As the number of unsuccessful applicants for the fund increased (the overall success rate was around 20 percent) interest waned. Table 9 shows that more than a fifth of people who had applied for support lost interest and did not respond when contacted by the secretariat to improve their proposals or, sometimes, to complete their projects. Contract and export crop researchers, on the other hand, received direct personal cash incentives. By proposing incentives similar to those available to contract researchers, ZARFs are trying to avoid such apathy.

An analysis was done of 16 approved projects for which a complete set of processing data was available (Figure 11). Of the 16, only one was processed within six months. Eight took seven to twelve months, while the remaining half took between 13 to 36 months to process.

Figure 11: Speed of Processing NARF Applications



Source: Chema (1999)

The NARF constitution does not permit the use of its funds for DRD operations through the charging of overheads nor does it allow payment or top-up salaries of permanent staff. (Payment of casual workers is permissible.) Initially the fund was intended to give incentives to scientists by funding travel to conferences, to other research institutions in the region and training. Apart from very limited number of training grants, NARF has yet to fulfill its intention of providing incentives to researchers.

5.1.4. Responsiveness to Farmers' Needs

The NARF constitution emphasized the need for research to correspond to the national and zonal priority setting exercises in order to serve farmer needs. A weakness, which DRD has attempted to address, is representation of beneficiaries in the bodies involved in decision making – from the approval and monitoring steps to the MT. The initial approval and monitoring system was largely exclusive of beneficiaries as indicated in.

Table 10: Contributors to Various Phases of the NARF Process

	Processes Projects Undergo From Conceptualization to Execution						
Who is Involved in Decision Making	**Initial Conceptualisation of project**	**Administrative pre-screening**	**Scientific pre-screening**	**Peer Review**	**Final Project Selection**	**Management**	**Monitoring & Evaluation**
Small Farmers	Indirectly	No	No	No	No	No	No
Large Farmers	No	No	No	No	No	No	No
Agro-industry	No	No	No	No	**Yes**	**Yes**	No
Consumers	No	No	No	No	No	No	No
Researchers	**Yes**	No	No	**Yes**	No	**Yes**	**Yes**
Policy Makers	No	No	**Yes**	No	**Yes**	**Yes**	**Yes**
Administrators	No	**Yes**	No	No	**Yes**	**Yes**	**Yes**

Source: Chema (1999)

5.1.5 Future Considerations for NARF

The NARF in Tanzania would appear to be an important financial mechanism still struggling to have a future. NARF has failed to replace or supplement public funding for agricultural research in Tanzania and thus does not in its current form offer much promise of attracting sustainable funding to the NARS. As indicated earlier, all entities that had pledged to fund it fell far short of fulfilling their promises. DRT (later DRD) was well aware of the fund's weaknesses and, as a prelude to TARP II, proposed a number of changes to improve performance, restore confidence and make the fund attractive to donors. At the beginning of 1999, a task force was formed and mandated to make further changes to the NARF constitution in an effort to make it more appealing. One possibility would be to widen participation to include representatives of the agribusiness community and members of the Chamber of Commerce, Industry and Agriculture. By the time of this study, the Dutch Government had pledged a total of US$ 120,000 for four years, to be matched by IDA at the same level. The NARF management team is receiving and processing applications and four projects are bing complete. Overall, however, Tanzania's NARF has had a rocky start and may continue to struggle to realize its potential as a sustainable funding mechanism.

5.2. The Zonal Agricultural Research Funds

The idea of having zonal research funds managed at each of the seven designated agricultural zones arose in the joint discussions between DRT and donors that culminated in TARP II in 1997. In part, the common desire by donors to concentrate their limited assistance in small geographic areas where local impact is easier to achieve motivated the zonal focus. A number of donors who had shown reluctance to contribute to the NARF were interested in investing in regional research centers. The objectives at the outset were to encourage research on locally important problems not adequately provided for nationally and ensure that such research is managed entirely by researchers and stakeholders at the zonal level. Contract research by beneficiaries, farmer groups, and district organizations was an important consideration.

5.2.1 The Guidelines for Zonal ARFs

The Ministry of Agriculture first issued *Guidelines for Zonal ARFs* in 1997 under TARP II (GoT 1997b). These went through a period of revision, with the most recent version issues in June 1999. The *Guidelines* lay out the terms for governing ZARFs as well as providing the format for the application along with a scoring system for awarding grants. They call for a ZARF management committee chaired by the Zonal Director of Research and Training (ZDRT) comprised of the Zonal Research Coordinator (secretary) and five non- researchers including farmers or farmer representatives, agro-industrialists and other stakeholders. A donor representative sits in as an observer. Selection of the five would be done under the guidance of the Zonal Director, an influential person in the zone, in consultation with stakeholders. Details concerning the workings of the management are left open in the *Guidelines*.

Research proposals may come from researchers at ARIs within the zone or from external recognized institutions if the work focuses on zonal priorities and involves active collaboration with young zonal scientists. Researchers contracted on a competitive basis by farmers, farmer groups, associations and/or district organizations can also submit proposals. Some donors working with District Council projects planned to encourage research contracting by making funds available that the local authorities could use for that purpose if they elected to do so. Theoretically, scientists from within or outside the zone could win contracts. Where the researchers come from institutions, the applications have to be submitted through - and technically reviewed by - the research committee of that institution (center or university).

The 1997 *Guidelines* specified a dollar maximum of $30,000 (Tshs 24 million) and up to three years for each grant. This ceiling was decreased to $6,000 (Tshs 4.8 million). Eligible expenses include expendable supplies, local travel costs, casual labor, publication costs and contingencies. They are not intended to cover travel grants, research awards, honoraria or collaborative research that addresses national issues. There have been proposals that in future, these groups should be able to apply to ZARF for funds to commission such research. Funds must be spent in the specified period; all assets acquired with ZARF funds are turned over to the sponsoring institute.

The competitive grant making process was not well specified in the *Guidelines*, although the criteria for judging applications were explicit. The Constitution for the Northern Agricultural Research Fund (1999e) sets up a system of review under the responsibility of the management committee.

The primary source of funding at inception was to be donors. DFID had expressed interest in the Southern Zone, the Irish in the Eastern Zone, the Swedes in the Northern Zone and the Netherlands in the Lake Zone. Guidelines originally developed by DRT and circulated to donors for comment had the zonal research management playing a dominant role. It soon became evident that, with a few notable exceptions, funding from donors was not going to be quick or easy, and alternative strategies were developed by GoT.

