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TOWARD THE YEAR 2000:

STRATEGIES FOR LESOTHO'S AGRICULTURE

written by

Jerry B. Eckert
Team Leader

with
Kenneth C. Nobe
Forrest E. Walters
Ronald A. Wykstra

Lesotho Agricultural
Sector Analysis Project

Research Report No. 10
May 1982

This report was prepared with partial support of the United States Agency for International Development under Cooperative Agreement USAID/ta-CA-1. Opinions expressed are those of the authors and are not necessarily those of the funding agency, the United States Government or the Government of Lesotho.

Planning Division
Ministry of Agriculture
and Marketing
Kingdom of Lesotho

Economics Department
Colorado State University
Fort Collins, Colorado
U.S.A.

EXECUTIVE SUMMARY

Introduction

The long term perspective for agricultural growth in Lesotho has not been well developed previously. In part this occurs because planning efforts have focused on projects and programs rather than the sector overall. This document takes a wholistic view of the agricultural sector, and particularly its condition and dynamics as of 1980. It then looks forward 20 years in an attempt to project the most important developments that will influence agricultural change. Within this context, both general and specific strategies for development programs are recommended. We have concentrated on those recommendations that will have maximum impact and those that are mutually reinforcing.

This executive summary provides the key points for decision makers who may not have time for more exhaustive reading. Chapter X provides a more detailed summary statement.

Developmental Philosophy

This volume expresses a fundamental philosophical point that a broadly participatory development strategy is essential to Lesotho's future. By this is meant that the number of people experiencing economic growth is an equally, or perhaps more, important objective than the rate of growth. To ensure widespread participation the volume emphasizes agricultural technologies that are appropriate to the small farmer with constrained resources. It is equally important that government adopt indirect stimulation as an implementation strategy rather than direct delivery of goods and services to individual farmers. Only through indirect means can development programs reach the majority of farmers (see pp. 115-117, 293-295).

Future Trends Affecting Planning

Several trends and patterns can be identified now which will set the overall development priorities in Lesotho's future. These are detailed in Chapter I (pp. 2-29). In very abbreviated form, the following are the events which will characterize the 1980-2000 period.

a. Population growth, now at 2.4 percent annually, will add at least 950,000 persons who must be fed, clothed, housed and

employed. Labor force will increase by nearly 400,000 persons (pp. 3-5).

b. The number of rural households, viewed here as both the principal actors and ultimate target of agricultural development, will rise from 247,000 to 337,000. All of the additions will likely be landless (pp. 6-7, 22).

c. Migration to RSA is projected to decline by 88,000, which exceeds the 66,000 by which Lesotho's own modern sector will grow. There could, thus, be a decline in the number of households with a member in wage employment (pp. 7-8, 16-18).

d. Rainfall will likely pass through a below normal period for the duration of the 1980s, followed by an above normal period in the 1990s. The productivity of cropping and range-fed livestock should reflect this oscillation (pp. 9-11).

e. Development of primary and secondary road networks will vastly improve the integration of the country (pp. 11-12).

These long term trends are used to show that Lesotho's development faces several present or near future crises. Most severe among them are the need for 1) employment generation, 2) raising productivity and incomes and 3) ensuring an equitable distribution of incomes. Failure to meet any of these challenges could have the severest of consequences. Finally, to increase participation and equity and to slow a potential flood of job seekers to urban areas, a decentralized or dispersed growth pattern is required (pp. 16-29). These considerations set the framework within which the recommendations of this monograph are made.

Nutrition

Chapter II (pp. 31-54) examines food supply and the adequacy of present consumption in order to identify nutritionally based priorities for agricultural planning. A second reason for this analysis was to improve the accuracy of Lesotho's current understanding of food consumption.

It was found that the population consumes an average of 210 kg/capita, moderately high by world standards (pp. 31-36). Consumption of cereals at this level is a contributing factor for certain nutritional diseases that are present in the population. In general, high consumption of cereals pre-empts adequate consumption of vegetables, fruit and protein among the poorer strata. It further contributes to

obesity problems concentrated in urban areas. High priority is accorded to changing the dietary balance by lowering the proportion of cereals and increasing consumption of vitamin rich and proteinaceous foods (pp. 38-40).

On average, per capita intake of calories and protein equals recommended levels (pp. 36, 38). However, serious distributional problems were found which result in various food shortages and a significant level of malnutrition among certain groups. Maldistributions of food are shown to be caused by poor income distribution, unequal distributions of land and livestock, the lack of interregional trade and seasonality of production (pp. 40-43). Finally, the analysis showed that pulses are important as sources of protein and could serve to remove protein deficiencies among children and in very poor households (p. 39). This finding leads to a strong recommendation for pulse production programs and nutritional education programs.

Economic analysis of the determinants of food consumption is then used to project cereals and meats consumption at the end of the century. Both will more than double, requiring at least a 3.2 and 3.6 percent annual increase in supply (pp. 44-53). Domestic production must increase at an even faster rate if progress in self sufficiency in these two commodities is to be made.

Farmer Resources

Limited supplies of farm resources constrain small farmers' development options. Agricultural strategies must recognize this and provide packages of technology which are within the small farmer's capacity. Furthermore, there is considerable variation among farmers in Lesotho in terms of the resources at their disposal. Failure to recognize this has been partly behind the ineffectiveness of many recommended changes in the past. A participatory growth strategy requires that target groups be defined based on similarities and differences in resources and that special development programs be provided to each (pp. 57-58).

Land and livestock holdings provide the first level of identification for the relevance of different programs. For example, in Lesotho cropping programs can only be relevant to the 68 percent of rural households who hold land. This figure will decline to 62 percent by the year 2000. Livestock programs could conceivably reach the one half of rural households who own animals, although only a small fraction, say 10-15 percent, have herds or flocks large enough to warrant commercial livestock operations. Even more important, some 15.4 percent of rural households have neither land or livestock and thus cannot benefit directly from any primary production programs except those that hire labor. This group will likely swell to 36.5 percent of rural households in 2000 A.D. (pp. 57-60).

Inequalities in resource distributions are shown to be substantial. The traditional tenure system has not preserved total equality in land allocations, although Lesotho is in a better situation than many developing countries. Cattle, sheep and goat holdings are particularly concentrated. To complicate matters there is a positive relationship between land and livestock holdings with the largest herds/flocks occurring with the largest landholders (pp. 60-63).

Finally, the various resource positions of Lesotho's farmers are analyzed to identify specific target groups for development attention (pp. 63-72). Those groups so identified include:

a. Those capable of foodgrain self sufficiency within their own household, at present and future yield levels.

b. A "better farmer" group most likely to be innovators with respect to new technologies (13 percent of farm households).

c. Part-time farmers who utilize their resources primarily to provide supplemental cash and home consumption and who will not likely lead the process of change (65 percent of farm households).

d. Market oriented farmers who are sufficiently commercialized to be responsive to price policies (ca. 35 percent).

e. A group of resource destitute landholders (22 percent) who have only land and no cattle, tools, outside incomes and usually no males in the family.

One significant finding is the identification of two ends of the farm resource spectrum; those with a resource mix suited for improvement in extensive field crop production and those whose resources are best suited for labor intensive, high value cropping (p. 71).

Cropping in Lesotho

Analysis of the cropping subsector is presented in three sections. Section 1 (pp. 75-87) provides an analysis of trends in crop production during the 1970s. The most significant of these was the decline in planted hectares occurring in mid-decade. The analysis concludes that this apparent de-emphasis of cropping was a rational farmer response to rapidly changing economic incentives resulting from the increase in mine wages in South Africa from 1972-76.

Concurrently with the reduction in planted area, crop yields increased approximately 50 percent. The higher yields measured since 1976-77 are a direct result of fallowing of lower yielding fields plus a

concentration of inputs, particularly labor, on the remaining area. These two trends counteracted each other with the result that total national production neither declined nor increased appreciably. Section 2 (pp. 88-114) provides a detailed analysis of several facets of the agricultural sector at the beginning of the 1980s. The cropping environment is characterized by a number of resource scarcities, variable climate and a wide range in quality of cereals. As a result of the economic incentives resulting from the mine wage increase, farmers are dissuaded from making significant investments to cropping.

Examining crop husbandry practices shows several factors which operate as significant constraints. Seedbed preparation and the planting techniques to control and establish an adequate plant population are among the most important. Weeding is another practice which could be improved considerably. Crop rotations are only infrequently used and this is not generally done for improving soil fertility. The use of purchased inputs, particularly fertilizer, remains still in its infancy. And the analyses show that large increases in production could be obtained through substituting improved varieties. In each of these instances improved techniques or better control are within reach of small farmers. The necessary technologies are relatively simple and inexpensive. It is necessary, however, to build systematic programs that will bring these technologies to the farmer and educate him in their use (pp 93-100).

The analysis of acreage decisions made by farmers during the 1970s shows them to be responsive to price policy and economic incentives (pp. 100-102). This conclusion is used throughout the volume to reinforce recommendations for significant improvements in agricultural marketing. Yields are shown to be primarily determined by climatic factors, especially rainfall, at the present time. Since climate and soils vary between districts there are inherent differences in the productivity of agriculture in the various regions (pp. 102-107). Subsequent sections of the volume build on this finding to recommend regionally distinct cropping strategies (pp. 279-287).

Section 2 concludes with an analysis of variability and risk in cropping (pp. 107-114). While the climatic environment for cropping is found to be variable and risky, this variability is not extreme by comparative standards and much of its impact on agriculture could be reduced through improved husbandry practices.

Section 3 presents a cropping program for Lesotho which concentrates on participatory programs that could be utilized by most of the nation's small farmers of one type or another (pp. 115-145). Among the objectives sought through crops development are: 1) increasing the marketed surplus, 2) raise employment, 3) achieving self sufficiency in a larger number of households, 4) increasing incomes from land, and 5) alleviating nutritional problems.

Appropriate technologies are identified which will permit average farmers in various target groups to relieve most of the constraints they face. The recommendations emphasize providing inputs which are now in scarce supply (pp. 120-123), increasing the productive potential and profitability of small farms (123-129), techniques for reducing the risk in cropping and an emphasis on shifting the management of land resources to the better managers or to village producers' associations (pp. 130-132).

An examination of recent experience in modern dryland farming of maize indicates that the above recommendations can lead to very high output and profits per hectare (pp. 133-136). Furthermore, the output of modern dryland farming can be used to generate substantial wage income which can be allocated in whatever fashion village society might choose. The analysis recommends that decisions regarding production technology and distribution of the benefits of production might well be taken separately within Lesotho's social context.

To meet the urgent mandate for maximum implementation and incomes, several radical changes will be necessary within the cropping subsector. High value horticultural, seed and nut crops offer one significant possibility for incomes which could compete with those from migration. These non-traditional crops are perhaps the largest potential source of employment from agricultural production. The second major innovation which deserves a significant increase in research and testing is irrigation. The analysis concludes, however, that irrigation is generally not suited for extensively grown cereals crops. However, it would seem particularly appropriate for potatoes and vegetables and for the establishment of orchards, vineyards and other high value enterprises (pp. 136-144).

Livestock and Pastures

Historical figures for livestock numbers and trade are rationalized and used to analyze trends during the 1970s (pp. 150-158). Again the major influence was rapid increases in off-farm wage incomes. During the latter part of the decade, livestock imports rose to unprecedented levels as did meat consumption. The national cattle herd increased in size, storing some of the new wealth. A 40 percent reduction in small stock (sheep and goats) occurred, matching the 40 percent reduction in planted area. Thus a similar de-emphasis apparently occurred in livestock based, cash incomes as was found in cropping. Grazing pressure has reduced somewhat as a result and offers the potential for greater effectiveness in range restoration programs in the near future. It was shown, however, that most of the additions to the cattle herd are female and a high percentage of these are heifer calves. Rapid expansion of the cattle herd is thus a distinct possibility unless off take is expanded rapidly.

The analysis of livestock ownership showed a highly concentrated distribution. Several social factors spread livestock wealth throughout society. Without these mechanisms, livestock would contribute, more strongly than they do, to concentrations of wealth. The emphasis by Dr. D. R. Phororo on livestock strategies which build on, rather than bypass, these social roles for livestock is repeated with emphasis (pp. 159-164).

Population dynamics reveal the livestock herds (all species) to be under ecological stress. The age structure is too old, the ratio of males to females too high, off take for slaughter is too low and total numbers exceed carrying capacity of the range in its present condition. As a result, birthrates are very low and mortality very high. Correcting these factors could result in a livestock subsector that could sustain meat and product outputs at several multiples of present levels (pp. 164-169).

Many existing reports provide an analysis and recommendations concerning stocking rates and carrying capacity. The most important of these are reviewed (pp. 169-175) as a prelude to the recommendations of this monograph which try to establish a culturally acceptable, economically sound modernization program for livestock (pp. 175-182). The central recommendation is that farmers be led to adopt new perceptions of both livestock and rangeland. Livestock must come to be viewed as a commercial enterprise of considerable potential for recurrent incomes, rather than as just a store of wealth and a social asset. Rangeland must be viewed as an economic asset requiring modern management and the economic costs of long term abuse must be appreciated. Several programs are suggested which would contribute to this change in perspective (pp. 175-178).

Explicit governmental strategies are then recommended for:

a. selectively reducing stocking rates. Emphasis is placed on reduction of small stock in the Lowlands.

b. gradual elimination of seasonal movements of stock from Lowlands to mountain grazing areas.

c. culling, through stock reduction.

d. confinement husbandry options, especially for the Lowlands, as a means of bringing animal numbers and feed supplies in balance.

Significant portions of the livestock owning households have but a few stock. Yet for nutritional as well as income purposes it is important that the productivity of these small herds and flocks be raised as much as possible. Several options are discussed including those

suitable for management by housewives (pp. 182-185). Finally, the important potential role for village management of confined animal enterprises or pastures is stressed.

Agricultural Marketing

It is difficult to make recommendations concerning agricultural marketing when the present situation is in a state of rapid change. Nevertheless, the analysis begins by identifying several characteristics of the agricultural sector which influence marketing strategies. These are:

a. Wide differences in farm types and their involvement in marketing.

b. Substantial year-to-year variation in total production levels.

c. Substantial year-to-year variation in commodity prices.

d. The remoteness of many of Lesotho's farms.

e. Variation in market structure over the recent past.

In line with these observations several objectives can be set for agricultural marketing. These include: 1) increasing the number of commercially oriented farms, 2) increasing trade of food commodities between regions and from rural to urban areas, 3) generating employment and incomes, and 4) capturing larger shares of value added within Lesotho's borders (pp. 191-193).

To achieve these objectives Lesotho needs a stable marketing system which is understood by farmers and with which they can deal confidently. It is recommended, therefore, that Lesotho move as rapidly as possible to finalizing a market structure and consolidating responsibilities of the various agencies involved. To do so will require new legislation. Secondly, it is important that definite price policies be established governing inputs and farm produce. The analysis suggests that Lesotho not attempt to extend marketing services beyond those areas in which they are economically viable.

To generate employment and capture value added a major national priority is indicated for various types of agro-industries related to Lesotho's present and future commodity mix. A number of such options are identified and many more will arise as cropping and animal production modernizes in the future. Especially important is domestic manufacture of agricultural tools and implements.

The final element of a marketing strategy is to design marketing development activities to meet the specific needs of the various target groups identified in Chapter III. Farmers producing commercial services will require the market to accept their product at attractive prices and offer a full range of farm inputs. Part time subsistence farmers will place a higher priority on a retail food market network that delivers food supplies on a reliable, attractively priced basis. Selected marketing strategies can also be directed at pulses in order to reduce identified protein deficiency problems.

Thus, marketing has a number of significant developmental roles to play. Without a modernized, efficient and more diverse marketing system, progress at the level of farm production will be impeded.

Conservation

The central conservation problem in Lesotho is that economic conditions do not adequately justify conventional conservation programs. The annual productivity of the land is so low and the farms so small that conservation works are not economic from the farmers individual perspective. Output from the land is sufficiently low so that the added value due to conservation might not even pay for maintenance costs. Hence, major conservation works remain a public responsibility (p. 211).

