

PN-ABE-112

Report to the Ministry  
of Agriculture, Cooperatives  
and Marketing of the  
Government of Lesotho

ISNAR R48e

# REVIEW OF LESOTHO'S AGRICULTURAL RESEARCH SYSTEM



International Service for National Agricultural Research

The International Service for National Agricultural Research (ISNAR) began operating at its headquarters in The Hague, Netherlands, on September 1, 1980. It was established by the Consultative Group on International Agricultural Research (CGIAR), on the basis of recommendations from an international task force, for the purpose of assisting governments of developing countries to strengthen their agricultural research. It is a non-profit autonomous agency, international in character, and non-political in management, staffing, and operations.

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RESEARCH SYSTEM**

November 1989

***isnar***

International Service for National Agricultural Research

## PREFACE

This review was conducted by ISNAR in conjunction with a local task force from the ARD, LAPIS, and USAID. The ISNAR team composed of Dr. T. Ajibola Taylor and Dr. Pablo Eyzaguirre would like to thank the local task force of Dr. Musi Matli and Mr. Narwane of the ARD, Dr. Ed Loomis of LAPIS, Dr. Abel Mustafa and Mrs. Khadikane of USAID for their invaluable assistance in completing the assignments in Lesotho. The team also acknowledges the full support that the Ministry of Agriculture gave to this mission, and would like to thank the Honourable Minister of Agriculture, Marketing and Cooperatives, Dr. Phororo, the Principal Secretary, Mr. Reid Ntokoane, and the Director of Field Services, Mr. Michael Motsoene, as well as the heads of departments and agricultural officers who contributed to the success of the mission. We would also like to thank Mrs. Christine Solinger of ISNAR for the typing and production of the report.

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## INTRODUCTION

This report summarizes the results of an ISNAR review mission to Lesotho from 23 May to 6 June 1989. The mission was undertaken at the invitation of the Ministry of Agriculture, Cooperatives and Marketing of the Government of Lesotho and supported by the USAID mission in the country. The purpose of the mission is to review Lesotho's agricultural research capacity in relation to the priority needs of the country, and to enhance the inputs of research into the development process. Working jointly with Basotho researchers and planners the ISNAR mission set as its main task the determination of a viable scope and size for a sustainable research system within the Lesotho context. This is to provide an essential research capacity that can be strengthened in the medium to long term, thus insuring the required flow of technological inputs needed to develop the national agricultural sector.

Another major task of the ISNAR mission was to give important consideration to the possible integration of agricultural research and agricultural education. The objective is to enhance the practical and development-oriented role of research while considering frameworks that make efficient use of the scarce physical, human, and financial resources in both agricultural research and education. In this way, both education and research can provide service to Lesotho's agricultural industry.

The review and recommendations for strengthening the agricultural research capacity in Lesotho are largely consistent with and in support of new directions taking place within the Agricultural Research Division (ARD) and the Ministry of Agriculture. The report is aimed at providing a systematic framework whereby these encouraging new directions can be implemented and sustained. The expected result is a national agricultural research system linked to agricultural education that will deliver the appropriate technological products and knowledge to Lesotho's farmers and agricultural industry. Agriculture remains a key to economic and social development in Lesotho, and research and technology development have vital contributions to make to this process.

Improving the effectiveness and efficiency of research in Lesotho will require innovative approaches to research organization and planning. Lesotho is a small country with limited resources and an urgent need to improve the productivity of agriculture while conserving the natural resource base. The country also suffers from a certain measure of isolation by virtue of its geographic location being surrounded by the Republic of South Africa. These problems of size, limited resources and isolation are shared by many small developing countries, and ISNAR recognizes these as important considerations for its collaborative and study programs. Apart from the initiative of the Government of Lesotho and USAID in requesting ISNAR to undertake this review and initiate the process of strengthening Lesotho's national agricultural research system (NARS), ISNAR has been provided some additional resources by the Danish Government to conduct full analyses of the special problems of NARS in small countries. The overall objective of the related activities covered in this review and studies is to produce new organizational strategies that will enhance the national research capacity and improve the flow of agrotechnologies with a more efficient use of scarce resources.

In the case of Lesotho, ISNAR will continue to work jointly with research leaders in Lesotho to extend and strengthen the impact of the work begun in this review. ISNAR will work to develop the organizational strategies and provide the decision-making framework needed to design a research system that meets the needs of Lesotho's agricultural sector and is sustainable over the long term.

Work program of the review mission: The national taskforce and USAID staff contributed to organizing a full and complete program of work for the ISNAR mission. The team was able to review the range of existing research facilities and programs, the facilities and programs for agricultural education at the Lesotho Agricultural College (LAC) in Maseru and Leribe, in addition to the scientific training facilities at the National University of Lesotho at Roma. The team held wide-ranging and detailed discussions with policy-makers in the Ministry of Agriculture and with USAID as a major donor in agricultural research and development. Meetings with the production and development departments, extension, and the District Agricultural Officers provided background to the needs and demand for research from the major clients and users of research in the ministry, among farmers, and in the agricultural industry in general. The success of the mission is due in large part to the participation provided by the Lesotho research leaders and the many interested parties within the agricultural sector. (Appendix 1 provides a list of the principal institutions and persons contacted.)

## CHAPTER 1

### LESOTHO'S AGRICULTURAL RESOURCE BASE AND IMPLICATIONS FOR THE AGRICULTURAL RESEARCH SYSTEM

The Kingdom of Lesotho is a mountainous country entirely surrounded by the Republic of South Africa. It is among the smaller countries in Africa with a surface area of 30,350 km<sup>2</sup> and a population of 1,577,000 (1986). Due to labor migration the de facto population is estimated at 1,447,000, which means that approximately 8 % of the population is absent from Lesotho.

Two thirds of the national territory is in the mountains. Most of the eastern half of the country lies at elevations of 2,450 meters above sea level. The western third of the country consists of foothills (elevations 1800m-2200m above sea level) and a narrow strip of lowlands near Lesotho's western border with elevations around 1500m.

The mountains form a major watershed in southern Africa and Lesotho is well endowed with rivers and streams. Rainfall averages 711mm per year with less rainfall in the southern part of the country (dry lowlands). The climate is basically temperate. There are frequent frosts in the winter, June-September, and hail is a frequent summer hazard.

Lesotho's soils are of basaltic origin. The mountain soils are thin but rich and the lowlands are characterized by red soils of sandstone origin. Erosion is the principal factor limiting the continued productivity of Lesotho's soils.

The arable land in Lesotho is estimated at 450,000 ha or approximately 13 % of the total area. Grazing lands account for about 1.8 million ha or approximately 60 % of the land. Both need to be carefully managed in order to remain productive given the high susceptibility to erosion. In the past, careful management of agricultural land has not been the case with a prevalence of overgrazing and cultivation techniques that promote erosion. Conservation of the agricultural resource base therefore remains a central problem confronting agricultural research and development.

While recognizing that montane environments are highly complex with a great deal of diversity in microclimates, Lesotho can be considered to have four major agro-ecological zones. These four zones are the ones which should be taken into consideration when designing and planning the scope of agricultural research and development in Lesotho. The four zones are: the Lowlands, the Foothills, the Mountains, and the Orange River Valley. (See map.)

The Lowlands: The Lowlands occupy a narrow band on the western border of Lesotho and account for 1/4 of the total land and the bulk of the arable land. Lowland here refers to elevations between 1500-1800m. The northern part of this zone is suitable for intensive crop production and dairy. A research strategy based on food self-sufficiency and intensification will depend on developing and

introducing technologies that maximize the productive potential of this zone. It is also situated near the population centers and thus has better potential for distribution and commercialization of the increased production.

The Foothills: This zone has elevations between 1850m-2100m and is characterized by mixed crop and livestock systems on fragile soils. Soil conservation and crop diversification are the appropriate research strategies for this area. Conservation agriculture should be a major theme in the provision of technologies and improved farming practices for producers in the foothills. This zone may also be appropriate for the introduction of high-value crops that are economic in small-scale production systems, as part of the crop diversification strategy.

The Mountain Zone: Lesotho's mountain zone is above 2100m and is suitable for livestock production systems. The area is generally above the upper line of village development and is divided into two sub-zones, the lower mountains and the upper mountains. In the lower mountain zones, some mixed livestock and crop production systems are practicable. Wheat, potatoes, and fruit trees production can be integrated with cattle-dairy production. Conservation and controlled grazing are important issues for research programs to address.

The upper mountain zone consists of the area above 2550m and is suitable for the grazing of small ruminants - sheep and goats. The potential for this area to augment its contribution to the country's foreign exchange earnings through improved livestock practices and production (mainly wool and mohair) is significant. The high risk of erosion precludes the introduction of many field crops or large ruminants.

The Orange River Valley: This is a special agro-ecological zone in a warmer part of the country which, because of the higher rainfall and the potential for irrigation in alluvial soils, can be important for intensive cropping of both high-value vegetables and grains. This potential is yet to be fully developed.

This brief overview of the 4 major zones provides a key element for the determination of the scope and strategy for agricultural research in Lesotho. Given the limited resources available, a national agricultural research system will nonetheless be required to address some of the more important problems of production and conservation in these four zones and identify new opportunities to benefit from the diversity of ecological conditions.

#### MAJOR CONSTRAINTS TO AGRICULTURAL DEVELOPMENT AND THE DEMAND FOR NEW AGROTECHNOLOGIES

While agriculture remains the main contributor to Lesotho's GDP, its relative contribution to Lesotho's gross domestic product has declined from 38 % in 1978 to 20 % in 1984. Dependence on the wages of mine labor in the Republic of South Africa has in the same period grown from 35.5 % of GNP to over 50 %. In terms of the labor available for agriculture, this means that half of Lesotho's able-bodied men are working away from their homes at any point in time. This is particularly acute in the rural areas and it is estimated that 70 % of the agricultural labor is done by women.

Lesotho's agricultural labor supply suffers a typical paradox of high rural unemployment and a limited capacity to absorb the rapid growth of population (2.6 % per annum) at the same time that there is a pronounced labor shortage for farming. This is due to the low level of productivity in agriculture which does not match the earnings potential of other labor opportunities.

Given the growing pressure on arable land, the fact that agricultural production has not kept pace with the increase in population, the low rate of return to agriculture, and depressed rural incomes, clearly agriculture has to be made more productive and efficient. This is the broad goal of Lesotho's agricultural research system. Its objectives are to provide new technologies, improve practices that increase productivity of agricultural land and labor, raise farm incomes and conserve the natural resource base for future generations of Basotho.

Intensification of agricultural production is the clear strategy the government of Lesotho has adopted to address the crisis in agriculture. This will require new and improved technologies that Lesotho's agricultural research system must select, screen, and adapt for use by the Basotho agricultural producers.

These needs are basically in the form of new technologies that meet the following goals:

- increase farm cash income: by lowering unit costs of production, introducing new high-value crops and varieties that produce higher yields, and cultivation practices that are more economical;
- provide technological inputs and new agronomic practices that can overcome labor constraints: herbicides, mechanization and machinery, cropping patterns, cycles and timing of farm operations;
- provide technological packages for intensification of production of basic grains and vegetables in the most productive lands;
- introduce practices, crops, varieties and technology that protect and enhance the productivity of the natural resource base: improved management of soil, water resources, agroforestry and conservation agriculture.

The introduction of new agrotechnology into Lesotho must be managed. Appropriate procedures for the selection and screening of technology to find those most suitable for the edaphic and socio-economic conditions of Lesotho must be in place; this is a key task of the Agricultural Research System.

Due to labor migration and the ready availability of apparently relevant agrotechnology in the Republic of South Africa, Basotho farmers currently have access to some new technology. However, our discussions with District Agricultural Officers in the most productive districts confirmed that there have indeed been serious problems with technology being adopted by farmers without adequate screening by the ARD and with disappointing results for Basotho farmers. Given the current gradient in agricultural technology between Lesotho and its neighbor and the flow of goods and inputs into Lesotho's agricultural sector, the National Agricultural Research System will have to provide strong leadership so that technological change in Lesotho's agriculture takes place with due regard to appropriateness and the sustainability of the country's natural resource base.

Furthermore, the particular socio-economic conditions of Lesotho's communal land tenure and small-scale production units require that technology be screened, adapted and packaged in ways that the bulk of Lesotho's farmers can use profitably.

