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AGRICULTURAL RESEARCH RESOURCE ASSESSMENT  
IN THE SADCC COUNTRIES

VOLUME II  
COUNTRY REPORT: SWAZILAND

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PREFACE

AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

IN THE SADCC COUNTRIES

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

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

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

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

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

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

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

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

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

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

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

## ACKNOWLEDGEMENTS

The authors of this updated Agricultural Research Resource Assessment (ARRA) report are greatly indebted to the Government of Swaziland's Ministry of Agriculture and Cooperatives (MOAC) for entrusting them to participate in this SADCC/CDA regional study. In addition, the Dean and staff of the University of Swaziland's Faculty of Agriculture and the Senior Agricultural Officer of the MOAC responsible for extension were especially helpful. In addition, the authors wish to thank Dr. John Menz who authored the pilot report upon which most of the conclusions of this report are based.

The assistance of Devres, Inc. in their work on the report and their coordination of the ARRA is also appreciated.

## LIST OF ACRONYMS AND ABBREVIATIONS

AID	Agency for International Development (United States)
ADB	African Development Bank
AFDB	African Development Bank
ARD	Agricultural Research Division
ARRA	Agricultural Research Resource Assessment
AVDRC	Asian Vegetable Development and Research Centre
BSc	Bachelor of Science degree
CCU	Central Cooperative Union of Swaziland
CDA	Cooperation for Development in Africa
CDC	Commonwealth Development Corporation
CIUSS	Permanent Inter-State Committee for Drought Control in the Sahel
CIMMYT	International Centre for Maize and Wheat Improvement
CSR	Cropping Systems Research
CSRP	Cropping Systems Research and Extension Training Project
CTCAR	Consultative Technical Committee for Agricultural Research
DES	Division of Extension Services
E	Emalangeni
EEC	European Economic Community
FAO	Food and Agriculture Organization of the United Nations
FTE	Full Time Equivalent
GDP	Gross Domestic Product
GNP	Gross National Product
GOS	Government of Swaziland
IBRD	International Bank for Reconstruction and Development (World Bank)
IDRC	International Development Research Council (Canada)
INTSOY	International Soybean Program
ITF	Individual Tenure Farms
L	Lilangeni
MOAC	Ministry of Agriculture and Cooperatives
MSc	Master of Science degree
NRC	National Research Council
OAU	Organization of African Unity
ODA	Overseas Development Agency (United Kingdom)
PhD	Doctor of Philosophy degree
POLI	Physical Quality of Life Index

RDA	Rural Development Area
RDAP	Rural Development Area Programme
SACCAR	Southern African Centre for Cooperation in Agricultural Research
SADCC	Southern African Development Coordination Conference
SCB	Swaziland Cotton Board
SDSB	Swaziland Development and Savings Bank
SIDA	Swedish International Development Agency
SIS	Swaziland Irrigation Scheme
SNL	Swazi Nation Land
UBLS	University of Botswana, Lesotho and Swaziland
UK	United Kingdom
UNDP	United Nations Development Programme
UOS	University of Swaziland
UPC	Usuthu Pulp Company
US	United States
USAID	United States Agency for International Development

## CURRENCY EQUIVALENTS

(December 31, 1983)

Currency unit	=	Lilangeni (L); plural, Emalangeni (E)
US\$ 1.00	=	E 1.22
L 1	=	US\$ 0.822
L 1	=	50 two cents

## WEIGHTS AND MEASURES

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

GOVERNMENT OF SWAZILAND FISCAL YEAR

April 1 to March 31

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## EXECUTIVE SUMMARY

### A. Background

#### 1. Country description and economic overview

There are four main ecological and production zones in the small, landlocked Kingdom of Swaziland. The Highveld region in the west is mountainous, and only 10 percent of the land is suitable for agriculture. The Middleveld is a hilly region with 20 percent fair to good soils. The Lowveld, the eastern part of the country, has about 30 percent fair to good soils, but there is great danger of drought. The Lubombo plateau contains small areas of deep, cultivable soils.

The population of Swaziland was 605,000 in 1983, and is growing at an annual rate of 3.4 percent. Most of the people (82 percent) live in rural areas where they are subsistence farmers. Agriculture provides employment for about 75 percent of the work force.

Swaziland's GDP was US\$ 374 million in 1982, having grown at the average annual rate of 5 percent between 1977-82. Agriculture accounts for one-fourth of the GDP. Agro-industry contributes three-fourths to value added in the manufacturing sector, which represents one-fourth of GDP. Agricultural products also contribute 70 percent to the value of exports, although Swaziland is simultaneously a net importer of food for local consumption.

#### 2. Agriculture in Swaziland

Swaziland's agricultural sector is divided sharply between a modern, capital-intensive sub-sector largely owned and managed by foreigners who produce mainly for export, and a traditional sector. The modern sub-sector consists of 790 privately-owned farms and estates averaging over 800 ha. These are termed Individual Tenure Farms (ITFs). Sixty percent of these farms are irrigated and the most important crops grown are sugarcane, citrus fruits, pineapples, cotton, maize, rice and vegetables.

The traditional sector coincides with Swazi National Land (SNL) which makes up 65 percent of the total land area. It is owned communally by the people and held in trust for them by the Monarch. Eighty-five percent of this is communal grazing land; the rest contains about 42,000 traditional homesteads with an average size of 2.75 ha. Since food self-reliance has long been an important national goal, the Government of Swaziland (GOS) instituted a Rural Development Area Programme (RDAP). The RDAs now encompass 49 percent of the total SNL. The objectives of the RDAP are to promote the transition from traditional to commercial agriculture and to enhance the welfare of rural people.

More than 85 percent of available farmland is used for grazing; only 10 percent is crop land. Efficiency is highest on the ITFs, followed by the RDAs and the other SNL. Farmers' ability and incentive to obtain long-term credit for land improvements on the SNL is limited by the fact that the land is held in usufruct. Although efforts are being made on the RDAs to compensate for these limitations, productivity on both the SNL and RDAs lags behind that of the commercial sector. In the period between 1978-79 and 1982-83, production in the modern sector grew at 12.9 percent per annum while that of the traditional sector grew at only 0.36 percent. In 1981, total output in the traditional sector amounted to US\$ 15 million or 3.9 percent of GDP; the modern sector produced US\$ 85 million, or 22 percent of GDP. The situation is especially serious because the traditional sector primarily produces food for local consumption and current production is lagging behind population growth.

Maize yields in the traditional sector ranged between 800 kg/ha to 1.5-2.0 T/ha; sorghum yields averaged between 640 kg/ha and 1.5 T/ha. Jugo bean yields were 926 kg/ha, and average groundnut yields were 426 kg/ha. In each crop, yields obtained in research trials have been much higher. The area planted to maize, jugo beans and groundnuts declined between 1979-81; output of maize and groundnuts also decreased. As the result of a ban on vegetable imports from the Republic of South Africa, output of fruit and vegetables in Swaziland has improved. Yields vary according to soil type, availability of irrigation water and input usage but are generally 10 percent below those obtained by researchers.

Among cash crops, area under cotton production has increased significantly and in 1981 there were 6,000 cotton producers. In recent years, low prices and drought have negatively impacted the area under cultivation, yields and output. Sugar produced on irrigated estates, is the major export, but has also been affected by low world prices. Average yields of tobacco were 339 kg/ha in 1979-80, though yields were higher (400-450 kg/ha) in the RDAs and as low as 15 kg/ha for some farmers.

In 1981, there were 656,000 cattle in Swaziland, about 80 percent of them on SNL land and the rest on ITF land. The income-generating potential of the livestock sector is constrained by the traditional uses of cattle as a store of wealth and for prestige, and for uses such as supplying milk and dung and for tilling the fields. Other problems are overgrazing, erosion and declining livestock quality. It is estimated that the country's carrying capacity that would guarantee a sustained yield of forage is 440,000 cattle, a figure which has already been exceeded. Moreover, the annual offtake is 9 percent on SNLs and 11 percent on other lands, and a rate of 12 percent is required to maintain the status quo.

Marketing for export crops is well-organised, but most crops produced on the SNL are consumed directly with only small quantities

being traded commercially. Agricultural credit is available mainly to commercial farmers through the Swaziland Development and Savings Bank (SDSB), commercial banks and processing companies. SNL farmers have access to credit only through the SDSB at a concessional 6 percent interest rate. Given the low returns to labour in subsistence farming, it is not surprising that men migrate to work in cities and the RSA and the farms are managed by women.

Achievement of self-sufficiency in maize production has long been a goal in Swaziland, but output is stagnant and imports are necessary to maintain per capita consumption at current levels. An FAO mission suggested that the main constraints to the achievement of food self-sufficiency were: the lack of clearly-defined policies to implement the government's stated strategies, the traditional land tenure system, and the failure of agricultural research to meet the needs of smallholders and be integrated with extension.

## B. Agricultural Institutions

### 1. Research

Agricultural research in Swaziland is conducted by the Agricultural Research Division (ARD) of the Ministry of Agriculture and Cooperatives (MOAC), the University of Swaziland, and five private companies. Research done by the latter is generally related to the particular crops they grow.

#### a. The Agricultural Research Division

The Agricultural Research Division (ARD) is a unit of the Department of Research and Planning of the MOAC. The Chief Research Officer of the ARD reports to the Director of Research and Planning. Research is done at the Malkerns Research Station and at Lowveld and Nhlanguano.

Research activities are primarily focussed on food crops, including fruits and vegetables, and on some cash crops grown by smallholders. Projects include research on disease-resistant varieties of mung bean seeds; multi-locational maize variety trials; evaluation of soybean cultivation potential in varied ecological zones; evaluation of the potential for introducing wheat; cotton breeding and control of cotton pests; and a Cropping Systems Research Project (CSR). The CSR is funded jointly by the GOS, USAID and the US Peace Corps.

The ARD staff consists of an administrator, 14 professionals (2 expatriates), 26 technical staff and six support staff, for a total of 47 persons.

Research facilities include the 400 ha experimental farm at Malkerns, 60 percent of which is used for experimental plots, 15 percent for seed multiplication and 25 percent for farm cropping

systems research. The Lowveld Station emphasises irrigated agronomy, cotton entomology and breeding, pest control and dryland farming research. It has 150 ha of land, two laboratories and a block of offices. The Nhlanguano Station in the Middleveld has 50 ha of land and an office. At Malkerns there are three laboratories, the main administrative offices and a library. The library contains about 5,000 volumes and acquires 50 more each year. It also receives 11 periodicals and is linked to libraries at the Universities of Swaziland, Botswana, Pretoria and Melbourne. The ARD's equipment consists of two spectrophotometers, one centrifugal pump, nine tractors, a baler, a land-plane, two trucks, 22 pickups, a fertiliser applicator and three Apple computers. The budget in 1983-84 amounted to US\$ 2.9 million of which US\$ 2.28 million was contributed by the US. Some funding of commodity research is by private associations of growers.

b. The University of Swaziland

A five-year research project at the Luyengo campus of the University of Swaziland (UOS) is aimed at improving the productivity of subsistence farmers' intercropping patterns of maize with pumpkin. The experiments are carried out on 2.4 ha of land belonging to small farmers in the area. The project employs technologies that are readily available to the farmers and disseminates the findings at field demonstrations. The project is jointly funded by the Canadian International Development Research Centre and the University; the budget in 1984 was US\$ 83,000. The University's failure to meet its share of recurrent costs has caused difficulties for the project.

The total number of staff employed in government-sponsored research (66 in ARD and UOS) include 24 professionals, 16 of whom are expatriates, and 34 technical personnel. The total amount devoted to this research in 1984 was US\$ 3.06 million.

c. Commercially-sponsored research

Research on special commodities is conducted by the following: Swaziland Fruit Canners, a subsidiary of Nestle's, on pineapples and citrus; the Usuthu Pulp Company on forest products; the Simunye Sugar Estate on agronomic aspects of sugarcane production; and the Swaziland Irrigation Scheme, which is concerned with sugar, citrus and livestock research.

2. Training

Higher education and training in agriculture are available through the Faculty of Agriculture of the University of Swaziland at Luyengo. Through the University, the MOA offers a one-year certificate programme in general agriculture which is the primary source of new field extension officers. It also offers diplomas in agriculture, agricultural education and home economics and a BSc

degree in agriculture. Most university graduates are employed either with the MOAC or the Ministry of Education; a few are employed with the Swaziland Development and Savings Bank.

The faculty consists of 30 full-time senior teaching staff. The 13 expatriates are 54 percent of the professional staff. The plan for the next ten years is to train 21 additional faculty members, ten to the doctoral level, six to the master's level and five to the bachelor's level. Over 98 percent of student funding comes from GOS loans that are payable when the student graduates and becomes employed. The Luyengo campus facilities include seven classrooms, five teaching laboratories and a library with 15,000 books. The University farm which is used for teaching, demonstration and research consists of 316 ha. Land under cultivation amounts to 110 ha and the rest is pasturage. There are no formal linkages with ARD, even though Malkerns Research Station is only 3 km away.

Between 1980-83, the average recurrent budget was US\$ 600,000 annually. There was no capital budget but the Swedish International Development Agency provided an additional US\$ 700,000 to the FAO Faculty of Agriculture Project that provided nine teachers, ten fellowships and some equipment. The EEC also provides US\$ 80,000 every year to support the diploma programme.

### 3. Extension

Most agricultural extension services are provided by the MOAC. Historically, there was limited linkage between the ARD and the Department of Extension Services (DES) primarily because of the ARD's orientation towards assisting the larger, more commercial farms. Now, through the CSRPs, formal links exist between the two agencies, and the orientation is shifting towards the SNL farmers. The organisation of the DES has also changed recently, becoming more unified and coordinated under the technical supervision of a Senior Agricultural Officer.

Extension services have generally been focussed upon the farmers within the RDAs providing them with information related to the production of a variety of crops and livestock. Services have also been available to farmers raising cash crops for export on the SNL and increasingly, emphasis has been given to cropping systems. Services related to the management of rural households are provided by the Home Extension Officers. There is also a radio programme for SNL farmers which is broadcast four times a week, and a quarterly publication known as the Rural Area Development News which provides general farming information for SNL farmers.

The DES currently has five administrators, 29 professional staff with BSc degrees, and 325 technical staff with diplomas or certificates. About 50 percent of professional staff time is devoted to food crops, 31 percent to livestock and fisheries, 10 percent to home economics and 7 percent to forestry. Current

reorganisation of the DES is intended to have mostly generalists as extension workers. The plan is to train 210 agents over the next few years, three-fourths of them to the certificate level, less than one-fourth to the bachelor's level and ten to the master's level.

Facilities include offices at the MOAC's headquarters in Mbabane and at the Crop Production Offices in Manzini. There are four district offices, each headed by a Senior Extension Officer, five sub-district offices, and 18 RDA project centres. Wherever extension personnel are located there are also houses for field officers. At the RDA project centres, there are adequate facilities such as tractor hire pools, farm sheds and offices. A Cooperative Development Centre has good facilities for in-service training. The Service's vehicles include 20 trucks, 80 autos and 30 motorcycles. At any given time, about 30 percent of the vehicles cannot be used because they are being repaired. Furthermore, most of the vehicles are in the RDAs, and the agents for other SNL farmers have no transportation.

The average capital budget allocation over the years between 1979-1982 was US\$ 1.58 million. The recurrent budget averaged US\$ 1.71 million; recurrent expenditures exceeded allocation by about 7 percent amounting to US\$ 1.83 million. The GOS contributed 27 percent of the capital budget and 65 percent of the recurrent budget. CDA donors contributed 16 percent of capital expenditures and 5 percent of recurrent expenditures. The rest of capital expenditures (57 percent) and 30 percent of recurrent expenditures were contributed by other donors.

## C. Constraints to Agricultural Production and Production Potential

### 1. Food crops

Average maize yields on the SNL is 1.7 MT/ha whereas research yields are between four to six MT/ha. The difference in yields may be accounted for by several factors, including: the fact that much SNL production is on steep slopes or in drought-prone areas; the lack of viable technological packages adapted for smallholder production; lack of improved maize varieties; low maize prices; seasonal shortage of labour; and factors related to land tenure and size of holding. Pricing policies are an important constraint that limit both commercial and subsistence farmer maize production. Government policy is to keep consumer prices low and this conflicts with the goal of achieving food self-sufficiency. Low producer returns discourage farmers from making larger maize plantings which is one way to increase production. Further, the marketing structure is very inadequate in that markets are poorly organised and contribute to gluts and low prices due to transport bottlenecks. Many of these constraints apply to the other major food crops as well.

## 2. Commercial crops

Yields in the commercial crop sector on estates are believed to be comparable with international production standards but smallholder production of cash crops such as groundnuts, tobacco and cotton are low. While marketing systems were adequate for cotton and tobacco, credit policies and low prices are important constraints for cotton as are plant diseases, pests and insects. The success of estate crop production is due to efficient management and cost sensitivity.

## 3. Specialty crops

Smallholder production of fruit and vegetable crops has increased substantially, but little data exists on yield potentials. Most of the research has been done by the extension staff except for some adaptability testing conducted by the Research Service. The main economic constraints to increased specialty crop production are credit and pricing policies. Marketing is also a problem because most smallholders are new to fruit and vegetable production and uncertain about when to harvest. They also lack knowledge of grading and packing procedures and are dependent upon itinerant traders to harvest and sell their produce. While this informal marketing system is adequate for now, as specialty crop production expands, there will be an increased need for investments in storage, transport, marketing and processing.

## 4. Livestock production

On SNL and ITFS livestock ownership is widespread in Swaziland but few smallholders raise cattle to supplement their earnings. Little is known about livestock production potential, since no livestock research programme currently exists. Swaziland is the most densely stocked country in Africa. This results in overgrazing which has reduced carrying capacity of the land to very low levels. Since livestock are so deeply integrated into the Swazi tradition, changes in management practices will have to be based on research into livestock holdings, animal/land ratios, social traditions and management practices designed to reduce long-term degradation of the resource base.

## D. Staff Assessment of Institutions

The staff of the research and extension institutions generally agree that the inadequacy of the recurrent budget and the timely release of funds are serious constraints to programmes. Most of the staff of the institutions were concerned about the inadequate qualifications of the support staff, the condition and maintenance of laboratory equipment, the lack of adequate transportation and the lack of incentives in the terms of service. The staff of the research institutions were particularly concerned about old offices and laboratories and the shortage of personnel while so many are being

trained. At the University there was some concern for the shortage of housing for students, while staff at the extension institutions were particularly concerned about the shortage of transport and lack of visual aids.

