ECA/MRAG/95/45/MR

REPORT ON A MISSION TO SWAZILAND ON MEASURES FOR PROMOTING COLLABORATIVE AGRICULTURAL RESEARCH 15 - 27 May 1995

By
G.I. Abalu,
Senior Regional Adviser
Food and Agricultural
Policy and Planning

Addis Ababa
May 1995

ECA/MRAG/95/45/MR

UNITED NATIONS ECONOMIC COMMISSION FOR AFRICA
MULTI-DISCIPLINARY REGIONAL ADVISORY GROUP

REPORT ON A MISSION TO SWAZILAND ON MEASURES FOR PROMOTING COLLABORATIVE AGRICULTURAL RESEARCH

By

G.I. Abalu,
Senior Regional Adviser
Food and Agricultural
Policy and Planning

Addis Ababa
May, 1995

Table of Contents

I. INTRODUCTION

Following a request from the Pro-Vice-Chancellor of the University of Swaziland for technical assistance to stimulate collaborative research amongst members of staff of the University of Swaziland and between them and other universities in the region, the United Nations Economic Commission for Africa's Senior Regional Adviser in Food and Agricultural Policy and Planning, Mr. G.I. Abalu, undertook a mission to Manzini, Swaziland from May 15 to 27, 1995 to provide the services requested.

The mission was in accordance with Programme Element 20.48 of the approved United Nations Regular Programme for Technical Cooperation for the 1994-1995 Biennium which calls for the provision of advisory services and training to member countries and inter-governmental organizations in support of their efforts at developing their agricultural support services.

II. COUNTRY BACKGROUND

General

Swaziland is a land locked kingdom which became independent in 1968. With a total land area of 127,364 km^2, the country is the second smallest country in Africa with a total population of some 825,000. The population is estimated to be growing at an average annual rate of 3.2 percent.

Despite its small size, the Swazi economy has performed fairly buoyantly and viably since independence although in more recent years, it has ran into some difficulties as a result of reduced export receipts from its most important export crop, sugar.

Relative to other African countries the Swazi economy has achieved growth rates that have been generally higher. As a result, the World Bank currently classifies Swaziland as a middle income African country. The economic success of the country has been attributed to its market oriented approach to development as well as its liberal attitude to private and foreign capital. It is, however, widely recognized that despite this apparent successful performance record, external influences on the economy

have resulted in somewhat uneven and distorted development. For example, the most recent analysis by the United Nations Development Programme of the state of "human development" in the world which reflects a wide range of economic development indicators - life expectancy, literacy, provision of basic amenities such as water supply, health care, income distribution, etc. - ranks Swaziland as the world's 26th least developed country.

A higher and stable level of income for the broad mass of the people has always been the declared objective of Swaziland's various programmes of economic development. However, although it can be argued that the masses in Swaziland have generally benefitted from the country's recent economic development through such indirect benefits as the provision of better and more extensive services in education, health, and transport, the general consensus is that only a relatively small proportion of the Swazi nation has enjoyed significant direct benefits in such areas as employment in the modern economy and administration and independent entrepreneurs.

There is, however, no doubt as to the Government's commitment to the objective of raising the standard of living and the well being of the generality of the Swazi People. To this end, the Government has accorded the highest priority to the development of the country's agriculture. The main objective of this strategy is to promote the progressive transformation of the country's traditional agriculture from its current predominantly subsistence form to a more desirable semi-commercial form that would raise incomes and create more opportunities for gainful employment in the rural areas.

The country is usually divided longitudinally into four topographical and climatic regions:

1. The highland with a total land area of 5,029 km^2 comprising mountains, valleys, and gorges. With an average altitude of 1,300 metres only about 10 percent of the area is cultivable.

2. The middleveld with an area of 4,592 km^2 and average elevation of 700 metes. This is the most agriculturally

developed region of the country with annual rainfall between 760 and 1,150 mm and supporting mostly maize but also sorghum and vegetables.

3. The lowveld with an area of 6,416 km^2 is presently the least developed agriculturally of all the regions. With an elevation of 60-350 metres, this drought prone region presently has about 25,000 ha. under irrigated cultivation with sugar-cane, citrus, cotton, and rice as the main crops.

4. The Lubombo plateau with an area of 1,322 km^2 which runs along the eastern border of Swaziland. Some 12 percent of the land is said to comprise faire to good arable soils and the average rainfall is between 750 to 1,150 mm.

Administratively, the country is divided into four regions as follows:

1. Hhohho (Pigg's peak, Mbabane, Mayiwane)
2. Manzini (Craydon, Manzini, Mankayane)
3. Lubombo (Big Bend, Siteki)
4. Shiselweni (Hlatikulu, Nhlangano, Hluti)

The Swaziland economy has traditionally had strong economic ties with the Republic of South Africa (RSA). By virtue of its membership of the Rand Monetary Area and the South African Customs Union, it is dependent on the RSA for its imports, transportation, government revenues and marketing arrangements. This linkage is largely given credit for the free flow of trade between Swaziland and the RSA and the relatively good management of the country's money supply, prices, and interest rates which are largely externally determined. As a result, the economy has been growing reasonably well over the last ten years.