TABLE I

VALUE OF AGRICULTURAL CONTRIBUTION  
TO GDP AT CURRENT PRICES FOR 1980/81 - 1983/84  
(MILLION MALOTI)

<u>Subsector</u>	<u>1980/81</u>	<u>1981/82</u>	<u>1982/83</u>	<u>1983/84</u>
Crops	26.5	27.1	21.6	14.4
Livestock	35.6	40.0	48.9	50.0
Sector Total	62.1	67.1	70.5	64.4
Total GDP	321.7	348.5	383.8	414.2
% Ag Sector	19.3	19.2	18.3	15.5

TABLE II

AVERAGE YIELDS BY CROP (1980/81-1984/85) (kg/ha)

<u>Crop</u>	<u>1980/81</u>	<u>1981/82</u>	<u>1982/83</u>	<u>1983/84</u>	<u>1984/85</u>
Wheat	721	536	465	511	427
Maize	774	608	601	573	637
Sorghum	748	446	539	540	671
Beans	385	294	255	116	249
Peas	652	432	298	411	324

TABLE III

DOMESTIC GRAIN PRODUCTION  
AS A PERCENTAGE OF TOTAL REQUIREMENTS

<u>Crop</u>	<u>1980/81</u>	<u>1981/82</u>	<u>1982/83</u>	<u>1983/84</u>	<u>1984/85</u>	<u>1985/86</u>
Maize	50.0	47.5	45.6	42.3	42.2	44.1
Wheat	42.8	35.9	30.0	22.0	22.6	22.7
Sorghum	98.3	96.6	88.7	95.9	97.1	98.2

Source: Fourth Five-Year Development Plan (1986/87 - 1990/91) v.1

**NATIONAL POLICY FOR DEVELOPING THE AGRICULTURAL SECTOR AND THE ROLE OF AGRICULTURAL RESEARCH**

The ISNAR team and the accompanying members from ARD, LAPIS and USAID held extensive discussions with policy-makers in the Ministry of Agriculture, Cooperatives and Marketing, including the Honorable Minister, the Principal Secretary, and the heads of departments.

Based on the analysis of the current situation, the constraints and potential of agriculture in Lesotho, a clear policy has been formulated at the highest levels of the Ministry. The national development policy for the agricultural sector has the following objectives:

- move towards self-sufficiency in basic foodstuffs;
- conserve the natural resource base;
- increase farm incomes and raise the productivity and profitability of agriculture;
- identify new high-value crops and agricultural products and diversify base of production and sources of income;
- increase employment opportunities in rural areas.

The mission's wide-ranging discussions and analysis confirmed that there is a strong demand from farmers and public and private development agencies for improved technologies in agriculture. The Basotho farmers and livestock producers are eager and willing to invest in agriculture and in new agricultural inputs. There is already a pattern of capital from non-agricultural sources, principally mine labor, being reinvested in agriculture and land. This provides a healthy and supportive atmosphere for the development and working of a national research system. The challenge is for the research system to mobilize stakeholders to acquire the necessary resources, develop a plan, and then manage the resources effectively and efficiently to meet the strong demand for appropriate technologies from the farm sector. This would require a small but well organized research system able to undertake and manage the research process for the development and delivery of appropriate products in the short to medium term.

## CHAPTER 2

### LESOTHO'S NATIONAL AGRICULTURAL RESEARCH SYSTEM: OBJECTIVES AND STRATEGIC PLAN

#### The Institutional Structure of Lesotho's Agricultural Research System

The conduct and coordination of all agricultural research in Lesotho is the sole responsibility of the Agricultural Research Division of the MOA. There are presently around 50 development projects with external support within the MOA and several of these conduct some elements of research. It is impossible for the ARD at its current level of staffing and funding to coordinate these activities as well. However, it can be confidently stated that the bulk of agricultural research, and certainly that which has the greatest long-term and strategic value to Lesotho is conducted by the ARD.

The ARD has always belonged to the Ministry of Agriculture and has been allocated a relatively low level of articulation within the structure of the Ministry. The precursor of the ARD, the Maseru Agricultural Research Station, was established in 1952 as a section within the Crops Division. Additional field stations were established at Machache, Matsieng, Mafeteng, Tsakholo, Teyateyaneng, Leribe and Mokhotlong and the research was conducted largely by expatriate research officers under the protectorate status prior to independence.

The mission of the research stations was to test available agricultural technologies for adaptation and or recommendation to Basotho farmers. While the primary scope and level of research remains the same, it was considered that the research station had very little impact on agricultural production and conservation prior to 1979. The Agricultural Research Division is presently established within the Department of Field Services of the MOA (see diagram of MOA).

From 1979 to 1986, the ARD benefitted from the assistance of the USAID. Most of the aid was provided through the Farming Systems Research (FSR) Project. The funds provided enabled the ARD to upgrade and expand its physical infrastructure and train much of its staff. The current 3 branch stations at Nyakosoba, Siloe and Molumong were built up as "prototype area stations" (a somewhat confusing term) under the FSR project.

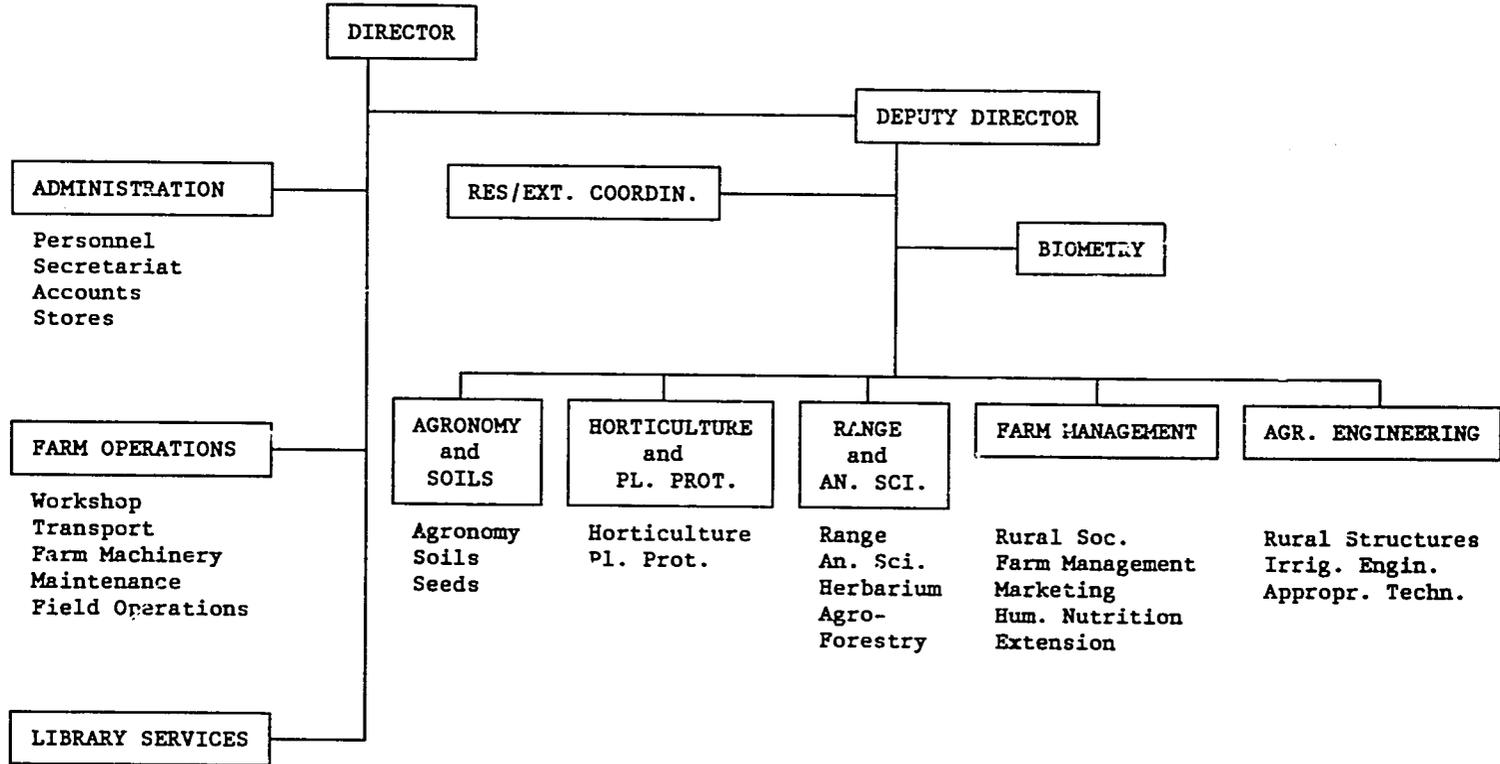
Overall, the FSR project tended to disperse the rather limited national research capacity. While it did bring research closer to the farmer, research had little to offer because it lacked the critical mass and resources to adapt the technologies needed by the farmers. A thorough assessment of the FSR project was conducted by E. Frolek, and W.N. Thompson for AID in 1986 and the achievements and shortcomings of this phase within the ARD are clearly stated therein.

It is the view of this mission that having acquired the experience in on-farm research provided during the FSR phase, the ARD is currently consolidating its resources to be able to test and adapt new technologies that are required. This is a healthy direction at present and should be encouraged as opposed to a decentralization and dispersal of the existing and limited research effort.

Fig. 1: The Current Organization Structure for Agricultural Research Division being Under Test since 1987

ORGANIZATIONAL STRUCTURE CHART

Agricultural Research Division



As a relatively young research service, the ARD has nonetheless had some notable successes in making appropriate new technology available to farmers in commodities such as pinto beans, leafy vegetables, and cereals. Our fact-finding visits to some rural districts confirmed the strong demand for continued technical leadership by the ARD in the production sector.

### Infrastructure

The ARD research capacity is concentrated at the main station in Maseru. It is the only station with laboratories and physical facilities to conduct adaptive crop production research and livestock breeding. The Maseru station is also the location of the administrative offices, the library and support services. The 17 Basotho researchers are all assigned to this station. Given the small number of researchers, the need to maintain a critical mass of effort in the crucial programs, and the lack of adequate facilities in the branch stations, the ISNAR mission supports the present concentration of scientific staff in the main station.

There are plans currently underway to select 4 of the 14 sub-stations to serve as branch stations. The remainder would be relatively undeveloped and be used for demonstration trials and extension work. The four proposed branch stations at Nyakasoba, Siloe, Leribe and Thaba Tseka would indeed cover the major agro-ecological zones in Lesotho. They are situated in places that make them easy to sustain and supply and with relatively easy communication to the main station. The branch stations can be adequately staffed by experienced research technical officers, under supervision of research program officers from Maseru. The current process of rationalization of ARD's research station network is deemed very positive. The main station at Maseru and the 4 branch stations would constitute the core network for the system. In the long term, Thaba Tseka with its distinct agro-ecological conditions and specific requirements may require a small critical mass of scientists on site to carry out research on crop and livestock production systems for the mountain zone. This is probably the only form of decentralization that can be considered worthwhile. In the same vein, the high production potential of the Orange River Valley may justify the development of similar on-site research capacity.

Main station:  
Maseru

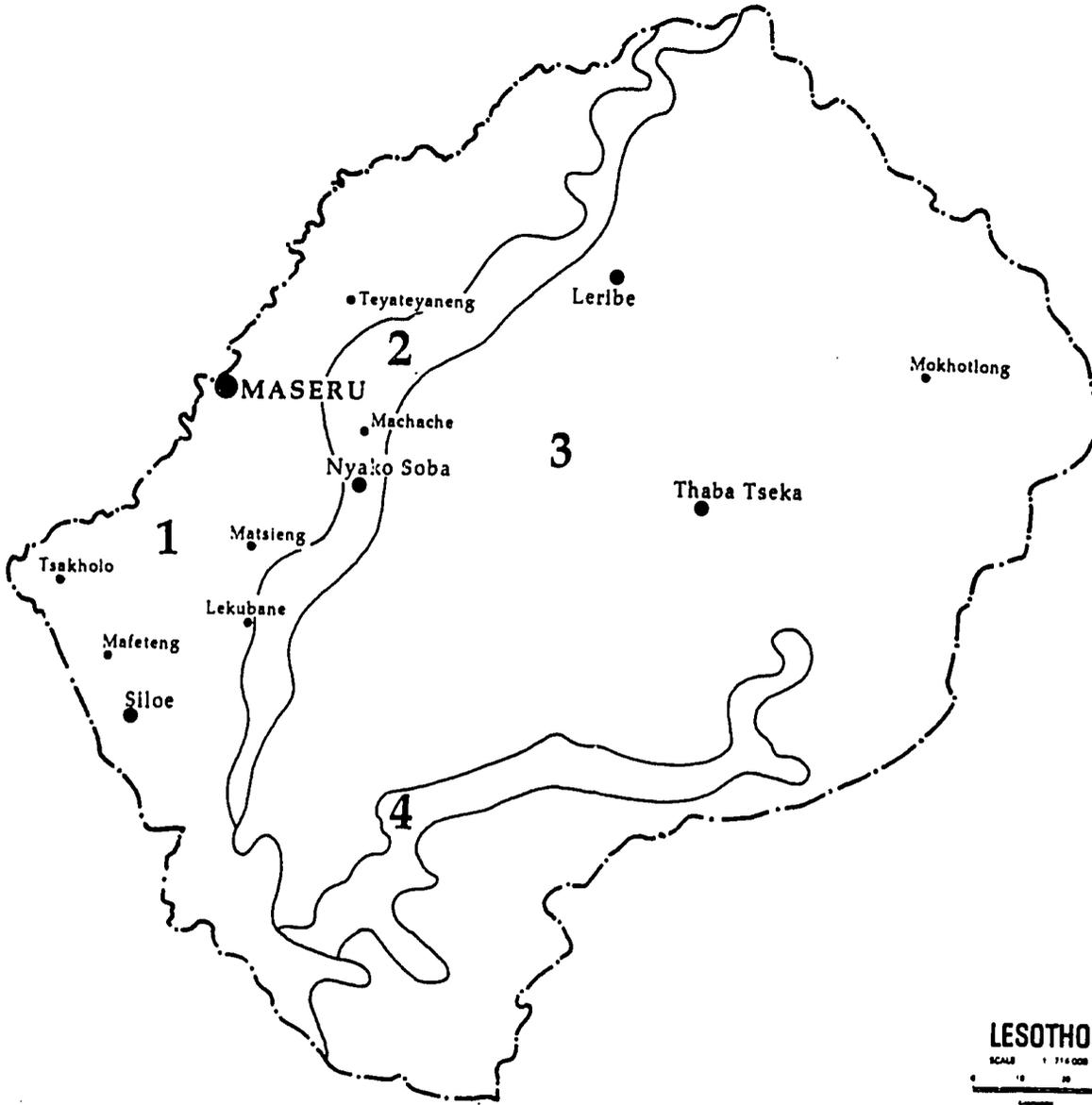
Branch Stations:  
Thaba Tseka  
Siloe  
Nyako Soba  
Leribe<sup>1</sup>

Sub-stations:  
Lekubane  
Machache  
Mokhotlong  
Teyateyaneng  
Mafeteng  
Tsakholo  
Matsieng

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<sup>1</sup> The Leribe branch station is in the planning stage.

