

# Impact of foreign assistance on institutional development of national agricultural research systems in sub-Saharan Africa



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ISBN 92-5-104853-3

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Impact of foreign  
assistance on  
institutional development  
of national agricultural  
research systems in  
Sub-Saharan Africa

Gora Beye

**SPECIAL PROGRAMME FOR AFRICAN AGRICULTURAL RESEARCH  
FOOD AND AGRICULTURAL ORGANIZATION OF THE UNITED NATIONS  
Rome, 2002**

**FAO  
RESEARCH  
AND  
TECHNOLOGY  
PAPER**

**10**

## FOREWORD

“The eradication of hunger and malnutrition is humankind’s oldest quest as well as its most elusive goal. Why is it that after centuries of effort there is still not enough food for everyone; and that despite the tremendous advances in our capacity to productively utilize resources, millions die each year of starvation and malnutrition?” This question asked in the foreword of the 1984 FAO/UNDP thematic study report entitled “National Agricultural Research” is still valid after three decades and was again raised at the 1996 World Food Summit. The problem of food insecurity is still pervasive for 800 million people.

Agricultural research has played a crucial role in food security and agricultural development by increasing agricultural production to meet the food needs of a rapidly growing population. The green revolution of the 1960s and 1970s can be considered a yardstick of this impact. Notwithstanding the achievements, the challenges of feeding 8.3 billion people by the year 2025, remains great. More than ever, science-based agricultural technologies, developed through agricultural research, are essential to increasing productivity while maintaining or, better, improving the sustainability of natural resources and the environment.

The agricultural research agenda must respond to these challenges. The choices made by governments and institutions now, both in developed and developing countries, will determine whether these challenges will be met. The National Agricultural Research Systems (NARS) are and will continue to be the cornerstone of the global agricultural research system. They alone can be responsible for addressing the range of productivity and sustainability issues in their own countries. Given the diverse nature of agro-ecological conditions, the location-specificity of small-scale production and the pervasive natural resource management problems, NARS must play an even larger role in the interface between the global agricultural research system and the producers.

The challenges faced by NARS in developing countries are many and in particular those related to institutional development and sustainability. Foreign assistance has played a key role in agricultural research in all developing countries and particularly in Africa. Funding in the form of loans and grants from bilateral and international donors accounted for about 34 percent of total research expenditure in sub-Saharan Africa in the early 1960s. African NARS have become increasingly reliable on foreign funding, reaching about 43 percent of their total funding in 1991.

Analysts of foreign assistance to agricultural research, particularly in Africa, are very critical of the role of foreign assistance. A flaw in external donor aid and assistance in the last two decades are noted to be high tolerance for defective institutional structures, which were supported with loan and grant funds but yielded little dividend. In particular, the interrelated issues of the size, performance and sustainability of NARS are not being addressed by African policy-makers, NARS leaders and donors.

These are issues that plague NARS of developing countries, despite more than four decades of heavy foreign investments. This constitutes the background and rationale of the present study. The Food and Agriculture Organization of the United Nations in its quest and mandate to help and better understand the developing countries’ NARS development problems, launched, in partnership with the Special Programme for African Agricultural Research (SPAAR), this global study. The transition from SPAAR to FARA was completed on 31 December 2001 when the former stopped existing. The main purpose was to investigate to what extent institutional development has been truly and properly dealt with in foreign assistance programmes and projects.

The study covered the four major developing countries’ regions: sub-Saharan Africa, West Asia and North Africa, Asia and the Pacific and Latin America and the Caribbean. More emphasis was given to sub-Saharan Africa. The findings for this region are presented in this publication.

Overall, the conclusion for the study is that the basis for institutional development is present in all countries, albeit after experiencing various periods of expansion, contraction, restructuring and downsizing. Agricultural research management has been improved at all levels (policy formulation, planning, organizing, evaluation and controlling, etc.). Adequate bodies have been established, but proper functioning of these is more uncertain. Human resources have improved in quality and quantity. Most governments have also striven to improve incentive schemes as well as a better research environment. Staff attrition is, however, still high. Strategic planning, priority setting and programme budgeting and management are routinely performed in the national agricultural research institutions (NARIs). The master-planning process has had an important and significant effect in institutionalizing priority-setting mechanisms in NARS. It has also been helpful in aligning agricultural research with national development objectives.

However, sustainable funding remains the Achilles' heel of NARS, particularly for non-staff related costs. After four decades of NARS development through expansion, restructuring and downsizing, the time has come for **consolidation**. This cannot take place without sustainable funding. Sole reliance on donor funding is not a long-term solution. Diversifying domestic sources of funding through resolute evaluation of all potential sources of funding mechanisms, could be one option. This, however, depends on African resolve, African political leadership and aggressive indigenous resource mobilization.

It is expected that recommendations made to government national policy-makers, NARS leaders and their development partners, at all levels, will have a positive impact on their continued effort to built sustainable national agricultural research institutions, capable of delivering the needed environmentally friendly technologies to eradicate hunger and malnutrition.

Isabel Fernandez-Alvarez  
Chief  
Research and Technology Development Service

Moctar Toure  
Former Executive Secretary  
Special Program for African  
Agricultural Research

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## EXECUTIVE SUMMARY

For the last four decades, agricultural production has increased considerably in developed as well as developing countries. Much progress has been made in increasing yields and production of various crops, especially cereals. In many food deficit countries food supplies have increased more rapidly than population growth. Results have been achieved thanks to the utilization of improved production technologies. Food production increase has also been the result of sustained investment in the agriculture sector, particularly in agricultural research, which took place in the 1960s and 1970s. Investment in agriculture in many developing countries is largely dependent on foreign assistance. However, since 1988 official development finance has declined and in particular from multilateral organizations. The major challenge is the downward trend in investment in agriculture in developing countries and how one will cope with providing food for a growing world population that is expected to reach 8.7 billion in 2030.

Agricultural research has played a crucial role in agricultural production through the sustained supply of improved production technologies. Investment in agricultural research has more or less followed the same trend as the agriculture sector overall. Foreign assistance has played a key role in agricultural research development in all developing countries and particularly in Africa. Funding in the form of loans and grants from international donors accounted for approximately 34 percent of total research expenditure in sub-Saharan Africa in the early 1960s. African NARS have increasingly relied on foreign funding, reaching about 43 percent of their total funding in 1991. Despite these huge investments, NARS are still plagued by many deficiencies, in particular as regards institutional development. However, the challenge ahead for agricultural research is immense and without continued investment in agricultural research there may be little impact on reducing food insecurity and poverty levels. In 2020 a total of 205 million children may be malnourished.

The many issues that plague NARS of developing countries, in particular those of sub-Saharan Africa, despite more than four decades of investments in particular from foreign assistance, constitute the background and rationale of this study. The objective was to investigate to what extent institutional development has been truly dealt with properly in foreign assistance programmes/projects. A set of indicators was chosen against which the impact of donor assistance on institutional development of NARS was measured.

All governments of the selected seven countries in sub-Saharan Africa, have defined their agricultural policies and, accordingly, their agricultural research policies.

Agricultural research started in sub-Saharan Africa as botanical gardens until the First World War. After the First World War and the need for more exotic raw materials for the fledgling industries of the colonial powers more formalized and structured research was needed and each colonial power organized it with its own particularities although with some similarities. The colonial powers, France and the United Kingdom, alike, adopted a similar approach of creating regional research entities catering for several territories. They soon realized that it was more cost-effective to run these research facilities at federal level.

The historical development of NARS in the seven countries indicates a marked difference between French- and English-speaking countries. The exception is Mali that created its national institute IER immediately after independence. All the three earlier French colonies (Cameroon, Madagascar and Senegal) created their national institutes almost a decade after independence. However, in the aftermath of independence, they all signed bilateral agreements with France whereby the French tropical research institutes established just after World War 2, were given full responsibility for the management and execution of the research programmes, with co-financing between France and each country almost on a par. However, apex policy formulation bodies came into being before the national institutions.



The English-speaking countries took responsibility for the research structures in their territories, although for a while the colonial power under fledgling federal institutions tried to maintain some inter-country organizations that nearly all collapsed a few years after. The most radical change happened in Ghana, where they began to reorganize the inherited research infrastructure, both those locally administered and those transferred from the federal institutions that had been disbanded.

Overall, in each of the selected countries a more or less diversified NARS exists. All NARS are dominated by a NARI/NARO that accounts for at least 60 to 70 percent of all resources. The NARI/NARO is always a public organization, funded from public funds. They have inherited important research facilities from the colonial period, but are generally too large for their national needs. They have always tried to use the facilities, but with limited resources. This has caused a serious run-down of research infrastructure and major need for maintenance. The cost for rehabilitation has, however, exceeded possible national financial sources. A lot of research infrastructure has therefore been abandoned as part of a downsizing of operations of NARIs/NAROs. In all countries human resources have increased fairly well in terms of quantity as well as quality, but the inadequacy of the research environment has created a high degree of instability in most NARS. Financial resources remain an Achilles' heel, because operational funds have not increased at the same rate as the human resource build up. Expenditures per scientist have been and are often inadequate for most NARS. The level of full time employment is often less than 50 percent.

Overall, NARS have had a positive impact, despite some weaknesses, on the production systems of these countries. Over time, they have also benefited hugely from foreign assistance.

The analysis and assessment of foreign assistance provided to seven selected countries in a total of 36 projects allow for the following conclusions:

- since their independence at the end of the 1950s and early 1960s the government authorities have taken steps to organize the inherited research infrastructure into National Agricultural Research Systems, through two phases. An expansion phase from 1960 to 1985 and the downsizing and restructuring phase afterwards corresponding to the cycle of structural adjustment programmes in these countries and economic crises. Unfortunately, no NARS has started to evaluate its research needs and tailored the inherited facilities and infrastructure to these needs. On the contrary with donor support, most of them expanded their NARS beyond real needs and budgetary capacity;
- institutional development is a long-term process and actors involved should place their action into this perspective. Continuity in strong national leadership with a clear vision for the institutional capacity-building process is essential to its success;
- institutional development is not an end in itself, its purpose is to build the capacity to effectively and efficiently execute what is of highest priority in relation to national policies and farmers' needs, and respond dynamically to changing internal and external environments. Therefore, it is a must for governments to develop, with proper priority setting, within a long-term strategic plan, its priority research programmes for their NARS/NARIs to execute, however, institutional long-term strategic planning is meaningless if resources to permit implementation cannot be assured;
- all resources, national and foreign alike, should be geared towards the execution of the priority programmes of the strategic plan as indicated above. The setting up of a consultative group for agricultural research or alike with all donors interested in supporting agricultural research, is a positive move in the direction of coordinating donor intervention for the implementation of priority programmes and could lead in the long run to the Consolidated Funding Mechanism put forward by SPAAR within the Framework For Actions (FFAs) in 1990. Unfortunately, a recent evaluation of the implementation of the principles of the FFAs concluded that the least implemented principle was the sustainable financing that encompassed the CFM; donors are still very reluctant to move to programme financing and CFM, they are still attached to enclave projects. The use of an integrated sector approach to research where all research operating costs are considered as a capital good, a development expenditure with long-term results, as opposed to short-term, and the introduction of time-bound contractual

arrangements for research funding, based on accountability for research relevance, is acceptable to research managers, but requires a long-term commitment from donors and government;

- the responsibility for financing agricultural research by government and full ownership should be clearly stated at the onset and funding assured based on this; progress towards financial self-sufficiency/sustainability is a *sine qua non* for institutional capacity-building;
- transparency and accountability should be the rule of thumb to gain confidence of all partners and clear mechanisms of independent evaluation for NARS/NARI development;
- decentralization of research is essential for its development, as it facilitates more relevance and responsiveness of research programmes to the needs of the stakeholders who can participate in the decision-making process of programme formulation and evaluation. However, mechanisms must be in place, which allow them to effectively have an impact on priority setting, activity design, and implementation and evaluation processes of the research institutions. All NARS have responded positively to this demand. However, this need of decentralization of activities nearer to the users should not result in overextending the research implementations and facilities beyond the capacities of the institution to operate and maintain properly;
- the development of well-trained researchers takes times and is costly; therefore, a long implementation period is appropriate for human resources development and institutional development type assistance. However, without an innovative and sustained effort to retain them through salaries, incentives and a proper work environment, massive training of well-qualified scientists can have a detrimental effect on the whole NARS that might become a training ground for other sectors of the economy or of the world market. It is reported that former NARS researchers from the selected countries today may be found in professional and management positions throughout Africa and in international organizations throughout the world. Donors, NGOs and private sector agencies looking for particular skills and appreciating the professional capabilities provided by the various training opportunities frequently seek their expertise;
- the linkages within NARS have improved in all NARS. However, an imbalance among institutions and component parts of NARS exists. The relation between the constituent parts of NARS has not improved much and academic institutions still receive little attention from governments as well as donors. This is unfortunate given the potential for higher educational institutions to contribute to agricultural research. Some innovative initiatives such as the Agricultural Research Fund, in Kenya, can contribute to boost their involvement in applied research programmes. However, for the sake of developing pluralistic NARS, weakening NARI/NARO predominance through the creation of artificial structures, should be avoided. The pluralism of NARS is better obtained by involving all its components in the strategic planning exercises and allocating activities and resources based on comparative advantages of each of them. As regards the linkages with the outside world, they have also been enhanced, in particular with IARCs and regional research organizations. For the latter, they are given much attention nowadays as the panacea for strengthening NARS. However, “*whether the proliferation of initiatives and agencies to coordinate the funding and, in some instances, whether the conduct of African agricultural research has had any substantive impact or has it merely served to increase bureaucratic overheads, is an open question*” and “*there may be few, if any, compelling reasons for countries and even bilateral donor organizations, who reflect the various priorities of their own governments, to subjugate, perhaps, some national interest for regional ones.*” (Roseboom et. al, 1997). One lesson of the SPAAR report cited above is that additional consideration needs to be given to the realities of collaborative regional research. NARS management, while appreciating the potential benefits of such activity, is conscious of the necessity to create stable, well-funded and self-confident national

systems as a first priority, and to avoid the dissipation of scarce national capacity and funding. The regional research agenda therefore needs to be very carefully identified and relative comparative advantages fully exploited to mutual advantage;

- overall, according to the criteria of analysis of institutional development against which this study is made, it can be concluded that for all countries, a sound basis for institutional development has been in place, after a series of expansion and restructuring and downsizing phases. Agricultural research management has been improved in all its processes (policy formulation, planning, organizing, evaluation and controlling, etc.). The adequate bodies have been established, although not all functioning properly. The human resource base has been developed in quality and quantity and most governments have striven to grant scientists with incentive schemes of service and to improve the research environment. This effort must, however continue, as staff attrition is still high. Strategic planning, priority setting and programme budgeting and management, are routinely performed in NARS research institutions. A 1995 SPAAR report on lessons learnt from the implementation of the Frameworks for Actions (FFAs), concludes that the master planning process “*has had an important and significant effect in institutionalizing priority-setting mechanisms in NARS and in aligning agricultural research with national development objectives. The process has had a marked value in capacity building for planning in NARS*”. Despite the progress noted, the institutions of the various NARS remain fragile institutionally and the Achilles’ heel is the funding, particularly of operating costs. The SPAAR report mentioned above came to the same conclusion “a universal and recurring problem is the shortage of operational funding. This persists despite the serious attempts by management to reduce staff levels and research sites to meet the requirements of the priorities and agenda.”;
- after four decades of NARS development through expansion, restructuring and downsizing, the time has come to *consolidation* or *decompression* (Eicher, 1998). Reliance on donor funding has proved not to be the solution although, it is still needed as some times, one solution might be to diversify domestic sources of funding through the resolute evaluation of all potential sources of funding mechanisms, as already recommended by the FAO/SPAAR/KARI expert consultation in 1993 on funding agricultural research in sub-Saharan Africa. It also requires African resolve, African political leadership and aggressive indigenous resource mobilization.

## ACKNOWLEDGEMENT

This study was carried out based on the principles of partnership and collaboration with all stakeholders.

Financially it was supported by FAO's Regular Programme, the Special Programme for African Agricultural Research (SPAAR) and the International Development Research Centre (IDRC), West and Central Africa Office, Dakar. The substantial contributions of SPAAR and IDRC were targeted specifically for sub-Saharan Africa and the latter for the preparation of the case studies of the western and central African participating countries (Cameroon, Ghana, Mali and Senegal).

Field data were collected and country case studies were prepared by national consultants identified with the assistance of the NARS leaders concerned. Those who carried out the painstaking work were: Drs J. Nya Ngatchou; R.G.J. Butler; R.S. Musangi; C.P. Ravohitrarivo; B.H. Dzowela; M.F. Traoré and M. Fall, respectively for Cameroon, Ghana, Kenya, Madagascar, Malawi, Mali and Senegal.

Besides its financial contribution, the SPAAR secretariat devoted a lot of time and effort to the provision of World Bank project documents and other valuable literature. Drs Moctar Touré and Mohamood Abdi Noor of SPAAR, who made positive comments on the first draft of this publication, deserve our appreciation.

It goes without saying that all the staff of the Research and Technology Development Service (SDRR) of the FAO Sustainable Development Department heartily supported this study in many ways. It is only right to single out the constant effort, interest and concern of Dr Isabel Alvarez-Fernandez, Chief, SDRR, as well as the most appreciated editing and formatting work performed on the first draft and second draft by Dr Colin Murphy, SDRR, Visiting Scientist, and Dr H.K Mwandemere, SDRR, respectively. Special thanks to Adrianna Gabrielli, FAO, for undertaking the final editing

While gratefully acknowledging the contribution and collaboration mentioned above, the author takes full responsibility for the content of the publication.

# CHAPTER I. BACKGROUND AND METHODOLOGY

## 1.1 Background

### 1.1.1 Agricultural productivity and development

Agriculture forms the mainstay of the economy in most developing countries. In 1997 it contributed on average to 40 percent of the Gross Domestic Production (GDP) and more than 60 percent to foreign exchange earnings in 1997. Agriculture provides the main livelihood, generating income and employment for the vast majority of people in developing countries. It also provides vital raw materials for national or international industry.

Agricultural production has increased significantly both in developed and in developing countries over the last three to four decades. Major progress in yields of cereals and other crops, increase in livestock and farmed fish has contributed to an 80 percent increase in global food outputs since the mid-1960s. Cereal yields, total cereal production and total food production doubled between 1960 and 1985. Production of important crops has also improved in many food deficit countries. Some net food importing countries have even become net exporting countries in less than two decades.

Overall, food supply has increased faster than population growth. Good results have largely been achieved through improved agricultural technologies. Adoption of high-yielding varieties has had a significant impact. Irrigation and use of fertilizers together with better resource management and a more appropriate agricultural policy have also been major contributors.

Some key developments globally and in sub-Saharan Africa have been:

- output of cereals per inhabitant increased 11 percent per year from 1970 to 1985 (305 to 342 kg);
- a steady annual increase in the production of major crops like paddy rice, wheat and maize between 1963 and 1983, which slowed down in the 1990s;
- annual yield increases per hectare for paddy rice, wheat and maize was also fairly high during the 1960s, 1970s and 1980s, but dropped in the 1990s;
- globally the most worrying sign is that the annual yield increase for staple crops is down to one percent;
- Africa is not able to achieve more than 42, 29 and 48 percent of the global average yields for paddy rice, wheat and maize, respectively;
- Africa has, however, shown higher production increases for rice and wheat than the global average for developing countries;
- Africa have shown higher production increases of sorghums and millets (1990-2002) than the global average;
- African farmers had approximately the same yield per hectare as the global developing country average (1963-1983);
- African farmers have not been able to increase productivity during the last few years compared with other developing regions.
- 

Although the global picture of agricultural development shows significant progress and potential, it has and will probably be unevenly distributed for a foreseeable future. Without the green revolution a far greater proportion of the world population would today be food insecure. The benefits of the green revolution have, however, not reached farmers in sub-Saharan Africa as in other continents. Progress has been much slower in resource poor environments, even if new varieties have also been widely adopted. Despite success stories the prospects in sub-Saharan Africa are therefore much grimmer.

There are many reasons why Africa and other continents are not experiencing growth in yields. A significant and recognized yield gap exists between proven technologies in experimental plots and farmers' fields. At the International Crop Research Institute for Semi-Arid Tropics (ICRISAT) in India, research scientists have been able to obtain 6 tonnes/ha per year of sorghum/maize plus pulse (chickpea/pigeon pea) in a double cropping system on vertisols. Traditional single-crop systems in the area typically yield only about 0.6 tonnes/ha of sorghum or 1.2 tonnes/ha of chickpea.

Similar yield gaps have been recorded in Latin America and especially in Africa. This occurs even if growing conditions between experimental plots and farmers' fields are almost identical. This shows that, not only access to inputs enhance yields, but also improvement in management skills. A major challenge is to find mechanisms that allow farmers to narrow yield gaps.

Increase in food production has come from sustained investment in the agriculture sector in the 1960s and 1970s. Although accurate figures are not always available, FAO data indicate that total net on-farm investment stood at US\$26 billion per year between 1987 and 1992. Most of this has come through private investment. To this must be added public funding for research and extension estimated at US\$10 billion per year (World Bank estimates). The investment in primary agriculture and public support in developing countries has, however, been fairly modest in comparison.

Investment in agriculture in many developing countries is largely dependent on foreign assistance. Decline in external agricultural assistance is largely attributed to a marked decrease in assistance from multilateral organizations. The contribution from multilateral contributions to total development assistance decreased from 13 to 8 percent between 1980 and 1990. World Bank lending to agriculture as a share of total lending alone fell from 30 percent in the 1970s to 16 percent in the 1990s. Bilateral organizations' share has been around 7 percent for most of the 1980s, but dropped to a low 6 percent in 1989.

The world food supply has more than tripled during the past four decades (1950-1990), but the green revolution-increased production has not solved the problem of chronic undernutrition for hundreds of millions of poverty-stricken people around the world. Dwindling of external assistance to agricultural development has exacerbated the situation. According to recent estimates, by the year 2030 world population will rise from 5.7 billion (1995) to 8.7 billion. As population grows, per caput availability of arable land will decrease further, heightening the need to intensify agricultural production and putting greater demands on land. If no action is taken to reverse the present trend, the number of chronically-undernourished will still be some 730 million by the year 2010 and not 420 million by 2015 as committed by the World Food Summit in 1996.

#### 1.1.2 The challenges for agricultural research

Agricultural research holds a vital key to improving food security, reducing poverty and sustaining broad-based economic development. The importance of agricultural research is greater now than ever, in particular in developing countries where food insecurity is widespread. Without continued investment in agricultural research, there may be little impact on reducing food insecurity and poverty. Agricultural research addresses poverty by:

- a) increasing productivity and income in rural areas where 83 percent of the world's poorest people live;
- b) reducing food prices for all.

By 2020, two-third of the population of developing countries will live in urban areas and their living standard will be greatly influenced by availability and price of food and other agricultural products (Alex, G. 1996).

The agricultural research agenda must respond to these challenges. The choices made by governments and institutions now, both in developed and developing countries, will determine whether one will be able to rise to this challenge. The National Agricultural Research Systems

(NARS) are and will continue to be the cornerstone of the global agricultural research system. They alone can be responsible for addressing the range of productivity and sustainability issues in their own countries. Given the diverse nature of agro-ecological conditions, the location-specificity of small-scale production and the pervasive natural resource management problems, NARS must play an even larger role in the interface between the global agricultural research system and the producers.

The success of the global agricultural research system in responding to global challenges depends on a strong national research capacity to do productive research, complemented by effective technology transfer mechanisms. Strong partnership among NARS, between them and the regional and international research institutes, particularly those of the CGIAR, constitute the second condition for increasing the efficiency of the global research system (FAO, 1996).

The challenges faced by NARS are many. Taking into account past investment levels it is important to study and analyse the impact of foreign assistance on the institutional development of NARS.

### 1.1.3 Development of funding for agricultural research

Investment in agricultural research has more or less followed the same trend as investment in the agriculture sector. In the 1980s public agricultural research funding amounted annually to US\$4.4 and US\$4.8 billion in developed and developing countries, respectively. This represented a 260 percent increase (Anderson, Pardey and Roseboom, 1997). From 1965 to 1985 funding for agricultural research in less developed countries grew in real terms (constant 1980 dollars) from US\$1.1 billion to US\$3.6 billion. However, in terms of expenditure per researcher, levels fell by 16 percent.

Since 1985, there have been severe cuts in allocation to agricultural research due to decreases in national budgets. Countries have had to adopt fiscal austerity measures that have affected public spending. Fewer resources have meant downsizing institutions. This has had a detrimental effect on the amount of research it has been possible to carry out. Investment in the agricultural research sector slowed in the late 1980s and remained stagnant in the 1990s (Roseboom and Pardey, 1995).

Africa was no exception in this respect. Public spending stagnated in the 1980s and the 1990s at about US\$970 million per year, slightly higher than the level reached in 1981 (Pardey, Alston, and Roseboom, 1998). This contrasts with the situation in the 1960s and 1970s when public funding almost trebled to US\$1 billion. During the 1970s and 1980s, Africa's share of total expenditure on agricultural research in developing countries, slipped from 9.6 percent in 1971 to 6 percent in 1995. Agricultural research as a percentage of agricultural GDP declined from a peak in 1981 of 0.93 percent to 0.69 percent in 1991. By contrast, public spending in industrial countries on agricultural research amounted to about 2.4 percent of agricultural GDP in 1991.

Foreign assistance has played a key role in agricultural research in all developing countries and particularly in Africa. Funding in the form of loans and grants from international donors accounted for about 34 percent of total research expenditure in sub-Saharan Africa in the early 1960s. African NARS have increasingly come to rely on foreign funding, reaching about 43 percent of their total funding in 1991 (FAO, 1995). Funding directed to NARS does not include funding of the Consultative Group on International Agricultural Research (CGIAR) through its network of International Agricultural Research Centres (IARCs). This stood at US\$270 million in 1996.

Financial support to agricultural research from two major international actors (the World Bank and USAID) mitigates this trend. World Bank lending to the agriculture sector increased in the 1980s, but was reduced in the 1990s. Commitments to agricultural research and extension have been increasing since mid-1960. As a proportion of sectoral lending, it rose from 7.5 to 12 percent from 1977 to 1992 and increased further until the end of the fiscal year 1996. During the period 1989-1992, the annual commitment to research was equivalent to US\$200 million. Within this total commitment to research, 61 percent was in the form of freestanding projects. The proportion allocated to research

institutes has shown an upward trend, reflecting the Bank’s increasing emphasis on helping countries develop the overall institutional capacity of their NARS.

As regards USAID a recent review (Alex, G., 1996) indicated that USAID support for NARS declined by 73 percent (including universities) in 1994-1996. The decline in support for research was also reflected in reduced support to the IARCs. Decrease in support to NARS naturally constrains their research productivity especially after intensive investments in institution building in the preceding decade. The downward trend reflects the widespread notion of “donor fatigue” and missed opportunity to follow-up on earlier investments in capacity building.

The role of foreign assistance has been and is still a prominent factor in the development of NARS in developing countries.

#### 1.1.4 Impact of foreign assistance on agricultural research

Research might be considered to produce two kinds of technology: production technology and research development (R&D) technology (Horton, 1998). The corresponding impacts might respectively be called production impact and institutional impact.

Production technology refers broadly to all methods which end-users use to cultivate, harvest, store, process, handle, transport and prepare food crops, livestock, etc., for consumption. R&D technology refers to the organizational strategies and methods used by research and extension programmes in their work.

Production impact refers to the physical, social and economic effects of new technology on crops and livestock production, distribution and use and on social welfare in general. Institutional impact refers to the effects of the R&D technology on the capacity of research and extension to generate and disseminate new production technology.

##### 1.1.4.1 Impact on production

There is ample and well-documented scientific evidence on the impact of research investment on production. Rates of return to investment in agricultural research have been impressive and are estimated to range from 20 to 190 in developing countries (Evenson, 1993). Specifically for sub-Saharan Africa a 1995 SPAAR study (SPAAR, 1995) reports in a synthesis of 27 case studies, that quantified rates of return to African agricultural technology development were similar in magnitude to those found in other parts of the developing world. Some examples from West Africa are provided in Table 1 (from Coulibaly, Adesina, Folaang, Endamana, and Ndango).

<b>Author</b>	<b>Year</b>	<b>Country</b>	<b>Technology</b>	<b>Rate of Returns (percent)</b>
Schwartz et al.	1992	Senegal	Cowpea	31-92
Sterns and B.	1992	Cameroon	Cowpea	3
Boughton	1992	Mali	Maize	136
Coulibaly et al.	1998	Benin	Biocontrol (cassava)	100
Coulibaly et al.	1998	Nigeria	Biocontrol	112
Coulibaly et al.	1998	Ghana	Biocontrol	104

Table 1. Recent estimated rates of return to technologies in sub-Saharan Africa (WEST AFRICA)



#### 1.1.4.2 Institutional impact

In contrast, records on institutional development impact of agricultural research are limited, particularly as regards foreign assistance. The importance of institutional issues is, however, reflected in the operational guidelines of different agencies (Brinkerhoff, 1994). In USAID, institutional development (ID) has long been a pillar in the agency's development policy. Institutional analysis (IA) is at the same time a component of USAID programmes. There is also often a gap between espoused ID policy and what has actually been done in the name of ID (Brinkerhoff, 1994). Some also attribute scarcity of institutional impact studies to lack of indicators for carrying out assessment (Nickel, 1996). There is also reference to definitional, attribution and temporal problems, which explain why foreign aid donors as a rule are reluctant to review and appraise their institutional ventures (Goldsmith, 1993).

Analysts of foreign assistance to agricultural research, particularly in Africa, are very critical of the role of foreign assistance. A flaw in external donor aid and assistance in the last two decades is noted to be of high tolerance for defective institutional structures, which were supported with loan and grant funds but yielded little dividend (Idachaba, 1991). The view is that many external donors have:

*“massively funded fatally defective institutional structures on the faulty assumption that these institutions would be reorganized, revitalized, revamped, etc. Many years and many million dollars of donor funding later, African countries are still saddled with defective institutional arrangements that have continued to hamper the growth of institutional capacity in agricultural research”* (Idachaba, 1991).

Others hold the view that the interrelated issues of the size, performance and sustainability of NARS are not being addressed by African policy-makers, NARS leaders and donors (Eicher, 1990). The view is put forward (Eicher, 1990) that:

*“Today, most NARS do not have the institutional, managerial and financial capacity to absorb current levels of project aid “with integrity” and to sustain the project activities after foreign aid is phased out. The present donor-financed project-by-project and country-by-country approach to building African scientific capacity is seriously flawed.”*

Eicher goes on, and concludes:

*“The challenge for donors in the 1990s is to move beyond the resource transfer model of financing the construction of buildings and purchasing equipment and vehicles for NARS and pursue a human capacity-institutional building model that is geared to the specific needs of the African nations at this stage of their development”* (Eicher, 1990).

Many donors have not realized that research capacity in a country is not a simple sum of well-trained researchers, adequate buildings, and well-equipped laboratories. These are means not ends. The research capacity in a country depends upon how well these means can be made to function and fulfil the mandate of providing farmers with tools (improved practices and technology) that can lead to increased food production, and whether the political, economic and social environments (at national and local levels) allow these means to become effective (Murphy, 1983).

These are issues that plague NARS of developing countries, despite more than four decades of heavy foreign investments. This constitutes the background and rationale of the present study: to investigate to what extent institutional development has been truly and properly dealt with in foreign assistance programmes and projects.

## 1.2 Objectives

Building agricultural research capacity implies developing the capacity to design rules for organizations that will facilitate activities of people in organizing, supporting, conducting and

monitoring agricultural research (Idachaba, 1991). Among the elements, which constitute institutional capacity the following can be singled out;

- the set of institutions or organizations within which people are expected to perform, as scientific researchers, academic entrepreneurs, research administrators or political entrepreneurs; and
- research management capacity within NARS, the components of which include the capacity to articulate medium- and long-term research plans and strategies for 10 to 15 years to serve as a frame for priority research programmes and projects; identify appropriate research instruments for realizing research objectives; transform human, physical and financial resources of research institutions into research outputs and practical technologies; mount and execute research agenda to accelerate sustainable agricultural production consistent with minimum environmental degradation; and monitor and evaluate all the agricultural research system. Research management capacity development is at two levels: macro, at the national level, and micro at the institutional level. Each level has its specific functions and needs.

An FAO and UNDP review of some 790 projects (FAO/UNDP, 1984) on support to strengthening national agricultural research during the period 1970-1981 came to the following conclusions on institutional development:

- planning of agricultural research was most effective when control lay with one ministry; coordination had little success when responsibility for research was dispersed;
- few countries had well-articulated short- and medium-term research plans. Hence individual research proposals were rarely subjected to formal scrutiny;
- the planning mechanism was most effective when there was a strong linkage between an apex policy body and the institutions responsible for programming of research;
- a major problem in research planning was posed by the lack of balance between recurrent expenditures and funds spent on investment and staff salaries;
- frequent reorganizations of national agricultural research structures were common but their deleterious effects appear to have out-weighed the benefits they created.

These deficiencies in institutional development have not improved after two decades of continued assistance as the current constraints of NARS listed below show.

What are the present constraints that most NARS of developing countries face in the process of their institutional development? Constraints analyses are quite abundant and in general there is some sort of consensus on the following, presented according to their seriousness:

- poor research management: the lack of managerial skills and leadership is widespread, and permeates all levels of institutional development; the reasons are numerous (Arnon, 1968) and most have been identified and programmes mounted to address them (FAO, 1997);
- institutional instability: this is a characteristic of NARS in developing countries, particularly in sub-Saharan Africa, where, instead of a thorough analysis of institutional inefficiency and ineffectiveness, the easy way of institutional reform, that delays a sound solution, is always chosen, very often on the advice of a donor;
- human resources instability: staffing instability plagues most NARS at the managerial as well as researcher levels, and the turn over rate in many NARS in sub-Saharan Africa reaches 10 percent. Reasons include: poor management, unattractive conditions of service, lack of job satisfaction, lack of funding, political intervention, etc.;
- inadequate funding: NARS in developing countries face a pervasive shortage of resources, particularly of operating budgets. Real expenditures per researcher declined considerably in the 1980s in all developing regions. Research intensity is currently at about 0.5 percent or less in developing countries;
- funding instability. NARS managers would be able to cope with limited resources disbursed in a timely manner, but in addition to the inadequacy of the amounts, they are disbursed in an erratic manner and rarely at the approbation level;

- research programme instability: as a result of the constraints mentioned above, and a lack of proper planning and priority setting, coupled with frequent changes of leadership, research programming is characterized by a high degree of instability;
- limited relevance of research to the development needs: deficiency in priority setting, lack of proper linkages with end-users and extension, and weak networks of out-stations and on-farm experiments, all lead inevitably to limited relevance of research activities and results;
- defective linkages with the World Knowledge System: insufficient linkages within NARS themselves (universities, private sector, non-governmental organizations, etc.) and with outside partners such as IARCs, regional institutions, and advanced research institutions in developed countries, etc.; reduce markedly the effectiveness and efficiency of a research organization. This situation occurs quite often in developing countries, and in particular, in Africa;
- weak monitoring and evaluation of research. Lack of monitoring and evaluation functions in most developing country NARS, a situation that generally leads to routine and poor quality work.

The current situation of NARS of most developing countries as described above and generally accepted, is in stark contrast with that which ought to be strong and sustainable. According to TAC (1997) *“a strong research system is one that has the sustained capability to effectively and efficiently execute that it is of highest priority in relation to national policies and farmer’s needs, and respond dynamically to changing internal and external information.”*

Given the sustained effort of government and donors for more than four decades, something went wrong. It has been demonstrated that research has had a positive impact on production technologies that have been developed and that have given high rates of return. However, most NARS are institutionally fragile. After more than 40 years of heavy investment they are not yet mature.

The objective of this study is to analyse the impact of foreign assistance on the institutional development of NARS in developing countries. To what extent have donors really taken into account the institutional development dimension in their assistance?

### **1.3 Methodology**

The countries were chosen based on pre-set requirements. The study is based on analysis of 36 projects in seven sub-Saharan countries. The case studies of selected countries were prepared using the following criteria for the country selection:

- importance of the agriculture sector in the economy;
- performance of the agriculture sector;
- government support for the agriculture sector;
- foreign assistance support to the agriculture sector;
- national and foreign assistance support to agricultural research;
- growth and development of NARS;
- performance of the agricultural research system; and
- political stability.

A sample of 16 selected countries considered appropriate with the following regional distribution:

<b>Continent</b>	<b>Country</b>
Sub-Saharan Africa	Cameroon, Ghana, Kenya, Malawi, Mali, Madagascar, Senegal (7)
West Asia, North Africa	Egypt, Morocco, Pakistan (3)
Asia and the Pacific	India, Malaysia, Philippines (3)
Latin America	Bolivia and Colombia (2)
Caribbean	Guyana

Table 2. Selected countries for case studies

For each of the selected countries, one well-experienced research scientist/manager was chosen in cooperation with the relevant NARS leaders. Each was granted an author's contract to prepare a national case study from a sample of key foreign assistance projects in the past 30 years. The recommendation was to select five to ten projects with clear stated institutional development objectives. A detailed guideline shown in Annex 4 was provided to each author for the preparation of each case. Each author was expected to collect data and information on the sample projects; analyse and interpret the collected data and information; and report on the findings and results. It was suggested that a sample of five to ten projects be selected for each country. Unfortunately none of the authors was able to comply with this suggestion. The size of the sample therefore varies from one country to another. Overall 36 projects were selected and analysed.

### 1.3.1 Key issues

A certain number of key issues have been selected for the study. The key issues do not cover all aspects, but point to key elements which NARS, both in the north and south, has dealt with in order to form a sound institutional framework within which research can take place. A major part of the study is devoted to looking at how donor assistance has had an impact on or influenced the following key issues/indicators:

- formulation of agricultural research policy and strategy;
- research planning, priority setting and resources allocation;
- development or improvement of organizational structure and management systems;
- human resources development and policy;
- establishment or strengthening of physical and/or technical facilities;
- adequacy and stability of budgets, including operating/recurrent funds;
- linkages with the World Knowledge System;
- research performance, effectiveness and efficiency;
- sustainability; and
- monitoring and evaluation systems.
- 

### 1.3.2 Donor assessments

In the second part of the study, key donors that have been supportive of investment in agricultural research would have been asked:

- (i) to make their own assessment of the impact of their assistance on the institutional development of NARS;
- (ii) to provide a statement on their present and future strategies for investment in agricultural research.

The approach to be adopted was to be determined after identification and consultation with donors, during the process of the study, either locally in the selected countries or from the donor head agencies.

In terms of leadership of the study, a team leader was to be contracted on a part-time basis for supervision of the study and for dialogue with the authors of the national case studies and donors. She/he was to analyse draft case studies, look for complementary documentation, and crosscheck data with donor countries and institutions to ensure accuracy of information. Finally, she/he was given responsibility for preparing the final draft report with the major conclusions and recommendations.