## E. Conclusions and Recommendations

### 1. Agricultural institutions

Since Swaziland is a small country with limited resources, it should focus its agricultural research and training efforts in the areas in which it has a unique advantage and continue to utilise external contacts with other SADCC countries and international agricultural institutions for most of its applied research needs. Institutionally, the CSRP provides a working model for the closer coordination that is needed between research and extension programmes. The Faculty of Agriculture of the University of Swaziland should become a more active partner in research and extension systems.

### 2. Agricultural productivity

The physical constraints to smallholder crop production require a strong adaptability testing programme linked to research and extension. Basic research needs could be met through closer relationships between Swaziland and other SADCC countries and international institutions. Swaziland's own resources could be directed to developing practical, systems-oriented and farmer-tested technical recommendations. A related priority should be the integration of social and economic analysis into the adaptability testing research, and the use of social scientists at the planning and implementation stages of projects.

The required strategy in livestock production is the establishment of a joint research unit with staff from the Livestock Division and the Planning and Research Division of the MOAC. A strategy linking technical and professional skills in both crop and livestock production would be useful and would reflect the importance of livestock to farmers in the smallholder sector. The development of programmes for small stock and poultry research via such a unit is needed to determine the possibility of improving smallholder incomes.

The present strategy of allowing the estate and commercial crop sub-sector to rely upon their own resources for developing research and technology is appropriate, though smallholder needs for cash crop production technology should not be neglected. Research needs in the specialty crops require the addition of a new research unit, which would consolidate the RDAs' testing programmes and improve capabilities in management, irrigation systems, crop production, marketing and storage. The unit could become a component of a SADCC-wide specialty crop network.

## I. INTRODUCTION

### A. Background

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

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

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

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

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

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

## B. Methodology

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

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

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

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

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

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

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

## II GENERAL INFORMATION ON SWAZILAND

### A. Description of the Country

#### 1. Geography

The Kingdom of Swaziland is the second smallest country in Africa, with a total area of 17,364 km<sup>2</sup>. A landlocked nation, it is almost completely surrounded by the Republic of South Africa (RSA), save a short common border with the People's Republic of Mozambique.

Despite its small size, Swaziland is a country of considerable natural diversity. It is divided into four major topographic regions: the Highveld, the Middleveld, the Lowveld and the Lubombo Plateau. (See Figure 1.) It has a wide range of climatic conditions, with relatively fertile soils and adequate rain. Swaziland has significant potential for irrigation and hydroelectric power production from the four main rivers which traverse all four topographical regions en route to the Indian Ocean.

#### 2. Agro-ecological zones

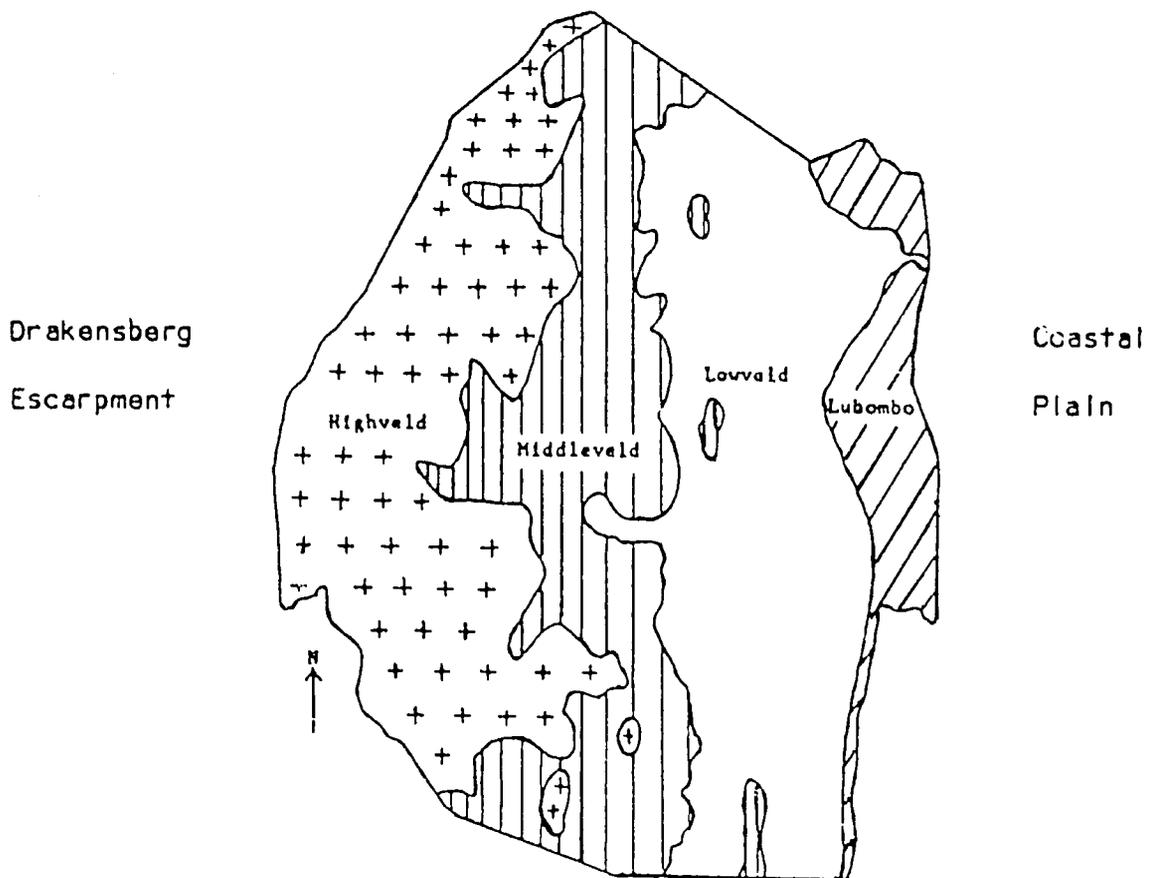
Swaziland can be divided into four agro-ecological regions, extending from north to south in roughly parallel belts. (See Table 1.)

##### a. Highveld

The Highveld is a mountainous region of 5,029 km<sup>2</sup> in the west with an average elevation of 1,300 m. Only 10 percent of its land has even fair potential for agriculture. Good soils with gentle slope and adequate drainage occupy only 3 percent of the area. The annual rainfall ranges between 1,000 and 2,300 mm, most of which falls in the summer between October and March. The soils are highly weathered but they are suitable for forestry, at least for conifers and eucalyptus trees. Only scattered areas of indigenous woodland remain in this area. Soil erosion is a problem, especially on the many steeper slopes which are overgrazed. Maize is the main crop grown, although some cotton and tobacco are grown in the south.

##### b. Middleveld

The Middleveld, with an area of 4,597 km<sup>2</sup>, has the highest proportion of Swazi Nation Land (SNL). It also has a larger proportion of good to fair arable soils, accounting for up to 20 percent of the country's total. A hilly region with several large valleys, its annual rainfall averages between 750 and 1,150 mm. Maize is the main crop on the SNL of the Middleveld, but peanuts, sorghum, beans, vegetables, cotton and tobacco are also cultivated, the latter two because of their high cash value and ease of marketing. On the private, freehold Individual Tenure Farms (ITFs), citrus and pineapple are the most important crops.



SWAZILAND: AGRICULTURAL RESEARCH RESOURCE DEVELOPMENT

Figure 1: Topographical Regions

Source: Nancy Horn, Swaziland Resources and Development Profile (Michigan State University, July 1983).

SWAZILAND: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

Table 1: Agro-Ecological Regions and Their Characteristics

<u>Region</u>	<u>Area</u> (km <sup>2</sup> )	<u>Average</u> <u>Altitude</u> (m)	<u>Average</u> <u>Rainfall</u> (mm)	<u>Climate and Mean</u> <u>Temperature Ranges</u> (°c)	<u>Predominate</u> <u>Vegetation</u>
Highveld	5,029	1,300	1,270	Humid, near-temperate 10.8 - 22.6	Sour grassland with some natural and man- made forests
Middleveld	4,597	700	940	Near-humid, sub-tropical 11.7 - 22.6	Tall grass and mixed bush
Lowveld	6,416	200	660	Semi-arid, hot 15.4 - 29.8	Broad-leaved savanna in west, thorn parkland and scrub in east
Lubombo	1,321	600	784	Near-humid, sub-tropical 13.9 -24.9	Mixed bush

Source: Data collected from the DEVRES/SADCC Agricultural Research Resource Assessment, 1983.

c. Lowveld

The Lowveld consists of 6,416 km<sup>2</sup> of gently rolling country with a highly variable annual rainfall (between 500 and 900 mm). Although about 30 percent of the eastern Lowveld's area has good to fair arable soils, the hazard of drought is great. In favourable years, good crops of cotton, sorghum and peanuts are harvested; however, most years yield poor harvests, and some years even bring total crop failures. About 20,000 ha are under irrigation, mainly for the production of sugar, citrus, rice and cotton. Vegetables are also grown. On non-irrigated grazing land, overstocking often leads to bush encroachment and increased soil loss. The Lowveld is also known as the bushveld, because almost all of the undeveloped land is covered by bush vegetation. Privately-owned land is most highly concentrated in the Highveld and Lowveld regions.

d. Lubombo Plateau

The Lubombo Plateau, with an area of 1,321 km<sup>2</sup>, has a climate similar to that of the Middleveld. It contains small areas of deep, cultivable soils: maize is the most important crop on its SNL, beans and cattle on the ITFs.

3. Natural environment

Mineral and metal resources, including asbestos, coal, gold and iron ore, are known to exist in Swaziland. With the closure of the iron ore mine in 1980, mining operations concentrated on asbestos in Havelock and coal at Mpaka. Formerly Swaziland's most important export earner, mining now follows sugar and wood products in providing export revenue.

The soils of Swaziland are complex; the distribution of the major soil types is closely related to relief and geological structure. Except for areas of alluvial soils, they have developed in place from underlying parent rock, thus reflecting the weathering and chemical characteristics of the rock base.

In the upper Middleveld and the Lubombo regions, the main soil types are deep, acidic and freely-drained red and yellow ferrisolic and ferralitic. Many are underlain by quartz. The natural fertility of these soils is low; there is little or no reserve of weatherable minerals due to leaching. The rooting depth is between 40 and 70 cm, although on flatter slopes it increases to 100 cm or more.

#### 4. Climate

The climate of Swaziland varies depending on the topographic zone, and it ranges from near-temperate to subtropical and semiarid. The climate in the Highveld in the west is humid and near-temperate; that of the Middleveld and Lubombo plateau is subtropical. The Middleveld is warmer but less humid than the Highveld. Due to the good weather and relatively fertile soils, the Middleveld is the most densely populated area of Swaziland.

The Lowveld has a hot, semiarid climate. As in the other regions, the dry season occurs during the winter months; however, rainfall is inconsistent in the rainy season (October to March). Often the rainfall is concentrated in a few heavy storms.

#### B. The People

##### 1. Population

Based upon the 1976 Population Census, Swaziland's total population was estimated to be 605,000 by mid-1983. Roughly one-half of the population is below 15 years of age. According to the Government of Swaziland (GOS), Swaziland's population is growing at a rate of 3.4 percent per annum. If the growth rate remains unchanged, Swaziland's population will nearly double by the year 2000.

Life expectancy at birth in Swaziland is 46 years, and infant mortality is high, estimated at 135 per 1,000 live births. The number of people per physician is over 9,100. The Government has emphasised curative, rather than preventative, health services. For example, over the five-year period ending in 1983, the proportion of recurrent spending for curative services averaged four times that for preventative services. Diarrheal diseases, respiratory diseases, and tuberculosis are the most prevalent health problems, although schistosomiasis and malaria are also present.

Most of the population live in rural areas where subsistence farming predominates. In 1982, the urban population was estimated at 106,000, or 18 percent of the total. The two largest urban centres, Manzini and Mbabane, are growing at an estimated annual rate of 10 percent, largely due to internal rural-to-urban migration that has been in process since shortly after Independence in 1968. Basic social and economic indicators for Swaziland are given in Table 2.

##### 2. Occupational patterns

Agriculture employs approximately 75 percent of the total indigenous work force. While the percentage of the population engaged in agriculture decreased nearly 10 percent from 1970 to 1980, the number of persons engaged in agriculture increased by 16 percent in the same decade due to population growth.

SWAZILAND: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

Table 2: Social and Economic Indicators of Development

Indicator	Average Annual Growth Rate (%)	Comment
Total Population	3.4	If this rate of growth remains unchanged, Swaziland's population will reach one million by the year 2000.
1983 (estimate)   605,000		
1975 <sup>a</sup> 483,000		
Percent of Total Population Living in Rural Areas		Rural growth rate is not available. Urban population growth rate is approximately 10 percent per annum.
1983                   82%		
Percent of Labour Force Involved in Agriculture <sup>a</sup>		The actual number of persons involved in agriculture has increased by 16 percent over the decade, whereas the total population has increased by about 30 percent.
1980                   72%		
1970                   81%		
Percent of Population Under 15 Years of Age		
1983                   52%		
Percent of GDP Attributable to Agriculture <sup>b</sup>		
1980                   24%		
1970                   31%		
Per Capita GDP <sup>c</sup>		
1982 (US\$)           \$618	5.5	The average annual growth rate is calculated for the years between 1960 and 1980.
Physical Quality of Life Index (PQLI) <sup>d</sup>	45	This figure is on par with most neighboring countries, but about one-half that of most high-income countries. (The PQLI) for the UK is 95 and for the US is 96)
Literacy <sup>d</sup>		
1983 (estimate)   55%		Literacy rate is measured among adults 15 years and older.
1972                   36%		

SWAZILAND: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

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

<u>Indicator</u>	<u>Average Annual Growth Rate</u> (%)	<u>Comment</u>
Life Expectancy at Birth <sup>c</sup>		
1981	54 yrs.	
Volume of Agricultural Production, 1969-71 to 1977-79 <sup>b</sup>		
Food	3.7	
Non-Food	14.6	
Total Agricultural Production Per Capita, 1969-71 to 1977-79 <sup>b</sup>		
Food	1.2	
Non-Food	12.1	
Food Self-Sufficiency Ratios <sup>e</sup>		
1964-66 average	86	
1978-80 average	85	

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

<sup>b</sup>Singh, Sub-Saharan Agriculture--Synthesis and Trade Prospects, World Bank Working Paper Number 608 (World Bank, 1983).

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

<sup>d</sup>John P. Lewis and Valeriana Kallab, eds., U.S. Foreign Policy and the Third World-Agenda 1983, Overseas Development Council (Praeger Publishers, 1983); U.S. Foreign Policy and the Third World-Agenda 1974, Overseas Development Council, 1974.

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

In relation to other African countries, Swaziland has a relatively large proportion (28 percent in 1980) of the working-age population engaged in wage employment.

Agriculture and forestry provide the largest number of paid jobs, accounting for 40 percent of the total. Social services employ the next largest number of paid workers, with 19 percent. Of the remainder of wage employment, manufacturing provides 12 percent, construction provides 9 percent and trade provides 8 percent. The private sector accounts for about 74 percent and the public sector 26 percent of wage employment, a higher private-to-public ratio than in other African countries. Nearly 90 percent of paid employment is in the formal sector, while 11 percent is in the informal sector.

Agriculture and forestry account for 69 percent of the employment in the manufacturing sector. The three sugar mills and the wood pulp and fruit canning factories, together, provide 45 percent of manufacturing wage jobs.

The average annual growth of formal sector employment is 3.4 percent (resulting in the creation of some 2,400 new jobs each year). However, it is estimated that each year some 7,500 school-leavers enter the job market. Thus, the numbers of the unemployed are increasing by 5,000 per annum, which is equal to more than 5 percent of all those employed in 1983. Historically, Swaziland's "excess" labour was able to find gainful employment in the South African mines. However, in the last five years this source of employment has been drastically reduced, and the number of Swazis working in South African mines has declined from 21,000 to 11,000. However, some 16,000 Swazis also work in South Africa outside of the mines and send remittances home: this number has remained relatively constant.

### 3. Language and ethnic groups

The vast majority (97.6 percent) of the Swazi people share a common language and tradition. Both siSwati (a Nguni language related to Zulu) and English are official languages. About 70 percent of the clans which make up the Swazi people are Nguni, and 30 percent are Sotho. The royal family is from the dominant Dlamini clan.

### 4. Religion

Over one-third of the adult Swazi people hold traditional religious beliefs. Nearly all of the rest of the adult population are Christian. However, the Christianity practiced in Swaziland, as in other African countries, is often mixed with traditional beliefs and practices.

## 5. Educational system

In comparison to other sub-Saharan countries with similar income levels, Swaziland's adult literacy rate of 65 percent and its primary school enrollment ratio of 78 percent are excellent. However, the high school pass rate for compulsory subjects is just under 50 percent; furthermore, many of the primary and secondary school teachers are poorly qualified. The GOS plans to provide universal primary education by 1985, eventually extending this to include three years of post-primary training with a strong practical orientation.

The education sub-sector was allocated 16 percent of the central government's capital expenditure budget of slightly more than US\$ 57 million for 1983-84 (partly financed by a World Bank loan). This constituted the largest capital expenditure allocation in the social services sector. As new schools are added to the system, the recurrent costs of the expanding system are being severely felt. Overspending on educational personnel is now a regular occurrence-- during fiscal year 1981-82, this amounted to US\$ 3.7 million, or 30 percent of the original budgetary allocation.

Notwithstanding the emphasis being given to physical plant and personnel, it is doubtful that the country's educational requirements will be met during the years ahead, given the rapid growth rate of the population, because of the lack of "places" in the education system.<sup>1</sup> Consequently, there is little room for optimism that the serious existing shortage of qualified candidates to matriculate into the agricultural sciences at the college level will be eased in the foreseeable future.

Swaziland has one national university, The University of Swaziland. Its campus is at Kwaluseni, about 8 km west of the central town of Manzini. Degrees are offered in administration, commerce, education, economics, law and the natural sciences. The Faculty of Agriculture of the University of Swaziland is located in Luyengo, about 20 km west of the main campus. It offers a certificate in agriculture; diplomas in agriculture, agricultural education and home economics, and BSc degrees in agriculture and agricultural education.

Swaziland has three teacher training colleges: the William Pitcher Teachers College in Manzini, which offers both primary and secondary teachers certificates; the Nazerene Teacher Training College, also in Manzini; and the Ngwane Teachers Training College in Nhlangano. The latter two offer certificate-level training for primary school teachers.