The Agricultural Sector

The agricultural sector plays an important role in Swaziland's economy. In 1993, the production and processing of agricultural and forestry products accounted for about 28 percent of GDP, 70 percent of export earnings, 30 percent of the paid employment in

the formal sector, and provided a living for about 70 percent of the rural population.

The importance of the Swazi Nation Land (SNL) to total Swazi agricultural production cannot be overemphasized. For example, in 1993, although SNL agricultural production comprised only 20 percent of the total agricultural GDP of the country, it accounted for over 60 percent of the aggregate decrease in total sectoral production. This highlights the importance of designing measures for improving the agricultural performance the SNL.

Land Tenure

The country operates a dualistic land tenure system. A traditional commercial tenure system operates under the chiefs and the king throughout the Swazi Nation Land. SNL, which makes up about 10,000 km^2 or 60 percent of the total land area of the country, accommodates roughly 70 percent of the country's population although many individuals operating in the SNL also engage in wage employment elsewhere. Commercial farmers largely occupy the other 40 percent of the land in what is referred to as Title Deed Land (TDL). Most of the TDL is occupied by non-Swazi's and European settler farmers although almost 200,000 km^2 of TDL have been re-purchased over the years by the Government, about half of which have informally reverted to communal use and the other half used as Government farms and ranches.

The chief allocates land to all eligible married men to meet their basic needs of residence, subsistence pasture, and energy. Allocated land is usually inheritable although such inheritances must be formally cleared with the concerned chief. Land is sometimes also transferred through gifts or loans. Women and unmarried men seldom occupy homestead land in their own names.

Climate and Soils

Swaziland's four agro-ecological zones provide considerable natural and climatic diversity reflecting potential for a wide range of crops and livestock activities.

The Highveld, Upper Middle and Lubombo regions generally have deep freely drained soils with relatively high PH content and exhibiting generally low fertility with the exception of the Lumbobo region. The soils have good moisture holding capacities for both dryland and irrigated cropping and they are suitable for the cultivation of a variety of crops although adequate fertilizer and lime applications are needed for optimum production.

On the other hand, the soils in the Lower Middleveld and Western Lowveld are said to be shallow and light textured clay-pan with some of the areas having internal drainage and sodicity problems, thus restricting their use for irrigated cropping. The soil fertility status and the moisture holding capacity of the soils are low thus reducing rainfed crop yields.

The soils of the Eastern Lowveld are clayish and of high fertility resulting in good yields for rainfed crops, particularly cotton, although the incidence of phosphorus deficiency poses some problems. Drainage is also a problem with the black clays and sodicity and salinity occur in some low lying areas.

Climatewise, the country is described as being sub-tropical. The mean annual rainfall varies widely from region to region with the lowveld having the minimum and the highveld the maximum. Between 75 percent and 83 percent of the total precipitation occurs in the summer months (October to March). Historical analysis of the rainfall pattern reveals that on average, precipitation is inadequate for optimum crop production in one year in ten. The country is, however, crisscrossed by several large rivers including the Komati, Usutsu, Mbuluzi and Ngwavuma which provide the country with excellent potential for ensuring adequate supply of water for both supplementary and full irrigation all year round to counter periods of low or no rainfall that are not uncommon.

The Farming Systems

Crop production in Swaziland is dualistic in line with the two predominant forms of land tenure in the country. The TDL farms produce mostly exports crops such as sugar, citrus, pineapples, cotton, and, to an increasing extent, beans. The SNL farms on the other hand are largely subsistence in nature and concentrate

largely on the production of maize, sorghum, pulses and vegetables although cash crops such as cotton, tobacco and horticultural crops are increasingly being produced on SNL farms.

Livestock are important both to Swazi society and to the economy as a whole. In 1993, the total cattle population was about 700,000 with about 80 percent being raised on SNL and the balance owned by TDL farmers. The average herd sizes are 16 and 54 on SNL and TDL respectively. On the SNL the cattle are grazed on communal land as a single herd and within reach of a drip tank. This provides good control which has resulted in the collection of fairly reliable livestock statistics. There is competition for grazing and the preferred system of grazing often gives rise to overgrazing which in turn has frequently resulted in problems of soil erosion.

The rural population lives and works in homesteads, comprising one or more nuclear families. The national average arable land holding per homestead is about 3.5 ha. with a range from less than 1 ha. to 20 ha. The typical homestead usually comprises about 8 members and usually, in approximately 6 out of 10 cases is headed by a man. The remaining 40 percent of homesteads are headed by women who are either widows or whose husbands are away at work.

The rural sector of the country relies heavily on non-farm cash incomes such as absentee remittances and non-agricultural homestead activities. Because of the relatively low returns to labour in the SNL vis-a-vis the public and private sectors, agricultural labour often seeks additional income from work in the non-farm sector. It is estimated that some 80 percent of homesteads in the country derive some income from employment in the formal sector of the economy. However the capacity of the formal sector to continue to provide supplementary income to the country's agricultural labour is becoming increasingly limited suggesting that a growing proportion of the labour force will have to depend on the farm economy and the non-formal sector for their livelihood.