Lesotho finds itself in a difficult position. Conservation structures can hardly be justified on the basis of short run returns from low productivity agriculture. Yet expected increases in the labor force, use of purchased inputs and technological change promise a steady growth in productivity so that in the future, conservation efforts might be quite profitable. Unfortunately much land could be lost before then. Therefore, the justification for a national conservation effort in the public sector is based on future, rather than present productivity. These indefinite, but probably substantial, future benefits, when combined with the facts of budget and manpower limitations, suggest that conservation be sustained as a priority activity within the MOA but that the program be run in the most cost effective manner possible (p. 212).

The report recommends the approach of considering whole watersheds as conservation planning units. Technically, the watershed comprises a hydrological unit and a partial program only on part of the watershed will affect other portions as well. Second, strong emphasis is given to vegetative mechanisms to control erosion, including improved ground cover and effective management of crop residues.

There follows (pp. 216-226) a review of several erosion characteristics of Lesotho's soils. Considerable variation is found with ten of

the 25 soil series in Lesotho being classified as highly erodible. Since it occurs sporadically, donga or gully erosion is considered a less severe problem than sheet and rill erosion.

A lengthy review of conservation efforts to date is presented in pages 226-239. Considerable success was achieved in early years through a program that reached nationwide. Soil losses were reduced, and most of the arable land terraced. Programs since independence and until very recently have emphasized capital-intensive, structural conservation technologies. The analysis suggests that this may have been an error and recommends a balanced program with highest priority given to labor-intensive, vegetative methods. A secondary priority is given to capital-intensive strategies which would be used only in carefully selected situations in which they are most appropriate. The advisability of a maintenance program is highlighted.

Agricultural Employment

Much has been written about employment in recent years, especially by two of the authors of the present report (see Appendix B). This chapter provides a brief summary of earlier work, describing conditions which have created an employment crisis that should last throughout the rest of the century (pp. 249-252). All the calculations and estimates lead to one inescapable fact: 20,000 new jobs are needed from agriculture and other rural enterprises annually.

One section which has not appeared elsewhere shows the limits to employment growth within the traditional crop mix. Using fairly optimistic assumptions it is possible to foresee slightly less than 6,000 new agricultural jobs annually. Thus, with traditional crops 70 percent of the annual job requirement will go unmet (pp. 252-254). This observation is used at several points in the text to reinforce the need for non-traditional, high value, labor-intensive crops and cropping patterns.

It is shown (pp. 254-260) that, 1) the employment problem remains severe even if population growth is assumed to drop markedly, 2) agriculture must bear the principal burden in the next 20 years, 3) employment needs are so important that job creation must be the main expected output in development, and 4) the need for jobs is selective and planners should be able to identify critical target groups with special needs for employment programs.

The balance of this chapter (pp. 261-277) presents a slightly condensed version of the Employment Generation Strategy for Agriculture which was developed and approved by the MOA in August 1980.

Each section of the strategy contains a section of analytical points followed by recommendations. The emphasis is on finding the means to maximize employment with programs that are compatible with other development objectives as well. Recommendations are constructed for cropping (pp. 262-267), livestock (pp. 267-271), marketing, processing and agro-industry (pp. 271-275), and labor-intensive public works utilized to provide agricultural infrastructure (pp. 276-277).

Final Considerations

Chapter IX (pp. 279-285) reviews briefly the use of geographic regions as a planning or program implementation concept and points out that there exists a growing supply of analyses and data that support regional planning. In its most recent form, this interest lies behind the concept of decentralization. This volume, at many points, supports decentralization and finds that dispersing economic activity widely is essential to participatory growth. We have also noted in earlier chapters that significant differences exist between regions in the agricultural environment. Therefore, pages 283-284 present different program emphases for each of several possible planning regions. Finally, Chapter X consolidates the recommendations of the volume around policy issues. It is prepared as a summary and should be read to supplement this Executive Summary section.

PREFACE

The need for a detailed understanding of the agricultural sector as a basis for agricultural planning was recognized early in Lesotho's independent history. The amount of sophisticated analysis available at the start of the first five year plan (1970) was meager and inadequate to support a comprehensive development program. During the first plan many early projects released a number of surveys and research reports. Some excellent work was done but few of these studies dealt with the sector as a whole. Thus, the second plan was based on an improved but still incomplete understanding of the sector.

In August 1976, the Lesotho Agricultural Sector Analysis (LASA) project was established by Cooperative Agreement between the Government of Lesotho, USAID and Colorado State University. Among the several purposes of that project was to complete an agricultural sector analysis which was to serve as one of the foundation cornerstones for more systematic agricultural planning. A second objective was to stimulate the use of analysis through improved planning methodologies within the Planning Division of the Ministry of Agriculture and Marketing.

This document represents one of the end products of that project. Toward the Year 2000 draws heavily on countless and continuous inputs and suggestions from nearly everyone in the Planning Division during the field phase of the project, 1977-1980. Leadership in stimulating this intensive interaction was provided by Dr. D. R. Phororo (P.S., 1974-79), Mr. Chaka Ntsane (DPS/T, 1975-79; P.S., 1979-80), Mrs. Manapo Moshoeshoe Sixishe (Chief Planning Officer, 1977-79) and Mrs. Matsiea Morojele (Chief Planning Officer, 1979 to present).

The volume was written by Dr. Jerry Eckert (LASA Team Leader, 1976-82). Preliminary drafts of Chapters VI, VII and VIII were provided by Drs. Forrest Walters, Kenneth Nobe and Ronald Wykstra, respectively (all of CSU). Draft chapters were reviewed in a week-long workshop involving all Division Heads, Section Chiefs and District Agricultural Officers in May 1980. Subsequent revisions were reviewed by individual members of the Ministry during April/May of 1982. The process was painstaking. But despite its focus on detail, this workshop constituted one significant point in Lesotho's history when the whole of the Ministry's leadership sat together to wrestle with long term agricultural development strategies.

The resulting document is divided into three parts. The first, Chapters I-III, provides a description of key elements of agriculture and the national economy which together provide the setting for agricultural growth and change. Part Two includes four chapters of technical analysis of various sector subcomponents. The chapter on cropping (IV) is most thoroughly elaborated, largely because the existing analytical literature on conservation (VII) and especially livestock (V) is much more abundant and marketing (VI) is in a state of rapid change and modernization. Part Three presents three chapters of summary recommendations, one from the employment perspective, one from the regional perspective and the last chapter from an overall development philosophy perspective. Two appendices are included. Appendix A presents basic priorities around which to construct a long term training program for the MOA with the intention of implementing the recommendations of this volume. Appendix B provides a record of the more important written outputs of the project.

Most of the analyses provided herein will not soon become obsolete and, thus, should provide an enduring analytical background to agricultural planning over coming years.

The LASA team is deeply indebted to their many friends and colleagues in the Ministry of Agriculture and elsewhere in the Government of Lesotho for the thousands of hours spent working together and learning from each other during the field phase of the project (1977-80) and in the following period during which this document was being finalized. We were privileged to be accepted as part of the Ministry, even though a non-typical part, and trust that our ultimate contribution will match the trust accorded us.

Finally, as a Cooperative Agreement, LASA received support from USAID, the Government of Lesotho and Colorado State University. Appreciation is extended to all three agencies for making the effort possible. We would especially thank the USAID Mission in Maseru who supported us exceptionally well with their sustained interest and active involvement.

K. C. Nobe
Project Director

Jerry B. Eckert
Field Team Leader

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PART ONE

THE SETTING

The following three chapters present an analysis of the overall national environment within which agricultural planning and development must occur. Chapter I develops a number of trends that will characterize the two decades, 1980-2000. From these trends, it is possible to quantify what must be the top economic development priorities for Lesotho. Chapter II examines the present nutritional situation to the extent it is known. From this analysis are derived several nutritional priorities which must guide agricultural development just as do income, self-sufficiency, and employment priorities. Chapter III provides the most detailed analysis yet of the availability of productive resources to Basotho farmers. This analysis is then used to carefully define target groups and to show the importance of alternative development strategies for each. The intent of Chapter III is to support development efforts that are more appropriately designed and thus more relevant than is possible when it is assumed that all farmers are alike and can be described by national average data.

CHAPTER I

THE FUTURE ENVIRONMENT FOR AGRICULTURE[1]

Introduction

Agricultural development planning is specifically concerned with change in the agricultural sector. However, agriculture is intimately linked with events in other sectors and with the economy as a whole. This is particularly true where agricultural resources such as land and livestock are spread widely among the rural population. In Lesotho's case, the dominant factors encouraging or constraining overall economic development are also those affecting agriculture.

Any plan, whether an annual plan or a five year plan, must fall within, and be consistent with, a long term perspective. A 20-year outlook addresses questions of the derived structure for the economy and society one generation hence. By so doing, stability and direction are provided for shorter run decisions.

This chapter examines trends that may occur in Lesotho over the next 20 years. For emphasis these trends are presented assuming no government intervention. Critical development priorities are thus identified which set the context for agricultural as well as general economic development. Beginning with Chapter IV, a wide range of agricultural programs and policies are suggested to meet these priorities, bringing Lesotho to the end of the century with a balanced, healthy agricultural sector. There is, in Lesotho, great potential for agricultural growth and for the agricultural sector to contribute to national development objectives. By starting from the long term perspective of national priorities, agriculture's contribution can be maximized.

Several significant trends can be identified and projected for the next twenty years. Each of these will have significant impacts on the prospects for development. In most cases they are not factors over which agricultural planners have much control. Consequently, when taken together they constitute the environment - the major problems and challenges - within which agricultural planning must take place. The analysis that follows first presents a descriptive set of projections of major economic, climatic, demographic and institutional

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[1]The excellent assistance of Mr. J. N. Mohapi of the Bureau of Statistics in preparing the calculations for this chapter is acknowledged and appreciated.

changes to be expected during the perspective plan period.[1] The final section analyzes these various trends for their implied policies and strategies that must be considered in Lesotho's context. Major trends described below include:

1. Population and labor force growth.
2. Growth in the number of rural households.
3. The future for migrant employment.
4. Rainfall oscillations.
5. Infrastructural and institutional developments.

Identifiable Future Trends

Population Growth

Lesotho's de jure[2] population stood at 1,216,815 persons in 1976 (BOS, unpublished tables from the 1976 population census). Growth rate during the previous decade was measured at 2.27 percent per annum, an increase from the 2.05 percent measured between the 1956 and 1966 censuses. Thus, while Lesotho's population growth is only moderate by African standards,[3] the rate of growth is increasing over time; a fact that has been recorded since 1940 (LASA, 1978).

Using the 1976 Census of Population preliminary figures as a base, Lesotho's population has been projected forward to 1980 and by five year intervals thereafter to 2000 AD (Eckert and Wykstra, 1979b). Two alternative projections are offered, one with a constant growth rate, and one where the historical increase in growth rates is sustained with the result that population continues to increase at a slowly increasing rate. While it would be less controversial to accept the constant growth rate assumption, the balance of evidence suggests that the growth rate will increase slowly for at least the near future. On the one hand the factors normally associated with voluntary reductions in fertility are relatively present in Lesotho compared to other

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[1]Planning over a twenty year horizon is generally referred to as perspective planning. Because of the length of the planning horizon such plans are generally confined to identifying major priorities and general overall long run policies.

[2]Includes migrants who have been absent from Lesotho less than five years.

[3]Comparing data from most African countries, 30 exceed Lesotho's population growth rate and 14 have lower rates (IADS, 1978).

African countries.[1] One would expect only a limited further impact from these sources. On the other hand there remains considerable scope for decreased infant and early childhood mortality and for an increase in life expectancy by both sexes. For these reasons, we accept the proposition that population growth rates will continue a slow rise and, in fact, probably stand at 2.4 percent in 1980.

Two future demographic elements must be mentioned. First, government announced at the 1979 donor's conference a policy of providing technical means and advisory services to families which voluntarily wish to plan their families. Second, if the declining income and employment opportunities discussed below do in fact occur, one possible response by the households affected would be to attempt to limit family size. These two factors could act together to cause a downturn in the population growth rate before the end of the century. Should this occur the principal impact will be a small reduction in the number of children under 15 years of age in the estimated 2000 AD population. It is highly improbable that these factors could make more than a 5 percent difference in total population. Their principal impact, should they occur, will undoubtedly be in the next century.

Table I-1 summarizes population projections to the year 2000.[2] Lesotho will add approximately 1 million persons bv 2000 AD over and

Table I-1. Estimated Future De Jure Population of Lesotho, 1980-2000.

Year	Male	Female	Total (Rounded)
1976 (Census)	587,331	629,484	1,216,800
1980	647,662	690,740	1,338,400
1985	735,197	779,618	1,514,800
1990	838,784	884,794	1,723,600
1995	961,805	1,009,701	1,971,500
2000	1,108,446	1,158,591	2,267,000

Source: Eckert and Wykstra, 1979b.

[1]These factors include literacy rates, education levels, incomes and standard of living, all of which are relatively high in Lesotho compared to elsewhere in Africa.

[2]We have used the increasing growth rate assumption of Eckert and Wykstra (1979b) for the reasons noted. If the population growth rate should immediately cease to rise, the total population given in Table I-1 for the year 2000 would be reduced by 100,000.

above the 1976 total. Gaining control over population growth rates will not be easy because, even if families choose to limit their children, additional progress will be achieved in medical services, thereby reducing mortality at the same time. Lesotho's population problem is the same as that of many developing nations; reducing overall population growth while continuing to improve life expectancy.

Growth in Labor Force

Labor force estimates are derived directly from population figures. Individuals of 15 years or older but under 65 years are conventionally assumed to constitute the work age population. Of these there will be some in each age group who do not work, either for reasons of preference or disability. Consequently a "participation rate" is applied to the work age population to arrive at an estimate of the labor force. Loosely defined the labor force is the sum of those employed and those available for work at any point in time.

The only available participation rates for Lesotho are those calculated prior to the Second Five Year Plan (CPDO 1976, Lesotho 1975/76). While admitting that these may change over time, these rates are applied to the estimated work age population to give labor force projections in Table I-2. Participation rates normally change slowly.

Household Numbers

For many agricultural policies and planning decisions, the rural household is the decision making unit on which influence is desired. Productive resources available to the household determine the farmer's potential to meet his food, income and other needs. The various sources of income received by the household and the relationships between them determine the incentive structure of household decision makers. To assess these factors in agricultural development it is important to know the number of rural households, presently and in the future.

In Lesotho, traditionally, a household is formed when a couple marries. To estimate the growth rate in household numbers, we have assumed an average age of marriage of 25 years, taken the growth rate of population 25 years earlier, adjusted for mortality between birth and age 25 and arrived at approximations for 1980, 1990 and 2000 AD. Table I-3 shows details of the calculations as well as the results.

Since the purpose is to estimate rural household numbers it is necessary to adjust for rural to urban migration. Unfortunately no systematic analysis is available. The only available figures are in the various censuses and relate to individuals, not households. Part of the net movement to urban areas shown in these individual data then results in smaller, rather than fewer, rural households.

As pressure on the land increases, it will become increasingly difficult for newly married couples to find means of earning a living in rural areas. It seems probable, therefore, that an increasing number of them must move to towns. As a guess it is suggested that 5, 10 and 15 percent of the net additions to rural households will move to urban areas during the 1970s, 1980s and 1990s, respectively. These three percentages are believed to be conservative; actual figures could be higher, in which case there could be a small drop in the steady increase in rural household numbers.

Table I-2. Current and Estimated Basotho Labor Force, 1980-2000.

Year		Males 15-24	Males 25-64	Females 15-24	Females 25-64	Total (000)
1976	Pop. (Base yr.)	109,206	211,821	123,061	223,011	667.1
	L.F.	74,260	199,111	71,375	191,789	536.5
1980	Pop.	135,051	233,647	143,641	252,777	765.1
	L.F.	91,835	219,628	83,312	217,388	612.2
1985	Pop.	152,112	262,199	152,878	290,815	858.0
	L.F.	103,436	246,467	88,669	250,101	688.7
1990	Pop.	155,259	309,788	156,372	341,761	963.2
	L.F.	105,576	291,201	90,696	293,914	781.4
1995	Pop.	168,587	355,391	168,102	389,872	1,082.0
	L.F.	114,639	334,068	97,499	335,290	881.5
2000	Pop.	203,304	400,554	198,292	436,763	1,238.9
	L.F.	138,250	376,500	115,000	375,600	1,005.4

Source: Age-specific population totals from Eckert and Wykstra, 1979b. 1976 base from Census of Population.