There are two nursing colleges in Swaziland: the Nazerene Nursing College in Manzini, and the Institute of Health Sciences in Mbabane.

The Swaziland College of Technology in Mbabane offers certificates and diplomas in various technical fields, including laboratory technology, motor mechanics, agricultural engineering and construction trades.

### C. Government and Political Framework

#### 1. Structure of government and political parties

Since Swaziland is a kingdom, the head of state is a monarch. If the monarch dies, the Queen Regent assumes the role of head of state, assisted and advised by the Supreme Council of State, the Liqogo, until a new king is installed.

Swaziland has four regional administrative districts, with appointed commissioners. These districts are further subdivided into 40 sub-regions called Tinkhundla. The civil head of government is the Prime Minister, who is appointed by the crown and who presides over the Cabinet.

Legislative authority is shared by a Parliament, consisting of a 50-member House of Assembly and a 20-member Senate, and the crown which approves legislation before it becomes law. Elections are held every five years to select members from the 40 Tinkhundla to form an electoral college. This electoral college elects about 40 members of the House of Assembly; the remainder are nominated by the monarch. Of the 20 members of the Senate, ten are chosen through indirect elections and ten are appointed by the monarch.

A traditional system of government also parallels a modern system in the judiciary. The High Court and Court of Appeals, whose members are appointed by the monarch, and their subordinate courts coexist with traditional courts.

In keeping with the Swazi tradition of government by consensus, all political parties are banned.

#### 2. National budget

The GOS budget for 1983 was equivalent to US\$ 182 million, approximately the same as for the previous two years. GOS revenues have doubled in the past decade; 62 percent of its revenues came from the Southern African Customs Union in 1982-1983.

### 3. Membership in international organisations

Swaziland is a member of the UN and most of its specialised organisations and of the Commonwealth of Nations. It is also a member of various associations of Third World and African nations, including the Non-aligned Movement, the Organisation of African Unity (OAU), and SADCC. It is a member, with the Republic of South Africa, of the South African Customs Union and the Rand Monetary Area.

#### D. Economic Overview

##### 1. General indicators

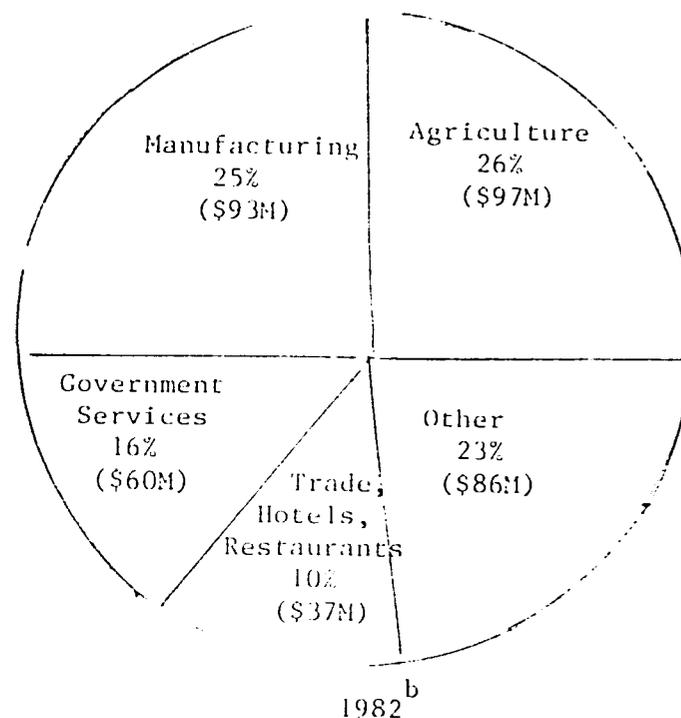
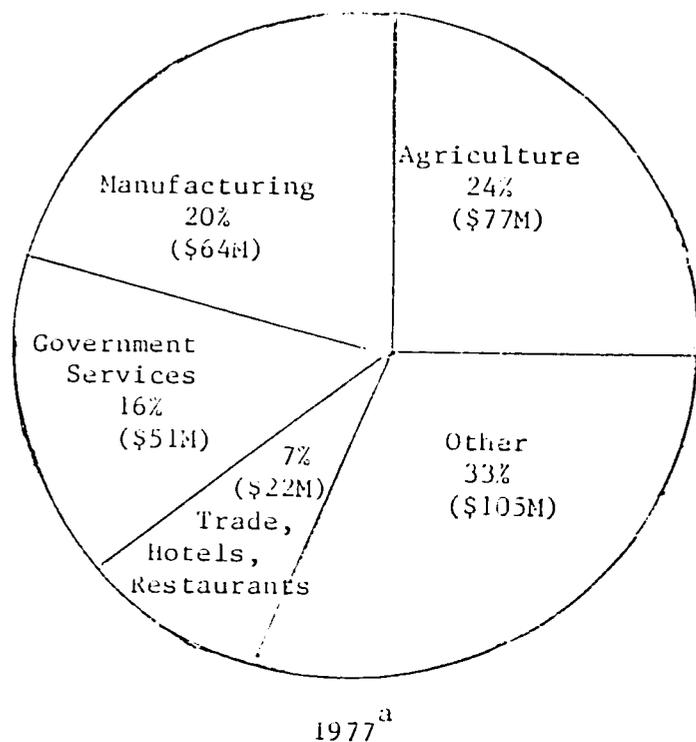
The Gross Domestic Product (GDP) for 1982 has been estimated at US\$ 373 million, the per capita GDP at US\$ 618. During the period from 1977 to 1982, the average annual rate of growth of GDP was 5 percent, though growth has been uneven due to drought, monsoons and changes in asbestos production and world market prices of commodities such as sugar. (See Table 2 and Figure 2.)

Agriculture dominates Swaziland's economy and, with agro-industry, is the largest economic activity. It alone generates about one-fourth (26 percent) of the country's GDP. In addition, a substantial part of the manufacturing sector is based on the processing of agricultural products. Thus, agro-industry, including forestry, contributes almost three-fourths (74 percent) of manufacturing value added. In 1980, four enterprises (two sugar mills, a wood pulp mill and a fruit canning factory) accounted for 68 percent of all manufacturing value added. Manufacturing accounts for 25 percent of the GDP, government services follow with 16 percent, and trade, hotels and restaurants contribute 10 percent.

##### 2. International trade

Agriculture accounts for more than 70 percent of the value of all national exports. Due to a limited local market, most of the agricultural production from the modern sector is exported. For example, in 1981, sugar alone accounted for 40 percent of the country's foreign exchange earnings. This overwhelming reliance on sugar, a commodity whose price fluctuates erratically, has increased the vulnerability of the economy to external forces. From 1981 to 1983, even with increased sugar production, the GOS lost the equivalent of US\$ 1.0 million a day in revenue foregone from export levies because of lower sugar prices. While the country is a net exporter of agricultural products (sugar, processed and canned fruits, and wood pulp), it is a net importer of food for local consumption, including from 30 to 40 percent of its domestic maize consumption. Food stuffs are one of the major imports.

Wood products and asbestos are the second and third most important export earners.



Total  
(1980 US Dollars)      \$319 Million

(1982 US Dollars)      \$373 Million

<sup>a</sup> Central Statistical Office, Annual Statistical Bulletin, (Mbabane: Government of Swaziland, 1981).

<sup>b</sup> Prime Minister's Office, Department of Economic Planning and Statistics, Economic Review: 1978-1982, (Mbabane: Government of Swaziland, February, 1983).

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Figure 2: GDP by Source, 1977 and 1982

### 3. Financial system

The Central Bank of Swaziland is the country's major financial institution, operating the monetary system within fiscal policies and guidelines determined by the GOS. The Swaziland currency, the Emalangeni, is exchangeable on a one-to-one basis with the South African Rand, which is accepted as legal tender within Swaziland. Foreign exchange transactions are made in South African Rand. Together with Lesotho and the Republic of South Africa, Swaziland is a member of the Rand Monetary Area.

### 4. National Development Plan

#### a. Third National Development Plan

The three overall objectives of the Third National Development Plan (1978-79 to 1982-83) are economic growth, self-reliance, and social justice with stability. To attain the first objective, the Plan set a target of increasing agricultural production by 6.5 percent per annum. It was projected that, to achieve this target, the following steps would have to be taken:

- o A higher proportion of cash cropping;
- o The extension of the Rural Development Area Programme (RDAP) to cover 60 percent of the traditionally-farmed Swazi National Land;
- o An improvement in the ratio of extension agents to farmers to 1:300 in general, 1:250 in the Rural Development Areas (RDAs);
- o The provision of farm inputs and marketing facilities;
- o Conservation;
- o Improvement in profitability of livestock farming;
- o An increase in the annual offtake rate of cattle (to 12 percent); and
- o The attainment of self-sufficiency in maize.<sup>2</sup>

High growth in the agricultural sector was expected, principally due to the new sugar mill which would increase output more than 50 percent. The strategies to achieve the goal of self-reliance were to secure more control of productive assets, to strengthen governmental administrative capacity, to develop local sources of goods and services, and to diversify external economic relations. It was felt that the third goal of social justice would be promoted by spreading economic opportunities and social services more widely and by involving rural people more in decision-making.

The GOS' overall policy in the agriculture sector was "to enhance the quality of rural well-being and to assist Swazi Nation farmers to make the transition from subsistence to commercial and semi-commercial farming,"<sup>3</sup> with the RDAP as the primary mechanism. The following were the agricultural sector objectives:

- o To protect the natural environment;
- o To promote the transfer of agricultural land from foreign to Swazi ownership;
- o To increase crop and livestock production and diversification;
- o To improve extension services;
- o To make farm inputs and services, including credit and marketing, more accessible to farmers and cattle owners;
- o To make basic services, including access to roads and potable water, available to RDA households; and
- o To make animal husbandry more profitable.

b. Rural Development Area Programme

The RDAP constitutes the basis of Swaziland's attempt to promote the transition from traditional to commercial agriculture and to enhance the welfare of rural people. However, the RDAP has disappointed its sponsors, because it has not achieved the goals set for it.<sup>4</sup>

As of December 31, 1982, some 55 percent of the funds available to the RDAP had been disbursed.<sup>5</sup> The execution of the project, however, has slipped far behind the original schedule. This is evidenced by the fact that only 60 to 80 percent of the annual capital budget allotments actually have been expended. Nevertheless, considerable physical construction and systems development have been realised. These have included building and improving roads, making agricultural inputs available, fencing grazing areas, improving credit and marketing facilities, intensifying extension activities, and improving livestock management and land consolidation. Tractor-hire schemes have also been established.<sup>6</sup>

In accordance with the Third Five-Year Development Plan, a major objective of the RDAP has been to increase maize production to the level of national self-sufficiency. However, although the use of credit, hybrid maize seed and tractor service exceed planned levels, maize yields have continued to fall short of targets. In addition, the yields of other food crops, such as beans and groundnuts appear to have remained relatively stable. The expected increase in the output

of cash crops, including cotton and tobacco, also did not take place. Cattle destocking has not occurred; instead, cattle numbers have decreased.

This disappointing performance, however, must be seen in the perspective of the overall household economy.<sup>7</sup> As indicated above, farmers appear to be using modern inputs and the tractor service only to the extent necessary to produce the maize they need for subsistence. What farm labour was released in the RDAP process has been used for employment in off-farm jobs, as the 1970s were years when opportunities for off-farm work were plentiful in Swaziland.

Roughly one-half of SNI households had one adult member working away from the farm in the 1970s; off-farm remittances made up 75 percent of the total income of the households concerned. However, with the decreases in off-farm job opportunities, including the cutback in hiring Swazis in the South African mines, the prevailing situation could change.

#### 5. External aid

The Department of Economic Planning and Statistics of the GOS coordinates international assistance to Swaziland. Donor assistance is concentrated in agriculture, industry and education, with most of the activity in agriculture designed to bring small farmers into semi-commercial and commercial production. The most significant activity is the RDAP, which began with UK funding, and for which USAID, the UK, IBRD and the AFDB are the principal donors. Also important is the Land Purchase Program, funded by the UK, which from 1975-1983 has increased the SNI from 45 percent to 63 percent of the total land area.

Major bilateral donors and total funds disbursed from 1978-1982 include: the UK, US\$ 56.7 million; West Germany, US\$ 33.4 million; the US, US\$ 28 million; Sweden, US\$ 10.8 million, and Canada, US\$ 6.2 million. Total bilateral aid in 1982 was US\$ 21.0 million.<sup>8</sup> In recent years, multilateral donors have included the World Bank, the African Development Bank, the EEC, and the United Nations agencies, especially the UNDP. Bilateral aid, totaling US\$ 49 million in 1979, accounted for 65 percent of total official development assistance received by Swaziland. It also was 15 percent of the GNP and 72 percent of gross domestic investment in that year.<sup>9</sup>

#### E. Agriculture

The agricultural sector of Swaziland is divided sharply into two parts: a modern, capital-intensive sub-sector, which primarily is owned and managed by foreigners and which produces mainly for export, and a traditional sub-sector which produces mainly for subsistence. Systems of land tenure and land use differ greatly between the two sub-sectors.

1. Land tenure

a. Swazi Nation Land

The traditional sub-sector coincides largely with the Swazi Nation Land (SNL), which now encompasses roughly 65 percent of the land in Swaziland. This area contains roughly 42,000 traditional homesteads, with an average size of two and three-quarters ha. The vast majority (90 percent) of SNL, however, consists of communal grazing land. (See Table 3.) The land varies in quality, depending on the ecological zone in which it is located.

SNL is owned communally by the Swazi people, and is held in trust by the Ngwenyama (the King) for the Swazi Nation. Through local chiefs, holdings are allocated to individual households to be used for farming plots and homesites. Such holdings are relatively secure, depending on the "good behavior" of the tenant. Only farming plots and homesites are allocated to families; all other land is held as communal grazing land. In addition, the arable land is open to grazing during the winter months.

Through an aggressive programme of land purchases (principally of the idle land of Individual Tenure Farms mentioned below), the GOS has been acquiring land from the private sector to add to SNL. This programme has been financed primarily with assistance provided by the British Overseas Development Agency. The success of the programme is evident. Between 1975 and 1983, 311,000 ha were purchased; SNL as a percent of total land increased from 45 to 65 percent.

b. Individual Tenure Farms

The modern sub-sector consists of about 790 privately-owned farms and estates on title deed land called Individual Tenure Farms (ITFs), averaging over 800 ha in size. Most of the land is owned or managed by expatriates who produce mainly for export. Over 60 percent of the farms are irrigated. Some of this private land is either undeveloped or occupied by Swazi squatters using the land in the same way as do traditional farmers. The most important crops produced on the ITFs are sugarcane, citrus, pineapples, cotton, maize and rice. These farms also account for more than one-half of the land area devoted to vegetables. The ITFs account for about one-third of all cropped land in Swaziland.

c. Rural Development Areas

GOS' concern about the growing disparity in incomes and the overall quality of life between SNL and ITFs dates back to before Independence. In addition, achieving self-sufficiency in basic foods, especially in maize has been, and continues to be, a national goal. Consequently, the Government embarked on a nationwide rural development programme involving SNL.

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Table 3: Agricultural Land Use and Tenure

<u>Land Use Category</u>	<u>RDA Lands</u>		<u>Non-RDA Lands</u>		<u>Swazi Nation Lands</u>		<u>Individual Tenure Farms</u>		<u>All of Swaziland</u>	
	<u>000 ha</u>	<u>Percent of Total</u>	<u>000 ha</u>	<u>Percent of Total</u>	<u>000 ha</u>	<u>Percent of Total</u>	<u>000 ha</u>	<u>Percent of Total</u>	<u>000 ha</u>	<u>Percent of Total</u>
<u>Cropland</u>										
Cropped	56	11	35	7	92	8	38	14	126	9
Fallow	<u>8</u>	<u>2</u>	<u>2</u>	<u>&lt;1</u>	<u>10</u>	<u>1</u>	<u>2</u>	<u>&lt;1</u>	<u>12</u>	<u>&lt;1</u>
Subtotal, Cropland <sup>a</sup>	65	12	38	7	102	9	40	15	142	10
<u>Grazing Land</u>										
Natural veld	NA <sup>b</sup>	NA	NA	NA	979	90	138	-	1,117	81
Improved	NA	NA	NA	NA	<u>4</u>	<u>&lt;1</u>	<u>20</u>	<u>3</u>	<u>24</u>	<u>2</u>
Subtotal, Grazing land <sup>a</sup>	470	87	514	93	984	90	158	60	1,141	82
Other Farmland	<u>4</u>	<u>&lt;1</u>	<u>3</u>	<u>&lt;1</u>	<u>6</u>	<u>&lt;1</u>	<u>68</u>	<u>26</u>	<u>74</u>	<u>5</u>
TOTAL <sup>a</sup>	<u>538</u>		<u>555</u>		<u>1,092</u>		<u>266<sup>c</sup></u>		<u>1,359<sup>c</sup></u>	

<sup>a</sup>Inconsistencies are due to rounding.

<sup>b</sup>NA = Not Available.

<sup>c</sup>Excludes approximately 265,000 ha of unused land and 102,000 ha of commercial forest lands. If included, total land in ITFs would be 633,000 ha. Adding a further 9,000 ha approximates Swaziland's total area or 17,364 km<sup>2</sup>.

Sources: Land Use Planning Section, Ministry of Agriculture and Cooperatives, 1983; Ministry of Agriculture and Cooperatives Rural Development Areas' Programme Annual Report, 1982; DEVRES calculations.

The present RDAP was initiated in 1970 and was initially supported by the UK's Overseas Development Agency. By 1974, the RDAs included in the programme covered 7 percent of SNL. There are currently 18 RDAs, covering more than 537,000 ha, or approximately 49 percent of total SNL. (See Table 3.) It is estimated that there are approximately 26,600 homesteads with a total of 227,000 people in the present RDAs. However, 34 percent of these (77,000) carry on their main economic activities away from the RDAs.