A steering committee, composed of FAO and SPAAR and other interested partner representatives was vested with the responsibility for overall supervision of the exercise, to review drafts and endorse conclusions and recommendations.

This approach could, however, not be completely adhered to due to resources limitations. The team leader was not recruited and hence responsibility was assumed partly by an FAO senior officer. Despite thorough guidelines for the case authors, none of them complied with their Terms of Reference.

It is recognized that more adequate briefings were needed. There should also have been detailed explanation of guidelines and report format. Duration and cost of the study was also underestimated. The donor assessment part of the study will be made separately. The Steering Committee met once and has never been completed with interested partners such as IDRC, which contributed funding. Due to the delay in completing the study it has been decided to report regionwise starting with sub-Saharan Africa.

#### 1.3.3 Expected outputs

Using the criteria outlined above the study should provide the following results:

- concrete indications of real commitment of government and donors to agricultural research institutional development in the selected countries;
- reasons for successes or failures of donor assistance impact on institutional development of agricultural research;
- mechanisms for improving capacity building of NARS through better use of foreign assistance;
- insight on the current and future strategies of some major donors for assistance to agricultural research and particularly as regards institutional development.

#### 1.3.4 Conclusions and recommendations

- a) **recipient countries** (policy-makers, NARS governance, research managers/leaders)
- b) **donors** (donor policy-makers, assistance planners/programme formulation; donor assistance implementation and monitoring, etc.).

## CHAPTER 2. NATIONAL AGRICULTURAL RESEARCH SYSTEM (NARS)

### 2.1 Agriculture sector

The seven countries selected in sub-Saharan Africa were Cameroon, Ghana, Kenya, Madagascar, Malawi, Mali and Senegal. Their populations range from 9 million in Senegal to 29 million in Kenya. All countries have a high proportion of people living in rural areas. The growth of cities exceeds population growth rate in rural areas in all countries. Cities are growing especially fast in Ghana, Kenya and Malawi.

Gross National Product is over three times as high in Kenya (US\$10.6 billion) as in Malawi and Senegal (US\$2.6 billion). Kenya has, however, a much lower GNP growth rate than the other countries. Agriculture contributes heavily towards Gross Domestic Product (GDP). Mali with 46 percent is on top and Senegal at the low end with 19 percent. The average for the sample countries is 34 percent. Agriculture naturally represents the main source of employment for rural inhabitants with figures ranging from 86 percent in Malawi to 60 percent in Ghana and Senegal. An economic and social overview of the countries is provided in the tables in Annex 1.

Overseas development assistance (ODA) contributes heavily to the agriculture sector. ODA is falling, but not as dramatically as in the mid-1980s and early 1990s. The countries received on average US\$78.6 million per year in the period 1996-1991 (OECD figures). Ghana, Senegal and Kenya received most with Mali, Malawi, Cameroon and Madagascar receiving less. Assistance to the agriculture sector represented roughly 16 percent of the total ODA to these countries. In francophone countries, France remained the major donor with the United Kingdom, Canada and the World Bank having a preference for the anglophone countries. The European Union and individual European countries also provide considerable financial assistance to the agriculture sector. Data for national support to the agriculture sector is unfortunately scant and not available for all countries. Based on OECD data national financial support show the following picture:

Came- roon	Ghana	Kenya	Madagascar	Malawi	Mali	Senegal
3.2	3.3	7.1	11.3	11.3	1.9	n.a

*Table 3. Government expenditures in agriculture as a percentage of total expenditures in 1990*

The Governments of Malawi and Madagascar spent the most on agriculture and the Government of Mali spent the least. The average government expenditure in 1990 for agriculture for sub-Saharan Africa was 6.3 percent.

All countries have been subjected to structural adjustment programmes. For the agriculture sector this has meant introduction of policies to liberalize provision and marketing of inputs and outputs, limit state intervention and promote private investments. Emphasis has also been on increasing the productivity of land and labour, export diversification and import substitution to improve balance of payments as well as improving natural resource management for sustainable development. The structure adjustment programme strategies have been geared at:

- (i) creating a free market system as a means of improving producer incentives;
- (ii) withdrawal of government services from activities better performed by others, whether small farms (e.g. seed production) or commercial companies (e.g. input supply); and
- (iii) concentrating government financial and management resources on essential government services (research and extension) and the rehabilitation and maintenance of rural roads and irrigation networks.

Governments in the sample countries, as well as in sub-Saharan Africa overall, have realized that agricultural research is crucial for the achievement of important development goals. Subsequently agricultural research policies have been developed to match these development aspirations.

## **2.2 Research policies for the agriculture sector**

There are major similarities in agricultural research policies among the selected countries. An outline of the policies is given in Annex 6. Key common traits are:

- the agricultural development policy is the basis for agricultural research policy;
- agricultural research should be responsive to the needs of end-users and stakeholders who should be involved in the decision-making process, in setting priorities and in monitoring and evaluation;
- agricultural research should be holistic, balanced in terms of subsector coverage and regional and agro-ecological zones; the network of facilities and its decision-making process should be decentralized towards regional and local levels;
- agricultural research should contribute to food security and alleviation of poverty and increase revenues, through diversification of production and more generally improve the living standards of rural people;
- agricultural research should protect the environment through a rational use of natural resources;
- funding of agricultural research should be consistent with its role in the national economic development, and foremost, it should be sustainable and timely disbursed.

The overall impression is that agricultural research should be more accountable and market oriented. These views might be welcomed by research managers and donor partners. The question is whether these policies will have an effect and whether governments will be able to make tough decisions on reform of management at national, regional and local levels. The policies entail that NARS need a reassessment in terms of their mandate, approach, size and composition, resources and other vital elements. The rest of this chapter and the next chapters deal with this issue.

## **2.3 Evolution of agricultural research systems**

The evolution of agricultural research in the selected countries is intimately linked to the overall History of Agricultural Research in sub-Saharan Africa (FAO/SPAAR forthcoming). An historic overview of NARS in the seven countries is given in Annex 1.

### **2.3.1 Common features of agricultural systems during the colonial period before 1960**

Agricultural research in the colonial period was completely dominated by the major colonial powers (France, the United Kingdom and to a lesser extent Germany) that ruled the countries in question. France in Madagascar, Mali and Senegal, Germany in Cameroon and the United Kingdom in Ghana, Kenya and Malawi initiated agricultural research in the late 19th and early 20th century.

The most prominent feature of this early period was the creation of botanical gardens. In Cameroon Germans established botanical gardens in three locations (Edea, Akonolinga and Victoria). The British created the Government Botanical Gardens in Aburi in Ghana in 1890. The Aburi Gardens were formally linked to the Kew Gardens in England, whose staff largely directed the work in Aburi. Research at that time focussed mainly on screening exotic material, such as oil palm, cocoa and rubber, for economic uses in the colony.

After the First World War colonial nations needed more exotic raw materials for their fledgling industries. A push was exerted towards creating more formalized research structures throughout the French and British colonies. Both France and the United Kingdom adopted a similar approach. Regional research entities were set up to cater for several local territories. Research

facilities located and run at the federal level were deemed better and more cost-effective than having large national research institutions.

In the British colonies basic research was conducted in commodity or discipline-based regional centres linked to an extensive international network. Research facilities were more or less evenly distributed. Each territory being headquarters to at least one federal institution for which it was thought to have a comparative advantage. For the French colonies the approach was slightly different. As the headquarters of the Federation was established in Dakar, Senegal, Bambey served as the hub of the research network for Sudano-Sahelian West Africa under the responsibility of Federal Government. Senegal, therefore, came to have a lion share in running and administering agricultural research in West Africa. Mali had little infrastructure and a weaker network. Cameroon and Madagascar had for historical and geographical reasons been administered and organized also a bit differently.

In Ghana, Kenya and Malawi, a network of adaptive research stations administered locally were in place and connected to the regional centres prior to independence. This constituted the embryo of NARS. In the French colonies locally administered stations were non-existent or limited, except for Cameroon and Madagascar. However, soon after the Second World War, France created a network of individual export commodities research institutes, with their headquarters and direct management from Paris. Activities were spread all over the colonial territories. They constituted along with ORSTOM (Overseas Scientific and Technical Research Institute), for basic research the backbone of the French colonial research system for tropical agriculture. The dual system in the organization of research was a characteristic feature in the French colonies. There was no common administration of research activities at the territory level and the activities were already fragmented. Therefore, the embryonic NARS that existed in the British colonies did not exist in their French counterparts.

### 2.3.2 Early post-independence (1960-1975)

From 1960 to 1970 almost all sub-Saharan African countries, in particular those in the sample of the study, gained independence. The responsibility for agricultural research was transferred to each country. The evolution of the system was formed by political decisions made by the new national governments. It might be useful to reiterate the common definition of National Agricultural Research System (NARS) used throughout this study:

*NARS are defined, in a given country, as encompassing all institutions public or private devoting full time or partially their activities to agricultural research and committed to a national research agenda.* Generally, the following categories of such institutions are identified as follows:

- (i) institutions whose mandate is to carry out research only, such as the NARI (National Agricultural Research Institute);
- (ii) higher education institutions devoting their activities to teaching and research: they are the faculties of agriculture and related disciplines and the faculties of social sciences and economics of the universities;
- (iii) technical departments of some ministries, development agencies that carry out some adaptive research programmes; and
- (iv) NGOs and the private sector.

The international agricultural research centres (IARCs) of the CGIAR are not part of NARS, (as often found in literature). For obvious reason they are never committed to a national research agenda. Their focus is on a regional/international level. However, spill-over of their research is important for NARS as they represent partners to other foreign research institutions.

There were marked differences between the French- and English-speaking countries after independence. With the exception of Mali, the former, in the sample (Cameroon, Madagascar and Senegal) waited a decade and more before setting up their own national institutes. In the aftermath of independence bilateral agreements with France, whereby French tropical research institutes created



just after World War 2, were given full responsibility for the management and execution of the research programmes. Co-financing between France and each country was almost on a par. However, apex policy formulation bodies came into being before the national institutions.

The English-speaking countries took immediate responsibility of the research structures in their territories. The colonial power under fledgling federal institutions tried to maintain some inter-country organizations, but they collapsed only a few years after independence. The most radical change was in Ghana where reorganization of the research infrastructure started and included the inheriting of locally and federally administered institutes.

## 2.4 Current national agricultural research systems (NARS)

The early 1970s was a turning point for the reorganization of NARS in sub-Saharan Africa, particularly for the French-speaking countries. A decade and a half after independence, they have had time to devise some research policy and reorganize their system. At present, NARS in each country are dominated by a national agricultural research institute/organization (NARI/NARO) that has quasi-monopoly of research activities and mobilizes 75-80 percent of all the resources, financial and human alike. In the following section dealing with the organizational structure and management, the analysis is limited to the NARI/NARO, backbone of NARS.

### 2.4.1 Organizational structure and management of NARS

In terms of organizational mode, all the countries except Malawi, have adopted the NARI mode with semi-autonomous management status. Malawi has kept the departmental mode inherited from the colonial era. Ghana has adopted a mixed organization combining the council for coordination and planning and the NARI for routine management and implementation under the direct supervision of a board for each individual NARI. For Cameroon, Senegal, Mali and to a lesser extent Madagascar, Kenya and Malawi, the dominant NARI has responsibility for research in all sectors.

Tables 4, 5 and 6 provide a summary of the policy guidance and coordination, organizational structure and management of the dominant NARI/NARO of NARS in each of the selected countries.

Country	APEX Policy body	Governance	
		MOA	MST
Cameroon	MINREST/MOST		Board
Ghana	MOST		Board
Kenya	MRTTT/NCST		Board
Madagascar	MOST		Board
Malawi	ARC	MOA	
Mali	CNRST/CNRA	CNRA/Board	
Senegal	MOST/DAST/CIRST	Board	

Table 4. Policy model chosen

Country	Organizational Model		
	Council	NARI (semi auto)	DAR
Cameroon		IRAD	
Ghana	CSIR		
Kenya		KARI	
Madagascar		FOFIFA	
Malawi			DAR
Mali		IER	
Senegal		ISRA	

Table 5. Organizational model

Country	Research Network		Agro ecological coverage
	No. of centres	No. of stations & exp.sites	
Cameroon	5 RRC	30	Total (5))
Ghana	7 sector institutes	14	Total
Kenya	6	25	Total
Madagascar	8 RRC	24	Total
Malawi	3	14	Total
Mali	6 RRC	23	Total
Senegal	11	30	Total

Table 6. Networks and agroecological coverage

NARS are all decentralized and have good coverage of all the agro-ecological zones with a network of national and regional research centres and stations and perennial experimental sites. The policy formulation and planning, priority setting and programme management processes differ from country to country and are summarized in the following sections.

#### 2.4.2 Policy formulation, planning and priority setting processes

Policy formulation in *Cameroon* is vested with the Ministry of Scientific and Technological Research (MINREST). It supervises IRAD management and research activities and provides a legal and operational framework for its cooperation with universities and institutions abroad. Priority setting and long-term planning, have never been a pervasive process in Cameroon or in the individual institutions. However, the latest reorganization was made after a comprehensive strategic planning process. The capacity and the methodology are in place for future exercises provided the authorities decide to institutionalize the process.

In *Ghana* CSIR has the formal responsibility for advising government on science and technology policy. However, the mandate does not specifically include the formulation of research policy. Recognizing the need for such policy formulation, CSIR established the Planning and Analysis Group (PAG). The Technical Committee for Agriculture, Forestry and Fisheries (TCAFF), was established in addition, to advice on science and technology policy for the agriculture sector. However, an initial report prepared by the TCAFF does not concentrate on research policy as such, whilst the PAG has been unable to address the issue, due to limited resources. Consequently, CSIR does not at present, provide a lead in formulating agricultural research policies with clear linkages with national development objectives. The Agricultural Research and Development Advisory Committee within the MOFA, has terms of reference that include the formulation of research policy. It is, however, not certain if this is operational. None of the committees or units described above is

responsible for the determination of research priorities, or has the authority to allocate resources to particular research proposals. The lack of a functioning mechanism to set these priorities, with the authority to allocate financial resources, is reflected by the dispersed nature of much of the research effort. The situation is clearly unsatisfactory and forms a major constraint to effective operation of the agricultural research system.

*Kenya* on the other hand, has a rather well established policy formulation process. The Amended Science and Technology Act (1979) provided for the establishment of the Agricultural Advisory Research Committee (ASARC). Its main function was to advise the minister responsible for agriculture, on scientific research and on a wide range of issues pertaining to agriculture, agricultural education and coordination and management of research. Thus, ensuring free flow of knowledge. This included the mechanism for establishing priorities for allocating research resources to research programmes within institutes. Unfortunately, although ASARC was constituted in 1980, it only operated in 1980 and 1981 and was disbanded thereafter. The National Council for Science and Technology, which was expected to be the apex organization for policy, has been starved of resources and moved around several ministries. As a result it has lost the pivotal role of overseeing the national research system. The Department of Research Development of the Ministry of Research and Technology, besides having its officers attend board meetings of the various research institutes, has no responsibility for directing national research. However, for the publicly funded components of NARS, the boards are responsible for policy-making and ensuring that they remain the apex organizations responsible for Kenya's agricultural research through development and application of science and technology.

Prior to the restructuring and reorganization of NARS, which took place in the early 1980s, there was not an appropriate and affective formal system for allocation of all research resources. Insufficient delegation of responsibility for design and the implementation of research programmes for key commodities, factors and disciplines exacerbated the situation. As indicated above the ASARC was responsible for policy guidance and determination of priorities and resource allocation. Unfortunately, it did not work and it was disbanded and the NCST could not fill the gap. The reorganized KARI has put into place a new mechanism for setting priority and allocating resources. Overall strategy and priorities have been worked out with the assistance of ISNAR and the donor community and the various stakeholders, this exercise yielded the National Agricultural Research Programme/Project (NARP I and II).

Regional research to adapt technology in different agro-ecological areas is carried out by the network of RRCs. Each research centre has a centre research advisory committee (CRAC) and a centre technical committee (CTC), which ensures that research proposals are consistent with the national/regional priority structure, respond to stakeholder needs and are technically sound. The membership of the regional CRAC comprise the RRC director as chairperson and representatives of farmer organizations, NGOs, agro-industries and exporters, extension workers and staff of the RRC. For the NRCs, the relevant assistant director chairs the CRACs; they have similar members as those of the RRC. Directors of relevant NRCs and RRCs are invited to participate. Proposals approved by these committees are submitted to the research coordinating committee (RCC) at KARI headquarters for consideration; KARI prepares a consolidated annual work programme including procurement plans.

*Madagascar's* Ministry of Scientific Research is in charge of the implementation of the National Research Policy, including the agricultural research policy. The Government recognizes that science and technology are essential elements for economic and social development; therefore, it is indispensable to define a national policy within the overall national development goals. Agricultural research master planning is commonly used in particular by FOFIFA. In the Ministry's structure, The Directorate of Planning and Coordination is responsible for the supervision of the agricultural research institutions such as FOFIFA.

Each research institution has its own bodies responsible for determination of priority and resource allocation. For FOFIFA they are:

- (i) the Scientific and Orientation Council (CSO) that determine priority programmes for FOFIFA;
- (ii) the Agricultural Research Funding Committee (COFIRA) determines the overall level of funding and the allocation for each research programme; and
- (iii) at policy level, the board of management validates the decisions of the previous lower level organs.

The programme formulation and budgeting follows a bottom-up approach from the stations/centres through to regional centres and up to national level where the programme committee deliberate on the proposals from the lower levels. This is done under the chairpersonship of the director of research. The proposals reviewed are finalized and submitted successively to the CSO, the COFIRA and the board of management for final approval.

*Malawi* has an elaborate policy formulation process. The Agricultural Research Council (ARC) was established to set policy guidelines within which DAR operates; the functions of the ARC are to:

- ensure that the agricultural research strategy is consistent with the national development goals;
- outline an agricultural research policy that is compatible with and supportive of national goals;
- approve annual research programmes and projects for implementation by DAR;
- consider and recommend contract research proposals, including the level of funding;
- recommend the appropriate level of expenditure in agricultural research, with the target of eventually investing at least one percent of the annual value of the agricultural gross domestic product;
- prepare the agricultural research master plan, which allocates priorities according to national goals.

The ARC is made up of a cross-section of experienced persons in the public and private sector who have varying perspectives on the nation's economic and fiscal policies and agricultural development goals.

ARC is organized with a secretariat and subcommittees. For the ARC to conduct its functions efficiently, an ARC secretariat in DAR's headquarters was established. This secretariat is responsible for preparing the master plan in collaboration with all researchers, and organizing triennial reviews of the research system. It has two subcommittees: a technical subcommittee that examines and reviews research programmes and proposals including contract research and a financial subcommittee that examines the annual budget and scrutinizes the estimates of programme and project costs. The council at its general meetings considers recommendations of the subcommittees. The various NARS institutions are coordinated nationally by the Ministry of Research and Environmental Affairs (MOREA).

The task of determining priorities, programme formulation and resources allocation is assigned to the ARC, where the Agricultural Development Division, sets the overall research priorities. The ARC employs a set of guidelines for priority setting and draws heavily on the desired national goals embodied in the 1987-1996 Statement of Development Policies. The criteria used for priority setting include national goals and research and technical factors.

Within commodities, the task is assigned to the national research coordinators (NRCs) and commodity team leaders (CTLs) who ensure that priorities set within research commodities are in line with nationally set priorities, taking into account the human, physical and financial resources available to the commodity.

Prior to the 1992/1993 fiscal year the allocation of DAR funds under the revenue account was primarily done on the basis of research station needs. The allocation was not based on systematic planning of research programme priorities. After the reorganization of DAR the team approach to research programmes with commodity groups and team approach focus of planning and budgeting rather than the stations, provides a more rational and defensible basis for programming and budgeting. Under this system the budgeting process is coordinated and directed by the financial controller and the research economist. The CTLs are responsible for preparing work plans and preliminary budget requests for their respective commodity teams. These are assembled into work plans and budget proposals submitted to the respective NRCs who collate them into unified budget proposals for consideration by the Deputy Chief Agricultural Research Officer.

In *Mali*, the process evolved as in other countries in terms of policy formulation. Following the various reviews undergone by NARS and particularly during the strategic planning carried out by ISNAR, the mandate of the CNRA was changed in 1990. The new CNRA has the mandate to formulate agricultural research policy and strategy. It decides on research priorities, reviews and approves research programmes and budgets, reviews the research results and decides on their diffusion, monitors the use of resources and establishes linkages between research and external research organizations as well as within the country, with development agencies.

The membership of the NARC is as follows: nine voting members including the chairperson who is a renowned scientist. The sector directors of the concerned ministries and the director-general of IER participate in the meetings without voting rights. One mandatory meeting is held in November each year.

The NARC has three specific committees, namely,

- (i) the Scientific Committee (SC);
- (ii) the Financial Resources Committee (FRC); and
- (iii) the Users Committee (UC). Furthermore, the NARC has a Permanent Executive Secretariat (PSE). It is composed of a research manager (the permanent secretary), a finance officer and two support staff. The secretariat is responsible for day-to-day implementation of policy decisions.

Planning, programming and resources allocation are made at three levels in Mali with the sharing of responsibilities:

- strategic planning: NARC is responsible for the preparation, regular review and updating of the National Strategic Plan for Agricultural Research. External programme evaluations, every three years, are part of the inputs for the strategic planning exercise. The strategic plan provides broad guidelines and only identifies research themes, their priorities for the long-term and the resources required;
- programme formulation: the scientists, in liaison with extension agents and the users, develop the identified priority themes of the strategic plan into fully-fledged research proposals. NARC reviews and approves proposals with their budgets assuming that the resources necessary for their implementation are committed for the duration of the research projects/programmes, unless the external review of the programme calls for adjustments;
- annual review, programming and budgeting: although activities and resources are agreed upon during project/programme approval, annual adjustments are needed in light of the previous year's results; a detailed annual budget also needs to be prepared.

For *Senegal* the research policy formulation body is the Interministerial Council for Scientific and Technological Research. The council meets every year under the chairpersonship of the Head of State. It deliberates on research priorities identified by standing sectoral committees. Moreover the quinquennial Economic and Social Development Plan that defines the overall development policy provides also for guidance on agricultural research policy and priorities. Since the cycle of sectoral adjustment programmes the country has gone through, the agriculture sector has issued several policy statements in which agricultural research policy and priorities are spelt out. However, these bodies are

designed to provide a general framework only. Detailed policy is formulated by each institution under this framework under the supervision of its governing bodies. Furthermore, ISRA has had experience in strategic planning as its first strategic plan was prepared in 1979, the second in 1989 and the third in 1995, respectively for the periods of 1980-1985, 1990-1995 and 1998-2003. Over time the methodology has been fine-tuned with better involvement of all the stakeholders in particular the farmer organizations. The board and the STC played an important role in the process. The strategic orientations of ISRA are as follows:

- demand-driven oriented research underpinned by excellence and responsiveness to stakeholders needs;
- highly qualified, productive, innovative and motivated human resources;
- insertion of ISRA in NARS as its backbone in bettering linkages and developing partnerships based on comparative advantages.

Priorities are determined within the general framework of the government development policy and developed bottom-up in an iterative way. The programme formulation and resource allocation is carried out annually based on the action plan. The process involves all ISRA partners (technical services, NGOs, farmer organizations). The programme committees ensure at all levels (local, regional and national) that all these stakeholders participate in this dialogue. The scientific directorate serves as a go-between in the process, consolidates the proposals and makes the necessary adjustments before submission to the STC. This latter examines the pertinence of the proposed activities with regard to national priorities and the adequacy with the financial resources allocated to the research programmes. The STC reports and makes recommendations to the board that takes the final decisions on the programmes and levels of resources allocated. The board's report is submitted to the two ministries in charge of ISRA for final approval.

It can be concluded from the above-mentioned description that each country has some sort of overall apex body for coordination, setting policy at the national level for science and technology with generally sectoral committees. In the sample of countries it can be assessed that these bodies do not work properly either for lack of resources or capacity or both. The bodies attached specifically to NARS, either ARC or boards of the NARIs, work much better and regularly and discharge their functions in most of the cases efficiently and effectively. The priority setting is based on national development priority and the process of programming is bottom-up and involves the stakeholders at all levels. In the next section the programme management process is discussed.

#### 2.4.3 Programme management process

The programme management responsibility in *Cameroon* is vested with the National Programme Committee that reports directly to its director-general. The operational aspect of the programme for implementation is under the responsibility of the directors of regional research centres in cooperation with the programme coordinators with delegation of authority for the stations and substations levels.

In *Ghana*, the process is under the management board of each institute. The management boards consider research proposals put forward by directors of institutes. Their role is thus, essentially, one of review, rather than planning of programmes. This is significant as the boards are the only forums in which users of research results, or their representatives from MOFA, have the opportunity to influence research programmes. Even research committees appointed by the management boards review ongoing programmes, rather than deciding on future programmes, though they may identify omissions, which may lead to an expansion of a particular programme. Furthermore, the management boards of individual institutions never consider relative priorities between programmes with responsibility vested with other agencies. The primary function of the management board is, in fact, the management of the physical means of carrying out research and of the substance of the research programmes.

In *Kenya*, national research programmes are coordinated and managed at the NRCs by programme leaders or programme coordinators based at the NRCs. The RRC directors, assisted by adaptive research coordinators, are responsible for adaptive research programmes of the regions,

which are predominantly conducted in farmers' fields. Furthermore, authority and responsibility for implementing the research programmes have been progressively decentralized to the centres, including financial operations, once the annual work programme and budget have been approved.

For *Madagascar*, the execution of the research programme falls under the responsibility of the scientific director and the chiefs of department. For each programme the department chief appoints a national research programme coordinator who is responsible for ensuring the internal coherence of the programme and the adherence to a multi-disciplinary approach. The coordinators are responsible for annual programme and budget presentations and provide elements for FOFIFA's annual report.

In *Malawi* the task of programme management is the responsibility of research scientists under the supervision of the commodity team leaders (CTL) and the national research coordinators (NRC). The NRCs direct and integrate research on a commodity or project in a coordinated way to ensure that there is a balanced focus on the production problems faced by the farmers.

*Mali*, within a very decentralized system, the administrative management is decentralized and streamlined with direct responsibility for budget execution given to the programme heads and experiment station managers.

In *Senegal*, as for Mali the administrative management is decentralized and streamlined with direct responsibility for budget execution given to programme-heads and centre directors.

Overall, the programme management is rather similar from country to country, but quite decentralized within the research network set up with responsibility delegated where programme implementation takes place. The question mark is how this process is actually applied on the ground, effectively and efficiently. In the following section the resources available to NARS are analysed.

## **2.5 Resources of the national agricultural research systems**

In this section the kinds of resources considered include: the human resources, infrastructure and equipment, and financial resources.

### **2.5.1 Human resources of NARS**

Figures 2a and 2b portrait the situation of the human resources in the various NARS of the sample in terms of full time researchers equivalents as of 1990 for Mali and Senegal, 1991 for Malawi and Kenya, 1992 for Ghana, 1994 for Cameroon and 1997 for Madagascar. The following remarks can be made from these two figures:

- Kenya has the largest NARS in the sample and the smallest are Malawi, Senegal and Madagascar, Cameroon, Mali and Ghana have almost similar size;
- Madagascar has the highest percentage of national staff, followed by Ghana, Kenya and Cameroon. Senegal has the highest percentage of expatriates almost one third of total staff. This is an indication of the effort made by these countries to train and retain national agricultural research staff;
- in terms of qualification, on average 55.6 percent of the staff hold a post-graduate degree, with Senegal having the highest percentage followed by Ghana, Madagascar and Mali. In this sample it is no longer possible to discriminate countries in francophone and anglophone in terms of staff qualification, with the latter having a higher level of qualified staff;
- the ratio of professional staff to technical support staff is very low, less than two, with the exception of Malawi that has a ratio of four. This is an indication that highly qualified staff is not efficiently used in most of these countries.

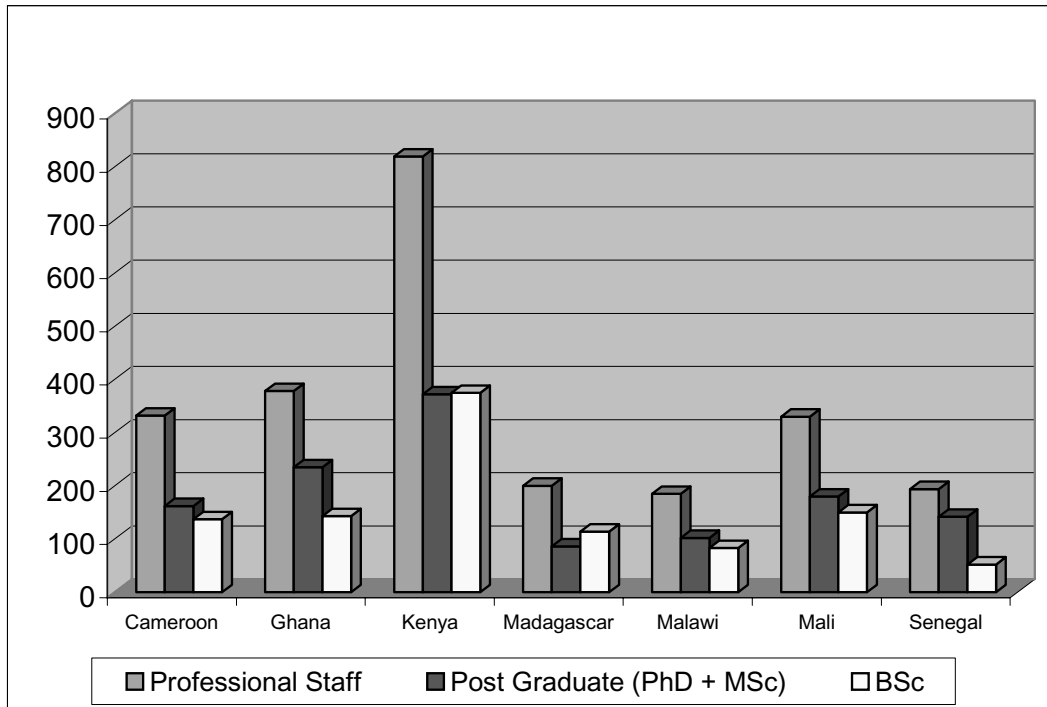


Figure 2a. Human research capacity: levels of training

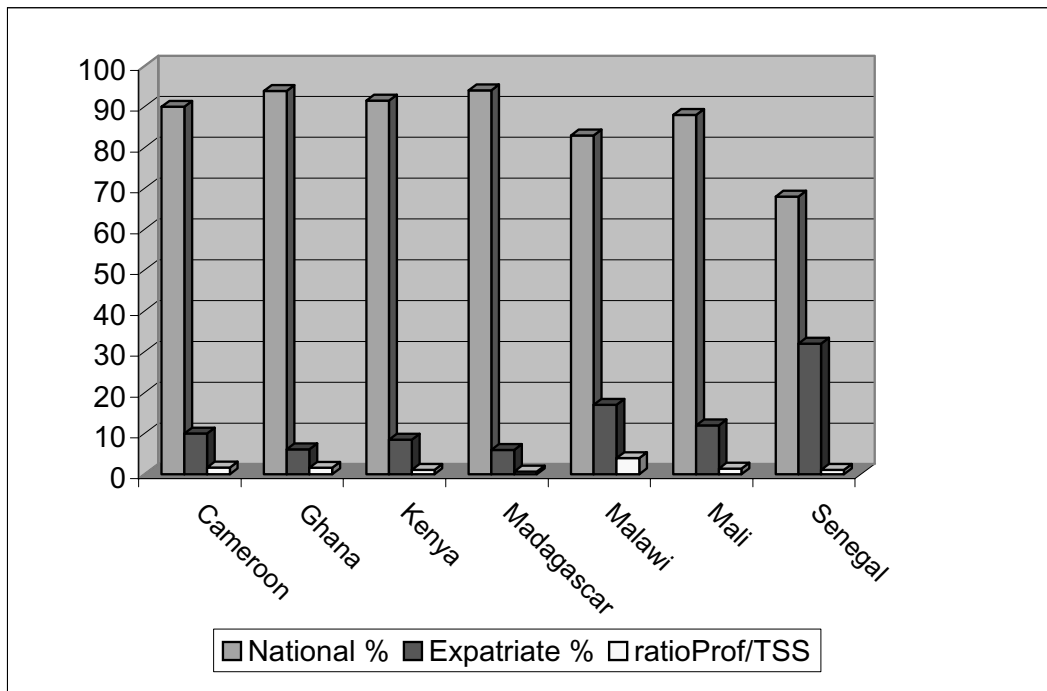


Figure 2b. Human resources categories of NARS in percentage



When analysing the evolution of human resources from 1981 to 1991, on average, the annual increase is 4 percent with only Senegal having a negative increase of -1.1 percent (Tabor, 1998). The highest percentage is for Madagascar, with 8.6 percent. However, a slow down can be observed when compared with the 1961-1985 period when the sub-Saharan Africa average was 6.8 percent.

### 2.5.2 Infrastructure and equipment of NARS

In the selected seven countries the equipment and infrastructure situation is described in the following paragraphs.

In *Cameroon*, the equipment and infrastructure constitute a liability. In 1994 both IRA and IRZV had a vast network of centres, stations and substations, in total 69. Their activities were often duplicated in the same agro-ecological zone. Total experimental land was more than 17 000 ha; offices, laboratories and equipment were deteriorating for need of proper maintenance not provided due to an acute financial crisis.

*Ghana's* NARS have the necessary land to perform research. However, buildings and housing are badly in need of rehabilitation. There was a serious lack of funding for maintenance and repair during the economic crisis of the 1970s and early 1980s. New buildings have been provided in some stations through donor funding. Elsewhere, planned improvements are often constrained by lack of funds. There is, therefore, a considerable need for upgrading and rehabilitation of many of the essential buildings and other structures of the agricultural research system. There is also a very considerable lack of equipment for undertaking research. Exceptions can be found, but these are nearly always due to specific provision from donors. The OPRI and two institutes outside the CSIR that contribute to agricultural research, the CRIG and the Forest Products Research Institute, receive substantial support under World Bank assisted projects.

*Kenya*, as the other countries, inherited a wide network of research facilities that has been streamlined over time. The public or semi-public components of NARS (headquarters, centres, outposts) have some of the best facilities among institutions in Kenya funded by the Government. The donors, mainly the World Bank, USAID, Germany (GTZ) and the Netherlands have also provided funding for purchase of equipment. In general, laboratories and equipment are often in very good condition despite little funding for maintenance from the GoK. This contrasts starkly with the poor state of physical structures and lack of maintenance of small pieces of equipment at public universities. The exception is the Jomo Kenyatta University of Agriculture and Technology, which has been generously endowed by the JICA's (Japan) assistance.

In *Madagascar*, the status of equipment and infrastructure is also variable depending on assistance received. NARS institutions inherited from the French a huge patrimony of infrastructure spread over the country including land beyond possible use of research institutions. Most buildings are old and built during the colonial era. They have not been maintained or rehabilitated. Within the streamlining process part of it has been rehabilitated with donor support and from government budget. However, the effort could not cover all needs for the priority programmes. As a result the infrastructure situation varies widely from one station to another depending on support received by donors. Limited budgetary resources of FOFIFA are used in priority for payment of salaries. The situation is the same with regard to equipment located in the central laboratories and stations. Much of FOFIFA's laboratory and agricultural equipment has become unsuitable or is redundant. The exceptions are those that have benefited from donor support.

For *Malawi*, the situation is similar to that of the other countries. Prior to the NARP project, infrastructure and equipment was in poor condition and insufficient. The project constructed and rehabilitated research buildings and required housing; provided much-needed scientific equipment, farm machinery, vehicles and office equipment/furniture. In terms of civil works: (i) the central buildings at Chitedze were rehabilitated and expanded including the construction of new administrative and library buildings, and soils and plant nutrition laboratories; (ii) Bvumbwe library, laboratories and selected other facilities were renovated; (iii) Lunyangwa's laboratory, library and

office facilities were expanded; (iv) land was prepared and a laboratory, office and other buildings constructed at the new site of Mkondezi; and (v) 115 staff houses were built and 62 renovated to accommodate relocated staff in remote locations. It can be stated that DAR has adequate and appropriate physical facilities to carry out most of its planned experimental work. Its network of research stations, experimental stations and substations and trial sites has sufficient laboratory, office space and library facilities. However, there is still a need for specialized equipment and structures and more residential houses for staff at all levels.

In *Mali*, until recently, most of the infrastructure and equipment was concentrated around the capital Bamako. In the regions, before the merger of the two institutions in 1990, there was a lot of duplication between stations. Since then a streamlining of the network has been made and consequently equipment has been better distributed among the centres and stations. In 1992, there were 36 research experiment sites ranging from full-fledged stations with resident scientists to experiment sites, more than IER can manage adequately given resources available. The NARP project has, within the strategic plan streamlined the whole network and provided the required infrastructure and equipment for proper running of the priority research programmes.

*Senegal*, inherited a huge research infrastructure, which was maintained fairly well until the mid-1980s with the advent of economic difficulties and the era of structural adjustment. Moreover, during the implementation of the first master plan with the first World Bank and USAID funding, the network was expanded with new sites, the Kaolack Centre, the Tambacounda Centre and the Fanaye Station. The Djibelor Station was for example upgraded to a full-fledged centre, the Camberene Horticulture Centre (CDH). With the huge financial resources provided by these projects, infrastructure and equipment developed beyond the management capacity of the institute for long-term maintenance. Therefore, since its creation, ISRA as a medium-sized well-decentralized institution needing only to internalize a full regional concept within a multidisciplinary approach, developed into a huge bureaucracy in which the research scientists were marginalized. As a result its has been under perpetual restructuring and streamlining of its structure and is more or less heading to the previous organization set up in the late 1970s.

The infrastructure and equipment status as described above is an indication that none of the selected countries has assessed its needs through proper strategic planning in order to tailor the facilities inherited to the necessities of their priority programmes. Most of the facilities were for a regional scope and were beyond the needs of one country and hence the general poor status of maintenance. Some countries like Senegal have even added new facilities and increased the budgetary burden of recurrent costs particularly for maintenance. Therefore, all countries in the sample currently rely heavily on foreign assistance for maintenance of physical infrastructure and equipment. Downsizing of facilities, therefore becomes almost inescapable. The financial resources are analysed in the following section.

### 2.5.3 Financial resources of NARS

Financial resources are the most critical for NARS in developing countries and particularly the sub-Saharan Africa and in the selected seven countries. Complete data series are difficult to obtain and are missing for some countries. Data for this section came from ISNAR Indicator Series (Roseboom et al. 1993/1994)

The graphs in the figure below indicate the evolution of total funding of agricultural research in six of the selected countries.