Notes: a) Population totals refer to ages 15-64 only.

b) Participation rates from Lesotho's Second Five Year Plan as follows:

	Male	Female
15-24	.68	.58
25-64	.94	.86

Table I-3. Methodology for Estimating Lesotho's Rural Household Numbers with Modest Rural to Urban Migration

Item and method	From 1969 to 1980	From 1980 to 1990	From 1990 to 2000
a. Midpoint of period	1975	1985	1995
b. Population Growth Rate - 25 years earlier	1.81% (1950)	2.05% (1960)	2.27% (1970)
c. Survival Rate to age 25	.8	.8	.85
d. Annual Growth Rate in Households (b x c)	.0145	.0164	.0193
e. Base Figure and (year) for projection	212,228(69)	246,800(80)	286,000(90)
f. Gross increase $e(1 + d)^t - e$	36,414	43,596	60,250
g. Rural-Urban Migration (f x specified %)	@ 5% -1,821	@ 10% -4,360	@ 15% -9,050
h. Net addition to Rural Households (f - g)	34,593	39,236	51,200
i. Total Rural Households (h + e)	246,821	286,036	337,200

Sources: Item b, LASA, 1978.
Item c, Monyake, 1973 (third figure assumed).
Item e for 1969 from BOS, 1972.
Item g, column one computed from LASA, 1978; other two columns assumed.

Migration to South Africa

A number of recent research reports have cast doubt on the ability of Basotho to look to the Republic of South Africa for employment in the

future (Clarke, 1978; Eckert and Wykstra, 1979a). Eckert and Wykstra, working with scholars, industry representatives and others in RSA, have provided long term projections based on an in-depth analysis of trends now underway in South Africa. They conclude that the number of Basotho employed in South Africa will be reduced to half of present levels by the end of the century and that most of this reduction will occur in the next 12-13 years. It should be pointed out that their projected rate of decline is slower than that considered "realistic" by the Chamber of Mines, the principal employer of Basotho migrants, although the Chamber does not expect the decline to begin in earnest until the early to mid-Eighties. They suggest that a 3.1 percent compound rate of reduction beginning in 1978 will simulate the probable path by which both of their predictions will be met. Beginning in 1978 migrant numbers would fall to about 65 percent of present levels by 1990 and to 50 percent ten years later. For our projections we have accepted the available estimates of some 200,000 migrants in 1976 (van der Wiel, 1977). Analysts who wish to use the "official" figures of 160,000 for the same year are invited to do so (CPDO, unpublished data). Table I-4 combines the estimated developmental path of migration with projected growth in the total Basotho labor force to show the magnitude of the domestic employment challenge. To avoid large scale unemployment or massive underemployment Lesotho must generate well in excess of 20,000 jobs per year in all sectors of the economy. For comparison, during the Second Five Year Plan the modern sector including government succeeded in adding only 2,500 jobs per year.

Table I-4. Projected Trends in Location of Employment for Basotho: 1980-2000.

Year	Total Labor Force (000)	Employed in RSA (000)	Remain for Domestic Jobs (000)	Required Employment Creation Rates	
				Annual Jobs	% Growth in Jobs
1976 (Base)	536	200	336		
1980	612	188	424	22,000	6.0%
1985	689	160	529	21,000	4.5%
1990	781	137	644	23,000	4.0%
1995	882	117	765	24,200	3.5%
2000	1,005	100	905	28,000	3.4%

Note: These projections assume no change in participation rates. Therefore, they have assumed that 233,000 people of working age will not be participating in the labor force by 2000 AD.

Rainfall Oscillations

Meteorological research in South Africa has fairly well established that the summer rainfall area of Southern Africa is characterized by alternative wet and dry spells. These clusters of wet years or dry years are approximately 9-10 years in duration and are popularly referred to as the "quasi-20 year oscillation". The pattern has been measured quantitatively since 1910. Less precise records from the writings of early local observers suggest that is was observable as early as the mid-19th century while tree ring research gives evidence that the pattern may have endured more than 300 years (Dyer and Tyson, 1977). The weight of evidence has led Tyson to assert:

> ". . . the oscillatory character of South African rainfall has been deomonstrated beyond all reasonable doubt for the period 1910-1972. . ." (Tyson, 1978).

Similar oscillations, coinciding with those in South Africa, are visible in Lesotho's rainfall data since the early 1940s (Eckert, 1980a). Figure I-1 shows this pattern based on combined rainfall records of seven Lowland stations.[1] Dyer and Tyson's analysis suggests the onset of a dry spell in approximately 1982 which will then presumably last until 1991. Figure I-1 would tend to confirm this possibility for Lesotho specifically.

The evidence from the summer rainfall region of southern Africa is relatively persuasive and gaining in acceptance. While other patterns have been shown to exist, and to even dominate certain regions, many studies have confirmed a widespread 20-year rainfall oscillation as the principal pattern in much of southern Africa. Unless this pattern ceases, the 1980s will be characterized by below average rainfall while the 1990s should return to above the long term average.

Average rainfall for the seven lowland stations in Figure I-1 is 735 mm per year. There is evidence in Dyer and Tyson's work that the amplitude of the deviations above and below normal has been increasing since 1920. Dyer and Tyson point out that their equations are better at modeling the change from one side of the long term average to the other than they are in depicting annual variations. Therefore, while one cannot predict annual rainfall totals, it seems plausible that during the 1980s, annual observations will average 650-660 mm, some 160 mm lower than was recorded between 1972-1980.

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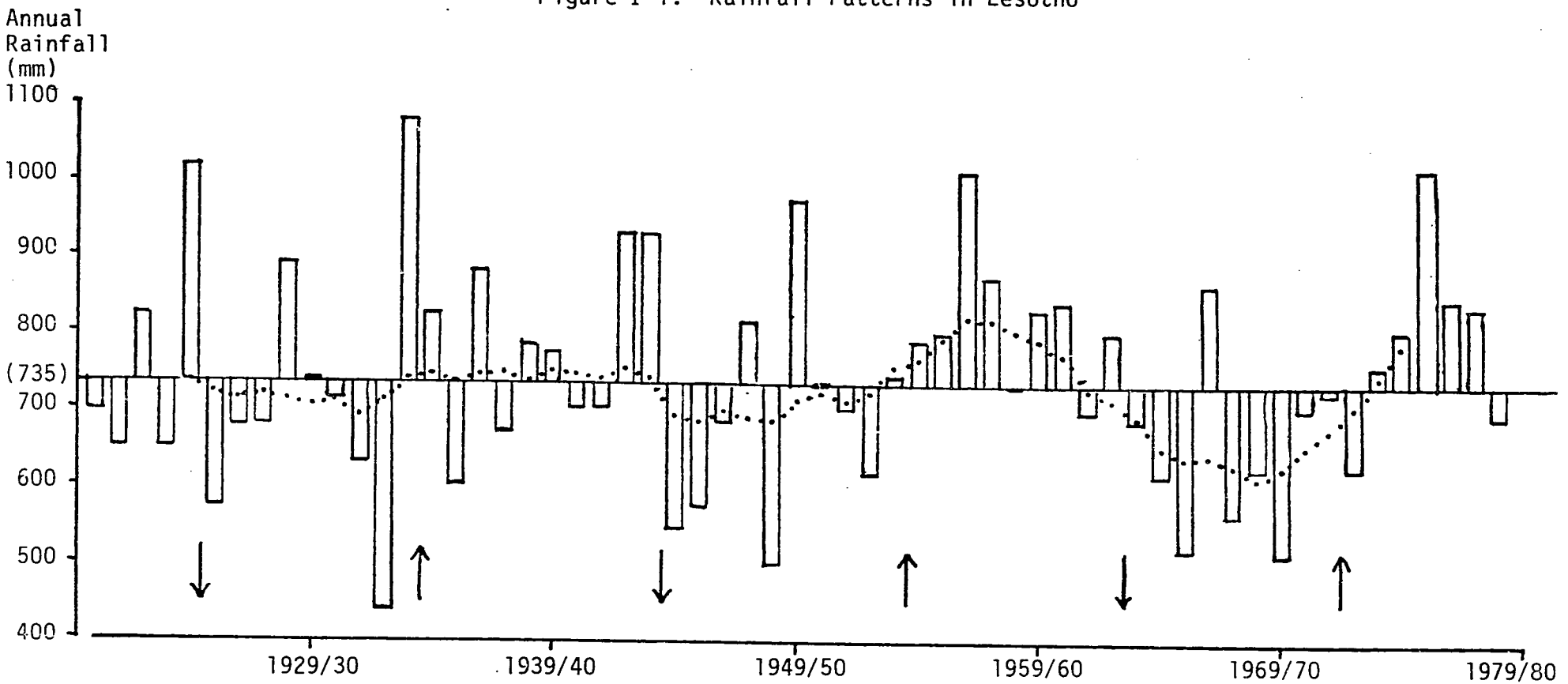
[1] Butha-Buthe, Leribe, Teyateyaneng, Maseru, Mafeteng, Mohale's Hoek and Quthing.

Figure I-1. Rainfall Patterns in Lesotho



Vertical Bars - Annual Rainfall
Horizontal Line - 50 Year Mean

Dotted Line - 9 Year Moving Average
Arrows - Point of Onset of Wet or Dry Period (Dyer & Tyson)

Rainfall differences between wet and dry years are concentrated in four months as shown below:

	Nov.	Dec.	Jan.	Feb.	Total (Yr.)
Wet average	98.9	113.9	128.4	116.4	820.6
Dry average	64.7	81.3	105.9	94.3	667.8
Difference	34.2	32.6	22.5	22.1	152.8

(Note: Averages for 1945/46 to 1978/79.)

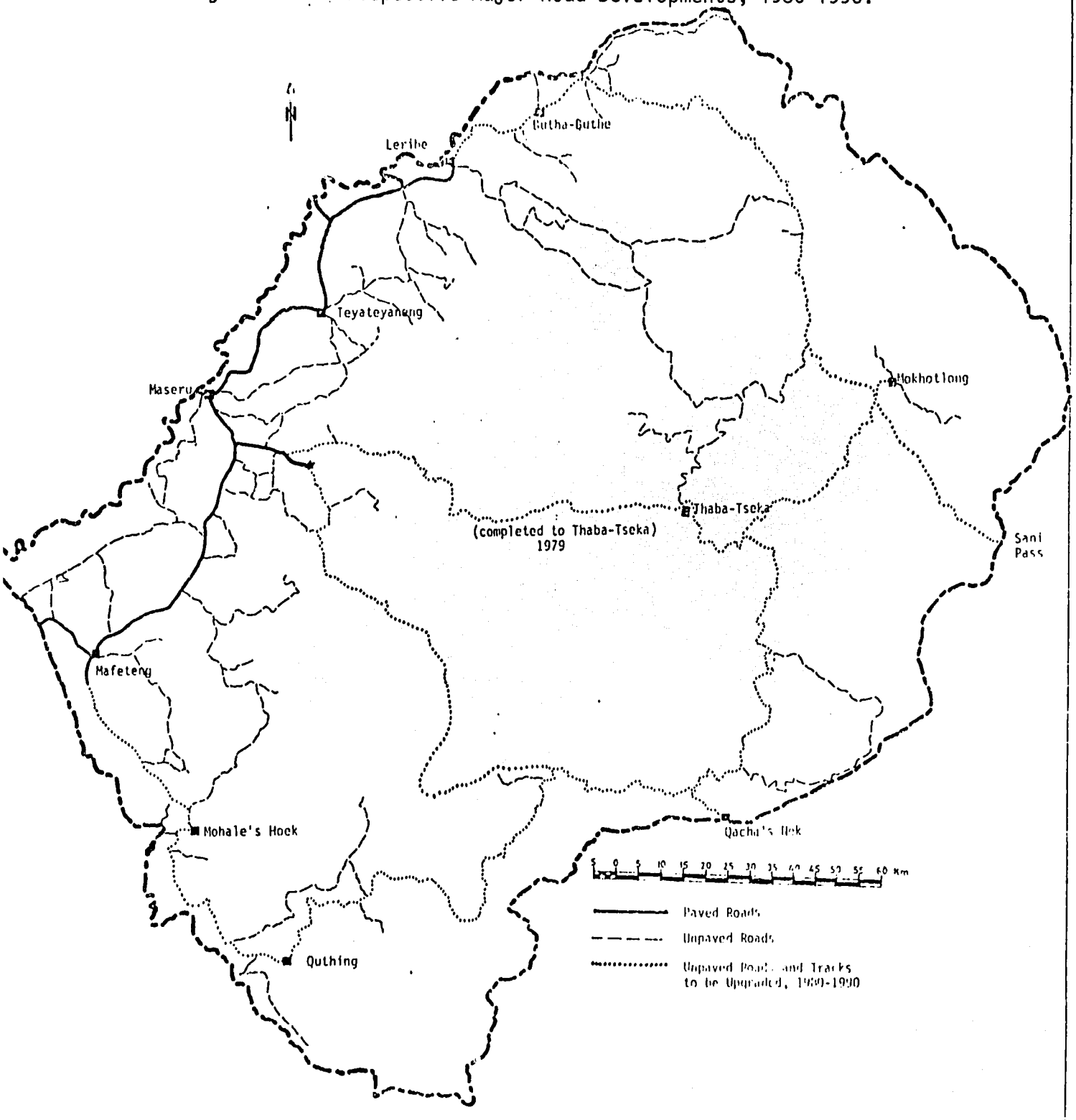
These are exactly the months affecting germination and emergence, root system development and pollination for Lesotho's major summer crops. Relationships have recently been estimated between monthly rainfall and maize and sorghum yields. Applying the monthly precipitation totals characterizing dry spells to these formulae suggests that maize and sorghum yields will decline 200 and 50 kg/ha respectively from present average levels. If labor supply per hectare remains constant and there are no offsetting technological advances, maize and sorghum production will decline to an annual level some 20,000 tons below recent figures (Eckert, 1980a).

Infrastructure Development

One major national developmental effort promises to bring significant change to Lesotho during the forthcoming twenty years. The network of improved roads now planned to interlace the mountains will constitute the largest infrastructure development program since conservation terracing between 1935-1952. Most segments have already attracted donor interest and are either in or beyond the feasibility study stage. Almost all of these road links will be completed during the 1980s. Figure I-2 details the probable locations for this "spinal road network". As these major roads are being built a parallel program will be underway to construct feeder roads in the lowlands. The Basic Agricultural Services Program (BASP) is undertaking 1,000 kilometers of feeder road improvement as part of their marketing infrastructure efforts.

Successful completion of these projects could change the economic face of Lesotho. The road network will finally integrate the mountains with the rest of Lesotho, reduce transportation times and costs, make it feasible to consider establishing small scale agro-industries, services and other activities in what are now remote areas and could measurably enhance the marketing of agricultural inputs and products. These represent potential benefits, however, many of them will not happen automatically. It will also make human movement easier which could easily lead to accelerated migration from rural to urban areas or from the mountains to the lowlands. This result will probably happen unless development programs succeed in capitalizing on the road network to generate economic activity in the mountains leading to jobs and incomes for mountain residents.

Figure I-2. Prospective Major Road Developments, 1980-1990.



Institutional Change - The 1979 Land Act[1]

The Land Act 1979 was passed by Parliament in September, received royal assent in October and was gazetted in December of 1979. Actual implementation is underway, being directed by the Ministry of Interior and Chieftainship Affairs. Once implemented this act will constitute the most fundamental institutional influence on agricultural development during the next 20 years.

While the Act preserves the fundamental inalienability of the land as "belonging to the Basotho nation" it includes several provisions which differ significantly from traditional tenurial practices. The first, for the purposes of the present analysis, are the provisions dealing with inheritance. The Act provides for the passing of land allocations to a single heir, usually the eldest son, and in the absence of a son to another single heir that may be designated by the family of the allottee. In effect a form of primogeniture is established. For development purposes the implication is that the number of allotments is essentially frozen at 1980 levels. There will be no further subdivision. The declining trend in acreage allotted per household which has been quantified since 1950 (LASA, 1978) has been arrested. The corollary implication is that any increase in rural household numbers will be essentially landless and must look to other sources for incomes. On the positive side, the possibility of inheriting land use rights should increase incentives for permanent improvements in one's allotted parcels.