With fund raising from local sources in mind, the Ministry of Agriculture launched a campaign late in 1999 and early 2000 to visit zones under consideration for the establishment of ZARFs. The intention was to convince local authorities of the importance of research in boosting agricultural production and of the financial returns of investing in ZARFs. The highest official in the Ministry, the Permanent Secretary and the Director of Research (DRD) led the campaign. Though not initially slated for a ZARF, people in the Central Zone requested that the team visit the area because of local interest. It was intended eventually to visit all the seven zones. So far, the team has visited the Southern, Lake and Central Zones. Following the visits by such high government officials, some District Councils pledged to contribute Tshs 3-3.5 million per year each to their respective ZARFs (see Section 0). They came to Mtwara and held meetings with the 12 councils in the Zone in January 2000. As a result of these meetings, some councils have pledged funds to the ZARFs.

In TARP II, IDA set aside $40,000 per zone per year as matching funds that could be disbursed to any ZARF that managed to raise funds for any source including District Councils. That was one of the selling points in the fund raising campaigns. The zonal centers individually made their own campaigns that resulted in contributions or pledges from a variety of sources described below.

Table 11: Contributions for the NZARF in 2001 (Actual)

Source	US$	Tanzania Shillings (millions)
Balance brought forward	**34,201**	**27.6**
Balance qualifying for IDA match	**46,000**	**37.0**
Netherlands	*15,000*	*21.1*
SIDA	*25,000*	*20.1*
VETAID	*6,000*	*4.8*
Other local clients	*0*	*0*
IDA match	**46,000**	**37.0**
Grand Total	**126,201**	**101.5**

Source: personal communication, Zonal Administrative Officer of the NZARF.

5.2.2. Northern ZARF

The Northern ZARF started operating in the year 2000 following the preparation of its constitution (1999e). In the first year, the Royal Netherlands Embassy contributed US$30,000, SIDA contributed $US 25,000, IDA matching funds were US$ 55,000 and ICRISAT contributed US$ 6,000. The first year, 22 projects were funded following competitive bidding. Grants ranged from US$ 2,000 to US$ 6,000. The NZAR monitored all 22 projects in the field in July 2000 and cancelled two for non-performance. For the current financial year, their anticipated sources of funding are quite diversified (Table 12). Donors, namely the Netherlands and Sweden, will be the main sponsors while an animal

health NGO, VETAID, is also expected to contribute. At the moment, the District Councils have made no pledges or contributions. Contribution from all these sources should qualify for a matching amount of the IDA credit to Tanzania.

5.2.3. Southern ZARF

Although the Southern ZARF is not yet in operation, an account was opened in 2000 which, to date, has Tshs 65 million ($81,000). Most of this is from the Cashew Research Fund Trustees, who have agreed to have 20 percent of the annual funding for cashew research donated to the ZARF on the understanding that SZARF funds are not intended for cashew research (Table 12). Since the other Naliendele programs are already supported by funds from the CRFT, scientists from outside might use ZARF money for contracted research.

The other donors to the SZARF are the local District Councils. The zone's 12 District Councils pledged Tshs 3.5 million each following the visit of Ministry of Agriculture meetings in January 2000. Actual contributions by February 2001 were 11 million Tshs ($13,700). Five districts out of the original 12 have yet to pay up. Likewise DFID, an original supporter of the ZARF concept for the southern zone, has not yet invested the SZARF.

Table 12: Sources of Funds for the SZARF

Source	Amount in Tsh	US Dollars
Cashew Research Fund Trustees	52,500,000	65,300
Mtwara Urban Council	1,500,000	1,900
Mtwara Rural Council	1,000,000	1,200
T/Himba	2,000,000	2,500
Newala	1,500,000	1,900
Nachingwea	2,000,000	2,500
Ruangwa	1,500,000	1,900
Tunduru	1,500,000	1,900
Total	63,500,000	79,100

Source: Naliendele Agricultural Research Institute

The SZARF management committee has yet to be formulated and there is an apparent lack of urgency in applying for matching funds from IDA credit. This delay suggests that the zone, which is well endowed financially at the moment, might be nearing its absorptive capacity for additional funds. It may be reaching a point at which an endowment fund for research could receive very serious consideration.

5.2.4. Lake ZARF

The Lake Zone drafted its guidelines with the participation of stakeholders. What was considered to be an interim launch committee of five women and five men was constituted in September 1999. They established an account and received initial funds from the Netherlands government. The Lake Zone Agricultural Research Fund (LZARF) constitution was filed with the Office of the Attorney General in Mwanza in October 1999. After receiving matching funds from IDA, it funded its first four projects (from a possible 14) in November for the 1999/2000 season. Those research activities covered the impact of HIV/AIDS on food security, opportunities for *rweye* (grassland) use, an analysis of the small ruminant subsector, and a study of milk production. In November 2000, the

LZARF issued its first annual report and workplan based on lessons learned in its first year of operation (GoT, 2000e).

According to the *Annual Report*, the Government of the Netherlands was the sole funder during the first year of the LZARF with contributions totaling of $40,000 (Tshs 32 million), the first $10,000 (Tshs 8 million) of which was matched by World Bank IDA funds for a total of $50,000 (Tshs 40 million) as of the writing of the 1999/2000 *Annual Report* (GoT 2000e).

A special effort is being made to involve agricultural NGOs in lobbying for funds. Lists of all NGOs involved in agricultural work have been drawn up in every region for canvassing during the ongoing campaign. LZARF management is also keen to have District Councils invest as a show of local commitment.

The funding situation should be much improved during the LZARF's second year of operation. In 2000/01, the LZARF will fund the second year of the original four studies as well as adding eight new activities (out of the 21 proposed). The anticipated 2000/01 budget is Tshs 56.5 million ($70,000), and includes research activities of Tshs 45.5 million ($56,600), 10 percent overhead costs of Tshs 4.5 million ($5,700) and Secretariat costs of Tshs 6.4 million ($8000). The average cost per research activity (net of overhead and secretariat costs) is Tshs 3.8 million ($4,700). With another $15,000 anticipated from the Netherlands, $33,000 anticipated from the Client Oriented Research Programme, and the corresponding World Bank matches, there should a surplus of more than Tshs 67 million ($84,000) to carry forward to the 2001/02 planning season.

5.2.5. Central ZARF

The study team was unable to travel to Central Zone and was not able to acquire any written reports on the Central Zone Agricultural Research Fund (CZARF). A brief interview with the Zonal Director from Mpwapwa (Dr. Sendalo) indicated that CZARF management structure radically differs from the other ZARFs and from the *Guidelines*. The Central ZARF Management Committee has only five representatives including 1) the District Council Chairman, the District Executive Directors (DEDs) from two of the districts (Dodoma Urban and Singida Rural), the ZDRD and the Zonal Research Coordinator. This is evidently an interim committee for the purpose of winning support from District Councils. It will need to change to accommodate potential beneficiaries including NGOs and others suggested in the guidelines, in order to bring about a more balanced representation. In the meantime, however, the local government administrators have proposed sweeping changes in the other committees that govern and oversee research.