The RDAs are currently being financed by several donors. Loans of US\$ 18.5 million have been received from the African Development Bank, the World Bank, and the US; grants of US\$ 9.3 million have been obtained from the European Development Fund and the US; and the GOS has provided counterpart funds of US\$ 4.2 million, for a total of US\$ 32 million.<sup>10</sup>

## 2. Land use

Land use in Swaziland can be classified in six categories: cropland, grazing land, "other" farmland, commercial forests, unused lands and urban lands. Subtracting commercial forests, urban and unused land areas from the country's total land area of 1.73 million ha leaves approximately 1.36 million ha of farmland. Of this total, 10 percent is cropland, 84 percent is grazing land and 5 percent is "other" farmland. (See Table 3.) The patterns of land use within these categories vary greatly according to tenure. Efficiency of land use is highest on the ITFs, followed by the RDAs and other SNL. For example, a higher ratio of cultivated land to total agricultural land is one indicator of intensity (and hence efficiency) of use. Table 3 shows a ratio of 14 percent for ITFs, 11 percent for RDAs, and only 7 percent for non-RDA SNL. Another useful indicator of efficiency is the ratio of improved to total grazing land; this indicator is 13 percent for ITFs, but it is less than 0.5 percent for SNL. Unfortunately, comparable figures for the RDAs are not available; however, it is known that pastures are being improved in accordance with the RDA work plan.

Since claims on SNL are of a usufruct rather than a titled tenure nature, SNL farmers' ability to obtain long-term credit for improvement of the land is limited, as is their incentive to do so. The RDAP, however, attempts to compensate for these limitations. For example, it provides lime, needed to counter high soil acidity, at subsidised prices to RDAP beneficiaries. The RDAP budget also includes appropriations for fencing, which would otherwise be an investment requiring long-term credit. The Land Development Unit and the Land Use Planning Section of the Ministry of Agriculture and Cooperatives (MOAC) also provide means for small-scale irrigation development, roads, terracing, and related activities in SNL.<sup>11</sup>

### 3. Principal crops and production systems

#### a. Introduction

Agricultural production on SNL, including the RDAs, has not proved to be as successful as was anticipated. While production in the commercial sector increased at a rate approximately 12.9 percent per annum during the plan period, production in the traditional sector increased by only 0.36 percent per annum.

In 1981, the output of the traditional agricultural sector (SNL) amounted to approximately US\$ 15 million, or 3.9 percent of GDP at factor prices. ITFs and the forestry plots associated with them produced over US\$ 85 million in commodities, representing 22 percent of GDP.

Crop yield indices for maize, sugarcane, cotton, and oranges over a ten-year period clearly show the widening gap between traditional and commercial sector productivity. (See Table 4.) Yields for both maize and cotton, principally grown on SNL, are down considerably from the 1971-72 base year, although they both have been rising since 1978-79 as a result of improved cultivation practices. Sugarcane and orange production, on the other hand, are activities in which only ITFs (including estates) engage. Yields of oranges have increased by 37 percent during this period, although yields of sugarcane remain relatively constant (this sector began with very high technology), overall production of sugarcane increased by 77 percent.

Table 5, showing the actual areas planted, production and yields of major crops grown on SNL in comparison with yield potentials, vividly illustrates the existing gap between actual and potential production performances on SNL. Since the commercial sector, which is increasing output rapidly, produces mainly for export while the traditional sector, which is showing little output increase, produces food for local consumption, it is readily apparent that food production is lagging increasingly behind the country's population growth of 3.4 percent per year. Indeed, per capita maize consumption has decreased since the 1970s.

#### b. Food crops

##### (1) Maize

Maize is the major food crop grown on SNL, in both the RDA and non-RDA areas. In most areas of the country it is intercropped with beans. In the Highveld and the Middleveld, yields of 1.5 to 2.0 T/ha of maize have been recorded. In the Lowveld, about 800 kg/ha have been achieved under dryland farming.<sup>12</sup> However, according to research investigations, maize yields of four to six T/ha could be achieved in practically all of the irrigated regions.<sup>13</sup>

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Table 4: Indices of Selected Crop Yields

<u>Crop</u>	<u>1971/72</u>	<u>1972/73</u>	<u>1973/74</u>	<u>1974/75</u>	<u>1975/76</u>	<u>1976/77</u>	<u>1977/78</u>	<u>1978/79</u>	<u>1979/80</u>	<u>1980/81</u>
Maize	100	65	89	82	83	70	74	42	61	71
Sugar Cane	100	91	82	92	101	98	98	106	99	105
Cotton	100	97	136	165	96	114	104	49	74	80
Oranges	100	94	105	109	123	110	113	113	118	137

Source: Central Statistical Office, Annual Statistical Bulletin (Mbabane: Government of Swaziland, 1981).

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Table 5: Area, Production, and Yields of Major Crops on Swazi Nation Land, 1979/80 and 1980/81

Crop	1979/80			1980/81			Potential Yield (MT/ha)
	Area (ha)	Production (MT)	Average Yield (MT/ha)	Area (ha)	Production (MT)	Average Yield (MT/ha)	
Maize	71,145	96,735	1.3	55,657	93,691	1.7	4-6 <sup>a</sup>
Groundnuts	2,740	1,271	0.5	1,494	637	0.4	2.5-4 <sup>a</sup>
Cotton	17,709	14,011	0.8	13,035	14,922	1.1	NA <sup>b</sup>
Jugo Beans	2,582	1,406	0.5	1,805	1,672	0.9	1.3 <sup>c</sup>
Sorghum	2,288	1,582	0.7	1,568	1,147	0.7	3.5 <sup>a</sup>
Beans	1,138	322	0.3	1,768	883	0.5	NA
Sweet Potatoes	560	8,400	15.0	1,063	2,039	1.9	NA
Tobacco	254	86	0.3	524	83	0.2	0.8 <sup>a</sup>
TOTAL	<u>98,416</u> =====			<u>76,914</u> =====			

<sup>a</sup>University of Swaziland at Luyengo, Research Advisory Bulletin, No. 1, 1978.

<sup>b</sup>NA = Not Available

<sup>c</sup>Mr. Frank Buckham, Chief Research Officer, personal interview, September 1983.

Source: Central Statistics Offices, Mbabane.

Although maize yields on some of the better ITF lands have been as high as six to eight T/ha, such yields may not be possible on SNL, on which the prime variable is fertiliser and little management is provided.

A study using data from approximately 100 SNL farm units to determine optimum levels of output indicates that, when the additional costs of adding fertiliser are compared with the value of the resulting marginal product, the economic optimum yield is less than the technically possible yield. In fact, it would approximate the 1.68 T/ha realised on SNL for 1980-81.<sup>14</sup> Ironically, if the same productivity achieved in 1980-81 had been achieved on the land area planted to maize the year before, Swaziland's maize gap would have been practically closed with a production of 120,000 T. In actuality, however, maize production has declined. Outputs of maize amounted to 96,700 T and were produced on some 71,000 ha in 1979-80. One year later, output had fallen by 3 percent to 93,700 T, and was produced on 55,700 ha, or 22 percent less land. (See Table 5.) What appeared to be taking place was that farmers were producing just enough to satisfy their own consumption needs. Farmers in the traditional sector (especially those within the RDAs) thus were applying more fertiliser, using higher-yielding hybrid varieties, and increasing productivity (from 1.36 to 1.68 T/ha during the period under observation). As a result, they needed to plant fewer ha of maize to meet their production targets. That such a "backward-bending supply curve" exists is borne out by studies prepared by MOAC and others.<sup>15</sup> In fact, the area of cultivated land in the RDAs has increased from 11 percent to only 13 percent within recent years, while on the less productive parts of the SNL it has fallen by a dramatic 50 percent.<sup>16</sup>

## (2) Sorghum

Sorghum does fairly well in the Lowveld, due to its drought-resistant nature. According to research findings, up to 3.5 T/ha can be obtained on fertile lands in all of the regions.<sup>17</sup> However, the national average is from 640 kg to 1.5 T/ha.<sup>18</sup> No information on sorghum yields in the RDAs was available.

## (3) Jugo beans

The SNL area planted with Jugo beans decreased from 2,582 ha in 1979-80 to 1,805 ha in 1980-81. Output was 1,406 MT in 1979-80, increasing to 1,672 MT in 1980-81.<sup>19</sup> Yields in 1979-80 and 1980-81 thus were 545 kg/ha and 926 kg, respectively. Yields per ha vary according to region. Research trials indicate that yields of up to 1.3 T/ha are attainable.<sup>20</sup> Current average yields per ha for the whole country are about 800 kg/ha.<sup>21</sup>

#### (4) Groundnuts

Production of groundnuts declined over the two-year period from 1979-80 to 1980-81. In 1979-80, 1,740 ha were cultivated and 1,271 T were produced; in the 1980-81 season, 1,494 ha were planted with groundnuts and only 637 T were produced. Yields in 1979-80 and 1980-81 were 464 kg and 426 kg respectively. Research findings indicate that yields of 2.5 to 4 T/ha of unshelled nuts are normal for recommended varieties.

#### (5) Vegetables

Vegetable output has improved significantly in Swaziland because vegetable imports from RSA have been banned by the Swazi Ministry of Health to avoid spreading cholera found in some parts of that country. The RDAs have taken the lead in increasing vegetable production, especially in the 12 irrigation schemes located around the country. As a result, all of the commonly consumed vegetables in Swaziland, i.e., tomatoes, cabbages, onions, potatoes and carrots, are now grown within the country. Yields vary according to soil type, availability of water for irrigation, and use of inputs. Vegetable yields that have been realised both on RDA and non-RDA land are: tomatoes--20 T/ha; cabbages--25 T/ha; onions--20 T/ha; potatoes--25 T/ha; and carrots--19.5 T/ha. Research findings show normal yields slightly more than 10 percent above the ones indicated.

#### c. Cash crops

##### (1) Sugar

As has already been noted, sugar is the major source of Swaziland's export earnings. It is grown in the Big Bend and Mhlume/Thaneni areas in the Lowveld. Sugarcane is only grown on irrigated land on large commercial estates. Each of the major sugar-producing areas has a large mill. The sugar industry is a major source of employment, accounting for about 20 percent of all formal sector employment. While Swaziland has increased its production of sugar, lower world prices have reduced export earnings in recent years.

##### (2) Cotton

Cotton is a major crop on SNL. Its production has increased significantly by area over the years. In 1981, there were approximately 6,000 cotton farmers, including those on title deed land. In the RDAs alone, an area of 7,800 ha was under cotton cultivation in 1982; 4,695 T were harvested. The average yield was 596 kg/ha. However, the cotton price in 1981 was disappointing. In 1982 farmers did not prepare their fields in time, and credit was unavailable. As a result, the RDA under cotton cultivation in 1982 was down by 22.5 percent, and output declined by 40.4 percent. In the 1983 season, yields dropped by more than 50 percent because of the

drought. However, there is evidence of some improvement in farmer responses to a new cotton campaign launched by the Swaziland Cotton Board (SCB) through its cotton registration scheme. Given the absence of drought, the SCB estimates that a potential land area of 60,000 ha could be developed for cotton production.

### (3) Tobacco

Tobacco has been grown mainly in the Shiselweni District, especially in the Southern RDA. On SNL, however, it has assumed a place of importance in other districts, especially in the Manzini and Hhohho districts. The national average yield was 339 kg/ha in 1979-80. The yields of some farmers were as low as 15 kg/ha in 1980-81, although yields of 400 to 450 kg/ha were recorded by farmers in the RDAs<sup>22</sup> and like yields have been realised in selected farms in the non-RDAs.<sup>23</sup> It has been demonstrated that under semi-mechanised management in the RDAs, yields of 800 kg/ha can be achieved.

### 4. Principal livestock

The Swazis have a long and important tradition of keeping cattle. In 1981, there were approximately 656,000 cattle in the country, of which 518,000 (79 percent) grazed on SNL land; the remaining 138,000 (21 percent) grazed on ITF land. Between 1966 and 1976, the number of cattle in Swaziland increased by 30 percent. This trend has continued, especially on SNL land where the number of animals has been increasing rapidly due to the low off-take levels in that area. Thus, even though livestock numbers have been diminishing on ITF lands due to a relatively high off-take rate, the overall national herd is growing at a rate approximating 3 percent per annum.

The potential for economic growth in the livestock sector is good, but traditional uses of cattle to achieve objectives other than production of income make it difficult to fully realise that potential. In addition to being used for the Lobolo (or bride price), cattle bring prestige, are used for ceremonial purposes, till the fields, provide meat, milk and dung for the homestead, and are a traditional measure and store of wealth. The high value and priority placed on owning livestock has created special problems. For example, overgrazing has resulted in erosion, deterioration of the natural veld, and a decline in the quality of Swazi livestock. The traditional value placed on cattle as a means to achieve status and store wealth means that low calving and off-take rates, poor growth performance, overstocking and other related factors do not guide farmers' actions with respect to their livestock. The number of cattle owned, rather than the current income earned from the herd, is the more important management objective.

These values of Swazi farmers with regard to their livestock help explain why, in spite of a number of programmes designed to upgrade the national cattle herd, the national herd continued to grow until, by 1981, there were approximately 655,700 cattle in the country. In 1979, the MOAC determined the actual carrying capacity of the country. It found that under conditions that would guarantee a sustained yield of forage for livestock, the country could support 440,000 animal units.

The growth in livestock numbers is taking place primarily on SNL. On ITFs the number of animals is diminishing. However, the net result of these trends overall is an increasing livestock population (recently decreasing due to drought from 1982 to 1984). Taking into consideration that each animal requires approximately the same amount of land for subsistence as a human, and that Swaziland's population is growing at an annual rate of 3.4 percent, the combination of the nation's rapid cattle and population growth rates is alarming.

The calving rate on SNL presently averages less than 32 percent, which is low by any standard, whereas on ITFs the corresponding rate is 50 percent or higher.

While the off-take for the country averages around 11 percent, that on SNLs continues to be approximately 9 percent. A rate of at least 12 percent would be required to maintain the status quo in terms of numbers of cattle.

## 5. Forestry products

The forestry industry principally depends on private plantations which are foreign-owned, capital-intensive, and export-oriented. Commercial forests cover approximately 102,000 ha, or 16 percent of freehold land. The two largest plantations, located in the cool humid Highveld, account for 65 percent of man-made forests, and consist mostly of pine and eucalyptus trees. Forest plantations and forestry-based industry contributed about 20 percent of Swaziland's export earnings in 1978. Woodpulp, from a mill at Bhunya supplied by cultivated pine forests, is the second most important export following sugar.

## 6. Agricultural marketing and credit

### a. Marketing

In general, ITFs producing export-type crops are not faced with serious marketing problems since most of their crops, such as sugarcane, pineapple, citrus and cotton, are channelled through well-organised and institutionalised marketing structures. Likewise, timber and woodpulp enjoy established and effective marketing systems, as does tobacco with its single-channel tobacco cooperative. Livestock, mainly cattle, are usually sold at dipping tanks (used for tick control) or directly to a single company, the Swaziland Meat Corporation.

In contrast, most of the crops currently being produced on SNL are marketed through less-sophisticated channels. A high proportion of the locally-produced maize is consumed by producers and their families or is traded locally. However, some limited surpluses do reach the larger commercial market; these are often purchased for resale by the Swaziland Milling Company or the Central Cooperative Union of Swaziland (CCU).

The main marketers of vegetables are market women who obtain their stocks directly from producers or from hawkers and wholesalers. They often buy bulk quantities and repackage them into smaller polyethylene bags. Such retailers are numerous in the main markets and are characterised by lack of competition, particularly with regard to price.

#### b. Credit

Institutional agricultural credit is well developed in Swaziland, but it is geared primarily to the needs of the commercial sector. Credit is available to farmers from three principal sources: the Swaziland Development and Savings Bank (SDSB), commercial banks, and processing companies.

In general, SNL farmers have access only to the facilities of the SDSB. Under its Agricultural Advisory Credit Scheme, financed mainly with assistance from USAID, SDSB extends seasonal loans which carry a concessional rate of interest of 6 percent per annum. Since cattle are the primary source of collateral, small farmers without cattle can only obtain credit if relatives or friends are willing to pledge their cattle to secure the borrowers' loans. The use of these loans is restricted to the purchase of agricultural inputs, small farm implements and, in some cases, dairy cows from the MOAC.

Two firms are the main suppliers of fertiliser in the country, with each company providing about 50 percent of the total NPK (nitrogen, phosphate, potassium) requirements. These firms sell fertiliser directly to the ITFs. Sales to SNL farmers are made through the CCU, which orders half of its requirements from each company, and then sells the fertiliser through one of its District Unions or primary cooperative societies to small farmers.

#### 7. Food security

The current drought affecting southern and southeastern Africa highlights the precarious food security situation in Swaziland. In 1983, maize production was reduced by drought to 50 percent of normal; and subsequently maize import needs in 1983-84 were estimated to be over 100,000 T, or about double the normal. The Government has requested assistance to cope with food shortages.

Even before Independence in 1968, however, the issue of food security was an important one in Swaziland. A major objective of the late King Sobhuza II was for the country to achieve self-sufficiency in the production of maize, its basic food crop. This objective was not only stressed repeatedly by His Majesty, but also was prominently included in all three of the country's five-year development plans. A considerable portion of the available resources of the RDAP has also been directed to this end.

However, in spite of the GOS's objectives, the gap between maize production and consumption continues to widen. Whereas in 1975 about 25,000 MT were imported, that figure has now nearly quadrupled. At present, maize output appears to be stagnating, with a reduction in area planted not sufficiently compensated for by an increase in yield. As a result, additional imports are necessary for per capita consumption levels to be maintained.<sup>24</sup> Consequently, the importation of maize and other cereals has been increasing steadily. The major source of such imports is the RSA. The gravity of this trend can be more readily appreciated when the two factors of population growth and present maize yields are taken into consideration. Swaziland's human population is growing at an annual rate of about 3 percent, thereby adding over 20,000 persons to the total population each year. Meanwhile, maize yields on SNL (including RDAs) average 1.0 to 1.2 T/ha. Thus, either additional maize land must be added annually, maize yields must be increased substantially each year, or maize imports must continue to rise. Fully cognizant of the seriousness of a Food Security Assistance Scheme Mission designed to "identify the food security policy and programme needs of the country and to advise on the establishment of security reserves."<sup>25</sup>

The Mission's report recognised that several constraints must be overcome for Swaziland to achieve a higher level of self-sufficiency in maize production. These include:

- o The lack of clearly-defined policies to implement GOS food self-sufficiency strategies and follow through with action programmes. This makes it difficult to interrelate production with consumption, distribution and nutrition;
- o The fact is that the traditional land tenure system limits SNL farmers to a small area, despite the fact that sufficient area exists to produce maize to fully satisfy expanding food requirements. This system must be adapted to accommodate modern agriculture; and
- o The failure of the agricultural research programme in Swaziland to keep pace with Government strategies and programmes. The programme must be reoriented to meet the needs of small farmers and to be incorporated into the extension system.