# LESOTHO RESEARCH STATION NETWORK - ARD 1989



## AGRICULTURAL ZONES

1. LOW LANDS
2. FOOTHILLS
3. MOUNTAINS
4. ORANGE R. VALLEY

## STATIONS

- MAIN STATION
- BRANCH STATIONS
- SUB STATIONS

### Library and Information Services

The scope and level of agricultural research in Lesotho focuses on the screening, testing and adapting of existing technology. This requires a small but well organized technical information service for agricultural researchers so they may know where, how and what to borrow. The current state of library and information facilities in the ARD is inadequate for this crucial task. The state of the library and information service within the LAC is worse still despite the more sophisticated hardware and building.

To pursue the agreed-upon strategy and scope for research in Lesotho an effective library and technical information service for agricultural research is essential. It is not necessarily costly but requires greater planning and management of information and a better identification of information needs and sources. Providing professional training of library staff in documentation science could solve much of the problem. The library staff can then work jointly with the research programs to identify the appropriate linkages to global sources of knowledge on new agricultural technology. The library and information services can also help researchers to document and disseminate research results.

### Linkages to Policy-Makers

Agricultural research has not had sufficient institutional autonomy to represent the case for agricultural research and advise policy-makers within the MOA and the GOL. Technological change is a clear strategic option that has been selected by the GOL as a key to develop agriculture as the base of the national economy. The ARD is the only entity within Lesotho charged with implementing this policy. However, as a small division within a department of the MOA, it has not always been an effective mechanism for dialogue on research and technology policy. The ARD has not been able at times to effectively interpret Ministry policies or to communicate the requirements for its implementation.

The ISNAR mission recommends that a ministerial policy body be constituted comprising the Permanent Secretary and the Heads of Departments including the Director of ARD, and that this policy body take up the responsibility for discussing and determining the research policy to guide ARD in its activities. This would provide an effective mechanism for ARD linkages to policy making and its implementation. The MOA has clearly stated the broad objectives for developing Lesotho's agricultural sector (see Chapter 1). The proposed research policy body would therefore be the mechanism by which those objectives can be translated into a national research strategy and effective research programs.

In the medium term it would be advisable to consider upgrading the institutional structure of research to a Department within the MOA. This will afford research greater opportunity to advise and formally interact with policy-makers on the crucial area of technological change and resource conservation in agriculture. It will also make research more responsive to the objectives of the Ministry and the agricultural industry.

### Linkages to Clients in the Agricultural Industry and Stakeholders

The ARD will also require greater inputs from clients in the formulation of its strategy and programs. The major clients are the production and development departments in the MOA, extension, DAOs, farmers, agro-industry and development projects.

Stakeholders from the private sector and international development projects should also be formally involved in the research planning process. With nearly fifty development projects within the MOA, there is need to put mechanisms in place to orient them to the national priorities and prevent duplication or extraneous efforts that cannot be sustained by national counterparts.

The planning process will have to consider ways that donor inputs can be managed in accordance with national goals. The linkage mechanisms and collaboration must be directed at enhancing the national capacity of the research system to screen and store research information produced in the course of other development projects. Chapter 3 provides specific frameworks for establishing these linkages and mechanisms.

There are many opportunities provided by IARC's, regional networks such as SACCAR, and bilateral agencies for technical assistance to Lesotho's NARS. The opportunities for collaboration are probably greater than the ARD's capacity to make effective use of all of them. The planning process needs to evaluate the costs and potential contributions of the linkages to national agriculture policy and the research objectives; then select those linkages that deliver the most to the areas deemed most important for national research.

### The Major Objectives of Lesotho's National Agricultural Research System (NARS) and the Development of a Strategic Plan

Having considered (i) the national policy for agricultural development established by the MOA, and (ii) the linkages and mechanisms needed to translate this broad policy into an agricultural research policy and plan, the outlines and scope of Lesotho's NARS can be determined. They can be summarized in the following objectives:

1. implement national agricultural development policy through providing appropriate technology and information for producers and clients of research;
2. identify clients and users of research: farmers, agro-industry, development projects and policy-makers (GOL);
3. establish effective linkages with policy-makers and clients to set an appropriate and sustainable scope for research;
4. act as national coordinator and clearing-house for agricultural research being done in the various projects within Lesotho.

The objectives outlined above provide the basis for the formulation of a strategic plan for research. Such a plan is an important instrument for Lesotho's NARS to achieve its objectives and increase its impact in the next 10 years. The plan sets a scope and size for agricultural research in Lesotho that will be sustainable over the long run.

Below we provide a brief outline of the elements that are essential in formulating a strategic plan. In Chapter 3 we suggest specific mechanisms that can be put in place to provide the plan.

Given the time frame for agricultural research, 10 years is a reasonable period of time for planning its objectives, organization and structure. This period is also sufficient for the monitoring and evaluation of the efficiency and effectiveness of the research programs, and an overall assessment of the impact of research on Lesotho's agricultural industry.

The following elements comprise the strategic plan:

1. set institutional goals and mission in terms of NARS objectives outlined above;
2. set the size and scope of research in consideration of:
  - the resources available for research in the medium to long term;
  - the size and complexity of the agricultural sector and the agroecological diversity;
  - the level of research based on the demand for new technology and the availability of appropriate technology in the region, IARCs, national and international private sector;
  - projected levels of growth and development of the research system based on resource allocations and evolution in the type of clients for research, production systems, and overall demand.

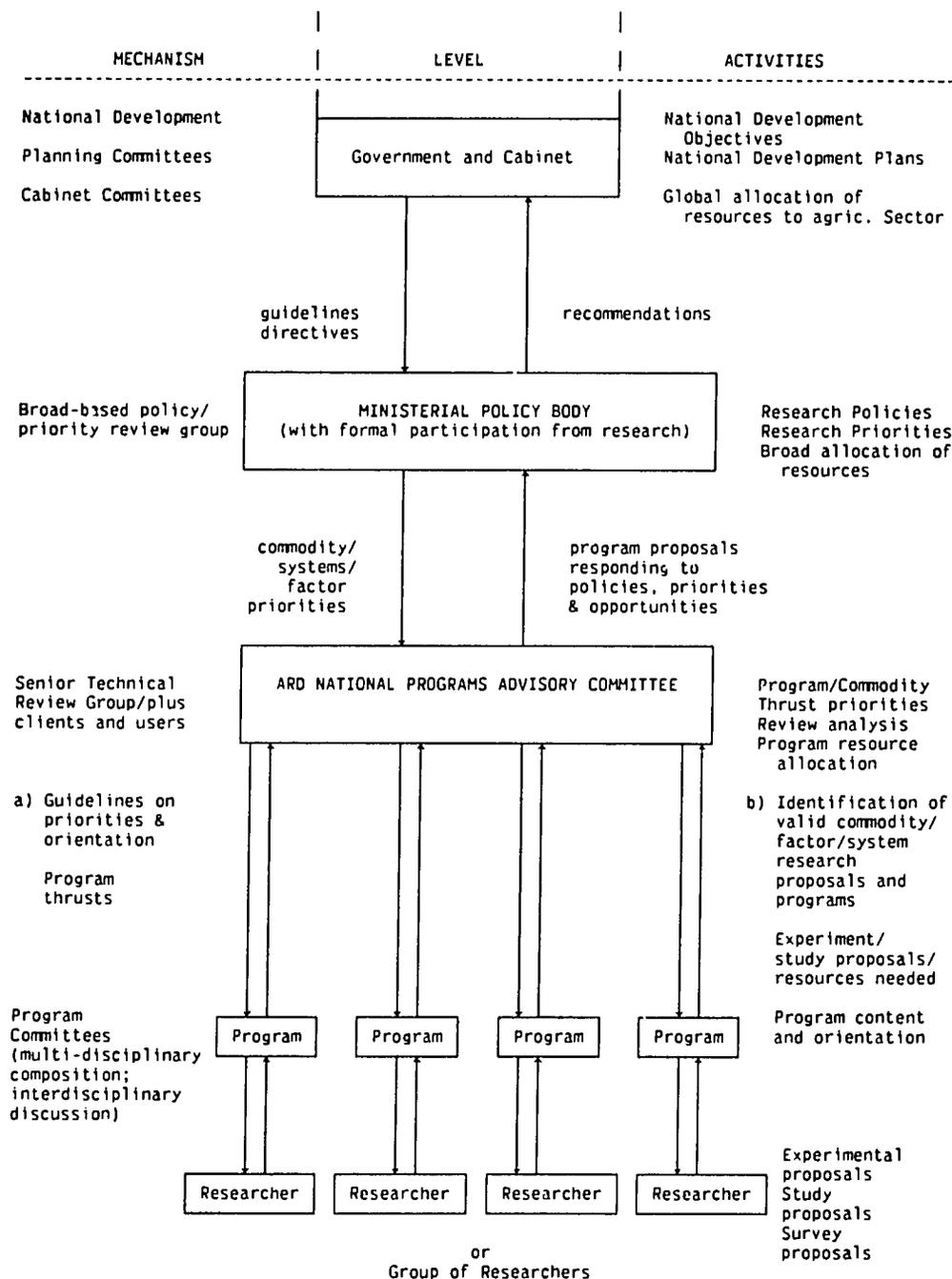
The brief outline of strategic planning provided here would support the immediate changes required in the direction and organization of programs that are discussed in detail in the following chapter.

The schematic diagram in figure 2 illustrates the feedback links between the agricultural research plan, the research programs, and the more effective technologies and information outputs that they generate.

### Funding of Agricultural Research

Agricultural research in Lesotho is basically project-driven both in terms of funding and programs. This situation has persisted almost since the inception of agricultural research in the Ministry of Agriculture. Unfortunately this has also led to the low-profile status accorded to agricultural research and to a low level of reckoning in resource allocation matters. The major investments in research for the support of programs and the training of staff have come mainly from donor sources in the last ten years. GOL's main contribution has been in the provision of personnel costs and minimal local operating costs which do not approach what can be considered reasonable requirements of funding per scientist for productive agricultural research.

**Fig. 2: Schematic illustration of Strategic Planning and Program Formulation at various levels in a National Agricultural Research System (NARS).**



While it is understandable that there could be very good reasons for the heavy dependence on technical assistance and donor funding for agricultural research in the difficult economic circumstances of Lesotho, there is need for the Ministry of Agriculture to demonstrate more clearly its concern for the development and stability of agricultural research through policy support and funding. The critical importance of agricultural research as the driving force for the improvement and growth of the agricultural sector needs to be recognized, and the vulnerability to which it is now subject leaves very much to be desired and should preferably be avoided.

Table IV gives the summarized expenditure of the ARD during the period 1985-1989.

TABLE IV

AGRICULTURAL RESEARCH EXPENDITURE OF THE ARD  
DURING THE PERIOD 1985-1989 (IN MALOTI)

	<u>1985-1986</u>	<u>1986-1987</u>	<u>1987-1988</u>	<u>1988-1989</u>
Personal emoluments	543,188	515,133	517,152	726,246
Operating costs	138,822	75,353	122,330	146,477
<b>Total (Maloti)</b>	<b>682,010</b>	<b>590,486</b>	<b>639,482</b>	<b>872,723</b>
<b>Total (US \$)</b>	<b>303,116</b>	<b>251,270</b>	<b>261,013</b>	<b>342,244</b>
Average Exchange Maloti per US \$	2.25	2.35	2.45	2.55

This expenditure profile shows that the GOL's main contributions were to personal emoluments costs and that operating costs varied from a low of 13% in 1986/87 to 20% in 1985/86 and were in the range 13-20% in the last five years. The operating costs per scientist per year when converted to US dollars were all below \$3,500 and in the range \$1,773 to \$3,447; whereas it is estimated that for functional and productive research systems in the developing countries of Africa, Asia and Latin America reasonable operating costs per scientist per year in agricultural research should be on the order of \$7,000 to \$10,000.

It is significant to note that in contrast to ARD-sourced expenditure in research, the LAPIS Project which is currently supporting agricultural research in Lesotho has an expenditure of \$1,166,700 per year comprising \$1,050,000 personnel costs and \$116,700 operating costs. The total project expenditure over the 6-year period of the LAPIS operation would be \$7,578,132, of which \$6,797,392 would be provided by a donor (USAID) and only \$780,740 by GOL.