Perhaps more important are the provisions relating to leases. One of the Act's principal purposes is to create a market in land use rights. The mechanism used is leasehold. Any allottee who wishes may convert his allotment to a lease provided the intended use is consistent with those uses sanctioned by regulation. A lease may then be sublet. Pending actual experience with implementation, it would appear that these provisions will permit the more serious farmers to lease in fields from others, accumulate economically viable holdings, profit from economies of scale, if any, and utilize higher levels of technology which are generally associated with larger farms. It is plausible that a viable group of farms will emerge, operating between 4 and 10 hectares of land composed of allotment and leased land. The smaller holdings now have the option of receiving a rental income from their allotted fields without the necessity of attempting to eke out a few bags of grain by investing their time and money in an impossibly small holding.

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[1] This section is based on extensive commentary from the Office of the Commissioner of Lands.

For planning purposes, if these developments occur, the land base of Lesotho will gradually concentrate, for management purposes, into the hands of the better managers. Technological change should become more readily possible and higher yields, the result. Fallow percentages could decline modestly since fallowing is now practiced largely due to the lack of incentive to plant rather than for soil fertility reasons.

Among the potential consequences are the following. First, there will likely be a concentration of land resources among fewer, more "progressive" farmers. The role of land as an income generating asset will change accordingly. One of the tradeoffs for higher productivity from the land base may be a concentration of the resulting incomes. Second, it was stated above that land would accumulate to the better managers. This is, perhaps, an ideal. It is also possible that land would accumulate to the affluent, whose affluence derives from urban or migratory jobs and who would remain so occupied. In this case, leasing could result in the emergence of an absentee landlord class.[1] Third, if larger farms are to result from the 1979 Land Act, they will probably be more efficient. They will also be better able to utilize capital equipment which raises the possibility of diminished needs for labor on a per hectare basis. On the other hand, the higher yields and output that could occur simultaneously offer the potential of increased employment in harvesting operations, marketing and output processing. The ultimate balance is important to Lesotho's employment objectives and deserves explicit attention at the policy level. Further, there is potential for the standard problem of land tenancy: soil fertility mining. This occurs when a tenant (lessee) nears the end of a lease and finds it in his best interest to use up as much of the fertility in the soil as possible before terminating the lease.

Finally, the "special agricultural areas" provisions of the Act permit a wide range of innovation in tenancy and usage. Under this section all titles would cease in a particular area and the land would be reallocated in a manner and for uses determined by the Ministry of the Interior and the Ministry of Agriculture in consultation. Specific analysis of the possible implications of the Special Agricultural Areas provisions must await definite plans for their utilization which have yet to be formulated. Several suggestions for using this law to further agricultural development are contained in Chapter IV and elsewhere.

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[1]However an absentee holder who allows his land to be misused can lose the land under the Act.

Summary

Agricultural development during the next twenty years will take place in an environment characterized by the following:

a. Population will increase by as much as 60 percent.

b. Labor force will increase by 64 percent to approximately one million workers.

c. Migration opportunities will halve with some 75-100 thousand migrants turning to the domestic economy for jobs.

d. The number of people requiring jobs in the domestic economy will increase by 210 percent, with net additions of over 20,000 per year.

e. Rural households will increase by one-third to a total of 337 thousand.

f. Rainfall during the 80s will average 160 mm per year lower than has been the case in the 1970s, depressing crop and rangeland productivity. This will be followed by a return to present rainfall levels in the 1990s.

g. An extensive network of improved roads will be completed throughout the mountains during the present decade.

h. During the next five years BASP will complete nearly 1,000 kilometers of feeder roads in the lowlands.

i. Finally, the Land Act of 1979 will be gradually implemented with, at least, the results of:

   (i) Restricting land holdings to those families presently having an allocation.

   (ii) Permitting some concentration of land use and an increase in the average size of operated farm units.

   (iii) Increasing security of tenure thereby encouraging investment.

Issues for Development

The trends depicted above suggest very definite priorities for development in Lesotho. Major dimensions are discussed below. Most of these issues have been recognized by planners in the Government of Lesotho, however, this analysis moves a step beyond to quantify the magnitude of the problem as it may develop in the future. The approach used is to estimate what major changes will occur in the absence of preventative measures being built into the development program. In so doing, the urgency of developing the necessary policies and programs is highlighted.

Employment

This topic has received considerable research and analysis in the last two years (JASPA, 1979; Eckert and Wykstra, 1979a, 1979b, 1980). Government has gradually moved toward accepting employment as one of the top priorities of the development program. This priority was strongly asserted in the 1979 Donor's Conference and more recently in a major policy address by the Prime Minister (GOL, 1979; TRH Dr. Jonathan, 1980). It would therefore be redundant to include more than a summary of the present or future position here.

Three factors contribute directly to Lesotho's impending employment crisis:

a. Labor force is growing moderately rapidly.

b. Opportunities for migratory employment appear to have peaked and begun a decline which is projected to continue to the end of the century.

c. Wage employment in Lesotho is growing slowly in terms of job numbers because of the very small number of modern sector jobs at present. The Third Five Year Plan estimates some 40,000 modern sector jobs within a nation with a total labor force of 612,200.

Table I-5 shows the timing of Lesotho's employment needs over the next two decades. Several conclusions can be made from these data. First, the annual need for jobs is high and will remain constant for most of this period rather than starting low and escalating as the growth in labor force would suggest. This is caused by the fact that for the next 15 years migration will probably decrease faster than the modern sector can expand. Table I-5 suggests that over the next twenty years there will be a net decline of more than 20,000 wage jobs available to Basotho.[1]

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[1]Migration declines by 88,000 while modern sector increases by 66,200.

Agriculture, alone, cannot solve Lesotho's employment problems. It can and must play a major role in their resolution, however. One point of this analysis is that agricultural productivity may well be depressed for the next two five year plan periods by below normal rainfall. This phenomenon should affect crop yields as well as rangeland stocking rates. Agriculture's capacity to create employment and incomes will be reduced accordingly until the 1990s at which time a return to somewhat higher productivity levels should occur.

Table I-5. Future Employment Generation Needs for Lesotho's Agriculture[a]

(figures in thousands)

Period	Growth in Labor Force	Number Migrants Returned	New Workers for Domestic Absorption	Modern Sector Growth[b]	Residual for Agric. Average Annual Number	Residual for Agric. Period Total
Both Sexes Combined						
1980-85	76.5	28	104.5	11.1	18.7	93.4
1985-90	92.7	23	115.7	14.1	20.3	101.6
1990-95	100.1	20	120.1	18.0	20.4	102.1
1995-00	123.9	17	140.9	23.0	23.6	117.9
Men Only						
1980-85	38.4	28	66.4	8.3	11.6	58.1
1985-90	46.9	23	69.9	10.6	11.9	59.3
1990-95	51.9	20	71.9	13.5	11.7	58.4
1995-00	66.1	17	83.1	17.2	13.2	65.8

[a]Based on most probable scenarios for labor force growth, migration and modern sector growth (public works excluded).

[b]Assumes a 5% compound growth rate in employment, 75 percent of which is filled by males.

Source: Eckert and Wykstra, 1979b.

At the same time that one recognizes constraints to employment generation in the agricultural sector, it is necessary to be realistic about the other sectors as well. Even with very high growth rates, modern sector employment will be limited due to its initial size. An additional constraint arises from the importance of government jobs in

total wage employment (roughly 30 percent) when coupled with the prospect of near stagnation in government revenue that is expected during the early 1980s. Financial limitations will likely constrain public works to a ceiling of perhaps 10,000 manyears of employment per year. The remaining element, the informal sector, is one about which almost nothing is known at present except that the numbers so involved have increased rapidly in Maseru in recent years. It is obvious that preventing destabilizing levels of unemployment will require maximum effort on all fronts.

The logic above, particularly the thoughts on the timing of the employment crisis, suggests that Lesotho's job needs will exceed her capacity more in the near future than later in the century. Clear cut and decisively implemented policy decisions taken now can build a basis for rapid expansion of employment in the 1990s. Job estimates given in the above table for that period could in fact be exceeded. However, the constraints operating over the 1980s would seem much less flexible. For this reason it is suggested that labor intensive public works be given immediate consideration for possible expansion. An annual budget of R5,000,000 devoted to the types of projects developed by the Labour Construction Unit, Ministry of Works is felt to be manageable. Nearly 6,000 men could be employed. Benefit:cost ratios exceed those of similar but more capital intensive projects. And the nation's transportation and/or conservation infrastructure could be built in anticipation of more rapid growth during the 1990s (Wykstra and Eckert, 1980).

Income Generation

Closely related to the problem of employment is the need for income growth. Here, again, Lesotho faces a significant challenge. Three factors will tend to reduce per capita incomes unless offset by successful development programs. First is the prospective decline in migrant numbers and probably total remittances. This could simultaneously increase the *de facto* population and reduce total income. Second, population will increase in the face of essentially fixed agricultural resource supplies. Arable land and livestock numbers cannot be realistically increased without risking serious deterioration of land resouces. A third constraint to income growth arises from the effective limits to growth in modern sector employment.

To emphasize this point, Table I-6 projects future per capita incomes assuming no change in resource productivity. The point of these calculations is to emphasize the urgent need for increased yields per land and livestock unit. *De facto* population has been used for these calculations to be consistent with the focus on the domestic economy.

Arable area is assumed fixed at 300,000 hectares. While only 230,000± hectares have been planted recently, we assume this will increase

Table I-6. Projected Income Per Capita Assuming No Change in Resource Productivity[a]

Year	Arable Hectares per Capita	Value of Gross Crop Income per Capita[b]	Large Stock Units per Capita	Value of Gross L.S. Income per Capita[b]	Off-farm Jobs in Lesotho per Capita	Off-farm Income per Capita[b]	Migrant Remittances per Capita[c]	Total Income per Capita
1980	.217	M26.08	.739	M19.95	.035	M69.06	M129.49	M244.58
1985	.203	M24.36	.627	M16.94	.038	M75.36	M105.90	M222.56
1990	.189	M22.69	.536	M14.46	.041	M82.13	M 83.54	M202.82
1995	.162	M19.41	.458	M12.38	.045	M89.68	M 70.71	M192.18
2000	.138	M16.61	.392	M10.59	.049	M97.95	M 60.03	M185.18

[a]Based on de facto population derived by subtracting migrants (Table I-4) from de jure population (Table I-1).

[b]At constant M120/hectare, M27 per large stock unit or M2000 per manyear as computed from CPDO, 1979.

[c]In 1978/79 there were an officially recognized 150,000 migrants remitting R125 million (CPDO, unpublished figures). Since we use a figure of 180,000 migrants for 1980, a proportional upward adjustment to R150 million has been made for remittances.

over time reaching the above ceiling in 1990. The contribution of cropping to GDP is currently M120/hectare (CPDO, 1979). Livestock are held constant at 850,000 large stock units returning M27.07 each. While historically livestock numbers have reached one million large stock units it is reasonable to assume that increases above present numbers will be accompanied by a proportional reduction in output per unit, thus leaving livestock incomes constant. Off-farm jobs in Lesotho are expanded at 5 percent annually, however, real wages are held constant under the assumption of constant productivity in the domestic economy. Finally, although migrant jobs are projected to decline, real migrant wages are assumed to increase at 1.5 percent for ten years while South Africa wrestles with its own unemployment problem. Thereafter a growth of 3 percent annually is assumed.

Without increases in productivity, per capita income from all sources except domestic off-farm employment will decline. Due to expected patterns over time most of the reduction falls within the next ten years. Causes for this particular timing problem were discussed above. From these data Lesotho's development program is faced with an overall rate of decline in per capita income averaging 1.9 percent annually from 1980 to 1990 unless offsetting growth can be achieved in one or more domestic sectors. It must be pointed out that modern sector growth in Lesotho will outpace the declines in other domestic income sources projected by this static technology scenario. Therefore, most of the net decline is caused by the projected 3 percent annual decline in migration. If this does not continue the picture would be somewhat more optimistic.

To hold agriculture's contribution to per capita income constant, productivity from both crops and livestock must grow as fast as the de facto population, a minimum of 2.4 percent annually. By African standards this will necessitate a high rate of technological change. From 1965 to 1974, the period spanning the "Green Revolution", only nine African countries recorded rates of growth in cereals yields in excess of 2.4 percent; eighteen grew at lesser rates, nineteen declined and five have no data (IADS, 1978). Lesotho is recorded as having experienced declining yields during this period. And despite the much higher crop yields reported after 1976/77, there is no evidence of any long-term positive trend in Lesotho's crop yields at present (Eckert, 1980b). While isolated examples of higher technology can be identified in Lesotho, they have yet to achieve the widespread adoption that would affect national production levels.[1] Consequently, generating technological change in agriculture remains an unmet challenge, but one which must be addressed immediately if further erosion in per capita agricultural incomes and food supplies is not to become a chronic characteristic of the foreseeable future.

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[1]Exceptions to this statement are found in eggs, broilers and milk production.

Beyond this, it is possible to imagine technological change that would lead to increased agricultural incomes. A five percent rate of growth in yields would allow Basotho farmers to reach yield levels presently attained by South African farmers in approximately 15 years. While technologically feasible, growth at this rate presumes a high level of effectiveness within Ministry of Agriculture programs. Indeed, most analysts today would suggest that for the 1980s, particularly in view of probable below normal rainfall, 2-3 percent per year may be a very optimistic target for crop yield growth. If this is, in fact, all that can be attained, then little progress toward self-sufficiency can be expected until later in this century.

Some technological progress has been mentioned in selected livestock activities. However, these programs are small and affect only certain localities. On the whole the livestock herd is considered large and the range is believed to be seriously stressed by over-grazing. Grazing control and matching range productivity with livestock numbers must receive an immediate priority as the 1980s rainfall depresses rangeland and productivity even further. For per capita incomes from stock farming to rise, productivity must increase fast enough to offset both the rate of herd reduction (if any) as well as human population growth. If, for example, livestock numbers are to be reduced 25 percent over the next decade, then incomes per large stock unit will have to grow at 4.5 percent annually just to hold per capita livestock-based incomes constant.

The one source of income from which one might expect growth is the modern sector. Table I-6 assumes a constant real wage despite the chronic 11-14 percent rate of inflation in southern Africa. Real wages could exceed this but, in the long run, only with an increase in productivity per worker. Strategies for achieving this must be carefully chosen. The most attractive mechanism would be to increase the proportion of capital equipment in the production process, thereby giving higher output per worker. However, in a fairly small economy such as Lesotho, this strategy runs a very great risk of displacing workers with the result being small numbers of well paid employees and a large increase in unemployment.

Income Distribution

The section above demonstrates that a serious challenge exists simply to increase per capita incomes appreciably. It further points out that the 1980s face more serious constraints than the following decade. An equally important issue which has been largely ignored thus far in national planning is the problem of income distribution. For ten years or more Lesotho has rested comfortably on the assumption that incomes were very equitably distributed. It is often asserted that traditional land tenure systems have ensured equitability.

Recent research has soundly disproved this hypothesis. When examined on a per capita basis land allocations deviate significantly from theoretical equality. The smaller 20 percent of farms hold only 5 percent of the land while the largest 20 percent farm nearly 40 percent of the acreage. Per capita acreages for these groups differ by as much as 8 to 1. The situation is even more skewed with respect to livestock ownership with a few large holders, many small holders and about half of the rural population holding none at all (LASA, 1978; JASPA, 1979).

If there is one source of equality in rural incomes it is off-farm employment. Most estimates in the latter half of the 1970s show that some 60 percent of rural households have access to migrant incomes and an additional 10 percent draw some incomes from off-farm work in Lesotho (van der Wiel, 1977).

The Jobs and Skills Programme for Africa (JASPA) Mission reviewed all available estimates and data sources in 1978. In addition to confirming the above, they found that urban income distributions were substantially worse than those in rural areas. They stated "...that inequality is greater than hitherto assumed..." and conclude that "...just to have shown that it (inequality) is higher than usually presumed necessitates some rethinking in development planning." (JASPA, 1979).

Looking toward the future does not necessarily paint a brighter picture. The 1979 Land Act freezes allocations at present numbers and present households. The provisions for inheritance will mean that present allocatons can and probably will remain in the same family. New households (from Table I-3) will be essentially landless. As of 1980 approximately 41,000 households are without land. To this will be added 76,000 new households over the next two decades so that only 62 percent of the rural households will have land by the year 2000.