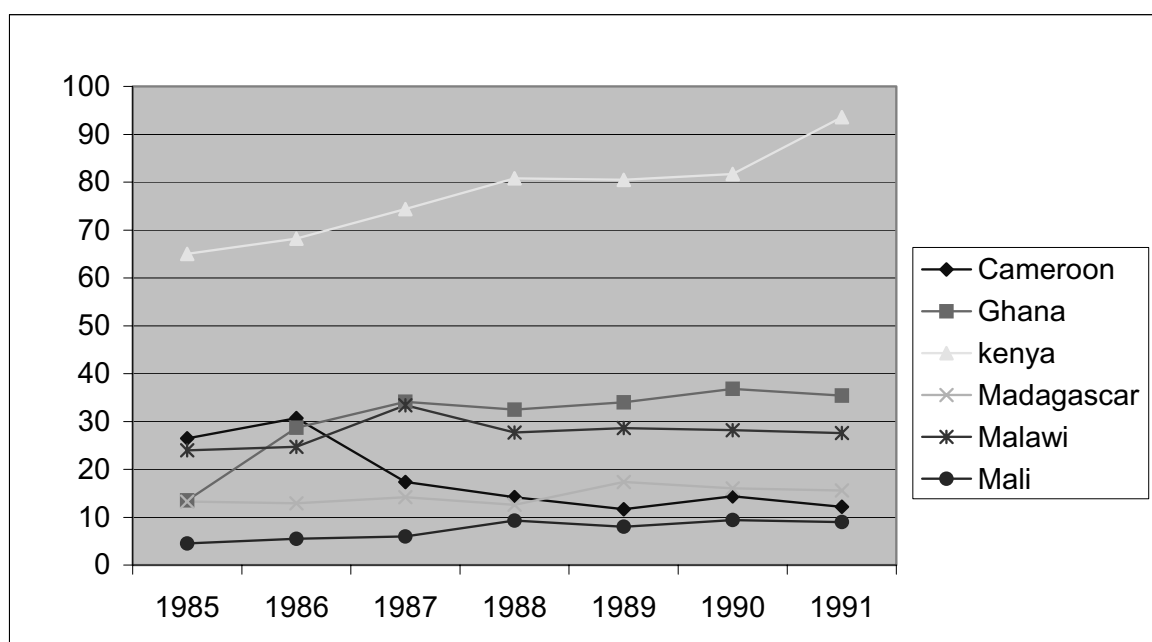


Figure 3. Evolution of financial resources of NARS of selected countries

The graphs show three groups of countries, in the first group, represented by Kenya, there is a high funding level commensurate with the size of the research system that has grown steadily during the period (from 21 percent in 1983/1984 to 45 percent in 1992/1993). In this group, but at a lower level is Ghana, where funding also grew steadily. Cameroon and Malawi represent a second group, where since 1986/1987 there has been a notable decrease in funding. This decrease was very sharp for Cameroon, but it experienced a very high rise during the 1970s and early 1980s. The third group, composed of Madagascar and Mali, had a small increase or stable funding over the period.

For Senegal which is not represented for lack of reliable data during the period, considering the trend shown below for a more recent period, it is obvious that it belongs to the second group of countries for which the funding is decreasing.

Country	1990	1991	1993	1994	1995
Senegal	19.7	14.6	7.8	12.5	11.5

Table 7. Evolution of financial resources of NARS in Senegal (current US\$ million)

For a research institution the breakdown of budget in cost categories is as important as the total amount. The situation in the selected countries is as follows:

It is apparent from the figure below that there are two groups of countries, the first one with a high percentage of personnel cost between 69 and 77 percent (Cameroon, 69, Senegal 75.4 and Mali 76.7 percent). The second group is that of countries with a percentage of less than or near 50 percent for personnel costs (Madagascar, 43, Malawi, 44, Ghana, 48.7 and Kenya 49.9 percent).

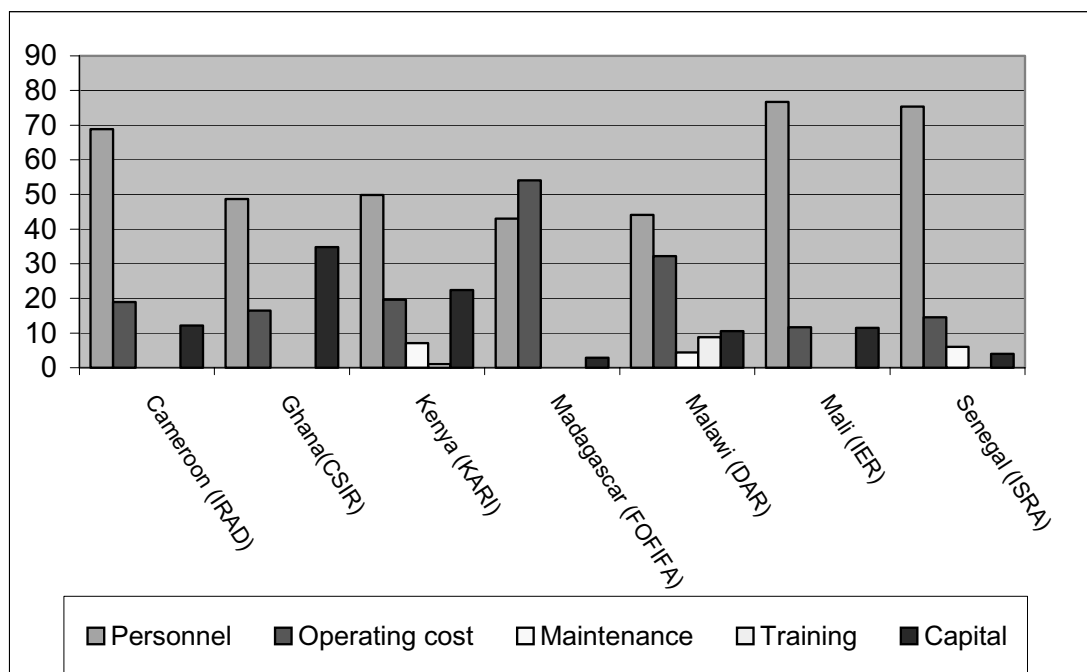


Figure 4. Breakdown of cost categories of expenditure in percentage (1991, US\$ million)

For Madagascar/FOFIFA, the cost of local personnel trended downwards over time due to a considerable reduction in support staff as well as low level of real salaries of researchers.

This situation is an indication of the heavy reliance of most NARS on donor funding for operating costs, indeed for actual research work, the research personnel, in the worst case, remain idle most of the time.

This over-reliance on donor funding is also clearly shown in Figure 5. The figure shows the source of funding of the major NARI/NARO of the selected countries. Again there are three groups of countries. The first group is funded at a level of more than 60 percent by donor assistance (Senegal, 65, Mali, 61 and Madagascar, 60.2 percent). The second group is donor funded at around 55 percent (Malawi, 54.7 and Cameroon, 56.3 percent). The last group funded at less than 50 percent (Kenya, 48.9; Ghana, 36 percent). This situation correlates well with the share of personnel and operating costs funded by national contributions except for Madagascar. Overall the resources from proceeds are very limited for all NARS, and do not amount to more than 3.5 percent.

Two other indicators are important regarding the funding of agricultural research, they are the expenditure per researcher and the research intensity, i.e. the national agricultural research expenditure as percentage of AgGDP.

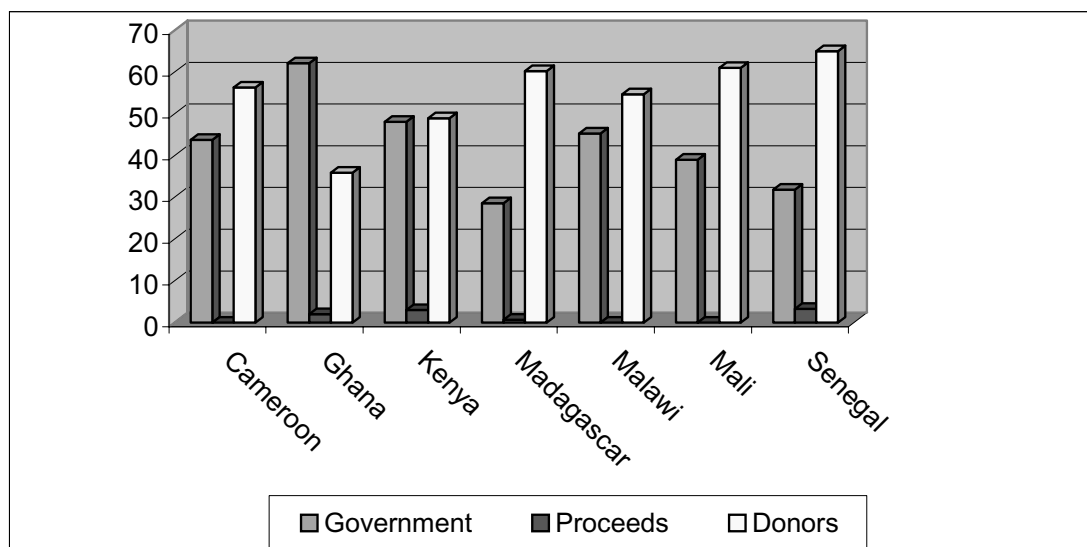


Figure 5. Sources of funding (percent)

Evolution of the research intensity in some of the selected countries (Roseboom, Pardey, et al., 1993) is presented in Figure 6. There are three groups of countries: the first group with a high ratio well above one percent for all the period, comprising Senegal with an average for the period of 1.91, Malawi, 1.73 and Kenya, 1.54 percent. A second group comprising only Madagascar that started high until the break up with France in 1971-1975 and afterwards showed a constant decline of 4.1 percent per annum, down to 0.57 in 1991, however the average for the period is 0.89 percent. These two groups have an average for the period higher than the one for sub-Saharan Africa (SSA) of 0.78 percent. The last group is composed of Ghana that started fairly low and remains almost stable throughout the period with an average of 0.41 percent well below the continental average. This evolution actually reflects the importance of donor funding as with the national resources, only the situation is quite different as shown in the Table 8.

Res.	Cameroon	Ghana	Kenya	Madagascar	Malawi1994	Mali 1989	Senegal
Intensity	1994	1989/1991	1991	1997	/1995		1990
National budget	0.44	0.38	0.56	0.25	0.78	0.34	0.44
Total including donor	0.64	0.41	1.99	0.57	n.a	0.56	1.30

Table 8. Research intensities in selected countries

With national resources only, all the countries have research intensity well below the SSA average. In the particular case of Cameroon an historical analysis of the financial resources provided by national budget shows an annual increase of 9 percent from 1976/1977 to 1985/1986 that means in less than 10 years the budget increased nine times, this period of fast of economic growth was followed by the sharp decrease and the crisis of 1994/1995.

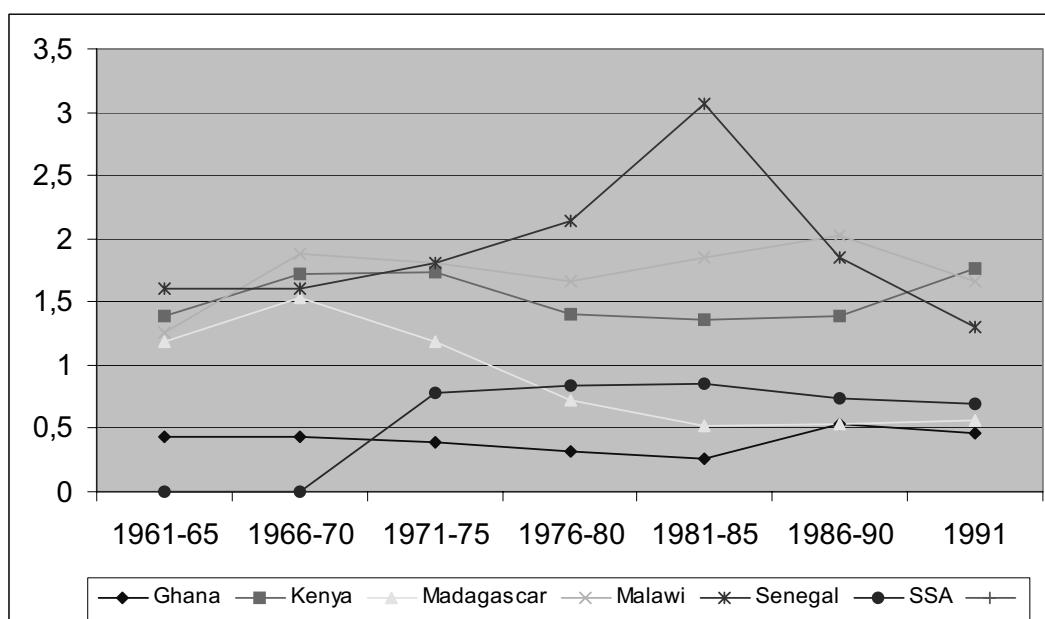


Figure 6. Evolution of research intensities in selected countries

A last aspect needing analysis within the review of financial resources of NARS is the expenditure per scientist, which can indicate if the scientific human resources are used efficiently and effectively. Table 9 shows the evolution of the expenditures per scientist for the selected countries. The data shows that there are three groups of countries. In the first group, comprising Ghana, Malawi and Senegal, expenditures per scientists are quite high and more or less stable, meaning that scientists have sufficient means for carrying out research. The second group, comprising Cameroon and Madagascar, for which the evolution is erratic with ups and downs but on average nearly acceptable for Cameroon and low for Madagascar. The last group comprising Kenya with a steady increase over the period, starting low to end and rising to an almost acceptable level.

Country	1986/1987	1987/1988	1988/1989	19889/1990	1990/1991	Average
Cameroon (a)	84 869	42 586	22 079	32 482	57 563	47 916
Ghana (b)	135 953	164 647	138 425	133 286	136 825	141 824
Kenya (b)	20 475	21 826	22 622	34 341	61 737	32 200
Madagascar (a)	1992: 35 005	1993: 31 585	1994: 19 245	1995: 26 345	1996: 19 883	26 413
Malawi (b)	169 315	228 657	187 171	167 386	158 668	182 239
Mali (a)	Na	Na	Na	33 939	51 851	42 895
Senegal (a)	Na	Na	Na	98 500	100 978	99 739

(a) Current US dollars; (b) 1985 PPP dollars

Table 9. Evolution of expenditures per research scientist

However, this evolution during a rather short period does not tell the whole story, and for much of NARS these figures are meaningless as they include donors' contributions which are never available for all researchers with the system of enclave projects. Sufficient resources are often provided for scientists working on these projects while the others are almost jobless. This is the reason why FAO has introduced the notion of potential research capacity and actual research capacity. The former refers to the total qualified research staff and for the latter to the total qualified research staff with optimum means for carrying out research. Another factor that can bias these figures is the inclusion of expatriate research scientists. As a result, in 1990/1991, for NARS of the Sahelian countries as a group, the average for actual research capacity was 55 percent (for Mali, 41 and Senegal, 89 percent), while for Ghana it was 51 percent and Cameroon 60 percent.

Another feature is the skewed distribution of the financial resources between institutions in NARS. The academic institutions always have a token amount of funding for research. For the NAROs the commodity foundations have the lion share: for Ghana, in 1989 for CSIR institutes the recurrent expenditures net of salaries was US\$3 900, while for the CRIG it was US\$12 570; for Kenya, in 1991/1992 the operating cost for KARI was US\$2 000, US\$9 300 for the Tea Research Foundation and US\$21 720 for the Coffee Research Foundation and; finally for Madagascar in 1997 the expenditure per scientist for FOFIFA was US\$22 344 and US\$140 050 for FIFAMANOR, which is six times more.

#### 2.5.4 Linkages with the World Knowledge System

Over time all NARS have developed good linkages within and outside the system, however these are diverse from county to country, being mostly informal, but also formalized in some cases. The most widespread linkages are with the IARCs of CGIAR and regional/subregional organizations and with some bilateral donor organizations. Currently it cannot be said that the lack of linkages is a main weakness of NARS, the question is how these linkages can be optimized and transformed into a true partnership for strengthening their own institutions.

#### 2.5.5 Conclusions

Diversified NARS exist in each country. All NARS are dominated by a NARI/NARO that accounts for at least 60 to 70 percent of all resources. NARI/NARO are always public organizations, funded by government. They have often inherited important research facilities from the colonial era. However, the infrastructure has often been too much for national needs. It has often been used with limited resources for maintenance. The result has been costly rehabilitation of infrastructure funded by donors or complete abandonment of infrastructure as part of a downsizing process. For all, human resource capacity has increased fairly well in terms of quantity as well as quality, but the inadequacy of the research environment has caused a high degree of instability amongst most NARS. Financial resources are the Achilles' heel for NARS. Funding has not increased at the same rate as human resources. Subsequently, expenditures per scientist have fallen to an inadequate level for most NARS. Full time employment is in many cases less than 50 percent.

Overall, NARS have had a positive impact, despite some weaknesses, on the production systems of these countries. They have also benefited over time from huge foreign assistance which impacts on the institutional development and sustainability analysed in Chapter 3.

## **CHAPTER 3. ANALYSIS OF FOREIGN ASSISTANCE TO AGRICULTURAL RESEARCH**

### **3.1 Introduction**

The analysis is based on data from the sample of projects from the seven countries. Each project was provided with foreign financial assistance to develop agricultural research and research institutions in their respective country. The projects were analysed with respect to key issues or elements in institutional development as described in the methodology. The project life cycle was taken as a point of reference. The chapter provides an overview and analysis of key characteristics of the projects with respect to: formulation, length, implementation modalities/mechanisms, priorities, human resources development, infrastructure development and equipment, recurrent, operational and overall costs.

### **3.2 Characteristics of the selected projects**

It has not been possible to attain an equal number of projects for all countries. The size of the sample therefore varies from one country to another. The table in Annex 3 summarizes the profiles of projects selected.

Overall, 36 projects were selected and analysed. Among these, bilateral donors funded 17 freestanding projects. USAID funded seven (three in Cameroon, one in Mali and three in Senegal). Seven projects were funded by international organizations also as free standing projects, with the World Bank/IDA accounting for five and UNDP for two.

A consortium of donors led by the World Bank funded eleven projects. Consortium type projects are based on an agreement between several donors on a concerted programme with a particular country. Each donor will then come to implement one or several components. The component is often closely tied to donor policies and strategies. Projects of this type could also be funded and implemented parallel with freestanding World Bank projects as in Cameroon, Kenya, Malawi and Senegal.

USAID is also sometimes associated with another donor as in Cameroon, with an American NGO, or in Mali, with a private company Novartis/CIBA-Geigy. Overall the World Bank participated in the funding of 14 projects or 39 percent of all projects and USAID in 12 projects or 33 percent of the total.

Twenty-four projects focussed on institutional building. Seventeen had institution building as a major objective and seven as a secondary objective.



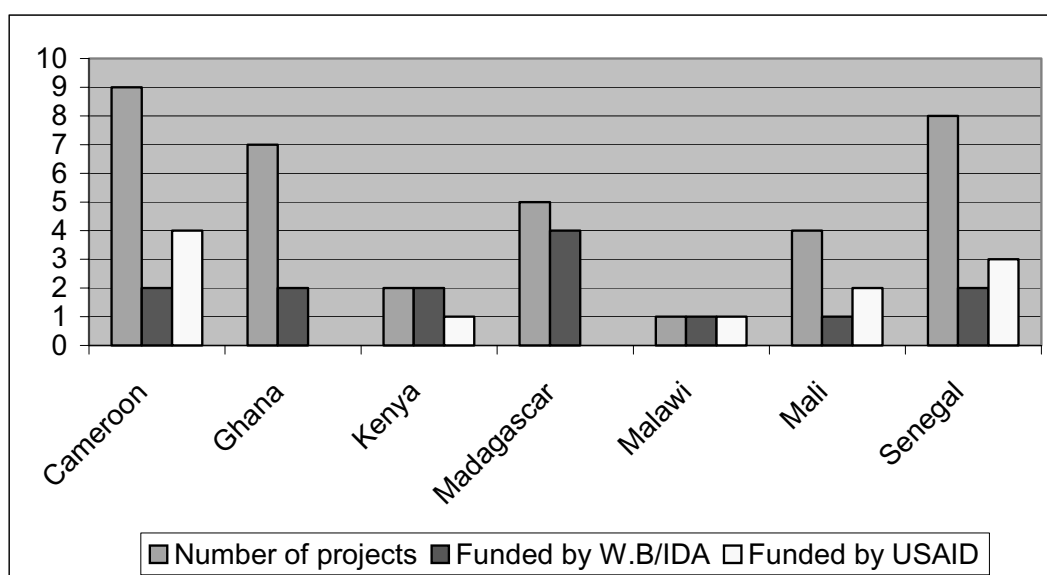


Figure 7. Division of projects per country and major donors (no of projects)

### 3.2.1 Programme/project formulation, priority setting mechanism, decision-making process and target group

Most programmes/projects were identified and developed in a dialogue between the donor and the recipient country or within a country programming exercise. Project ideas were either initiated by the donor country representative or finalized at donor headquarters or directly through a mission from the donor agency.

All countries in the sample have developed national strategic/master plans that set distinctive priorities for at least five to ten years. The strategic/master plans form the main framework for development cooperation. During negotiations a consensus is reached on objectives, the scale and the scope of the project and how decisions are to be made with regard to the project. How projects are managed becomes important in order to establish donor involvement. If they live their own lives or are well integrated into the national plans and recipient institutions. This includes also the level of involvement of expatriates and donor influence on monitoring and evaluation of projects.

The situation differs in respect of donor to donor. For USAID and most other bilateral donors the projects are systematically subcontracted to a university or a consortium of universities within the Title XII Framework or to an IARC. Examples of this are Cameroon with IITA, University of Maryland and University of Florida in Mali, University of Texas A&M in Senegal with MSU, CID with Oregon State University and likewise. France with CIRAD in Cameroon, and Madagascar, the German cooperation with GTZ in Cameroon and Ghana, The Netherlands with KIT in Ghana, Kenya and Mali and others. The list is long.

The World Bank on the other hand does not intervene in the management of the project as such, but sets strict guidelines for implementation. The projects are regularly monitored during the project life through supervision missions. UNDP projects were executed by FAO and autonomously managed. Generally a national coordinator is appointed to manage specific government counterpart contributions. The person is also the go-between with national authorities. For some donors a technical/scientific steering/planning committee is put into place to oversee project activities. It is fair to state that IDRC and CIBA-Geigy have a fairly liberal approach towards funding projects. There is for instance a reluctance in involving expatriates in project management, accounting and reporting procedures.

Despite the effort of training national scientists in most of the projects, scores of expatriate scientists were fielded. Given the mobility of these scientists it is difficult to gather concise data on their number and extent of involvement. Apart from some senior staff as team leaders most of the other staff are junior involved in post-graduate research and thus competing in some way with junior nationals for tutorship.

### 3.2.2 Length of projects

Most projects were long-term. Donors seem to respect the need for longevity in institution building projects. There is also a preponderance for implementing projects in several phases spanning four to five years each. Commitment could under such circumstances extend to 10 or 15 years. Donors might also be committed for longer periods. World Bank supported NARP projects usually have a time perspective of 15 years. Overall, 44 percent of the projects had a duration of more than 10 years and 42 percent being between five and ten years and only 14 percent less than five years duration.

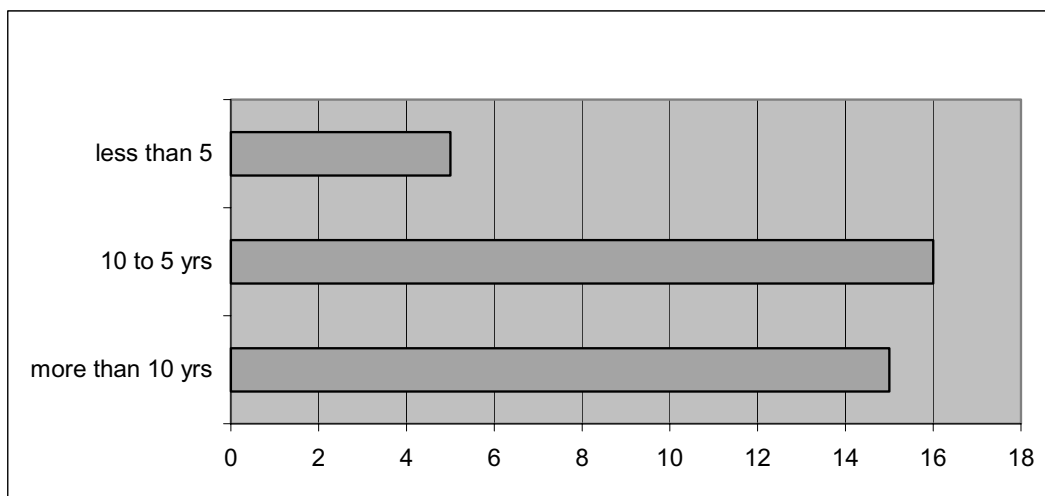


Figure 8. Length of projects

### 3.2.3 Priority focus for agricultural research assistance

Most projects focussed on institution building. This was particularly the case with the World Bank and USAID funded projects (for example, the NARP projects in Cameroon, Ghana, Kenya, Madagascar, Malawi, Mali and Senegal for the World Bank, and SPARC in Mali, NCRE in Cameroon, MARE in Malawi, SARP and SAR in Senegal for USAID).

Some projects had limited scale and scope and multipurpose objectives. The goal might be building research capacity to tackle a particular problem in an agro-ecological zone or research field (as in Cameroon, the French Garoua Research Station, ICRAF, the USAID/ROTREP, the German/GTZ Nyanakpala Station, the Ghana Grain Legume project of CIDA, the IDRC, Plantain development IDRC project, in Ghana, the Netherlands DRSPR and the CIBA-Geigy Cinzana Station in Mali, the USAID NRBAR, the IDRC Cereals and Post-Harvest Technology project, the UNDP/FAO ITA and UNDP/Belgium/FAO projects in Senegal).

Few projects had a sole adaptive orientation without institution building objectives (HPI/USAID in Cameroon, SG2000 in Ghana, and the FIFAMANOR of Norway and FAFIALA of Switzerland in Madagascar). One project in Cameroon focussed on educational institution building. This was supported by USAID.

### 3.2.4 Human resources development

Kenya had the biggest share (32 percent) of output of trained staff from the projects, commensurate with the dimension of its NARS. The figure relates, however, only to KARI. The second largest was Ghana (23 percent) and the third Cameroon (19 percent). Mali and Senegal had the same percentage (8 percent), although for a different number of projects, Madagascar (6 percent) and Malawi (4 percent) had less.

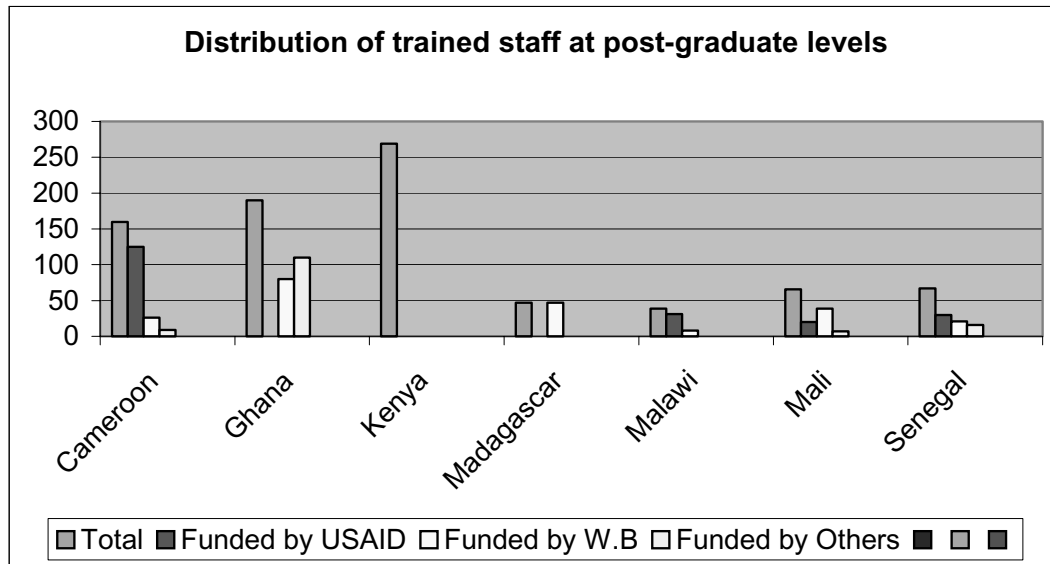


Figure 9. Distribution of trained staff at post-graduate level

Training high calibre staff is important for carrying out high-quality research, but equally important is to retain people through incentives (motivating scheme of service, a good reward and recognition systems, proper work environment and career development prospect, etc). In general, donors are not willing to take a strong stand on the need for incentives despite being aware of the importance of incentive structures. This is mostly because donors are not keen on interfering with civil service regulations.

Most donors provide incentives to involved staff in one form or another. This might often cause frustrations with other staff outside the project. The World Bank and USAID to a lesser extent include covenants for revision of staff service regulations and an organizational model more favourable to staff (Ghana, Senegal, Mali, Kenya and Madagascar). These efforts have not always been successful, such as in Malawi where the Government was adamant to keep the departmental model for DAR. The apparent effect was a high turn over of staff.

### 3.2.5 Infrastructure development and equipment

Most NARS need updating and renewal of infrastructure. Inherited facilities from the colonial period were in a poor condition. Donors were most willing to support NARS in this respect. The budgetary expenditure for this is not always available. Of the 36 projects, information was provided for half. Expenditures for equipment and infrastructure amounted on average to 28.3 percent of total donor contribution. Details are given in Table 10.

Country	Cameroon	Ghana	Kenya	Madagascar	Malawi	Mali	Senegal	Aver.
<b>All projects percent total donor assistance</b>	47	33	19	32	21	21	25	28.3
<b>NARP (WB alone/others)</b>	46	32.5	52	32	21	30	38	38

Table 10. Percentage of donor contributions to infrastructure and equipment

The figures are quite conservative as many facilities have been built from scratch and developed to full fledged research institutions. This has been the case with the Garoua Research Station supported by French cooperation, the Regional Centre for Bananas and Plantains, the University of Dschang by USAID in Cameroon as well as the Nyankpala Research Station upgraded to the Savannah Research Institute (SARI) in Ghana built with German assistance. KARI headquarters and other regional research centres in Kenya also come under this category. The Cinzana Research Station built by CIBA-Geigy, in Mali, the Kaolack Regional Research Centre and the headquarters of ISRA, built with the assistance of the World Bank and the Centre for Horticulture Development (CDH), built with the assistance of UNDP/Belgium/FAO, in Senegal must also be mentioned. Donors seem to have been most generous in providing funding for research infrastructure. Some might say too generous. One of the main donors in this respect has been the World Bank/IDA.

### 3.2.6 Recurrent and operational costs

A major constraint for NARS is the funding of operational and recurrent costs. Very often the national budget is barely sufficient to cater for payroll of staff. In order to achieve any project objectives, funding agencies are obliged to contribute or support recurrent and operational costs for research activities.

The data are seldom epitomized for recurrent and operational costs. Out of 36 projects information is only available for 10 although most projects state that non-salary related operational costs are paid for. Forty-eight percent of recurrent/operational costs came from donors for these 10 projects. NARP (National Agricultural Research Projects) stand out as the exception in this respect. NARP often have a national scope based on priorities set in a national strategic plan. The number of NARPs in the sample is, however, few. The projects are mostly funded solely by the World Bank or together with other donors. NARPs often provide adequate funding to cover operational and recurrent costs for priority programmes of NARS. Bilateral donors are much more restrictive in providing funding for these types of costs. Limited support for some activities as well as overhead charges for the recipient institution is also given. It is, therefore, not surprising that at the end of bilateral supported projects activities stop.

### 3.2.7 Total donor contribution to project costs

Information on total donor contribution is often difficult to get even if project and donor information is available. The amount of donor support is often given as rough estimates. Generally, governments contributed in a range of 15 to 60 percent of total project costs.

The size of the individual project is largely determined by the number of donors involved (multi-donor or single donor). Kenya had the largest projects. Other large projects are NARP projects in Senegal and Malawi (World Bank/USAID). Data on total donor contribution were available for 30 projects. The distribution of size is given in Figure 10 below. Most of the projects are between US\$10-50 million. A good proportion was around US\$20 million, particularly those funded only by the World Bank. A consortium of donors generally funded projects with a size of more than US\$20 million.

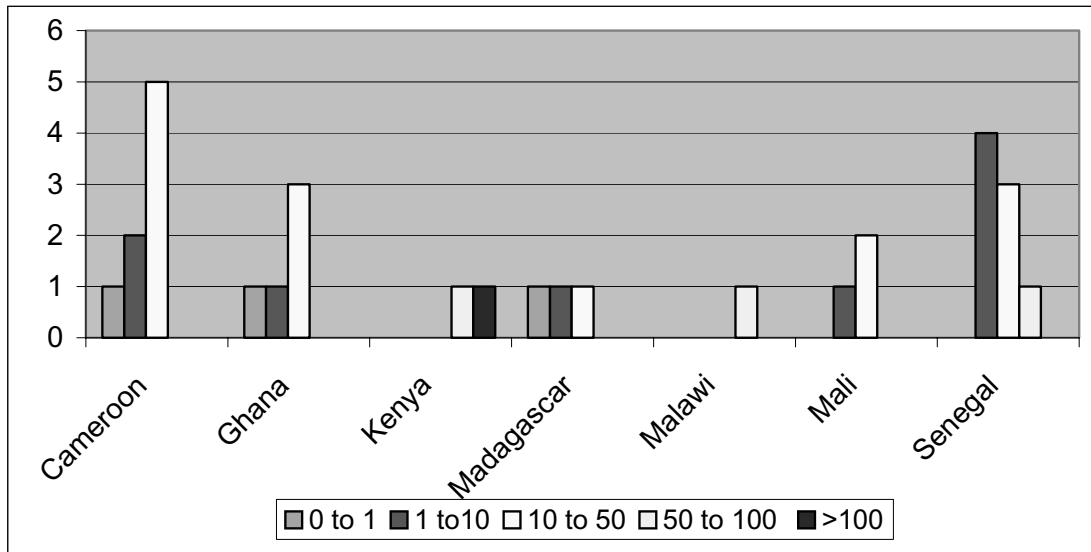


Figure 10. Distribution of size of projects (US\$ million)

## **CHAPTER 4. ASSESSMENT OF THE IMPACT OF FOREIGN ASSISTANCE ON THE INSTITUTIONAL DEVELOPMENT OF NARS**

### **4.1 Introduction**

The impact of foreign assistance on the institutional development of NARS was conducted by looking at a selected number of key indicators. The key indicators have been chosen to reflect key elements that are essential to any successful NARS. Each project has been analysed with respect to these indicators. Conclusions have been drawn at country level. Additional available information was also used to analyse the material. The selected key indicators are:

- quality of research management (policy, planning, organization);
- institutional stability;
- personnel stability;
- levels of budget and stability of funding;
- linkages with the World Knowledge System;
- size of the research institution/system;
- monitoring and evaluation.
- 

### **4.2 Quality of research management**

The quality of management was analysed based on the following elements of management: policy formulation, organization; monitoring and controlling; and evaluation.

#### 4.2.1 Policy formulation

It is often necessary to deal with policy formulation at the highest level of government. Government policy statements provide a vision for NARS. It indicates what is expected of NARS in contributing to agricultural and economic development. Research policy statements should usually also provide indication of the national resources committed to development of NARS now and in the future. NARS needs this in order to plan activities, determine size of operations and agro-ecological coverage. The project data do not provide a blueprint for how policy formulation shall be done. Each country seems to have adopted its own approach. Each country has, however, created an apex body for policy formulation, but it does not seem that these have always been able to fulfil their national role. How these bodies have functioned and been influenced by foreign assistance is presented in the following pages.

#### 4.2.2 Country by country evidence

*Cameroon* created a National Council for Applied Research (CNRSA) in 1962. The council was situated in the Office the President of the Republic. The intention of the council was to act as an apex body for research policy formulation. It is uncertain if it was able to fulfil this role. Later on ONAREST was somehow given the role of formulating and coordinating research policy. ONAREST took also direct management responsibilities for some national institutes later on. The succeeding institutions at government level, the DGRST, MESRES and MINREST did not have a clear-cut mandate. Therefore, there is at the present no explicit body defining government research policy within the country. The only nationwide and truly institution building project, the NARP, funded by the World Bank, ODA and GTZ did not tackle this issue. French cooperation that has existed since the colonial period did not demand an effective national policy formulating body.

*Ghana*, soon after independence, strove to streamline its agricultural research organization. It set up a body for policy guidance (CSIR). However, the CSIR, did not provide a lead in formulating agricultural research policies with clear linkages with national development objectives. The NARP funded by the World Bank was the only project that put this need as a major objective for its assistance to NARS. One of the five components of the project addressed this issue. The mid-term

review of the project, 1995, reported, “*the National Agricultural Research Committee (NARC) has been established as an apex body to formulate a national agricultural research policy and to determine agricultural research priorities at the macro-level. It played a key role in the formulation of the National Agricultural Research Strategic Plan (NARSP), a Technical Secretariat (TS), has been established to service the NARC*”. The adjustment was made as recommended by the mid-term review. The NARP was the only nationwide project that really addressed all aspects of NARS institution building/strengthening.

In Kenya, even before independence, the colonial power did formulate policy for agricultural research. The general policy on agricultural research after independence and recently has been presented in several sessional papers and strategic documents. The policies of agricultural research were a natural follow up on streamlining NARS, started in the colonial period and the collapse of the East Africa Community. Important sessional papers are *No.1 of 1986 on Economic Management for Renewed Growth* and of 1994 on *Recovery and Sustainable Development to the year 2000*; the *National Development Plans of 1989-1993 and 1994-1996*; the *National Council for Science and Technology Report on National Priority Areas* (No.30 of October 1989) and the *National Agricultural Research Strategy and Plan (1986)*. There has also been special policy framework papers, especially the one of 1995-1997. The Letter of Sectoral Policy devoted to the National Agricultural Research Project Phase II (NARP), was also quite explicit. It can therefore be stated that Kenya has had in place a framework and structure for policy guidance to NARS through the National Council for Science and Technology and its Sectoral Committees. It is difficult to ascertain if it was able to perform and carry out its mandate in a satisfactory manner. Moreover, individual NARS institutions formulated their own detailed policy. Publicly funded NARS institutions have benefited greatly from foreign assistance in policy formulation. KARI was assisted by ISNAR through World Bank funding; JICA and DFID also assisted KEFRI and KETRI in this area respectively. The two projects analysed have contributed to consolidate and further improve and institutionalize policy formulation at the institution level.