The Performance of the Agricultural Sector

A recent study draws attention to six characteristics regarding the **structure** of Swaziland's agricultural sector. The first is the

strong export orientation of crop production and forestry. Until the mid 1980s, 75 percent of commodity export revenues were based primarily on sugarcane and forestry products. The second revolves around the use of different types of capital in the production process. Most cash crop production is supported by infrastructure investments in irrigation and a transportation network linking produce to distant external markets. Land is privately owned and there is no serious fragmentation of land holdings, which would adversely affect productivity. Human capital inputs consist primarily of a few expatriate high quality professional and technical management supported by low employment of unskilled labour per unit of capital. The use of physical capital inputs is related to the capacity of technical human capital to maximize returns from its use. Production technology in the production of the main food crop, maize, differs substantially from that prevailing in irrigated cash crop production. The natural capital base is poor, with little or no supplies of renewable resources such as irrigation water. Land is frequently held in fragmented communal ownership and the use of physical capital inputs is negligible, although it has clearly increased in recent years. The human capital base is extremely poor, with virtually a total absence of scientific and technical knowledge.

The third characteristic is the generally sustainable practices followed in the forestry sector in Swaziland. There is a history of sound management, with periods when concerns were even expressed at the excessively rapid rates of afforestation. The principal reason for the lack of deforestation is the fact that forestry was implanted as a commercial activity in Swaziland, concentrating on wood pulp production. Varieties such as eucalyptus and pine were introduced for the purpose of commercial exploitation, thus establishing a structure of sound forestry management, which has been maintained. The fourth characteristic of the agricultural sector is the imbalance in the livestock sub-sector. This has a small component of commercial range management with good technical support. However, the majority of livestock ownership is characterized by overstocking, defined as low offtake rates in relation to commercial viability and the capacity of the soil to regenerate from grazing. As a consequence of the common property resource problem associated with relatively uncontrolled grazing, soil erosion has acquired increasingly serious dimensions.

Fifth, Swaziland's food security situation has been characterized by increasing imports of maize. The quantities have obviously varied with domestic production, which is mainly on dryland farming, and therefore particularly susceptible to drought-related fluctuations. Food imports through the South African Maize Board provide access to relatively swift supplies of needed imports. Finally, the sector is characterized by a highly uneven distribution of assets and income.

Maize is the most dominant crop produced in the country although, sorghum which is drought tolerant is also grown particularly in areas of low and/or poorly distributed rainfall. A number of small rice schemes are also being developed for small scale farmers by a Taiwan Agricultural mission with the support of the government. Vegetable production is also increasing in importance.

The aggregate performance and trends of the agricultural sector is summarized in figure 1. The first 4 years after independence witnessed an average annual growth of 1.7 percent in per capita incomes generated in agriculture. Except for one year, the next five year period witnessed a substantial decline in per capita production. The 1980s were a generally more buoyant decade, with an average annual growth rate of 4.4 percent up to 1989 - 90. The major downturns in the 1980s were due to climatic shocks such as droughts and a cyclone. For similar reasons the early 1990s were a period of a very substantial decline in agricultural output, as the region was hit by one of the worst droughts in recent history.

Realisation of self-sufficiency in maize has long been a priority objective of the agricultural development policy of Swaziland. Despite this policy, however, maize output has continued to be low and maize imports play a significant role in sustaining per capita consumption.

The livestock sub-sector of Swaziland is fraught with the problem of overstocking and this is especially acute on the SNL. Reducing the national herd through increased offtake is one of the most difficult problems faced by the Ministry of Agriculture and Cooperatives. Furthermore, the nexus between livestock numbers on SNL and the high rate of population growth is especially

disturbing. There are growing signs that Swazi Nation Land is both overcultivated and overgrazed. Increasingly more marginal and fragile land is being exploited so as to cater for the requirements of the fast expanding populations - both human and livestock. As a result, the combination of overpopulation and overstocking is decidedly jeopardising the country's prospects for sustained long-term development and growth.

All in all, the good performance of the Swazi economy has not been matched by growth of the traditional agricultural sector whose performance has been poor. It is reported that the growth in agricultural production has been marginal due not only to a fall in commercial harvests but also and perhaps more importantly in a fall in production in the traditional agricultural sector (Swazi Nation Land).