This funding situation whereby ARD's expenditure constitutes only 17%-25% of the total research expenditures and about 26%-33% of operating costs demonstrates clearly that agricultural research in Lesotho is largely project driven. This has been a long-standing situation because an earlier donor-funded project - the Farming Systems Research Project - also involved a substantial expenditure of \$9,031,300 (\$5,984,400 for the FSR Program and \$3,046,900 for the FSR Research Unit) along similar lines and with very limited contributions from GOL. The dependence on donor project funding calls into question the longterm sustainability of the modest research that is currently being undertaken and highlights the need for GOL to make greater commitment to research as a matter of policy.

The average level of funding provided to research by the GOL for the period 1985-1989 is M 696,00 (maloti) or US\$ 285,000 a year. The present level of GOL-sourced funding for agricultural research is therefore of the order of 0.6% of the AGDP<sup>1</sup>. This is generally considered to be a low level of support and it is recommended that the GOL should raise the level of support to 1% AGDP over the next five years. Given the comparatively small size of Lesotho's agricultural sector, the value of 1% of AGDP may still be inadequate to fund a research system with the critical mass of scientists and the necessary infrastructure to operate the essential programs. This is one of the inherent problems of scale that affects NARS in smaller countries. It may therefore be advisable in the long run to consider a level of research funding over 1% of AGDP. While increased funding is required, the long term sustainability of the research system will depend on innovative strategies that maximize the benefits from linkages with external sources of technology and that make the most efficient use of other institutions in the country and in the region.

GOL should not expect to have its critical and strategic research in agriculture funded from donor sources indefinitely. If Lesotho's agricultural research system is to be sustainable over the long run and if it is to respond to priorities set by government and the demands of the agricultural sector, donor funding should only supplement the core funding for research in a few critical areas necessary to stimulate and support the agricultural sector.

At present, donor funding does not pay the basic personnel costs of the ARD. Adequate core-funding from the GOL is therefore crucial to maintain a stable, motivated and productive base of technical and scientific manpower within the national research system, with the funds to conduct their programmed activities. For Lesotho this does not have to be a large system but one that is stable and well supported with operating funds necessary to carry out the rationalized programs proposed in this report. An element of the strategic plan for research should be the realistic costing of these national programs considered necessary to stimulate and sustain a productive agricultural sector in the long term.

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<sup>1</sup> In 1987 agriculture accounted for 21% of the total AGDP, a total value of approximately 48.3 million US\$ (1987 market exchange rate).

### CHAPTER 3

#### ESTABLISHING COHERENT AND EFFECTIVE PROGRAMS WITHIN THE AGRICULTURAL RESEARCH DIVISION (ARD)

The strengthening of the structure, organization and linkages of the agricultural research system, important as it is, should be seen as a means to improve the research process and the delivery of the required outputs to the farming community. The ARD would only be able to do this effectively if it establishes and executes coherent and effective research programs that address the priority needs of the farmers, the development agencies and other clients and stakeholders in the agricultural community of the country.

Effective programming would allow researchers and planners to develop a framework to carry out relevant research and to monitor and evaluate the outputs and products in terms of their relevance and impact. In addition, ARD should be seen to contribute more effectively to the development process through the adoption and application of its outputs of improved technologies, its continuing efforts to develop and test appropriate technologies that keep abreast of the needs of farmers, and its ability to provide satisfactory solutions to their problems.

The importance of appropriately translating GOL's development objectives into research policies and programs, establishing and managing internal and external linkages with policy-makers, clients and sources of technology, and the putting in place of mechanisms for improving the efficiency of utilization of research resources have been discussed in a previous chapter. In this chapter the focus is on the programs, their coherence and how, even in a small system, they can be made to have greater effectiveness on improving the performance of the agricultural sector.

#### Current Status and Perception of ARD Programs

The ARD has been criticized by policy and decision-makers for the lack of relevance of its research and for lack of impact. This is a common criticism of agricultural research in both developing and developed countries. Such criticism often reflects the lack of consistent inputs by policy-makers and users of agricultural technologies in the research program formulation process, and in some cases absence of clear policy guidelines to which research is expected to respond. In the case of Lesotho, the ARD is seen as not doing enough to provide farmers with usable products that allow them to increase their productivity and realistically tackle the problems they face. Farmers are therefore tempted to introduce and test technologies which they judge to be relevant to their needs from the neighboring countries, with varying degrees of appropriateness and success. Also, the Ministry of Agriculture has expressed a strong demand for research products and outputs that are focused on integrated production systems of farmers and producers and therefore have the potential to increase their productivity through cost reduction, improved resources management, and increased production. Some of these demands are not reflected in ARD's program strategy.

The mission's review of ARD's research shows that the programs are formulated and organized in a way that does not necessarily match or respond to the specific objectives of farmers and policy-makers. While the essential ingredients of improved technologies are present in both the conceptualization and execution of the programs, the outputs do not necessarily reflect the urgent needs for farmer-oriented 'technology packages'; consequently, impact or potential impact is difficult to demonstrate.

#### Improving the Impact of Research (ARD)

There are weaknesses in the organization of research programs and the linkage to MOA policies. These account for ARD's low visibility and apparently limited impact. These problems are due largely to the way the programs are organized along disciplinary lines and partly because of the low level of interaction of agricultural research with the policy-makers in the Ministry. In the current situation, it has been difficult for ARD to define and effectively communicate its mission to the policy-makers, primary clients and other users of technology.

There is now a clear need for ARD to define its mission in the context of GOL development objectives and goals, and to indicate the outputs of its research efforts in terms that are relevant to the needs of the farmers, other clients and stakeholders. Such a definition will require effective dialogue at both the levels of policy-makers and clients and will require greater inputs from both. ARD's 'mission statement' should be phrased in terms understandable and explicit to policy-makers and clients, and not just in scientific and technological terms. In that way the relevance of its origin and output can be emphasized and it could generate the necessary support for research.

At present, ARD largely organizes its research along scientific disciplinary lines: e.g., horticulture, agronomy, soils, plant protection, range management, farm management, agricultural engineering, etc. The organizational and program structure, prior to 1987, in which these areas were shown as sections, demonstrated this clearly. Even with the grouping of disciplines as shown in Fig. 1, the specific disciplinary approach has persisted. With such an organization it has been difficult to focus on integrated outputs relevant to farmers' needs. The specific products required by farmers and government are the result of interdisciplinary research on commodities or production systems.

Currently, the outputs, products, time and other resource allocation issues in ARD research are ill-defined or unspecified and it is difficult to determine how much research effort is going into specific problem areas in commodities and production systems, or into improvement in systems productivity and management. It is even less clear what is expected from these efforts. Research efforts are aimed at producing technologies that provide solutions to some problems within the scope of the discipline. However, they lack the necessary inputs or consideration of other disciplines or the overall production and marketing context. Wherever such disciplinary research is practiced or undertaken in the context of research as a service to the agricultural industry, there are usually other mechanisms present for integrating the research output in the farm context, and for evolving, adapting and testing technologies appropriate for farmers; these mechanisms are normally organized and managed by the farmers themselves or by other industries servicing the farmers. However, these other mechanisms are largely absent in Lesotho and ARD's attempt at technology integration and testing is therefore weak and poorly supported.

Another problem which is related to the disciplinary organization of programs, is the lack of a 'critical mass' of researchers concentrating on one problem, commodity or technology output. With only 17 national scientists (9 with BSc) and 6 expatriates in the Lesotho Agricultural Production and Institutional Support (LAPIS) Project, it has been difficult to allocate a critical mass of researchers' time (person years) either to the several disciplines in the division or to groups of disciplines that contribute to technology development for a commodity or production system. In 1986, the ARD covered 13 disciplinary areas ranging from agronomy to rural structures. Although the 1987 reorganization reflected in Fig. 1 groups these into 5 groups of disciplines, most programs still operate as one-person disciplinary teams, and that individual is expected to contribute to too many and too diverse problems, commodities and systems, as well as to the discipline. There is an urgent need to redefine the programs, their objectives and outputs, and to allow the objectives and the required research inputs to guide the allocation of a 'critical mass' of researchers to particular programs. This calls for a sharpening of the focus for research and the rationalization of the programs.

Another major weakness concerns the inadequacy of socio-economic inputs into the programs. As a result, the technologies being developed and adapted are not planned and evaluated in the socio-economic context of the farmer. The minimum that is required for relevant improved technologies, even when they are just being introduced, adapted and tested, is for some socio-economic considerations at the planning and testing stages. In this way the system would try to avoid social science concentration on ex-post analysis of why technologies are not adopted but rather ensure that socio-economic considerations ab initio strengthen the relevance and adaptability of what is recommended. The present Farm Management Program in ARD with the disciplines of rural sociology, farm management and marketing could contribute more effectively to the strengthening of such socio-economic inputs into programs by participating actively in commodity and production system program teams in selecting, developing and testing technologies required by farmers. This would be a more effective way of utilizing the existing expertise, but ARD would eventually have to train and deploy more of its own staff in this essential area.

The mission did not consider decentralization to be a viable solution to the problem of bringing the farm context into the research program given the urgent need to maintain a critical mass of scientists actively interacting in the essential programs. The distribution of the existing research staff over 4 or 5 locations would further exacerbate the lack of critical mass and lead to isolation, inadequate supervision and lower productivity.

In reviewing these major reasons for a lack of coherence between the research objectives of the ARD and those of policy-makers and farmers, it is obvious that redress is firmly within the competence of the Ministry and the ARD. Furthermore, this is an area in which immediate measures can be taken to strengthen the national research capability. It is recommended that ARD should be encouraged to develop a 'statement of mission' in consultation with the policy-makers and the various clients and stakeholders in the Ministry, the primary clients (farmers), and the rest of the agricultural community (see previous chapter). This 'mission statement' should focus on the development of goals and objectives of the GOL and the needs of the farmers and should indicate clearly the contribution of research, in terms of outputs, to the achievement of these objectives. The 'mission statement' and the rest of the strategic plan should clearly state the objectives of research, the resources required to achieve these objectives and give an indication of the time frame for relevant outputs.

## PROGRAM REORGANIZATION FOR GREATER RELEVANCE AND IMPACT

The next major step is for the ARD to reorganize its programs and program formulation process. This will allow research to do three things:

- i. to set clear objectives for each program;
- ii. to specify the required inputs and 'critical mass' of resources that need to be allocated;
- iii. to specify the projected outputs within a time frame of research activities.

This step must be related to the scope and size of research that is relevant to the needs and circumstances of Lesotho. The strategic plan for agricultural research in Lesotho will therefore be based on the mission statement and strategy, environmental assessment, client needs, and would provide a vision for research into the next decade. It would be an essential step in moving towards more coherent and effective programs within the ARD.

The review of the present scope and size of research at ARD and for the short and medium term indicates that Lesotho requires a small but sophisticated national research system with the capacity to carry out mainly adaptive research through the introduction, adaptation, and testing of relevant improved materials and technologies. The only exception in the short to medium term would be some applied research in the areas of natural resource management and conservation farming, where relevant technologies are not likely to be easily accessible. There exists a clear need to immediately sharpen the focus of the programs so that they can respond to specific high priority development objectives of GOL and provide outputs for the needs of Lesotho's farming population. In moving towards a program rationalization and the sharpening of focus, it is recommended that ARD should reorganize its programs to develop and pursue the following five essential commodity and production systems programs.

1. Cereals Program (maize, sorghum, wheat)

This program should focus on the objective of the attainment of staple food self-sufficiency and food security. Emphasis would be on ensuring a flow of improved materials and technologies to the producers so that they would be able to utilize the various agro-ecological zones for increased overall production and increased efficiency of production. The program would need to identify and characterize the specific constraints and needs in production and to address these within the scope of what is technically and socio-economically feasible in the context of Lesotho.

2. Food Legumes Program (beans, peas)

This program should focus initially on the improvement and selection of high-yielding, disease-resistant varieties of beans and peas for the Lesotho farmer as a contribution to food and nutrition and as substitutes for imports. Production systems for food legumes would be worked out so as to maximize the contribution of legumes to food, fodder, soil fertility and rural incomes. This program should be able to build successfully on the achievements with pinto beans.

3. Fruits and Vegetables Program

This program would focus on the development of technologies for increasing the quantity and quality of fruits and vegetables produced for internal consumption and for export. A limited number and range of fruits and vegetables would be selected for improvement and adapted materials and technologies developed for the Lesotho farmer and producer. Some of these technologies would include those for intensive production under rainfed, irrigation and other water management regimes, with emphasis on improved crop quality and higher incomes per unit area.

4. Livestock Program (sheep and goats, cattle, range management and fodder production)

This program should focus on the production systems for the three major classes of livestock with a view to developing improvement, feeding and management systems that would improve the quality of performance and products such as meat, milk, wool and mohair. Special emphasis would be paid to range management, fodder and forage production and storage, and the feeding systems compatible with performance maintenance and improvement during the winter seasons.

5. Natural Resources Management Program (Soil/Water Management, including Agroforestry)

This program should focus on applied and adaptive research for the improvement of soil and water management for increased crop, livestock and environmental productivity. Emphasis would be on the development of technologies for the appropriate management of soil, water and vegetation, compatible with increased agricultural productivity and the conservation of these resources. The output would be conservation farming technologies that would avoid and control the soil erosion and soil degradation currently experienced in the various agro-ecological zones of the country. Research and technology development would include some emphasis on agro-forestry and other soil improvement and land rehabilitation technologies that would conserve and make productive the natural resource base of the country.