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<sup>1</sup>Swaziland simply does not have enough educational "places". For example, in 1976 the ratio of total enrollment to the population in the standard age group for primary education (6-12 years) was 90 percent, indicating that only nine out of ten of the 120,000 youngsters in that age group would have a place. Between one-fifth and one-quarter of those actually enrolled in primary school were over-aged. Thus, more than one out of ten aspirants in the standard age group were actually without places. Likewise, in 1976, the ratio of lower-secondary enrollment to the population in its standard age-group (13-15 years) was 38 percent and the corresponding figure for the upper-secondary bracket was 17 percent--which meant that 83 percent of those in the latter age bracket were, for whatever reason, unable to attend classes.

<sup>2</sup>The Government of Swaziland, The Third National Development Plan 1978/79 - 1982/83 (Mbabane: GOS, 1984), p. 33-34.

<sup>3</sup>Ibid., p. 74.

<sup>4</sup>Prime Minister's Office, Economic Review, 1978-1982, 1982.

<sup>5</sup>Mr. Peter Linsey, Financial Controller, RDAP Management Unit, personal interview, 1983.

<sup>6</sup>Although the demand for tractor ploughing is high, the scheme is losing money at the rates it charges for its services (which are the same as those of private tractor operators for comparable work). These losses are due to high costs to the point that the RDA tractor-hire service would have to charge at least twice as much as it currently does to break even. There are at present some 300 privately-owned and 34 government-owned tractors operating in the RDA.

<sup>7</sup>See the Economic Planning and Analysis Section, Ministry of Agriculture and Cooperatives, "A Study on the Alternatives Available for Estimating Costs of Achieving Maize Self-Sufficiency," 1977, and Prime Minister's Office, Economic Review, 1978-1982, 1982: also, A. Low, "Farm Household Theory and Rural Development in Swaziland," Development Study No. 3, Department of Agricultural Economics and Management, University of Reading, 1982.

<sup>8</sup>U.S. Agency for International Development, Congressional Presentation Fiscal Year 1985, Annex I: Africa, (Washington: USAID, 1984), p. 521.

<sup>9</sup>The World Bank, Accelerated Development in Sub-Saharan Africa: An Agenda for Action (Washington: World Bank, 1981), pp. 164-65.

<sup>10</sup>Ministry of Agriculture and Cooperatives, Rural Development Areas Programme, Annual Report 1982 (Mbabane: GOS, 1983).

- <sup>11</sup>Ibid.
- <sup>12</sup>Economic Planning and Analysis Section, Ministry of Agriculture and Cooperatives, Crop Profitability Guide Book (Mbabane: GOS, 1982).
- <sup>13</sup>Research Division, Ministry of Agriculture and Cooperatives, "Research Advisory Bulletin No. 1977" (Mbabane: GOS, 1978).
- <sup>14</sup>A. Low, "The Economics of Fertilizer Use on Swazi Nation Land," Mimeographed paper (Reading, Pa: University of Reading, 1982).
- <sup>15</sup>Economic Planning and Analysis Section, "Alternatives Available for Estimating Costs of Achieving Maize Self-Sufficiency," 1977, and A. Low, "Farm Household Theory," 1982.
- <sup>16</sup>Although figures are not available for the current year (1984), there is little question but that yields of maize and other crops have fallen dramatically as a result of the drought affecting the area. In fact, Swaziland, like many of its neighbours is now receiving food aid.
- <sup>17</sup>Ministry of Agriculture and Cooperatives, Rural Development Areas Programme, Annual Report (Mbabane. Government of Swaziland, 1982).
- <sup>18</sup>Crop Profitability Guide Book, 1982.
- <sup>19</sup>Central Statistical Office, Government of Swaziland, Mbabane.
- <sup>20</sup>Ibid.
- <sup>21</sup>Mr. Frank Buckham, Chief Research Officer, personal interview, 1983, and Crop Profitability Guide Book, 1982.
- <sup>22</sup>Ministry of Agriculture and Cooperatives, Rural Development Areas Programme, Annual Report (Mbabane: Government of Swaziland, 1982).
- <sup>23</sup>Crop Profitability Guide Book, 1982.
- <sup>24</sup>FAO, "Report of the Food Security Policy Formulation and Project Identification Mission to Swaziland." 1981.
- <sup>25</sup>Ibid.

### III. AGRICULTURAL RESEARCH INSTITUTIONS

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

Most agricultural research in Swaziland historically has fallen under the aegis of what is now the Agricultural Research Division (ARD) of the Ministry of Agriculture and Cooperatives (MOAC). In addition, agriculture-related research is being carried out by the University of Swaziland as well as by five private and/or parastatal companies. The latter generally carry out research directly related to the specific plantation crops grown and processed by them. The advisory National Research Council (NRC) is responsible for suggesting research priorities in all areas, including agriculture, which is dealt with by its Sub-Committee for Agriculture.

The major research activities, funding and staff levels of the two major research institutions, the ARD and the University of Swaziland, are shown in Table 6.

#### B. Agricultural Research Institutions

##### 1. Agricultural Research Division of the Ministry of Agriculture and Cooperatives

##### a. Organisational structure and purpose

Agricultural research began in Swaziland in 1959 with the establishment of the Agricultural Research Division of the MOAC. The National Agricultural Research Centre was established at Malkerns in 1962. Substations were later established at Big Bend in the Lowveld, at Nhlanguano and Luve in the Middleveld, and at Mangcangco and Hebron in the Highveld. In 1972, responsibility for research was transferred to the College of Agriculture of the University of Botswana, Lesotho and Swaziland. It remained there until 1978 when it was transferred back to the MOAC.

At that time, the ARD was criticised because its research was carried out by an all-expatriate staff and was focussed on the needs of the estates and larger title deed owners, rather than on those farming small plots on SNL. To counter this focus on larger farms and on monoculture, and to add resources to the ARD, assistance was sought and obtained by the GOS from the Food and Agricultural Organization of the United Nations (FAO). The FAO provided two social scientists to the ARD; these persons were to obtain socioeconomic information which would assist the ARD in determining the nature and composition of the research needed to accomplish national goals. In particular, they were to focus their efforts on the GOS's goals aimed at meeting the needs and aspirations of Swazi families within the RDAP. This project was superceded in fiscal year 1982-83 by USAID's larger and more comprehensive Cropping Systems Research and Extension Training Project (CRSP).

SWAZILAND: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

Table 6: Agricultural Research Institutions: Funding, Location, Activities and Staff, 1984

<u>Institution</u>	<u>Funding</u>		<u>Location of Headquarters</u>	<u>Principal Research Activities</u>	<u>Number of Staff</u>				
	<u>Source</u>	<u>Amount (US\$)</u>			<u>Profes- sional</u>	<u>Adminis- trative</u>	<u>Technical<sup>a</sup></u>	<u>Support Services</u>	<u>Total</u>
Agricultural Research Division	National, Private <sup>b</sup> , Donor	600,683 66,400 2,278,201	Malkerns	Maize, Beans, Soybeans, Cotton, Fruit and Vegetables, Wheat, Cowpeas, Mungbeans	14	1	26	6	47
	Private <sup>c</sup>	41,500		Forestry Research	1	-	-	-	1
University of Swaziland	National, Donor <sup>d</sup>	24,900 58,100	Luyengo	Intercropping Project: maize/pumpkins	10	-	8	-	18
TOTAL		<u>3,069,784</u>			<u>25</u>	<u>1</u>	<u>34</u>	<u>6</u>	<u>66</u>

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

<sup>b</sup>Swaziland Cotton Board.

<sup>c</sup>Usuthu Pulp Company.

<sup>d</sup>International Development Research Council of Canada.

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

The ARD, at present, is an integral unit of the MOAC's Department of Research and Planning. The Chief Research Officer, who is responsible for the operation of the Division and its personnel, reports to the Director of Research and Planning, who in turn reports to the Permanent Secretary.

The administrative offices of the ARD are located at Malkerns. Research is carried out there and at the Lowveld and Nhlanguano Research Stations, as well as on research plots at Luvu, Mangcongco and Hebron.

b. Research programmes

At the time research authority was transferred back to the MOAC in 1978, 14 areas of agricultural research were being pursued, as follows:

- o Crop agronomy;
- o Horticulture;
- o Veld and pasture management;
- o Dryland crop production;
- o Soil fertility and crop nutrition;
- o Soil chemistry;
- o Soil physics;
- o Plant pathology;
- o Entomology;
- o Cotton breeding;
- o Cotton entomology;
- o Biometry;
- o Forestry; and
- o Pineapples.

The ARD is currently concentrating its research activities on the area of food crops. Work is also being done with cash crops which are mostly for export and are grown by smallholders. Some attention is given to seed production and multiplication. The ARD is not carrying out research in animal husbandry or veterinary science. Although the Malkerns station has a small dairy herd and carries out some pasture

and nutrition studies, serious problems of erosion resulting from overstocking and overgrazing are not being addressed by the ARD. The major agricultural research programme is the USAID-sponsored CSRP. In addition, some other commodity-specific research is funded by private and parastatal organisations.

(1) The Cropping Systems Research and Extension Training Project

The objectives of the CSRP are clearly in accord with GOS policy, in that it seeks to "increase the economic viability of farming on Swazi Nation Land."<sup>1</sup> The research emphases of the CSRP continue to be on food crops, including vegetables and some fruits, and some cash crops. Certain export crops (especially cotton) also receive attention. Such research is hoped to enhance agricultural production and the quality of rural life. The methodology followed by the project is basically that developed and employed by the International Centre for Maize and Wheat Improvement (CIMMYT); it consists of various cropping combinations and techniques designed to reduce the constraints faced by small farmers on SNL. The experiments are carried out on the land of volunteer or cooperating farmers. The trials seek to discover the means to overcome obstacles to improved production, using methods that are relevant both to small farm household needs and goals and to their existing natural, human and financial resources bases. Solutions are being sought, for example, which do not require long-term capital investment or enabling legislation. The CSRP not only provides demonstrations to both the farming community and extension workers, but also serves as a useful source of in-service training for the GOS's research scientists and others.

(2) Maize project

The objective of the multi-location maize variety trial is to identify high-yielding, stable and adaptable maize cultivars. Trial results serve as the basis for recommendations formulated about the maize varieties which are most suitable for local use.

(3) Sovbean project

Varieties from worldwide soybean collections are provided to the ARD through the International Soybean Program of the University of Illinois (INTSOY). These varieties are evaluated under varying ecological zones to determine their potential applications. The MOAC's Home Economics Section uses superior varieties in small-scale, on-farm agronomic and nutrition demonstrations.

(4) Wheat project

A wheat production and screening trial is underway. Its objective is to determine and evaluate the yield potential, disease resistance and quality of various wheat cultivars.

(5) Cotton breeding and entomology project

The purpose of this project is to identify cotton varieties adapted to local ecological systems and environments which are high-yielding, have high ginning percentages and a fibre quality acceptable to the commercial spinners. Research on the control of cotton pests is also done under this project. The project funding is divided between the Swaziland Cotton Board and the ARD.

The Cotton Board annually provides about US\$ 70,000 for recurrent costs, including the salary of the expatriate cotton entomologist which is supplemented by the ODA; the ARD provides housing for the entomologist, laboratory facilities, land and support staff.

(6) The mungbean project

The objectives of the Mungbean seed multiplication project are to multiply promising cultivars and to make seeds available to farmers.

Mungbean variety trials are also being conducted on their resistance to cercospora leafspot. These trials are designed to determine promising high-yielding varieties which are resistant to certain foliar diseases. Varieties for testing are provided by the Asian Vegetable Development and Research Centre (AVDRC).

The Mungbean management practices trial activity is focussed on evaluating agronomic management practices in order to evolve a suitable mungbean agronomic production package.

c. Human resources

The number of professional, administrative, technical and support staff of the ARD is shown in Table 6. At present, all but two of the ARD's professional authorised posts are filled by Swazi nationals. The two expatriates are a cotton entomologist, whose salary is paid by the Swazi cotton Board and supplemented by the British ODA, and a dryland crops agronomist, whose salary is paid by the GOS.

However, the number of personnel presently available to the ARD prevents it from making progress on long-term research activities until those staff members who are in training overseas return to their posts and become involved in the ongoing applied research. The first of these newly-trained personnel returned in 1983; the rest will

return over the next three years. The addition of Swazi socioeconomic research capability should provide valuable inputs to the CSRP work on cooperating farms, especially those on SNL.

Expatriate personnel assigned to the five-year CSRP consist of seven professionals and a Chief of Party, for a total of 40 person-years. Two of the seven professionals, the information and extension officers, are posted in Mbabane at the MOAC Headquarters. The remaining five are posted at Malkerns Research Station and are involved in cropping systems research. They include an agronomist, a horticulturalist, an agricultural economist, a rural sociologist and an irrigation specialist. The Chief Research Officer of the ARD is designated as the counterpart of the CSRP Team Leader. The other expatriates in the project have counterparts in the ARD, with the exception of the two project officers stationed in Mbabane, whose counterparts are in the Division of Extension Services (DES). In addition, ten of the 26 technicians of the ARD are assigned to the CSRP project.

d. Research facilities

(1) Malkerns Research Station

(a) Land

The Malkerns Research Station, the main research station of the ARD, has approximately 400 ha of land for its administration building, various offices, laboratories, greenhouses and staff housing. The experimental farm consists of about 320 ha of deep reddish-brown soils, located in an area of the Middleveld where annual rainfall approximates 1,200 mm. Sixty percent of the station's research farm land is used for experimental plots, 15 percent for seed multiplication, and 25 percent for farm cropping systems research. The major types of projects include research on horticultural crops, cereals, grain legumes and cultivated pasture. There are 73 ha of irrigated land, all of which are used for horticultural experiments.

(b) Buildings

There are three laboratories in fair condition, with a total floor space of about 400 m<sup>2</sup>. They are used for general research, including soils study, plant material analysis, and entomological research. The Malkerns Research Station also houses the ARD's administrative offices. Three office blocks, with a combined floor space of some 800 m<sup>2</sup> (including a library with 100 m<sup>2</sup>), are in fair condition. Staff housing is provided in several buildings on the station property.

(c) Equipment

The most important equipment at Malkerns consists of two spectrophotometres, one centrifugal pump, nine tractors, one baler, one land-plane, two lorries, two pickups and one fertiliser applicator. The Division also has three Apple II computers.

(d) Library

The ARD's main library is at Malkerns. It has approximately 5,000 volumes and acquires about 50 more each year; it also receives 11 periodicals and scientific journals on a regular basis. The Division has linkages with other libraries, such as those at the two campuses of the University of Swaziland and at the Universities of Botswana, Pretoria, and Melbourne (Australia). During the past five years, due largely to the transfer and start-up difficulties described earlier, the ARD has produced no significant publications.

(2) Lowveld Research Station

The experimental farm at the Lowveld Research Station, near Big Bend, consists of 150 ha of duplex dark soils, of which 7 ha are irrigated. The station has an average annual rainfall of some 800 mm.

Nearly 70 percent of the farm area, including all of the irrigated land, is dedicated to experimental plots. Ten percent is used for seed multiplication; the remaining 20 percent is devoted to farming systems research. For some time the Lowveld Station has emphasised irrigated agronomy, cotton entomology and breeding, pest control, and dryland farming research.

The Lowveld Station has two laboratories in fair condition, with a combined floor space of 200 m<sup>2</sup>. One of these is used for research in cotton entomology, and the other for cotton breeding. There also are one block of administrative offices in good condition, one repair workshop (360 m<sup>2</sup>) and one storage shed (400 m<sup>2</sup>) in good condition. The station has two pickup trucks and three tractors.

(3) Nhlangano Research Station

The Nhlangano Research Station has a farm with more than 90 ha of unirrigated land. Since it is also in the Middleveld, soil and climatic conditions are similar to those at the Malkerns Station. Approximately 80 percent of the farm land is used for experimental plots, with seed multiplication accounting for the remaining 20 percent. The station has an administrative office in good condition, and a storage shed with a floor space of approximately 200 m<sup>2</sup>, which is in poor condition.

#### (4) Experimental plots

In addition to the research stations noted above, the ARD has three experimental plots, each under 20 ha. These are located at Luvu in the Middleveld, and at Mangongco and Hebron in the Highveld.

#### e. Financial resources

In the 1983-1984 fiscal year, the GOS's contribution to the ARD's capital and recurrent budget was E 723,714 (US\$ 600,683). In addition, the Swaziland Cotton Board contributed E 80,000 (US\$ 66,400). USAID's contribution to the ARD budget was E 2,744,820 (US\$ 2,278,201). While most is spent at Malkerns, the Lowveld Research Station (Big Bend) receives about one-fourth of the budget and a somewhat lesser amount is spent at the Nhlanguano Station.

Almost all of the ARD programmes are funded by the GOS. However, some of the research funds for research on specific commodities are provided by the Swaziland Cotton Board, the Pineapple Association and the sugar and forestry industries. The GOS is reimbursed, in part, for office and laboratory space and staff housing for research officers of the pineapple and forestry programmes conducted on ARD stations.

The total costs of the five-year CSRP are paid by the GOS, the U.S. Peace Corps and USAID, who contributed US\$ 4.4 million, US\$ 55,000 and JSS 12.9 million, respectively.

#### 2. Faculty of Agriculture of the University of Swaziland

Members of the Faculty of Agriculture at the Luyengo Campus of the University of Swaziland are carrying out a five-year research project to improve the productivity of subsistence farmers' intercropping patterns, particularly of maize with pumpkins and other crops. Ten researchers, assisted by eight technicians, carry out the project, working only part-time on it.

The experiments sponsored by the project are carried out on approximately 2.4 ha of land belonging to small cooperative farmers in the area. As both the Luyengo campus and the farms are in the Malkerns Valley, climatic conditions and soil types are similar to those at the Malkerns Research Station. The technologies tested are readily available to small farmers. In order to disseminate the projects' findings, field day demonstrations are held in conjunction with those sponsored by the Malkerns Research Station.

The project is jointly financed by the Canadian International Development Research Centre (IDRC) and the University. The budgeted capital expenditures for fiscal years 1979-1980 and 1981-1982, averaging US\$ 20,000 per year, were provided in equal shares by both the IDRC and the University, although the University's contribution

was in-kind only. The annual recurrent budget for the project over the same period averaged US\$ 26,000 and was provided by the IDRC. However, the University was committed to contributing US\$ 54,000 toward recurrent costs of the project, in accordance with the project document signed by both sponsors. Implementing the project's work-plan has been more difficult than anticipated because the University did not make its contribution to the recurrent costs.