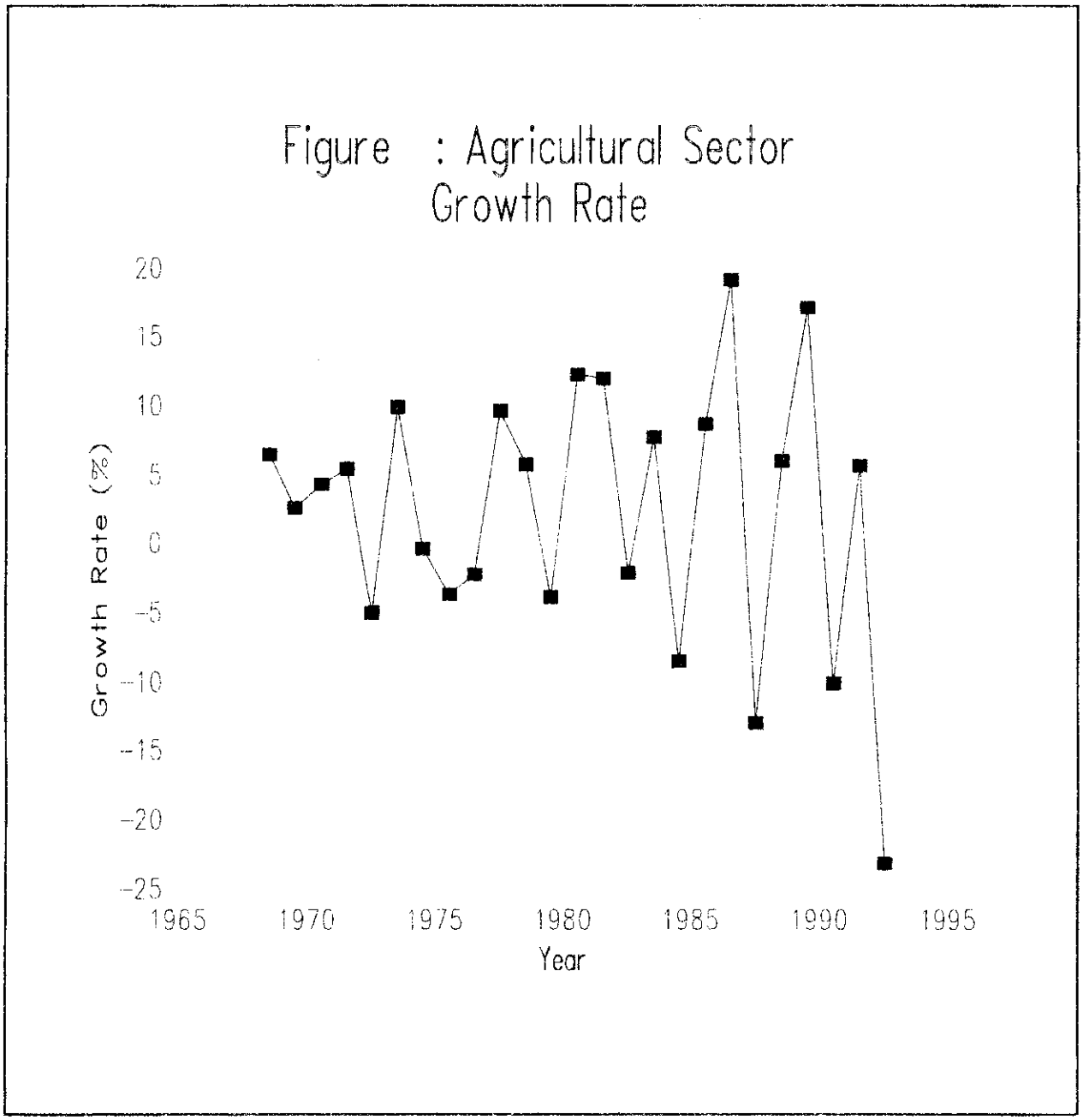
Figure : Agricultural Sector Growth Rate
Growth Rate (%)
20
15
10
5
0
-5
-10
-15
-20
-25
1965
1970
1975
1980
1985
1990
1995
Year

Constraints to Development

One of the major constraints to increased crop production in Swaziland and, hence, to improvements in the incomes and standard of living of Swazi small holder farmers, is their unwillingness and or inability to adopt improved technologies that are on offer to them. A credible explanation of this constraint is the fact that many of these technologies appear to have been designed outside the context in which the Swazi farmer lives and operates, i.e. outside the context of his homestead resources, goals and objectives.

Another key constraint facing the sector is the continued difficulties with the successful establishment of self-sustaining development institutions and infrastructures in the country. It is unlikely that small-holder farmers can be persuaded to increase their production, if appropriate structures and institutions are not created to attend to their needs and aspirations. A number of projects and programmes have been adopted in the past which aimed at upgrading and reorganizing some of these infrastructures and institutions. While some progress has been made in attaining their stated objectives, there is still some way to go yet before many of them become efficient and viable.

Government Strategy for Agricultural Development

Swaziland's agricultural development strategy is informed by the following three central themes.

1. The development of agriculture and agribusiness based on response to the priority needs of the people;

2. An overall development framework encompassing agricultural industry as a whole and taking into account the farmers in both the TDL and the SNL; and

3. The planning of government projects and programmes within the parameters of available budgetary funds for operating expenditures.