These five programs which we refer to as 'core programs' are considered strategically important priority programs on which the present resources of the ARD and LAPIS should be concentrated in the short to medium term. Critical masses of researchers should be assigned to each program according to the needs of the program and the relative priority of the researchable problems defined. This should be without prejudice to the need for strengthening some of the existing research support services whose main objective should be to improve inputs and support for these core programs.

Program organization along commodity and production system lines recommended here does not imply the dismantling of laboratory and other facilities in the various disciplines. In fact, these would need to be strengthened to make major program inputs. The main difference is that research would now focus on multidisciplinary approaches required to respond to clearly defined commodity/production systems objectives and on relevant outputs in these program areas. Research activities would be planned and resources (including personnel) allocated and managed on this basis. It would therefore be possible to provide greater balance in research efforts and monitor and evaluate research outputs in terms of the overall research goals and objectives of ARD.

In addition, and in view of the Government's concern about the diversification of agricultural production and the role that research should play in this, it is recommended that a sixth program be considered and initiated as soon as the resource situation permits. This sixth program would be a Crop Diversification Program. The program should, with minimum manpower input, focus sharply on identifying opportunities for the diversification of crop production. The emphasis would be on exploring and exploiting the country's potential for the production of new, high value crops to increase the income-earning capacity of Lesotho farmers. Such a crop diversification program might involve crops for export, internal consumption or import substitution. It is considered important and advantageous to initially develop this program as a separate program focusing specifically on the need for diversification and the exploitation of the potential in various agro-ecozones. The main advantage would be that with a minimum input and perhaps a large component of transferred or borrowed technology, some high value crops not necessarily covered by the five commodities and systems in the core program, could be introduced and established in the production sector. In cases where there are indications of the need for further research work in the adaptation and testing of technologies for these crops the work may be transferred to and integrated with one of the five core programs of the ARD after careful priority and resource considerations.

There may be a need to further reorganize these programs or further sharpen the definition of the elements to be addressed within each of them when a long-term strategic research plan is developed for the ARD. It is, however, recommended that ARD retain the commodity and systems focus and program formulation procedures in which the objectives are clearly articulated and outputs related to the needs of the agricultural industry. Special attention should be paid to the clear definition of objectives, time frame and outputs of these programs so that the ARD continues to be accountable in these terms to the Ministry and other clients and stakeholders in the Lesotho agricultural sector.

### PROGRAM FORMULATION

Program formulation within the ARD reflects to a considerable extent the research goals and expectations of individual researchers. While in some cases these may match closely the demand for research from farmers and government, and may be consistent with the availability of resources, it is not always so. A common problem is that too many projects are undertaken to meet the interests of researchers or expatriate scientists. The situation at present in a program such as horticulture is that work is being conducted on over 10 crops despite the fact that there are only 2 Basotho research officers assigned to the program. While the actual choice of crops may be appropriate such a dispersal of effort is not productive or sustainable in the case of Lesotho. A formal process of program formulation (see attached sheet) would reduce the possibility of unrealistic program objectives, or dispersal of effort and would clearly justify the resources required to meet the agreed upon objectives.

### Research Program Data Sheets

Research program data sheets are useful tools in formulating realistic and relevant programs. They enable both researchers and government to keep track of the resources needed and the products expected. It provides a common basis for the ARD, the Ministry of Agriculture, clients and stakeholders to plan and evaluate the goals and contributions of agricultural research.

This requires that specific program objectives, as well as the features of sub-programs and themes, be clearly spelled out. What is lacking at the moment is an organized procedure for describing and justifying the programs, themes and operations. These must be spelled in terms of specific objectives to be attained over a specific time frame. The objectives should be easily understood as products that farmers can use and that government should support.

It is with reference to these specific objectives -- the continuing validity of which must be reexamined each year -- that the choice of operations must be made. It is the business of the ARD directors and program leaders to take the necessary steps to remedy the existing shortcomings.

One will then find that many themes require the cooperation of researchers from different programs. For these themes it will be necessary to jointly define the research context, then the resources and the time frame.

The program data sheets should include:

1. title of program;
2. name and location of program leader;
3. the national development objectives and major development themes that are served by the program in question;
4. descriptive titles and justification of the sub-programs and their themes;
5. potential application of results, with reference to:
  - geographic regions;
  - potential users of results that are already available;
  - potential users of unexpected results;
6. state of progress and summary of results, and their utilization/adoption, in relation to objectives and targets;
7. citations of reports and publications produced in the context of this program;
8. linkages with other institutions, projects and/or programs (actual and planned);
9. names of researchers contributing full-time;
10. names of researchers contributing part-time (with number of person-months);
11. names of technicians (with number of person-months);
12. quantity of labor (permanent personnel only);
13. additional personnel needed (researchers, technicians, labor);
14. funding:
  - needs expressed;
  - approved budget;
  - amounts received;
15. additional equipment needed;
16. additional infrastructure needed.

Annual updating of this information is essential (while keeping past year's records). The best time to do this is when preparing the program and budget for the following year.

The program data sheets would be reviewed annually by a committee of ARD scientists, farmers and clients, stakeholders in government and the donor community. The participants would be competent to judge both the relevance and feasibility of the research program.

#### RESEARCH PROGRAM ADVISORY COMMITTEE

The present research programming procedures, which to a large extent are confined within ARD, are partly responsible for some of the lack of coherence and responsiveness that has been observed. Under the current ARD and LAPIS program formulation procedures, research activities are initiated by researchers within the framework of disciplinary sections. The research programs emanating from these sections address different elements of researchable problems in crop or livestock commodities and systems without any clear common objectives or provision for integrated outputs. These procedures, which are largely historical, are being modified and the purpose of our recommendations is to formalize and strengthen these modifications.

The ARD should first of all ensure that there is sufficient dialogue with the policy-makers, the development departments of the Ministry and the primary clients. There is an immediate need for this dialogue in developing ARD's 'mission statement', and in determining its mandate and the scope and size of its research activities. The inputs made at this stage and the periodic consultations (through the Ministerial Policy Body) will take account of developments in Government policy and in the agricultural sector. As far as possible, provisions should be made so that these consultations take place on a regular, rather than ad-hoc basis, so that both parties can prepare for and make valuable contributions to them. These consultations would primarily provide policy guidance to research. (Formal and scheduled meetings of the Ministerial Policy Body - see Chapter 2.) The proposed ministerial research policy body in which the ARD could participate directly at the department level would improve the relevance of ARD's contribution to the national agricultural development strategy.

Moving towards the programming process within the ARD, it is recommended that stakeholders and clients in the Ministry and in the agricultural industry be formally involved. Through this formal involvement, the ARD could combine the knowledge and experience from the development and users' areas with scientific knowledge of senior researchers in the articulation of the research programs. The ARD would thereby obtain the necessary program guidance and have greater assurance that the programs are relevant to the needs of development and the users of technologies. Research programs would be more responsive to particular needs and be sharply focused on the agreed priority areas. Given the size of the research system in Lesotho, it is recommended that a moderate size National Programs Advisory Committee be formally constituted to serve as the major instrument for the discussion, consideration and approval of the research programs proposed by the researchers and the program leaders within ARD. It is proposed that the Committee should have the following composition:

- Director ARD (ex officio)
- Deputy Director (ex officio and Secretary)
- Heads of the following development divisions of the Ministry:
  - Crops,
  - Livestock
  - Conservation and Forestry
  - Extension
- 3 District Agricultural Officers (Lowlands, Foothills, Mountain)
- 2 Farmers
- 1 Representative of the Lesotho National Development Corporation (LNDC)
- 1 Representative of the National University of Lesotho (NUL)
- 1 Representative of the Lesotho Agricultural College (LAC)

Provisions should be made for the committee to meet twice a year - one session to review the plans for research and consider and approve programs and projects, and one session to receive reports and recommendations based on the results of research activities.

The formal programming process would permit the development of a national program of research and facilitate the integration of projects such as LAPIS into a national program framework. This would avoid the current situation whereby the ARD research activities are largely project-driven as was the case with the Farming Systems Project and now LAPIS, both financed largely by USAID. It would also make it easier to relate future projects to national program priorities and facilitate their specific inputs into the overall national research strategy.

The ARD might consider the convening of an Annual Research Conference once a year, perhaps to coincide with or follow the second session of the Programs Advisory Committee. The opportunity should be devoted to communicating and demonstrating the highlights of results of research and technology development. Such annual research conferences might be organized in collaboration or jointly with the Ministry at the annual agricultural shows or fairs. This may be a useful way of building support for research at the national level, whereas the Ministerial Research Policy Body acts to garner support and assure the strategic relevance of national agricultural research, the Program Advisory Committees operate at the more specific level of concrete research programs to insure their feasibility and to monitor the suitability and relevance of their products to Lesotho's farmers and the agricultural industry in general.

In the event that ARD becomes integrated into the NUL as part of the Institute, School or Faculty of Agriculture, there would still be the need for a Programs Advisory Committee with broad representation of clients and stakeholders to interact with senior researchers and academics in determining the specific priorities for research and approving programs that would generate relevant outputs for the agricultural industry.

## CHAPTER 4

### THE DEVELOPMENT OF HUMAN RESOURCES FOR AGRICULTURAL RESEARCH

#### Current Situation

The ARD in Lesotho is barely ten years old and so the history, development and culture of agricultural research is relatively recent. At initiation in 1979, the division was staffed principally by diploma and certificate holders from the college of agriculture. Training for agricultural research at the degree level started soon afterwards and over the decade some researchers were trained at the BSc, MSc and PhD levels. It is not certain how many staff were trained in the period 1979 to date but in mid 1989, the division had a total of 17 national research staff including 3 in Administration (9 BSc, 7 MSc and 1 PhD) and 11 Technical Officers, mostly diplomates. The distribution of staff according to the various disciplines (previously regarded as programs) is shown in Table V. In addition, to these 17 research staff, there are 6 expatriates (MSc & PhD) in the LAPIS Project providing inputs into the research programs at various levels.

At present, the average length of service of research staff is 12 years. This is a good situation and indicator of stability. The emerging trends lead us to conclude that this situation is unlikely to be maintained and we urge that measures be taken to motivate and retain this experienced core of research staff.

Training of researchers for the ARD has been going on since the early days of the Division, under the Farming Systems Project, and subsequently under the LAPIS Project and other regional and international projects. There are 14 research officers currently in training. It is expected that 3 of these trainees would return in 1989, 4 in 1990, 2 in 1991, and 5 in 1992. However, nearly half of these would only be at the BSc level, and further training would be required to make them fully functional and productive as research officers.

Although there have been major investments in training since the establishment of the ARD, it has been difficult to retain and maintain the stability of the better trained research staff because of attraction to other areas within the Ministry and to neighboring countries where more attractive conditions of service are offered to qualified researchers. It is estimated that in the last 5 years, ARD has lost more than 5 researchers in these ways. With such a small system, the loss or turnover of staff on this scale can be very disruptive to the establishment and pursuit of stable research programs.

#### Level of Training

Apart from the instability of staff, there is the question of the low level of training of research staff. As shown in Table V the majority of national researchers are trained only to the BSc level. While this is a considerable improvement on the situation at the inception of the division when all those assigned research responsibilities were diplomates, it must be pointed out that the BSc degree does not provide

the requisite training for a research officer. The tacit understanding in Lesotho that the BSc degree qualifies a person for a research officer post is erroneous and needs to be corrected. The BSc degree training is in no way a research-oriented training and experiences elsewhere have shown that some postgraduate research-oriented training is required for a researcher to be fully productive.

TABLE V

CURRENT RESEARCH AND TECHNICAL STAFF IN THE  
AGRICULTURAL RESEARCH DIVISION (JUNE 1989)

Discipline	BSc.	MSc.	PhD.	Technical Officer
Administration	1	2	1	-
Agronomy	1	-	-	3
Soils	1	-	-	3
Horticulture	1	1	-	1
Pest Management	-	1	-	1
Farm Management	2	3	-	-
Livestock	2	-	-	-
Range Management	1	-	-	1
Agricultural Engineering	-	-	-	2
<b>TOTAL</b>	<b>9</b>	<b>7</b>	<b>1</b>	<b>11</b>

Note: 6 BSc, 4 MSc and 4 PhD are currently in training and are expected back by the end of 1992.

Lesotho needs to train most of the present holders of the BSc degree in the ARD to at least the MSc level by 1992. This would expose them to diverse and complementary aspects of research techniques and methodology and make them better qualified and more productive in the research system.

The nature and scope of research determined as being most appropriate for Lesotho specifically requires that researchers should be well-qualified to be able to access, assess, select, adapt and test relevant technologies to generate improved technology outputs for the Lesotho farmer and producer. The mission would like to point out that the screening and adapting of existing technology requires a sophisticated understanding of the state of technological development in world agriculture and a close knowledge of the agro-ecological and socio-economic conditions in Lesotho. This knowledge is the basis upon which intelligent decisions about borrowing appropriate technology can be made in the best interests of Lesotho. It will require a higher level of training, exposure and experience than presently exists within ARD.