According to information received from the zone, there were two main reasons for focusing on District Councils for ZARF funds. First, the Central Zone receives almost no funds from GoT for operational research. Second, TARP II funds were seen as insufficient and untimely. At the internal program review in September 1999, Central Zone researchers discussed the possibility of tapping into local livestock levies collected at auctions and slaughterhouses to fund livestock research. Council by-laws apparently permit the use of up to 20 percent of the levies for the development of the livestock sub-sector. In November 1999, the Zonal Director held exploratory meetings in the zone, followed in December by the PS for Agriculture meeting attended by all senior officials in the local authorities. At that meeting, Central Districts agreed to an initial contribution of Tshs 1 million, which were raised in January 2000, to 3 million per District per year. As of mid February 2001, only

three of nine districts had actually disbursed funds, and even then at a level much lower than they had committed (Table 2 in Section 0).

In addition to funds from District Councils, SIDA, the Dodoma Micro-project and the Dairy Goat Project have contributed Tshs 7 million, 22 million, and 81 million (over 2 years), respectively (total US$ 137,000). The CZARF secretariat has sent in a request for Tshs 4.5 million in matching funds from the World Bank. For reasons unclear to them, the SIDA contribution of Tshs 7 million (US $8,700) has not yet been considered for matching in the Central Zone although it was matched in the Northern one.

5.2.6. Summarizing Tanzania's Very Recent Experience with ZARFS

Four of Tanzania's seven research zones have taken steps towards establishing a ZARF. The DRD's decision to provide broad guidelines to the zones within which the players are given wide latitude to develop operational models best suited to their conditions has started to yield interesting innovations. These range from very tentative structures in the Central and Southern zones to the fully operational ones in the Lake and Northern zones.

ZARF Management

In terms of ZARF management, the DRD emphasizes that the ZARF *Guidelines* are not binding and each zone is free to organize itself in accordance with stakeholder wishes. DRD does recommend broad representation of stakeholders to broaden the ZARF's appeal. So far, there is great variation in the composition of the ZARF management committees (Table 13). The Lake ZARF has made some effort to conform to the *Guidelines* but has several non-voting research center representatives to ease the administrative burden. The Central ZARF management committee bears no resemblance to what the guidelines propose. The Southern ZARF, despite having established an account, appointed signatories to the account, did not appear to have constituted a management committee. The two groups of signatories to the ZARF account in the Southern Zone represent local government authorities and the Naliendele ARI.

Table 13: Recommended and Actual Composition of ZARF Management Committees

Category	Recommendation	Northern	Central	Lake*	Southern
Researcher Community	1	3	2	2 (4)	Not Constituted
Extension	1	1		1	
Farmers	3-5	2		3	
NGOs	2	2		1	
Donors	2	1		1	
Input suppliers	1	0		1	
Cooperatives		1			
Private Sector		1			
Colleges/Universities	1	0		1	
Women	One third			5	
Local Authority	None as such		3		

* For the Lake ZARF, a secretariat of 3 (Secretary, Accountant and the Zonal Administrative Officer, sit on the committee although only 2 are eligible to vote (one administrator and a scientist).

The Lake ZARF management committee has set up offices away from the ARI. Separation of ZARF management committee from the management of the zonal center is one of the requests made by

DFID, the potential donor to the Southern ZARF. The ZDRT for the southern zone, in a DRD headquarters meeting to address the way forward for the ZARFs in 1999, felt there was merit in addressing the management and other concerns raised by DFID.

ZARF Funding

In their short lives, the existing ZARFs have attracted funds and enthusiasm from donors, NGOs District Councils and commodity boards. Already the ZARFs have raised at least $500,000, twice as much as the $240,326 disbursed by the NARF since 1993. They have been particularly aggressive in seeking funding from the District Councils, appealing to the central government to urge these Councils to take greater interest and responsibility for agricultural research in their zones. Though laudable, the push to get funding from local councils has been slow. Even with more promotion, it is unlikely District Councils will ever be able to contribute large sums. A more promising source is likely to be the commodity funds based on the unique example of cashew cess funding for the southern ZARF.

Matching funds are credits to the GoT and, if the current enthusiasm in funding is maintained and good innovative management styles continue to evolve, IDA credits are likely to continue. However, dependence on World Bank matching funds is also a concern, both in terms of the national treasury and also in terms of the continuity of local research.

Given the very low remuneration levels, incentives to scientists will still need to be devebped. In the meantime, ZARFS have also been innovative in handling some of the overhead costs associated with research.

ZARF Recipients

There has been a good response to the initial call for proposals. The Northern ZARF alone is funding more applicants in this financial year (over 20) than the NARF was able to do since its inception. It is still too early to judge the pattern of grants because only two ZARFs have actually funded research activities (Lake and Northern). Both have just adjudicated a second round of grants competitively. In spite of language which suggests the scientists across the Northern zone could apply, none of the NZARF awards were made to scientists in coffee research or Tanzania Pesticides Research Institute. Now that an autonomous Coffee Research Institute has been established, its researchers will not be expected to draw any funds from the ZARF.

Summary

Overall, there has been a positive response to the ZARF opportunity. Where available, ZARF constitutions, annual reports and workplans were well written and comprehensive, demonstrating a high level of care and consideration. Funds are coming in and being allocated to research activities reflecting local priorities. Perhaps enticed by the World Bank match, some donors have demonstrated their willingness to use this channel for disbursing their funds. The sums represent an impressive addition to the meager operational and development resources available directly from the Government.

Sustained efforts will be needed, however to encourage donors to fund the ARFs. Tanzania's experience with donors is that they are not willing to put money into a common pool. As donors are

often are more interested in being associated with a specific zone, the ZARFs may be more attractive than the NARF. To ensure future sustainability, MAFS and the zones might consider extending their current efforts at inviting District Council participation both to other zones (already underway) and to other stakeholders. In the wake of privatization and more private sector involvement in agricultural production this may be possible. However, for District Councils and private stakeholders to fund public sector research will require the ARIs to meet certain basic conditions. Programs must be responsive, with clear strategies, convincing programs and well-defined users. There must be substantial communication between ZARF management and both researchers and stakeholders. Scientific and financial accountability is required throughout the system. In particular, as recipients and disbursers of funds, ZARFs will need to ensure more transparent systems and accountability in managing the funds.

One way of helping ZARFs meet these conditions would be for the DRD or World Bank to field a review team to analyze the current procedures in place and make practical recommendations for how each ZARF could be improved. In particular, the team might focus on providing guidelines on how to achieve transparency and accountability as well as fund acquisition. Such a team should consist of specialists in accounting and stakeholder participation as well as representatives of ZARF technical advisors, the NARF, the private sector (perhaps the commodity boards) and the donor community. The results of such a review would be helpful as the ZARFs try to expand and consolidate their procedures.