In assessing the problems facing the project, the staff gave highest importance to the need for additional financial support to compensate for the lack of recurrent cost contributions by the University. Other problems cited were that the junior technical staff working on the project are in need of further training to the BSc level and that the service and maintenance staff also need more training. Lastly, it was emphasised that sufficient equipment is unavailable and maintenance for that which is available is very unsatisfactory.

### 3. Commercially-sponsored agricultural research

#### a. Libby's Swaziland Fruit Cannery

Libby's Swaziland Fruit Cannery, a subsidiary of Nestle's, adjoins the Malkerns Research Station. Its main concern is the processing and canning of pineapples, although citrus juices and fruit are also canned from time to time. It has a one-person unit carrying out research related to company objectives, i.e., improving yields and lowering unit costs. The research officer has a MSc degree in agronomy. He exchanges information with the Pineapple Research Institute in Hawaii, the Pineapple Research Station in East London (South Africa) and the Malkerns Research Station. The company provides demonstrations and field days for private pineapple growers. Statistics relating to production on the company's farms, output of the factory, and Libby's budgetary allocations for research are considered classified information and were not made available for this report.

#### b. Usuthu Pulp Company

The Usuthu Pulp Company (UPC) is the largest of several timber-growing companies in the country and has a pulp mill at Bhunya which produces about 140,000 MT of pulp a year. It has one soil scientist, an expatriate with a bachelor's degree, carrying out silviculture research related to the maintenance and improvement of forest productivity. Facilities at the Malkerns Research Station, including laboratory and office space and housing, are made available to the forest research officer, with the stipulation that all of his findings be made available to the other timber-producing companies in the country. He is assisted by one technician.

The annual recurrent budget for this unit, provided by the Usuthu Pulp Company, ranges from US\$ 40,000 to US\$ 45,000.

c. Sugar estates

The Simunye Sugar Estate, also referred to as Swaziland's "third sugar mill", produces sugar for export, as do the country's two other sugar-growing/refining complexes. Since the research carried out at all three estates is similar, the following consideration of Simunye's agricultural research also describes the research carried out by all three sugar operations.

The research programme is designed to maximise sugar yields and returns. All aspects of agronomic research related to sugarcane are addressed, including trials of fertiliser rates, pest and disease control, herbicides, ripeners, new varieties and irrigation.

The research unit at Simunye consists of three researchers and six technicians. One of the research officers and all six of the technicians are nationals; the remaining two research officers are expatriates. The two expatriate researchers have bachelor's degrees in agronomy, while the national has a diploma in agriculture. The head of the research unit stated that the company wishes to send two nationals overseas to earn bachelor's degrees in agronomy and to train one for a diploma and two for certificates locally or elsewhere in Africa.

The research unit meets regularly with the Swaziland Sugar Association Extension Committee and the Swaziland Sugar Cane Agronomists Association; it interacts less frequently with the South Africa Sugar Association Experiment Station and the South Africa Sugar Industry Agronomists Association.

The recurrent budget expenditure for the Simunye research unit for 1980-1982 amounted to US\$ 220,000 and was supplied by the company.

d. Swaziland Irrigation Scheme--Inyoni Yami

The Swaziland Irrigation Scheme (SIS), funded by the Commonwealth Development Corporation (CDC) of London, is concerned with three programme areas: Iysis Sugar Estates, Tunzini Citrus Estate and Iysis Livestock. For all three, the major objective is to improve productivity and economic returns.

As in the case of the other estates growing sugarcane, SIS trials associated with sugarcane include soil salinity, drainage, irrigation, fertiliser, ripeners and cultivation practices. Citrus experimental trials relate to soil types, the effects of irrigation and drainage, and pest and disease control. Livestock trials are being conducted relating to bush encroachment and control.

Personnel of the research unit include three researchers and four technicians. The research officers (all expatriates) have master's degrees in agricultural agronomy, soil agronomy and entomology, respectively. A national is currently undergoing training for a bachelor's degree in agriculture. The company plans to send three additional nationals to the University of Swaziland for bachelor's degrees in agriculture and another three to a developed country to earn master's degrees in soil science, entomology and agronomy, respectively.

The average capital budget for the period 1980-1982 amounted to US\$ 5,000. The recurrent budget for the same period totalled US\$ 80,000.

The staff, in assessing problems impeding the unit's ability to achieve its purposes, emphasises the need to train nationals for both senior and junior technical posts.

### C. Human Resources Available for Research in Swaziland

#### 1. Staffing patterns

The numbers of persons engaged in agricultural research in the two major research institutions, the ARD and Faculty of Agriculture, are shown in Table 7. This table illustrates the very high percentage of expatriates who hold professional and administrative positions: while only two expatriates, both with BSc degrees, hold authorised posts in the ARD; five more expatriates provided by USAID hold non-authorised posts. Thus, nearly one-half of ARD's 15 professional positions are occupied by expatriates.

The country's professional staff effort is distributed by programme area as follows: 50 percent to food crops, 23 percent to farming systems, and 12 percent to commercial crops. (See Table 8.) The training of the professionals who work in those areas is shown in Table 9.

The academic background of the agriculture research professionals is summarised in Table 10. There are four Swazi nationals with MSc degrees, one each in plant breeding (currently serving as Chief Research Officer), plant pathology, agricultural engineering and rural sociology.

All of the eight persons who hold PhD degrees are expatriates. Three of the nine Swazi professional researchers are women; while none of the 17 expatriates are women.

SWAZILAND: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

Table 7: Total Agricultural Research Staff, 1984

	<u>Administrative</u>	<u>Professional<sup>a</sup></u>	<u>Technical<sup>b</sup></u>	<u>Support Staff</u>	<u>Total</u>
<u>Total Authorized Posts</u>	1	25 <sup>c</sup>	36	6	68
<u>Positions Vacant</u>	-	1	2	-	3
<u>Nationals (Citizens)</u>					
Staff in training	-	5	-	-	5
Staff on long-term leave	-	-	-	-	-
Number of nationals currently in authorized posts	1	8	34	6	49
Expressed as a percent of authorized posts	100	32	94	100	
<u>Expatriates</u>					
Serving in authorized posts <sup>d</sup>	-	11	-	-	11
Expressed as a percent of authorized posts	-	-	-	-	-
Not in authorized posts	1	5	-	-	6
Total number of expatriates	1	16	-	-	17
<u>Total Number of Staff</u>	<u>2</u>	<u>24</u>	<u>34</u>	<u>6</u>	<u>66</u>

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

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

<sup>c</sup>Of the 25 researchers reported, 10 are employed by the University of Swaziland in its Inter-Cropping Project and devote not more than 30 percent of their time to agricultural research.

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

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

SWAZILAND: AGRICULTURAL RESEARCH RESOURCE ASSESSMENT

Table 8: Summary of Professional Staff Effort and Source of Funds by Programme Area of Agricultural Research, 1984<sup>a</sup>

<u>Commodity-Related Programme Area</u>	<u>FTE<sup>b</sup></u>	<u>Source of Funds</u>	<u>Percentage of National Research Effort</u>
<u>Food Crops</u>			
Maize			
Sorghum			
Pulses			
Pumpkin			
Subtotal, Food Crops	<u>13</u>	GOS/USAID	<u>50</u>
<u>Commercial Crops</u>			
Cotton	1	Swaziland Cotton Board (private)	4
Fruit/Vegetables	1	GOS/USAID	4
Forestry	<u>1</u>	Usuthu Pulp Co. (private)	<u>4</u>
Subtotal, Commercial Crops	<u>3</u>		<u>12</u>
<u>Other Programme Areas</u>			
Farming systems	6	USAID	23
Irrigation	2	GOS/USAID	7.5
General administration	<u>2</u>	GOS/USAID	<u>7.5</u>
Subtotal, Other Programme Areas	<u>10</u>		<u>38</u>
TOTAL	<u>26</u>		<u>100</u>

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

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

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

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Table 9: Training of Professional Staff Related to Agricultural Research Programme Area, 1984

Programme Area	Number of Professionals						Total
	Nationals			Expatriates			
	BSc	MSc	PhD	BSc	MSc	PhD	
<u>Food Crops</u>							
Maize	1	-	-	1	-	8	10
Sorghum	1						1
Pulses	1						1
Pumpkin	1						1
Subtotal, Food Crops	<u>4</u>	<u>-</u>	<u>-</u>	<u>1</u>	<u>-</u>	<u>8</u>	<u>13</u>
<u>Commercial Crops</u>							
Cotton	-	1	-	1	-	-	2
Forestry	-	-	-	1	-	-	1
Subtotal, Commercial Crops	<u>-</u>	<u>1</u>	<u>-</u>	<u>2</u>	<u>-</u>	<u>-</u>	<u>3</u>
<u>Other</u>							
Farming Systems	-	1	-	3	2	-	6
Irrigation	-	1	-	1	-	-	2
Subtotal, Other	<u>-</u>	<u>2</u>	<u>-</u>	<u>4</u>	<u>2</u>	<u>-</u>	<u>8</u>
TOTAL	<u>4</u>	<u>3</u>	<u>-</u>	<u>7</u>	<u>2</u>	<u>8</u>	<u>24</u>

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

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Table 1C: Summary of Technical Skills of Agricultural Research Professionals by Degree Held, 1984

Discipline Areas	Nationals								Expatriates							
	BSc		MSc		PhD		Subtotal		BSc		MSc		PhD		Subtotal	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
General agriculture	1	3	-	-	-	-	1	3	-	1	-	-	-	-	-	1
Agronomy	-	1	-	-	-	-	-	1	-	1	-	-	-	3	-	4
Entomology	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	2
Horticulture	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	2
Plant breeding	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-
Pathology	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-
Agric. engineering	-	-	-	1	-	-	-	1	-	-	-	1	-	-	-	1
Extension spec.	-	-	-	-	-	-	-	-	-	2	-	-	-	1	-	3
Rural sociology	-	-	1	-	-	-	1	-	-	-	-	-	-	1	-	1
Agric. economist	-	-	-	-	-	-	-	-	-	1	-	1	-	1	-	3
Subtotal	1	4	2	2	-	-	3	6	-	7	-	2	-	8	-	17
TOTAL	<u>5</u>		<u>4</u>		<u>-</u>		<u>9</u>		<u>7</u>		<u>2</u>		<u>8</u>		<u>17</u>	

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

## 2. Staff training

Three Swazis have recently left for the US for MSc training. All four research staff members currently receiving education at the master's level are in crop sciences; one of these is a woman. Another staff person is currently receiving training for a BSc degree.

Plans for future training included educating three more Swazis to the MSc level (one male and one female in crop sciences, and one male in economics).

### D. Financial Resources Available for Research in Swaziland

Agricultural research programmes in Swaziland have been supported by various CDA donors. The UK has supported the ARD of the MOAC since its inception in 1959. US funding has been dedicated to the CSRP, which aims to increase the economic viability of farming on SNL. Canada supports research on the improvement of subsistence farmers' intercropping practices being conducted by the Faculty of Agriculture of the Luyengo Campus of the University of Swaziland. Details of the donor funding are shown in Table 11 and show a total contribution of US\$ 2.3 million for the 1983-1984 fiscal year.

The Government of Swaziland provided US\$ 625,583 and private companies US\$ 107,900. (See Table 7.) Thus, of a total of US\$ 3,069,784 available for the agricultural research programmes of the ARD and University of Swaziland, 76.1 percent was provided by donors.

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<sup>1</sup>Prime Minister's Office, Third Five-Year Development Plan, 1978-1982 (Mbabane: GOS, 1983).

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Table 11: Donor-funded Agricultural Research Activities, 1984<sup>a</sup>

<u>Donor Country</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 (US\$)</u>
United States (USAID)	Farming systems	Improved small farmer productivity	1981-1986	6	600,683	2,278,201
Canada (IDRC)	Inter-cropping <sup>b</sup>	Improved small farmer productivity	1980-1984	8	24,900	58,100
51 TOTAL				14 ==	625,583 =====	2,336,301 =====

<sup>a</sup>Agricultural Research in Swaziland has been funded in part by the British Government since its inception in 1959. The U.K. provided research officers and the Swaziland Government provided all the support staff. At present, the research staff have only one research officer (a Cotton Entomologist) on a British Technical Assistance Contract.

<sup>b</sup>Managed by the University of Swaziland.

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

## IV. AGRICULTURAL TRAINING INSTITUTION

### A. Overview of Agricultural Training in Swaziland

Higher education and training in agriculture is the responsibility of the Faculty of Agriculture of the University of Swaziland at Luyengo. The University was originally established in 1964 as the University of Botswana, Lesotho and Swaziland (UBLS) with headquarters in Lesotho. The Swaziland Agricultural College and University Centre at Luyengo was opened in October 1966. In 1975, Lesotho withdrew from UBLS in order to establish its own university. In 1982, Botswana also withdrew, and the institution was renamed the University of Swaziland (UOS).

The UOS has two campuses: one at Luyengo, which houses the Faculty of Agriculture, and the other at Kwaluseni, which provides higher education in the humanities and social sciences.

### B. The Luyengo Campus of the University of Swaziland

#### 1. Organisational structure and purpose

The Faculty of Agriculture of the University of Swaziland provides agricultural training at the certificate-, diploma- and BSc degree-levels. The specific fields and numbers of students enrolled at each level are shown in Table 12.

In an attempt to improve the extension officer-to-farmer ratio in accordance with the targets contained in the Third Five-Year Development Plan (1978-82), the MOAC reestablished a certificate training course in general agriculture in 1977, making it a one-year programme. Dropped by the UOS in 1972, the certificate programme is now the primary source of new field officers for the MOAC. The Ministry leases facilities from the UOS and ensures that 40 students are enrolled each year. Financial support is provided by the European Economic Community (EEC).

#### 2. Training programmes

Certificates, diplomas and BSc degrees are offered in agriculture. Two additional diploma programmes are offered in agricultural education and home economics.

There are currently 40 students enrolled in the certificate programme, 90 in the three diploma programmes, and only 11 in the BSc programme.

Over 98 percent of student funding comes from GOS loans which must be paid back once students finish their courses and begin working. The remaining funds come from grants and family sources.

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Table 12: Agricultural Training Institutions: Degrees Offered, Number of Staff and Students, 1984

<u>Name of Institution</u>	<u>Degrees, Diplomas, or Certificates Offered</u>	<u>Number of Staff<sup>a</sup></u>	<u>Enrollment</u>		
			<u>F</u>	<u>M</u>	<u>Total</u>
University of Swaziland Faculty of Agriculture	Certificate in Agriculture	42	7	33	40
	Diploma in Agriculture		7	32	39
	Diploma in Agr. Education		2	14	16
	Diploma in Home Economics		35	-	35
	BSc in Agriculture		3	8	11

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<sup>a</sup>Includes all but support staff.

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

The majority of university graduates find employment in either the MOAC or the Ministry of Education. A few find employment with the Swaziland Development and Savings Bank, which has an agricultural credit section, or in the private sector. There is evidence that employment opportunities for graduates in government services are becoming relatively limited, especially for diplomates.

With the exception of ad hoc personal contacts, the UOS has no formal linkages with the ARD, even though the Malkerns Station is only 3 km away. The University does extend its services to other segments of the community. These services include a five-month course in animal production offered to the staff of the prison farms, open field days for agricultural extension staff, and one-day in-service training courses for agricultural education teachers. Special courses are offered for approximately 15 field-level extension officers and 40 agricultural education teachers each year.

### 3. Human resources

The faculty consists of 30 full-time senior teaching staff, of which six are away on educational leave and 13 are expatriates. (See Table 13.) More than one-half of the professional teaching positions currently filled thus are held by expatriates. However, the Dean is a Swazi, as are all 17 technical officers and seven support personnel on the UOS staff.

The disciplines and levels of education of the teaching staff are summarised in Table 14. Ten Swazi staff members have MSc degrees, including five in food sciences and two in agricultural education. Only one has a PhD degree, it being in agricultural economics. Of the six teaching staff in training, one is working toward a doctoral degree (in crop science), three for master's degrees (two in crop science and one in animal science), and two for bachelor's degrees. Over the next ten years, an additional 21 faculty members are expected to be trained: 10 to the doctoral level, six to the master's level, and five to the bachelor's level.

### 4. Training facilities

The campus has seven classrooms in good to fair condition, with a total floor space of about 435 m<sup>2</sup>. In addition, there are five teaching laboratories in excellent to good condition with a total floor space of 583 m<sup>2</sup>. Major equipment include one spectrophotometre, five tractors, and one power tiller. The campus library has 15,000 volumes and an acquisition rate of 300 volumes per year. It also annually receives approximately 150 periodicals, scientific journals and serials. The library possesses a microfilm reader. Students have free access to the stacks and, through an inter-library loan agreement, to other libraries in Swaziland and the RSA.

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Table 13: Total Agricultural Training Staff, 1984

	<u>Administrative</u>	<u>Professional<sup>a</sup></u>	<u>Technical<sup>b</sup></u>	<u>Total</u>
<u>Total Authorized Posts</u>	1	30	19	50
<u>Positions Vacant</u>	-	-	2	2
<u>Nationals (Citizens)</u>				
Staff in training	-	6	-	6
Staff on long-term leave <sup>c</sup>	-	-	-	-
Number of nationals currently in posts	1	11	17	29
Expressed as a percent of authorized posts	100	36	89	58
<u>Expatriates</u>				
Serving in authorized posts <sup>d</sup>	-	13	-	13
Expressed as a percent of authorized posts	-	43	-	-
Not in authorized posts	-	-	-	-
Total number of expatriates	-	13	-	13
<u>Total Number of Staff</u>	<u>1</u>	<u>24</u>	<u>17</u>	<u>42</u>

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

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

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

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

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

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Table 14: Disciplines of Teaching Professionals, 1984

<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>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>			
<u>Plant/Soil Science</u>											
Crop sciences, general	-	-	-	-	-	-	-	-	-	2	2
Crop breeding	-	-	-	-	-	-	-	-	-	1	1
Agronomy	-	-	-	-	-	-	-	-	-	1	1
Entomology	-	-	-	1	-	-	-	1	-	1	1
Horticulture	-	-	-	-	-	-	-	-	1	1	1
Pathology	-	-	-	-	-	-	-	-	1	1	1
Range ecology/pasture	-	-	-	-	-	-	-	-	1	1	1
Soils (agricultural chemistry)	-	-	-	1	-	-	-	1	-	1	2
Subtotal, Plant/Soil Science	-	-	-	2	-	-	-	2	8	10	
<u>Animal Science</u>											
Animal nutrition	-	-	-	-	-	-	-	-	1	1	1
Animal pathology (health)	-	-	-	-	-	-	-	-	1	1	1
Animal production	-	-	-	-	-	-	-	-	1	1	1
Subtotal, Animal Science	-	-	-	-	-	-	-	-	3	3	
<u>Other Disciplines</u>											
Agr. economics	-	-	-	-	-	1	-	1	2	3	3
Agr. engineering	-	-	-	1	-	-	-	1	3	4	4
Extension specialists	-	-	-	-	-	-	-	-	2	2	2
Food sciences	-	-	-	5	-	-	-	5	-	5	5
Agr. education	-	-	-	2	-	-	-	2	1	3	3
Subtotal, Other Disciplines	-	-	-	8	-	1	-	9	8	17	
TOTAL	==	==	==	10	==	1	==	11	19	30	

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

The University farm consists of 316 ha; of these, 110 are cultivated and the remaining 206 are in pasture. The farm used for teaching and demonstration purposes as well as for some experiments in intercropping.