These themes are to be articulated through the attainment of the following objectives:

1. The achievement of basic food self-sufficiency;

2. The improvement of nutritional levels;

3. The increasing of agricultural imports;

4. The creation of employment opportunities through the promotion of agri-business;

5. The boosting of rural incomes; and

6. The conservation and development of soil and water resources.

The government believes that these objectives can best be achieved through the intensification of agricultural production amongst small-scale farmers on SNL although it also acknowledges the fact that the performance of large farms and plantations on TDL remains crucial to export growth and overall economic development in Swaziland. However, because of the urgent need to increase rural employment and incomes, the government has decided to concentrate its resources on SNL farmers whilst ensuring that such support will not negatively affect agricultural production on TDL.

III. COLLABORATIVE AGRICULTURAL RESEARCH

Research Phylosophy

Given financial and human resource limitations, the phylosophy for agricultural research in Swaziland should be dictated by a need to concentrate efforts. Hence, the phylosophy should be to develop, in stages, a national research service covering all sub-sectors and focused sharply on the needs of the country's different agro-ecological zones and production systems. It should be entirely adaptive in nature and, wherever possible, be executed on producers' fields rather than in research stations. There may be need to develop a 10-15 year agricultural research plan with the assistance of international organizations such as the International

Service for National Agricultural Research (ISNAR). Such a system should be backed up by a lean but highly qualified staff capable of providing the diagnostic services required in land management, crop production and other areas. The future organization and orientation of the research and extension services should be carried out in close synchronisation with the agricultural development strategy and objectives of the country. It is important to emphasize that the country's agricultural development targets will not be attained unless agricultural research in the country is properly organized and managed. Improvements in agricultural management, therefore , hold the key to meeting the great challenges facing Swaziland agriculture.

The Importance of Good Management

Before we talk about the management of agricultural research in Swaziland, it is important to first agree on what we want to manage. In other words, what is the nature of this agricultural research we want to manage. It should be obvious that when we are talking about research in this context, we are not talking about a single monolithic national research organization but a network of different organizations each either influencing or engaging in agricultural research and each with considerable initiatives as to what research activities is undertaken. In Swaziland as in most African countries, the membership of this network is quite diverse and the different organizations and agencies involved are distributed within various ministries, parastatals, faculties of agricultural universities, colleges of agriculture, development projects and the private sector.

In the Swaziland context, therefore, I would like to define agricultural research management as the efficient administration and control of the national agricultural research system including the linkages among the various organizations involved in agricultural research in the country and between them and the major clients of research (the producers, the extension services, the policy makers and planners, the development parastatals, etc.) in a manner that most effectively achieves the objectives of national agricultural policy.

The critical task that will face agricultural managers in the country will centre around the twin challenge of how to maximize the research output obtainable from the combination of resources and knowledge available to the country and how to maximize the socio-economic benefits resulting from the solutions on offer from agricultural research. The former can be refereed to as the efficiency with which available research resources are utilized and the needed scientific, technical, social, economic, and managerial knowledge applied. The later relates to how well the NARS produces the expected results and how favourably this impacts on the country.

The words **effective** and **efficient** in the above definition have been used deliberately as they refer to the extent to which scarce research resources are utilized to obtain the best results in the best possible manner. In this regard, the results expected from the research system include (ISNAR and SPAAR, 1987):

1. To make available to the principal clients of research detailed, appropriate, and reliable agricultural information for increased and sustainable productivity.

2. To make available to the government, the private sector and other decision makers, the required technical and socio-economic information for effective policy making and planning.

Is Swaziland's national agricultural research system being effectively and efficiently managed.? This is a difficult question to answer as there has been no purposeful study ever undertaken on the subject. However, before we can speculate on the management of agricultural research in Swaziland, it is important to first define the general characteristics of a properly managed NARS. An efficiently and effectively managed NARS must:

1. Have a basic core of competent research workers as well as a reasonable set of personnel policies to facilitate their recruitment, retention and retraining and a reward system that gives the research workers credit for what they do.

2. Operate within a functional system of operating procedures and a network of physical facilities and research infrastructures including properly organized research and experimental stations, adequately equipped laboratories, and an efficient layout of experimental plots to ensure scientific standards.

3. Have adequate research equipment and operating funds for each of the organizations and agencies operating in the system.

4. Operate a communication system which is responsive to the needs of policy makers, farmers, extension agents, development agencies, parastatals and private organizations.

5. Encourage cooperation among scientists in the system in an inter-disciplinary manner on problem oriented research projects as well as cooperation between and among research institutes, universities and private sector research.

6. Attract political support form political leaders, farmer groups, and the general public.

7 Permit budgetary and expenditure flexibility within the broad mandates of the different research organizations in the system.

The problems confronting many African countries in their efforts to manage their agricultural systems are well known and are typically related to: institutional management constraints; difficulties with the allocation and management of research funds; ineffective management of research personnel; sloppy management of equipment and buildings; and ineffective management of information.