In Madagascar, before independence and later on until 1974, the French institutes responsible for carrying out research were not interested in formulating any national agricultural research policy. They seem to prefer to maintain status quo. This involved basically promoting export of agricultural crops. In 1974 with the nationalization of the French research institutes and the creation of FOFIFA and other national research centres, the Government took the first decision to streamline NARS. An interministerial committee on technical and scientific research was created simultaneously with the creation of FOFIFA. Their mandate was to: deliberate on the general research policy, approve research programmes of the parastatal research institutions, and decide on the levels of resources to be provided by the Government as well as allocation of resources. At the same time a unique research institution FOFIFA was created with the mandate to formulate the national research policy on rural development in addition to defining, orientating, promoting, coordinating and controlling all research activities. The FOFIFA was mandated to present the national research policy for rural development, the budgets of the centre and the national and international agreements to the interministerial committee on technical and scientific research. Government reshuffling and other political changes led to the establishment of the Ministry in charge of scientific and technical research as the apex policy formulation body for Government with FOFIFA under its responsibility. Foreign assistance had little influence on this organizational set-up. However, during phases one and two of ATIA, ISNAR with World Bank funding helped FOFIFA to fine tune its organization and policy to be responsive to national agricultural development objectives and to farmers’ needs. As a result FOFIFA prepared a national agricultural research master plan with a 15-year time horizon. The master plan led later on to development of the NARP project. The projects funded by the World Bank have contributed in consolidating, improving and institutionalizing policy formulation in the country.

Malawi had prior to independence and after, no clear-cut agricultural research policy. However, government policy was spelt out in the Statement of Development Policies (1987-1996) and Agricultural and Livestock Development Strategy and Action Plan (1994). With the assistance of donors and particularly the NARP project funded by World Bank/IDA, a streamlining process of NARS has been put into place with policy formulating bodies. The Agricultural Research Council of

Malawi (ARCM) was established as early as 1967 only to be abolished in 1975. It was re-instituted in 1985 at the recommendation of the World Bank/IDA through the NARP project. The council has the following functions:

- to ensure that the agricultural research strategy is consistent with the national development goals;
- to outline an agricultural research policy that is compatible with and supportive of national goals;
- to approve annual research programmes and projects for implementation by DAR;
- to consider and recommend contract research proposals, including the level of funding;
- to recommend the appropriate level of expenditure in agricultural research, with the target of eventually investing at least one percent of the annual value of the agricultural gross domestic product;
- to prepare the agricultural research master plan, which allocates priorities according to national goals.

The ARC is made up of a cross-section of experienced persons in the public and private sector who have varying perspectives of the nation's economic and fiscal policies and agricultural development goals. The various NARS institutions are coordinated nationally by the Ministry of Research and Environmental Affairs (MOREA). The ARC was supposed to function differently from the Malawi National Research Council (NRC). NCR's main objective is to organize external financing for individual research projects in several sectors with the view of avoiding duplication and seeking to coordinate research efforts.

An effort to install proper policy formulating bodies was made with foreign assistance. However, available information does not provide a clear-cut answer if they were able to carry out their work effectively. The Completion Report of NARP cited above indicated: *"the effectiveness of ARC was severely compromised by several factors. Its creation by internal memorandum, established ARC as an internal committee, without legal standing and little status. Meetings were ill attended and held irregularly because of competing claims on members' time. The Treasury did not fund ARC's approved programme and budget recommendations fully but, instead, cut them quite severely. These weaknesses were recognized and changes proposed, but they were not put into effect under the project. The ARC has been helpful to DAR in the provision of policy advice, development of the master plan and identifying strategic research issues."* Recently, the Government has revitalized an Agricultural Sciences Committee under the National Research Council of Malawi, to coordinate agricultural research carried out by both government departments and private institutes. The responsibilities also include providing small research grants to deserving scientists upon application. Whether the semi-public and private components of NARS were better off in terms of policy guidance under their own governing bodies is not clear.

When *Mali* gained independence in 1960 it sought to organize and streamline its own agricultural research system. IER, which is the backbone of NARS, was organized under the Ministry of Agriculture, which determined its policy orientation. Soon, however a policy formulation organ for NARS was in place (the CNRA). The CNRA included all public stakeholders. NARC/CNRA was reformed in 1993 within the NARP covenants, based on the experience of the body over the last three decades. The new CNRA has the mandate to formulate agricultural research policy and strategy. It decides on research priorities and it reviews and approves research programmes and budgets. It also reviews research results and decides on their diffusion, monitors the use of resources and establishes linkages between research and external research organizations as well as within the country, with development agencies.

The role of the CNRST (under the Ministry of Education) in policy formulation is not clearly defined. The relation with the NARC/CNRA does not stand out clearly either. Foreign assistance has supported and contributed to strengthening agricultural research in Mali. However, how the new NARC/CNRA, whose role has been expanded, is discharging its function is not clear-cut from the information available.



*Senegal* inherited, after independence, a large network of research infrastructure. The network was designed by the colonial power focussing on a federal level beyond fulfilling national needs. The Government adopted a careful stepwise approach in streamlining its research system and signed a bilateral agreement with France. Under the agreement, French research institutes managed the various research institutions under policy guidance of Government. As early as 1966 the Government set up an apex body for national science policy, which has undergone many alterations. It originally started as the Scientific and Technical Affairs Bureau in 1966 under the aegis of the Office of the Head of State. Later on it developed into the Scientific and Technical Delegation in 1992 and is now termed the Directorate of Scientific Affairs placed under the Ministry of Education in 2001. Throughout, the Interministerial Council for Scientific and Technical Research (CIRST), established in 1966, has been the body responsible for defining scientific policy. Major decisions are mainly made in its annual meetings (prepared by the lead agency backed up by the standing advisory committees). The Interministerial Council for Scientific and Technological Research meets every year under the chairpersonship of the Head of State. It deliberates on research priorities identified by standing sectoral committees. Moreover, the quinquennial Economic and Social Development Plan that defines the overall development policy also provides guidance on agricultural research policy and priorities. Within the cycle of sectoral adjustment programmes the country has gone through, the agriculture sector has issued several policy statements in which agricultural research policy and priorities are spelt out. However, these bodies are designed only to provide a general framework and not the detailed policy as needed by each institution. These are formulated under the supervision of individual governing bodies. For ISRA the backbone of NARS, the board of directors is mandated to provide, *inter alia*, strategic orientations on medium- and long-term research policy of the institute and monitor their implementation.

#### 4.2.3 Planning

Once a policy is formulated, the next step is to formulate a strategy for its implementation. The usual practice is to prepare a plan that identifies and prioritizes research needs. In the francophone countries, planning of the national economy is a routine exercise. This is more seldom in the anglophone countries. How planning of agricultural research has been implemented and influenced by foreign assistance is described below.

In *Cameroon*, economic planning at national level was almost a routine exercise every five years. Each sector contributed to the exercise. Agricultural research was no exception in this respect. However, no separate agricultural research plan was made. So far annual planning or programming was the only exercise the research institutions went through. This was not always carried out with extension services and farmers. ISNAR in 1988 recommended in its review of IRA and IRZV that: "MESRES/IRA/IRZV, in consultation with other concerned parties, prepare a 15-20 year strategic plan for organizing agricultural research by agro-ecological zone, rationalizing research infrastructure within zones and over time developing this infrastructure for future needs as staff and funds permit without reintroducing undesirable dispersion". The World Bank picked up this recommendation and included it among the covenants of the agreement for the NARP. It was also included in the preparation of a National Agricultural Research Programme (NARP) which was supposed to be a sort of medium-term plan for IRA and IRZV. DRST was given responsibility for coordinating the exercise, which was intended to be institutionalized later on. Finally, the completion implementation report of the project prepared by the FAO Investment Centre for the World Bank in 1993 indicated that the programming system made good progress in IRZV thanks to the technical assistance of GTZ that was provided within the project. No progress was, on the contrary, made in IRA.

To summarize, none of the projects reviewed with the exception of the NARP World Bank led project addressed the urgent need for an overall strategic plan for NARS. Each project, however, managed to have some sort of annual programming for its own activities. A long-term strategic plan and subsequently a medium-term plan were prepared in 1994/1995/1996 with the assistance of FAO and other donors (particularly the World Bank). These strategic plans have streamlined the system,

downsized activities in accordance with the foreseeable resources of the country and subsequently led to the creation of IRAD.

In *Ghana*, the logical process as outlined in Cameroon did not take place. No committee or particular body was made responsible for defining research priorities or was given the authority to allocate resources to particular research proposals. The lack of a functioning mechanism for setting priorities with the authority to allocate financial resources was reflected by the dispersed nature of the research effort. The situation was clearly unsatisfactory and formed a major constraint to effective operation of the national agricultural research system. The only project that addressed this important constraint was the NARP World Bank funded project. The National Agricultural Research Strategic Plan (NARSP) was published in 1994 together with a medium-term action plan. NARSP for the first time is a true NARS plan with involvement of all stakeholders. The NARP project also made funds available for NARS parties to participate in the implementation of priority programmes/projects outlined in the plan. NARSP also constituted the framework of priority programmes for other donors' assistance. The Plantain Development Project funded by IDRC was picked up from the priority programmes included in NARSP. The other projects included in this review implemented during the same period, did not participate in the NARP exercise or address this aspect in this assistance. The only exception was planning of its own activities for the achievement of the project's objectives.

*Kenya's* NARS institutions, such as KARI, KEFRI and KETRI have equally benefited from donor assistance in planning. NARP I and II were formulated with the assistance of donor community that later on supported the implementation. KARI's latest document on "Research Priorities to the Year 2000" benefited greatly from ISNAR assistance through World Bank funding; a workshop on principles and methodologies of priority setting was conducted which enabled the various KARI officers of the task force to come up with the above-mentioned document.

Similarly KETRI's Strategic Plan for 1990-2000 had not only the input of local scientists but also members of various external reviews, which the institution has undergone, and from the United Kingdom's DFID. For KETRI both the first workshop on setting forestry research priorities in Kenya in 1989 up to the year 2000 and the second workshop in 1997 to evaluate the progress made in the implementation of the recommendation of 1989 workshop, received financial and technical assistance from JICA.

However, all components of NARS do not have strategic plans and there is no formal National Strategic Plan derived from priority setting at national level. This is a definite weakness, because such an exercise would allow three crucial investment decisions:

- what investment should be made in agricultural research versus other policy tools for agriculture sector development?
- within agricultural research, how should funds be allocated across different components of the research system based on comparative advantages and mandates?
- national agricultural research priorities in place would constitute the framework for cooperation with development partners and would make it easier to coordinate donor assistance.
- 

In Kenya, it is usual for broad public-sector investment decisions to be made on the basis of national development objectives. These will often involve issues such as increased rural welfare, poverty alleviation, and export growth and food security. Formal analysis is rarely used to justify these decisions. It is therefore no revelation that the implementation of the national development plans does imply changes in overall development priorities.

In *Madagascar*, FOFIFA and to a lesser extent ESSA have benefited from donor assistance in planning research. As mentioned earlier, FOFIFA has prepared a master plan with the assistance of ISNAR. The master plan was funded by the World Bank with the condition (and recommendation by ISNAR) that organizational reforms, preparation of a research strategy and resources for its formulation be adhered to. Later on, the master plan was complemented with a Human Resources

Development Master Plan, under recommendation and funding by the World Bank. Other institutions are also reported to have developed planning tools with the help of foreign assistance.

For *Malawi*, the ARC prepared a research master plan in the early years of the NARP project. It was extensively revised during the NARP project and has provided strategic guidance for prioritizing research. The preparation and updating of the master plan has become a routine exercise for the ARC. Foreign assistance has been instrumental for this to happen.

In *Mali*, the NARC, since its reform of 1993, has had the responsibility for the preparation, regular review and updating of the National Strategic Plan for Agricultural Research. External programme evaluations, every three years, are part of the inputs for the strategic planning exercise. The strategic plan provides broad guidelines and only identifies research themes, their priorities for the long-term and the resources required.

In *Senegal*, the quinquennial planning for economic and social development is a routine exercise and agricultural research is part of it. As mentioned above, within a general policy framework each institution under its own governing body formulates a detailed policy and an implementation mechanism. ISRA has since its inception accumulated experience in planning. Its first strategic plan was prepared in 1979, the second in 1989 and the third in 1995 for respectively the periods of 1980-1985, 1990-1995 and 1998-2003. The methodology has been fine-tuned over time with better involvement of all the stakeholders. Farmer organizations have in particular been better represented. The board and the STC played an important role in this process. Priorities are determined within the general framework of the government development policy and developed bottom-up in an iterative way, from identified constraints.

In conclusion: planning is a routine exercise in many countries. It is, however, not an end in itself, the most important is the basis for the formulation of the plan and the realistic commitment of Government to provide, in a sustained manner, the resources for its implementation.

#### 4.2.4 Organization

Organizing the implementation of an agricultural research plan is an important next step. Tables 4, 5 and 6 summarize the organizational model of the backbone NARIs of NARS of the seven selected countries. What has been the impact of foreign assistance in the process is analysed below.

In *Cameroon*, none of the projects reviewed was concerned with the organization and streamlining of NARS or its major components IRA and IRZV. In 1974, the Government started organizing the research system. Before the reorganization had taken place, the affluence provided by oil revenues changed things. The organizational structure that existed in 1979 did not change until 1996.

The study review shows that each donor has added more or less a new unit within its own project. NCRE has expanded the infrastructure of IRA and has added testing and liaison units (TLU) with extension. The Garoua project added a new centre. The NARP/PRAN added the centre of Foubot and two substations at Minkomeyos and Mbonda for IRA. A new commodity centre for regional purposes for bananas and plantains was created. Cameroon in the end solely supported it. Finally the network of centres, stations and substations of IRA and IRZV was 69 in 1994. Most of the reviews, particularly those of ISNAR recognized that the organization of agricultural research well covered the major agro-ecological zones. It was also recognized that the existence of IRA and IRZV in the same sites in these zones duplicated infrastructure. Many identified weaknesses were not promptly rectified. None of the donors or reviewers recommended a merger of the two institutions for the sake of efficiency and effectiveness of research and for reducing costs. The drastic reorganization first took place in 1995/1996 when the whole system was about to collapse and within the strategic planning referred to above. This led to the creation of IRAD.

The Agricultural Research System in *Ghana* is quite complex. The main components are, however, well identified. NARS is dominated by the CSIR. CSIR has under its umbrella 12 institutes. Eight of these are agricultural or agriculturally related. A director-general with executive functions heads the CSIR. A 26-member council assists him. Five technical committees make up the secretariat. The subcommittees of the council oversee and deliberate on specific areas of their competence such as agriculture, forestry and fisheries, etc. Each of the institutes is semi-autonomous and is headed by a director assisted by his own management board. Directors of different institutes meet monthly at the directors' management committee chaired by the director-general. The CSIR Council appoints the members of the management boards of the institutes. The other components of NARS include, the faculties of agriculture of the three universities of the country, the technical departments of the MOFA, commodity, corporations and commissions and to a lesser extent development programmes.

Analysis of the existing structure, has shown that in terms of determination of priorities and allocation of resources, programme formulation, budgeting and management, the organization was not effective and efficient in discharging the mandate of NARS. NARP has therefore addressed the issue. Under the implementation of NARP, each of the seventeen national commodity and factor research programmes had national coordinating committees, comprising the leading scientists in the field in addition to a national coordinating institute and a national coordinator. Programme budgeting has been introduced for carrying out these commodity and factor research programmes. The technical secretariat, established under the CSIR, coordinates the review of research proposals, their funding and quality assurance. So far, three of the seven agricultural research institutes have been subjected to an external review.

To summarize, as stated by the completion report of the NARP project "a reasonably working agricultural research system has been established, forging multi-disciplinary and multi-institutional collaboration by researchers in the national agricultural research institutes, the universities, the Ministry of Food and Agriculture and the private sector. The national agricultural research strategic plan, has been prepared using criteria reflecting the agricultural development priorities of Ghana."

The *Kenyan* NARS, has been well streamlined and consolidated into few publicly funded research institutions. KARI dominates NARS. The organizational structure is as follows. In the case of the publicly funded components of NARS, their management structure is built around three major bodies: *the board of management, the executive (directorate) and the network of research centres*. The boards are responsible for policy-making. They also ensure that they remain the apex organizations responsible for Kenya's agricultural research through development and application of science and technology. The board normally has two committees, namely: Finance and Administration and Research and Technical.

The Kenya Agricultural Research Institute, is managed by a board of management comprising twelve *ex-officio* members representing relevant government offices, and seven members appointed by the MRTTT (one of whom is the chairperson) that represent researchers, members of the academic community, agri-business, organizations/parastatals and farmers. KARI comprises a headquarters secretariat that provides coordination of implementation through technical and administrative operations. The day-to-day management of the institute is the responsibility of the director-general of KARI. A director of research and a director of administration assists him. Under the director of research there is an assistant director for crops, an assistant director for livestock and five other assistant directors for disciplinary research areas who provide technical oversight.

A board of directors, on which farmers, the Coffee Board of Kenya, KARI and the Ministry of Agriculture are represented, governs the Coffee Research Foundation (CRF). The day-to-day management of CRF is delegated to the director of research who is assisted by a deputy-director of research. The Tea Research Foundation of Kenya (TRFK) is managed by a board of directors, on which are represented the Tea Board of Kenya, the Ministry of Agriculture, the Kenya Tea Development Authority, Kenya Tea Growers' Association and KARI. The Tea of Kenya supports TRFK. Its day-to-day management is delegated to the director who is assisted by a deputy-director.

The faculties of agriculture and other faculties carrying out research activities pertaining to the rural sector of the Kenyan universities and operate under their organizational structure.

The two projects under review have contributed a lot to improving the organizational structure and in setting research priorities.

NARS of *Madagascar* is relatively consolidated. The FOFIFA is the dominant component of NARS accounting for 80 percent of the potential agricultural research capacity of the country. The other publicly funded agricultural research institutions are much smaller and less structured as FOFIFA. The decision-making body of FOFIFA is the board of management. The board of management is made up of the Office of the Director-General, directors of the supervising ministries (MRS, Ministry of Finance, Ministry of Budget, Ministry of Planning) and representatives of the technical ministries in charge of agriculture, livestock, and forestry. It decides on the allocation of all resources to FOFIFA. The board is assisted by an orientation scientific committee composed of the department heads of FOFIFA, the heads of regional centres and representatives of the supervising ministry (MRS) and of technical ministries. Three independent scientists of international repute or other resource persons are added as representatives of the development community. The mandate of this committee is to deliberate on priority research programmes, to formulate priority options and validate the research proposals of FOFIFA. The funding of the Agricultural Research Committee (COFIRA) is composed of the different donors and the management of FOFIFA with the mandate of deliberating on the funding of research programmes.

The director-general assumes responsibility for the day-to-day management of the institution. The director of administration and finance, the scientific director and the director of support services assist him. The scientific department heads report to the scientific director while the chiefs of the regional centres report to the director of support services. Initially FOFIFA included four research departments: agronomic research; livestock and veterinary research; forestry and inland fisheries research; and technological research. A research and development/farming system research department was added in 1984, while the rice research department was separated from the agronomic department in 1989. However, the mandate of FOFIFA has remained unchanged since 1974. FOFIFA has a network of eight regional centres, nine stations and seven substations covering the various agro-ecological zones of the country; in total 24 locations against the previous 31 and the proposed 17 of the master plan. The other public research institutions besides FOFIFA have a semi-autonomous status while the ESSA and the organizations of the universities operate under their organizational structure.

Initially FOFIFA was compartmentalized with little collaboration among departments and a concentration of staff in the capital city of Antananarivo. More than 70 percent of scientific staff was located in the capital. Donor assistance has been instrumental in decentralizing activities and the setting up of regional research centres with some financial management autonomy and with the deployment of scientific staff to RRC (56 against 27 at the start of NARP). The system is now effective, decentralized, nearer to its clients and more responsive to their needs. It is based in a network of regional centres, equipped with adequate physical facilities and staffed with core teams of researchers. Furthermore, donor coordination by the Government was also improved.

NARS of *Malawi*, is quite fragmented and organized under the ministerial departmental model, as there are many ministries dealing with rural development and many departments having research activities. The organizational structure of DAR, the backbone of NARS is as follows. The department of agricultural research and technical services programmes are organized into seven commodity groups each headed by a national research coordinator (NRC) and within each commodity group there are multi-disciplinary commodity teams each headed by a commodity team leader (CTL). Research funds are allocated to NRCs while the administration officers-in-charge of stations is allocated funds for administration. However, the accountable officer is the station's officer-in-charge. Since the reorganization exercise in 1985, allocation of research resources in the National Agricultural Research System relates to the nationally important commodities. It is also focussed on improving the quality and quantity of the output from the research system. Under the new system, a sharper focus is

placed on the management of multi-disciplinary commodity research programmes, the plant protection and technical services.

DAR has, after the reorganization under the NARP in 1985, streamlined its network into three research stations, five experimental stations and nine substations, covering the three agro-ecological zones of the country and in total 17 locations. Basically, the new organizational structure is coordinated nationally and is using a multi-disciplinary team approach to research. Technically, the CTL is responsible to the NRC who in turn is responsible to the two deputy directors, one deputy for research programmes and the other for technical services and administration based at the headquarters within the Ministry of Agriculture and Irrigation Building. NARS operates within a set of guidelines and realities of the national budget. The responsibility of guiding NARS is vested in the ARC whose mandate and effectiveness has been discussed in the previous section. TRIM, FRIM and SUCOMA have their own organizational structure.

NARS of *Mali* is relatively consolidated and is prominently dominated by IER. Its organization set up has been decentralized and reduced. From 32 experiment stations and permanent research sites, the network has been reduced to six regional agricultural research centres (CRRA), nine research stations, 14 substations and four central laboratories, covering the whole agro-ecological zone of the country. Furthermore, within the NARP project the legal statute of IER has been changed from a ministerial departmental model structure to a public semi-autonomous organization with a board of directors. The board of directors of IER which consists of nine voting members including the President, the Minister for Rural Development, provides the management oversight with the following specific functions:

- monitoring the implementation of NARC's decisions affecting IER;
- proposing the appointment of the director-general and defining his/her mandate;
- appointing the scientific director, the director of the technical support services, and the six regional centre directors upon recommendation of the director-general;
- deciding on management policy by adopting the management operation manuals and deciding on their modification upon recommendation of the director-general; and
- approving the annual budget and financing plan, verifying implementation of audit recommendations and approving the annual accounts.

There are two mandatory meetings of the board each year: one before the end of the fiscal year and following NARC's meeting of November to approve the budget and financing plan and the other following the annual audit to formally approve IER's accounts. The other components of NARS operate under their own organizational structure.

NARS of *Senegal* has been rather well consolidated since the creation of ISRA in 1975 concentrating all research pertaining to the rural development with the exception of food technology research vested in ITA. The two institutes represent about 99 percent of NARS research capacity. ISRA is the dominant component of NARS as mentioned earlier. It had semi-autonomous status already on its creation. However, its status has changed recently into the public scientific and technological institution more appropriate for a research institute. The governing bodies have not changed and encompass the board of directors, the scientific and technical committee (CST), steering committee and the office of the director-general. *The board of directors* of ISRA consists of 18 members, among them 12 have voting rights, six have consultative status including the director-general an *ex-officio* member assuming the secretariat of the board. The board members appoint among them a chairperson and vice-chairperson. In general the 12 members of the board are heads of departments of the various subsectors of rural development (agriculture, animal production, fisheries, forestry), representatives of the Ministry of Finance, the Prime Minister and two representatives of professional organizations of rural development and agro-industry, etc. The board provides the management oversight with *inter alia* the following specific functions:

- provides strategic orientations on medium- and long-term research policy of the institute and monitors their implementation;
- approves research programmes both annual and multi-annual;

- approves annual budgets and the financing plan, verifies implementation of audit recommendations and approves the annual audited accounts;
- approves the annual activity report of the institute.

The board meets at least three times a year at the convocation of the chairperson. ISRA has a network of four national research centres, seven regional research centres, 10 research stations and around 20 experimental sites covering all the agro-ecological zones of the country. *The steering committee* is a subsidiary body of the board that deliberates between sessions of the board on matters delegated to it by the board. It is chaired by the board chair and is composed of the representatives of the two supervisory ministries (Agriculture and Finance), the vice-chair and three other board members elected by their colleagues, the director is an *ex-officio member* with consultative status and secretary of the committee. *The Scientific and Technical Committee (STC)* is a consultative body of the board with specifically the following functions:

- advises the board on scientific and technological orientations of the institute as well as on the research programmes, the recruitment and training of the scientific staff. It also advises on the transfer, production and communication activities;
- advises on the rules and procedures for the evaluation of the activities, of the structures and the scientific personnel. Examines all evaluation reports and makes recommendations to the board;
- organizes, draws up the terms of reference and supervises the evaluation missions on the research activities and the research staff and advises on the common principles of evaluation; it is also responsible for taking any appropriate initiative in its field of competence, to guarantee the quality of research activities in view of conferring the scientific integrity and needed credibility of the institute and reports to the board.

The STC is composed of national and foreign scientists competent in the fields of activities of ISRA. The Ministry appoints them to their position based on their personal competence. It elects a chairperson. The STC meets at least once a year in ordinary session and as necessary on extraordinary sessions. The STC can set up *ad hoc subcommittees*. The director-general assumes the secretary of the STC.

### 4.3 Improvement of institutional stability

Annex 2 gives an historical overview of NARS. The overview shows that research institutions have changed organizational structure many times. As in many segments of society, the research institutions must also evolve over time to adjust to their environment and for agricultural research institutions in particular to adjust to the needs of their stakeholders. However, frequent changes and reorganization may be disruptive and this is why it is useful to look at the institutional instability and how it has been influenced by foreign assistance.

In *Cameroon*, during the period 1960 to 1974, the Government tried to take over the system from the French. They started carefully with policy formulation and coordination. From 1974 onward, many changes occurred until 1991. The period corresponded with the setting up of IRA and IRZV, which became two truly national research institutions. These two institutions also dominated NARS. The organization has been streamlined at each step. The most recent change occurred in 1996 with the merger of IRA and IRZV into one institute IRAD. The projects under review did not have a major influence on this organizational process. The NARP/PRAN project might have had a slight influence. Donors who wanted to reduce costs due to the financial crisis that had affected the country since 1986/1987 triggered the creation of IRAD.

Since independence the Government of *Ghana* has striven to streamline NARS. NARS is dominated by the CSIR with its 12 to 13 research institutes. Seven to eight of these deal entirely or partly with agricultural research. The foreign supported projects that had institutional strengthening at its core were integrated in the existing structure (Nyankpala Experimental Station, The Ghana Grain Legumes Development, Plantain Development), namely the CRI of the CSIR. The Nyankpala Station,

given its dimension at the end of the project became a fully-fledged institute, named the Savannah Research Institute (SARI). This corrected an imbalance of NARS coverage of agro-ecological zones in the country. Furthermore, the network of research stations has been drastically reduced from 30 to eight national stations run by the institutes, complemented by six regional research stations to be run by the MOFA. Foreign assistance can therefore not be said to have detrimentally influenced the stability of NARS in Ghana.

For *Kenya*, the Government worked consistently on streamlining the research system. Now NARS are composed of a limited publicly funded research institution dominated by KARI that results from the consolidation into one institution of all the previous research organizations and projects dealing with publicly funded agricultural research with the exception of forestry and fisheries. The projects under review contributed to this consolidation. They have assisted in reducing the network of research centres and stations to a manageable size and at the same time in covering all agro-ecological zones. Therefore, foreign assistance has not detrimentally influenced the stability of NARS.

In *Madagascar*, NARS is dominated by FOFIFA under the aegis of the Ministry of Scientific Research that controls all public applied research institutions of the country. However, this has not prevented some institutional reshuffling. FOFIFA has been restructured five times since its creation and three times during donor assistance. The restructuring process under way has improved its effectiveness. The other institutions have been relatively stable. It cannot be stated that donor intervention has had a detrimental impact on the stability of NARS in Madagascar.

In *Malawi*, the research division of the Department of Agriculture already existing in 1964, evolved eventually into the Department of Agricultural Research (DAR). Research was organized on a project basis, by crop, livestock or discipline and was carried out in a network of 11 main stations, nine substations and 220 trial sites scattered throughout the country. In 1985 within the NARP, DAR was reorganized as mentioned above and the network of stations was reduced to three main stations, five experimental stations and nine substations. One new trial site was constructed in the north at Mkondezi, an otherwise unrepresented eco-agricultural zone, for research on tropical fruits and roots/tubers. Great care was taken to ensure that this consolidated network represents all of Malawi's arable ecological zones and that research services are available regionally. It can be stated that donor intervention has been instrumental in streamlining the research system and stabilizing its current structure.

*Mali*, was the first francophone country to create its own national research institution immediately after independence. Since then NARS did not evolve much except for a split of the Ministry of Agriculture into two ministries in 1981. The split was instrumental in creating a new institute, away from IER, under the aegis of the new ministry of livestock and forestry. In 1990 a new IER was constituted from the merger of IER and INRZFH, following several mission reviews and appraisal of NARS. This was followed a step further with the preparation of a long-term master plan submitted subsequently for funding to the World Bank. NARS is mainly composed, besides the apex body for policy formulation and management (the NARC/CNRA), of the IER that dominates the whole agricultural research system. The network of research facilities has been downsized and streamlined in the period under review with the assistance of donors. Donors have for instance built the station of Cinzana from scratch (mainly by the CIBA-GEIGY). Foundation for an otherwise not covered agro-ecological zone. It can, therefore, be stated that donors have contributed positively in streamlining and stabilizing the whole system.

In *Senegal*, ISRA was stable up until the mid-1980s when it became over-sized as a result of huge infrastructural investments made through two World Bank/IDA projects (PRA I and II). During this period and later, the institutional-capacity building effort has been hampered by a relative rapid and continuous turnover of senior management, particularly at the director-general level. ISRA has had, in 26 years of existence, eight director-generals. The average tenure duration was 3.25 years. Moreover, each director-general has brought a new deputy or director of research. Rapid turnover has meant that the institution has gone from one strategic plan to another as each director-general attempted to set his stamp on the evolution of the institution.



This institutional instability at management level was also observed at ITA especially at the start (1965 to 1968). The director changed four times at a crucial time at its beginning when stability was essential. Later on things improved and from then to 2001 the management staff has remained almost unaltered.

Although in terms of NARS components, some stability was noted as no major new institution was added. Within ISRA, the backbone of NARS, besides the management changes indicated above, new stations and centres were added (Kaolack Centre, Tambacounda Centre, CDH, Fanaye Station, etc.) The number of scientific departments increased from seven at the creation of ISRA to twelve in the mid-1980s. The institutional organizational chart changed significantly at least four times from 1981 to 1995. A recent evaluation report of USAID assistance to ISRA, July 1998, indicated “the leadership changes seem to have moved USAID support increasingly away from the capacity building support to ISRA”.

Overall, although some good practices in terms of research programming, planning, financial and personnel management have been introduced, the institutional growth quickly outstripped ISRA’s internal administrative capacity to manage its expansion and was soon judged not sustainable.

Foreign assistance has played a major role in this situation by indiscriminately providing huge infrastructure beyond the capacity of the recipient country to operate and maintain.

#### **4.4 Personnel stability**

As already shown, many governments made major strides to develop the human resource base. Human resources form a key element in institutional development of all research institutions. Equally important, however, is how one should motivate and inspire staff in order to retain them. This question along with how foreign assistance has contributed to stabilize the research personnel in NARS institutions, is dealt with in this section. Analysis of the project reveals large differences from one country to another.

In *Cameroon*, the staff of the agricultural research system (constituted by IRA and IRZV) increased tremendously in the two decades following independence. The most striking change occurred with regard to scientific staff. The number of national research scientists in 1974-1975 was 44. Already in 1980-1981 this had increased to 68 implying a 54 percent increase in six to seven years. During the period 1984-1985 to 1988-1989, the number of national scientists rose from 137 to 246 representing an 80 percent increase in five years or a 16 percent increase per year. A sinusoidal pattern appeared from 1989-1990 to 1993-1994 giving a total number of research scientists of 227 (IRA and IRZV). This represented a decrease of 8 percent in six years, which cannot be considered as high.

The major increase in number of scientists (average 9.6 percent per year) throughout a fifteen year period cannot be explained by the need for replacing expatriates. The average decrease in the number of expatriates was about 5 percent in the period from 1984 to 1994. Other staff categories did not experience the same increase. The number of technicians remained fairly stable which maintains the non-favourable technician/researcher ratio. In 1993 the distribution of staff categories was as follows: researchers 9.9 percent, technicians 10.2 percent, administrative staff 5.2 percent and the support staff 71.5 percent. The introduction of a more attractive service scheme in 1980 encompassing additional allowances attracted and maintained staff in the institutes. Furthermore, the economic prosperity provided a favourable research environment and working conditions during this period. From 1986 and to the start of the economic crisis around 1994 the situation changed. The suspension of government contributions curtailed funding for operational and running expenditures as well as causing delays in payment of salaries.

The projects also experienced an increase in staffing. During the crisis period 1986 to 1993 they constituted islands of affluence within the whole system, as only scientists working in projects

had the resources to do their work. This situation was frustrating for the other scientists and introduced some element of instability in the whole system.

For *Ghana*, the situation appears different. Scientific research staff increased annually at about 4.2 percent (1961 to 1990). This is slower than the 6.8 percent average of sub-Saharan Africa (1961 and 1985). The share of expatriate agricultural researchers was only 35 percent in 1961-1965, modest by African standards at the time. Since the 1970s the share has remained at less than 10 percent. The foreign assisted projects have increased the quality of the human resources through intensive post-graduate training programmes. This was particularly the case with the NARP project, the Nyankpala project and the GGDP. Short in-country courses were arranged for scientists and technicians. Some were also given the opportunity for short courses abroad.

A CSIR/ISNAR review in 1989 showed a very high attrition of staff from the CSIR institutes over the previous decade with rates ranging from 12 to 60 percent. NARS is in a sense reconstituting after this decade of loss. Many scientists left the country mainly to escape the hardship of the economic crisis, which had a major de-motivating effect on agricultural research. The sign of the return of researchers is an indication of an improved economy and foreign assistance to agricultural research. A Human Development Resource Plan was developed along with NARSP/MTAP. However, the conditions of service are poor. Promotion criteria have recently been reviewed. Greater recognition is now given to work that may not directly lead to research publications, but that makes an important contribution to solving farmers' problems.

In *Kenya*, scientific research staff grew rapidly at an annual rate of around 12.5 percent from 1961-1965 to 1971-1975. It slowed down in 1976-1980 to an annual growth rate of 2.4 percent. This again increased to 6 percent in 1981-1985. For the whole period the growth of the research personnel was estimated to be about 7 percent of full time researcher equivalent. This is equivalent to the average of sub-Saharan Africa between 1961 and 1985, which was 6.8 percent. As regards expatriate researchers, it took until the mid-1970s before the number actually began to decline. Currently less than 10 percent of the research staff is expatriate compared with 85 percent in the early 1960s. For the national scientists although the upgrading to higher degrees has been fast, the upgrading to PhD level appears to have been relatively slow. Even in the early 1980s the number of PhDs declined probably due to an inadequate personnel service scheme. The projects under review improved the stability of the personnel by assisting in having new and more rewarding schemes of service and providing a better work environment in KARI. Overall the turn over of staff during the last ten years has been low.

In *Madagascar*, as a consequence of the nationalization of the research institutions in the 1970s, there was a reduction of researchers during the 1970s. A slight recovery was experienced from the mid-1980s onwards. Staff increase over the period is around 2.2 percent per annum. This is three times less than the average of sub-Saharan countries (1961-1985). Foreign assistance has improved the quality of the staffing through the programme of degree training. The plethora of non-essential staff has been reduced. A better scheme of service has been put into place with incentives for staff working in remote research centres and stations. The percentage of expatriate scientists is low, only 7 percent for FOFIFA.

In *Malawi*, the situation has been alarming. A high rate of attrition is reported resulting in personnel instability. Low salary levels have complicated the issue of personnel instability. Poor salaries have been reported to be the main cause of people leaving NARS as well as Malawi altogether. In the last 10-15 years six MARE-trained staff left NARS' services for the private sector. A recent study by the World Bank consultant found that from 1985 to 1991, thirty-one people or 32 percent of DAR professional staff (MSc or PhD degree) had left the department. This has been cited as evidence that trained personnel were leaving for higher salary packages. In the long run more people may leave due to low salaries, low operational funds or general frustration of NARS lack of ability to perform in an efficient manner.

This is a real dilemma. Country and the donor community that have assisted in educating a motivated and energetic group of agricultural scientists only come to realize that NARS in the end cannot afford to retain them. NARS institutions have thus come constantly to recruit new personnel with little experience who are in need of further training. Thus, instability of personnel resources has robbed NARS institutions of creative scientists hindering development of research quality.

The issue of human resource development was properly identified in the NARP appraisal. A technical career stream for DAR was introduced with the intention of providing good incentives for scientists. Despite strong pressure from IDA, the establishment of a scientific career stream outside the main civil service grade structure was not achieved (according to the Completion Report of the NARP). This was due to GoM opposition, who feared budgeting implications and isolation of researchers from other civil service career streams. NARS scientists have recently formulated and submitted proposals for salary incentives and a social welfare scheme for national staff. The objective is to upgrade all scientific positions. Under the proposal, scientists would be promoted to senior positions without assuming administrative responsibilities.

*Mali* placed emphasis on recruiting and training national scientists as a matter of priority soon after Independence. However, as in many other sub-Saharan countries funding did not follow suit. Donors have insisted on the need for streamlining the system. Human resources development should focus on quality instead of quantity. Considerable efforts have been made to recruit and train well-qualified national personnel. Between 1976 and 1990 the total number of scientific staff increased from 65 to 243 for the two national research institutes. This is an annual increase of more than 18 percent the highest recorded in West Africa. The high rate of recruitment has not had a negative impact on qualification levels as the post-graduate holders represented 180 or 74 percent and the PhD holders rose at the same time from 3 to 60 or 25 percent of the total.

During the last years a high rate of attrition in the research scientist category has been noted due to the non-application of the new scheme of service (around 30 in two and a half years). This has occurred despite the recommendations of the World Bank/IDA for the application of the new service scheme. It is reported that the morale of the remaining scientists is quite low. However, recent supervision mission reports of NARP indicated positive development in this regard. The new status as well as the new scheme of service is applied. To support the effort, donors have agreed to temporarily contribute to salary payment.

In *Senegal*, the situation was not much different in terms of evolution of human resources. With the creation of ISRA in 1975, the Government placed great emphasis on recruitment and training of national scientists. The number of scientists grew at an annual rate of 8.2 percent. By early 1987 the management of Senegalese research was entirely under national directorship. The number of Senegalese scientists increased from 30 at the end of the 1970s to 110 representing almost a four times increase. This increase of research scientists and nationalization of management has made ISRA a truly Senegalese research institute. The hope is that this will better orientate research towards national priorities and local conditions.