The leasing provisions of the Land Act permit the more aggressive farmers to lease in land from the smaller sub-optimal farms. This possibility could well become fact if government follows a policy of encouraging the emergence of "viable farms" which has been recommended by many. If a viable farm under Lesotho's conditions is defined as one of approximately four hectares (10 acres), the arable land base would support approximately 75,000 such units. If such a land reform were fully implemented in twenty years, some 145,000 present allottees would be leasing out their land. Rental rates must be determined by the market but it is difficult to see how these could exceed M50 per hectare as long as real gross income per hectare remains at M120. If the smaller farmers lease to the larger, then the arable land resource (and the resulting incomes) would be distributed as shown in Table I-7. In this scenario the number of "farm units", defined as units of land managed together as one enterprise, would decline from 206,000 to 75,000.

Table I-7. Hypothetical Distribution of Land Resource Assuming Full Land Reform to Create "Viable" (4 ha) Farms.

	Household Numbers (000)			
			With Land	
Year	Total	Without Land	Managed by Household	Leased to Others
1980	247	41	206	(see note)
2000	337	117	75	145

Note: An appreciable amount of sharecropping exists at present but it is not reliably quantified at the national level.

While it is doubtful that such a complete land reform can or should be implemented, it is useful as a hypothetical case because it indicates probable directions of change under the Land Act. It is fairly certain that by the end of the century nearly 120,000 rural households will be without arable land as a basis for income. To the extent that a rental market for land develops, additional large numbers of households will receive annual rental incomes of less than M100 from their allotment.[1] Obviously land will not be an important income source for these households. Finally, arable land resources will gradually become concentrated into fewer management units composed of allotted and leased land with an equivalent concentration of incomes thus derived. It is not difficult to envision 100,000 or less such farm management units by the end of the century. Furthermore, there will not be much demand for hired farm labor from these farms as long as farm sizes remain about four hectares which is small enough to be farmed well by a single family. Lessee households cannot realistically expect additional incomes from wage employment on lessor household farms.

Livestock ownership is more difficult to forecast. More than half of Lesotho's rural households have no livestock. An additional sizable portion have noncommercial holdings; a few animals kept for household and social needs. Probably less than 50,000 rural households hold livestock as an important income generating farm activity.

The ultimate contribution of livestock to household incomes will depend on the policy mix adopted by government. If government agrees to recent recommendations for restricting the use of mountain pasture by lowland and foothill cattle owners, a decrease in the number of

[1]Assumes that the smaller holders (<2 ha) lease to the larger holders at a rental rate ≤ M50/ha in 1980 value.

animals held will occur in the lowlands. If government mounts a program of stock reduction, the impact on household incomes will depend on how such reductions are implemented. Furthermore, the government's capacity to deliver high income livestock husbandry programs will definitely be restricted for the foreseeable future by budgeting factors. Consequently one foresees some decline in the number of households holding livestock for income purposes. Finally, incomes from free ranging livestock should be somewhat depressed during the 1980s as the grass responds to below normal rainfall.

Off-farm income prospects can be projected relatively well and have been fully developed elsewhere (Eckert and Wykstra, 1979b). What has not appeared elsewhere is an analysis relating numbers employed off-farm to the number of households affected. Many households have more than one family member involved. Not only do the incentives causing one family member to migrate affect other members as well but also the first member to find off-farm employment can be helpful to others in gaining such employment. Van der Wiel presents the following data (1977, p. 86):

	Number of Migrants per Household							
	0	1	2	3	4	5	6	Total
Household Numbers	522	586	123	42	12	-	1	1,286

From the sample it appears that only 755 households are needed to produce 1,000 migrants. Table I-8 assumes this same relationship for persons involved in off-farm wage employment in Lestho and projects future access to wage employment for households.

The conclusion is a dramatic increase in the number of households without a family member in wage employment as a source of income. In 2000 AD less than half will be directly involved, compared with 70 percent at present. It should be noted that even if migration remains constant at present levels a similar, though not so drastic, trend will occur, with the number of households without a wage earner growing by 53 percent to 115,000.

The above analysis strongly suggests that an income distribution crisis is imminent for Lesotho. Over the next 20 years, the number of landless households will grow by 76,000 and the number receiving only small rental incomes from their land could increase by 100,000 or more. Simultaneously, a similar reduction in households deriving income from livestock may occur. And the number of households without access to wage employment could increase by as much as 100,000 or more.

Table I-8. Projected Involvement of Households in Wage Employment Off-Farm

(Thousands)

Year	Total Household Numbers	Migration		Modern Sector Lesotho[a]		Households Without Wage Employment[b]
		Persons Employed	Supplying Households	Persons Employed	Supplying Households	
1980	247	188	142	40	30	75
1990	286	137	103	65	49	134
2000	337	100	76	106	80	181

[a]Assumes a 5% compound growth rate in employment from 40,000 in 1980.

[b]These figures assume no overlap between households supplying migrants and modern sector workers. Since, in fact, considerable overlap occurs, the numbers of households without wage employment are underestimated, perhaps substantially, in this column.

The problem is compounded by the tendency for these income sources to have co-existent distributions. There is a definite positive correlation between land and livestock holdings. Farms with larger arable areas tend also to have larger livestock herds (Tribble, unpublished data). There is also a tendency for these same households to have a disproportionate share of migrants and domestic wage earners. Again data from van der Wiel provide an illustrative confirmation. His sample was stratified into income groupings which represented approximate quartiles of the rural population. The distribution of incomes by source for these groups in shown in Table I-9. The more affluent households command a heavily disproportionate share of incomes from all sources. Even though family size in the top quartile is more than twice that in the bottom quartile, per capita incomes are more than 10 times as great.

The inverse of this observation is that households with limited sources of income tend to be limited with respect to all sources simultaneously. Off-farm incomes do not offset the absence of incomes from agricultural resources. Instead the coincidence of distributions results in severe imbalances in household and per capita incomes.

Table I-9. Coincidence of Distribution of Sources of Income Among Rural Lesotho Households

Item	Income Strata (M) 0-199	200-599	600-999	1000
Percent of Households	27	20	27	26
Percent of Total Crop Incomes	15	27	17	41
Percent of Total Livestock Incomes	6	19	15	60
Percent of Total Agric. Incomes	9	22	16	53
Percent of Domestic Wage Incomes	4	9	24	63
Percent of Total Migrant Remittances	≈0	8	34	58
Total Household Income	M66	M408	M859	M1739
Percent of Total Rural Incomes	2	13	28	57
Average Household Size	3.1	4.9	5.1	7.7
Per Capita Income	M21	M 83	M168	M 226

Source: Computed from van der Wiel, 1977: 84-88.

Thus, incomes are poorly distributed at present and the analysis above strongly suggests that the situation will worsen as land and livestock become less accessible and modern sector employment cannot keep pace with increasing household numbers. Without government intervention in the form of an income distribution policy, there is a strong likelihood that presently affluent households will use their influence to retain control of the bulk of income sources even as supply dwindles relative to demand. Reliance on the market as an allocation mechanism will only further increase the concentration of resources in the hands of the affluent.

Thus, it is strongly recommended that government assume a definitive role in resource allocation with policies geared toward establishing greater equality in incomes. Equity has been espoused as a fundamental objective in both the second and third five year plans. However, adequate progress toward this objective has not been achieved, in part because the urgency of the issue has not been previously understood. While this urgency is visible today, it can only become worse as growth in household numbers and job seekers outstrips the supply of income generating assets and wage employment.

If government were to take a role in resource allocation, one of the more fundamental issues is whether or not certain households can be allowed to accumulate more than one major income stream. For example,

given the scarcity of jobs projected for the near future, should not migrant opportunities be controlled with first preference given to those households without an adequate land base? Should not modern sector employment in Lesotho be largely restricted to households without agricultural resources or a migrant abroad? Should not arable land and commercial livestock herds be allocated to different households? How should civil service jobs be allocated? As employment becomes scarcer and pressures for incomes mount, a combination of market and non-market allocation mechanisms will arise. Without a determinant role being played by government, the present imbalance of influence and economic power will lead inexorably toward a worsening of the distortions portrayed in Table I-9. The result could easily be a large number of households, desperately lacking in sources of income, while a much smaller group enjoys relative prosperity.

Economic Dispersion

Several of the foreseeable trends can operate together to create significant differences in growth rates between rural and urban areas. During the 1980s agricultural productivity will be depressed by below normal rainfall. This situation will affect both livestock and cropping activities. Rural households which are most dependent on these income sources will be most severely affected. The effect of the Land Act on excluding new households from receiving land allocations will impact primarily in rural areas. Most of the recent growth in modern sector activities and employment has taken place in urban or peri-urban areas. Unless there are explicit policies to the contrary this trend will continue with the result being a concentration of opportunities in emerging urban growth poles. Finally, projected improvements to the road network will substantially reduce the costs of travel to larger urban centers. Rural residents should respond by much more frequent travel and repeated exposure to the "delights of the big city".

The result could easily be a massive increase in rural to urban migration within Lesotho with Maseru, Maputsoe and two or three other locations receiving most of the impact. There will be several very serious problems in the long run if this type of migration is not constrained to manageable numbers. Among them are:

a. Serious overburden on already strained urban public services. Maseru is already sprawling with large numbers of dwellings without water, sewer or electricity. Clinics and hospital space are overcrowded to the point of reducing the quality of medical services. And schools operate with astronomical student teacher ratios.

b. The presence of growing numbers of unemployed in urban areas has contributed measurably to the urban crime rate.

c. As rural residents visit towns more often, they will tend to make more of their consumer purchases in urban stores. Purchasing power will be drained away from rural areas causing the small enterprises that do exist there to suffer. The gap in development between rural and urban settings will widen, thus further increasing the incentives to migrate.

Without development policies to the contrary, Lesotho could ultimately be characterized by a stagnant rural sector drained of its money and talent (in effect, an economic wasteland) and congested urban centers growing too fast for proper town planning.

The solution lies in a strategy of economic dispersal, with productive activities being sited around the country. The same roads that threaten to increase rural to urban migration also provide the infrastructure for economic decentralization.

The principal advantages of a dispersed or decentralized economy include the following:

a. Economic growth and vitality in remoter areas.

b. Jobs located so that employees may continue to live in their village homes, thereby preserving village structure and society.

c. Individuals can combine a higher modern wage with the low cost of living which characterizes village residence.

d. The agonies of urban glut are partially avoided.

e. Scale of production in rural firms will be small, therefore more appropriate technology is possible utilizing local inputs and maintaining relatively high labor intensity.

The main disadvantage of a strategy of economic decentralization is that somewhat higher costs per unit of output may result because of small scale enterprises. However this outcome is not automatic. Normally there is some difference between urban and rural wage levels. In this case the combination of labor intensive small scale operations paying the lower rural wage can often compete successfully with urban manufacturing.

Summary

The next twenty years of development in Lesotho will be a period of severe challenge. Without a highly effective, well integrated development strategy, Lesotho could quickly experience serious unemployment, growing food shrotages, declining incomes and the emergence of a highly stratified society. The latter is perhaps the most important because the gap between rich and poor that would emerge would be a new and very unfortunate characteristic for the Basotho people. The magnitude of the task ahead will test the capacity of government at every turn. By quantifying the major issues it is hoped that this chapter will have made a small contribution.

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CHAPTER II

LESOTHO'S FOOD BALANCE:

PRESENT AND FUTURE

Introduction: The Policy Context

This section provides an assessment of the food balance and nutritional status of Lesotho. Presently agricultural and nutritional planning are both constrained by the absence of reliable quantitative data on this subject. Food self-sufficiency is accepted as a key development objective even though precise indicators of the extent of the problem have yet to be estimated. Land use planning, an important part of recently enacted land law, requires national food objectives to be clearly stated and translated into required hectares of different crops and technologies. These priorities are important determinants of the overall balance of agricultural development programs.

It is important that nutritional planning and agricultural planning be more closely interrelated than they are at present. One of the factors limiting this coordination is the absence of a clear picture of Lesotho's food needs, developed from both quantitative and qualitative standpoints.

The analysis in this chapter presents both current status and likely future trends. The former suggests current priorities to guide implementation programs of the Third Five Year Plan. The latter suggests important priorities for longer term perspective planning. It is recognized that a national household budget and nutrition survey is planned for the near future. The results when available should support the analysis below and contribute to refining its recommendations.

Food Balances: Quantitative Estimates

Cereals

Due to their importance in several dimensions of agricultural planning, consumption of cereals has received the bulk of the research attention to date. Table II-1 summarizes recent estimates of annual consumption. Some confusion has arisen due to the range in estimated quantities. Ignoring for the moment the estimates of Vassiliou and Geuting, the following comments may contribute some clarification.

Table II-1: Alternative Estimates of Per Capita Annual Food Grain Consumption in Lesotho.

Source	Kg/yr/person Maize	Sorghum	Wheat	Total	Data for:	Comment
Geuting, 1979.	150	50	91	291	74-78	Grain equivalent
Geuting (rev.*)	136	41	83	260	74-78	Grain equivalent
Vassiliou, 1979, pp. 7-8	153		83		74-78	Grain equivalent
Vassiliou, (rev.*)	138		78		74-78	Grain equivalent
IADS, 1981, p.21				247	77-79	Includes feed, seed, harvest and post-harvest losses.
Guma, 1980, p. 9	104	48	60	212		Sample of 111 households.
FAO, 1978	91	36.5	55	183	72-74	FAO Food Balance Sheets.
Anderson, 1978, p. 13a	99	18	55	172	1976	Urban Household Budget Survey.
Gay and Guma, 1978, p. 125	78	51	34	161	75-76	Progressive farmers, home produce only
Gay and Guma, 1978	37	28.5	6	71.5	75-76	Ordinary farmers, home produce only
UC/NUL, 1978	34	15	5	54	1976	Rural residents, home produce only

*Revised to reflect harvest and post-harvest losses of 25 percent for maize and sorghum and 30 percent for wheat rather than the 10 percent used in the original source.

Only one set of available data is based on rural household enumeration of food consumption (Guma, 1980). This sample suffers three methodological problems: the limits of sample size (n = 111), its geographic restriction to the Senqu River project area and the fact that data were collected only during a three-month period, thereby missing seasonal variations. Guma's estimates are based on food entering the household and thus do not account for losses in cooking and preparation. Guma's data do not reflect the more restricted diets of winter suggesting that they may be higher than annual averages. However, his study took place in the southern districts where yields are lower than average. These two factors may be offsetting to some extent with the actual net effect unknown. There are, furthermore, mathematical errors in the published version although these do not appear to affect the cereals figures.

IADS figures are simply production minus exports plus imports divided by population. This process would bias the figures upwards because the estimates are based on official yield figures taken from standing crops and thus ignore harvest and post-harvest losses. Feed and seed uses are also included. IADS designates this figure "cereal use" rather than consumption.

FAO provides lower figures than Guma or IADS. Their methodology is standard and has been in use for years. The results, however, reflect 1972-74 harvests, when production totals were lower than achieved since 1977. Consequently, they will understate the position as of the beginning of the 1980s.

Anderson finds urban consumption to be lower than Guma's rural data and lower than FAO national estimates. Most of the differential appears in a much lower sorghum consumption. Both the overall level and the sorghum difference are consistent with what would be expected from urban consumption practices.

Estimates by the UC/NUL and Gay/Guma studies purport to represent food produced on the farm and consumed by rural households. Both have adjusted for non-producing households with the intent to represent rural populations as a whole, rather than just the families of producers. Gay and Guma probably underestimate the national average in that they have built on below average yield levels measured in the Senqu River project area. For this reason, the even lower figures of the UC/NUL study are undoubtedly also underestimates. Both studies have particularly questionable figures for wheat consumption. Vassiliou (1979, p. 8) shows that 40-50 percent of total wheat supply has been produced domestically in recent years. Applied to either the Guma or FAO data, this suggests a substantial error in wheat consumption estimates by UC/NUL and Gay/Guma.

Estimates by Vassiliou (1979) highlight one of the more important data problems on the topic of cereals consumption. His study utilized a fairly complete methodology including adjustments for seed use, post-harvest losses and incorporating imports and exports. The results stand substantially above other figures for both maize and wheat. Geuting (1979) refined and reissued these data, adding sorghum to obtain a total cereals estimate of 291 kg/capita. Geuting's minor modification reflects more accurate seed rates. Harvest and post-harvest losses were included by both at 10 percent, an unrealistically low figure for Lesotho's conditions. Table II-1 makes further adjustments to show the effects if 25, 25 and 30 percent had been used respectively for maize, sorghum and wheat.