The Key Players

The three key players in the agricultural research system in Swaziland are the policy makers, the researchers, and the farmers. First there are the policy makers and agricultural administrators

whose responsibility is to mobilize and allocate resources to meet whatever agricultural development target has been set and who, by implication, have to allocate the resources for the research to be carried out. Secondly, there are the researchers operating in the NARS who are responsible for translating national agricultural development policies into agricultural research goals and objectives. Then there are the majority of the farmers who, by all assumptions, are poor and resource constrained but produce the bulk of the agricultural production.

Ideally there should be institutionalized collaboration between and among all the three set of players aimed at ensuring that objective and realistic agricultural policies and targets are set, are translatable into researchable objectives and are attainable by the farmers in a sustainable manner. When this collaboration does not exist, the results have usually been:

1. The setting of agricultural production targets by decision makers who do not often accept responsibilities for the implementation of the policies and policy instruments required to attain the targets.

2. The stating of targets in terms which the farmers cannot identify with and which require activities which the government cannot easily influence or control.

3. The existence of research administrators who are rarely involved in the setting of national agricultural policies in a meaningful way and who are unable to present the political authorities with other alternatives based on different research scenarios, so as to allow the government to carefully weigh the advantages and disadvantages of each alternative before deciding on which targets to choose and at which levels to set them.

4. The absence of firm agreements between researchers and the government on the specification of ex-ante indicators and measures for judging how research success or failure would be determined which has, in turn, resulted in arbitrary government assessment of the contribution of research to

the attainment of national agricultural development objectives.

Effective mechanisms for ensuring that national decision makers are able to set and agree on priorities in a coherent and consistent manner and that this targets are translatable into attainable research objectives are therefore needed. The importance of developing a national research strategy which effectively translates national development goals into research objectives by establishing research plans for each of the organizations in the national research system for the short-, medium, and long-run, can, therefore, not be over-emphasized.

IV. RECOMMENDATIONS FOR IMPROVING COLLABORATIVE RESEARCH IN SWAZILAND

Institutional Reforms

There is need for a central authority to keep abreast of exactly who is doing what and where throughout the country's agricultural research system (NARS) as well to operate simple but effective programme budgeting procedures to efficiently allocate the human, physical, and financial resources available to the system. To achieve this would require creative reforms in the following areas:

1. The establishment of a productive balance between centralized and decentralized research activities within the NARS.

2. The establishment of a creative balance between coordinated nationwide research arrangements and the freedom of individual research organizations in the system to select and work on local problems.

3. The establishment of an effective balance between research on problems considered by research administrators to be of high national priority and research projects that may be of special interest to individual researchers or interest groups.

4. Agreement on the combination of research to be undertaken uniquely by research institutes and between research institutes and other agencies such as universities and agricultural development projects in the country.

5. The establishment of effective working relationships with the international research community without becoming excessively dependent on it.

Further action would also be needed in the following areas:

1. Coordination of administrative procedures at all levels consistent with the objectives of national policies and the objectives of the different research programmes in the NARS.

2. Coordination between the Ministries of Agriculture and field offices in reviewing the effects of research activities and policies on individual and groups and taking action to correct anomalies.

3. Coordination among and between the Ministries of Agriculture, the university and other national education and training institutes to help assure availability of adequate skills for all individuals involved with the research programmes.

4. Coordination between the field offices of Ministries of Agriculture and regional, district, and village offices in shaping programme implementation and in encouraging farmers and rural dwellers to build economic, social, political, and cultural infrastructures and institutions in support of the objectives of the programmes.

5. Coordination between the Ministries of Agriculture and other government agencies to ensure that each employee in these Ministries and in the agencies is offered a perspective on his or her role and the expectations from him or her in the total effort at implementing the research programme.

Funding Reforms

It is generraly aggreed that because of the so called "donor fatigue" syndrome, the bulk of future increases in research funding in Swaziland, as in most other African countries, will increasingly have to come from internal sources.

Elliot and Pardey (1988) have proposed three interesting measures that could be used to increase domestic funding. These include:

1. Improving the fiscal environment by increasing the total government budget relative to the Gross Domestic Product so as to enable it to spend more on all areas of development including agricultural development.

2. Improving the policy environment of agriculture by increasing the share of total agricultural expenditures in the total budget.

3. Improving the policy environment for agricultural research so that the share of agricultural research expenditure in the agricultural budget is increased.

While structural and fiscal improvements would go a long way to contribute to increased domestic funding for research, this certainly will not be enough. There would be need to identify and tap new funding sources

New Funding Sources

There is need to tap new funding sources in support of existing public funding arrangements for agricultural research in the country. These would include new funding sources such as endowment funds, production cess, the earmarking of taxes, and the organized private sector. The potential of these sources are discussed below.

Endowment Funds

Swaziland has its fair share of well to do people. Many of these category of Swazis are keen to immortalize themselves in one

way or another. The creation of endowment funds by these people should be encouraged.

Production Cess

These involve the provision of an autonomous core of financial resources for research on a particular commodity or group of commodities. This source of funding is particularly useful when the commodity faces an elastic demand and the farmers can capture the benefits of the research in an immediate and tangible manner.