Whither the current NARF? DRD should review this allocation mechanism to decide whether to maintain it. One option would be to convert it to an endowment or trust fund to support the ZARFs. It would require a legal and policy framework to establish it and identify sources of funding, both domestic and foreign, such as levies, debt swaps and monetized food aid.

6. Issues and Ongoing Questions

The Tanzanian government – and especially the agricultural research community – has made very impressive efforts to reform the country's research institutions and policy environment in order to invite stakeholder participation and funds into the research process. The World Bank has played an especially important role in this process, with over 15 years of project support to agricultural research. The Special Program for African Agricultural Research (SPAAR) at the World Bank has also provided a general road map to guide research policy, strategies and program formulation and implementation in African countries. SPAAR (1999) has advanced six principles to serve as a Framework for Action (FFA) for such changes: institutionalize a strategic planning process, develop sustainable financing mechanisms, improve institutional and management capacity, build coalitions, strengthen linkages among stakeholders, and encourage regional and international collaboration. In an assessment of institutional innovations in African agricultural research, SPAAR looked particularly closely at the Tanzanian experience. The country received very high marks as one of only 11 African countries that adhered to the all six FFA principles.

As demonstrated in the previous sections, the results of the current study concur with the SPAAR result. Nevertheless, additional efforts will still be needed to ensure that agricultural research performs cost-effective, client-driven research that increases agricultural productivity and incomes.

Consistent with the sustainable financing analytic framework developed by Bingen and Brinkerhoff (2000), the creation, implementation and ultimate success of financial mechanisms depends not only on those mechanisms themselves but on the larger institutional and policy context in which they operate. Our analysis of the issues and ongoing questions for Tanzanian agricultural research starts with the narrower issues related to the financial mechanisms and then expands outward to the larger institutional and policy context.

6.1. Financial Mechanisms

As a result of government policies and institutional reforms, the Tanzanian NARS now has a rich array of innovative funding mechanisms to mobilize both public and private sector sources of funding. Selected ARIs have been privatized. Agricultural research funds have been setup for commodities (funded by industry cesses) and for zones (funded by primarily by donors). In most cases these funds are intended to be competitive, demand-driven and performance-based. The GoT permits ARIs to retain 100 percent of the revenues they earn from commercialization, fee collection, and research contracts. Some of these efforts to attract funds work better for certain institutions and commodities than for others, but overall the country has embarked on an ambitious program of experimentation and change.

Problems of course remain. Funds for research are still in short supply and levels are very difficult to predict. Those from industry cesses fluctuate with underlying production and price parameters. Those from government and donors may not arrive on time or at all. Efforts to seek research funds for within are commendable but still too small to really be meaningful. The NARF has not succeeded in attracting funding or disbursing grants. The ZARFs are too new to really evaluate. Self Help funds are currently too small and disorganized to have much impact.

Issue 1: What does it take to broaden and deepen these financial innovations?

Ongoing Questions:

1.1 Is the NARF worth keeping? At present, the NARF is underfunded, unresponsive, and operationally defunct. Can the NARF be reorganized to be effective, or should it be dropped? In theory, a national fund could be used to treat issues that reach across zones or commodities. The DRD needs to consider the merits of reinvigorating this fund or putting in place other mechanisms to address matters of national priorities.

1.2 How can Tanzania ensure that the ZARFs are funded and lead to good research? Using ZARFs to fund the public goods part of the research agenda is an important innovation. The *Guidelines* and constitutions governing ZARFs provide a solid foundation for moving forward. Attracting funding will require scrupulous adherence to the principles laid out in these documents.

- Of particular importance will be transparency, fairness and good financial management. With a handful of ZARFs now reaching their second anniversary and attempts to scale up the effort to other regions, the timing may be right for a review of ZARF experience. Such a review should focus on helping ZARFs with practical suggestions on how to improve transparency, accountability and research management.
- Clearer decisions are needed concerning which scientists in the Zones are eligible for grants.
- Is it intended that this be the only source of operational funding for the ARIs in the DRD? If not, attention will be needed to address the relationship between core funding (allocated by the internal program review) and special project funding (allocated by the ZARF). At present the flow of funds into ZARFs is too meager to fund a coherent research agenda.
- The SZARF, which includes the cashew-based farming system, may want to consider tailoring their fund to emphasize value-added research or provides research to small business production partnerships.

1.3 What does it take to increase the use of cess funds? More than other countries in Africa, Tanzania has set up systems to ensure that a certain proportion of commodity levies are dedicated to research, with the result that cesses have brought a tremendous infusion of funds into the research system. However not all commodities are equally successful in funding their needs through cesses and not all commodity boards are well integrated into the research process. Possibilities for improving the potential for cess-funding of agricultural research include:

- Reviewing cess management and disbursements from the commodity boards and setting in place guidelines to ensure proper management of these resources.
- Re-evaluating the parameters that dictate the value of cess revenues directed towards research. Should the levels of taxation be raised? Or should a greater proportion of the existing revenues be directed to research (as opposed to other functions of the commodity boards)? Should there be an attempt to equalize the flow of research revenues coming from cesses, relative perhaps to the export value of the crop?
- Setting up revolving funds to stabilize the normal variability implicit in taxing the export value of agricultural commodities.

- Introducing grading systems that would permit farmers to get a higher price for top quality commodities and thereby induce researchers to breed for the qualities valued by the market.
- Extending the example of cross-commodity funding by the cashew cess in the Southern Zone to other crops and zones.
- Broadening the focus of research from strictly production-enhancing technologies to better processing and packaging of agricultural products.

1.4 **What does it take to deepen Self Help fund innovations?** The basic policy is in place to allow ARIs to raise funds from private sector activities. However the sums are meager and the systems are not yet in place to manage this resource effectively. The primary challenge will be to balance income-generating activities against the effort required to maintain the research program. On one hand, ARIs are struggling to use the SHF mechanism to generate funds for research. On the other hand, many of these activities are unprofitable and off-mandate, thus risking in the long run cannibalizing the meager resources of the research stations. In the absence of significant inflows from internal GoT sources, flagging donor interest in supporting research could lead to an expansion of SHF activities to the possible detriment of meaningful research. The World Bank/IDA through TARP II has commissioned a study that will draw recommendations on how to optimize revenue generation in the DRD research network. Hopefully the results of that study, once operationalized by the DRD institutions, will lead to a significant – and rational - inflow of self-help funds to the system.