If one is to accept the loss figures presented by Vassiliou and Geuting, then one concludes that Basotho consume very high amounts of cereals or that there are large unmeasured sources of wastage. This anomaly has caused serious criticisms of Lesotho's yield and production figures during recent years. Since we show elsewhere in this report that the official cropping data are basically correct, then the rationalization must come from another source. Two further adjustments are appropriate. First, nearly all of Lesotho's maize and wheat imports are in the form of cereals products. Vassiliou, and Geuting after him, convert these tonnages to their whole grain equivalent, multiplying by 1.11 and 1.15 for maize and wheat. While this procedure is useful in estimating acreage requirements for self-sufficiency, it inflates actual consumption estimates. More appropriate would be to deflate domestic production by the inverse of the above factors in order to reflect milling and processing that must occur. Second, the inclusion of all sorghum production by actual weight is questionable. A significant portion of this cereal enters diets in the form of sorghum beer (joala). Nutritional studies are not available concerning the calorie or nutrient content of joala from which to construct conversion factors. However, the FAO sorghum consumption figure represents a modest reduction from the Guma or Geuting estimates and therefore is accepted as more nearly reflecting the actual nutritive equivalent of sorghum ingested.

Table II-2 follows a methodology similar to Vassiliou's but with adjustment factors changed to reflect the above analysis. The resulting figures, derived from a defensible macro-methodology, are reasonably consistent with Guma's household level study. We utilize the results of Table II-2 throughout this report, primarily because of the limited sample size and geographical base of Guma's work. One can also conclude that Anderson's calculations based on the Urban Household Budget Study seem a reasonably accurate depiction of urban cereals consumption. FAO estimates are out-dated but probably provide an accurate description for the period covered.

Table II-2. Estimated Per Capita Cereals Consumption in Lesotho (Average for 1976/77 through 1979/80).

Item	Maize	Sorghum	Wheat	Total
Area Harvested (ha)	101,118	52,997	30,868	184,983
Yield (kg/ha)	1,221	1,304	1,268	
Production (MT)	123,506	69,085	39,127	231,718
Harvest loss, post-harvest loss and feed use (%)	25	25	30	
Net Production (MT)	92,630	51,814	27,389	171,833
Change in Stocks (MT)	2,500[a]	0	2,500[a]	5,000
Seed Requirements[b] (MT)	5,488	1,167	4,960	11,615
Grain for Home Use (MT)	84,642	50,647	19,929	155,218
Imports: Grain Equiv.[c] (MT)	70,366	0	54,290	124,656
Total Consumer Supply (MT)	155,008	50,647	74,219	279,874
Assumed Milling and Brewing Loss (%)	10	15	12	
Net for Consumption (MT)	139,507	43,050	65,313	247,870
Population (middle of period)	----------	(1,136,060)	----------	
Per Capita Consumption (kg)	122	38	57	217
Final Adjustment[d] (kg)	120	35	55	210

[a]Arbitrarily assigned equally to maize and wheat for lack of data.

[b]Maize @ 50 kg/ha, sorghum @ 20 kg/ha, wheat @ 150 kg/ha, of area planted.

[c]Average for 1976/77 to 1978/79. 1980 quantities, when available, should exceed these figures.

[d]Representing small losses in transit from imported cereals, cooking waste, etc.

Source: All data from Bureau of Statistics, various publications, except loss estimates which are best available approximations based on expert opinion in Lesotho.

The final line of Table II-2 reflects kilograms of grain actually ingested by Basotho residents in Lesotho. They may be compared with the following FAO/WHO recommended dietary composition (FAO/WHO, 1974).

Maize	Sorghum	Wheat	Total
65.7	21.9	36.5	124.1 kg

By this standard the Basotho diet is overbalanced toward cereals consumption, reflecting both cultural preferences and the poverty of the nation. Around the world low income countries are characterized by heavy dependency on cereal calories and Lesotho is no exception.

Food Groups Other Than Cereals

Table II-3 summarizes available estimates for major food groups other than cereals. Two sources are included that have not been previously discussed. Estimates presented by LASA are based on livestock numbers from the 1970 Agricultural Census combined with known or assumed productivity factors. No field enumeration was involved. FAO, 1980 presents meat and milk consumption levels for 1977. These figures are drawn from the latest available FAO food balance estimates and thus represent the red meat portion of the meat and fish total given in FAO, 1978.

Considerable variation between the components of Table II-3 defies generalization. In particular, although Guma's study was found to be of the right magnitude with respect to cereals, it departs dramatically from general tendencies in the case of most other food groups. In the absence of clear consensus, it is suggested that the FAO figures be used as suitably indicative for planning purposes until more precise field work is completed. The variability in these data underlines the urgent priority for a national level nutrition survey.

Food Balances: The Qualitative Dimension

It was noted above that actual consumption of cereals in Lesotho exceeds FAO/WHO recommended levels by approximately 86 kg/capita annually. Quantities of maize from Table II-2 are nearly twice the level suggested as nutritionally optimum. Researchers and planners must be alert for possible nutritional imbalances that could result.

Calorie Intake

Total caloric consumption has been estimated at 2,245 kilocalories per capita daily, a figure considered to be 99 percent of requirements. This total compares with an average of 2,051 for the low income developing countries and 2,235 for all developing countries in Africa south of the Sahara (World Bank, 1980). Guma (1980, p. 19) supports

Table II-3. Alternative Estimates of Per Capita Annual Consumption of Non-Cereal Food Groups

	Kg/Capita/Year						
Source	Meat & Fish	Milk	Eggs	Vegs.	Fruits	Dry Pulses	Area Applicable
FAO, 1978	21.9	14.6	1.1	18.3	14.6	7.3	National
Anderson, 1978	7.3	18.3	1.1	32.8	3.6	0.7	Urban
Guma, 1980	44.6	67.2	0.1	55.4	110.2	24.1	Rural
LASA, 1978	7.5	31.8	1.1	-	-	-	National
Gay & Guma, 1978	32.8	-	-	-	-	7.3	Ordinary H.H.'s
Gay & Guma, 1978	69.4	-	-	-	-	18.2	Progressive H.H.'s
Anderson, 1978	11	29	5	44	11	11	Recommended

this with an estimate of 2,473 kcal per day. One must accept that, on the average, caloric requirements are met. Cereals consumption levels derived in Table II-2 would produce 1,950 kcal/person/day, or some 93 percent of total. This figure is undoubtedly high since it exceeds similar percentages derived for Bangladesh, India and Pakistan (70-85%) which rank among the most cereals-dependent countries of the world. Part of the explanation lies in the use by the World Bank of FAO Food Balance Sheets which were shown in the above analysis to underestimate recent cereals consumption levels by nearly 20 percent.

Adjusting for this factor would increase the World Bank estimate to 2,513 kcal at which level the proportion provided by cereals is 78 percent (1950/2513). While there is obviously additional room for refinement in the data, the best depiction possible with present information suggests that 1) Basotho, on average, slightly exceed calorie requirements specified by FAO but that, 2) their dependence on cereals for these calories ranks high by world standards. This cereals dependency should lead to higher levels of nutrient deficiency diseases since a diet composed largely of cereals does not usually contain adequate supplies of the "preventative" food groups; e.g., meat, milk, vegetables and fruits.

Nutrient Deficiencies

Guma's work states that FAO recommended levels are equaled or exceeded for calcium, iron, vitamins A, B, C and niacin. A 30 percent shortfall was recorded for riboflavin. However, it must be remembered that his estimates of quantities consumed for foods other than cereals exceed most other such estimates.

In the absence of good national food consumption data, most evidence must be drawn from studies of clinical records, biometric measurements and household interviews. One excellent study has been completed in which anthropomorphic measurements were used to determine the incidence of nutritional deficiency (GOL/UCLA, 1976). Basotho measurements were compared against international standards generally accepted for LDC's as a whole. Their principal findings include:

a. 22.7 percent of young children had stunted growth and were at high risk of having chronic protein-calorie malnutrition.

b. 3.4 percent of children studied had body wasting (excessively low weight for height) and were thus a high risk of having acute protein-calorie malnutrition.

c. 22 percent of children were underweight for their age.

According to the UCLA study (GOL/UCLA, 1976), these three nutritional problems were concentrated in the mountains although occurring to a

lesser extent in rural lowlands and urban areas as well. A general tendency was observed for these problems to be most prevalent in 1) large families, 2) in families where the father was absent and not contributing or was dead, 3) in families where the mother was the only adult in the household, and 4) where the mother could not read Sesotho. These correlations suggest that both poverty and lack of nutritional information are contributing factors. The study examined the possibility of genetic causes for stunting and concluded that "the genetic component of stunting in children was not a dominant factor compared with other factors, such as poor diet and health" (GOL/UCLA, 1976, p. 4). Anderson's study (1978, p. 10) supported by recent analyses of clinical data suggests these deficienty diseases to be most visible in the southern districts including Qacha's Nek.

Other nutritional problems include:

d. 25 percent of children aged 6-60 months were anemic as defined by World Health Organization criteria.

e. 5 percent of mothers are undernourished and nearly 5 percent had visible signs of goiter. This latter observation represents an improvement over the 15 percent observed in 1956.

f. 21 percent of all mothers were obese by international standards for developing countries. This problem was concentrated in urban areas (41%) and lowland areas (29%) and lower in the foothills and mountains (13%). The obesity phenomenon and its distribution reflects two factors. First is a diet composed primarily of cereals, particularly where the dominant cereal is maize as it is in the Lowlands. The second is the distribution of income which is worst in urban areas and most equitable in the mountains (JASPA, 1978).

g. It should also be noted that nutritional programs have succeeded in controlling pellagra over the last twenty years.

One significant observation concerning protein should lead to a priority in development programs. Of children aged 6-24 months, the dominant protein source other than milk was pulses; and consumption levels from this source were often inadequate. The dual finding of poverty as a key cause of malnutrition plus a high dependence on pulses for protein in these households strongly suggests that a national emphasis on increasing production of beans and peas can make significant impacts specifically on this critical malnutrition problem. Pulses tend to be the poor man's source of protein the world over. They are both cheap and storable. In Lesotho there is an apparent need for larger and more equitably distributed supplies coupled with extension of nutritional information advocating their fuller use. A second derived priority should be apparent for the

production of animal protein from sources suitable for small households at the village level. Milk, cheese, eggs and poultry are obvious possibilities.

The GOL/UCLA survey was conducted from September to November and thus fell within Lesotho's "hungry season" which lasts from October to December.[1] Recorded measurements of nutrient deficiency disease were probably high as a result. Nevertheless, there is substantial evidence that deficiencies exist (some chronic, more seasonally) in calcium, vitamin A, riboflavin, and niacin. In short, the diet needs more milk and green and yellow vegetables (LASA, 1978, p. III-23). Consequently, the agricultural production strategies developed below give emphasis to small scale dairy and poultry husbandry and to vegetable improvement programs.

Food Distribution

Average consumption levels discussed above mask significant distributional problems. Large portions of the population do not reach national average intake levels of one or more food groups. Hunger is apparent in the villages and recognized by villagers as a serious problem. Nutrient deficiencies, as noted above, affect a significant portion of the population. Sources of distributional problems may be easily identified. Thereafter, corrective programs can be developed specifically aimed at identified needs.

Income Distribution: The average figures in previous sections include both purchased and home produced commodities. Several sources show serious maldistributions of income in Lesotho. While the problem is national in scope, it is particularly acute in urban areas (van der Wiel, 1977, p. 88; JASPA, 1979, pp. 280-296). It has been calculated that "at least 30 percent of the households---experience income shortfalls that make them vulnerable to nutritional inadequacy". This same study found that based strictly on income analyses, "the distribution of vulnerable households is regionally uniform" UC/NUL, 1978, pp. 92-94).

Asset Distribution: Closely related to income distribution is the distribution of productive assets. In addition to determining income levels, asset ownership has a direct influence on household diets in countries where the bulk of the farm produce is consumed in the producing household. Limited assets can create food shortages which can only be offset if off-farm incomes and a reliable market exist.

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[1]The "hungry season" can best be defined as that period of spring or early summer before the first summer harvests are available but after foods stored in the household have been consumed. Note that the UCLA report erroneously lists this season as January to April whereas this as a season of harvest for many summer vegetables, fruits and other protective foods.

It has often been assumed that land is equitably distributed in Lesotho and that this distribution acts to ensure subsistence welfare for Basotho households. The assumption of equality has recently been disproved. JASPA (1979) examined this issue in detail concluding that land distribution in fact shows a Gini ratio of 0.38 (larger than any previous estimate) and that "there is a considerable concentration of farmers and acreage -- farmers at the lower end and acreage at the top end."

It is not total acreage but acreage per capita that determines the household's ability to feed itself. Per capita acreage figures are available and show a similar or slightly greater disparity between large and small holders than calculated by JASPA (LASA, 1978, p. V-15). Table II-4 below groups these data and translates them into a rough indication of household capacity for foodgrain self-sufficiency. It must be remembered that the groupings in Table II-4 are not simply small, median and large farms. A median farm in terms of acreage when supporting a large family, could easily fall within the "land restricted" classification based on per capita holdings.

Table II-4 may raise more questions than it answers; however, it is clear that the land restricted group, at average yield levels and growing nothing but cereals, can only produce one-third of household cereals requirements. This group must constitute a particular target for nutritionally related development programs.

Similar data are not available for livestock on a per capita basis. However, it is known that half of the households in Lesotho do not possess livestock. One would expect consumption of meat, milk, and eggs to be accordingly depressed in these households. It has been shown that the Basotho nation on average almost exactly equals FAO's recommended intake of 41 grams of protein daily. If a normal distribution prevails, half of the population may fall below this level, and this probably is closely associated with the pattern of livestock ownership.

The dietary effects of scarcities in land or livestock could be offset by adequate off-farm employment. Unfortunately, there is strong recent evidence that the distributions of assets and off-farm jobs coincide. Households with limited sources of income tend to be limited with respect to all sources simultaneously. Off-farm incomes do not offset the absence of incomes from agricultural resources. Furthermore, there are developments underway (population distribution, declining migration, limited expansion capacity for modern sector wage employment) which will seriously worsen existing income and asset distributions (Eckert and Mohapi, 1980). The numbers of deprived households may well increase rapidly over the next 20 years with a consequent increase in serious nutritional problems.

Table II-4. Arable Land Holdings Per Household Member: Implications for Household Self-sufficiency in Cereals.

Item	Land Holding Class		
	Land Restricted	Median Farms	Land Abundant
Per capita land area deciles included[a]	1 - 3	4 - 8	9 - 10
Size range (ha/capita)	0 - .20	.20 - .61	.61 - 5.06
Median (ha/capita)	.11	.36	2.83
Assumed fallow, other crops (%)	0	10	30
Available for crops (ha)	.11	.32	1.98
Cereals production (kg)[b]	116	338	2,089
Minus feed, harvest losses and post harvest losses at 25%	-29	-85	-522
Minus milling, brewing and cooking losses @ 12%[c]	-10	-30	-188
Minus seed @ 56 kg/ha planted	-6	-20	-160
Available for Consumption (kg)	71	203	1,219
Required for Consumption (kg)[d]	210	210	210
Household capacity for cereals self-sufficiency (%)	34	97	580

[a]From distribution calculated in LASA, 1978 using 1970 Agriculture Census data. Figures given are deciles from smallest (1) to largest (10) group of farms on a per capita hectarage basis.

[b]Using weighted average recent yield levels from Table IV-2.

[c]Applied after deducting seed, harvest and post-harvest losses.

[d]From Table II-2.

Regional Differences: Cropping patterns and productivity levels differ between the regions of Lesotho. The northern Lowlands, plus Qacha's Nek district, grow a higher proportion of maize; Mafeteng and Mohale's Hoek show a relatively higher proportion of sorghum while Mokhotlong, in the mountains, is distinguished by committing over half of its crop area to wheat. This latter percentage is nearly double that of any other district. There is little interdistrict trade in cereals for consumption purposes. There is, however, some trading of wheat grain for maize meal. Nevertheless, one can expect the regional mix of crops grown to be partially reflected in household diets. Arable land resources are not distributed as is population. Qacha's Nek district is particularly disadvantaged with only .09 arable hectares per person compared to .32 as the national average. This district is particularly dependent on imported food supplies, the interruption of which could cause severe short-term nutritional effects.