Earmarking Taxes

Possibilities for earmarking taxes on specific commodities such as imported luxury goods, alcohol, tobacco, and other items should be examined. The earmarking of taxes is particularly effective when the desirability for the tax is understood and accepted by the population.

The Private Sector

Private sector involvement in agricultural research should be encouraged. This would require new legal arrangements for collaboration between the private and the public sector as well as incentives for industrial and manufacturing support for agricultural research. Private sector involvement should also be strengthened at the policy making level.

The Need for Accountabilty

Of course, increased funding has to be accompanied with increased responsibility in the management of the available funds. A sound and transparent accounting system is an important pre-requisite for the efficient and effective management of agricultural research. It will not only ensure confidence in the NARS but, more importantly,it will also permit greater financial flexibility, including block-funding, carry over of funds from one year to another, and the release of funds to meet peak requirements, which is so vital for the efficient and effective management of research

Human Resource Management Reforms

With or with out the availability of adequate financial resources, the efficient management of the human resources involved in national agricultural research would be vital for keeping agricultural research going at its peak in the country. Human resource management reforms are, therefore, needed to remove the numerous constraints facing the agricultural research scientists and workers. These would include reforms concerning the procedures for employing and retaining research staff as well as reforms regarding the conditions of service under which those who are recruited operate.

Staff Recruitment

Agricultural research is a trying professional activity particularly under African conditions and not every one has a heart for it. Consequently, recruitment policies must be such that agricultural research is not seen as a dumping ground for those who cannot find "first choice" employment elsewhere or those who need a transient camp while they await the availability of greener pastures elsewhere. The prestige associated with involvement with agricultural research service would need to be enhanced and the recruitment of scientists, technicians and administrative and financial staff for agricultural research service must be based on careful screening for high qualification, exceptional aptitude and the right attitude. In this regard, formal professional linkages between agricultural researchers from the ministries, research agencies and the university should be encouraged.

Working Conditions and Conditions of Service

Attractive conditions of service are critical not only for retaining the services of research staff but also for guaranteeing continued creativity and service. In this regard the following reforms are needed:

1. Salary rewards and upward mobility of researchers should be based largely on productivity and contributions to the effectiveness of their research rather than heavily on seniority as appears to be the case now. In any case,

upward mobility should never be tied to the availability of vacancies or limited to positions entailing administrative or management responsibilities.

2. The working and living conditions of all research staff including health and schooling facilities for children both at the research stations should be given special consideration so as to attract and retain competent staff with the right attitude to agricultural research.

3. Each research organization in the NARS should have a comprehensive long-term man-power development strategy as well as a coherent training and retraining plan for all category of staff including management staff. This would not only include formal training to the highest levels possible for all levels and categories of staff but also opportunities for the staff to broaden their understanding of the agricultural problems of the country through involvement in short in-service courses, workshops, and exchange programmes.

4. A system for ensuring that credit is given to researchers for their work would need to be worked out so as to ensure that researchers are given adequate and appropriate recognition for their contributions towards the achievement of the nation's agricultural targets. The award of national honours, cash prizes, patents and other forms of honouring significant research accomplishments should be institutionalized.

Information Management Reforms

In order to ensure that agricultural research is effective, the information flowing into and out of the research system must be adequately managed. To accomplish this task, adequate dialogue is needed at four levels: at the researcher-researcher level, at the researcher-policy maker level, at the researcher-extension worker level; and at the researcher-farmer level. The promotion of this dialogue would require a number of reforms. Some of these are discussed bellow.

Researcher-Researcher Level

Reforms are needed to facilitate dialogue between and among researchers at the national, regional, and international levels so as to ensure that the scientific and technical information needed by researchers to do their work are available with minimum effort and at minimum costs. This would require the holding of regular meetings and consultations at the different stages of research design and implementation. It would also require improved management of the library and documentation system including easy access to relevant up to date journals and contemporary text books, the creation of an effective system for the exchange of research results, and the holding of thematic workshops and seminars.

Researcher-Policy Maker Level

Reforms are required to improve research/policy linkages so as to provide Government with information essential for the formulation of policy and the attainment of government targets. This process is usually a political one as it involves political, social as well as economic choices. Ideally, research should provide the political authorities in government with the needed information to enable them set targets that are politically conformable, economically feasible, and socially acceptable.

Present arrangements for dialoguing would need to be reviewed with a view to strengthening dialogue at the following critical levels:

1. Dialogue between research scientists and the politicians and the community leaders regarding what is desirable and what is feasible with respect to the agricultural development targets of the country.

2. Dialogue between national and state planning agencies and scientists in the NARS, preferably in with the involvement of appropriate academic leaders of university, to promote understanding of the national agricultural research game plan and what is expected from everyone.

3. Dialogue between and among the Ministries of Agriculture and the planning units of other specialized departments and the leadership of relevant associations and groups on the content and intention of the research programmes which, through communication to their membership will help build local support for the programmes at all levels.

4. Dialogue between the Ministries of Agriculture and their field offices so as to maximize the use of local insights of both government and private individuals, regarding the implementation of agricultural policies and the development of support services.