5. Financial resources

From 1980 to 1983, there was no capital budget appropriated for the Luyengo Campus, although the GOS did provide an average recurrent budget of US\$ 600,000. The Swedish International Development Agency (SIDA) provided an additional US\$ 700,000 to the FAO-executed Assistance to the Faculty of Agriculture Project which was to be completed in 1983. This assistance consists of nine experts to serve on the teaching staff, ten fellowships, and equipment. The EEC provides US\$ 80,000 each year in support of the diploma programmes.

## V. AGRICULTURAL EXTENSION INSTITUTION

### A. Overview of Agricultural Extension in Swaziland

Agricultural extension services in Swaziland are provided principally by the Division of Extension Services (DES) of the MOAC. In addition, some private and parastatal associations have a few in house extension agents who deal with commercial crops typically grown on title deed land: timber, sugarcane, citrus and pineapple. Only DES will be discussed in this chapter.

### B. Division of Extension Services of the Ministry of Agriculture and Cooperatives

#### 1. Organisational structure and purpose

According to the Senior Agricultural Officer in charge of DES, personnel of the USAID-sponsored CSRP, and others, historically there has been very little relationship between the DES and ARD-- notwithstanding the fact that they have been in the same ministry (MOAC) for the past five years. Several factors have contributed to this lack of effective linkage. Perhaps the most important is the fact that, since its establishment in 1959, the ARD has been oriented more to the needs of the larger and more prosperous privately-owned farms and estates than to those of the smaller SNL farms.

It is the desire of the GOS, however, that these two interdependent agencies work together more closely to serve the needs of the SNL farmers in general and those within the RDAs in particular. Consequently, the ARD now is reorienting its priorities to become more effective in meeting the needs of smaller farmers. Through the CSRP, formal links now exist between the DES and the ARD. Personnel of the DES are becoming increasingly involved with the activities of the ARD and are beginning to serve as channels for feedback, relaying the needs felt by small farmers to those engaged in research.

Until recently, the extension services provided by the MOAC were fragmented, with elements of extension dispersed among several units of the Ministry in accordance with the specific services provided. For example, crop extension was dealt with by the DES within the Department of Agriculture, whereas livestock extension officers dealing with poultry, fisheries, forestry and home economics came from their respective MOAC units of the Ministry. Linkages were informal and ad hoc at the working level; they became formal only at the level of the Permanent Secretary.

This system was recently changed. A unified and coordinated DES, under the technical supervision of a Senior Agricultural Officer (Extension), now exists. This Division is a component of the Department of Agriculture, whose Director reports to the Permanent Secretary.

## 2. Extension programmes

Although the Government is responsible for providing extension services to the entire agricultural community, within recent years all services have been concentrated on those farmers within the RDAs, which include about half of SNL.

Specific extension services are provided relating to the cultural practices of growing fruits, vegetables, maize, legumes, fish, and livestock, including poultry and beef and dairy cattle. Extension services also are made available to those farmers on SNL (including RDAs) who grow export crops such as cotton and tobacco. Of late, an increased emphasis has been given to cropping systems, undoubtedly due in large part to the presence of the CSRP. Lastly, services relating directly to management of rural households are provided by the Home Economics Extension Officers.

The DES staff prepares a programme on general farming information directed toward SNL farmers which is broadcast over the local radio station four times a week. The staff also prepares the Rural Area Development News, published quarterly, which consists of approximately 20 pages of farming information and news items.

With assistance from CSRP project personnel who are assigned to both the ARD and DES, the GOS' specific plans for extension are to:

- o Involve research officers in in-service training sessions being planned for extension officers;
- o Conduct area extension workers' field days at the on-farm (cropping systems) research sites;
- o Conduct combined national extension worker field days at Malkerns Research Station and the Agricultural College at Luyengo;
- o Conduct regional extension worker field days at the other Research Division stations;
- o Continue to involve all local extension workers in on-farm research trials being conducted in their areas; and
- o Involve the officers of the ARD in the teaching of the certificate course for field officers being given at the Luyengo campus of the UOS' Faculty of Agriculture.

### 3. Human resources

Excluding support staff, there are 384 authorised posts in the DES. (See Table 15.) Most of these posts are filled. The professional positions requiring a bachelor's degree have the highest percent of expatriates with about 20 percent. These posts are held by six Peace Corps Volunteers.

About 50 percent of the professional staff time is devoted to food crops, 31 percent to livestock and fisheries, 10 percent to home economics and 7 percent to forestry. (See Table 16.)

The 1983 pilot ARRA survey revealed there were 410 posts in the DES, 386 of which were filled at that time. Of these, 30 were posted at DES' headquarters in Mbabane, 85 at the district level and 263 (or 68 percent of the total) at the local level. More than 50 percent of those posted locally were field-level agronomists specialising in crops. Next in importance were livestock specialists with 11 percent of the total and home economists with 9 percent, followed by those in forestry, fisheries and horticulture. More than 20 percent of all extension workers are women.

Since the DES has been reorganised, all field-level extension workers are generalists, except for a few specialised sections such as home economics. In the 1983 pilot ARRA, almost three-fourths (71 percent) of all extension agents were educated at the certificate level, and 14 percent were diplomates. Twenty-eight men and four women had bachelor's degrees; two men and one woman had master's degrees.

Presently, the ratio of extension agents to farmers is one to 1/400 on SNL and 1/200 in the RDAs. The Government's goal included in the Third Five-Year Development Plan is to lower this to 1/200 on SNL and 1/100 in the RDAs. The DES plans to train and employ an additional 210 agents over the next few years to lower the extension agent-to-farmer ratio. All will be trained in-country. Nearly three-quarters of the new agents will be trained to the certificate level in the cooperative training programme at the Luyengo Campus of the UOS. In cooperation with the UOS, the MOAC has established a one-year certificate course for the training of 40 students per year to serve as Field Officers. Slightly less than one-fourth of the 210 agents will be trained to the bachelor's level, while ten will be trained to the master's level. It is estimated that approximately 40 percent of these will be women.

### 4. Extension facilities

The extension services are well-housed with modern offices at the MOAC's headquarters in Mbabane and at the Crop Production Offices in Manzini, which is considered the headquarters' annex. The four district offices (located in the administrative districts of Hhohho, Manzini, Shiselweni and Lubombo, each headed by a Senior

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Table 15: Total Agricultural Extension Staff, 1984

	<u>Administrative</u>	<u>Professional<sup>a</sup></u>	<u>Technical<sup>b</sup></u>	<u>Total</u>
<u>Total Authorized Posts</u>	5	32	347	384
<u>Positions Vacant</u>	-	3	22	25
<u>Nationals (Citizens)</u>				
Staff in training	-	-	-	-
Staff on long-term leave <sup>c</sup>	-	-	-	-
Number of nationals currently in posts	5	23	325	353
Expressed as a percent of authorized posts	100	72	94	93
<u>Expatriates</u>				
Serving in authorized posts <sup>d</sup>	-	2	-	2
Expressed as a percent of authorized posts	-	6	-	
Not in authorized posts	-	4	-	4
Total number of expatriates	-	6	-	6 <sup>e</sup>
<u>Total Number of Staff</u>	<u>5</u>	<u>29</u>	<u>325</u>	<u>359</u>

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

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

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

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

<sup>e</sup>U.S. Peace Corps Volunteers.

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

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Table 16: Summary of Professional Extension Staff Effort and Source of Funds Related to Programme Area

<u>Programme Area</u>	<u>Funding Source</u>	<u>FTE<sup>a</sup></u>	<u>Percentage of Total Staff Time</u>
<u>Commodity-Related</u>			
Food Crops	MOAC,		
Maize	Republic of China	15	52
Sorghum			
Millet			
Cassava			
Pulses			
Tubers			
Livestock/Fisheries		9	31
Forestry		2	7
Home economics		<u>3</u>	<u>10</u>
TOTAL		<u>29</u>	<u>100</u>

<sup>a</sup>FTE = Full Time Equivalent (professional staff only).

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

Extension Officer), five sub-district offices (Hlute, Hlatikulu, Piggs Peak, Mbabane and Mankayane), and 18 RDA project centres also have adequate offices. In addition, field officers' houses have been constructed in all areas where extension personnel are located.

All of the RDAP project centres have adequate facilities such as tractor hire pools, farm sheds and offices. These facilities are used to train farmers in new practices, as well as to train extension workers. A Cooperative Development Centre located near Mbabane has five facilities for in-service training with modern training aids.

DES's vehicles include 20 trucks, 80 autos, and about 30 motorcycles. At any given time, about 30 percent of the vehicles are in the Central Transport Administration shops for repairs. The majority of the vehicles are in the RDAs. In many of the non-RDA areas, on the other hand, there are numerous extension agents without transportation of any kind. They often must travel on foot or hitch rides with others to visit farmers in their areas. Thus, not only is the agent/farmer ratio nearly 50 percent lower in non-RDA SNL than in RDAs, but the effectiveness of the former is further reduced because of inadequate or nonexistent transport.

#### 5. Financial resources

In the three most recent years (1979-80 to 1981-82), the DES' average capital budget allocation was US\$ 1.58 million, while expenditures were US\$ 1.25 million, or 79 percent of what was allocated. Recurrent budget allocations for the same period were US\$ 1.71 million, while expenditures were US\$ 1.83 million, an over-expenditure of more than 6 percent.

The GOS contributed 27 percent of the capital budget and 65 percent of the recurrent budget. CDA donors (mainly the US and UK) contributed 16 percent of capital expenditures and 5 percent of recurrent expenditures. Other donors, namely the African Development Bank, the World Bank, and the EEC, contributed 57 percent of capital expenditures and 30 percent of recurrent expenditures.

## VI. CONSTRAINTS TO AND THE POTENTIAL FOR INCREASED PRODUCTIVITY

### A. Introduction

As was discussed in Chapter II, there is a sizeable gap between the level of productivity of SNL farms and that of government research plots. (See Table 5.) This gap indicates that there is considerable potential to increase Swazi smallholders' productivity if the obstacles to such increases could be overcome. In this chapter, a variety of constraints hampering production of food, commercial and specialty crops and of livestock will be analysed, focussing on those most relevant to smallholders. The analysis includes consideration of the perceptions of some 18 persons knowledgeable about agricultural production in Swaziland who were surveyed during the course of the ARRA. Respondents completed a questionnaire, ranking the severity of a variety of constraints limiting small farmer productivity from one to five. (See Table 17.)

### B. Food Crops

Since maize is the principal food crop, discussion in this section will focus on maize. However, the factors limiting increased smallholder production of maize are similar to those for other food crops.

#### 1. Yield potential

The average yield of maize on SNL is about 1.7 MT/ha. The University of Swaziland and the Research Station yields range from 4 MT/ha to 6 MT/ha.

The reasons for the lower production levels on SNL farms are linked both to direct--physical and biological--constraints and to indirect--economic, policy, rural tradition and institutional--constraints.

#### 2. Physical constraints

While Swaziland has modestly good soil and moisture conditions, a substantial amount of the best agricultural land is owned by commercial and estate farmers. Much of SNL is on the steeper slopes or the more drought-prone areas. The survey on constraints to increased productivity thus shows that poor soils and degradation are major constraints to the increased productivity of maize. SNL soils in general are very acidic, requiring heavy applications of lime, and there has been a long period of degradation due to cultural practices such as livestock over-grazing. Research is needed to develop technologies which could improve production under these circumstances.

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Table 17: Perceptions of Severity of Constraints to Achieving Higher Crop Yields<sup>a</sup>

Constraints	Maize	Vegetables	Cotton	Tobacco	Average
<u>Physical/Biological</u>					
Climate	3.2	3.5	4.5	5.0	4.1
Annual rainfall	3.6	3.8	4.0	5.0	4.1
Rain distribution	2.8	3.6	4.8	5.0	4.1
Soil suitability	4.2	2.3	1.5	3.0	2.8
Soil degradation	3.8	2.2	1.5	3.5	2.8
Soil topography	3.4	2.2	2.0	1.5	2.3
Weeds	-	-	-	-	-
Plant diseases	2.6	3.8	3.8	2.5	3.2
Pests/Insects	2.6	3.0	3.8	2.5	3.0
Predators	2.0	2.2	3.0	1.5	2.2
Varieties/Species	3.8	1.0	1.0	1.0	1.7
Human power	4.0	4.0	4.0	3.0	3.8
Animal power	3.2	1.5	3.5	3.0	2.8
<u>Economic/Policy</u>					
Prices	5.0	4.2	4.2	5.0	4.6
Marketing	4.6	3.2	3.2	2.5	3.4
Short-Term credit	4.6	5.0	5.0	3.5	4.5
Long-Term credit	4.2	5.0	5.0	4.0	4.6
Government subsidy	1.8	2.2	2.2	5.0	2.8
Import policies	1.4	1.0	1.0	1.5	1.2
<u>Traditional</u>					
Land tenure	4.2	3.2	3.2	3.0	3.4
Farm size	3.8	2.8	2.8	2.5	3.0
Education	3.2	1.5	1.5	2.0	2.1
Role of women	-	-	-	-	-
Overall Average	3.5	3.0	3.2	3.2	3.2

<sup>a</sup>Weighted average of respondent rankings: 1 = Not serious, -5 = Very serious. Number of respondents varied by crop from 2 to 6.

Source: Data collected from the DEVRES/SADCC Agricultural Research Resource Assessment, 1983/84.

The varieties of maize commonly planted could also be improved. The use of hybrid maize seed has markedly increased in recent years, most notably in the subsistence sector. Two cultivars now predominate: the SR52 and NPPxK64r. Other varieties are available in the commercial market, but their characteristics are not widely known nor are they included in the extension programme. More consideration should be given to adopting open-pollinated "synthetics" and "composites" having different lengths of maturity suited to local agro-ecological conditions. Introduction of open-pollinated germplasm from international institutes, coupled with trials and selection in different locations, could provide useful material. The present seed improvement activities and the CSRP project studies are providing some useful information in this regard.

Another major constraint identified was the shortage of labour, especially at planting and harvest times. In addition, there is a common belief, not yet documented, that a substantial amount of maize produced on SNL is lost due to inadequate farm storage conditions.

### 3. Economic constraints

The respondents to the questionnaires rated pricing policy as the most serious constraint to increased production of maize, followed closely by the related marketing and credit systems. (See Table 17.)

#### a. Pricing

Swaziland is confronted with a dilemma with regard to maize prices. One of the country's national goals is to become self-sufficient in this, its basic food; at the same time, however, it wishes to keep the cost-of-living relatively low. Meanwhile, Swazi farmers find themselves in competition with those in South Africa producing maize on capital-intensive farms that also benefit from a variety of indirect subsidies. An expatriate farmer interviewed, who has in the past grown maize commercially, stated that he could not profitably produce maize given the present pricing structure in the country.

Swazi farmers are price-responsive and will lower maize production should input/output price relationships become seriously out of balance. This relationship is probably as important as relative prices between crops. There is a need to adjust farm prices as costs increase but, because of the need to link Swazi maize prices to those in South Africa, there also is a limit to the effectiveness of focussing on the price mechanism. Because of this, the approach to optimising small farmers' income from maize should concentrate on increased productivity and larger area plantings rather than on price increases.

A 1977 study pointed out that perhaps the most efficient way to achieve self-sufficiency in maize production (the country was then producing 100,000 T, or 83 percent of its total consumption of 120,000 T) would be through large-scale production on title deed farms.<sup>1</sup> However, this is counter to the GOS policy of promoting self-sufficiency by transforming subsistence farming into viable, market-oriented agriculture. The study further indicated that a switch from production of crops such as cotton to production of maize would require either a price increase of approximately 50 percent for maize, or else the additional maize would have to be grown by a statutory, government-controlled body. Both alternatives raise the following questions: Who should bear the financial burden involved? Should the farmers be subsidised so that maize and maize products would continue to command low prices, or should the markets be subsidised so that the consumer prices for maize and maize products remain low? If subsidies were offered to protect consumer prices, would they also apply to animal feed manufacturers which are important users of maize?

Finally, there are some opportunity costs of maize self-sufficiency. The first is that foregone production of crops would have to be replaced at an estimated cost of about US\$ 0.6 million in 1977 prices. The second is the South African Customs Union revenue which would be foregone, which amounts to approximately 20 percent of the value of maize imports from South Africa (about US\$ 0.5 million). These costs would total well over US\$1.5 million in 1983. Nevertheless, the fact remains that the proportion of total imports of maize to Swaziland's total consumption is increasing with each passing year.

#### b. Marketing

The marketing system for maize, as indicated by the questionnaire, is very inadequate. For example, the Swaziland Milling Company will pick up and market maize in quantities of no less than 30 bags of 70 kg each. Few farmers on SNL have net surpluses of that quantity to market; unless two or more producers are able to pool their excess, they are in effect deprived of a market outlet. What markets do exist are generally poorly-organised and often contribute to gluts and low prices due to transport bottlenecks. Because of the uncertainty of Swazi smallholder production, traders have often preferred to secure their supplies from South Africa, where produce of the required quantity and quality have been easily available, while Swazi production remains unsold.