6.2. Institutional Reforms

The last 40 years have been marked by the constant reinventing of the Tanzanian agricultural research system. Recent years have seen a trend towards greater decentralization of the priorities, management and funding of research. A new system of ARI management has been put in place in the DRD to match zonal priorities with resources. Research stakeholders have been built into the process of defining priorities and selecting projects. In spite of a great institutional and individual flexibility to adapt to evolving conditions, the system continues to struggle with a core of persistent challenges:

Issue 2: There is an ongoing need to integrate research with extension and farmers. The client-oriented programs piloted in the Lake and Northern Zones need to become sustainable and extended to other zones if they are to have an impact on rural development.

Ongoing Questions:

2.1 **Can these efforts be scaled up?** The TARP II mid-term review (1998/1999-2000/2001) that took place in February 2001 recommended scaling up their implementation in Western, Southern, Southern Highlands and Central zones. Some funds were set aside for this purpose and the DRD Agricultural Economics Unit was assigned the coordinating role. Ireland AID supports the Eastern zone under the eastern zone client-oriented research and extension program.

2.2 **What other reforms will bring researchers closer to farmers?**

- One possibility is to explore the possibility of extending the Northern Zone's practice of using a small share of NZARF funds to reward research liaison officers who successfully identified and proposed researchable topics that actually won NZARF funding.
- Another issue to the unstable relationship between crop and livestock research. The constant re-arranging of the ministerial functions for livestock and crops makes it difficult for ARIs to pursue an cohesive approach to crop and livestock research. Both research and extension should reflect these two critical and highly entertwined dimensions of the Tanzanian farmer's agricultural operations.

Issues 3: From the institutional perspective, total funding remains highly variable and hinders the ability to carry out a research agenda.

Ongoing Questions:

3.1 What institutional reforms might ARIs undertake to improve overall funding?

- Current financial accounting procedures are woefully deficient. It is very difficult to determine how much funding from whom is going into any of Tanzania's agricultural research institutes, whether public, semi-autonomous or private. If ARIs want to be financially sustainable, then their accounting systems and financial practices need to be dependable and transparent. Public and private sector investors in agricultural research will have little patience with irregular books.
- Building capacity to compete should also increase funding. ARIs may need assistance building Business Development Units to reach out to potential public and private sector clients. Researchers may need support for learning how to write good proposals and, as importantly, properly value the cost of the services in those proposals.
- Strengthening the socio-economics units at the ARIs so that they could explore the returns to research in marketing, processing and packaging of agricultural products.

3.2 What tools can be used to decrease variability and improve planning horizons? In addition to increasing the base funding through several of the mechanisms mentioned above, there is a great need to stabilize funding to improve resource allocation decisions.

- Improving financial information accountability will help ARIs track, monitor and even project spending.
- At a minimum, efforts should be made to ensure that government and cess funds, once allocated, are actually disbursed to the ARIs in a reliable and timely fashion.
- Guidelines for cess funds may include provisions to divert "excess" revenues (above and beyond the annual budget) to special revolving fund to use for shortfalls in other periods.
- Might donors make a commitment, perhaps on a matching basis, to match GoT investments in an endowment or trust fund?
- Finally, like any institute operating in an uncertain environment, ARIs should consider their funding sources as a *portfolio* that will sustain major thrusts of research. Single sources of funds, are not sustainable -- the only thing that will really work is a research and funding portfolio that takes into account all of the institutional and policy issues. ARI financial managers may thus benefit from training in concepts of portfolio management.

6.3. Policy Reforms

The Tanzanian government has put in place policies to revitalize agriculture and agricultural research. The nation's farmers and livestock owners operate in a context of structural adjustment, macroeconomic changes, privatization and economic liberalization. The GoT has set in motion a far-reaching process of decentralization that gives local governments responsibility for planning and service provision, political and legal devolution, and greater delegation of discretion to local management units of central government agencies. Economic liberalization has meant that agricultural commodity boards have given way to private sector marketing. Protective tariffs have fallen or disappeared. Businessmen take a greater share of the economic decisions in the country. With a renewed focus on regional and international trade, there is a focus on increasing production high-value products. In this context, agricultural researchers are under pressure to provide new technologies that help farmers increase their exports.

These trends have implications for agricultural research. In an era of economic liberalization, research must respond to farmers' needs, the extension system must be able to transmit it to the farmer, and the private sector is asked to provide a major share of the key agricultural inputs, including technology and knowledge. Opening agriculture and agricultural research up to the forces of the market should increase production, decrease costs, and increase incomes and, ultimately, increase economic growth. At the same time, the newly transformed agricultural sector remains the main instrument for reducing poverty, ensuring food security, and managing the resource base on a sustainable basis. Tanzania's agricultural research system has struggled with these two – sometimes conflicting – sets of demands.

Issue 4: Although the Tanzanian research system has radically and fairly successfully restructured itself in order to attract funding from clients, the public research agenda remains critically underfunded. For research to generate the type of income growth needed to alleviate the poverty crushing Tanzania's rural sector will require focused and sustained investment in the crops the vast number of Tanzania's farmers grow for food and incomes. Hiving off the potentially profitable research activities (tea, coffee) and using marketing proceeds to partially fund others (cashew, cotton) may secure funding for the commercial crops. But this strategy by itself leaves the GoT holding the very difficult public sector portfolio of subsistence smallholder crops and livestock. Typically those ARIs focusing on smallholder subsistence agriculture lack both cess funds and the client base to which to sell research products and services.

Ongoing Questions

4.1 **What is needed to support research on the subsistence agricultural sector that provides the incomes and food for the majority of Tanzania's rural poor?** Possible approaches might include:

- Exploring the use of cesses, levies and check-offs for crops not so easily commercialized. One option would be to establish or reallocate a general tax on all agricultural output to partially fund public research. Another would be to explore the feasibility of instituting "farmer-managed levies" raised by commodity associations either to conduct their own research or fund research in public or private organizations.
- Promoting wider use of cesses on one commodity to fund research on another. Already the cashew industry has been willing to fund other research on other crops in the cashew-based farming system. Perhaps this model can be extended to other commodity cesses.

- Ensure that budgetary policy reflects the strategic importance of the agricultural sectors as reflected in the PRSP. Because most subsistence agriculture is based on open-pollinated varieties and serves a very large, impoverished, client base scattered across different agro-climatic zones, it is fundamentally public sector good. It therefore will have difficulty attracting private sector sources of funding. Just as business development units market goods and services to the private sector, so too should the GoT market this part of its agenda to those holding a stake in the public sector: governments, donors and NGOs.