5. Dialogue between the headquarters of the Ministries of Agriculture and their field offices to monitor resource flows and the progress with agricultural support services for the research efforts.

6. Dialogue between the Ministries of Agriculture and the Central Planning Agencies and their field offices to assure close monitoring and evaluation of the research programme with timely feedback for altering plans, policies, and programme structure.

7. Dialogue between planners at the Ministries of Agriculture and those at the regional, district, and community levels to assure the workability of the component parts of the programmes and to assure administrative commitments at all levels for the implementation of the various aspects of the programme.

8. Dialogue between the planning authorities in the Ministries of Agriculture and the Central Planning Agencies and counterpart budgetary personnel at all levels to assure adequate and timely resource support to the research effort.

Researcher-Extensionist Level

The most urgent reform needed here is the development of cost effective modes for joint planning and implementation of research between researchers and extensionist. Creative modifications to the existing extension system which result in reduced administrative costs are urgently needed. However before the dialogue needed here can be ensured, other subtle factors such as differences in prestige, educational level, pay, status and other conditions of service between extension people and researchers must be addressed so as to ensure effective cooperation.

Researcher-Farmer Level

Considerable progress has been made in Swaziland to improve the level of communication between researchers and farmers through the the introduction of FSR. The problem, however, is that, while the gathering of relevant information on the physical, agronomic, and socio-economic characteristics of the different farming systems is a necessary condition for the success of the agricultural development effort in the country, it is not sufficient. To be complete, these efforts must also be articulated within the existing agricultural policy formulation process in the country. There is, therefore, need for a new look at how well the FSR methodological approach is solving the problems of food and agricultural development in the country and what new corrective measures are needed.

Management of Physical Resources

Swaziland's financial situation has been relatively bouyant compared to other African countries. As a result, considerable investment has been made in physical infrastructures such as buildings, equipment, vehicles, machinery, and research farms. With the advent of financial austerity, the management of these physical resources will be the first casualty. The maintenance of these physical resources should, therefore, feature prominently in all efforts to revitalize and sustain effective collaborative agricultural research in the country. Service, repair and maintenance requirements should, therefore, be built into the process. These effort should, however be accompanied by the

implementation of effective mechanisms to ensure sound management such as:

1. The implementation of administrative rules and procedures that encourage the development of a maintenance culture for physical resources.

2. The implementation of a comprehensive and transparent inventory control system for spare parts and supplies.

3. The institutionalization of a coherent training and retraining programme for building, equipment, and office managers.

V. CONCLUSION

The conclusion of this report is that modern scientific agriculture is going to play a critical role in meeting Swaziland's food and agricultural production challenge in the 1990s and into the twenty first century. The bulk of the challenge will be met from intensified agricultural production by the country's small-holders who now produce most of its agricultural production and constitute the majority of the population.

Swaziland's agricultural research managers will hold the key to meeting the agricultural development challenge facing the country. The critical task that will face these managers will centre around the twin challenge of how to maximize the research output obtainable from the combination of available resources and knowledge and how to maximize the socio-economic benefits resulting from the solutions on offer from agricultural research. This will require renewed efforts to efficiently and effectively manage the linkages between and among the key players in the NARS, the mobilization of new funding sources and their management, and the management of research personnel, research information, and research equipment and infrastructures.

In carrying out the proposed management reforms, careful consideration should be given to the sequential implementation of the proposals. In other words,what should be done first under existing circumstances of limited financial and human resources, and so on.

REFERENCES

1. Abalu, G.I.
1992. Policy choices for African Agriculture: An Alternative Framework, in M.R. Langham and F. Kamajou, Eds, Agricultural Policy Analysis in Sub-Saharan Africa. Gainsville, Florida, University of Florida Press.

2. Contant, R. B.
1989 Strengthening National Agricultural Research Systems in Africa: Human Resource, Institutional and Financial Dimensions. Paper Prepared for the AFAA Workshop on Agricultural Research and Development. Abidjan, Ivory Coast, June 19 to 24.

3. Economic Intelligence Unit (EIU)
1994, Swaziland: London, Author

4. Elliott, H. and P. G. Pardey
1988 Determinants of Support for National Agricultural Research Systems. Paper presented at the ISNAR-CTA-DSE Seminar on The Changing Dynamics of Global Agriculture: Research Policy Implications for National Agricultural Research Systems. Feldafang, Federal Republic of Germany, September, 22 to 28.

5. Hobbs, S.H.
1986 Efficiency and Effectiveness: A managerial perspective for Agricultural Research. In Report of a Workshop on Improving Agricultural Research Organization and Management: Implications for the Future., the Hague, the Netherlands, September 8 to 12.

6. International Service for National Agricultural Research (ISNAR) and the Special Programme for African Agricultural Research (SPAAR)
1987 Guidelines for strengthening National Agricultural Research Systems in Sub-saharan Africa. Washington D.C., the World Bank

7. UNCED (United Nations Conference on Environment and Development).
1992. Adoption of Agreement on Environment and Development, Rio de Janeiro, United Nations, June 3 to 14.