The remarkable agricultural training effort was largely supported by donors, in particular within the projects analysed in this study. However, also for ITA, foreign assistance has been instrumental in the development of human resources, even if ITA has always had a small staff. There were 15 full-time equivalent researchers in 1990, and 10 in 1992.

Overall, the Senegalese NARS, had in 1990, 194 full-time equivalent researchers, of which 132 were provided by nationals (68 percent) and 62 by expatriates or 32 percent. The expatriates were mostly French and one of the highest concentrations of French agricultural scientists in West Africa.

Both institutes went through severe personnel cuts under the structural adjustment programme. In early 1987, ISRA personnel were reduced from 1 500 to less than 1 000. It was further reduced to 600 in 1990 before the start of the second agricultural research project. The balance

between scientist and support staff also worsened. ITA also experienced similar drastic personnel cuts.

NARS in Senegal is experiencing a crisis due to insufficient funding and poor personnel management. At ISRA, the situation is more or less just as discouraging as at the advent of heavy foreign assistance in the 1980s. Foreign assistance seems therefore not to have improved things for the better.

#### **4.5 Level of budget and stability of funding**

This is a crucial item for all NARS in sub-Saharan Africa and particularly for those countries under review in this study. The level is important but equally important are the stability and foremost timely disbursement of funds. What has been the influence of foreign assistance on these issues is analysed in this section.

In *Cameroon*, the budget of the two institutes decreased continuously from 1984-1985 to 1992-1993. There were barely funds for paying staff salaries. The expenditure per scientist during the period decreased from US\$58 085 to US\$9 591. Salaries represented 55 percent of total budget on average during this period running costs for administration and research programmes accounted for 10 and 12 percent, respectively and infrastructure and equipment 20 percent. Disbursement of funds was neither regular nor timely during this crisis period. In general, projects that did not contribute to running costs suffered from these crisis as Government counterpart for these expenses was not paid.

*Ghana* experienced a rather different scenario. Overall agriculture research expenditures during the past 30 years grew on average at a rather low annual rate of 2.2 percent. During the period of structural adjustment from 1984, a rather higher growth rate, caused mainly by more donor support, was experienced. In terms of research intensity, the ratio of research expenditure was in 1989-1991, 0.38 percent from the national budget. With foreign assistance included, it became 0.41 percent. However, with the costs of expatriates at national costs, it increased to 0.49 percent. In terms of source of funding of agricultural research, Ghana is among the few African countries where national effort has always been prominent. National contribution has stood at about 80 percent. Foreign assistance including loans represented in 1989-1991 20 percent of total research expenditures of US\$11.9 million. The level of funding per scientist during the period 1974-1987 decreased from US\$56 700 to US\$33 140, in constant 1987 dollars. In 1989, in the CSIR institutes concerned with agricultural research, the actual recurrent expenditure per researcher per year, net of salaries, was even lower in terms of dollars, amounting to only US\$3 900, this including donor funding for operational expenses. The figures above indicate a low level of financial support to NARS in proportion to the human potential. In most national institutions, with the exceptions of CRIG and OPRI and the foreign assisted programmes of CRI, national scientists are condemned to severe underemployment. As a result NARS did not have more than about 150 real research years in 1987.

In *Kenya*, the trend has been similar to Ghana, but higher in terms of rate of evolution. Total agricultural research expenditures increased steadily from 1983-1984 to 1986-1987 at an annual average of 21 percent. Later on it attained a high annual average of 45 percent per year. This corresponded to increased donor funding from 1987-1988 to 1992-1993. As a result the research intensity has been high, reaching 2.1 percent which includes donor contribution. This is far above the average for sub-Saharan African countries. The research intensity with GoK funds averaged 0.61 percent which is also high by African standards. In spite of sizeable total investment in agricultural research, the funding pattern is clearly deficient. More research scientists have not been matched by increases in operating cost per scientist. Today this stands at US\$2 000, which is clearly inadequate. Personnel costs absorb overall 76 percent of funding allocated to research, leaving about 24 percent for operations.

*Madagascar* has had a different pattern. From the creation of FOFIFA in 1974 until 1992 the institute was funded nationally. National budget provided from 64 to 75 percent with remaining funds coming from sales and services. In 1989-1990 the Government and IDA signed an agreement for

funding of the NARP. A major increase of research budget followed from this. The share of the IDA increased steadily between 1992 and 1997 to reach 67 percent of the total budget of the institute. From 1992 to 1997 FOFIFA took 85 percent of the budget allocated to the MRS. A marked change in the distribution of funding occurred in 1996-1997. The share allocated to the network of centres and stations rose from 6 percent in 1992 to 38 percent. The distribution of more funds to centres and stations reflected the decentralization policy of the World Bank supported NARP project. After 1974, the share of funding to public research institutions has been fairly constant. It has fluctuated between 91-94 percent of the total agricultural research expenditures, leaving a modest 6-9 percent for the academic sector. From the period 1961-1965 to 1991 the research intensity ratio dropped by 4.1 per annum from 1.18 to 0.57 percent. This is quite in line with sub-Saharan averages.

In *Malawi*, overheads and administrative costs absorbed NARS resources, before the reorganization and streamlining of the research network. For DAR for example these expenditures amounted to nearly 50 percent of its recurrent budget. In DAR's fiscal year 1984/1985 research work absorbed only 31 percent of the recurrent budget. Since the restructuring process things improved. However, the annual data for the years 1986 to 1991 reveal a substantial degree of instability in total real agricultural research expenditures. Malawi experienced a high rate of inflation at this time with prices doubling between 1985 and 1989. The instability was also caused by change in donor capital investment from one year to another. Research intensity figures have also been high despite a drop from 1991. In 1986 to 1991 the ratio was a high 2 percent falling to 1.66 percent in 1991. The figures reflect the effect of high inflation and varying donor contribution. Data for the fiscal years 1992/1993 indicate an intensity of research expenditure of 0.5 percent from public resources. The master plan proposals sought to raise this level of investment in research by more than 100 percent. The target was above one percent of agricultural GDP in real terms over a five-year period and was to reach 2.5 percent by 2000. The contribution by the Government of Malawi to the total research budget was only 28 percent in 1998/1999. The remainder coming from donors and local seed companies. The country is therefore heavily dependent on foreign assistance.

In *Mali*, in 1990 the total agricultural research expenditures was estimated at US\$11.2 million. In terms of research intensity it was 0.34 percent in 1989 if only the national contribution is included. Total agricultural research expenditures stood at national costs at 0.56 percent of the AgGDP. From 1984 the Government contribution increased steadily from zero to 10 percent yearly. After the devaluation of the CFA currency in 1994 this was decreased, but catching up later on. The rise signifies the Government commitment to fund a substantial proportion of the national agricultural research from its own resources. It became difficult to maintain a high level of national support and foreign contributions became steadily more important. The financial resources were, however, unequally distributed between NARS institutions and within IER among the research units and programmes. Those receiving funding from foreign assistance being more affluent than others. The former received between US\$20 000 to US\$33 000 for operations and equipment, the latter received barely US\$6 600 per researcher per year. The NARP project intended to correct such imbalances. This was not achieved despite the availability of financial resources. The main reasons seem to be inadequate financial management or lack of proper training on the new computerized financial management system put into place by the SPARC project funded by USAID.

The *Senegalese* NARS was not better off. The total financial resources in 1990 was US\$19.7 million. The national agricultural research expenditures from national sources, without loans and grants represented 0.44 percent of the AgGDP in 1990. The total agricultural research expenditures evaluated at national factor costs was roughly US\$14.2 million or 1.18 percent of the AgGDP, one of the highest rates in sub-Saharan Africa. During the 1985-1990 period, the financial resources of ISRA fell sharply: the total consolidated budget (including the cost of expatriates) fell from US\$26.6 million to US\$18.6 million, basically because of retrenchment of personnel, (personnel cost of nationals decreased from US\$9 million to US\$4 million). The analysis of the financial situation of ISRA in the period of 1993 to 1995 confirms the trend of the previous decades. Government contributions did not exceed 30 percent of total research expenditures. The research intensity for this period averaged to 1.23 percent, which is high in Africa. Personnel costs despite several retrenchments remained at the high level of around 69 percent from 1976 to 1992.

This precarious financial situation is pervasive, as during transition periods from one IDA project to another and follow-up projects of several other donors, research activity at ISRA came to virtual standstill due to lack of funds to cover operating costs. The shortage of recurrent operating funds led to serious underfunding of recurrent station operating and maintenance costs, thereby increasing the need for infrastructure rehabilitation.

#### **4.6 Research programme stability and relevance**

In this section the situation of the role played by foreign assistance in the programming process is examined.

In *Cameroon*, evaluation reports indicated an improvement in programme planning. This was especially the case within animal research, but also overall. This occurred despite lack of national research plans. Institutes responded, however, positively to the orientations towards national agricultural development. The projects under review played a positive role in this respect. Most have as their objectives: increased food security, diversification and intensification of production, better linkage with extension and farmers, for better transfer of results, participatory approach in programming, sustainable improvement of farming systems, adapting technologies to the small farmers' and herders' circumstances and accelerating the transfer of technologies to the producers to raise their productivity and income.

Leadership has been stable within the research system with a positive effect on the stability and relevance of the research programmes. The research programmes have been properly distributed to different agro-ecological zones. Relevance and effectiveness of the research system were mitigated by the difficult economic situation of the country during most of the period under review. This coincided with implementation of the structural adjustment programmes. There seems, however, still to be a neglect of attention of real transfer of research results to farmers, the relevance of the programmes and the pertinence of the whole system.

In *Ghana*, all the agricultural research projects analysed had programmes relevant to national development objectives and a positive impact on national agricultural production. The NARP completion report noted that institutes have released several recommendations for adoption, particularly new crop varieties and improved cultivation practices of maize, cowpeas, soybeans, cassava, plantain, millet, sorghum, pineapples and vegetables. Crop production in Ghana has increased which is reflected in a per annum growth of 4 percent in the agriculture sector since 1996. In particular, production of maize increased by 70 percent from 700 000 tonnes in 1993 to 1.2 million tonnes in 1997. The release and enthusiastic adoption by farmers of several soybeans, cowpea varieties and the high lysine maize variety, Obatampa, has contributed to improved rural nutrition. In addition three high-yielding hybrid varieties of maize were released in 1998. The other production related research programmes have also developed useful technologies capable of sustaining high productive capacity of the natural resource base. Leadership has been stable within the system and had a positive effect on the stability and relevance of the research programmes. The programmes had good agro-ecological coverage.

In *Kenya* donors agreed to fund coordinated programmes/projects during the NARP (I and II) implementation. Priority programmes received sufficient funding although GoK contributions have been smaller than foreseen. All institutions of NARS including academic institutions have been as well endowed as KARI. Proper national priority setting procedures involving all the stakeholders has increased the relevance of the research activities and linked research closer to national development policy. There is also great emphasis on the on-farm and participatory research approaches. This is grounded in the mandates given to NARS institutions. The research programmes located in the network of research centres ensure good coverage of the agro-ecological zones.

In *Madagascar*, overall programme stability and relevance has improved greatly with the help of donor assistance. A bottom-up approach planning process has been adopted involving extension

services and farmers. Implementation of the multi-disciplinary, on-farm research programme has been instituted. FOFIFA also modified its strategy in 1997 to adapt to the national and international economic environment. Priority was given to market-oriented agriculture in high potential areas, including diversification towards high value crops for exports, while maintaining yield levels in marginal areas. Genetic improvement remains the underlying thrusts for yield improvement and increasing adaptability to local conditions and resistance to pests and diseases. To improve the quality of research programmes, each researcher is now obliged to include indicators that can be monitored for their research work and to monitor field impacts at farmer level together with extension staff. Staff has been deployed to regional research centres and stations in order to be closer to the end-users. FOFIFA is also developing its links and cooperation with the large private sector as a result of its work on export-oriented higher value agriculture (cotton, vanilla, soybeans, temperate and tropical fruits, etc.).

In *Malawi*, before the reorganization of DAR in 1985 under the NARP, investments have not always reflected national or farmers' priorities. Increasing expenditure on overheads and non-research work had also greatly exceeded what was invested in research. The current priority setting procedure, programme formulation and management was implemented with donor assistance, in particular during the NARP project. Effective channels of communication with all stakeholders (policy-makers, all researchers in the system, extension workers and users of research information and technology) have been established. All partners in the research process are part and parcel of priority settings and programme formulation. This holds for all agro-ecological zones covered by the research network. This ensures relevance to the national and farmers' goals with the ARC playing a leading role as the apex body. However, the Treasury seldom follows recommendations from ARC in terms of resource allocation. As a consequence DAR needs to spread its resources thinly over a large number of projects greatly reducing the likely impact of the research.

For *Mali*, since the reorganization of the NARC/CNRA, introduction of a decentralized structure of IER and the strategic planning process involving all the stakeholders (in particular the users through the users committees at the local regional and national levels) through a bottom-up approach, research programmes have become more relevant to national development objectives and to the users' needs. Through the pilot users' fund established by the World Bank/IDA, the users have a leverage to orient research activities on themes of particular importance for them. The NARC with its various committees, the new structure of IER and management system, are proper safeguards for continued relevance and stability of research programmes. However, over-reliance on foreign assistance for funding these programmes particularly as regards operating expenditures remains an Achilles' heel.

In *Senegal*, proper programming priority setting mechanisms are in place. ISRA has also gained considerable experience in preparing strategic plans. It has developed several strategic plans with foreign support. The USAID projects SARP and SAR II in particular, presented many tools and methodologies that helped ISRA in its strategic planning work. The support permitted also competent reviews of the ongoing research programmes. During this period ISRA in search of a more efficient management strategy began to re-examine its research portfolio.

Long-term strategic programme planning is, however, "meaningless if the resources to permit implementation cannot be assured" as mentioned by the USAID mission team. ISRA has never had necessary government support to adequately maintain a core staff with reasonable pay, neither have they been given a meaningful level of resources to carry out implementation of established strategic plans. The donors have not been of major help in this area. On the contrary, ISRA's experience demonstrates how donor funding, "being the only game in town" can distort institutional long-term plans and priorities, moulding them along donor driven themes and interest.

#### **4.7 Linkages with the World Knowledge System**

NARS, as outlined earlier, have developed good linkages within and outside the systems. The donor community has helped NARS develop and maintain these links. Mechanisms such as TLU (testing

liaison unit) for Cameroon, or research/extension liaison committees (RELEC) in Ghana, agricultural research fund in Kenya, Malawi, Mali and Senegal, adaptive research team (ART), in Malawi, etc., have been created with donor assistance. Donors have had the explicit intention of fostering linkages within the system. The focus has in particular been on linkages with extension/farmers. A 1995 SPAAR report on lessons learnt from the implementation of the Frameworks for Action (FFAs) indicated that attempts to institutionalize researcher-farmer linkages at national level have gone furthest in Mali. A hierarchical system of user consultation has been set up within IER programming, priority setting and reporting process, to be overseen by NARC/CNRA. Outside the system, the most widespread linkages are with the IARCS of the CGIAR and regional and subregional organizations and some bilateral organizations. Creating linkages is a continuous process that should improve as contacts intensify. Currently the main issue is how linkages can be optimized and transformed into a true partnership for the strengthening of NARS.

#### **4.8 Size of the research institution/system**

In Chapter 3, the actual size of each NARI/NARO of NARS of each country, was described. The present size of NARS is as a result of a long evolution process often involving periods with painful downsizing of activities. In countries with structural adjustment programmes, no institution could escape this process. How donors contributed towards build-up of oversized and unsustainable research systems are well documented in the section above. According to the definition of a sustainable NARI/NARO/NARS provided by ISNAR (ISNAR, 1991): *“as one in which domestic funding provides most of core salaries, operating funds, and capital investments; and where the contribution from external sources is within the limits of domestic effort that the Government could take on progressively, with a definite schedule”*. This has also been termed by Eicher (Eicher, 1999) as *“the ability to mobilize domestic political support to pay the salaries and required operating costs of the core scientific staff from national sources”*. None of NARS in the countries under review is for the time sustainable. They are often fragile as the case of ISRA in Senegal demonstrates. During the transition period from an IDA project to another and follow-up projects of other donors, research activity at ISRA came to a virtual standstill due to lack of operational funds. A USAID impact study of its assistance to ISRA (July 1998) describes the situation *“As the National Agricultural Research Centre for Senegal, ISRA in 1998 is in critical danger of extinction. From the days and months lived during the SARP project years, which could perhaps be considered ISRA’s best and most promising years, there has been a steady institutional decline, in spite of USAID/Senegal and other donor support... ISRA’s major problems are systemic. Having a professional and active agricultural research programme focused on long range issues of national significance does not appear to be a national priority, as reflected in the major decline of the Government support to the programme over the past 17 years. Pulled one way and another by the nature of the financial support and conditionalities of donors, ISRA has lost any clear Senegalese vision of its future”*. The situation is similar to most NARIs of sub-Saharan Africa. Below are excerpts from IDA/NARP completion reports for the selected countries

*Cameroon*, is not sustainable in relation to public or national funding for a foreseeable future, neither is *Ghana*. The relation between financial resources and available human resources is not sound. In *Kenya* the Project Appraisal Report of NARP II concluded that *“GoK finances about a third of the total cost of agricultural research and the balance is currently financed by donors.”* The donor share of research financing is expected gradually to decline over the years. In *Madagascar*, the current size is not sustainable. As stated in the completion report of NARP, until 1997 the Government did not meet its obligations of providing adequate funds to pay wages, arrears in social benefits and staff pensions and back taxes. The project completion report for the first NARP phase rated the achievements of the institutional development objective substantial and sustainability as likely. *Malawi*, as regards sustainability, the NARP completion report indicated, *“sustainability of the activities/programmes supported by the project and the facilities provided is in doubt.”* For most of the project duration, GoM was unable to provide operating costs at the level agreed to at negotiation. This affected both the conduct of experimental programmes and maintenance of buildings and plant. DAR, despite strong pressure from IDA, was unable to establish a separate scientific career stream that would provide incentives to motivate and retain research scientists. In *Mali*, the NARP



completion report is not yet available, however the analysis indicated that, despite the remarkable effort made by the Government, the system cannot yet operate properly and fulfil its mandate without donor support for many years to come.

These results confirm those of a World Bank study (WB, 1997). Of nine free standing research projects, the sustainability was rated only likely for two, uncertain for six and unlikely for one. Institutional development was rated as modest for the entire sample in the World Bank study. The current study also shows the same picture. Although the research intensities, calculated with national resources alone, for the countries in the sample, remain well in the regional average, and above the developing countries average (Byrelee and Alex, 1998) funding remains the Achilles' heel for the sustainability of NARS. Downsizing of facilities and retrenchment of staff do not seem to create enough resources to provide sufficient operating funds for research programmes or decent salaries for research personnel.

#### **4.9 Monitoring and evaluation**

Monitoring and controlling are pervasive functions of management that should be performed on a continuous basis. They are a process of tracking or follow-up and documenting observations on how decisions regarding programmes have been implemented, the deviations to the intended objectives, the reasons and the corrective measures that ought to be taken, etc. Evaluation is an exercise that should be carried out at regular intervals. While the former is purely an internal exercise, the latter can and should involve outsiders either nationals outside the system, foreigners or both. The effectiveness of monitoring therefore depends on the effectiveness of management at all levels and in particular on its organizational structure and delegation of authority. The quality of management has been dealt with in a previous section.

As regards evaluation it concerns the institutions and their programmes as well as their personnel, while the former is scientific and managerial, the latter is more administrative. Internal institutional bodies perform programme planning, monitoring and review (as described earlier). The issue here is how these bodies perform these functions. For all the institutions under NARS included in the study, donors have put into place mechanisms for evaluation of performance. Furthermore, within NARP projects funded by the World Bank, monitoring and evaluation systems have been part of the institution-building project component. All countries have therefore developed systems for monitoring and evaluation of projects more or less operational as shown briefly below.

In *Cameroon*, programming committees at the national and regional/agro-ecological zone levels also have responsibility for annual evaluation of programmes. Programme and subprogramme data sheets were available and used as tools for monitoring and evaluation. ISNAR in its review of 1988 recommended that all programmes be reviewed every four to five years with some external participation and the data sheets updated as appropriate. Personnel evaluation follows the civil service mode as spelt out in the researchers' scheme of services adopted in 1980. Although the initial scheme had provision for reward systems with various kinds of allowances, economic crisis and structural adjustment programmes have eliminated all rewards as such, only the seniority increment was granted.

In *Ghana*, the projects under review have established regular evaluations. For NARS as a whole the mid-term evaluation mission of the NARP recommended a monitoring system of the project. The monitoring should be carried out jointly with the programme coordinator, the director of the coordinating institute and the technical secretariat. An external evaluation of the institution every five years was also proposed. The NARP completion report noted that three of the seven agricultural research institutes have been subjected to an external review. For personnel evaluation in the CSIR institutes two types of appraisal are undertaken: a) grade promotions; and b) annual confidential reports. For the former, the research scientists are submitted to procedures of the university. External assessors rely solely on written material. The appropriate CSIR Promotion Panel reviews their assessments. Primary emphasis has, until recently, been given to scientific publications in scientific journals, which has meant that there is little incentive for staff to participate in programmes to

strengthen linkages with farmers. Promotion criteria has recently been reviewed and greater recognition is now given to work that may not lead to research publications, but makes an important contribution to solving farmers' problems. Concerning annual confidential reports, a more open process has to be introduced.

In *Kenya*, the projects and Government agreed on regular evaluations. Moreover, a monitoring and evaluation unit has been established within the directorate of KARI. External evaluation of NARS as a whole or particular components, has been explicitly mentioned in this context.

Personnel, whether scientific or support staff, must as a matter of routine be reviewed annually in order to establish performance. The performance review forms the backdrop for salary increases and promotion. The scheme goes back to the civil service arrangements where salary awards are related to each individual performance. It also determines whether or not the individual staff should be recommended for further studies. Unfortunately, the system has not worked well. The creation of KARI was not preceded by a carefully developed compensation strategy. KARI management has endeavoured to produce, within NARP I, a workable scheme of service involving better terms and conditions but it has not managed to have them institutionalized. Consequently promotions and salary awards are on an ad hoc basis.

In *Madagascar*, the establishment of the Funding Steering Committee for Agricultural Research (COFIRA) with the mandate of approving the work plan and budget, was considered an innovative set up with positive connotations for FOFIFA. The NARP appraisal report indicated that "Research quality and adaptability improvement" of the NARP was to: *"reinforce research monitoring and evaluation through the introduction of a research programme review system, including research protocol reviews, report writing standards and requirements, mid-term and pluri-annual reviews, and a research data resource management system."* The completion report of the NARP is mute on the achievement of this activity.

Concerning the evaluation of personnel the NARP project has assisted in: 1) the development of a human resources development master plan; 2) the creation of a personnel and human resources development service; and 3) the improvement of personnel management policies and procedures including the introduction of incentives for scientific staff to work and live on remote research stations.

In *Malawi*, prior to submission of each subsequent fiscal year's budget, DAR management including NRCs, review and evaluate the quality, productivity and cost of each research programme of the previous season. Next year's proposals are also reviewed in terms of content, cost and importance to the national economy. DAR management also presents annually a programme and budget to the ARC for review and adjustment.

Within the NARP IDA there have been requests that every third year a group consisting of a distinguished research scientist of international repute review the whole research programme in depth. The ARC was responsible for organizing such triennial reviews.

The Completion Report of NARP indicates that two triennial reviews (1989 and 1992) both reported extensively on research programmes as well as management issues. It was mentioned that the reviews provided valuable information to help guide the research effort and its management. However, external reviews need considerable preparatory work by research workers, especially the CTL and NRC, which contributes towards reducing time available for research. Triennial reviews are unusual, both IARCs and some NARS have for a long time settled on reviews every four years for their external reviews, therefore, the current practice should be adjusted accordingly for the future. The personnel employed prior to implementation of NARP did not have proper job descriptions. Criteria for the assessment of potential recruits for promotions were therefore not clear. Currently managers prepare annual confidential assessments of their staff using standard evaluation forms, which are finally transmitted to the Public Service Commission (PSC) for review. The evaluation

format is quite comprehensive, but it lacks both an adequate assessment of quality of output and a system of feedback to the staff on their performance. Since 1983 the PSC has ruled that promotion of civil servants should be by interview on issues related to their field of competence. Recently DAR attempted to evaluate its staff on the basis of the following criteria: technical ability, technical bulletins and reports, technical output, creativity, managerial ability and special contributions.

*Mali*, the research programming, monitoring and evaluation of IER prior to the NARP was considered extremely weak. A process linking the short-term activities proposed by individual scientists to the strategic plan was to be put into place. Independent external evaluation of research projects under implementation and upon their completion was undertaken only in the context of individual donor projects. USAID under the SPARC project provided technical assistance to IER in the design of a research programming, monitoring and evaluation system. Under the NARP it was decided that IER was to implement jointly with extension services, impact evaluation for at least five programmes per year. The first impact evaluation of all programmes was completed in 1997 and the supervision mission report of NARP dated February 2000 recommended that all programmes should have been re-evaluated before the end of June 2001. The system of programme budgeting has been considered lengthy and cumbersome. The effect on the availability of resources to research programmes and on their performance is deemed to be negative. Prior to the NARP and the new statutes of IER, the staff, in particular the scientists, were civil servants. They were evaluated every year for salary increments and upgrading. Within the NARP and the new statutes whereby all staff are seconded to IER and subcontracted, initial evaluation was made for all staff to determine their new grade by an initial evaluation committee of independent external scientists. The personnel management manual henceforth determined the procedures for regular annual evaluation.

*Senegal*, the board of directors of ISRA and its subsidiary committee the STC have a major role in the process of monitoring and evaluation. STC has in particular mandate to: 1) advise, also on rules and procedures for the evaluation of the activities, structures and scientific personnel and examine all evaluation reports and makes recommendations to the board; 2) organize, draw up the terms of reference and supervise the evaluation missions on the research activities and the research staff and advise on the common principles of evaluation.

It is also responsible for taking any appropriate initiative in its field of competence, to guarantee the quality of research activities taking into account scientific integrity and needed credibility of the institute. During the second World Bank project, ISRA introduced external programme reviews in the CGIAR model, aimed at improving research quality. Five (out of 23) programmes were reviewed in 1993 and 1994. In addition, in 1995 as part of the mid-term review and as a basis for preparing ISRA's 1998-2003 Strategic Plan, all programmes were reviewed. It was noted, however, that mechanisms to ensure that recommendations made by the external programme review teams were implemented, did not exist. The Completion Report of the second World Bank project mentioned that ISRA did not have a formalized monitoring and evaluation system. However, its management was aware of this need and it was planned to address the issue as part of the implementation of the 1998-2003 Strategic Plan. This plan effectively contained, in annex, a logical framework that should allow monitoring of activities. How effective it will be applied remains to be seen. As regards personnel evaluation, a one shot exercise was carried out, but the outcome was never applied. The evaluation system of personnel put into place by the French institutes has therefore been abandoned and no system of researcher promotion exists at present. As a condition for the third phase of assistance from the World Bank, new ITA and ISRA conditions of service have been adopted. The new system involves ongoing evaluation of staff performance, including an incentive and reward system. The salary scale is high enough to attract and retain well-qualified personnel while compatible with government contribution. Both institutes have also adopted a management and internal organization manual.

## **CHAPTER 5. CONCLUSIONS AND RECOMMENDATIONS TO COUNTRIES INVOLVED IN THE STUDY**

### **5.1 Introduction**

The analysis of the 36 projects from the sample of seven sub-Saharan African countries makes for the following country-by-country conclusions and recommendations. The conclusions or lessons learnt from the analyses of the projects are often specific for each country. Some general characteristics appear, however, with regard to impact of foreign assistance on institutional development. To avoid repetition some salient recurrent conclusions for all countries are presented below before the presentation by each country.

### **5.2 General comments**

Since early independence most governments have taken steps to organize inherited colonial research infrastructures into NARS. The evolution might be divided into two phases (Eicher, 1991); an expansion phase, between 1960 to 1985, and a downsizing and restructuring phase from 1985 onwards, the last phase corresponds to the economic crisis and structural adjustment programmes experienced by these countries. Unfortunately, none has started to evaluate its research needs and tailored the inherited facilities and infrastructure to these needs. On the contrary, with donor support most of them expanded these facilities beyond their real needs and budgetary capacity.

Almost all projects, with the exception of the NARPs' project, were managed autonomously and some with a heavy presence of expatriates. Subsequently, the projects were subjected to their own system of programming, monitoring and evaluation geared to flag out success. In an institutional development perspective, national counterparts should have been more involved in running and managing the projects. Good management practices as set-up and experienced by national participants could have been disseminated for the benefit of recipient institutions. Although in all or most projects national coordinators were appointed and national counterparts provided, they were often confined to some activities and did not gain necessary experience from a complete coaching of the foreign experts.

Assistance was provided, in most cases, in the short- to medium-term, generally three to five years renewable once or more. Even if the duration was long enough to have an impact, this did not occur to the extent that could have been expected. However, execution of projects in five-year periods was not reported as having a negative effect on institutional development in the concerned institutions. It permitted instead proper evaluation of performance and identification of weaknesses that were addressed in the subsequent phases.

Provision of infrastructure and equipment was generous, but without careful consideration of the recurrent costs of maintenance and operation after termination of the project.

Human resources development through degree training as well as short-term courses received great attention in almost all projects. Unfortunately, increase in scientific staff was not concomitant with an increase in operational costs. Most NARS noted that this led to underutilization of human resources, creating frustration and high attrition of high calibre staff. Some countries addressed this issue in innovative ways through a diversification of funding mechanisms (cess, private sector funding, commercialization, etc.).

Linkages with the World Knowledge System, within NARS and outside are crucial for effective and efficient research enterprises. The projects reviewed had designed effective ways of promoting such linkages. Strong examples are the Agricultural Research Fund in Ghana and Kenya and similar arrangements in other countries.

There is a clear indication that proper definition of priorities and firm commitment of government authorities, together with concerted action with donors in project preparation, can lead to coordinated funding of government priority programmes. Well defined policies and priorities constitute the best government negotiating tools with development partners.

### **5.3 Findings by each country**

#### **Cameroon**

Very few projects had clear institution building characteristics. Out of nine projects only the NARP/PRAN, the World Bank co-funded project, nationwide in scope, had specific objectives of this sort. NCRE funded by USAID also had institution building as a project objective. The others may have elements of institutional development as a by-product of their activities, as for example, human resources development, and infrastructure tailored to the needs for the achievement of their objectives. In short, the projects did not have an institutional perspective and were seldom concerned with sustainability issues.

The formulation and priority setting processes are limited in scale and scope. As examples, the Garoua project was for the cotton growing area, the ROTREP-project for roots and tubers in the south-west and the Littoral regions, the NCRE-project for cereals, mainly for the North, etc.

Human resources development particularly through degree training received great attention in all projects. It also covered most disciplines. A study in 1995 revealed that training of researchers within foreign assistance was satisfactory. IRA and IRZV had respectively the following number of staff trained at various degrees: 35 PhD; 52 MSc.; 77 BSc and 14 PhD and 47 MSc.; overall a total of 225 national research scientists. However, the increase of 9.6 percent per year in number of researchers was not matched by a similar increase in operational funding. In 1993 the expenditure per scientist was US\$9 591, representing 16.5 percent of the optimum, and thus putting the scientists in the situation of working part-time.

The Government has the prime responsibility for the situation as described above. The Government did not provide an overall framework for developing a long-term agricultural research plan (10 to 15 years) with necessary resources. A plan of this sort could guide scientific cooperation with the partners that would be demand-driven. Ad hoc and push approaches as adopted could be avoided. A research plan could indicate the necessary size of institutions, agro-ecological implementations, staffing needs and corresponding training programmes. The responsibility is at present shared between donors who have not been cautious enough to put safeguards or provide enough flexibility in order to adapt to the changing economic environment.

The conclusion is that the institutional development impact has been rather modest. This conforms with the World Bank study (1996) ranking cited above.

#### **Ghana**

The sample consisted of a few projects with explicit institution building objectives. This in spite of NARP (World Bank) not stating clearly that institution building was a prime objective and all its components had provided the foundation of a strengthened NARS as a whole. The Nankpala Experimental Station funded by the German GTZ for about 20 years was also an example of a successful institution building assistance project. It constituted, however, a prosperous island within NARS and was not well-integrated into NARS. The Ghana Grains and Legumes Development Project also placed emphasis on strengthening the capacity of Ghanaian research and extension institutions. The other projects had elements of institutional development as by-products or enabling factors of their activities, such as human resources development, infrastructure, etc. Most projects did not have an institutional perspective and cared seldom for issues related to sustainability.

With the exception of the NARP project, the formulation and priority setting processes were limited in scale and scope. As examples, the GGLD, was limited to grain and legumes; the plantain project for this commodity only, the SG 2000 interested only three regions, etc. With the formulation of NARSP some negative aspects have been reduced. The plan should guide the domains of priority in scientific cooperation with demand driven partners. This would avoid the ad hoc and push approaches adopted often earlier.

## **Kenya**

The projects analysed were funded by a consortium of up to 10 donors led by the World Bank. Institutional development of NARS was given pre-eminence during both phases of the project. Particular emphasis was put on research organization and management of KARI. This was carried out in a coordinated manner with support from the consortium of donors. KARI and donors have shown remarkable flexibility and most donors have been able to focus on research areas with which they felt comfortable. This was achieved despite the difficulty of coordinating donors as the number of participants, project size and complexity, increased. A national agricultural research programme (NARP) has been prepared with the assistance of ISNAR and the World Bank. The process of priority setting has been developed and fine tuned. Donors that participated in the appraisal of the project agreed to place assistance within the framework of NARP. This clearly indicates that well-defined policies and priorities constitute the best government negotiating tools with development partners.

Although the project had a national scope, donors were free to pick up a component or part on a regional or sectoral scope. USAID funded for instance mainly KARI headquarters and some national and regional centres. ODA on the other hand concentrated on Muguga and veterinary and livestock research programmes. The executing agency of the project was KARI and no component was managed autonomously. Donors agreed to channel their funds to meet local expenses entirely through KARI. It was, however, still felt necessary to harmonize the project planning and budgeting process, financial and accounting procedures, disbursement procedures and provision of equipment and technical assistance to minimize confusion and administrative burden on KARI.

Multi-donor projects need strong coordination from one source. The current system whereby donors support elements of crop, livestock or factor research, according to their own research interest or bias, tends to lead to donor-driven identification of projects. This trend which has been, however minimized as a long-term programme was already prepared somewhat with their involvement.

The assistance provided although considered of a long-term nature was phased in five year slices. This did not, however, have a negative impact on the institutional development. Institutional strengthening remained a vital objective of the project. The imbalance of operational costs with the increase in human resources development through degree-training as well as short-term courses, has been well identified and innovative solutions have been sought (cost-sharing, cess, breeders' property rights, transferring research programmes on industrial crops to producer and processor organizations, savings on personnel costs for operational expenditures, etc.).

## **Madagascar**

The projects geared to FOFIFA were in the first instance for technical assistance (ATIA I and II). This resulted in recommendations for institutional reforms to be underpinned by a sound policy and strategy (the Master Plan). This was implemented subsequently during the NARP project including its second phase. The projects have definitely contributed in laying the foundation for creation of strong institutions. The projects of FIFAMANOR and FAFIALA were sectoral and research was a minor component, and no explicit objective of strengthening a research institution was mentioned. Further development in an uncoordinated manner poses a risk of duplication of research and consequently a weakening of NARS as a whole. The risk is exacerbated by the fact that these institutions are not under the same ministries, as FOFIFA that is under the aegis of the MRS.

The projects funded by the World Bank were prepared with the assistance of ISNAR. During the process of the preparation of the master plan a priority setting, programming and budgeting mechanisms were internalized in FOFIFA. Donors participating in the appraisal of the NARP project agreed to put their assistance within the framework of the NARP.

Although the NARP project had a national scope, donors were free to choose a component or part of a component of regional or sectoral scope. USAID for instance funded the rice programme with IRRI as an executing agency, France/CIRAD concentrated on export crops, the European Union, funded research programmes on tubers and ground nuts, etc. The executing agencies of these projects were national assisted institutions, in particular for NARP, FOFIFA was the executing agency. However, the components funded by USAID and France were managed separately by the donor agency, information available did not indicate what the role of the recipient institution was.

All donors who participated in the appraisal did not participate in the support of the project. Donor coordination was easier and the interministerial steering committee satisfactorily fulfilled its role at the beginning of the project. It became, however, less important as many bilateral donors withdrew from the subsector, leaving the USAID and Swiss Cooperation as the only other donors remaining and cooperating in the national research programme.

The situations described above brings out the general conclusion that institutional development impact has been substantial. Sustainability is, however, fragile and recommendations were made for continued assistance at least until the completion of the master plan. This implies at least eight more years for FOFIFA.

## **Malawi**

The NARP project was prepared after the review of the NRDP. It was considered essential to establish a 10 to 15 year programme to restructure and improve Malawi's agricultural research system. ISNAR reviewed NARS and DAR assisted by consultants. The World Bank Regional Mission of Eastern Africa supervision missions prepared the project, following the review. The World Bank with the participation of USAID later appraised it. After the appraisal the two donor partners decided to finance separate components of the NARP. This is a clear indication that concerted action of donors and government at the project preparation phase can lead to coordinated funding of a government priority programme.

Although the NARP was a research project, the USAID funded component was linked to the Malawi Research and Extension Project (MARE) and approved in July 1985. The Consortium for International Development, involving four universities, with Oregon State University serving as the lead institution, managed this component.

The executing agency was the Ministry of Agriculture that administered it through the Principal Secretary for Agriculture who was also responsible for implementing the project. The Chief Agricultural Research Officer who reports to the Principal Secretary through the Controller of Agriculture Services, was directly responsible for project management. Some guidance for this purpose was also expected from ARC. Human resources development through degree-training as well as short-term courses received great attention, in total 31 MSc and eight PhD. Unfortunately, with opposition from Government of giving a special career stream to research scientists, most of these scientists left soon after their return for better paid jobs. Overall the number of scientists of DAR did not increase consistently during the assistance.

Linkages with the World Knowledge System within NARS and outside are crucial for effective and efficient research enterprises. Within NARP it has been a pervasive concern and has been enhanced. However, linkages with extension through adaptive research teams were not as effective as expected. ARTs have not been fully staffed and in particular the turn over of economists in these teams was high as they regularly left for better employment elsewhere.

The assistance to DAR within the NARP encompassed key elements for laying the foundation of a strong institution (establishment of ARC, consolidation of DAR's network of stations, reorganization of DAR into multi-disciplinary research teams, preparation of a long-term strategic plan, training of high calibre scientists, development of sufficient infrastructure and equipment, introduction of a better scheme of service and research environment, improved linkages and partnership with the World Knowledge System, etc.). However, the project did not have as an objective, to consolidate all public research systems. The system remains dispersed in various ministerial departments, although coordinated by the Ministry of Research and Environmental Affairs and in some way by the Committee of Agricultural Sciences of the Scientific Council of Malawi.