Upgrading the scientific training of research officers should therefore be encouraged in the manpower development plans of the national research system.

#### Critical Mass

With a total staff of 17 national researchers it has been difficult for Lesotho to assign a critical mass of researchers' time to specific programs of research. In the current situation even the highest priority commodity or system does not have more than one person year and most others have less than one person year when all research and research-related involvements of staff are taken into consideration. The situation improves slightly when the inputs of the expatriate staff under the LAPIS project are considered but this places considerable dependence on expatriate staff for program execution and leadership and such a situation should not be perpetuated.

The lack of the required critical mass to address the research problems in the high priority commodities and systems is a serious problem. It calls for the rationalization of the research programs as proposed in Chapter 3. ARD should consider those things that can be done in the meantime under each core commodity or systems program so that interdisciplinary research can be encouraged and the flow of improved technologies from research assured. With a commodity or systems program approach it should be easier to determine and plan for the required critical mass of researchers for each program and this could be built into the training program.

It is recommended that the ARD should undertake a careful assessment of the required needs of the five core programs (and possibly the sixth program) and allocate the present research staff to meet these needs. Given the present level of resources not all areas of need would be met initially; the shortfalls should provide guidance for areas for further training and staff development or for technical assistance requests. The ultimate objective would be to train and have in place the necessary critical mass of researchers in the required disciplines as determined in the strategic plan, assigned and supported for the various programs.

By 1993, the ARD with a total projected national staff of 31 should on the average have about 5-6 person years assigned to each priority program, and it is estimated that this would be as close as possible to what is considered as sustainable for Lesotho's agricultural research system in the long run.

#### Technical Support Staff

The situation with regard to research-support staff known as technical officers is even less satisfactory with regard to critical mass. The ratio of research officer to technical officer is 1:0.6, which is highly inadequate. The plan should make arrangements to have a ratio of at least 1:1 by 1992 and eventually attempts should be made to increase the ratio to 1:1.5 so that there is greater flexibility in the operation of the researchers and productivity per unit of research officer can be increased.

### Scheme of Service

It is significant to observe that in the 10 years of the development of the ARD the need for the establishment of a suitable scheme of service has not been sufficiently felt to initiate action in this area. There is only one grade of Research Officer, irrespective of qualification, length of service, performance, or productivity. A research officer could remain a research officer from appointment until retirement or redeployment. The only avenue of advancement is by appointment either to the position of Deputy Director or Director of ARD. While this may be partly due to the fact that the division is a relatively new division within the Ministry, the lack of a career structure and scheme to reward performance and productivity does not augur well for the development of a professional scientific service that is expected to be responsive and productive.

The lack of incentive and rewards for professional researchers is one of the major reasons for the lack of motivation and the instability and loss of trained staff to other sectors of Government service and to the neighboring countries, in particular RSA and the "Homelands". Given continued investments in the training of research staff, it is urgent that this matter be addressed. Otherwise, there is a real danger that all the investment that is going into the training of staff under LAPIS, USAID and from other technical assistance and donor agencies would be largely wasted and the ARD would continue to be understaffed and the programs remain unstable.

It is recommended that a research scheme of service with a recognizable career structure be considered and approved for the ARD as a matter of urgency. This should be considered a crucial first step in ARD's human resource development plan.

The level of training, style of work, and expectations of performance and productivity of research officers within the ARD are similar to those for the National University of Lesotho (NUL). It is therefore suggested that the Public Service Commission consider establishing a scheme of service for agricultural research staff with a career structure and reward scales that are similar or comparable to those for the NUL. Such career structure should take into account the requisite qualifications for research scientists in determining entry points; and it should make provisions for advancement on the basis of evaluated performance and productivity. The scale should preferably span the grades of Research Officer II, Research Officer I, Senior Research Officer, Principal Research Officer and Chief Research Officer, so that it would be possible to retain the services of experienced persons in research for as long as possible without having to move them into a restricted number of administrative or management positions. Experience has shown that such a scientific research scheme of service usually guarantees that following an investment of 7 to 8 years in the training (degree and postgraduate) of a research staff, the service could still benefit for 20-30 years or more of contributions from such individual research scientists before their retirement.

In the Lesotho context and in comparison with scales in the NUL it is suggested that the following levels of remuneration be considered for the various grades of Research Officer:

<u>Grade</u>	<u>Salary (Maloti)</u>
Research Officer II	14,621 - 15,603 (equivalent Asst. Lecturer)
Research Officer I	18,811 - 25,672 (equivalent Asst. Lecturer)
Senior Research Officer	25,779 - 30,201 (equivalent Senior Lecturer)
Principal Research Officer	30,935 - 33,761 (equivalent Assoc. Professor)
Chief Research Officer	34,000 - 38,000 (equivalent Professor)
Deputy Director	34,000 - 38,900 (equivalent Professor)
Director	34,987 - 39,192 (equivalent Dean)

These suggestions are made only as a rough guide and on the understanding that the Public Service Commission in consultation with the Ministry would determine other benefits and perquisites that would constitute acceptable packages necessary to attract and retain the limited number of highly trained persons that would be required for Lesotho's national agricultural research service.

Establishing a research scheme of service would seem to be the immediate and urgent task to be addressed in relation to human resources development. In addition, there is the need to develop a human resources development plan in conjunction with the national strategic plan for agricultural research, and to relate the training, socialization, and deployment components of these to the objectives of the plan and the essential programs to be developed and sustained in the long term. An integral part of this human resources development plan would be an evaluation of the supply and demand for research manpower in the realistic context of Lesotho and of the SADCC region.

## CHAPTER 5

### AGRICULTURAL RESEARCH AND AGRICULTURAL EDUCATION IN LESOTHO PROSPECTS FOR INTEGRATION AND/OR COORDINATION

The second major task of this study has been to consider the proposal to integrate agricultural research and agricultural education within the framework of the National University of Lesotho (NUL). The ISNAR mission considered the various provisions and institutional arrangements that would enable Lesotho to effectively and efficiently respond to its needs in the three areas - research, education and service - for the agricultural industry. In fact the idea of a Faculty of Agriculture had been brooked since 1977 and featured in the University's first and second five-year plans. The current third five-year plan states that the Faculty would be established as soon as possible and a proposal was actively under consideration at the time of this mission. This proposal has been considered by a number of teams, including a USAID consultants' team (Box, Dwyer and Jacobs) and a SACCAR team reviewing the requirements for the strengthening of higher education in the SACCAR region; as well as by a national Task Force comprising the ARD, the Lesotho Agricultural College (LAC), the Ministry of Agriculture and NUL. The proposal remains a topical issue in agricultural circles in Lesotho.

Our wide-ranging discussions with the ARD, NUL, LAC, members of the Task Force, the Ministry and other agencies concerned, showed that the idea of integrating and developing the ARD and LAC to constitute the nucleus of an agricultural research and education institution under the NUL is well-grounded, has wide support at all levels of government and is most likely to be followed through. A national Task Force chaired by the Pro Vice-Chancellor of the NUL has deliberated on aspects of the organization and structure of such an institution, assessed its preliminary requirements, and made suggestions about its position and relationships within the University context. A full report of the deliberations of the Task Force was being prepared for submission to the University as well as to SACCAR, but no firm commitment as to funding of the program has been made. We also believe, and were assured, that there would be flexibility in the consideration of institutional arrangements and the determination of mandates if such a consolidation were to be finally agreed and implemented.

The major attraction in the integration and consolidation of the ARD and LAC as the nucleus of a school or faculty of agriculture of the NUL is the possibility that the scarce physical, human, and financial resources of a small, but predominantly agricultural, country like Lesotho could be utilized more effectively and efficiently in the interrelated areas of research, education and service to the agricultural community. This is particularly so in the context where the scope and requirements for research and education are limited by the size and absorptive capacity of the country and its agricultural industry. From a practical standpoint, the greatest concentration of agricultural research scientists in Lesotho is in the ARD and they could serve as the basis of any attempt to establish a national Faculty of Agriculture.

There are many more advantages in the concept of integration of agricultural research and education in this way. These include:

- possibility of assuring that the training programs are directly relevant to the needs of agricultural development and agricultural industry.
- greater flexibility in the utilization of resources (physical, human and financial)
- availability of a solid agricultural educational base and nucleus infrastructure in the LAC
- possibility of harmonizing conditions of service in similar and closely related fields of agricultural research and higher agricultural education
- possibility of the early launching and progressive development of the program while intensive recruitment and training are proceeding
- possibility of involving university teaching, research and education in the mainstream of the development process.

These advantages must have weighed heavily, and rightly so, in the minds of those who originally conceived the idea. It is, however, important to point out that while the idea is attractive and acceptable in principle, our observations indicate that there are important precautionary measures to be taken to avoid the weakening of the established and highly relevant research and service capacities of both ARD and LAC. There is some doubt within sections of the agricultural services as to how this can be avoided in a traditional university faculty context where teaching functions might take precedence over these essential research and service functions.

There is also the view that in reality what is envisaged might turn out to be an absorption of LAC and ARD by NUL rather than a joint effort to create a national institution that would render valuable agricultural research, education and service for the benefit of agriculture in Lesotho.

There are justifiable grounds for exercising caution and making special provisions in view of the history and evolution of similar institutions in other parts of Africa. Our mission's major concern is how, in this evolving decision context, to guarantee that effective and responsive research and education services are maintained in Lesotho.

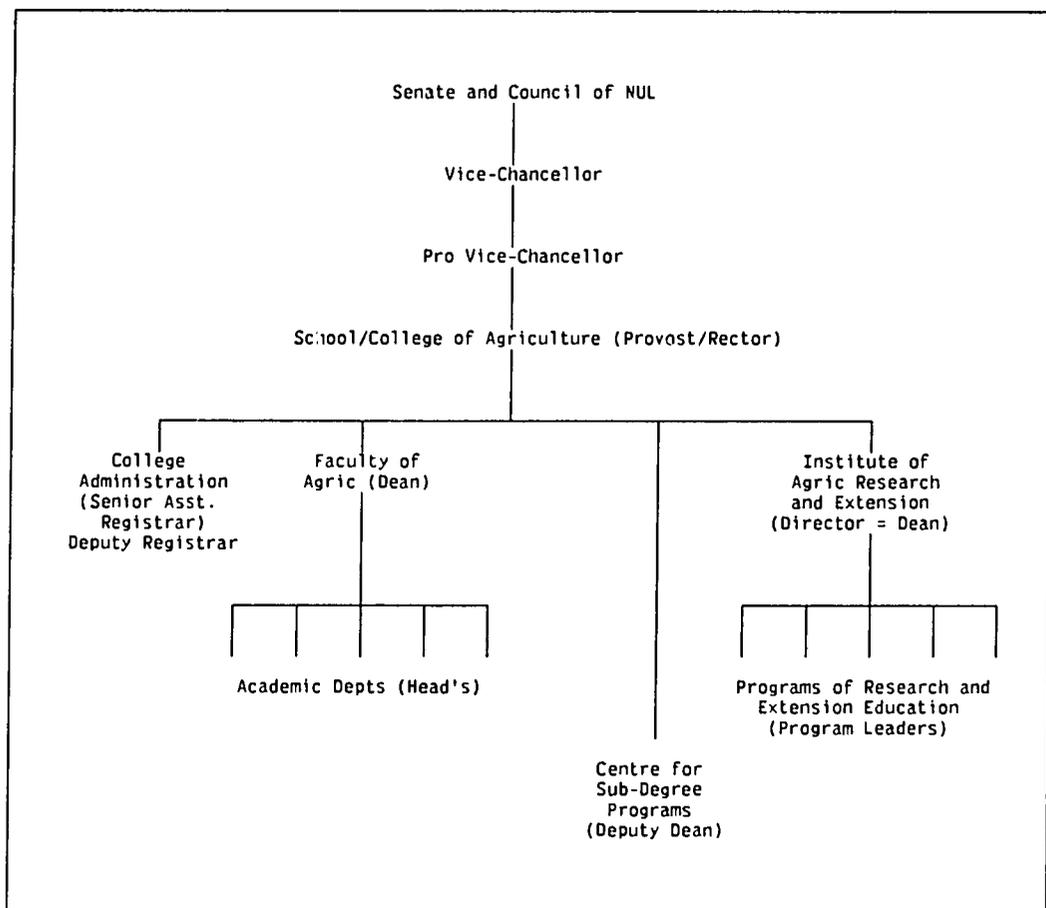
In these connections we should like to draw particular attention to the following observations, needs and requirements:

- (i) The mere combination or integration of the physical, human and financial resources of ARD and LAC would not provide adequately for the development of a Faculty of Agriculture, let alone permit the continuation and strengthening of the essential functions of both the ARD and the LAC. For example, Box et al give the total number of staff (ARD and LAC), including those on study leave, as 5 PhDs, 14 MScs and 30 BScs in all fields of agriculture, and suggest major efforts to upgrade as well as develop qualified staff. Our view is that considerable increases in trained manpower, infrastructure and operating funds would be required on a consistent basis for many years to establish a sustainable agricultural education and research system. These requirements should not be underestimated.