Issue 5: Despite great efforts to expose agricultural research to market signals and competition, the current system faces huge challenges in providing profitable technologies to farmers due to poor staff performance and motivation. Nearly all government funds to ARIs are devoted to staff compensation; the operations and development funds left over are too small to allow scientists to actually perform much research. Many stations are without adequate technology and communications infrastructure, and sometimes even electricity. For some ARIs, much of the funds garnered from the private sector are devoted to supplementing inadequate salaries rather than improving research output. Where such funds are not available, the system's well-trained scientists are often absent, earning income in other, non-research, endeavors. The GoT has to make some very hard decisions concerning its commitment to public sector research. There is simply not enough public sector funding currently available to support the current number of DRD researchers.

Ongoing Questions:

5.1 **What viable options exist for boosting researcher compensation?** If GoT resources prove inadequate to carry out the programmed increases in all civil service salaries over the next four years, it may be necessary to consider other approaches to funding researcher salaries. Possibilities to consider may include some combination of the following strategies:

- Removing the DRD from the civil service structure, perhaps by converting all DRD ARIs into semi-autonomous institutes or by transferring DRD researchers to the stations primarily supported by other sources of (nongovernmental) funding.
- Further honing the research agenda and staff with the provision that the financial resources thus liberated could be reallocated to pay the remaining staff well.
- Formalizing and standardizing methods of applying outside sources of funds (from SHF, donors, or cesses) to compensation packages. For donors or other stakeholders to endorse this use of funds, the policy would need to ensure that "top-offs" were fair and transparent, while maintaining links to scientist performance.
- Exploring the potential for boosting non-salary aspects of reward system: internal recognition through newsletters, prizes, promotions, etc.

5.2 **What can be done to maintain the nation's sizeable investment in human capital?** Although Tanzania's research staff are well-educated, the lack of funds for research, conferences, and communication threatens to erode their much needed skills. Unless they are kept up to date, they will be unable to compete in some of the national, zonal, and eventually sub-regional funds against researchers that have library and internet capacity or are more recently out of the university. Likewise, they will be unable to produce products the private sector clients are willing to purchase.

5.3 **What can be done to ensure performance?** Higher salaries and complementary investments in information provide the carrot. Successful organizations worldwide find they also need a stick. Salary increases, promotions and even the continued offer of employment should be made contingent on annual performance reviews, whether or not the employees are civil-service. The research community may want to work with stakeholders to define appropriate

measures of performance in their particular line of work. Under the evolving demands of client-oriented research, traditional measures such as publications may no longer be appropriate.

Tanzania has put in place the basic mechanisms and policies to attract public and private sector interests to fund agricultural research. At present, however, that agenda is well under-funded. The government now faces the hard decision to radically narrow that agenda in order to put the considerable talents of NARS researchers into the task of delivering the technological goods and services needed to stimulate agricultural sector growth and alleviate poverty.

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Appendices

Government Agricultural Research Institutions

Appendix Table 1: Agricultural Research Zones, Institutes and Centers, and Research Programs

Zone	Institute/Center	Programs
National	• DRD Headquarters, Temeke	• FSR/Agricultural Economics
	• Animal Disease Research Institute (ADRI), Temeke	• Animal Health and Disease
Lake	• Ukiriguru	• Cotton, Roots and Tubers
	• Maruku	• Banana and Coffee
Southern Highlands	• Uyole	• Dairy, Potatoes, Agricultural Engineering
	• Kifyulilo	• Pyrethrum
	• Ugano	• Coffee
Northern	• Selian	• Wheat, Barley, Phaseolus beans
	• Lyamungu	• Coffee
	• Tengeru	• Horticulture
	• West Kilimanjaro	• Livestock
Eastern	• Ilonga	• Maize, Grain Legumes, Sunflowers Sorghum, Millet and Crop Protection
	• Ifakara	• Rice
	• Kibaha	• Sugarcane
	• Mlingano	• Soil and Water Mgt., Sisal
	• Mikocheni	• Coconut & Biotechnology
	• Tsetse and Trypanosomiasis Research Institute, Tanga	• Animal Health and Disease
	• Livestock Research Center, Tanga	• Beef/Dairy Cattle, Small Ruminants
Southern	• Naliendele	• Cashew Nuts, Oil Seeds, Roots and Tubers
Central	• Mpwapwa	• Beef and Dairy Cattle
	• Kongwa	• Small Ruminants, Pastures and Forage
	• Makutupora	• Viticulture
	• Hombolo	• Sorghum and Millet
Western	• Tumbi	• Tobacco, Agroforestry

Notes:

1. Livestock research institutes, included above, were removed from the DRD of the MAFS to the newly created Ministry of Water and Livestock Development in March 2001. They include ADRI, TTRI, and LRC Tanga, Mpwapwa, Kongwa and West Kilimanjaro.
2. The Lyamungu, Maruku and Ugano stations will be reassigned to the newly formed Tanzania Coffee Research Institute (TACRI).
3. The Tumbi station will come under the private Tobacco Research Institute (TORITA) when it is finally established.
4. The privatized Tea Research Institute of Tanzania, TRIT, maintains stations at Ngwazi and Marikitanda.

Appendix Table 2: Zonal Prioritization of Research Programs

Category	Research Programmes/Commodities		
	First Priority	Second Priority	Third Priority
Central Zone Dodoma and Singida (Regions)	Dairy cattle, beef cattle, sorghum and Millets, feed resources, grain legumes, maize Cotton agrof., soil and water mgt., FSR/econ, animal health/mgt.	Viticulture, Oil seeds, small ruminants, roots and tubers, tobacco, rice, crop prot., animal traction, post-harvest techn.	Hortic., dates, non-ruminants (poultry and pigs etc.)
Eastern zone (Morogoro, Tanga, Coast and Dar es Salaam regions)	Maize, rice, dairy cattle, beef cattle, grain legumes, coconuts, sisal, sugarcane, agrof., crop prot., animal health, soil and water mgt., FSR/econ	Cotton, Coffee, roots and tubers, fruits, sunflower, sorghum and millets, bananas small ruminants, cashew, tea, phaseolus beans, pastures and forages, spices, agric. engin.	Groundnuts, sesame, sheep, pigs, non-traditional fruits/vegetables, agroclimatology post-harvest techn.
Lake zone (Mwanza, Shinyanga, Kagera and Mara regions)	Cotton Coffee, rice, maize, cassava, sweet potatoes, banana, pasture and for., beef cattle, phaseolus beans, sorghum and millet, crop prot., agrof., soil and water mgt., FSR/agric. econ., post-harvest techn.	Tea, fruit trees, goat sheep, pigeon pea, groundnuts, animal traction, and animal health.	Sugarcane, tobacco, round potatoes, sunflower, vanilla bambaratus, yams, agr. Engineering, climatology
Northern zone (Arusha and Kilimanjaro regions)	Coffee, maize, wheat, hort., dairy cattle, barley, phaseolus beans, crop prot., soil and water mgt., agrof. FSR.	Bananas, beef cattle, oil seeds, roots and tubers pastures and forages, biotechnology, post-harvest techn., agr. climatology.	Sugarcane, rice, flowers, poultry, small ruminants, sorghum and millet, grain legumes, pigs, animal protection, agric. Engineering, range management.
Southern Highlands Zone (Mbeya, Ruvuma, Iringa and Rukwa regions)	Coffee, maize, rice, tea, beans horticulture, dairy and beef cattle, crop protection, agro forestry, soil and water mgt., organic farming post-harvest system	Cotton oil seeds, wheat, small ruminants, bananas, round potatoes, pyrethrum, non-ruminants, animal traction, agricultural economics/FSR, animal diseases, range management.	Cocoa, pasture, sorghum and millet, tobacco, cassava, barley, sweet potatoes, soyabeans grain legumes, agroclimatology, biotechnology.
Southern Zone (Mtwara, and Lindi regions)	Cashew, sesame cassava, groundnuts, goat, coconut, FSR/socio-economics, crop protection, crop processing, soil and water management	Maize,pountry, fruits, sorghum, vegetables soyabeans, beef cattle, pasture and forages, rice, pigeon peas, dairy cattle, agroforestry, animal health, land use planning, agroclimatology, mechanization, animal traction	Sisal, sweet potatoes, sheep, cowpea, bambara nuts, green gram, pigs, castor, rabbits, bullalo beans (upupu)
Western Zone (Tabora and Kigoma regions)	Rice, tobacco, sweet potatoes, beef cattle, dairy cattle, maize, cassava, plant protection, animal health, agroforestry, soil and water management.	Cotton, poultry, small ruminants, sorghum and millet, horticulture, grain legume, phaseolus beans, farming systems, post-harvest techn., agricultural engineering, pasture/forages/range management.	Coffee, pigs, rabbits, coconuts, agricultural climatology and agricultural economics.