The above-mentioned situation brings out the general conclusion that institutional development impact has been substantial, however, the sustainability was considered doubtful and recommendations were made for continued assistance at least until completion of the master plan.

## **Mali**

Most of the projects analysed even if they preceded the completion of the strategic plan (the Cinzana CIBA-GEIGY, the DSRPR), that their activities fit in its priority programmes. The SPARC and the NARP were prepared after its validation and presentation to the round table with donors. The USAID (that funded the preparation of the strategic plan) decided to fund part of it with a limited scope and a duration of seven years despite the 12 year duration of the plan. The World Bank/IDA prepared the NARP as a donor of the last resort with a system wide perspective. The other two projects, the DSRPR and the Cinzana CIBA-GEIGY project, at the start or after some years could mobilize other donor partners (IDRC and Ford Foundation for the DSRPR; USAID and ICRISAT for the Cinzana CIBA-GEIGY). All the four projects were prepared in a long-term perspective, those stemming from the strategic plan as well as those that preceded it. However, all of them were executed in several phases and managed separately and differently. The DSRPR through the KIT as executing agency; the SPARC by a consortium of US universities led by Texas A&M, the Cinzana CIBA-GEIGY, by a board of directors encompassing donors representatives and government representatives with management responsibilities vested in the national director supported periodically by foreign technical assistance, and the NARP executed by IER/CNRA under strict agreed upon procedures of IDA.

The assistance provided although considered of long-term nature, were executed in phases: the DSRPR for 20 years in five phases; the SPARC in one phase for seven years, the Cinzana CIBA-GEIGY, over 15 years and still ongoing in five phases; the NARP for the 12 years duration of the strategic plan in two phases of six years each. Overall IER has been substantially strengthened and has changed statutes from a ministerial department model to a public semi-autonomous scientific and technical institution. All projects were provided with technical assistance either long-term bilaterally (SPARC, DSRPR), or short-term within the NARP and the CIBA-GEIGY assistance. The former took a sizeable amount of the total funding (more than 33 percent). For the latter the amount was less important with 10 percent for the NARP and a negligible sum for the CIBA-GEIGY project.

The assistance provided to NARS with the four projects encompassed key elements for laying or consolidating the foundation of a strong institution. This included:

- reform of the NARC and its strengthening for fulfilling its new mandate of policy formulation;
- coordination and management of donor funding;
- reform of the statutes of IER from a ministerial department model to a public semi-autonomous institution, EPSTC;
- Strategic planning, reorganization and down-sizing of the network of IER stations and decentralized organizational structure with regional research centres;
- completion of the coverage of all agro-ecological zones with the creation from scratch of the Cinzana Agricultural Research Station for the Sudano-Sahelian zone;
- creation of a farming system research programme and department within IER enabling better linkages with farmers and understanding of their production system;



- rehabilitation and construction of infrastructure, purchase of equipment and training of high calibre cadre of scientists and support staff with good research environment through a motivating scheme of service, etc.

However the assistance increased/maintained the imbalance in the system in favour of IER, the other components, particularly the academic institutions did not receive the attention they deserved given their human resources potential. The role of the CNRST in the overall coordination of research has not been clarified and evaluated.

The above-mentioned situation brings out the general conclusion that institutional development impact has been substantial. However, the sustainability was considered to be consolidated given the continual high ratio of donor funding and the lack of any innovative funding alternative mechanism. Therefore, recommendations were made for continued assistance at least until completion of the strategic plan that has been revised.

## Senegal

Most of the projects analysed even if they preceded the strategic plan (CDH, UNDP/FAO ITA project, IDRC), were in line with the country priority programmes. The PRA I and II, the USAID SARP, SAR II and NRBAR were prepared within the ambit of the first strategic plan and its successors. This is a clear indication that donors can accommodate their priorities with those of the recipient country. There must be a provision of firm commitment of government authorities and strategies along with concerted action with donors at the project preparation phase. The result will often be coordinated funding of priority programmes.

Most of the eight projects were prepared in a long-term perspective with a clear and consensual vision of institutional development. This was similar to the process that prevailed between ISRA and the donor community with ample funding, in the early 1980s. However, all projects were implemented in several phases and managed differently and separately. USAID's approach as analysed by the USAID Impact Study Mission stated:

*“Overall the projects have had a major reorientation in at least four critical points. First, a consistent 15-year institutional capacity building process with ISRA as projected in 1981 was effectively abandoned by unilateral decision when SARP II Project was rejected by USAID as the second phase of the process. Second, the SAR II reorientation to work on irrigated crops in the Senegal River Basin changed the fundamental focus of the continuing assistance from a broad-based institutional strategy with ISRA to a much narrower regional development project. Third the decision of USAID/Senegal in 1990 to refocus its agricultural research/extension assistance targeting exclusively to the area south of 400 millimetre rainfall isohyet and de facto toward rain-fed crops again juxtaposed a unilateral donor decision against ISRA's broader strategy for agricultural research in Senegal. Finally, the NRBAR Project approach as it evolved moved USAID/Senegal progressively further and further from institutional development approach adopted in 1981. The approach adopted not only resulted in NRBAR Project operations being conducted essentially as an independent activity not integrated within ISRA but refocused the acceptable realm of research exclusively on natural resource management interventions in the southern half of the country.”*

For the IDA projects as well as for the Belgian and IDRC projects, the stepwise execution was not reported to have a negative effect on the institutional development of ISRA. It permitted proper evaluation of performance and identification of weaknesses to be addressed in the follow-up phases. The legal status for research institutions (ISRA and ITA) was changed, with IDA constant advice, into a more appropriate one, *the public science and technological institution*, that allows for a better scheme of service for scientists.

All projects provided technical assistance, both in the long-term and short-term. The USAID ones executed by American universities, the UNDP/FAO and Belgian projects and to a lesser extent

the IDRC funded project. Consequently a good percentage of the project costs was spent on technical assistance with expenditures ranging from 14 to 50 percent.

The assistance provided to NARS with the eight projects encompassed key elements for laying the foundation of a strong institution encompassing:

- institutionalizing strategic planning;
- strengthening of the board of directors and its STC of ISRA;
- creation from scratch of CDH to cover the horticulture subsector research;
- regionalization, decentralization and streamlining of the research network of ISRA;
- creation of ITA for the food processing subsector;
- strengthening of the farming system research approach within ISRA enabling better linkages with farmers and understanding of their production system;
- rehabilitation and construction of huge new infrastructure;
- purchase of equipment and training of high calibre cadre of scientists and support staff and striving to provide a good research environment and a motivating scheme of service, etc.

However, assistance increased/maintained the imbalance in the system in favour of ISRA in particular and to a lesser degree ITA, this left academic institutions aside. Academic institutions with their human resources potential should have received more attention in the effort to strengthen NARS. Moreover, at the policy formulation and coordination level, the role of the CIRST was not evaluated.

Overall, assistance provided during the early 1980s by several donors brought a fast growth of ISRA that increased its network of centres and stations, infrastructure, equipment and personnel of all categories. The institutional growth quickly outstripped ISRA's internal administrative capacity to manage its expansion and was soon judged not sustainable. By the end of the SAR II Project, USAID recognized that ISRA could not properly manage its resources whether financial, physical, technical or human. It was recognized that ISRA's greatest challenge was to bring its research programme in line with existing financial and human resources. Henceforth, ISRA underwent a series of restructuring and downsizing exercises. The project completion report of the first agricultural research project stated: *"Perhaps the single most important constraint to the operational effectiveness of ISRA was its limited capacity to manage its financial resources"*. The completion report of the second agricultural research project added that *"the fact that this statement remains valid at the conclusion of the second project is a regretful indictment of donors' and ISRA's ability to correct this situation despite heavy consultant involvement. Despite the continued donor heavy involvement, ISRA remains institutionally fragile and far from being sustainable, the funding ratio of donor funding is still high and no innovative alternative funding mechanism is available."*

#### **5.4 Recommendations to governments and NARS in each country**

As for the country specific conclusions, some of the recommendations are recurrent for all countries. This is only to be expected given the common theme of institutional development. Therefore, they are presented as the hub of the section and are valid for all countries.

Supporting agricultural research for the contribution to a national knowledge system and in particular for providing improved production technologies for the small farmers and the preservation of natural resources and the environment, is the sovereign task governments cannot escape. It is their inalienable responsibility to organize and provide required resources to fulfil this mandate. However, the task can be shared within a well-defined partnership at national as well as the bilateral and international levels under the condition that priorities are set beforehand.

Public resources, particularly financial resources, are generally the limiting factor. Due to financial demands from many sectors, governments should prefer sustainable solutions as opposed to wholesale approach for institutional development. It is essential to design the system on a modest scale such that current costs can be met in the future through local resources. For this purpose

governments should resist donors showing erratic generosity for projects of peripheral importance. “Many NARS are suffering sudden withdrawal of aid and the aftershock of their expansion” (Eicher, 2001). Interruption of research programme activities is costly and wasteful and should be avoided as much as possible.

Sustainable support for research is entailed for research managers besides accountability and transparency, salesmanship for research results through a well-designed marketing programme towards the various end-users who very often take for granted the effort and resources that cost the technologies they use for their various needs including comfort. A strong lobby system including policy-makers and leaders of farmer organizations is also necessary.

### **Cameroon**

National financial resources (public and private) for funding agricultural research in Cameroon were not more than 58 percent of total research expenditure of IRA and IRZV from 1992 to 1994; 42 percent was provided by foreign assistance; this is a situation that is not acceptable in the long run in terms of institutional development and sustainability. Therefore, mechanisms for increasing national financial resources should be worked out. A study, sponsored by FAO in 1996, entitled “the Cameroonian NARS, modalities for long-term funding of agricultural research”, after a review of several scenarios of funding, involving relevant national stakeholders, came to the conclusion that national resources (Government, proceeds from IRAD activities and private partners) could cover 95 percent of the annual budget of IRAD; this avenue should be explored seriously by Government and national research leaders.

### **Ghana**

National financial resources (public and private) for funding agricultural research in Ghana in 1989/1991 were US\$8.7 million out of total resources from all sources of US\$11.9 million or about 80 percent which is the highest percentage in West Africa. *The reliance on foreign assistance is therefore relatively limited.* There is no doubt that with serious analyses of various funding mechanisms involving the private sector and other research users, particularly in the cash crop sector, additional resources could be found to fill the gap of full national funding of NARS priority programmes that would improve or achieve its sustainability. Government and national research leaders should explore this avenue seriously.

### **Kenya**

National financial resources (public and private) for funding agricultural research in Kenya in the 1992/1993 fiscal year amounted to about US\$22 million or 34 percent of the total funding requirement of US\$65 million. Donors made up the gap of US\$43 million or 66 percent. This situation of reliance on donor funding of agricultural research is very common in sub-Saharan Africa and questions the sustainability of NARS. It is expected that government funding will reach 42 percent at the end of NARP II, leaving still some 52 percent to donors. The expectation is that their support will continue for the years ahead. However, it is reported that innovative initiatives in tapping new sources of funding at national level are underway such as transferring to industry organizations in the case of industrial crops, retrenchment of non-essential support staff, rationalization of KARI’s research centres network and expanding KARI’s revenue base through the sale of seeds and planting materials of improved crop varieties, animal breeds and vaccines, etc. Government authorities and national research leaders should further seriously explore this avenue of diversifying the national potential sources of funding agricultural research.

## **Madagascar**

National financial resources (public and private) for funding research in Madagascar in 1997 was estimated at US\$2 939 122 or 0.25 percent of AgGDP. The budget of FOFIFA in 1997 was US\$2 921 821 in which the donor accounted for 67 percent, meaning that without donor support the country could afford only the support of one institution albeit the dominant one. The research intensity of Madagascar without donor support is only 0.25 percent, which is among the lowest in sub-Saharan African countries. The figure with donor support is 0.57 percent. Therefore, donor support will still continue to be needed at a high level. However, it is reported that innovative initiatives in tapping new sources of funding at national level are underway such as research contracts with big private growers, more research on export crops and levies of cess on them, retrenchment of non-essential staff, rationalization of research centres network and expanding FOFIFA's revenue base through sale of seeds and planting materials of improved crop varieties, animal breeds and vaccines, etc. Government and national research leaders should further seriously explore this avenue of diversifying the national potential sources of funding agricultural research.

## **Malawi**

Recent data on funding showed that the situation has been deteriorating. It is reported that most government subventions to research go to salaries and overheads whereas almost all donor grants and loans support operational activities. Out of the total research budget (in 1998/1999) of US\$1 647 845, the Government of Malawi's contribution represented 28 percent. Donor and local seed companies contributed the rest. Without donor agency support most of the ongoing research activities would have been stopped. In 1994/1995 research expenditures corresponded to a research intensity of 0.78 percent of AgGDP, less than the planned target of one percent in the research master plan. In terms of sustainability the completion report of the NARP, as indicated previously, considered that it was doubtful. However, there is some consciousness in Malawi of the major constraint of funding agricultural research from the sole public resources and donor support. Innovative approaches are being sought to supplement them, such as the creation of an agricultural research and development fund (ARDF), endowment foundations, commercialization of research, etc. Government and national research leaders should further seriously explore this avenue of diversifying the national potential sources of funding agricultural research. Among the national resources the Government avails to NARS the most important are the human resources and among them the high calibre research scientists trained in international universities at high costs. The situation in Malawi shows that the Government is the training ground for other institutions, as most of DAR scientists left (32 percent at MSc and PhD levels) from 1985 to 1991 for better-paid employment. Therefore, Government should strive to provide a proper organizational framework that can allow better salary packages and research environment. The department model of DAR has definitely been a constraint despite the strong donor pressure to improve the career stream of research staff.

## **Mali**

The Government has signed a contract with IER for increased contributions over a five-year period. However, the proportion of the total research budget to be funded from domestic resources is not projected to increase. Furthermore, since the signing of the contract, the government contribution has been paid on time each quarter, a substantial improvement on past performance. A recent World Bank supervision mission report of February 2000, indicates that the Government has decided to increase its contribution by US\$120 000 to take into account the salary increment induced by the new scheme of service of scientific staff. Despite this notable effort, the donor community is still financing 72 percent of the research expenditures of IER. Furthermore, the research intensity is only 0.56 percent which is below the target of one percent of AgGDP that developing countries strive to reach. As no innovative action has so far been taken to mobilize more domestic financial resources, funding will remain the Achilles' heel for NARS. Government and national research leaders should seriously explore the avenue of diversification of national potential sources of funding. Recent reports show that the Government is a training ground for other sectors (30 among the highly qualified scientists have IER within 2.5 years). Therefore, Government should strive to provide a proper organizational framework

that can allow for better salary packages and research environment. The Government of Mali has made an important stride in this direction with the adoption of the new EPSTC statutes.

## **Senegal**

Continuity in strong national leadership with a clear vision of the institutional capacity building process is essential for its success. The high turnover of senior management (more than eight director-generals in 26 years) has hampered the institutional capacity-building in ISRA. The Government should strive to stabilize the high management turn-over through fixed term-appointment of the director-general for at least five years. This can be renewable based on performance and not political cronyism. Downsizing of ISRA on several occasions in the past two decades has not resulted in increased availability of funds for either significantly increased salaries or coverage of other recurrent costs. Funding will, therefore, remain the Achilles' heel for NARS. Government and national research leaders should seriously explore the avenue of diversification of national potential sources of funding agricultural research. The application of the recommendations of the FAO sponsored study, dated February 1997, entitled: "*Modalities of long-term funding of agricultural and agro-industry research*", has been flawed in many ways: (i) creation of a fund as a unique mechanism of funding without putting into place a process of its replenishment; (ii) instituting the sole access to the fund through competition, in a country where NARS is dominated by two specialized research institutions each having a strategic plan encompassing the priority research programmes adopted by the Government and the stakeholders. This approach has been the result of the application of covenants worked out by incompetent staff of an international funding agency. They have been eager to experiment an idea that has flourished no where. A competitive grant fund cannot be a major source of funding a publicly funded NARS/institution, it can only be a complementary mechanism of funding. The system put into place is wasteful of resources and is an additional bureaucratic layer for NARS leaders. It ignores completely the criteria of alternative funding mechanisms that includes: additionality, accountability, administrative cost, flexibility of research, sustainability and acceptability (Jannsen, 1998). Furthermore, a number of studies reported that competitive funding should be introduced on a pilot basis and viewed as a complement to core funding of a NARS (Byerlee, 1991).

The most important national resources Government avails to NARS, are human resources and high calibre research scientists trained in international universities at high costs. Recent turnover reported in ISRA shows that the Government is a training ground for other sectors. Of the 42 scientists trained at MSc and PhD levels, within the SARP and SAR II USAID projects, 50 percent of them and the most experienced left ISRA as of 1998. Therefore, the Government should strive to provide a proper organizational framework that can allow better salary packages and research environment. In this regard the Government of Senegal has made an important stride in this direction with the adoption of the new EPST statutes.

## **CHAPTER 6. RECOMMENDATIONS TO DONORS, NARS AND GOVERNMENTS**

### **6.1 Introduction**

Recommendations for better use of foreign assistance to institutional development of NARS in sub-Saharan Africa are presented in this chapter. The recommendations are based on findings from the selected projects from the seven countries.

Since independence all governments have increasingly invested in agricultural research. Funding has come from own resources as well as from development partners. Production technologies provided by the public agricultural research institutions have sustained agricultural production and ensured food security despite a high rate of population growth.

National Agricultural Research Systems (NARS) have been shown to have a positive impact on agricultural production. Agricultural research institutions remain, however, fragile and further institutional development is in no way ensured. A major objective of the study was to determine if donors took institutional development issues into consideration when assisting NARS or NARIs/NAROs.

### **6.2 Recommendations to donors**

Contribution of donors to agricultural research in sub-Saharan Africa will continue to be appreciated for many years to come. However, experience gained from the implementation of the 36 projects, allows one to make the following recommendations for more efficiency and effectiveness of donors' assistance.

#### **Priorities**

Priorities set by government should be adhered to and not by-passed through supply-driven projects. Although there might be no single political notion of how to achieve scientific institutional building or strengthening, there is always a hidden agenda or vested interest of promoting one field of science and one type of technology rather than another.

#### **Long-term**

Institutional development is a long-term process that needs decades rather than years to achieve its goal (Eicher, 1991). Donors must take heed of the long-term nature of institution building when decisions are made to participate in projects of this sort. Consistent donors hold the key to optimal utilization of development resources. Donors who change their approach every three years create confusion and havoc to institutional capacity building projects.

#### **Negative impacts**

External assistance sometimes had negative impacts despite the intention of strengthening agricultural research. Some donors might encourage government to over-extend their commitment of infrastructure and operating funds with insufficient attention to long-term sustainability of the research system. World Bank, NARP projects fall partly into this category. Projects that provide new buildings, vehicles and opportunities for overseas training in order to achieve visible progress in four to five years do not take sustainability sufficiently into account. The repetition of this cycle often leads to a large magnificent set of buildings, limited scientific capacity and a bloated and fiscally unsustainable institution (Eicher, 1999).

Provision of expatriate experts and consultant services has also in some cases tended to reduce or delay the development of local skills and capacity (FAO/UNDP, 1984).

#### **Assistance should not be experimentation**

Donors should avoid using recipient countries/institutions as a testing ground for new ideas or models. Success cannot in any way be guaranteed for this type of experimentation.

#### **Avoidance of donor influence on priority setting**

Care must be taken to avoid excessive donor influence in setting priorities through proxy organizations in the pursuit of a demand-driven research agenda. If the priority setting process within NARS is truly demand-driven, the demand must be expressed by the clients themselves and negotiated between those clients and NARS based upon realistic appraisal of the resources available for agricultural research.

#### **Adequate costing**

Support to major research programmes must be on a modest scale in order to secure that future recurrent costs can be covered locally. Donor support for national research programmes must be realistically tailored to the capacity of research institutions to cover recurrent costs. It is extremely demotivating for researchers to have access to state-of-the-art equipment and infrastructure during the course of a donor project, only to see them deteriorate and become technologically obsolete almost as soon as the donor support ends.

#### **Measuring progress**

The number of participants trained at various levels, buildings constructed and the number of saloon cars and 4WD vehicles provided, should not be a measure of project success. Success must be measured by research results delivered to the farmers and sustainability of the recipient institutions. The abrupt ending of assistance is often also detrimental to the sustainability of donor assisted activities. Small financial support in a transitional phase should be viewed as a valuable way to phase out projects. The agricultural research capacity in a country must not be regarded as a simple sum of well-trained researchers, adequate building and well-equipped laboratories. These are means and not ends (Murphy, 1983). The most successful assistance instances are when the project continues to run smoothly after project termination. In order to achieve a successful follow-up it is necessary to keep in mind that: (i) the types and levels of intervention should have a diminishing dimension as NARS/NARI will be expected to further improve in strength; and (ii) the supply of external interventions should be expected to be more structured and better targeted to specific needs. In other words, a phasing out mechanism should be built-in when designing the programme/project.

### **6.3 Recommendations to NARS**

#### **Long-term planning in NARS**

Institutional development is a long-term process. Various national actors must therefore put their actions in a long-term perspective. Supplying continuity in national leadership and a clear vision for the needed institutional capacity-building process is obviously a target for governments. It must not be forgotten that institutional development is not an end in itself. Its purpose is to build capacity to effectively and efficiently execute high priority issues in relation to national policies and farmers' needs. NARS must also be shown to have the capacity to respond dynamically to a changing internal and external environment. Governments must therefore develop priority research programmes for NARS/NARIs based on a long-term strategic plan. The exercise becomes, however, meaningless if resources for their implementation are not assured.

## **Priority programmes**

All resources, national and foreign alike, should be geared towards the execution of priority programmes as set out in the national strategic plan. The creation of a consultative group for agricultural research among donors is a positive move to improving coordination and implementation of priority programmes. Such bodies could in the long run expand to become consolidated funding mechanisms (CMF). This suggestion was put forward by SPAAR within the Framework For Actions (FFAs) in 1990. Unfortunately, a recent evaluation of the implementation of the principles of the FFAs concluded that the least implemented principle was the sustainable financing that encompassed the CFM. Donors are still reluctant to move to programme financing and CFM and strongly attached to single projects. The use of an integrated sector approach to research where all research-operating costs are considered as a capital good development expenditure with long-term results, as opposed to short-term is often acceptable to research managers. Introduction of time-bound contractual arrangements for research funding, based on accountability for research relevance, requires moreover long-term commitment by donors and government.

## **Being responsible for financing**

The responsibility for financing agricultural research by government and full ownership of NARS should be clearly stated at the onset and donor funding assured based on this government commitment. Progress towards financial self-sufficiency/sustainability is a *sine qua non* for institutional capacity building. Transparency and accountability should be the rule of thumb. In order to gain the confidence of all partners clear mechanisms of independent evaluation of NARS'/NARI's development is also necessary.

## **Decentralization**

Decentralization of research is essential in order to bring about more relevance and responsiveness of research programmes. The needs of stakeholders must be taken into account. Stakeholders must also be able to participate in programme formulation and evaluation. Mechanisms must therefore be in place, which allow stakeholders to effectively have an impact on the priority setting, design, implementation and evaluation processes of the research institutions. All NARS have responded positively to this demand. Decentralization of activities closer to users should not result in investments in facilities beyond the capacity of the institution to operate and maintain these properly.

## **Incentives for researchers**

Development of well-trained researchers takes times and is costly. Human resources development and institutional development projects must therefore be long-term. Training is however not enough. There must be an innovative and sustained effort to retain researchers through salary incentives and a proper working environment. Training of well-qualified scientists can easily become training for work abroad and in donor countries. Many NARS researchers have found high level positions in management throughout Africa and in international organizations. Donors, NGOs and private sector agencies frequently seek their expertise. Their skills and professional capabilities acquired through training organized by NARS are well appreciated by many donors and employers outside of NARS.

## **Internal and external linkages**

The linkages within NARS have improved considerably. However, a major imbalance between research institutions, universities, farmers' organizations, NGOs and other stakeholders still exists. Academic institutions receive, for instance, little attention from government and from donors. This is unfortunate given their potential contribution to agricultural research. There have been innovative initiatives that can contribute to boost stakeholder involvement in formulation of applied research programmes (such as the Agricultural Research Fund in Kenya). Even if recognition of pluralistic NARS is a present trend one should avoid weakening NARI/NARO by creating new artificial structures. The pluralism of NARS is better obtained by involving all parties in national strategic



planning exercises. There should be a subsequent allocation of tasks and resources based on comparative advantages of each party.

External linkages have also been enhanced particularly with IARCs and regional research organizations. Much attention is given today to regional research organization as a tool for strengthening NARS. Questions have been asked if proliferation of initiatives and agencies to coordinate funding and, in some instances, the conduct of African agricultural research really has had any substantive impact. Or on the contrary, if it merely has served to increase bureaucratic overheads (Roseboom, Pardey and Beintema, 1998). A lesson reported by SPAAR is that additional consideration needs to be given to the realities of collaborative regional research. There might be appreciation for the potential benefits of such activity, but the necessity of creating stable, well-funded and self-confident national systems remains as a first priority. The goal must also be to avoid the dissipation of scarce national capacity and funding. The regional research agenda needs therefore to be carefully identified and relative comparative advantages fully exploited.

### **Institutional development**

Overall, the conclusion for the study is that the basis for institutional development is present in all countries. Albeit after experiencing various periods of expansion, contraction, restructuring and downsizing. Agricultural research management has been improved at all levels (policy formulation, planning, organizing, evaluation and controlling, etc.). Adequate bodies have been established, but proper functioning of these is more uncertain. Human resources have improved in quality and quantity. Most governments have also striven to improve incentive schemes as well as a better research environment. Staff attrition is, however, still high. Strategic planning, priority setting and programme budgeting and management are routinely performed in NARIs. A master planning process has had an important and significant effect on institutionalizing priority-setting mechanisms in NARS. It has also been helpful in aligning agricultural research with national development objectives. The process has had a marked value in capacity building for planning in NARS (SPAAR, 1995).

Despite the progress noted, NARIs remain fragile institutionally. Sustainable funding remains the Achilles' heel of NARIs and particularly of non-staff related costs. SPAAR came to the same conclusion in 1995 and stated that: *"a universal and recurring problem is the shortage of operational funding. This persists despite the serious attempts by management to reduce staff levels and research sites to meet the requirements of the priorities and agenda."*

After four decades of NARS development through expansion, restructuring and downsizing, the time has come for consolidation or decompression (Eicher, 2001). This cannot take place without sustainable funding. Sole reliance on donor funding is not a long-term solution. To diversify domestic sources of funding through resolute evaluation of all potential sources of funding mechanisms might be one option (FAO /SPAAR/KARI expert consultation, 1993). This requires however, African resolve, African political leadership and aggressive indigenous resource mobilization.

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### EVOLUTION OF THE AGRICULTURAL RESEARCH SYSTEMS

#### Introduction

The evolution of agricultural research in the selected countries is intimately linked to the overall history of agricultural research in sub-Saharan Africa (FAO/SPAAR forthcoming). This was particularly the case for the colonial period when two major colonial powers (France and the United Kingdom and to a lesser extent Germany) ruled these countries. Agricultural research was initiated in the late 19<sup>th</sup> to the early 20<sup>th</sup> centuries by the colonial powers. France in Madagascar, Mali and Senegal, Germany in Cameroon and the United Kingdom in Ghana, Kenya and Malawi. The most prominent feature of this early period was the creation of botanical gardens. After the First World War and the need for more exotic raw materials for the fledgling industries of the colonial powers more formalized and structured research was needed. Each colonial power subsequently organized its own system with its own particularities. There were, however, also some similarities.

#### Cameroon

In Cameroon, Germany established botanical gardens in three locations (Edea, Akonolinga and Victoria). There were also research projects on ways to achieve rural development, in rural sociology as well as botany and zoology. After the First World War with the oncome of the French, fully fledged research stations were created for arabica coffee (1925), animal production (1930) and for food crops (1933), robusta coffee and food crops (1938). A research station was also created for soil studies and groundnut/animal traction in agriculture. The stations were set up by the agricultural services for the High Commissioner of Cameroon.

Agricultural research was later boosted with the creation of branches of the French tropical research institutes. *The Institute of Tropical Fruits* (IFAC/IRFA) set up a station in Nyombe in 1944, the *Institute of Oils and Oil Seeds* (IRHO) created a station on oil palm and coconut palm in Dibamba in 1948 and *the Tropical Institute of Veterinary and Livestock Research* (IEMVT) established a research station in Wakwa in 1955. The French Overseas Office for Scientific Research (ORSOM/ORSTOM) also established a centre in Yaounde in 1949 focusing on pedology, entomology, geography, etc. In the English-speaking part of Cameroon, the British administration created the Barombi-Kang Station in 1951 and the Ekona Centre in 1954.

Later on in the sixties, national authorities placed emphasis on higher education. A national agriculture school (faculty/college) was created in 1960 (Yaounde) with the assistance of USAID. It was transferred in 1988 to Dschang to become the National Institute of Rural Development (INADER) and later on the Faculty of Agriculture of the University of Dschang. Other centres or universities were created later on in Yaounde, Douala and Ngaoundere, etc.

In 1962 the National Council for Applied Research (CNRSA) was created in the Office of the President of the Republic. However, this did not reduce the monopoly of the French research institutes that operated under the cooperation agreement between France and Cameroon signed in 1963. New tropical French institutes completed the network with the cotton and textiles institute established in Maroua. The Research Institute on Tropical Agriculture (IRAT) was responsible for research on food crops. The French Institute on Coffee and Cocoa took over the stations of Nkolbisson and Nkoemvone. The Technical Centre for Tropical Forestry (CTFT) set up a station in Bertoua in 1964.

In Cameroon the reorganization that started in the sixties was pursued. The National Office for Scientific and Technical Research (ONAREST) became operational in 1974. The year marked a cornerstone in the evolution of the country's research system. Nine national institutes were created encompassing the previous national and foreign institutes within the new cooperation agreement

between France and Cameroon. In 1976 the nine institutes were reduced to five of which two dealt with agriculture and were:

The Institute of Agricultural Research (IRA), which in 1979, succeeded *the Institute of Agricultural and Forestry Research (IRAF)*, created in 1976 with the merger of three previous institutes, created in 1974; and *the Livestock and Veterinary Research Institute (IRZV)* successor, since 1976, to the Livestock, Veterinary and Pasture Research Institute (IRZPV) created in 1974 and took over from the IEMVT French Institute in Ngaoundere. In 1979, IRZV took the responsibility from ORSTOM for research on marine and inland fisheries.

In 1982 the High School of Agro-Food Industries of Cameroon (ENSAAC) was established in the University Centre of Ngaoundere, in 1992, it was named the *High School of Agro-Industry Sciences (ENSSAI)*.

From 1979 onwards many changes occurred in the helm of the policy formulation and coordination bodies of the research system. In 1979 the ONAREST in charge of both the definition of the national research policy and the direct management of some national institutes was changed and named General Delegation of Scientific and Technical Research (DGRST), in the Office of the Head of State. The responsibilities, however, remained the same. In 1984 the Ministry of Higher Education and Scientific Research (MESRES) was created with one of its departments having the same responsibility as the DGRST, until 1992 when a full fledged Ministry of Scientific and Technical Research (MINREST) was established.

The two institutes, IRA and IRZV, were consolidated, in 1996, into one institute: Agricultural Research Institute for Development (IRAD). This restructuring was carried out within a careful exercise of redefinition of priority research programmes and research network covering the major agro-ecological zones of the country within the framework of a long-term strategic research plan. IRAD dominates the whole NARS.

## **Ghana**

Ghana, formerly known as the Gold Coast, was a British colony established in 1874. Agricultural research started with the establishment of the Government Botanical Gardens in Aburi in 1890. The Aburi Gardens were formally linked to the Kew Gardens in England, whose staff largely directed the work in Aburi. Research at that time focussed mainly on screening exotic material, such as oil palm, cocoa and rubber, for economic uses in the colony. The gardens later on formed the basis for the Department of Agriculture that subsequently assumed leadership in agricultural research. Between 1900 and 1910 the Department established agricultural experiment stations in four stations. The stations carried out research mainly on one or two crops. This was supplemented with more generic crop introduction work in the Aburi Gardens with research on specific crop production systems.

Several regional research organizations were established throughout British West Africa in the late 1940s and early 1950s with support from the Government of the United Kingdom. This research organization represented an addition to research carried out by the Department of Agriculture of the colonial government. At independence in the late 1950s and early 1960s the regional organizations collapsed and their research facilities and activities were transferred to national governments. This happened first in Ghana. Ghana came to assume the headquarters of the *West African Cocoa Research Institute* and some facilities of the *West African Institute for Oil Palm Research* and the *West African Timber Borer Research Unit*.

At independence Ghana started the implementation of its development policy by putting into place a proper institutional framework. Scientific research was hitherto being conducted in an uncoordinated manner in isolated research stations of some government departments. The Joint British West Africa Inter-Territorial Organization was also responsible for institutes and schemes spread throughout the four former British colonies of West Africa. In order to assert its independence



and sovereignty, Ghana broke away from the West African Research Organization with the firm objective to consolidate all scientific activities under one umbrella.

According to the Research Act of 1958, the Government created the National Research Council (NRC), charged with the responsibility of scientific, social and industrial research in Ghana and specifically to carry out the following functions:

- exercise control over any research scheme, unit or project created by the council;
- coordinate research in all its aspects in Ghana;
- assist and encourage academic, commercial and other organizations undertaking research in Ghana;
- cooperate and liaise with national and international research organizations in any part of the world;
- secure full use of the results of research by collection and dissemination of information and advice.

The National Research Council (NRC) has undergone many changes in name and is now known as the Council for Scientific and Industrial Research (CSIR).

The next step for the Government was to set up a network of the research institutes under the umbrella of the CSIR. The CSIR has 12 research institutes operating under its umbrella. Of these six are entirely concerned with agricultural research and two others are partly so. Each of the institutes is semi-autonomous and is headed by a director and has its own management board. They are listed as below:

*The Animal Research Institute (ARI)* was established in 1964 to carry out research into all aspects of animal production and to disseminate information to support the animal industry. Its permanent site has moved from Achimota to Katamanso. In 1994, ARI had a scientific staff of 24 scientists.

*The Crop Research Institute (CRI)* was established in 1964; it has two sites located in Fumesua (main laboratories and experimental plots) and Kwadaso (main office) near Kumasi. It conducts research into production of cereals, legumes, roots and tubers, horticultural crops and farming systems in all the ecological zones of the country. CRI is responsible for a major semi-autonomous station in Nyankpala Experiment Station that evolved, from June 1994, into the Savanna Agricultural Research Institute. The CRI has a research staff of 80 including 28 in the SARI.

*The Food Research Institute (FRI)* was established in 1963 in Accra to conduct research into problems of food processing and preservation, storage, marketing, distribution and utilization. The FRI has, since 1994, 36 research scientists on its staff.

*The Oil Palm Research Institute (OPRI)* was established in 1964 and became semi-autonomous in 1988. It is located in Kusi, near Kade and provides scientific and technological support for the oil industry of the country. It had in 1994, 21 research scientists on its staff.

*The Soil Research Institute (SRI)* was established in 1964 in Kumasi (Kwadaso). It supplies data on soils and the environment for planning agricultural activities for increased and sustained production; furthermore it has responsibility for all national soil classification and mapping. The Institute, in 1994, had 28 research scientists.

*The Institute of Aquatic Biology (IAB)* was established in 1965 in Accra; it conducts research into all aspects of the biology of the resources of inland, estuarine, lagoonal and immediate coastal inshore water systems of Ghana. Apart from agricultural aspects, it also studies problems such as water borne pests and diseases. In 1994, the institute had 27 total research staff.

*The Forestry Research Institute of Ghana (FORIG)* was formed in 1963 in Kumasi. The research work of FORIG is in silviculture and management, agro forestry, processing and utilization and protection of forest products.

*The Water Resources Research Institute (WRRRI)* was established in 1982 in Accra. It is responsible for research on the water resources of the country and is partly concerned with agricultural research.

Besides the CSIR and its network of 12 institutes for which eight are agriculture oriented, as enumerated above, other components of NARS include the following institutions:

a) Universities

The three universities are located in Legon, Kumasi and Cape Coast. They operate under the Ministry of Education and carry out agricultural research in several departments in their agricultural faculties/schools as well as other departments and institutes.

*The University of Ghana, Legon (UGL)*. The main unit conducting agricultural research within the University is the Faculty of Agriculture. The Faculty has three agricultural research stations that were established in 1953-1954, 34 staff are involved in agricultural research.

*The University of Science and Technology (UST) Kumasi*: the UST conducts agricultural research within the semi-deciduous rain forest and the transition zones. Much of its research activities on horticultural and other crops, livestock, poultry and agricultural engineering are conducted on the farms of the faculty within the campus. The Faculty of Agriculture has five departments that conduct agricultural research. They conduct research on: horticulture, agricultural engineering, animal science, crop science and agricultural economics and farm management. The Institute of Renewable Natural Resources and the Bureau of Integrated Rural Development are under the UST. Twenty staff are involved in agricultural research.

*The University of Cape Coast (UCC)* has a School of Agriculture that undertakes agricultural research in the high and semi-deciduous rain forest and the coastal thicker zone. The School of Agriculture has five departments (Animal Science, Crop Science, Soil Science, Agricultural Engineering and Agricultural Economics) that were established in 1975. Fifteen staff are involved in agricultural research.

b) Ministry of Food and Agriculture (MOFA)

The Ministry has a department of extension and five technical departments that conduct some agricultural research, mainly on-farm testing and verification trials. These technical departments are: Crop Service, Animal Health, Animal Production, Engineering Services and Fisheries. They are semi-autonomous and headed by a director. They are responsible for 32 stations and special farms located throughout the agro-ecological zones of the country.

c) Commodity Boards, Corporations and Commissions

Some commodity boards, corporations and commissions undertake research in their special areas or commodities of interest. Some have institutes or special units devoted to research while others undertake research in collaboration with research institutes and agencies, particularly those of the CSIR and the universities. Among the commodity boards it is worth mentioning the *Ghana Cocoa Board (GCB)*. It handles all aspects of the cocoa industry in the country including research that is conducted by the *Cocoa Research Institute of Ghana (CRIG)* and is sited in Tafo. The CRIG, established in 1938 also undertakes research on other tree crops such as coffee, sheanut and kola. Besides several farms and facilities in the cocoa growing areas, it has out-stations in Bole for sheanut research and Afosu for coffee research.

#### d) Development Programmes

Some of the agricultural related development programmes have research components as part of their activities. They usually undertake on-farm testing and verification trials. An example is Sasakawa Global 2000 (SG 2000), which is a non-government organization set up in 1986.