- (ii) Specific measures would need to be taken to ensure that the school/college or faculty of agriculture is not treated as, nor does it become, a predominantly teaching institution and that agricultural research within it continues to be development and client-oriented. A mission of service to the agricultural industry must be maintained and improved.
- (iii) Measures would have to be taken to ensure that the essential middle level manpower training and development at the Certificate and Diploma levels for which LAC has acquired a region-wide reputation is not sacrificed vis-a-vis the degree program, but that the present strength is built upon and continually improved. In particular, the erroneous term 'sub-degree' should preferably be avoided in describing these programs which in their own right prepare individuals for professional entrepreneurial and service roles in the agricultural sector.
- (iv) Practical measures would need to be taken to orient and motivate agricultural research and researchers in a development and service context. This would be achieved by the recognition and reward of performance and productivity in areas of services and development which are not strictly academic but which are of significance to the country's agricultural development.
- (v) Attention would need to be given to the regulation of intakes to the degree, diploma and certificate programs and to relate these to the scope and size of the agricultural public and private sectors' activities and needs. This should be based on an independent assessment of national manpower needs having regard to the strategic plans for research, education, service and the overall development of the agricultural sector.  

There is a special need to consider contents and orientation of programs so as to provide greater flexibility and possibility of employment in the private and public sectors, including self-employment. LAC has already initiated a commendable program of supervised student commercial enterprises which shows considerable promise and which should commend itself to other programs in the complex.
- (vi) There would be the need for a simple but innovative organizational and administrative structure that would facilitate and strengthen interactions and functions of development-oriented research, teaching and service in a university context. As far as possible, this should be without creating too many senior managerial posts for which there are very few qualified and available Basotho with the necessary experience.
- (vii) Special attention would need to be paid to the requirements for policy guidance and direction from extra-university bodies such as the Ministries of Agriculture and Education, Development Agencies and Corporations, farmers, and other clients and stakeholders of research, education and service. Provisions could be made for their representation on the various boards that would guide the institution on priority, policy, programs and resource allocation issues in agricultural research and education.
- (viii) Special consideration would need to be given to the mechanisms for maintaining effective institutional linkages with the Extension Services and farmers, especially in relation to the research, service and training functions.

Fig. 3: The proposed organizational structure of the School/College of Agriculture NUL



Based on these observations, needs and requirements, which are fundamental to the concept of a relevant, responsive and academically sound institution, and following a review of the thorough analysis and recommendations in the Box, Dwyer and Jacobs' report, we have come to the conclusion that what is needed and would be most appropriate is not a traditional Faculty of Agriculture (FOA) but an institutional arrangement that would effectively and efficiently combine and perform the functions, and deliver the products, of research, education and service in the context and special circumstances of Lesotho.

We have examined and discussed the structure and institutional arrangements that are being proposed for this development. Although we did not have access to the up-to-date report of the Task Force, we understand that a School or College of Agriculture of the NUL that would integrate the ARD and LAC and build on this nucleus is the proposal most actively under consideration. The School or College would be headed by a Provost directly responsible to the Pro Vice-Chancellor and through him and the Vice-Chancellor to the Senate and Council of the University. The School/College would comprise a Faculty of Agriculture headed by a Dean; five academic departments and Heads of Departments; an Institute of Agricultural Research and Continuing Education, headed by a Director (equivalent to a Dean); and a Unit for Certificate, Diploma and Short-term Training programs, headed by a Deputy Dean of Agriculture. This structure and organization is summarized in Fig. 3.

This institutional arrangement would appear appropriate for a relatively large School or College of Agriculture, or one that is envisaged would grow substantially in the first five to ten years. It would however require several experienced research and educational institution managers, notably a Provost, a Dean, a Director, a Deputy Dean, Heads of Academic Departments (5), and perhaps heads of Research Programs or Sections in the Institute (a total of 9-14 senior managers and administrators). In our opinion this would stretch the managerial capacity in NUL, LAC and ARD unduly and would probably require major expatriate inputs for it to operate successfully. Alternatively, the combined loads of administration, teaching, research and service might be such that some essential elements, and most likely research and service, of these would suffer by default and to the detriment of the students or the clients and stakeholders. In the long run it is doubtful if such a complex arrangement would be sustainable in the Lesotho context.

The details of the operational procedures and relationships, etc. provided in Box et al if adopted, would appear satisfactory but our main reservations relate to whether such an organizational structure would be defensible in a School or Faculty with 20 undergraduate intakes per year for the foreseeable 10 years; academic departments with 4 or 5 staff each; certificate and diploma programs with similar intakes as at now, and the research functions currently performed by the ARD. An acceptable staff:student ratio is unlikely to be attained at any time and the level of management proposed would seem to render this even more difficult to attain.

Furthermore, the sub-institutional separation of research, diploma and certificate training, and degree programs in three units (institute, school and faculty) does not appear to take full advantage of the pooling and flexible utilization of human resources that is considered as a major reason for integration.

It is quite likely that the Units would develop separately, pursuing their own interests and possibly competing for resources within the College. In our opinion this should be avoided by institutional mechanisms that promote interaction and the meaningful sharing of responsibilities in teaching, research and service.

In view of these analyses, we consider it appropriate to propose options of institutional arrangements that should be considered to enable Lesotho i) to benefit maximally from close interaction of research, service and education, ii) to retain a strong emphasis on service to the agricultural industry, and iii) provide efficient utilization of scarce resources. Further, it is important that arrangements be institutionalized for the Ministries of Agriculture and Education, the development agencies, the farmers and other clients in the agricultural industry to make inputs in the policy and program direction, resource allocation, support, and implementation aspects of the appropriate institutional option.

## INSTITUTIONAL OPTIONS FOR LINKING AGRICULTURAL RESEARCH AND AGRICULTURAL EDUCATION

### 1. National Institute of Agricultural Research and Education

The first option is the creation of a National Institute of Agricultural Research and Education (NIARE) under the National University. The National Institute would combine the ARD and LAC and develop them into a unified agricultural research and educational institution to be headed by a Director or Dean assisted by two Deputies, one in charge of research and research-related services, and the other in charge of education (degree, certificate and diploma). The Institute would have a Professional and Academic Board made up of clients and stakeholders and some academics. The Board would provide guidance in the policy, priorities and resource allocation areas and be responsible to the Senate and Council of the University through the Vice-Chancellor for the overall direction of the Institute.

The Director or Dean and his deputies would have responsibilities for the day to day management of the Institute. Emphasis would be on a simple institute structure that would make the most effective use of scarce human resources and management capacity available to the system. The Institute could be jointly funded as a corporate unit by the Ministries of Agriculture and Education, with some technical and donor assistance in the areas of staffing and infrastructure at least in the early years.

Fig. 4 presents the main organizational features of this option. The major difference from the proposed school/college of agriculture is that it would economize on human managerial resources and provide for close integration of research and teaching programs. As indicated in the figure, attempts will be made to integrate or align research and teaching programs so that all staff will have dual responsibility for teaching and research albeit with different levels of concentration. Instead of academic departments, both teaching and research would relate to programs and the programs would be the units for the execution of teaching and research activities.

For example, the cereals, food legumes and fruit and vegetable programs would teach and manage the crop production and crop science programs; the livestock program would teach and manage the animal production, nutrition, management and breeding programs; the natural resource management program would teach and manage the soil science and soil fertility programs; and the cross-programs production systems research personnel would teach and manage the socio-economic and production systems inputs into the degree program.

In effect, research and teaching would be laterally integrated, with the product of the teaching and research functions being an integrated B.Sc. Agriculture degree program which in the medium, and possibly long term would not be resolved into specialized areas at least at the first degree level.

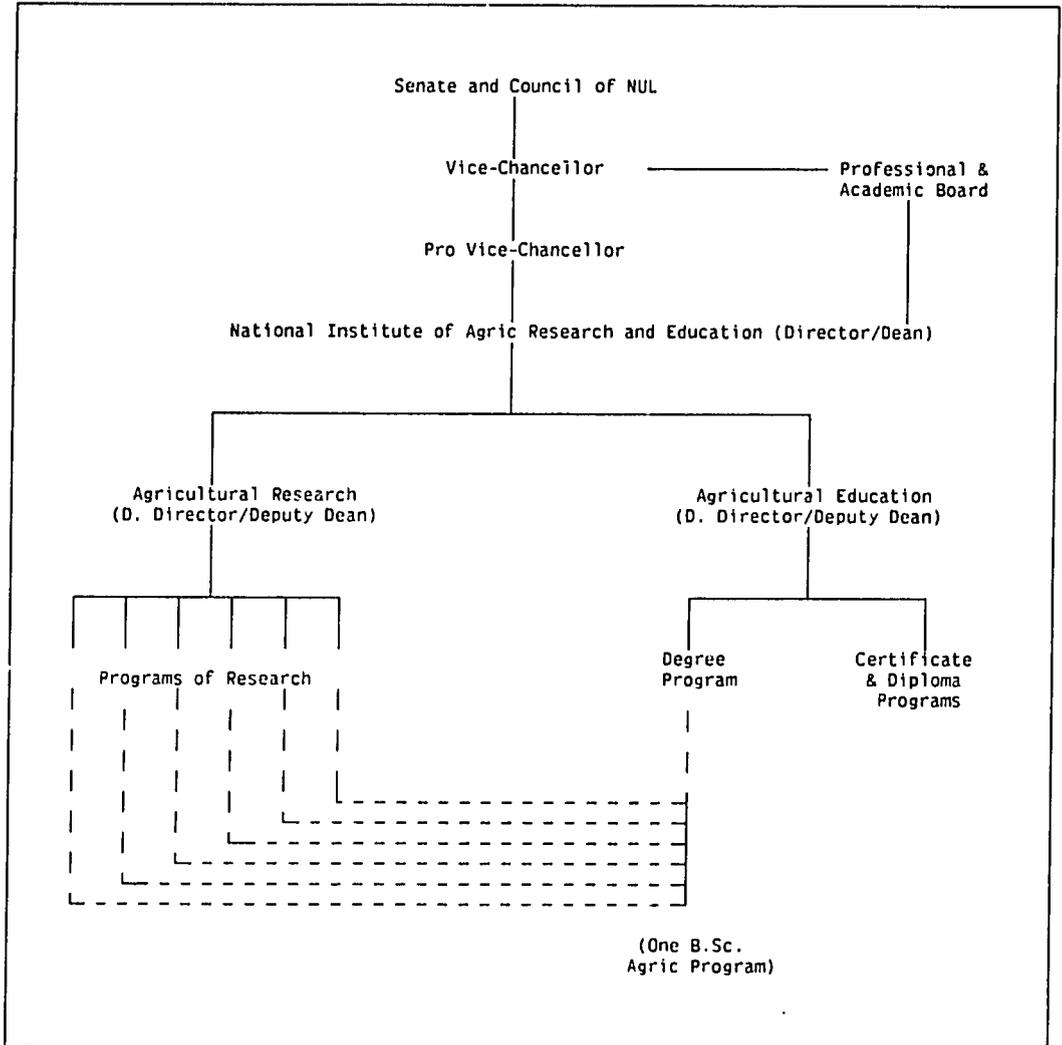
Similar interactions between the Certificate and Diploma programs and the programs of research would also be provided for, although these would be less intense than those between the degree and research programs.

One of these joint programs would provide for the research/extension liaison and training and would be the main linkage of the Institute with the Extension Services of the Ministry of Agriculture.

The main advantage of this option is that it would not be, nor contain, a traditional Faculty of Agriculture. It could have a special status by statute as part of an amendment or addition to the Act of the NUL. With such a statute, the temptation to draw the Institute inexorably into the mainstream of the other academic faculties in the university would be avoided. The statute would guarantee its research, teaching and service functions and ensure that the Board maintains the necessary balance in providing for and supporting these functions for the benefit of the agricultural industry in Lesotho. It would also ensure that the University recognizes its special responsibilities and reflects this in the recognition and reward of its services in all these areas. As indicated above, special provision would need to be made for a program or unit of the Institute to have responsibility for liaising with the Extension Services and for the training of the extension personnel that would remain in the Ministry of Agriculture. It is important to note that under no option would the Extension Services be required to be separated from the Ministry of Agriculture. If this option is selected for consideration there would be the need, through a special study, to work out further details of the operational procedures and relationships necessary to guarantee its successful implementation.

The above option is very similar to the options that have been successfully operated in University-based national research institutes such as the Institute of Agricultural Research (IAR), Samaru, Nigeria, and the Institute of Agricultural Research and Training (IAR&T), Ibadan, Nigeria. The statutes and provisions of these institutes could serve as useful guidelines in the further development of the concept and operation of a National Institute of Agricultural Research and Education in Lesotho.

Fig. 4: Organization structure for a National Institute of Agricultural Research and Education (NIARE)



## 2. An Agricultural Research Department and a Faculty of Agriculture based on LAC

This option envisages the development and strengthening of a separate ARD as a department with continuing research and service functions to the agricultural sector and industry. This would be in parallel with the development of a Faculty of Agriculture based on the LAC which is already an educational institution with a strong tradition for relevant and practical education in the field of agriculture. Such an institutional arrangement would require that the infrastructural facilities and staff in LAC be upgraded and strengthened in numbers and quality to be able to adequately cover the theoretical and practical aspects of agricultural education at the degree, certificate and diploma levels. Initially, substantial inputs would be required to strengthen staff and infrastructure, but with realistic planning and flexible utilization of these resources it should be possible to establish a small but sustainable system with efficient utilization of the educational resources. It would be necessary to have the Ministries of Agriculture and Education represented on the Faculty Board and thereby to advise the Faculty and the university on policy orientation and the needs of the industry. The mainstreams of agricultural education (with emphasis on teaching and some research) and agricultural research (emphasis on research and services) would be kept and managed separately.