Source: Zonal Prioritization Workshop

Appendix Table 3: DRD Scientific staff and Educational Qualifications by Zone, 1999/2000

Zonal/Institute/Centers	Number & Educational Qualification			
	Ph.D.	Masters	Bachelors	Total
DRD HQ	**6**	**17**	**4**	**27**
ADRI	**3**	**9**	**10**	**22**
Eastern Zone				
Ilonga	6	10	6	22
KATRIN	1	1	2	4
Kibaha	-	8	4	12
LRC Tanga	1	4	1	6
Mikocheni	4	10	4	18
Mlingano	3	23	4	30
TTR-Tanga	1	3	3	7
Sub-Total	**16**	**59**	24	**99**
Central Zone				
Mpwapwa	3	9	2	14
Hombolo	-	-	3	3
Makutupora	-	1	2	3
Sub-Total	**3**	**10**	**7**	**20**
Lake Zone				
Ukiriguru	2	18	8	28
Maruku (Coffee)	-	2	5	7
Sub-Total	**2**	**20**	**13**	**35**
Nothern Zone				
Selian	6	14	6	26
Lyamungu (Coffee)	3	4	4	11
West Kilimanjaro	-	1	1	2
Sub-Total	**9**	**19**	**11**	**39**
Southern Zone				
Naliendele	3	12	4	19
Sub-Total	**3**	**12**	**4**	**19**
Southern Highlands Zone				
Uyole	7	28	12	47
Kifyulilo	-	2	-	2
Iringa	-	2	2	4
Ugano (Coffee)	-	1	-	1
Sub-Total	**7**	**33**	**14**	**54**
Western Zone				
Tumbi	1	9	4	14
Sub-Total	**1**	**9**	**4**	**14**
TOTAL DRD	**53**	**197**	**98**	**348**

Source: DRD internal memos.

Description of TARP II

The following description of the main components of the Tanzania Agricultural Research Project Phase 2 (TARP II) is taken verbatim from Annex 2 of the World Bank's Project Appraisal Document (1997a).

Project Component 1 - US$2.93 million (12.8 percent)
(a) Institutional Development: The project will continue the process of institutional reform of the research establishment initiated during the first phase research project. The focus of this component would be on decentralization and zonal empowerment so that the zonal stations, which are closer to the farmers, are able to carry out mandates of the stakeholders. The specific initiatives will include: (i) redefining roles of DRT, the National Agricultural Research Council and Zonal Research Stations with emphasis on stakeholder participation; (ii) establishment of a zonal executive committee with substantial representation of research users; (iii) financial and operational empowerment of the zones; (iv) an effective arrangement for donor coordination and for coordinating regional and other collaborative research programs; (v) a phased downsizing of the research establishment; and (vi) supporting initiatives for privatizing research, as feasible. The project would finance costs of research-extension-farmer linkage activities, consultant costs for establishing information systems and improving financial management system, and incremental operating costs of zonal research management, and project monitoring and evaluation.

Project Component 2 - US$8.50 million (37 percent)
(b) Research Programs: The focus of this component would be to support research programs undertaken by the DRT, to mainstream the SUA into national agricultural research and to promote sustainable research by assisting in the establishment of the zonal research funds. The project would provide incremental non-salary operating costs for the priority research programs undertaken by the national livestock research institute, zonal research stations, and the SUA in foodcrops, livestock and factor programs (e.g. soil conservation, agro-forestry). It would meet limited costs of strengthening research infrastructure in SUA and provide support for research programs. The project would assist in establishing zonal agricultural research funds (ZARFs; pilots in a few zones initially) by providing seed capital, and continue to support the ongoing national ARF; it would help establish guidelines for operating the ARFs on a demand-driven basis. Assisted by the establishment of irrigation facilities at the research farms the project would help in breeder seed production at the zonal research stations.

Project Component 3 - US$11.55 million (50.2 percent)
(c) Resource Development and Management: The component would provide support for the development of human resource, essential research infrastructure and in improving critical support services and systems. The project would support: (i) strengthening human resource development; assistance to SUA for carrying out approved training programs; (ii) consulting services and short-term technical assistance; (iii) selective rehabilitation of research stations, equipment and infrastructure; and (iv) strengthening financial management and accounting, information and communication services, documentation and library services, and research monitoring and evaluation. The project would finance training of the DRT staff, civil works including rehabilitation of selected buildings and completion of the DRT headquarters building, vehicles and equipment, computers, infrastructure like irrigation facilities at the research farms, and costs of hard and software for the information and financial systems.