Remoteness creates additional nutrition problems. Since the logistics infrastructure and marketing system are quite underdeveloped in Lesotho, food supplies can be restricted in more remote areas. The underdeveloped marketing system also restricts movement of agricultural inputs to remote areas. As a consequence, low crop yields and restricted commercial food supplies both characterize the remoter regions.

Productivity differentials have been quantified between lowland districts. In general, the northern lowlands achieve better yields due to more adequate and better timed rainfall plus better soils. Maize yields in Butha Buthe and Leribe average 65 percent higher than those of Quthing in the South. These differences are only partly offset by slightly larger farm sizes in the southern districts. Consequently, a given farm size has a better chance of being self-sufficient in the northern Lowland districts than it does in the South. Colder temperatures and shorter growing seasons in the mountains also affect not only the crops grown but also yield levels (Planning Division, 1980). In his review of existing literature, Anderson (1978, p. 10) found that the "highest incidence of malnutrition appears to be in a band across the mountains in the south of Lesotho in the districts of Mafeteng, Mohale's Hoek and Qacha's Nek."

Seasonal Shortages: Finally, as in many other countries, there is a "hungry season" in Lesotho. This is the period just before harvest when stored food supplies have been drawn down to low levels. This season falls during the months of October to December in Lesotho. One would expect the problem to be most noticeable in the mountains where trade in food is restricted by logistical difficulties. And it should appear most significantly in the case of fruits and vegetables which are not readily storable. Hence, in remote areas, seasonal deficiencies of particular vitamins or nutrients may be expected.

Summary: Present Food Situation

The food and nutrition situation in Lesotho can be summarized in several general conclusions. Average consumption levels of energy and protein appear adequate by conventional standards, and somewhat higher than other parts of Africa. Significant nutritional problems do arise, however, because of the very high reliance on cereals as staple foods. Lesotho's diet is unusual in one respect. Most nations in which cereals compose 70 percent or more of total caloric intake, are very poor and overpopulated. Their diets are also generally deficient in protein. The presence of extensive range resources, high livestock numbers and the Basotho livestock tradition seem to provide adequate protein supplies on the average despite the high preponderance of cereals. Vitamin and nutrient deficiencies do occur where maize is the predominant cereal and constitutes a high proportion of the diet. These deficiencies are sufficiently widespread and important to warrant attention at the planning and program level.

A second serious problem arises from a maldistribution of food resources. Most important is the maldistribution among various strata of the population with the poor, the landless and land restricted, and those without livestock being most vulnerable in different degrees to specific types of dietary inadequacies. In addition, there are regional differences in climate and agriculture which suggest that parallel effects could be found in the diet by systematic study. Unless specific corrective programs are developed, these dietary inequities may well worsen as income and land distribution problems worsen.

Projected Food Requirements

Introduction

For long-term agricultural and nutrition planning, it is essential to predict future food requirements. This is particularly true in Lesotho where a major political objective is to reduce dependency on South Africa for food supplies. Future demand for food depends on the number of people to be fed and on their incomes. The latter affects the types and qualities of food consumed as well as the amount of processing purchased with the product. While reliable estimates of future population growth are available, data concerning changes in consumption that will accompany changes in income are less well developed. And predicting future income changes can only be a matter of assumption under present circumstances. Nonetheless, because of the importance of such projections, an attempt is made below despite inadequacies in the data and analytical base.

Determinants of Demand

Population Growth: Baseline data on the size and structure of Lesotho's population are available from the 1976 Census of Population (BOS, 1980). Monyake (1973) presents the only available set of demographic parameters based on field enumeration. These two have been combined to provide estimates of future population by age and sex for the rest of this century. High and low projections are available based on assumptions of constantly increasing vs. stable growth rates (Eckert and Wykstra, 1979). Recent policy on family planning and other factors suggest that the truth will ultimately lie between these two growth paths. Accordingly, we have used an average of the two to obtain the following estimates of present and future populations (in thousands).[1]

1976	1980	1990	2000
1,216.8	1,334.7	1,694.7	2,175.3

In Lesotho food requirements must be calculated on the basis of resident or de facto population to take account of the sizable proportion of migrants who work and are fed in South Africa. In former years one could assume that perhaps one-quarter of these men would be in Lesotho at any one time. However, at present the average length of contract substantially exceeds one year (as opposed to nine months in 1976-78) and time spent at home between contracts is usually held to that allowed by reemployment certificates plus occasional weekend visits.

Several estimates of the future trend for Basotho migration have appeared recently. As noted elsewhere in this report, the evidence suggests a decline in migration over the next twenty years. There seems almost no chance of an increase occurring. The extent of the decline is difficult to project; however, likely alternatives suggest that migrant numbers in twenty years will be either half or three-quarters of present levels. Table II-5 assumes 50 percent reduction at a uniform 3 percent annually. Should the less severe alternative occur, the number of persons resident in Lesotho and consuming in Lesotho would be 50,000 less than the above estimate for the year 2000.

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[1]These figures are somewhat more conservative than those of Tables I-1 and I-2 which are the higher of two estimates in the original source.

Table II-5. Projected Population of Persons Consuming in Lesotho (Thousands)

	1980	1990	2000
Total Population	1,335	1,695	2,175
Migrants	188	137	100
Penmanently Resident	1,147	1,558	2,075
Migrants Visiting (10%)	19	14	10
Total In-Country	1,166	1,572	2,085

Income Growth: Projecting future trends in real income is indeed difficult. The economic future of Lesotho, as well as that of South Africa with which Lesotho's economy is intimately linked, and the future climate for foreign assistance are all subject to a wide range of influences. Both positive and negative factors will influence developments. The net result over 20 years can only be guessed, and even then with some uncertainty. The absence of up-to-date national accounts makes it difficult to quantify recent trends from which to make simple projections.

During the 1970s most of Lesotho's total national growth has been derived from increases in migrant remittances. However, as discussed elsewhere, fundamental changes have occurred in the migration picture and it is no longer realistic to expect significant increases from this source.

The government has recently calculated that "real GDP has been growing at the rate of 5 or 6 percent annually but---the rate of population growth brings the per capita GDP growth down to roughly 3 percent per annum" (Kotsokoane, 1979). However, it would be unrealistic to simply project this 3 percent rate of growth indefinitely.

Table II-6 provides estimates of future paths for major sources of income. Foreign income via migrant remittances is developed on the assumption of a migration decline as discussed above. Real wages for migrants in South Africa are assumed to rise at 1.5 percent annually for ten years while that country wrestles with its severe domestic unemployment problem, followed by a 3 percent annual increase thereafter. This pattern is felt realistic based on extensive research within South Africa.

Three assumptions are offered for the future of resource productivity in Lesotho. To establish a baseline the first section assumes no change. The steady decline in per capita incomes from agricultural sources thus reflects simply the growth of population in the presence of fixed land and livestock resources. No increase is included in

real wages per job in the domestic modern sector although the number of jobs expands at 5 percent annually. Assumption two allows real wages as well as the productivity of land and livestock to increase at 2.5 percent annually. These are approximately sufficient to offset population growth and some increase in per capita incomes occurs due to an expanding wage sector. It should be noted that these increases in real income will tend to be concentrated among households with members involved in wage employment. Real incomes in strictly agricultural households would remain constant unless the productivity of their farm resources can be increased faster than population growth.

Finally, a 5 percent growth in resource productivity and real wages is assumed in the third segment of Table II-6. While yielding much more optimistic results, this scenario will be difficult to sustain over 20 years. A coherent, integrated development strategy, effectively implemented without let-up, will be required. One must also note that if Lesotho successfully sustains a 5 percent growth in real output including productivity of labor employed in the modern sector, the nation will, in 20 years, transform from one principally dependent on migration for incomes to one where 65 percent of total incomes will be derived from wage employment in the modern sector. Agriculture's share will remain constant at 18 percent while migrant remittances decline from 53 percent to only 16 percent of total. A transformation of this magnitude would be significant and highly desirable as a means of reducing this fundamental dependency on South Africa.

Achieving a 2½ percent rate of growth in output should be feasible with a modest development effort. Many of the foundations have been established during the past decade. Obtaining 5 percent, sustained for 20 years, will be quite difficult. The final result will probably lie somewhere in between. Nevertheless, these two alternative scenarios are utilized in the projection of food demand below. To summarize, annual rates of change in per capita income projected in Table II-6 are as follows:

	1980-1990	1990-2000	1980-2000
2½% Assumption	-0.2%	1.5%	0.6%
5% Assumption	1.5%	3.8%	2.6%

Income Elasticity of Demand: Growth rates in per capita income are translated into their influence on food demand by the income elasticity of demand. Unfortunately, neither time series nor cross-sectional data exist with which to calculate these elasticities with respect to the all-important food component of household budgets.

Table II-6. Alternative Estimates of Future Per Capita Incomes by Source[a]. (All figures are per capita.)

Year	Cropped Hectares[c]	Gross Value: Crop Income	Large Stock Units[d]	Gross Value L.S. Income	Off-Farm Jobs in Lesotho[e]	Domestic Wage Income	Migrant Remittances	TOTAL All Sources
- - - - - - - - - - - Assumption: No change in domestic resource productivity or wages[b] - - - - - - - - - - - - -								
1980	.217	M26.04	.741	M20.00	.035	M 70.00	M129.49	M245.53
1990	.193	M23.16	.546	M14.74	.042	M 84.00	M 85.07	M206.97
2000	.145	M17.40	.410	M11.07	.051	M102.00	M 65.58	M196.05
- - - - - - - - - - - Assumption: Real wages and productivities grow at 2½% annually - - - - - - - - - - - - -								
1980		M26.04		M20.00		M 70.00	M129.49	M245.53
1990		M29.65		M18.87		M107.53	M 85.07	M241.12
2000		M28.51		M18.14		M167.14	M 65.58	M279.37
- - - - - - - - - - - Assumption: Real wages and productivity grow at 5% annually - - - - - - - - - - - - - - -								
1980		M26.04		M20.00		M 70.00	M129.49	M245.53
1990		M37.73		M24.01		M136.82	M 85.07	M283.63
2000		M46.17		M29.37		M270.64	M 65.58	M411.76

[a]Adapted from Eckert and Mohapi, 1980, p. 15.

[b]Current levels are M120/hectare, M27/large stock unit and M2000/man year as computed from CPDO, 1979.

[c]250,000 ha in 1980, 300,000 ha in 1990 and 2000. These are hectares planted to crops. The expansion assumed could come more from multiple cropping than from an increase in area under the plow.

[d]850,000 large stock units held constant throughout.

[e]Modern sector employment growing at 5% annually from 40,000 in 1980.

The closest approximations to date are calculations based on imported foods only, for which annual data are available for 1968-1977. During this period national incomes doubled in real per capita terms. As mentioned, most of the increase was derived from migrant remittances. In particular, the dramatic mine wage increase in the 1973-76 period caused the real value of remittances to more than treble, and household income to double in three years. Since some time is required to adjust consumption practices to sudden income changes, it is unfortunate that food imports for later years are not yet available. Nevertheless, Table II-7 indicates some of the characteristics of food demand associated with income change. Since imported foods constitute a significant percentage of total (see Table II-2), these elasticities are more representative than if imports were limited to a small quantity of specialty commodities.

The income elasticities in Table II-7 are more accurate in depicting relationships between food groups than they are for overall levels. The income elasticity of demand for all food will exceed 1.0 only under rare circumstances. The coefficient for all foods represents a weighted average of coefficients for separate commodity classes. The figures in Table II-7 are therefore high, reflecting, in part, the abrupt nature of the income change plus the fact that only the imported component of demand is measured by these coefficients. If one assumes that the domestically produced component remained relatively unchanged in real value, then the coefficients for total consumption must await further data collection.

The relationships between categories follow normal or "expected" patterns. Meats and animal products are invariably higher than cereals. Fruits and vegetables fall between these two. Normal human desires to increase consumption of high value commodities as incomes increase are evident here. Between the cereals an interesting pattern emerges. Wheat is definitely the preferred cereal with maize showing the lower elasticity characteristic of a food staple. Over time, as incomes rise a gradual substitution should occur with wheat and wheat products (primarily bread) replacing maize and maize meal in Basotho diets.

Sorghum shows the negative coefficient of an "inferior good"; that being one whose consumption drops as incomes rise. As people become more affluent they will substitute maize and wheat for the consumption of sorghum.

In order to include the effects of income on future cereals demand, we have maintained the approximate relationships between cereals shown in Table II-7 but adjusted downward to more realistic overall levels for income elasticities of demand. This is necessary to adjust for the overestimation mentioned above as well as to accommodate the fact that

Table II-7. Income Elasticities of Demand for Food Imports by Major Commodity Groups[a]

Commodity Group	Elasticities calculated for: 1968-77	1972-77
Live Animals	2.40	2.80
Cattle	2.45	2.98
Sheep	2.14	2.62
Meat	2.05	2.70[b]
Milk and Cream	1.04	2.19
Fish, fish product	1.68	1.71
Cereals	1.57	1.51
Wheat, wheat products	2.04	1.79
Maize, maize products	1.07	1.12
Sorghum, sorghum products	-0.37	-0.09
Fruits	2.28	1.92
Vegetables	2.39	2.35
Sugar, sugar preparations	1.36	1.56
Coffee, tea, spices	1.52	1.45

[a] "Demand" in this instance is in value terms (1970 prices) rather than quantity.

[b] 1972-1976 only.

all income elasticities for food should decline gradually with long-term income growth. As people become more affluent they tend to devote a higher share of their incomes to non-food items of consumption (housing, recreation). For the estimations below we have assumed the following income elasticities which are consistent in their internal relationships with the estimates of Table II-7.

	Maize	Sorghum	Wheat
1980 - 1990	0.5	-0.1	0.8
1990 - 2000	0.4	-0.2	0.6

The effects of alternative assumptions may be derived by recalculating Table II-8.

Cereals Demand Projections: Table II-8 illustrates fairly clearly the interaction of population growth and income change on cereals demand. In Lesotho's case the dominant influence is exerted by population growth. Only if incomes rise at a sustained rate of 5 percent (and thus appreciably higher than population growth) will income change exert a significant influence. As noted above, a slight shift toward wheat and away from sorghum appears in per capita consumption. Nevertheless, effective demand for sorghum will nearly double in 20 years.

One word of caution is warranted. It is probable that the income elasticity for maize could drop more rapidly than assumed above if incomes rise steadily. In that case maize consumption in the year 2000 would not rise to 152 kg/capita and total tonnages as well as the projected per capita figure of 262 kg yearly would need to be adjusted downward by a modest amount.

To summarize the planning challenge implicit in Table II-8, annual growth rates in total cereals demand are summarized as follows:

	1980 - 1990	1990 - 2000	1980 - 2000
2½% Assumption	2.9%	3.4%	3.2%
5% Assumption	3.7%	4.4%	4.1%

Meats Demand Projections: In 1980 a team of specialists from FAO visited Lesotho to review the livestock sector and to propose a long-term development strategy. Their report contains per capita consumption levels for various meats and suggests income elasticities of demand drawn (in the absence of Lesotho data) from surrounding African countries at similar development stages (FAO, 1980). They estimate future demands for meats using the same income growth assumptions presented above and various income elasticities of demand which

Table II-8. Estimated Future Consumption Demand for Cereals Under Alternative Income Growth Rates.

Item	Units	Maize	Sorghum	Wheat	Total
1980 Per Capita	(Kg)	120	35	55	210
1980 Total[b]	(MT)	139,920	40,810	64,130	244,860
1990 Per Capita[a]	(Kg)				
2½% Assumption		119	35	54	208
5% Assumption		129	34	62	225
1990 Total[b]	(MT)				
2½% Assumption		187,068	55,020	84,888	326,976
5% Assumption		202,788	53,448	97,464	353,700
2000 Per Capita[a]	(Kg)				
2½% Assumption		126	34	59	219
5% Assumption		152	31	79	262
2000 Total[b]	(MT)				
2½% Assumption		262,710	70,890	123,015	456,615
5% Assumption		316,920	64,635	164,715	546,270

[a]Income change from Table II-6 times assumed income elasticities times 1980 or 1990 per capita consumption.

[b]Per capita consumption times population consuming in Lesotho from Table II-5.

average 0.95 for all meats excluding fish. However, by using total de jure population rather than resident population, their estimates err on the high side.