#### **Kenya**

Kenya up until 1895 was part of the British East Africa; it became a British Protectorate from 1895 to 1920 and was designated as Kenya after 1920. The British considered provision of raw materials for their industries an important colonial issue. To enhance this role improvement of agriculture was necessary. A first step was to establish botanical gardens. In Kenya agriculture development was first initiated as a scheme to settle ex-British soldiers who had participated in the Boer War, 1898-1902. Agricultural research was formalized in 1903 when the Department of the colonial government established the first experimental station at a government farm in Kabete, located near to Nairobi.

Between 1903 and 1924 a team of government scientists was appointed to the Kabete Station (entomologist, a tobacco officer, a coffee planting inspector, a horticulturist, a plant breeder, a mycologist and an agricultural chemist). In 1924 the staff was transferred to a new facility called Scott Agricultural Laboratories (SAL). Veterinary research laboratories were also set up in Kabete in 1908. In these early days of agricultural research, the focus was primarily on the production problems of the European settlers. Later on as crop and animal production grew in economic importance and settlers spread throughout the country, several other agricultural research stations were established: a plant breeding station was established (Njoro, 1927), animal husbandry research stations (Naivasha, 1928 and Mariakana, 1932) and a sisal research station (Thika, 1937). Other relocations of research facilities on the basis of the policy of “research facility where the crops grow well” involved:

- 1944, a horticultural research station opened in Molo to undertake research on temperate fruits and vegetables. The station was later (1950) developed into a Pyrethrum Research Station; with limited research being continued on these other commodities;
- 1946, the research facilities in Kbarani (coast): this was later upgraded and relocated in Kikambala as a regional research station in 1960 to undertake research into tree crop improvement: coconuts, cashew nuts, mangoes, citrus, etc.;
- 1948, a sugar research substation was located in Miwani in the Kano Plains;
- 1949, coffee research, which had been ongoing in SAL since 1924, was transferred to the Jacaranda and Rukera Estates in Ruiru;
- 1951, pasture (grassland) research was moved to Kitale and named the Grassland Research Station, Kitale;
- 1953, cotton research facilities were opened in Kibos, a few kilometres outside Kisumu by the Empire Cotton Growing Corporation;
- 1955, the maize research part of the wheat programme in Njoro was moved to Kitale.

Kenyan agricultural research concentrated until World War 2, on exportable crops and commodities favoured by European farmers. However, during and soon after the War there was a significant shift in government policy towards agricultural problems in African areas. The new policy objective was to exploit the country’s substantial agricultural potential in order to support a market economy and to meet domestic food requirements. This was also spurred on by the outcome of the war and the famine in 1943. The blueprint for the development of the African areas was a ten-year plan (1946-1955) called the African Land Development Plan (ALDEV). This was later substantially recast into the Sywnnerton Plan of 1954 covering the period of five years up to 1959. The Sywnnerton Plan was the first concrete step taken by the Government to direct agricultural research into “non-scheduled areas”. In order to tackle some new research problems such as low yields and fertility, a number of new research stations were established in different ecological zones as follows:

- Embu, to cover Central Province and parts of Eastern Province (1952);
- Kisii, to cover Kisii, Kericho and Nandi areas (1963);

- Katumani, to cover the dry areas of Eastern Province (1956);
- Kakamega, to cover the Western Province (1956).

After independence, it was found that a number of important commodities/research areas had not been adequately provided for, hence efforts were made to establish research stations to cover sugarcane, potato development, range management, seed quality and beef production as follows:

- National Sugar Research Station, Kibos, 1968;
- National Seed Inspection Services (NSQRC), 1969;
- Beef Research Station, 1969;
- Range Management Research Station, 1971;
- National Potato Research Station, Tigoni, 1972;
- Mwea Cotton Research Station, Wanguru, 1972;
- Garissa Regional Research Station, 1980.

Besides the main research stations a number of substations were built in various locations in the country to augment activities of some of the main stations.

At the same time the Government of the United Kingdom decided to create regional agricultural research organizations in East Africa that complemented or partially replaced existing research institutes. The Government mainly financed these. The territorial research institutions, were on the other hand, funded locally. In addition, the East African Agricultural and Forestry Research Council was created in 1947 with a mandate to monitor all research carried out by the territorial and inter-territorial institutes of Kenya, Tanganyika, Uganda and Zanzibar.

The council had its headquarters in Nairobi. It was within this framework that the Amani Agricultural Research Institute was transferred from the Usambara Mountains base (Tanganyika), to Muguga as the East African Agricultural and Forestry Research Organization (EAAFRO). At the same time, the valuable collection of identified plant specimen was moved to the new East African Herbarium that is attached to the National Museum of Nairobi. The Central Veterinary Research Institute established in 1959 in Kabete, evolved to the East African Veterinary Research Organization (EAVRO) based in Muguga.

A significant expansion of the Department of Agriculture's network of research stations took place between 1945 and up to the year of independence in 1963. Experiment stations were established in neglected areas of the country in which African farmers predominated. For the first time, the problems of local farmers were given some serious attention by the country's research agencies.

A series of regionally mandated institutes that were primarily directed and funded by metropolitan government, came into existence (see list above). They continued with little change until the collapse of the East African Community in 1977 after which they were taken over temporarily by various ministries.

With independence in 1963, all the national agricultural research agencies were transferred, with few disruptions, to the newly independent government. During the first 10 to 15 years after independence there were few changes in the organizational set up of the agricultural research system other than some expansion of the network of experiment stations as described above. Most of the national agricultural research was conducted by the Department of Agriculture, under the Scientific Research Division created in 1974, and the Veterinary Services Department of the Ministry of Agriculture.

Research on coffee and tea was conducted, as previously since 1949, by *the Coffee Research Foundation (CRF)* and *the Tea Research Institute of East Africa (now the Tea Research Foundation)*, both funded through taxes and cess on these products collected by the respective commodity boards.

At the time of independence, there were no academic institutions in agricultural sciences operating in Kenya. Diploma-level training in Kenya was offered in *Egerton Agricultural College*, which was established in 1939 and initially for Europeans only. After independence the Government engaged on a forceful programme of building academic institutions. The University College of Nairobi, in 1962, upgraded to university status and named, *University of Nairobi* in 1970. In 1981 the Jomo Kenyatta College of Agriculture and Technology was established and became a constituent *College of the Kenyatta University*, in 1988; in 1984, the *Moi University* was established with a *Faculty of Forest Resources and Wildlife Management*, an *Agricultural Mechanization and Rural Engineering Faculty* was due to be established in 1994.

Kenya took during the 1970s and 1980s important decisions to streamline NARS with several acts of Parliament. In 1968, the Government commissioned an Agricultural Research Survey Team to review the research activities in the Ministry of Agriculture. The team noted many deficiencies and made wide-range recommendations. Among them one was implemented e.g. the establishment of an Agricultural Research Advisory Council. Unfortunately, apart from its inaugural meeting in 1969, it never became operational.

Upon the collapse of the East African Community, in 1977, the Government *took the Science and Technology Act of 1977*, to provide a new framework for research institutions. Under this Act, the *National Council for Science and Technology (NCST)* was established to advise the Government on all aspects of science and technology. The council advised the Government to reorganize agricultural research into a number of semi-autonomous parastatal institutes.

An *Amended Science and Technology Act, of 1979*, made provision for the establishment of the above-mentioned institutes. The same act provided for the establishment of Advisory Research Committees (ARCs), in each of the major areas of science, directly under the NCST, the highest policy-making body in the country for science and technology. The ARCs are the institutional organs, which link the technical ministries and the research agencies. The ARCs serve also, primarily as forums for the establishment of research programmes and budget allocations and evaluation. Among these ARCs, is the Agricultural Sciences Advisory Research Committee.

Under the provision of the above-mentioned Act the following institutes were created in 1980:

- *Kenya Agricultural Research Institute (KARI)*, combining formerly EAAFRO and EAVRO in one institute and later in 1986 the research stations under the Scientific Research Division of the Ministry of Agriculture was added to form the current KARI;
- Kenya Forestry Research Institute (KEFRI), in 1985, formerly part of EAAFRO;
- Kenya Trypanosomiasis Research Institute (KETRI), formerly based in Tororo, in Uganda;
- Kenya Marine and Freshwater Fisheries Institute (KEMFRI), formerly part of EAMFRO based in Zanzibar;
- Kenya Industrial Development Research Institute (KIRDI), formerly part of EAIRO.

Besides these public research institutions, other components of NARS are: (i) the two research foundations mentioned previously (coffee and tea); (ii) the faculties of agriculture of the universities listed above; (iii) various development agencies and regional development authorities, that have small research branches; and (iv) some private companies.

## **Madagascar**

In Madagascar the French colonial administration started some research when experimental gardens were established in 1896 and 1905 in four locations. A cotton testing station was also established as early as 1904.

After World War 1, the experimental gardens evolved into experiment stations. In contrast to the diverse collections in botanical gardens, the focus in stations was often only on a few crops. Over time the Maravoay Station became specialized in rice, the station in Lac Alaotra (established in 1922) in rice and cassava, and the Ivailona Station in coffee and vanilla, two of the country's major export crops. By 1930 central laboratories for agricultural chemistry and phytopathology had been established in the old jardin d'essais in Nanisana near Tananarive. To this a phyto-genetic laboratory and a central service for agricultural hydrology was added. This network of stations was backed up by a metropolitan research institute established in 1921 and named the Institute National of Colonial Agronomy (INAC).

During the period leading up to World War 2, all country's experiment stations and laboratories reported directly to the colonial local government. INAC's role was limited to providing scientific backstopping from its headquarters in France to these Malagasy research facilities. In 1950 the local agricultural research activities were reorganized into an agronomic research service, a plant protection service and a locust control service. The agronomic service comprised a group of central laboratories that were formerly part of the Institut Pasteur, as well as the plant improvement service and the experiment stations in Alaotra, Ivoloïna, Marovoay and Bealahana. The plant protection service conducted some phytopathological research, while the locust service had a research centre in the Betsioky Station.

Livestock research in Madagascar and the establishment of the veterinary services dates back to 1907. The first veterinary laboratory was established in Mahamasina in the early 1920s. Between 1925 and 1950, livestock experiment stations were opened in five locations (Befanamy, Ambovombe, Antsirabe, Moraharivo and Kianjaso). After 1950, the station in Kianjaso developed into one of the country's two main livestock research centres. The other centre was established in Miadana in 1956. In 1934, the laboratory in Mahamasina was integrated into the Institut Pasteur. The laboratory was relocated to Ampandrianomby in 1955 and renamed Central Livestock Laboratory Joseph Carougeau.

Formal forestry and fisheries research did not begin until the early 1950s when a research section was established within the Forestry Service. Research in forestry and fisheries strengthened with the establishment of CTFT in 1961 and the subsequent delegation of forestry and inland fisheries to CTFT. In 1974 with the creation of FOFIFA, the CTFT's activities were absorbed into the new organization.

With independence the management of the local research stations was delegated to the commodity tropical research institutes created by France after World War 2 through a series of bilateral agreements. These were (using acronyms): IRAT, IRCT, IFCC, IRHO and CTFT. This situation persisted until 1974 when the Government of Madagascar assumed direct control of the country's agricultural research agencies and established the "*Centre national de la recherche appliquée au développement*" (*CENRADERU* or *FOFIFA in Malagasy*). Some collaboration, at a substantially lower level of intensity, continued with these French institutes.

In 1972, a bilateral agreement between Norway and Madagascar led to the creation of FIFAMANOR, an institute designed to promote improved production practices for wheat, potatoes and milk (forages), that was maintained during the last two decades a long with an extension programme. FIFAMANOR is under the aegis of the Ministry of Agriculture.

Academic organizations include the Ecole supérieure des sciences agronomiques (ESSA), established in 1962. Some agricultural oriented activities are also carried out at the University of Antananarivo, and fisheries research is also carried out at the Marine Institute of the University of Tuléar.

Madagascar followed the same path in reorganizing its NARS as the other countries. Presently at the policy level is the Ministry of Scientific Research in charge of defining the national scientific policy, it has changed name and acronym several times. This has come about by a desire

from Government to streamline its research system under a unique policy guidance. Under the MRS the following institutions operate:

1. *National Centre of Applied Research for Development (FOFIFA)*

FOFIFA, the Malagasy acronym of the CENRADERU, was created in 1974 following the nationalization of the French research institutes. It is the unique national agricultural research institution of the country accounting for 80 percent of the country's research capacity in terms of full-time equivalent researchers. From 1974 to 1982 it has undergone several changes, in terms of legal status and management along with the acute financial crisis in the 1980s. As a consequence, a board of management was set up in 1983 and a thorough review was carried out by ISNAR at the request of the Government. As a result a restructuring of FOFIFA was carried out with a new management structure and programme budgeting system; a multidisciplinary and regional approach was adopted. A master plan was prepared in 1988 within this new policy and in view of pursuing the reorganization of the institute. The execution of the National Agricultural Research Programme (NARP), started in 1990 for seven years but was interrupted during the period of political turmoil (1990-1993) and updated in 1994.

2. *National Research Centre on the Environment (CNRE)*

The CNRE is one of the six centres under the aegis of the MRS; it was created in 1988 with the following mandate:

- contribution to the formulation and execution of the national research policy on the environment;
- elaboration, execution/control the execution and evaluation all research programmes on the environment;
- contribution to the utilization and application of research results on the environment; and
- participation in training on research.

This mandate conforms to the orientation of research policy on the environment defined in 1996 and aimed at responding to the needs of a sustainable and environmental-friendly development. Only a small proportion (10 percent) of CNRE's activities are of direct relevance to agriculture.

3. *National Centre of Oceanographic Research (CNRO)*

Created in 1977 with the nationalization of the research activities and facilities of ORSTOM in Nosy-Bé, CNRO is part of the MRS. It encompasses three research departments (namely fisheries, marine biology and oceanography), a statistical unit and support services. Most of the research staff is located in the headquarters in Nosy-Bé. The statistical unit is located in Antsiranana and there are also two maregraphic stations in Taolognaro and Nosy-Bé.

4. *Fiompiana Fambolena Malagasy Norwegian (FIFAMANOR)*

FIFAMANOR was created in 1972 under an agreement between the Malagasy Republic and the Kingdom of Norway. It is a semi-autonomous institution under the aegis of the Ministry of Agriculture. From 1972 to 1992 Norway funded it and from 1993 it was funded multilaterally. Its mandate is to promote the cultivation of wheat, potato, sweet potato, cassava, milk production, agro-forestry and social development activities. Specifically its objectives are:

- promotion of cultural practices that are environment-friendly;
- production and diffusion of improved basic seed;
- management of the genetic stock of the milk production folk;
- strengthening of producer associations for them to progressively take over;
- promotion of women's involvement in development activities; and finally
- extension of research results.

5. *Malagasy Board for Tobacco (OFMATA)*

OFMATA has semi-autonomous status, created in 1969, with the monopoly for tobacco production, handling and marketing in the country that will end with its forthcoming privatization. It performs applied and adaptive research. It is under the aegis of the Ministry of Agriculture.

6. *Academic Institutions*

As mentioned earlier the academic institutions involved in agricultural research are the Ecole supérieure des sciences agronomiques, the major one and some laboratories and departments of the universities of Antananarivo as well as the university of Tuléar.

7. *Experimental and Training Centre (FAFIALA)*

The FAFIALA was created in 1992 as a follow up to the village reforestation project funded by Switzerland (PARV) in the region of Antananarivo. The centre has private status with the objectives of preparing actions and working out technical solutions that can help farmers and decentralized communities to act for the protection of their environment with particular emphasis on trees. It performs on-farm experiments

## **Malawi**

Agricultural research began in Malawi at the turn of the 20th century. Research was undertaken as a side activity by the Department of Agriculture and commodity organizations such as the Empire Cotton Growing Organization. Research in this period primarily involved variety-screening trials on various experimental farms for export crops such as coffee, cotton, tea, tobacco, etc. The research division of the locally administered Department of Agriculture established its first agricultural research station in 1940 in Bvumbwe. Stations in Chitedze (1949), Mbawa (1950), Chitala (1955) followed. As in its other colonies, the Government of the United Kingdom formed an Agricultural Research Council of Central Africa with its own research facilities in each participating country. The Council was disbanded in 1963 at the dissolution of the Federation of Nyasaland and Tanganyika. In Malawi the activities of the council were transferred to the Agricultural Research Council of Malawi, established in 1967. Activities covered research programmes on forestry that were transferred to the Forestry Research Institute of Malawi (FRIM) established in 1970, and on cotton, grain legumes, and soils that were transferred to DAR in 1975 when it was abolished. Veterinary research as well as forestry and fisheries research started very slowly before independence and expanded somewhat after that.

At independence in 1964, the Research Division of the Department of Agriculture, which eventually evolved into the Department of Agricultural Research (DAR), was staffed with 22 researchers, of whom 21 were expatriates. The research was organized on a project basis, by crop, livestock or disciplines and was carried out in a network of 11 main stations, nine substations and 220 trial sites scattered throughout the country. The Department's research focused mainly on export crops, particularly tea, tobacco and cotton, while livestock research received only marginal attention. In 1967, cotton research was transferred from DAR to the Agricultural Research Council of Malawi (ARCM). The Cotton Research Corporation provided financial support for cotton research at that time (previously the Empire Cotton Research Corporation) and the British Cotton Growing Association. When, in 1975, ARCM ceased to exist, the responsibility for research on cotton, grain legumes, and soil shifted to DAR. In 1979, research on tobacco was transferred from DAR to the newly established Malawi Tobacco Research Authority.

Tobacco and tea research started early during colonial times, on a regional basis, to cater for the colonial growers' needs. After independence DAR assumed responsibility for tobacco research before being taken over successively (1980 and 1989) by the *Malawi Tobacco Research Authority* and the *Tobacco Research Institute of Malawi (TRIM)*. For tea the regional arrangement continued and in



1966 the *Tea Research Foundation of Central Africa (TRF)* was established. It received funds from the tea industry in Zimbabwe, Zambia and recently from tea states in Mozambique and South Africa. *The Sugar Corporation of Malawi (SUCOMA)* carries out research on sugar cane.

Academic research in agriculture is carried out mainly in *Bunda College of Agriculture* of the University of Malawi in 1966, however only around 25 percent of the college staff is devoted to research. Similarly Chancellor College also carried out some research of interest to agriculture.

Malawi as other countries in the sample also continued a reorganization of NARS. An *Agricultural Research Council (ARC)* was created in November 1985 with the mandate of being the high-level policy body on research priorities. The composition of the council has been revised to 15 selected members chaired by a prominent scientist with the Principal Secretary of Agriculture as alternate and represented by the heads of different departments, institutions and private sector related to agricultural research. The main function of the ARC is to orient the direction of research and approve the research programmes, budgets and funding levels. In addition the ARC has a specific function of preparing periodically and reviewing the Agricultural Research Master Plan. A secretariat was established in DAR, eventually with the Agricultural Economics, Statistics and Data Processing Unit (AGREDAT). Technical and finance subcommittees were appointed to give detailed consideration to research programmes and contract research proposals before their eventual submission, with appropriate comment, to the council, which approves the annual research programmes and budget before forwarding them to the Treasury.

#### 1. *The Department of Agriculture Research (DAR)*

DAR is the main organization of NARS with more than half the total research potential of the country. DAR is within the organizational chart of the Ministry of Agriculture. DAR's mandate covers crop and livestock production, natural resources, agro-forestry, farming systems and agricultural engineering. It was reorganized in 1985 into seven commodity groups, each group being led by a national research coordinator (NRC) who is a senior research scientist responsible for research programmes, without administrative responsibilities. The seven commodity groups are the following:

- cereals;
- horticulture;
- grain legumes, fibres and oilseeds;
- livestock and pastures;
- soils and agricultural engineering;
- technical services;
- adaptive research.

DAR has a network of three research stations, five experimental stations and nine substations, covering the three agro-ecological zones of the country and in total 17 locations. In 1998/1999, 87 researchers, 66 technical officers and 281 technical assistants staffed it. Among them 17 were PhD holders, 46 MSc holders and 24 BSc holders. Seventy-two percent of the researchers have post-graduate degrees.

#### 2. *Department of Animal Health and Industry (DAHI)*

This Department provides veterinary services to smallholder farmers, carries out animal disease research and is also engaged in production and marketing. Scientists in DAHI carry out research on poultry breeding, goat breeding and pasture evaluation. The breeders work jointly with those of DAR.

3. *Forestry Research Institute of Malawi (FRIM)*

FRIM is under the Ministry of Forestry and Natural Resources and concentrates its research on forestry. The DAR agro-forestry research unit maintains collaboration with FRIM in sharing of plant material and analysis of plant and soil nutrient content.

4. *Tobacco Research Institute of Malawi (TRIM)*

The Government created a statutory institute to focus on tobacco research initially in the form of the Tobacco Research Institute of Malawi. This Institute later, in 1995, became ARET (Agricultural Research and Extension Trust). It conducts research on all tobaccos and provides extension services to the estate sector. It fully cooperates with DAR.

5. *University of Malawi*

The Bunda College of Agriculture and the Chancellor College are the two institutions of academic nature carrying some research of interest to agriculture. They cooperate with DAR through research contract awards.

6. *The Tea Research Foundation of Central Africa (TRF)*

This is one of the oldest research institutions in Malawi. It conducts all research on tea for Malawi. Though privately owned and funded, research results on tea are made available to smallholder tea farmers as well.

7. *Sugar Research*

Research on sugar is conducted by the Sugar Corporation of Malawi (SUCOMA) and Dwangwa Sugar Corporation (DWASCO). Interactions with DAR are mostly during introduction of new varieties where DAR's quarantine facilities are used.

## **Mali**

Mali presents an exception to the other countries as no botanical garden was set up and agricultural research did not start until after the First World War. Agricultural research started in 1927 with the creation of the animal husbandry farm in Sotuba near Bamako, the agricultural research station of the Niger Office, near Segou in 1931, and the Research and Serotherapy Laboratory (LRS), Bamako in 1939. It expanded further after 1945 particularly with the creation of IRCT cotton research stations in N'Tarla and Kogoni. Food crop trials were later carried out in these stations by the French Institute IRAT after 1960. The Sotuba farm was transformed into the Federal Livestock Research Centre that covered the whole Sahelian zone. It was later entrusted to IEMVT during the 1950s.

After independence in 1960, the Government of Mali was anxious to have national structures for higher education and research, particularly in agriculture. It created:

- the first national agricultural research institute in French-speaking Africa: the *Rural Economics Institute (IER)*, that became the backbone of NARS (1960);
- the *Higher Research Council* in 1962 (within the Ministry of National Education), replaced in 1967 by the National Council for Scientific and Technological Research, that was forced to close down in 1970 for lack of funds;
- the *Rural Polytechnics Institute* in 1969 (IPR) in Katibougou responsible for training the medium-level and senior staff that the agriculture sector needed badly;
- *National Engineering Directorate of the Agricultural Mechanization* (1970). Study and training centre in Samanko/Bamako, for experimentation of agricultural tools;

- a modern *laboratory for vaccine production (1972)* in replacement of the previous LBS and was upgraded in 1979 as the Central Veterinary Laboratory including research in its mandate, with semi-autonomous status.

In 1976 the 1962 Franco-Malian agreement whereby the French Institutes (IRAT, IRCT and IEMVT) managed jointly with IER the research programmes, was abolished and IER had full responsibility of its own activities that allowed it to diversify its cooperation with bilateral and international research organizations and donor agencies (in particular with the Netherlands and USAID).

A step further was taken in 1990 with the merger of IER and INRZFH into one institute (the new IER). A long-term master plan for NARS was also prepared. Currently NARS is composed of the following institutions:

At the apex level for policy formulation *the National Agricultural Research Council (CNRA)*, an organ of nine voting members. Under the Ministry of Rural Development it has the function of preparing the national agricultural research policy and strategy and of supervising its implementation. It has three committees: the scientific committee, the financial and resources committee and the users committee. It is managed by a permanent executive secretary.

*The National Agricultural Research Institute (IER)*: it dominates NARS with about 75 percent of the full-time equivalent researchers and nearly 80 and 70 percent of the national and total financial resources of NARS and all the agricultural research centres and stations outside the regions of Bamako and Koulikoro. IER was responsible for all agricultural research sectors except for rural engineering and mechanization and animal health. IER had departmental model status under the aegis of the Ministry of Rural Development that has evolved recently to the status of a public semi-autonomous scientific research institution (EPSTC), with a board of directors. It has a network of six *regional research centres, nine research stations and 14 substations*, covering all the agro-ecological zones of the country; IER under its strategic plan runs seven major research programmes as follows:

- cereals and food legumes;
- industrial crops;
- horticulture crops;
- forestry and fisheries productions;
- animal production;
- economics of the commodities; and
- farming systems and the management of natural resources.

Other components of NARS include technical divisions and development projects under the ministries responsible for the agriculture sector and the environment, and performing various agricultural research activities. They are as follows:

The CEEMA, which is entrusted with the promotion of agricultural mechanization through applied technology and development of agricultural implements. Its 10 senior staff has only very limited national research resources. It performed a quite important training programme (rural craftsmen, mechanics and drivers for agricultural machinery).

LCV (Central Veterinary Laboratory): its function is to produce and market vaccines and applied research on animal health. It was staffed with 30 senior staff of whom 10 researchers; it received considerable foreign assistance particularly from USAID.

The Mali Livestock and Meat Office (OMBEVI): was charged with the promotion of marketing animal products and studies and adaptive research. Its research capacity was estimated at 10 full-time equivalent researchers out of a total staff of 50 senior technical staff.

Some miscellaneous development projects with adaptive research activities (Niger Authority, the Livestock Development Office of Mopti) for around a total of 20 full-time equivalent researchers.

There are several academic institutions, mostly under the Ministry of Education.

*The Polytechnics Institute of Katibougou*: a college training at BSc level and technicians. Its staff accounted for 96 professors of which 89 nationals highly trained; 44 percent held post-graduate degrees. Their research activities were limited. Some faculties of the university of Bamako with research activities of interest to agriculture (biology and social sciences, etc.), with limited financial resources. They accounted in 1990, for about 15 full-time equivalent researchers.

*CNRST (Conseil national de la recherche scientifique et technique)*: the CNRST has coordinating authority over all research institutions in Mali but its limited resources and experience in research management were a handicap for fulfilling its mandate.

Mali also hosts some branches of international agricultural research centres and regional research organizations (ICRISAT, ILCA, INSAH), however they cannot be counted as part of NARS.

## Senegal

Research started between 1821 and 1824 when Mr Richard under the leadership of the Governor Baron Roger, implemented a garden near Dagana along the river Senegal, to be known later as Richard Toll (meaning in the local language as the “Garden of Richard”). Trials were first carried out on cotton and later on various crops such as vegetables, tree crops, sweet potato, cassava, etc. Unfortunately the effort did not continue after the departure of Mr Richard and his team. Later on a model farm was created in Bambey in 1913, up-graded in 1921 as a groundnut experimental station.

Senegal was the hub of the very first agricultural research activities in French-speaking sub-Saharan Africa. Later on it attained headquarters for institutions responsible for this sector for the whole Sudano-Sahel zone. The model from Bambey played a central role in the development and management of agricultural research. In 1938 it became the Sudanese Agricultural Research Sector and then in 1950 the Federal Centre for Agricultural Research which ran a network of food crop stations in French West Africa.

Similarly, animal research in the Dakar-Hann Laboratory was created in 1935. Subsequently taken over by the French Institute IEMVT in 1948. It was responsible for veterinary research with stations in various countries of French West Africa. In 1952 ORSTOM (Overseas Scientific and Technical Research Office) set up offices in Dakar and expanded into many sectors including fisheries. In 1961 it took over the *Seafood Technology Laboratory* created in 1957 by the Livestock and Animal Industries Service, renaming it the Oceanographic/Research Centre of Dakar-Thiaroye (CRODT).

After independence in 1960, the Government of Senegal showed great interest in research in general, and agricultural research in particular. It took the following decisions:

nationalization of the two existing federal institutions: Bambey became the *National Agricultural Research Centre (CNRA)* of Senegal, with its management entrusted to the French Institute IRAT created in 1960. *The Hann Laboratory* received the status of a national institution, called the National Livestock and Veterinary Research Laboratory (LNERV), still under the management of IEMVT. New impetus was given to new research sectors with the creation of the *Food Technology Institute (ITA)*, in 1964 with the assistance of UNDP/FAO, and the *National Forestry Research Centre (CNERF)* in 1965, run by the French Institute CTFT.

The creation of apex bodies/committees for national science policy, which have undergone many changes starting as the Scientific and Technical Affairs Bureau in 1966 under the aegis of the Office of the Head of State and ending as the Scientific and Technical Delegation in 1992 and now as

the Directorate of Scientific Affairs under the Ministry of Education in 2001. Throughout, the Interministerial Council for Scientific and Technical Research (CIRST), created in 1966, has been the body responsible for defining scientific policy and taking major decisions at its annual meetings (prepared by the lead agency backed by standing advisory sectoral committees).

The true birth of NARS dates from 1975 with the creation of the *Senegalese Agricultural Research Institute (ISRA)*, that consolidated all existing agricultural research institutions (with the exception of ITA), including the research stations hitherto run by the French institutes IRCT and IRHO. In 1979 it also took over the Horticulture Development Centre (CDH), a R&D centre for fruit and vegetables launched in 1975 with the support of FAO under UNDP and Belgian funding.

Senegal also had a dynamic university. *Dakar University* was the first in sub-Saharan French-speaking Africa and numerous training institutions followed. However, paradoxically for a dominantly agricultural country, agricultural sciences were for a long time ignored at the academic level and it was not until 1980 that the Institute for Rural Development, called later on INDR, then the Agricultural Training College (ENSA), was founded in Thies.

As with the other francophone countries, Senegal decided in 1974 to revise the bilateral agreement with France in terms of agricultural research. It created in 1975 the Senegalese Institute of Agriculture Research (ISRA). The current composition of NARS is as follows.

At the apex there is the CIRST with standing sectoral committees for policy guidance, however, this function faded away overtime and the small Directorate for Scientific Affairs within the Ministry of Education has no influence on sectoral research policy.

#### *The Senegalese Institute of Agricultural Research (ISRA)*

The current NARS is largely dominated by ISRA with about 90 and 95 percent of the total human and financial resources. It also covers all agricultural research centres and stations outside the Cape Verde administrative region (Dakar). ISRA was a public semi-autonomous institution that has been changed recently into the new more relevant category, the public scientific and technological institution. ISRA has moved around but now is under the aegis of the Ministry of Agriculture. At its creation ISRA encompassed seven scientific departments that were reduced later on to five and since the early 1980s it has gone through many structural changes. It accounted in 1990 for 173 research staff including 60 expatriates or around 35 percent of the total ISRA research staff.

#### Other components of NARS

*The Food Technology Institute (ITA)*: it has a research mandate and development as well as training and production in the field of food technology. ITA has 24 senior staff equivalent to eight full-time researchers. Its legal status is similar to that of ISRA (public scientific and technical institution), under the aegis of the Ministry of Industry and Craft.

*Three training colleges*: under the Ministry of Education they have limited agricultural research resources; the largest (in terms of agricultural research potential) is the ENSA (14 professors, of whom 12 are nationals), responsible primarily for training of agricultural engineers (ingénieurs agronomes), and secondarily for research and support to agricultural development in the Thies region. The two other colleges are the National Technological College (ENSUT), that focuses mainly on training of engineers for agro-food technologies and the National Applied Economics College (ENEA: 30 professors of whom seven are specialists in rural economics and sociology). It trains engineers for planning, statistics and development.

*Two colleges/institutes of the university*. The Environmental Sciences Institute (ISE) and the Earth Science Institute (IST), which together accounted in 1990 for a small number of professors-researchers concerned with the rural environment.

## ANNEX 2

**OVERVIEW OF POPULATION, ECONOMIC INDICATORS, LAND  
RESOURCES, GOVERNMENT SUPPORT TO AGRICULTURAL  
RESEARCH**

Country	Population, in Millions	Percent Rural Population	GNP in Billions US\$	Rate of growth of GNP	Annual per Capita in US\$
Cameroon	15	52	8.5	5.0	580
Ghana	19	62	7.4	4.8	390
Kenya	29	68	10.6	0.5	360
Madagascar	15	71	3.7	5.5	250
Malawi	11	76	2.6	6.9	190
Mali	11	71	2.6	5.8	240
Senegal	9	53	4.7	5.1	510

*Table 10. Population and economic indicators*

Country	Land under permanent crops in 1997, in Million/ha	Percent Irrigated land 1995-1997	Agricultural productivity/agricultural worker 1995 dollars 1996- 1998	Food production Index 1989- 1991=100
Cameroon	2.6	0.3	1 054	120.2
Ghana	7.5	0.2	542	144.2
Kenya	0.9	1.5	228	104.9
Madagascar	0.9	35.0	186	108.7
Malawi	0.9	1.6	138	109.7
Mali	0.0	2.1	271	114.5
Senegal	0.2	3.1	320	100.4