Miscellaneous NARS Funding

Appendix Table 4: Actual Government Appropriation 1995/96 - 1999/00 in Tanzania Shillings

	1995/96	1996/97	1997/98	1998/99	1999/00
Total	1,630,140,233	1,411,760,236	8,035,680,466	2,404,297,554	4,736,143,080
Recurrent	1,393,000,000	1,391,760,236	5,936,026,771	1,617,818,554	1,673,143,080
Personnel Emoluments	N/A	1,355,538,763	5,854,094,654	1,294,742,122	1,602,927,114
Operations, incl. training	N/A	36,221,473	81,932,117	323,076,432	70,215,966
Development	237,140,233	20,000,000	2,099,653,695	786,479,000	3,063,000,000
NARPL/TARP	125,000,000	20,000,000	1,886,653,695	771,479,000	3,063,000,000
GoT	50,000,000	0	213,000,000	15,000,000	0
Other	62,140,233	0	0	0	0

Source: Appropriation Accounts, Ministry of Agriculture and Food Security

Appendix Table 5: Actual Government Appropriation 1995/96 - 1999/00 in $US

	1995/96	1996/97	1997/98	1998/99	1999/00
Total	2,849,049	2,329,157	12,581,471	3,519,965	5,970,718
Recurrent	2,434,591	2,296,160	9,294,041	2,368,536	2,109,283
Personnel Emoluments	N/A	2,236,401	9,165,760	1,895,542	2,020,764
Operations, incl. training	N/A	59,759	128,281	472,994	88,519
Development	414,458	32,996	3,287,429	1,151,429	3,861,435
NARPL/TARP	218,467	32,996	2,953,935	1,129,469	3,861,435
GoT	87,387	0	333,494	21,960	0
Other	108,604	0	0	0	0
Tsh/US$	572	606	639	683	793

Source: Appropriation Accounts, Ministry of Agriculture and Food Security

Appendix Table 6: Cess Revenues

Fiscal Year	Cashew	Coffee	Cotton	Sugarcane	Barley	Tobacco	Sisal
1990/91	-	-	2,900,000	-	-	300,000	1,600,000
1991/92	-	30,000,000	29,100,000	2,000,000	-	500,000	2,200,000
1992/93	-	3,000,000	46,000,000	4,300,000	500,000	1,400,000	1,400,000
1993/94	-	30,000,000	42,600,000	8,700,000	500,000	-	800,000
1994/95	-	72,600,000	37,300,000	10,700,000	1,700,000	-	2,500,000
1995/96	89,000,000	126,000,000	-	9,600,000	900,000	-	-
1996/97	150,000,000	113,000,000	88,900,000	15,500,000	-	-	-
1997/98	335,000,000	130,000,000	155,000,000	18,900,000	-	-	-
1998/99	500,000,000	255,000,000	255,000,000	13,800,000	-	-	-
1999/00	650,000,000	155,000,000	116,900,000	41,700,000	-	-	-

Source: DRD Internal Report

Appendix Table 7: World Coffee Prices

Prices paid to growers in exporting Member countries in US cents per lb (Arabica): Tanzania

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1991	44.70	45.72	43.23	42.98	40.22	38.31	56.70	56.70	56.70	56.70	56.34	55.75
1992	55.75	55.26	50.14	44.89	43.47	43.47	51.31	49.52	49.52	49.52	49.02	48.04
1993	47.66	45.98	45.98	44.23	44.09	44.34	32.86	31.18	31.13	30.71	31.20	30.05
1994	29.17	28.63	28.72	28.64	27.99	27.46	97.09	97.55	95.57	91.84	91.89	95.14
1995	93.30	91.43	90.18	90.18	89.77	85.17	99.35	96.06	96.38	75.47	72.69	71.32
1996	62.54	66.75	64.19	63.59	60.21	56.70	63.27	68.43	69.63	63.27	63.70	62.95
1997	62.32	68.43	n/a	136.52	134.20	132.08	131.60	128.87	122.83	129.12	129.23	131.35
1998	127.38	130.87	95.97	93.95	93.96	94.08	93.32	72.12	71.96	71.49	71.29	70.95
1999	70.67	70.07	69.65	68.73	68.31	67.30	62.64	60.74	60.43	63.99	64.00	64.00
2000	63.87	63.76	63.72	63.80	63.83	63.82	46.10	46.11	46.11	45.96	45.92	n/a

Source: International Coffee Organization web pages: http://www.ico.org/asp/statschoice2.htm

Appendix Table 8: Approved NARF Projects 1993-1997

Code #	Submit	Approved	Institute	Project Title
94/018	11/7	24/8/95	Ilonga	1. Indigenous multi-purpose trees and shrubs survey in Mkata plains
94/025	16/9	27/5/97	Ilonga	2. Integrated Striga control in maize for small scale farmers in Tanzania
95/032	14/2	14/8/96	Ilonga	3. On-farm verification of newly developed components of the common cowpea inter-cropping technology
94/020	18/8	24/8/95	LRCTanga	4. Evaluation of locally available feed resources for dairy cattle in Tanga region
93/002	7/9	24/8/95	Mlingano	5. Utilisation of Roch Phosphate with FYM in Maize-Cow-Pea Cropping sequence in acid tropical soils
94/015	9/6	17/1/95	Mlingano	6. Enhancement of Phosphorus from Panda and Mijingu phosphate rocks by reaction with Pyrite.
93/003	25/9	9/3/94	Mpwapwa	7. Improvement of Ruminant Meat through introduction of fodder trees in Central Zone
95/039	7/8	27/5/97	Mpwapwa	8. Control of *Astripomoea hyoscyamoides*, a noxious weed in pastures of Central Tanzania
94/017	6/7	24/8/95	Naliendele	9. Use of *Leucaena leucocephala* and *Gliricidia sepium* to increase goat productivity in farming of Southern Zone
96/003	23/1/96	14/8/96	Naliendele	10. Effect of Sulphur dusting on soil acidification and performance of Cashew and Cashew inter-crops growing in South-eastern Tanzania
93/008	23/11	22/9/94	Selian	11. Integrated pest management (IPM) for the Control of Bean Foliage Beetle
93/010	25/11	22/9/94	Selian	12. Incorporation of Rust Resistance Genes into Common Bean
94/016	30/6	17/1/95	Selian	13. Improvement of biological nitrogen fixation of Phaseolus bean in Northern Tanzania
94/028	28/11	24/8/95	Selian	14. Investigation of problem "Y" in Northern Tanzania
95/035	4/5	27/5/97	Selian	15. Characterisation and evaluation of the potential of various crop residues to supply nutrient to crop for sustainable cropping system.
95/036	4/5	14/8/96	Selian	16. Promoting sustainable Crop-livestock systems in the highlands of Arusha and Kilimanjaro regions
95/042	25/8	14/8/96	SRI	17. Development and testing of feeding packages for improved dairy cattle under small holder farming systems in semi-arid areas of Central Tanzania
94/013	22/2/94		TTRI	18. Studies on community based control of tsetse flies using simple low cost traps
95/031	8/2	14/8/96	Uyole	19. Evaluation of indigenous finger millet cultivars collected in Tanzania