#### c. Credit

Another constraint considered to be serious by the respondents was the lack of adequate short- and long-term credit. At present, farmers on SNL can only obtain short-term credit by mortgaging their cattle (at from US\$ 80 to US\$ 100 per animal, depending on its condition). In the event farmers do not own or have already mortgaged their cattle, their only recourse is to have a

friend or a relative lend cattle to them as security. Yet, in spite of the importance of cattle to the overall culture of the country, only a small number of those living on SNL own cattle. Thus, the amount of short-term credit which is currently available is limited.

Even those on SNL who are included in the RDAs do not have title to their land for mortgage purposes. They therefore have no access to long-term credit. Nor is there any guarantee that they will be allowed to reap the benefits of any long-term investment of labour and money. Consequently, very few SNL farmers are able, or willing, to lime their soils, provide for drainage, plant fruit trees, or carry out any other activities of a long-term nature.

#### 4. Traditional and institutional constraints

There are some social and cultural constraints to production of food crops, and of maize in particular. These include systems of land tenure and size of holdings, the practice of open grazing of livestock during part of the year, and traditional gender-linked responsibilities for rural labour and farming tasks. While these issues and relationships have been studied and reported, the strategies developed for food crop production have not always taken these constraints into account.

The system of using general extension workers at the farm level supported by specialised maize officers is appropriate to Swaziland conditions. However, considerable improvement is needed in the information base upon which the extension officers operate. The Extension Service's coverage must be extended geographically to reach the many farmers who currently receive no assistance or advice.

For maize, in particular, there is ample scope for improvement in extension. For example, with erratic rainfall, considerable variations in temperature and different cropping patterns, the time of soil preparation and planting, seeding methods, plant population densities, weeding and other practices can be critical to tasselling, disease control, maturity and yields. Improvement in these cultural practices will require not only an expanded research programme, but a more effective extension programme as well. One unpublished survey undertaken in 1979 determined that, in the surveyed area, less than 5 percent of the women farming had had contact with an extension officer. This is an extreme case, but it provides one indication of the magnitude of improvements needed.

Another constraint to increasing agricultural production has been the absence of adequate linkages between the staff of the Research and Extension Services Divisions. Traditionally little or no feedback from the farmer to the ARD was provided by extension agents, nor did the agents disseminate relevant research findings to the farmers. This was due to several factors, of which two are dominant. The first is that much of the research carried out at the time was irrelevant to the needs of the small farmers. The second is the fact that the

researchers themselves were Europeans whereas the extension agents were Swazis; the cultural, social and economic differences between the two groups had a negative effect on their coordination and communication. However, with external assistance in the form of the CSRP, an adequate number of Swazis are undergoing further training. This will localise much of the research staff, as well as blending the culture, social values and traditions of Swaziland with those of the countries in which the returning ARD staff have studied.

Within the RDAs, the linkages between research and extension programmes are continuing to improve. However, the lack of a strong research base from which to draw viable recommendations or technical packages has constrained increases in smallholder productivity.

## C. Commercial Crops

### 1. Yield potential

The yields of the commercial crops grown on Swaziland's large estates are believed to be comparable to those of international production.

The commercial crops produced in Swaziland are nearly all produced in a modern, estate-oriented and reasonably high-technology system. The estates' management is very professional and cost-sensitive. Their efforts are supported both by their own estate research and adaptability testing operations, and by worldwide links with either their parent companies or with research known by the managers. Because of this, the Swaziland ARD is not involved in any substantial way with research on these crops, with the exception of a modest research programme on cotton which is privately supported.

Smallholders produce a relatively significant amount of only three commercial crops: cotton, groundnuts and tobacco. While data on comparative yields for cotton were not available, those interviewed believed that smallholder yields are well below the estate sub-sector levels. Incomplete data on groundnuts indicates that the smallholder yields of 1.1 MT/ha are very low in comparison to those of research plots, where yields have been at least 2.5 MT/ha. Smallholder tobacco yields (0.2 MT/ha) are about one-fourth those of the estate sector.

### 2. Physical constraints

The climate and rainfall, which is inadequate both in amount and distribution, were considered very serious constraints, perhaps because the smallholder commercial crops are grown on the Lowveld and Middleveld. (See Table 17.)

Plant diseases, pests and insects were also rated as important constraints for cotton but not for tobacco. There were several suggestions that further research be carried out in these areas. Notwithstanding the presence of a cotton entomologist presently posted

at the Lowveld Experiment Station, where entomological research has been going on for the past several years, cotton production continues to be plagued by insects and pests.

Likewise, a shortage of farm labour was indicated as a serious constraint for cotton but not for tobacco.

### 3. Economic constraints

Pricing policy and the low prices received by smallholders for their products ranked as very serious constraints. However, marketing systems were considered adequate for cotton and tobacco. While both short- and long-term credit policies were considered major constraints for both crops, they were perceived to be more serious for cotton than for tobacco.

## D. Specialty Crops

### 1. Yield potential

In the last few years, smallholders' interest in and production of vegetables and fruit have increased substantially. While there is not accurate data at this time regarding yield potentials in Swaziland for these cash crops, the RDAP and the CSRP are active in this work. Most of the studies done on these crops have been done by extension programme staff. There has been little research done by the agricultural research service, except for some adaptability testing on some of the branch stations and research field plots. The increased production of these crops is related to small-scale irrigation activity in the RDAs, and has been encouraged by Swaziland's ban of RSA imports.

### 2. Physical constraints

Even though many of the specialty crops are grown on irrigated land, insufficient and erratic rainfall were considered to be serious constraints to increased smallholder production of these cash crops.

Plant diseases and lack of farm labour were also ranked as major constraints.

### 3. Economic constraints

Credit and pricing policy were considered the major economic or policy-related constraints to increased production of specialty crops.

Marketing of Swazi smallholder vegetable production has been inhibited by the fact that produce is not washed, graded and packed ready for sale. Indeed, traders wanting produce often harvest the produce themselves or with their own labourers. In part, this is because Swazi farmers are uncertain of the time of the sale and therefore hesitate to harvest until the itinerant traders appear.

Since production of specialty crops is a relatively new activity, there are few well-defined problems. As long as these crops are produced for the fresh market, and as long as only a few smallholders are involved, the present informal marketing system will no doubt perform adequately. However, as production of specialty crops expands, there will be a need for economic research to establish a basis for the need for private or public investments in such areas as storage, transport, marketing and processing. It is also foreseen that similar research studies will be required to assist in the development of smallholder marketing systems or cooperatives as well as for meeting credit needs.

## F. Livestock Production

### 1. Production potential

Ownership of livestock, mainly cattle, is a dominant characteristic of Swazi society. Relatively few smallholders raise livestock to earn cash. There are a few commercial livestock operations; some evidence exists suggesting that mortality and calving rates are significantly better under these conditions. However, accurate data concerning either actual productivity on SNL and ITFs or potential yields under Swazi conditions is not available because there is no livestock research programme in the ARD. The AID-sponsored CSRPF also does not include a livestock component, perhaps because of the failure of previous attempts to solve the problems caused by livestock.

### 2. Physical constraints

Expatriates have suggested for years that the prime causes of the alarming degradation of Swaziland's land and water resources are the large number of cattle retained for non-economic reasons and the practices of uncontrolled grazing and common access to land characterising Swaziland's livestock management practices. While dire predictions of imminent disaster have been heard for several decades, there seems to be strong evidence of some serious problems, especially on the steeply-sloped grazing areas of SNL. For example, it is reported that Swaziland is the most densely-stocked country in Africa, with an average density of one animal per 1.6 ha in 1977. The average density of SNL grazing lands was one animal per 1.37 ha, whereas on ITFs it was one animal per 4.57 ha.

The consequences of overstocking and overgrazing are widespread. Important areas of the country have been eroded to such an extent that their carrying capacity has been reduced to very low levels. In some areas, better grasses have given way to inferior ones with less nutritive value; in other areas, cattle have had to be removed altogether. Each year many tons of the country's topsoil are eroded.

Since livestock is a key element of rural life, there is a strong need to examine management practices that would reduce the possibility of long-term degradation of the resource base.

### 3. Constraints related to rural traditions

It is probable that the major constraints to increased productivity of livestock and livestock products are related to rural traditions. Since livestock and livestock management practices are so strongly woven into the Swazi tradition, it will be very difficult to achieve major attitude shifts in a short time. Carefully documented social and economic analyses must be the base for any policy changes recommended to deal with this constraint.

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<sup>1</sup>Economic Planning and Analysis Section of the Ministry of Agriculture and Cooperatives, "A Study on the Alternatives Available for and Estimated Costs of Achieving Maize Self-Sufficiency," (Mbabane: Government of Swaziland, 1977).

## VII. STAFF ASSESSMENT OF INSTITUTIONS

### A. Agricultural Research Institution

Fourteen professional and technical staff of the ARD were interviewed concerning the problems they felt most seriously affected the Division's work. An inadequate recurrent budget and poor maintenance of facilities were rated as the most serious problems by 79 percent of the professional and 73 percent of the junior technical staff. It was emphasized that not only is the recurrent budget usually too small, but due to delays in its release, work sometimes actually comes to a halt on experiments being implemented. It also was stressed that both offices and laboratories are old and difficult to maintain. Almost two-thirds (64 percent) of those queried felt that the poor condition of equipment, especially laboratory equipment, is a grave problem. Serious delays in repair and replacement are common.

Training also was seen as an area requiring high-priority attention. Over 70 percent of those interviewed felt that the junior technicians need further training. Fifty-seven percent stated that senior technicians also lack training, although it was felt that this need could be met by short-term workshops and courses. Half of those interviewed indicated that the service and maintenance staff are poorly trained or too few in number. Recommendations included in-service training courses and larger recurrent budgets.

It was also noted that the absence of many of the professional staff members who are in training outside the country places a very heavy burden on those who remain.

### B. Agricultural Training Institution

Thirty interviews were carried out on the UOS campus, including most faculty members and administrative staff. The single most serious problem for more than half (53 percent) of those queried was the difficulty of obtaining and properly maintaining sufficient equipment, including laboratory equipment and supplies. The lack of budgetary provision for laboratory acquisitions was blamed.

Half of those interviewed believed that inadequately-trained support staff presented a serious obstacle to the University's effectiveness. Several linked this problem to a shortage of appropriately structured courses to train technicians.

Another staff-related issue was raised by 40 percent of those interviewed, who expressed serious concern that less than half of the senior teaching staff were nationals and that expatriates have had an excessively high turnover rate.

Only one-third of those interviewed stated that the recurrent budget is seriously deficient. However, the Luyengo campus of the UOS has not received a capital appropriation for the last few years. One-third of those queried felt that the inadequacy of classroom facilities--with respect to both size and number--was a serious constraint. A shortage of housing facilities for students was also stressed as a problem.

#### C. Agricultural Extension Institution

Sixteen staff members of the DES were interviewed for their assessment of the major problems affecting the institution's ability to efficiently carry out its responsibilities. Four-fifths (81 percent) of those interviewed stated that the inadequate recurrent budget of the DES presents a major obstacle. Examples given of the impact of this problem ranged from the inability to recruit additional staff to shortages of transport and consumables.

Three-fourths of those interviewed stated that a shortage of support materials presents a serious constraint to their effectiveness. The most common complaint was that there are not enough visual aids.

Insufficient transport facilities and supplies were considered a major problem by 62 percent of those queried. A great number of vehicles assigned to the DES are inoperable and repairs in government-operated shops are very slow. Within recent years, many of those vehicles which are operational have been idled part-way through the fiscal year because the recurrent budget allocation for transport already had been expended, leaving no more funds to purchase petrol.

An insufficient number of support staff was also viewed by 62 percent of those interviewed as a serious constraint.

Another item stressed by a large number of those interviewed was that the structure of the civil service system and the promotions procedures is inadequate. Incentives for better performance including promotion prospects were felt to be especially inadequate.

#### D. Summary of Staff Assessments

Among the staff members of the three institutions, there was strong agreement that the lack of an adequate recurrent budget and of the timely release of funds are two of the most serious constraints to the effective implementation of their programmes and projects. On other important points, there was nearly universal agreement including:

- o Staff qualifications: Respondents were more concerned about the qualifications of support staff than those of other groups, although the senior staff's qualifications were also often seen as a constraint;

- o Maintenance and equipment: The research and training staff were particularly critical of the maintenance of their laboratory equipment and of the condition of equipment in general;
- o Transportation: Transportation was seen by all respondents as a very serious constraint to their job performance, having the most detrimental effect on the work of the extension staff; and
- o Terms of service: Staff from all institutions indicated concern about the structure of the civil service system and the promotions procedures. These were not viewed as effective incentives for improved performance by many of those interviewed.

## VIII. CONCLUSIONS AND RECOMMENDATIONS

### A. Strengthening Swaziland's Agricultural Institutions

#### 1. General conclusions and recommendations

There is great potential for Swaziland's agricultural institutions to work closely together. Informal relationships among the staff of each already exist; furthermore, their various offices, training centres, and research facilities are not far apart. The policies set forth in Swaziland's development plans, strongly based on the RDA concept, support close cooperation between research and extension. The present CSR activity also presents a useful working model for cooperation at informal working levels. However, even closer coordination of plans and programmes is needed. A formal structure for liaison between the institutions should be established as part of the RDA system.

External linkages and networks with other SADCC countries and with international agricultural institutions must also be strengthened. This will permit Swaziland to maximise its limited resources for applied adaptive research, while focussing its basic research on the very few areas where it has unique advantages.

#### 2. Agricultural Research Division

The ARD's three research stations and their farms, offices, laboratories and equipment effectively support research and the daily administrative work necessary to carry it out. The three environments in which they are located are representative of all of the country's ecological zones except the Highveld.

The present institutional focus of the ARD on cropping systems research linked to the needs of SNL farms is highly appropriate. Research programmes traditionally have not focussed on the problems related to, or unique to, the enterprise mix between crops and livestock (either cattle or small stock or both) which is common among small-scale producers. Even the present cropping systems programmes, however, have not kept pace with GOS strategies and programmes, and still require improvement to meet ongoing needs. In particular, more relevant, tested research information should be incorporated into the extension service. This will require above all a sharper focus on the needs of small farmers. Since Swazi farmers have strong social and traditional values, applied research aimed at meeting small farmers' needs must start from a knowledge of small farmers' needs and desires.

Implementation of the following specific recommendations will help improve research's capacity to meet Swaziland's needs and priorities:

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- o ARD's facilities, including offices and laboratories, should be rehabilitated and, in some cases, expanded to increase its ability to resolve agricultural research issues;
- o The recurrent budget of the ARD must be increased to adequately support existing and potential agricultural research activities;
- o The training needs of junior staff and those senior researchers presently at their posts should be given detailed attention as a means of further upgrading ARD's research capacity;
- o Localisation and training of research staff should continue, deepening ARD's understanding of and capacity to meet Swaziland's development needs; and
- o Closer working relations with the Luyengo Campus of the UOS by ARD should be developed to reduce duplication, sharpen ARD's research focus, and enhance its research capacity.

### 3. Training institutions

The UOS Faculty of Agriculture is located within a few km of the Malkerns Research Station. It is strongly recommended that the Faculty of Agriculture be included in a network of SADCC training institutions and programmes. Swaziland's Mananga Agricultural Management Centre also has the capability to do short-term training of managers, with additional strong regional potential.

Swaziland's internal needs for scientists and advanced-degree personnel in research seem, to date, to be met by external training. The expected demand for such narrow technical skills does not indicate a need for in-country advanced-level training capacity.

### 4. Division of Extension Services

The system of using general extension workers at the farm level supported by specialised officers is appropriate. However, considerable improvement in the information base is essential. The DES' geographic coverage also needs to be extended. A high priority should be given to the improvement of cultural practices, as this should yield relatively rapid results from known technology. More attention must be given to training local extension staff and to providing extension aids.

## B. Dealing with Constraints Affecting Crop and Livestock Production

### 1. Traditional smallholder production

As has been noted in this study, the Swaziland research programme only recently received a strong mandate. The GOS' policies related to food crops and to food security strongly suggest the need to relate agricultural research to the production problems of smallholders. For instance, the importance of livestock to farmers in the smallholder sector is not reflected sufficiently in research activities. The crop-livestock mix in smallholder farming systems should be studied more intensively, and the components of this research should be better integrated. Such research must also address land/smallholder relationships and tenure patterns. Developing practical alternatives to present land use practices will require that local leadership become involved in the planning of applied research in their communities. The success of such involvement will depend, in turn, on extremely close cooperation between research and extension.

### 2. Smallholder production of commercial crops

The commercial or estate sector does not require publicly-funded research at this time, nor is such contemplated. Smallholder production of cotton, groundnuts and tobacco should continue to be included in research programmes.

A new research unit focussing on horticultural (vegetable and fruit) research should be established within the agricultural research system. This would consolidate the investigations and variety trails of the RDAs and, over a period of time, would develop research capability in such areas as management, irrigation and moisture needs, crop husbandry and crop production systems, plant disease and insect control, and crop processing, marketing and storage. Such a unit could eventually become a component of a SADCC-wide specialty crop network.

### 3. Data bases

Swaziland has a partial data base of soil maps, land use planning analysis, and climatic and hydrological information. This information should be examined, organised and related to alternative crop or crop/livestock potentials. It would be highly desirable to add other components to such a resource inventory, including:

- o A comprehensive physical inventory, including correlations of climatic, edaphic, and land use data. One use for this would be the preparation of maps of agro-climatic and soil fertility zones for land use planning;

- o A comprehensive analysis of the carrying capacity of the Swaziland rangelands, to determine at what level this resource can be sustained. This analysis is of great potential value to policy-makers; and
- o A research-developed data base linking social and economic information to smallholders' needs and responses. Such a data base is needed to better design and evaluate research activities.

4. Other research activities

Research in a number of other areas would be helpful in addressing some of the constraints to increased agricultural productivity. These recommended areas include:

- o Research in the area of water use and conservation. This should focus on the development of the increased efficiency in the use of available moisture by crops, under both irrigated and rainfed conditions;
- o Research on animal tillage and dryland farming;
- o On-farm grain storage and processing research, focussed on the needs and capabilities of Swazi farmers. This would aid in reducing high post-harvest losses;
- o More consideration to adopting open-pollinated "synthetics" and "composites" having different lengths of maturity suited to local agro-ecological conditions. Introduction of open-pollinated germplasm from international institutes, coupled with trials and selection in different locations, could provide useful material; and
- o Research on the effects of various pricing, marketing, and credit policies. This would enable decision-makers to implement more effectively the broader policies of the National Development Plan.