Source World Bank, 2000, World Development Report 2000-2001: Attack on Poverty

*Table 11. Land resources*

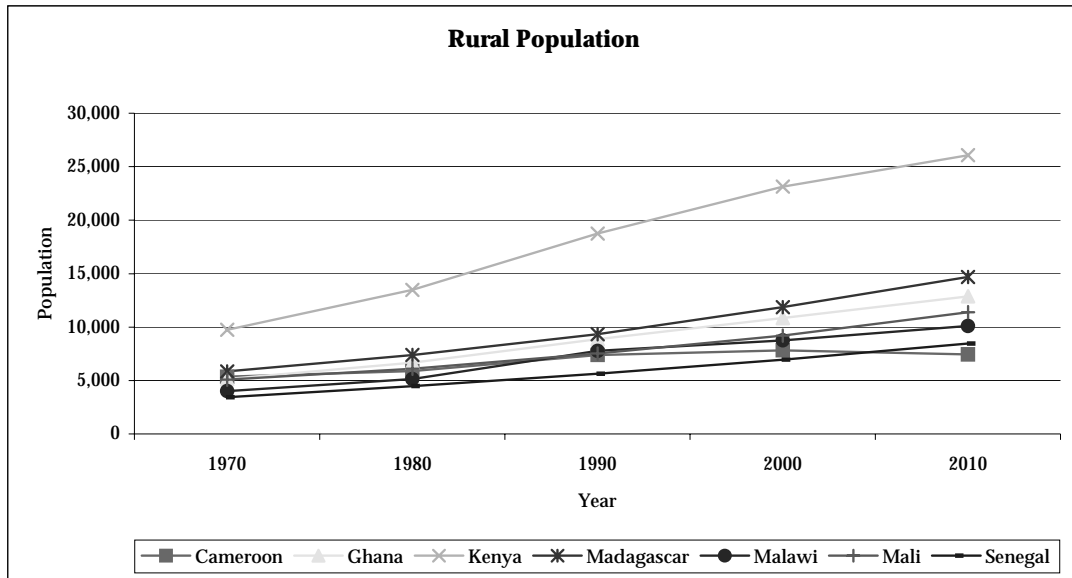


Figure 15. Rural population since 1970 and the projections to 2010

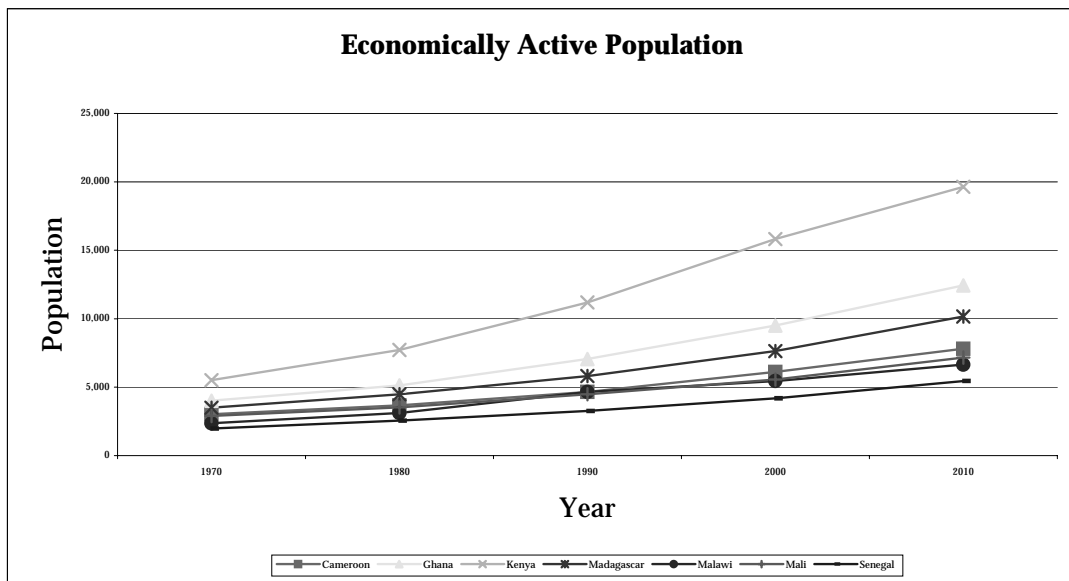


Figure 16. Economic active population

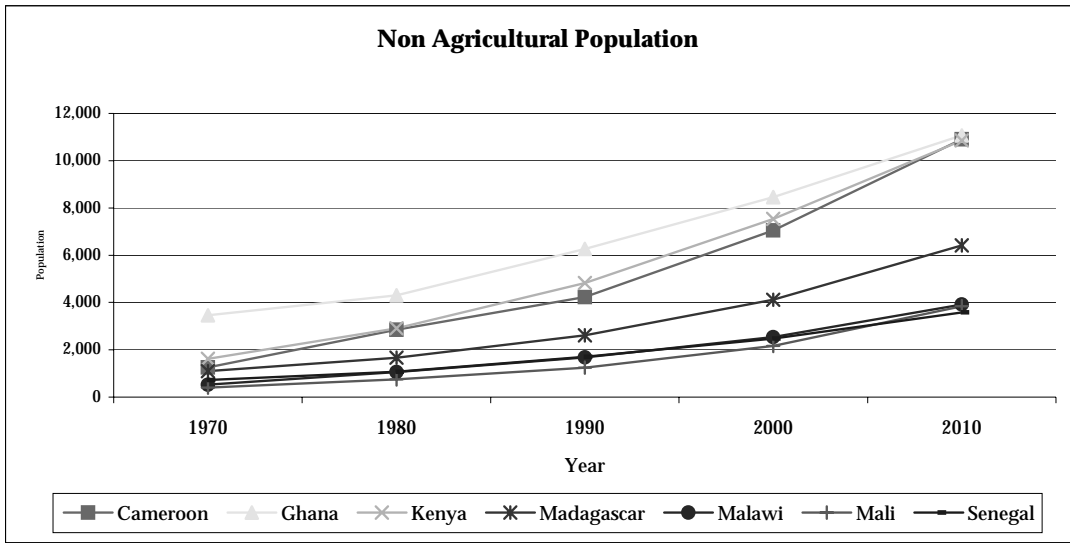


Figure 17. Non-agricultural population in the seven countries, 1970-2010

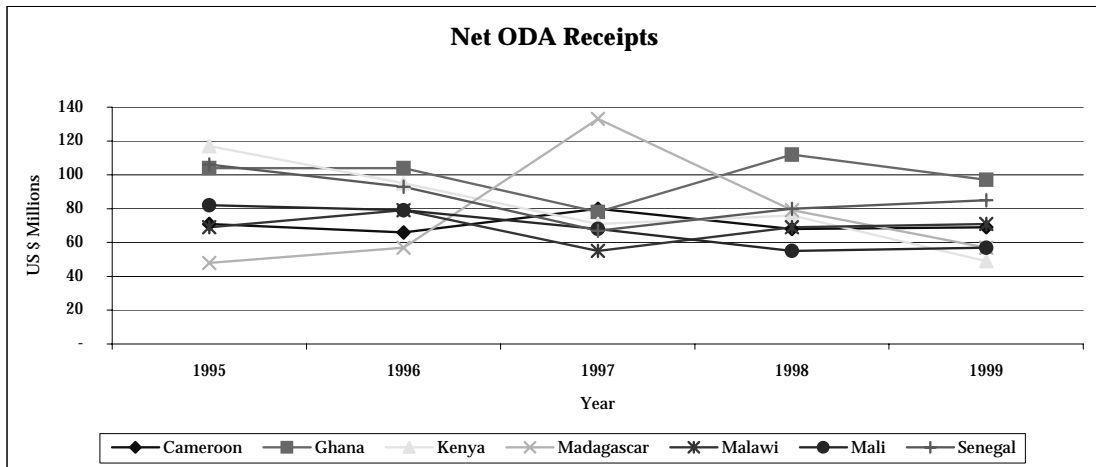


Figure 18. Net official development assistance



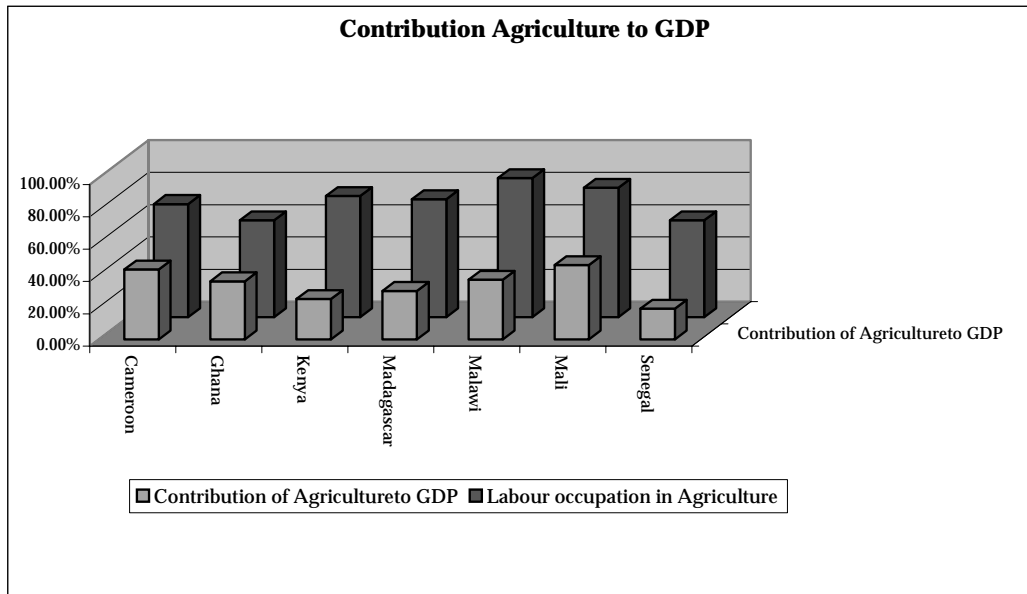


Figure 19. Agriculture Contributions to GDP

**SUMMARY OF EX POST STUDIES OF RATE OF RETURN  
(ROR) FOR AFRICAN AGRICULTURAL RESEARCH AND  
EXTENSION**

Table A

Study	Location, commodities and years covered	ROR (percent)	Comment
Abidogun, 1982	Cocoa, Nigeria	42	Econometric methods Aggregate RORs by region, econometric Econometric. returns to research only via statistical separation of research from extension; seed distribution effects Using Karanja data, finds minimal effect of fertilizer policy on ROR to research
Makau, 1984	Kenya, Wheat, 1922-1980	33	
Evenson, 1987	Africa, maize, staple crops	30-40	
Karanja, 1990	Kenya, maize, 1955 to 1988	40-60	
Mazzucalo, 1991	Kenya, maize, 1978	58-60	Non-adoption of varieties released in the study period, includes extension costs, benefits
Mazzucalo and Ly, 1992	Niger, cowpea, millet, sorghum, 1975-1991	<0	
Laker-Ojok, 1992	Uganda, sunflower, cowpe, soybean, 1985-1991	<0	Six-year study period used due to civil unrest in previous 15 years
Boughthon and de Frahan, 1982	Mali, maize, 1969-1991	135	Introduction of maize into cotton system by CMDT. Returns to TDT system including research extension and input distribution
Ewell, 1922	East Africa, potato, 1978-1991	91	Regional network-NARS collaboration. Returns to research and extension
Sterns and Bernsten, 1992	Cameroon, cowpea, 1979-1991, sorghum 1979-1991	3	ROR to research and extension
Howard, Chitalu and Kalongue, 1993	Zambia, maize, 1978-1991	64-90	ROR to research, extension, seed distribution and additional inputs
Schwart, Sterns and Oehmke, 1993	Senegal, cowpea, 1980-1985	31-92	ROR to research based famine relief; includes all aspects of TDT
Sanders, 1993	Ghana, maize, 1982-1992	74	Starting date determined by initiation of SAFGRAD project
Smale, and Heisly, 1994	Malawi, maize, 1957-1992	4-7	Improved research performance since 1985
Kupfuma, 1994	Zimbabwe, maize, 1932-1990	4.3.5	Research and extension activities of the DAR and specialist services
Aklitu, 1930	Ethiopia, extension and adoption	nc	Significant extension impact on adoption of improved practices
Moock, 1973	Kenya, productivity	nc	Significant extension impact on productivity (factor analysis)
Hoberaft, 1974	Kenya, maize	nc	Significant effect of extension visits and demonstration on productivity
Moock, 1976	Kenya, maize	nc	Extension effects only for farmers with less than four years of schooling
Perraton, Jamison and Orivel, 1985	Malawi, maize	nc	Extension visits increase maize yields
Deaton and Benjamin, 1988	Côte d'Ivoire, Cocoa and coffee Kenya	nc	Small extension impact
Bindlish and Evenson, 1993	Burkina Faso	100	Significant T&V impact
Blindish, Gbetibouo and Evenson, 1993		91	Study of recent T&V managed system

nc= not calculated

Sources: Oehmke and Crawford, 1994<sup>1</sup>; Birkhaeuser, Evenson and Feder<sup>2</sup>, 1991

<sup>1</sup> Oehmke, J.I. and E.W. Crawford, 1994. The impact of agricultural technology in sub-Saharan Africa, Department of Economics, Michigan State University, East Lansing, Michigan, USA, Duplicated

<sup>2</sup> Birkhauser, D.; Robert E. Evenson and Gershan Feder, 1991: The Economic Impact of Agricultural Extension: a review on economic development and cultural change, 39 pp. 607-50

## RETURNS TO AGRICULTURAL RESEARCH IN DEVELOPING COUNTRIES

**Table B**

Commodity	Country	Rates of return (percent)	Source
Maize	South America	191	Evenson, 1989
Maize	Mexico	78-91	Ruvalcaba, 1986
Rice	Indonesia	60-65	Pardey, 1992
Rice	India	65	Evenson, 1990
Soybean	Brazil	46-69	Ayers, 1985
Sugar cane	Philippines	51-71	Lebrero, 1987
Potato	Peru	22-42	Norton, 1987
Cowpeas	Senegal	60-80	Schwartz, 1989
Wheat	Pakistan	58	Nagy, 1983
Wheat	Developing countries	50	Byerlee and Traxler, 1995

Source: Bonte-Friedheim et al.<sup>1</sup>

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<sup>1</sup> Bonte-Friedheim, C., Steven, R. Tabor and J. Roseboom: Financing National Agricultural Research: The Challenge Ahead, 1994, 8 pages

## GUIDELINES FOR RESOURCE PERSON FOR CASE STUDY PREPARATION

Each case study will be prepared in close collaboration with the leaders of agricultural research institutions, departments, agencies and other institutions involved in agricultural research as part of the National Agricultural Research System, under the overall supervision of the FAO Research and Technology Development Service (SDRR), the Special Programme for African Agricultural Research (SPAAR) and the Team Leader. The Government authorities, the FAO Representative and donors (bilateral and multilateral) active in agricultural research will be intimately informed of and involved in the exercise. Specifically the resource person will include the topics listed below:

1. Background
  - 1.1 Natural resources and environment (soil, climate and rainfall)
  - 1.2 Economic indicators (total and rural population; total GDP and agricultural GDP)
  - 1.3 Government policy and priority for agricultural development
  - 1.4 Donors' contributions to agriculture sector development
  
2. Agricultural research, institutions and system
  - 2.1 Evolution of the agricultural research system
  - 2.2 Organization, structure and management
  - 2.3 Agricultural research network: number of centres, stations, distribution by agro-ecological zones, etc.
  - 2.4 Research personnel: number of professional staff, educational level (PhD, MSc, BSc. or equivalent) distribution between nationals and expatriates by age and seniority, number of support staff, etc.
  - 2.5 Research budgets:
    - breakdown by category, salary, infrastructure and equipment and operating costs and as percentages of total budget;
    - origin of budgets (give year and exchange rate against US\$);
      - i) national sources: absolute amount and as percentage of total budget
      - ii) foreign sources: absolute amount and as percentage of total budget
    - research intensity: research budget as percentage of GDP of agriculture
  - 2.6 Infrastructure and facilities: appropriateness and state of maintenance
  - 2.7 Linkages within and outside the system: institutions of higher education, extension and development agencies, regional and international research institutions, donors, etc.
  
3. Analysis of foreign assistance to agricultural research: donors' policies and strategies for assistance to agricultural research in the following areas:
  - 3.1 Programme/project formulation and priority setting mechanism; decision-making process; governance; target beneficiary; resource-poor farmers, commercial farmers, environmental considerations, etc.
  - 3.2 Timeframe of the assistance: short- (two to four years), medium- (five to ten years) or long-term (10 years or more) commitment
  - 3.3 Implementation modalities/mechanisms:
    - i) donor-managed programmes and projects with expatriate expert input: number, age, professional qualifications and seniority relative to nationals; evolution during programme or project life. This category could include CGIAR/NARS executed research projects;
    - ii) donor/recipient country jointly managed programme or project, with limited expatriate expert input: number, age professional qualifications and seniority relative to nationals; evolution during programme or project life;

- iii) national executed programme or project: modalities of monitoring and evaluation mechanisms; procedures of programme or project reporting.
- 3.4 Priority areas for agricultural research assistance:
  - i) institutional building type: multidisciplinary or multi-sectoral research programmes or projects;
  - ii) commodity-oriented research programmes or projects;
  - iii) research-extension development programmes or projects;
  - iv) research-education-training programmes or projects;
  - v) adaptive, on-farm research component of agricultural or rural development programmes or projects
- 3.5 Human resources development: policy and practice
  - i) training of professionals and support staff:
    - long-term academic training, number, discipline and level of training for research scientists (PhD, MSc, BSc or equivalent)
    - short-term training, including seminars and workshops
    - field of training (research management; maintenance of equipment; experiment stations management, etc.)
  - ii) salaries, incentives and social welfare for national staff;
  - iii) social and recreational facilities for research centres and stations
- 3.6 Infrastructure development and equipment: policy and practice:
  - i) building of new infrastructure:
    - laboratories, offices, libraries and documentation facilities
    - experiment station development, etc.
    - staff houses and amenities
    - equipment procurement for the above
  - ii) refurbishment of, upgrading or expansion of existing infrastructure (same as above)
- 3.7 Recurrent and operational costs: policy and practice:
  - i) operational and maintenance costs of the above-mentioned infrastructure and equipment;
  - ii) research activities cost *per se*
  - iii) as percentage of overall programme or project cost and institution budgets
  - iv) breakdown of cost elements by sources (government as counterpart contribution, donors, self-financing, etc.) and relative percentage
- 4. Assessment of the role and contribution of foreign assistance to the development of three institutional national agricultural research capacity. Based on the information and data collected above, the resource person will assess the impact of foreign assistance, using the following indicators:
  - 4.1 Quality of research management: in terms of policy formulation, planning, priority setting, organization, etc.
  - 4.2 Improvement of institutional stability: how much reorganization and restructuring has the institution gone through during donor involvement?
  - 4.3 Personnel stability: ratio of turnover of staff; did it improve or worsen; conditions of service, job satisfaction, work environment, etc.
  - 4.4 Level of budget and stability funding:
    - adequacy of expenditure per research and evolution from year to year
    - level of operating costs versus staff salaries; equipment and maintenance
    - regularity and timelines of disbursement of budget

- 4.5 Research programme: stability and relevance:
  - programme formulation and priority-setting process; involvement of stakeholders in the processes
  - coherence of programmes with national development policy and priority of the agriculture sector
  - influence of leadership change on the programming process
  - importance given to adaptive, on-farm and participatory research approaches
  - agro-ecological distribution of the research programmes and structures
- 4.6 Linkages with the World Knowledge System:
  - linkages with NARS components (universities, other research institutions, NGOs, private sector)
  - linkages with the regional and international research institutes, particularly those of the CGIAR
- 4.7 Size of the research institution/system:
  - increase or decrease in staffing, network of centres and stations, etc.
  - correlation of the size with:
    - i) importance of the agriculture sector for the economy;
    - ii) sustainability in relation to public or national funding resources, etc.
- 4.8 Monitoring and evaluation:
  - mechanisms of monitoring and evaluation of research institutions, programmes and projects
  - performance evaluation of staff, reward system, etc.
- 5. Conclusions and recommendations for efficient and effective use of foreign assistance:
  - recommendations and conclusions of a general nature
  - recommendations addressed to recipient country, research leaders, government authorities, etc.
  - recommendations addressed to donors

## CHARACTERISTICS OF THE PROJECTS REVIEWED

Country	Number of projects	Donor contribution US\$1 000 and donors	Institution building major, either multidisciplinary or	Sectoral/commodity/ research component minor or no institution building	Component of regional project with institution building minor	Duration and number of phases	Implementation and J/mg, n/mg modalities:dm.	Target group: PM, Sc.C, Pr&C, etc.
Cameroon	1. NCRE	47.3 USAID	High			1980-1994	D.M./ITA ex agency	Sc.C and small farmers
	2. Garoua Research	26.2 France				1988-1995 2 pha	D-M/CIRAD extg ag	Small cotton grower farmers
	3. CRBP	5.3 France/WB/EU		Yes		1990-1993	DM/CIRAD/exc.agency	Small banana grower
	4. NARP	20.2 WB/ODA/GTZ	High			1990-1993 1 ph	N.Mg	PM/SC/s. farmers
	5. I CRAF	0.5/ICRAF			Yes	1986-1993	ICRAF	SC.
	6. ROTREP	8.7 USAID	Moderate			1987-2002	DM/Maryland UNIV	SC.
	7. HPI	20.6 HPI/USAID		Yes		1986-1994 2 ph	HPI	S.heders
	8. DSHANG UNV	43.02 USAID	High education			1974-1996	DM/C.UNIV	Education
						1983-1993 2ph		SC.
Ghana	9. FRENCHAS	n.a		Yes		1960-1995	n.a	PM/SC
	1. NARP	21.63 WB	High			1991-1999	N.Mg.	SC.S. farmers
	2. Nyankpala Station	20.0*GTZ	Moderate	Yes		1977-1999	D.M/GTZ	SC.S. farmers
	3. GGLDP							SC.S. farmers
	4. OCP	17.0 CIDA			?	1979-1997 3 ph	D.M/CIMMYT/ITA	PM/SC
	5. Art.Fish project	na 22donors/WB		Yes	?	1974-2002 5 ph	D.M/WHO	Fishermen
	6. PD project	na Netherlands		Yes		1988-1998 2 ph	Jt.Mg	S. farmers & SC
	7. SG2000	0.164 /IDRC		Yes		1991-1999 2 ph	N.M	S. farmers
		n.a SG2000				1986-1990 1 ph	JT.Mg	
Kenya	1. NARP I	59.4 Cons.Donor /WB/ODAGON,etc	High			1988-1995 1 ph	N.Mg and D.Mg	PM/SC and S. farmers
	2. NARP II	62.9Cons.Donors/WB/ODA/GON ODA/SIDA/EU/USAID	High			1997-2001 second phase	N.Mg and D.Mg	PM/SC/S. farmers
Madagascar	1. ATIA I	5.0 WB	Moderate, TA			1983-1987	N.Mg	PM/SC
	2. ATIA. II	10.0 WB/IDA	Moderate, TA			1986-1992	N.Mg	PM/SC
	3. NARP	10.6 WB/co-financiers	High			1990-1997	N.Mg and D.Mg	PM/SC/S. farmers
	4. FIFAMANOR	n.a NORAD/France/WB		Yes		1972-1999	N.Mg/D.Mg	S.farmers
	5. FAFIALA	1.0 Switzerland		Yes		1992-2000	Jt.Mg	S.farmers
Malawi	1. MARP	41.29 WB/USAID	High			1985-1993 first phase for a 15 year programme	N.Mg for WB and D.Mg/OregonUNV.	PM/SC/S. farmers
Mali	1. SPARC	19.5 USAID	High			1993-2000	D.Mg/Texas.A&M UN	PM/SC.
	2. DRSPR.	n.a Netherlands	High			1975-1995 5 ph	D.Mg/KIT	PM/SC. S.f farmers
	3. CINZANA St	6.4 CIBA-Geigy+USAID/ICRIS	High			1983-2001	N.Mg. and ICRISAT	PM/SC.S. farmers
	4. NARP	20 WB/IDA.	High			1993-2000 1 <sup>st</sup> phase	N.Mg	PM/SC.s. farmer

**ABBREVIATIONS RELATED TO ANNEX 5A**

Sc/SC=scientific community; P.M.=policy-makers, PC& C=producers and consumers. small farmers; NCRE=National Cereals Research and Extension Project; Graoua Agricultural Research Station Project; CRBP=Regional Research Centre for Bananas and Plantains; NARP=National Agricultural Research Project; ICRAF=International Centre for Research on Agro-forestry; ROTREP=In-vitro Multiplication for Roots and Tubers; HPI=Hiefer Project International; DSCHANG UNIV=Agricultural Education Project for the University of Agriculture of DSCHANG; French AS=French Assistance in Agricultural Research; D>M/IITA=autonomous project with executing agency designated by donor; N.Mg=Project Nationally Executed within Donor Guidelines Jt.Mg=Project jointly managed by recipient institution and donor team leader; Nyankpala=Nyankpala Experimental Station Project; GGLDP=Ghanaz Grain Legume Development Project; OCP= Onchocerciasis Control Programme; Art.Fish=Training and Applied Research Project for Artisanal Fish Processing; PD=Plantain Development Project; SG2000=Sasakawa Global 2000; GON=Government of the Netherlands; ATIA=Agricultural Institutions Technical Assistance Project; The FIFAMANOR=Norwegian Highlands Agricultural Project; FAFIALA=Experimental and Training Centre; SPARC=Supporting Research and Planning and Research on Commodities Project; DRSPR=Regional Farming System Research Project; CINZANA=Cinzana Agricultural Research Station; PRAi and I I= Agricultural Research Project I & II; SARP=Senegalese Agricultural Research and Planning; SSSAR II=Senegalese Agricultural Research Project Phase 2; NRBAR=Natural Resources-Based Agricultural Research Project; C.I.P.H.P.T.=Cereals Improvement, Post-Harvest Technology and Training of African Researchers; ITA=Strengthening the Food Technology Institute; CDH=Centre for Horticulture Development



## GOVERNMENT POLICIES AND PRIORITIES FOR AGRICULTURAL RESEARCH

Cameroon	Ghana	Kenya	Madagascar	Malawi	Mali	Senegal
<p>Government priority areas and policies were as follows:</p> <ul style="list-style-type: none"> <li>consolidate food security for the nation;</li> <li>increase incomes from agricultural exports and decrease food imports;</li> <li>improve living standards of rural people;</li> <li>protect the environment through rational use of natural resources</li> </ul> <p>Furthermore research activities should be balanced in terms of regional coverage and subsectors in particular emphasis should be given to the following areas:</p> <ul style="list-style-type: none"> <li>small farmer export production: cotton, coffee, cocoa;</li> <li>industrial crop productions: oil palm, rubber, tea, etc.;</li> <li>livestock: cattle, small ruminants, pigs and poultry;</li> <li>inland and marine fisheries;</li> <li>management of natural resources and sustainable protection of the environment</li> </ul>	<p>Based on the agricultural policy, the general agricultural research policy objectives were as follows:</p> <ul style="list-style-type: none"> <li>science and technology should play a leading role for the advancement of agricultural industry;</li> <li>agricultural research, particularly on-farm-related problems, is only a part of the total research needs of the agricultural industry, therefore agricultural research should be more holistic;</li> <li>the research system should address the needs of all participants in the agricultural production and distribution processes, recognize the limited capabilities and resources of these participants and be consistent with the national objective of poverty alleviation through a profitable agricultural undertaking.</li> </ul> <p>Agricultural research should aim to</p> <ol style="list-style-type: none"> <li>ensure food security for all people,</li> <li>promote increased small holder productivity,</li> <li>ensure that agriculture contributes to the foreign exchange balance of payment needs through increases in exports and import substitution; and</li> <li>provide balanced regional development and growth</li> </ol>	<p>Agricultural research has all along been recognized as an integral part of a well-defined long-term strategy for agricultural development and indeed the entire economy AS Kenya is primarily an agricultural country. As a result, overall priorities for national agricultural research have been stated as follows:</p> <ul style="list-style-type: none"> <li>increased food production;</li> <li>growth in agricultural employment;</li> <li>natural resources conservation;</li> <li>poverty alleviation.</li> </ul> <p>Within these broad priorities there were two priority research programmes, namely, conservation of resources, which includes national soil/water management, farming systems research in dry land areas, livestock systems in pastoral areas and the generation and application of improved technologies in major agricultural zones. The second one was on crop and livestock research. This included breeding of improved varieties of major crops and vegetables and breeds of livestock, animal nutrition and veterinary research in areas of epidemic diseases and parasites.</p>	<p>Within the broad orientations defined in the national Economic Policy Framework Document of the Government, the priority areas for agricultural research concern: agriculture and livestock, fisheries and the environment. The priority actions in these areas are geared towards:</p> <ul style="list-style-type: none"> <li>intensification of agriculture production in the zone with high potential and sustained yields in marginal areas;</li> <li>diversification of production with high added value crops for export;</li> <li>protection and preservation of the environment;</li> <li>integration of plant protection; etc.</li> </ul> <p>The strategy for the implementation of these priority research areas is embodied in the following options:</p> <ul style="list-style-type: none"> <li>regionalization of research activities and network of research facilities;</li> <li>development of scientific and financial partnership;</li> <li>transfer and adaptation of new technologies;</li> <li>improvement of research environment (scheme of service, research equipment, funding, information system and management)</li> </ul>	<ul style="list-style-type: none"> <li>Government policy and priority is for the National Agricultural Research System, NARS, to plan and conduct applied research or production-oriented research that will generate information and technologies which can be directly utilized by the farming sector (estate and smallholder farmers) to solve technical production problems. It must assist in poverty alleviation by: providing information and technologies that would minimize agricultural production risks and the deterioration of the natural resources base; reduce over-dependence on a few food and cash crop options leading to stable and sustainable yields, in accordance with the Government's agricultural policy of balanced and diversification production. In particular in the smallholder areas it should address the following production constraints:</li> <li>low soil fertility;</li> <li>small land holdings;</li> <li>seasonal labour scarcity; paucity of production credit;</li> <li>lack of improved farm tools and equipment.</li> </ul>	<p>In accordance with the development policies spelled out in the sectoral master plan (1992) and the action plan (1993) the agricultural research policies and priorities were sketched out as follows:</p> <ul style="list-style-type: none"> <li>integrate the sustainable use and conservation of natural resources in the research agenda;</li> <li>contribute to the achievement of national goals of food security and improvement of the living conditions of farmers, through diversification of productions and revenues;</li> <li>better linkages with extension through participatory on-farm trials and demonstrations.</li> </ul> <p>To achieve these objectives NARS was to be reorganized in terms of policy formulation and management at national, regional and local levels so that the end-users be fully involved in the definition of research priorities and programmes as well as in their monitoring and evaluation</p>	<p>The agricultural research policy as spelt out in the agricultural policy statement of June 1994 was as follows:</p> <ul style="list-style-type: none"> <li>strengthen agricultural research activities both public and private in close cooperation with the stakeholders;</li> <li>increase agricultural research financing.</li> </ul> <p>In order to generate adapted technologies for increased agricultural production, agricultural research should:</p> <ul style="list-style-type: none"> <li>be responsive to the needs of end-users of research results through their involvement in decision-making process of research;</li> <li>better market its results for their utilization by producers;</li> <li>develop regional cooperation through its involvement in regional programmes and networks.</li> </ul> <p>Accordingly the Government was committed to:</p> <ul style="list-style-type: none"> <li>adopt a new strategic plan for agricultural research;</li> <li>change the legal status of ISRA into a public, scientific and technological institution;</li> <li>strengthen and sustain the financial support from Government.</li> </ul> <p>To achieve these objectives NARS was to be reorganized in terms of policy formulation and management at national, regional and local levels so that the end-users be fully involved in the definition of research priorities and programmes as well as in their monitoring and evaluation</p>

## LIST OF ACRONYMS

<b>AgGDP</b>	<b>Agricultural Gross Domestic Product</b>
<b>ALDEV</b>	<b>African Land Development Plan</b>
<b>ARI</b>	<b>Animal Research Institute</b>
<b>ARC</b>	<b>Agricultural Research Council; Agricultural Research Advisory Committee</b>
<b>AGREDAT</b>	<b>Agricultural Economics, Statistics and Data Processing Unit</b>
<b>ART</b>	<b>Adaptive Research Team</b>
<b>ASARC</b>	<b>Agricultural Advisory Research Committee</b>
<b>ARCM</b>	<b>Agricultural Research Council of Malawi</b>
<b>CDH</b>	<b>Centre de Développement Horticole</b>
<b>CEEMA</b>	<b>Centre d'Etude et d'Expérimentation de Machinisme Agricole</b>
<b>CFM</b>	<b>Consolidated Funding Mechanism</b>
<b>CIRST</b>	<b>Comité Interministériel pour la Recherche Scientifique et technique</b>
<b>CGIAR</b>	<b>Consultative Group on International Agricultural Research</b>
<b>CIRAD</b>	<b>Centre de Coopération Internationale en Recherche Agronomique pour le développement</b>
<b>CID</b>	<b>Consortium for International Development</b>
<b>CIDA</b>	<b>Canadian International Development Agency</b>
<b>CNRA</b>	<b>Centre/Comité National de Recherche Agronomique</b>
<b>CNRSA</b>	<b>Conseil National de Recherche Scientifique Appliquée</b>
<b>CNRF</b>	<b>Centre National de Recherche Forestière</b>
<b>CNRE</b>	<b>Centre National de Recherche sur l'Environnement</b>
<b>CNRO</b>	<b>Centre national de recherche Océanographique</b>
<b>CNRST</b>	<b>Centre National de la Recherche Scientifique et Technique</b>
<b>COFIRA</b>	<b>Comité de Financement de la Recherche Agronomique</b>
<b>CRAC</b>	<b>Centre Research Advisory Committee</b>
<b>CRF</b>	<b>Coffee Research Foundation</b>
<b>CRI</b>	<b>Crop Research Institute</b>
<b>CRIG</b>	<b>Cocoa Research Institute of Ghana</b>
<b>CSIR</b>	<b>Council for Scientific and Industrial Research</b>
<b>CSO</b>	<b>Comité d'Orientation Scientifique</b>
<b>CRODT</b>	<b>Centre de Recherche Océanographique de Dakar Thiaroye</b>
<b>CTFT</b>	<b>Centre Technique Forestier Tropical</b>
<b>CTL</b>	<b>Commodity Team Leader</b>
<b>DAR</b>	<b>Department of Agricultural Research</b>
<b>DGRST</b>	<b>Délégation Générale à la Recherche Scientifique et Technique</b>
<b>DFID</b>	<b>Department for International Development</b>
<b>DRSPR</b>	<b>Regional Farming System Research</b>
<b>DWASCO</b>	<b>Dwanga Sugar Corporation</b>
<b>EAAFRO</b>	<b>East Africa Agricultural and Forestry Research Organization</b>
<b>EAVRO</b>	<b>East Africa Veterinary Research Organization</b>
<b>EAIRO</b>	<b>East Africa Industrial Research Organization</b>
<b>EAMFRO</b>	<b>East Africa Marine Fisheries Research Organization</b>
<b>ENEA</b>	<b>Ecole Nationale d'Economie Appliquée</b>
<b>ENSUT</b>	<b>Ecole Nationale Supérieure Universitaire de Technologie</b>
<b>ENSA</b>	<b>Ecole Nationale Supérieure d'Agriculture</b>
<b>ENSAAC</b>	<b>Ecole Nationale Supérieure d'Agro-Industrie du Cameroun</b>
<b>ENSSAI</b>	<b>Ecole Nationale Supérieure des Sciences Agro-industrielle</b>
<b>ESSA</b>	<b>Ecole Supérieure des Sciences Agronomiques</b>

<b>FAO</b>	<b>Food and Agriculture Organization of the United Nations</b>
<b>FFA</b>	<b>Framework For Actions</b>
<b>FORIG</b>	<b>Forestry Research Institute of Ghana</b>
<b>FOFIFA</b>	<b>Centre National de la recherch� Appliqu�e pour le D�veloppement</b>
<b>FRC</b>	<b>Financial Resources Committee</b>
<b>FRI</b>	<b>Food Research Institute</b>
<b>FRIM</b>	<b>Forestry Research Institute of Malawi</b>
<b>GDP</b>	<b>Gross Domestic Product</b>
<b>GNP</b>	<b>Gross National Product</b>
<b>GoK</b>	<b>Government of Kenya</b>
<b>GTZ</b>	<b>Deutsche Gellschaft f�r Technischen Zusammenarbeit</b>
<b>GGD</b>	<b>Ghana Grain Legume Development Project</b>
<b>HPI</b>	<b>Heifer Project International</b>
<b>IA</b>	<b>Institutional Analysis</b>
<b>IAB</b>	<b>Institute of Aquatic Biology</b>
<b>IARC</b>	<b>International Agricultural Research Centre</b>
<b>IDA</b>	<b>International Development Association</b>
<b>ID</b>	<b>Institutional Development</b>
<b>IDRC</b>	<b>International Development Research Centre</b>
<b>ICRAF</b>	<b>International Centre for Research in Agroforestry</b>
<b>ICRISAT</b>	<b>International Crop Research Institute for Semi-Arid Tropics</b>
<b>IEMVT</b>	<b>Institut d'Eleavage et de M�decine V�t�rinaire Tropicaux</b>
<b>IER</b>	<b>Institut d'Economie Rurale</b>
<b>IFAC</b>	<b>Institut Fran�ais pour les Agrumes et le Cacao</b>
<b>ILCA</b>	<b>International Livestock Centre For Africa</b>
<b>INAC</b>	<b>Institut National d'Agronomie Coloniale</b>
<b>INADER</b>	<b>Institut National de D�veloppement Rural</b>
<b>INDR</b>	<b>Institut National de D�veloppement Rural</b>
<b>IPR</b>	<b>Institut Polytechnique Rural</b>
<b>IRAD</b>	<b>Institut de Recherche Agronomique pour le D�veloppement</b>
<b>IRAT</b>	<b>Institut de Recherche d'Agronomie Tropicale et des cultures Vivri�res</b>
<b>IRCT</b>	<b>Institut de Recherche sur le Coton et les textiles</b>
<b>INRZFH</b>	<b>Institut National de Recherche Zootechnique, Foresti�re et Hydrobiologique</b>
<b>INSAH</b>	<b>Institut du Sahel</b>
<b>IRAF</b>	<b>Institut de Recherch� Agronomique et Foresti�re</b>
<b>IRFAC</b>	<b>Institut de Recherche sur les Fruits, Agrumes et le Cacao</b>
<b>IRHO</b>	<b>Institut de Recherche sur les Huiles et Ol�agineux</b>
<b>ITA</b>	<b>Institut de Technologie Alimentaire</b>
<b>IITA</b>	<b>International Institute for Tropical Agriculture</b>
<b>IRRI</b>	<b>International Rice Research Institute</b>
<b>ISRA</b>	<b>Institut S�n�galais de Recherches Agricoles</b>
<b>ISNAR</b>	<b>International Service for National Agricultural Research</b>
<b>IRZV</b>	<b>Institut de Recherche Zootechnique et V�t�rinaire</b>
<b>IRZPV</b>	<b>Institut de Recherche Zootechnique Pastoral et V�t�rinaire</b>
<b>JICA</b>	<b>Japanese International Cooperation Agency</b>
<b>KARI</b>	<b>Kenya Agricultural Research Institute</b>
<b>KEFRI</b>	<b>Kenya Forestry Research Institute</b>
<b>KEMFRI</b>	<b>Kenya Marine Fisheries Research Institute</b>
<b>KIRDI</b>	<b>Kenya Industrial Development Research Institute</b>
<b>KIT</b>	<b>Royal Tropical Institute</b>
<b>LCV</b>	<b>Laboratoire Central V�t�rinaire</b>
<b>LNERV</b>	<b>Laboratoire National d'Eleavage et de M�decine V�t�rinaire</b>
<b>LRS</b>	<b>Laboratoire de Recherche et de S�roth�rapie</b>

<b>MARE</b>	<b>Malawi Research and Extension</b>
<b>MESRES</b>	<b>Ministère de l'Enseignement Supérieur et de la Recherche Scientifique</b>
<b>MINREST</b>	<b>Ministère de la Recherche Scientifique et Technique</b>
<b>MOFA</b>	<b>Ministry of Agriculture</b>
<b>MOREA</b>	<b>Ministry of Research and Environmental Affairs</b>
<b>MRTTT</b>	<b>Ministry of Research , Technical Training and Technology</b>
<b>MRS</b>	<b>Ministère de la Recherche Scientifique</b>
<b>MSU</b>	<b>Michigan State University</b>
<b>NARC</b>	<b>National Agricultural Research Council/Committee</b>
<b>NARI/NARO</b>	<b>National Research Institute/Organization</b>
<b>NARP</b>	<b>National Agricultural Research Project</b>
<b>NARS</b>	<b>National Agricultural Research Systems</b>
<b>NARSP</b>	<b>National Agricultural Research Strategic Plan</b>
<b>NCST</b>	<b>National Council for Science and Technology</b>
<b>NRC</b>	<b>National Research Coordinator; National Research Centre</b>
<b>NCRE</b>	<b>National Cereals Research and Extension</b>
<b>NGO</b>	<b>Non-governmental Organization</b>
<b>NRBAR</b>	<b>Natural Resources-Based Agricultural Research</b>
<b>NSQRC</b>	<b>National Seed Quality Inspection Services</b>
<b>ODA</b>	<b>Overseas Development Administration</b>
<b>ODF</b>	<b>Official Development Finance</b>
<b>OECD</b>	<b>Organization of Economic Cooperation and Development</b>
<b>OMBEVI</b>	<b>Office Malien du Bétail et de la Viande</b>
<b>ONAREST</b>	<b>Office National de Recherche Scientifique et Technique</b>
<b>OPRI</b>	<b>Oil Palm Research Institute</b>
<b>ORSTOM</b>	<b>Office de la Recherche Scientifique et Technique Outre Mer</b>
<b>PAG</b>	<b>Planning and Analysis Group</b>
<b>PRA</b>	<b>Projet de Recherche Agricole</b>
<b>PRAN</b>	<b>Projet de Recherche Agricole National</b>
<b>PSE</b>	<b>Permanent Secretariat</b>
<b>R&amp;D</b>	<b>Research and Development</b>
<b>RELEC</b>	<b>Research/Extension Liaison Committee</b>
<b>ROTREP</b>	<b>In vitro Root and Tuber Research Project</b>
<b>RRC</b>	<b>Regional Research Centre</b>
<b>SAL</b>	<b>Scott Agricultural Laboratories</b>
<b>SARI</b>	<b>Savannah Research Institute</b>
<b>SRI</b>	<b>Soil Research Institute</b>
<b>SG2000</b>	<b>Sasakawa Global 2000</b>
<b>SC</b>	<b>Scientific Committee</b>
<b>STC</b>	<b>Scientific and Technical Committee</b>
<b>SARP</b>	<b>Senegal Agricultural Research Planning</b>
<b>SAR</b>	<b>Senegal Agricultural Research</b>
<b>SPARC</b>	<b>Supporting Research Planning and Research on Commodities</b>
<b>SPAAR</b>	<b>Special Programme for African Agricultural Research</b>
<b>SUCOMA</b>	<b>Sugar Corporation of Malawi</b>
<b>TAC</b>	<b>Technical Advisory Committee</b>
<b>TLU</b>	<b>Testing and Liaison Unit</b>
<b>TCAFF</b>	<b>Technical Committee for Agriculture, Forestry and Fisheries</b>
<b>TRIM</b>	<b>Tobacco Research Institute of Malawi</b>
<b>TRF</b>	<b>Tea Research Foundation</b>
<b>UC</b>	<b>User Committee</b>
<b>UNDP</b>	<b>United Nations Development Programme</b>
<b>USAID</b>	<b>United States Agency for International Development</b>
<b>WANA</b>	<b>West Asia and North Africa</b>
<b>WRI</b>	<b>Water Resources research Institute</b>

The study on the "Impact of foreign assistance on institutional development of national agricultural research systems in sub-Saharan Africa" is the analysis and assessment of foreign assistance provided by 36 agricultural research projects in seven selected countries of sub-Saharan Africa. It traces the evolution of national agricultural research systems (NARS) from independence to the present. It highlights the development of the NARS with regard to infrastructure, human resources and funding as a consequence of foreign assistance. The constraints to NARS institutional development are identified and recommendations made.

ISSN 02-5-104803-5 ISSN 1020-0641



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TC/MY4348E/1/12.02/000