Under this option the ARD would be strengthened in parallel along the lines suggested in the review of the division's research approach and activities. It would focus on development-oriented research and service to the agricultural community and develop its programs in accordance with a strategic plan considered and approved by its National Programs Advisory Committee. Similar schemes of service would be provided in the Department and the College to ensure reciprocity and comparability of staff whose qualifications and combined productivity would be expected to be of the same order.

Provisions should be made for effective linkages that would permit mutually acceptable reciprocal arrangements in the sharing of teaching and research functions with the FOA, it being recognized that FOA would concentrate primarily on teaching and the ARD on research. The ARD would develop a Research Experiment Station at Maseru and the close proximity of the ARD to the LAC campus of the Faculty of Agriculture of NUL should facilitate the exposure of students to on-going research and technology developments and encourage Faculty staff to collaborate in research compatible with their teaching functions. Linkage arrangements may eventually involve joint appointments or shared allocation of time to research, teaching and service.

As for the institute, ARD would need to provide for a unit to have responsibility for liaising with the Ministry's and other Extension Services and for the training of the extension personnel. This could be based on the present position of Research Extension Coordinator, with full utilization of the main and branch stations in the four agro-ecological zones for training and demonstration for the extension services personnel and farmers. This option is similar to that which Botswana undertook in establishing its own Faculty of Agriculture in 1988-1989.

### 3. Establishment of a University School or College of Agriculture

This option has been discussed earlier as the option currently under active discussion. It would involve the combination of ARD and LAC and the upgrading of their staff and facilities to adequately cover the functions of teaching, research and service. This option has been presented in details in Box et al and in the report of the National Task Force. It is a viable option and one that can be successfully operated, although as proposed it would appear to be the most costly and perhaps less sustainable in the long term, given the size and scope of agricultural activities in Lesotho. It is an option that would be more suitable for a regional University College with possible intakes from 3 or more small countries and the sharing of education and research costs and markets for products.

It is also possible that a School or College could be operated along the lines suggested for the National Institute with a more limited number of senior managers at the School/College, Institute, Faculty, Departmental and research program or section levels. It could by special provisions avoid being a traditional School or College and integrate more at the levels of research, education and service. As in the case of the National Institute, necessary precautions would need to be taken to ensure proper policy guidance, recognition, and funding of the functions of research, education and services to the agricultural industry. Also provisions will have to be made for effective linkages involving information and technology flows and training with the extension services and other technology transfer systems.

As Box et al indicated in their report, it would be important to select a person of stature and someone with vision and understanding of education and research as foundation Dean. In addition to having a strong record of developing a quality program elsewhere and fully understanding agriculture in an African development context, he should be sufficiently imaginative and innovative in the development of programs and the management of resources. The success of the enterprise would depend largely on the demonstration of these qualities in the organization and management of any option selected.

### 4. Establishment of a Faculty of Agriculture entirely within the National University of Lesotho (NUL)

This option requires that a Faculty of Agriculture be developed de novo within the NUL in accordance with its original first development plan. This option is likely to be very capital intensive as entirely new facilities would have to be provided, staff recruited and trained, and the Faculty developed slowly in accordance with the availability of resources for these. Such a Faculty would be entirely under the control of the University, although the University would benefit by having representatives of the agricultural industry and clients on some of its advisory organs. It would seem that such an option would only be viable if a substantial investment by donors can be assured in establishing the Faculty and perhaps in supporting a 'linkage' or 'twinning' arrangement with a University Faculty of Agriculture in a developed country for a reasonable period of time. An important justification would be in the possibility of providing services to other countries besides Lesotho.

Such a development would take several years to mature and would not be benefiting from the established in-country capacity for technical education in agriculture as is available in the LAC and ARD. Whatever the case, there would be the requirement for imagination in developing a relevant and acceptable curriculum and in establishing linkages with relevant national institutions. In particular, it would be necessary to make arrangements to establish and maintain functional and reciprocal linkages with the ARD and the LAC in collaborative teaching and research with the emphasis on training relevance and exposure and the development of practical skills.

### SELECTION OF OPTIONS

After considering the pros and cons of the various options, our preference is for a University-based National Institute of Agricultural Research and Education (Option 1). This is because it has the ingredients for meeting all the needs, requirements and aspirations of all those collaborating in the establishment of a viable institution for higher education and research in agriculture in Lesotho. It is innovative and has a good chance of developing in the spirit of excellence and service to the agricultural industry. We therefore strongly recommend this first option. A school or college of agriculture based on the integration of ARD and LAC but with a modest management hierarchy and a simple functional structure would be equally acceptable if adequate provisions can be made for effective research, education and service interactions and the flexible utilization of critical human resources. (See Fig. 3)

We conclude that in the final analysis what would be most acceptable to the Basotho is a cost-effective institutional arrangement that would ensure that agricultural education and research are developed and strengthened to more effectively contribute to the service of the agricultural industry and the development process in the country. In deciding on such institutional arrangements, the role, responsibilities and expected output of the components and their relevance to the development process should be recognized as central so that the agricultural industry as a whole can look forward to the end of this century and beyond with confidence and assurance of improved quality and productivity of agriculture and the environment.

**IMMEDIATE RECOMMENDATIONS FOR THE STRENGTHENING**  
**OF AGRICULTURAL RESEARCH AND EDUCATION**

1. The ARD should proceed with a consolidation of its research effort into 5 commodity-based, systems-oriented program (see Chapter 3).
2. The ARD should improve dialogue and inputs from policy-makers, clients and stakeholders at the Ministerial level. (Ministerial Policy Body)
3. The ARD should create a National Programs Advisory Committee composed of representatives of clients, DAO's, Dept. Heads, farmers and projects (see Chapter 2).
4. The MOA & ARD should propose a scheme of service for agricultural research officers to provide incentives and insure staff development and stability (see Chapter 4).
5. The ARD, MOA, LAC and NUL should consider the strengths and weaknesses of the proposed options for linking agricultural research and agricultural education. They should consider ways to avoid weakening or dispersing the existing capacity in both areas.

**SHORT-TERM TO MEDIUM-TERM RECOMMENDATIONS**

1. The ARD initiate a strategic planning process to produce a national plan and strategy for research to the year 2000 - involve the formal links to policy, clients and stakeholders.
2. The MOA consider alternative organizational structure that links agricultural research more directly to the higher policy-making levels in the Ministry (Agricultural Research Department).
3. The ARD establish a 6th program on crop diversification to focus on the exploration of production potential in new and high-value crops.
4. The ARD upgrade the level of training of research officers to the MSc. and increase the number of PhDs to lead the core programs.
5. The MOA and NUL should periodically review the demand and supply for agricultural research and education on a national basis and in the SADCC region to determine whether more productive borrowing or collaborative strategies are possible.

Appendix 1

Acronyms and Abbreviations

AEC	Agricultural Education Component of LAPIS
ARC	Agricultural Research Component of LAPIS
ARD	Agricultural Research Division Ministry of Agriculture
CGLAR	Consultative Group for International Agricultural Research
CIAT	Centro Internacional de Agricultura Tropical
CIMMYT	International Center for Maize and Wheat Improvement
DAO	District Agricultural Officer
DFS	Director of the Department of Field Services
FAO	Food and Agriculture Organization of the United Nations
FSR	Farming Systems Research
FTE	Full Time Equivalent
GOL	Government of Lesotho
LARC	International Agricultural Research Center
ICRISAT	International Crops Research Institute for the Semi Arid Tropics
IITA	International Institute of Tropical Agriculture
ISNAR	International Service for National Agricultural Research
LAC	Lesotho Agricultural College
LAPIS	Lesotho Agricultural Production and Institutional Support Project
MOA	Ministry of Agriculture
NARS	National Agricultural Research System
OFR	On-Farm Research
PA	Prototype Area
RSA	Republic of South Africa
SACCAR	Southern African Centre for Cooperation in Agricultural Research
SADCC	Southern African Development Coordination Conference
USAID	Agency for International Development
USAID	AID Mission to Lesotho

**Appendix 2**

**Principal Institutions and Persons Contacted**

Director, Agricultural Research Division (ARD), Deputy Director (ARD) Research-Extension Coordinator (ARD) Staff of the ARD : Maseru and Branch Stations	M. Matli T. Namane E. Mokheseng
The Honourable Minister of Agriculture, Cooperatives and Marketing, (MOA) Principal Secretary (MOA) Deputy Principal Secretary (MOA) Director of Field Services (MOA) Director of Crop Services (MOA) Director of Planning Division (MOA) Director of Personnel (MOA) Butha Buthe: District Agricultural Officer (MOA) Leribe: District Agricultural Officer (MOA)	Dr. Phororo R. Ntokoane Mr. Monyane M. Motsoene N. Peshoane T. Ramotsoari  Mr. Mashupha A. Sefane
LAPIS Chief of Party LAPIS Deputy Chief of Party LAPIS Team Leader Agricultural Research Component (ARC) LAPIS Team Leader Agricultural Education Component (AEC)	B. Freeman F. Rooyani Ed Loomis F. Bobbitt
USAID - Lesotho	B. Sandoval B. Hill A. Mustafa M. Khadikane
Vice Chancellor National University of Lesotho (NUL) Pro-Vice Chancellor NUL Acting Principal, Lesotho Agricultural College (LAC) Staff of LAC	A. Baikie N. Ndebele P. Cweba

LESOTHO: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

Table 6: Summary of Technical Skills of Agricultural Research Professionals by Degree Held, 1989

<u>Discipline Areas</u>	<u>Nationals</u>				<u>Expatriates</u>				<u>Total</u>						
	<u>BSc</u>		<u>MSc</u>		<u>PhD</u>		<u>Subtotal</u>								
	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>	<u>M</u>							
Agronomy	1	-	-	-	-	-	1	-	-	-	-	1	-	2	
Range Management	-	1	-	-	-	-	-	1	-	-	-	-	1	2	
Animal Science	-	1	-	-	-	-	-	1	-	-	-	-	1	2	
Agr. Economics	-	1	-	-	-	-	-	1	-	-	-	-	1	1	
Agr. Engineering	-	-	-	1	-	-	-	1	-	-	-	-	1	2	
Agr. Education	-	-	-	1	-	1	-	2	-	1	-	-	1	2	
Administration	1	-	-	-	-	-	1	-	-	-	-	-	1	2	
Soils	-	1	-	-	-	-	-	1	-	-	-	-	1	2	
Horticulture	-	1	1	-	-	-	1	1	-	-	-	1	1	3	
<b>TOTAL</b>	<b>2</b>	<b>5</b>	<b>1</b>	<b>2</b>	<b>-</b>	<b>1</b>	<b>3</b>	<b>8</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>5</b>	<b>18</b>

Source: SADCC/DEVRES Agricultural Research Resource Assessment, 1984. Updated ARD/ISNAR/LAPIS, 1989.

Table 7: Total Agricultural Research Staff, 1989

	<u>Administrative</u>	<u>Professional<sup>a</sup></u>	<u>Technical<sup>b</sup></u>	<u>Support Staff</u>	<u>Total</u>
<u>Total Authorized Posts</u>	3	18	17	36	74
<u>Positions Vacant</u>	-	-	-	-	-
<u>Nationals (Citizens)</u>					
Staff in training	-	13	-	-	13
Staff on long-term leave	-	1	-	-	1
Number of nationals currently in authorized posts	-	-	-	-	-
Expressed as a percent of authorized posts	-	-	-	-	-
<u>Expatriates</u>					
Serving in authorized posts <sup>c</sup>	1	6	-	-	7
Expressed as a percent of authorized posts	-	-	-	-	-
Not in authorized posts	-	-	-	-	-
Total number of expatriates	-	-	-	-	-
<u>Total Number of Staff</u>	-	-	-	-	-
	<u>4</u>	<u>38</u>	<u>17</u>	<u>36</u>	<u>95</u>

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

<sup>b</sup> Technical - diplomate and certificate

<sup>c</sup> Irrespective of source of funding.

Source: SADCC/DEVRES Agricultural Research Resource Assessment, 1984. Updated ARD/ISNAR/LAFIS, 1989.

Table 8: Donor-Funded Agricultural Research Activities, 1979-1989

<u>Donor</u>	<u>Activity</u>	<u>Expected Results</u>	<u>Duration</u>	<u>Expatriate Technical Support (FTE)</u>	<u>Country Contribution (US\$)</u>	<u>Donor Contribution</u>	
						<u>Recurrent (US\$)</u>	<u>Capital (US\$)</u>
<u>USAID</u>	Farming systems research, on-farm adaptive research	Raise the standard of living in the rural areas	6 years	9	373,769	910,126	865,767
<u>USAID (LAPIS)</u>	Agricultural production and institutional support	Assist ARD to produce and deliver a continuing flow of improved technologies for increased agricultural productivity	4 years	6	780,740	6,270,092	527,300
<u>FAO</u>	Rural structures construction	Farmers grain storage losses will subside	4 years	1	29,600	36,000	
			16 years	16	1,184,109	7,216,218	1,393,067

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

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