For the present analysis FAO's estimates have been retabulated on the basis of de facto, or resident, population. The following tabulation summarizes, without detail, the rate at which demand for all meats (excluding fish) should rise during the next two decades:

	1980 - 1990	1990 - 2000	1980 - 2000
2½% Assumption	2.9%	4.3%	3.6%
5% Assumption	4.4%	6.6%	5.5%

The FAO study presents a livestock development program by which these growth rates could be met. It is, however, an ambitious plan requiring a sustained, integrated effort over two decades. The FAO proposals are described in some detail in Chapter V.

Food Planning Priorities

The implications of these calculations for crop planning are discussed elsewhere in this report. To conclude this chapter, policy issues related strictly to food and nutrition planning are identified.

First, there is a definite need for development programs aimed at dietary diversification. Analysis of existing data revealed deficits in milk and vegetable consumption leading to certain nutrient shortages. While some improved dairy herds exist, the principal milk problem is one of low levels of production among unimproved herds at the village level. Vegetables have long been recognized as a subsector in need of improvement. Production at the village level is low and subject to serious seasonal pest and disease problems. Imports remain high and the seasonal offerings normally monotonous. Major increases in quantities, quality and diversity should be possible with only a modest but well-planned effort.

There is also considerable scope and need for a diversification in fruits available. Given the longer gestation periods for increasing fruit production, progress toward this objective, if adopted, would be visible only after five years or longer.

Vegetables, on the other hand, could show significant results in the first year of program implementation. Research is needed to select vegetables with high nutrient content and low perishability that will grow well under Lesotho's conditions. Vegetable production programs should then be targeted specifically toward the relief of identified

nutrient scarcities. Particular attention is warranted for vegetable programs in mountain and remote areas. Similarly, additional research work on the nutrient content of indigenous vegetables and wild plants could be used in nutrition extension programs.

While cereals consumption is adequate, foodgrain self-sufficiency is an important national objective. Table II-2 clearly shows harvest and post-harvest losses to be the leading source of reduction for domestically produced grains. If these losses could be halved, the savings would provide the cereals needs of 126,300 people at present consumption levels. The savings would equal 17 percent of the total grain for home use from domestic production. If yield levels are to rise with time the quantities that can be potentially saved will rise accordingly.

A significant nutritionally related development priority is to increase home produced supplies of protein at the village level. Such a program would recognize resource constraints of small farm households and attempt to offer improvements in existing husbandry or new and appropriate alternatives. Milk from cows and dairy goats, small poultry flocks, rabbit raising, pulse production and possibly high lysine maize can all be offered in technologies suitable for village or household management.

Finally, serious distributional problems exist. Protein consumption is just adequate on the average. Large portions of the population must fall below the average. Since nearly half of foodgrain consumed is imported through market and concessional channels, one must expect that those households with limited incomes will be less able to purchase the necessary additional supplies. The incidence of hunger and the incidence of poverty should be very closely associated in Lesotho as elsewhere.

Factors influencing maldistribution of food were identified. Among them were regional differences in climate and agricultural productivity, differences in the distribution of productive assets and a skewed income distribution. Each suggests its own remedial effort. One of the more important general solutions would be to capitalize on the newly emerging nationwide network of improved roads by developing internal trade in foodstuffs. A viable non-government operated retail sector combined with regional production specialization and trade in food commodities would contribute significantly toward easing regional scarcities.

Lastly, food scarcity in remote areas in the two or three months immediately before harvest can be particularly severe for selected households. One suspects that these households suffer seasonal deprivation of essential nutrients and, for the poorer homes, calories. Development programs stressing commodity storage to achieve a uniform seasonal supply are important, especially in the case of the vitamin and nutrient-rich food groups.

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CHAPTER III

THE RESOURCE POSITION OF THE MOSOTHO FARMER: POLICY IMPLICATIONS

Introduction

Agricultural development programs and policy initiatives seek to influence farm management decision makers and encourage them to improve their production along lines consistent with established development objectives. The decision making framework of small farmers has been the subject of considerable research in recent years. Several conclusions from this research are important for Lesotho.

First, it is now recognized that small farms are managed by rural households and that management decisions reflect both household and farm system priorities (Hayami, 1978; Barnum and Squire, 1979). Second, the resource constraints faced by small farmers establish definite limits within which decision making must be made. Those resources that are fully owned or controlled by the farm household may be used as, and when, needed. Others, over which farmers may have only partial control, are subject to use limitations arising from the fact that the farmer must arrange with others or through the market for access to these goods or services. Farm resources that are unavailable to the farm manager are irrelevant to his managerial decisions regardless of how attractive they might appear on paper.

Farmers thus manage their farming activities primarily based on the resources at hand. The input which most clearly illustrates the need for joint management of household and farm enterprise is the use of family labor as a farm input. This one resource can be allocated interchangeably to either household chores or farm work with tradeoffs weighed and allocation decisions taken almost on a daily basis.

Effective development policy must be based on clearly defined resource patterns. Target groups can be identified by their resource differences and special development strategies designed for each group. Each segment of the population can thus benefit from an "appropriate" package of policies, institutional and technological changes. One alternative, that being generalized programs of change aimed at "average" farmers, runs the serious risk of only being truly attractive to a limited portion of the rural population. Wider progress

including larger and smaller farmers can be prevented by using too generalized an approach. Another alternative, development programs for the so-called "progressive farmers," will probably bypass the smaller, really poor farmers altogether.

This chapter provides a detailed examination of various groupings of farm households based on the resources under their control. From this emerges a definition of alternative target groups for different development strategies. Numbers of households in each classification are identified in order to suggest the size of the clientele in each target group.

The Distribution of Productive Assets

For a considerable portion of Lesotho's post independence history the distribution of income was assumed to be relatively uniform. As recently as 1975, the World Bank claimed that income distribution among the rural population was "remarkably even". Their assertion was based on the belief that "the distribution of productive assets is quite even---(and) Second, the incidence of migrant labor is higher among poorer families than among the richer" (World Bank, 1975, p. 21). This analysis was adopted as an underlying premise of the Second Five Year Plan which, after a review of the World Bank's data, states, "This degree of equality is unlikely to be matched by any other country" (Kingdom of Lesotho, 1975/76, p. 3).

The hypothesis of equality contributed two serious shortcomings to the planning process.

a. Feeling comfortable that Lesotho had an equally distributed resource base, the distributional consequences of development programs were largely overlooked.

b. The egalitarian view resulted in planning and agricultural programs which assumed that all farmers were relatively the same; that there was an average or reference Mosotho farmer toward which change could be aimed.

Considerable recent research disproves both of the underlying bases of this earlier perception. Productive assets are not particularly well distributed (LASA, 1978; JASPA, 1979). Migrant remittances are received in disproportionate share by those households with larger holdings of land and cattle (van der Wiel, 1977). The consequences for the distribution of household incomes are shown in Table I-9. Furthermore, the analysis in Chapter I shows that income distribution will likely worsen, perhaps considerably, over the next two decades.

The sections that follow examine, in considerable detail, the distribution of productive assets (land, cattle, capital equipment and household labor) as well as off-farm incomes. Our purpose is to identify resource constraints operating in agriculture as well as provide a basis for classifying farmers into specific target groups for development. For reasons mentioned above, a resource based stratification system is felt to be one of the more useful mechanisms for target group specification.

Aggregate Considerations

Not all rural residents hold an allocation of arable land. Landlessness as a percent of rural households has grown slowly but steadily since the earliest surveys (LASA, 1978, p. V-21). Some 40,800 rural households, or 16.5 percent, were landless in 1980. With the impact of the 1979 Land Act as described in Chapter I, the rate of growth of landless rural households will accelerate to an average of 5.3 percent annually over the next 20 years. The conclusions regarding land holdings must be modified over time as this phenomenon develops.

Similarly over half of the rural households do not own livestock. Of those households with livestock, 97 percent also hold land. Table III-1 presents the very broadest classification of rural households by livestock and land assets. Data for 1980 are based on the 1970 Census of Agriculture (BOS, 1972) extended by known trends as developed in LASA, 1978. Estimates for 2000 A.D. are the 1980 figures adjusted to reflect growth in households from Table I-3 combined with the effective ceiling on the number of farm units contained in the 1979 Land Act.

The number of livestock owning households without land has been increased arbitrarily by 50 percent between 1980 and 2000. Simultaneously the total number of livestock owning households has been reduced 15 percent to reflect the probable results of stock reduction programs discussed in Chapter V.

Several broad policy conclusions can be drawn from Table III-1. First, programs aimed at increasing the productivity of land can, at present, only assist the 83.5 percent of the population with arable land allocations. Over two decades this percentage will drop to approximately 62 percent. Second, programs of livestock productivity can only directly affect half of the rural households at present, and this proportion will decline to nearly 30 percent by 2000 A.D.

Third, and perhaps most crucial, fifteen percent (38,030 households) have neither livestock nor land and thus cannot participate directly in incomes resulting from increased productivity in agriculture. This group must look toward non-farm employment. If growth in primary

agricultural production stimulates the growth of agri-business and marketing employment, this group can participate in the jobs created indirectly by agricultural change. The urgency of planning for this target group specifically is shown by its rapid projected rate of growth; from 15 percent of rural households in 1980 to 127,000 households, or 36 percent in 2000. Households without land or livestock will increase by six percent annually for the next twenty years.

Table III-1. Aggregate Groupings of Households by Possession of Land and Livestock; Present and Projected to 2000 AD.

Livestock Holding	Land Holding: With Land	Land Holding: W/O Land	Row Totals	Percent
1980				
With Livestock	118,960	2,770	121,730	49.3
W/O Livestock	87,040	38,030	125,070	50.7
Column Totals	206,000	40,800	246,800	100.0
Percent	83.5	16.5	100.0	
2000				
With Livestock	101,100	4,200	105,300	31.2
W/O Livestock	108,900	123,000	231,900	68.8
Column Totals	210,000	127,200	337,200	100.0
Percent	62.3	37.7	100.0	

Note: 1980 figures are estimates and many be subject to small revisions once the 1980 census of agriculture is tabulated and released.

Land

Many of the impressions of the presumed equality of land distribution are derived by examining the size of holdings per household. It is much more useful for policy purposes to examine land holdings on a per capita basis, relating the size of a household's land allocation to the number of people in the household. Per capita arable area determines whether a household can be self-sufficient in food, whether surplus production for market is possible and the relative proportions of land and labor used in crop production.

Table III-2 presents the per capita distribution of land in hectares by deciles of land holding farm households. Data for two groups, families larger than nine members and holdings larger than six hectares, could not be included in these calculations due to the nature of the data. Some 16,647 households (8.9%) are thus excluded from this tabulation. Through other means it has been possible to establish that the 4,600 households with land holdings in excess of six hectares average 7.16 hectares each and have an average population of 7.2 persons. These larger farms thus average almost exactly one hectare per person, placing them on par with membership in the top decile of land holders.

These data emphasize that land is not equally distributed in Lesotho. The smallest 20 percent of rural households (as defined by hectares per capita) hold only 5.3 percent of the total arable area while the largest 20 percent hold 37.5 percent of all arable land. The Gini index of concentration (Gini ratio) for this distribution is .30. While this figure is not severe, it does indicate a level of inequality that is significant enough to have policy implications.

Table III-2. Estimated Distribution of Per Capita Arable Land Holdings and Associated Area Held, by Deciles for Lesotho 1969-70.[a]

Decile		Land held by decile members	
Number	Boundaries (ha/cap)	(hectares)	(% of total)
1st	0 - .078	6,914	2.3
2nd	.078 - .141	9,077	3.0
3rd	.141 - .207	18,004	5.9
4th	.207 - .268	26,948	8.8
5th	.268 - .336[b]	28,149	9.2
6th	.334 - .391	29,360	9.6
7th	.391 - .516	34,732	11.3
8th	.516 - .606	38,157	12.4
9th	.606 - .929	56,804	18.5
10th	.929 - 5.000	58,621	19.0

[a]Holdings larger than 6.0 hectares and households larger than 9 members excluded.

[b]Median value = .336

Source: Calculated from BOS, 1972, p. 49.

Livestock

Ownership of livestock is considerably more concentrated than land. Table III-1 shows that half of the rural households do not own any stock at present. Table V-3 presents additional details concerning the distribution of livestock by species. Over 70 percent of the nation's cattle and 90 percent of all sheep and goats are owned by 20 percent of the rural population.

Gini ratios of 0.68, 0.88 and 0.88 can be calculated from census data for cattle, sheep and goats respectively. Ratios of this magnitude are generally considered representative of seriously unequal distributions. In the present context, these figures simply emphasize the limits that face livestock production programs when viewed as a strategy for overall development. Because of the concentration of ownership, the direct benefits to livestock improvement programs will be equally concentrated. Partially offsetting this concentration is that livestock products lend themselves to considerable value added in marketing and processing. Many of these activities can be accomplished with labor intensive means. Thus, livestock improvement programs can indirectly generate incomes for a broader range of rural households through employment in processing industries.

Joint Distributions

The relationships between the distribution of land and livestock are important for policy analysis. Where two uneven distributions coincide, they will reinforce each other and accentuate income distribution problems. If they do not coincide, they may well offset each other, resulting in greater income equality.

Data from the 1970 Census support a positive relationship between total land and livestock holdings. Detailed examination of farm survey data from the Thaba Bosiu project area show a similar pattern even when land holdings are measured on a per capita basis. Survey data from the Senqu and Hololo Valley projects reinforce this conclusion with very similar patterns.

Thus whether viewed at the macro- or micro-level, one must conclude that the households with larger land holdings tend to be those with larger livestock holdings as well. For analytical purposes the following two equations relate cattle numbers to household land base under different measures.

a. When related to total household acreage:
   Cattle Owned = 1.45 + 0.13 (Total Hectares)

b. When related to per capita acreage in the household:
   Cattle Owned = - .40 + .45 (Hectares/Capita)

The conclusion from the above is that total income distributions are probably less equal than would be concluded by examining any one income source independently. Households with the largest land-based incomes are probably the largest recipients of livestock incomes as well. Furthermore, it was suggested during the 1970's that what income equality existed was caused by relatively equal access to off-farm incomes. Recent analyses show this not to be the case. Instead migrant remittances and off-farm work in Lesotho are concentrated in the same hands as are land and livestock. Table I-9 shows these relationships quite clearly at the aggregate level.

The Resource Positions of Lesotho's Farm Households[a]

An examination of resources owned permits a classification of farm households into target groups for which separate development strategies can then be designed. What follows provides a detailed disaggregation of resource differentials characterizing Lesotho's Lowlands.

Data are from the General Economic Survey (GES) conducted by the Thaba Bosiu project. Although this sample is relatively small (n = 284) and from a single geographic area there are many indications that the sample is relatively representative of the Lowland ecological zone in general. First, one must realize that this sample reflects land holding farm households only. Within this context Table III-3 shows 55 percent without cattle compared to national figures of 50.7 from Table III-1. Second, approximately 13 percent can be identified as "progressives," matching closely the 10 percent found in other village surveys (Gay and Guma, 1979). Third, median farm size in the sample is 0.40 hectares per capita, relatively close to the figure of 0.34 hectares calculated by LASA (1978) from national data. Fourth, the percentage of farmers owning planters is very close to that found throughout the Lowlands (BASP, 1980). Finally, some 78 percent of the sample households have one or more members in off-farm employment, compared with a national average of 70 percent. The slightly higher figure for the Thaba Bosiu sample undoubtedly reflects the nearness of the area to modern sector employment in Maseru.

Thus, these comparisons support the assertion that the Thaba Bosiu sample, at least with respect to the distribution of ownership, is fairly representative of Lesotho's Lowlands in general. Once this proposition has been accepted, then the details from the sample provide very useful insights into relationships which probably apply generally throughout the Lowlands.

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[a]A "farm household" in Lesotho is defined as one holding an allocation of arable land, or a specified minimum complement of livestock, or both.

Table III-3 presents the data graphically. Columns identify land holdings per household in hectares per capita. Land holders have been divided into deciles and the columns constructed with a proportional (equal) width. The per capita emphasis is used to isolate those households which have sufficient land to feed themselves with basic cereals. Rows identify the presence or absence of cattle (which offers the potential of tillage power under the household's direct control), migration (providing external cash income to the household) plus various types of capital equipment needed to farm at different levels of effectiveness.

Vertical height of the cells in each row is proportional to the percentage of rural households in each resource group. Since both horizontal and vertical axes are proportionally constructed, the area of each cell is proportional to the percentage of households falling in that resource classification.

Column and row totals define several relationships. A positive relationship between land and livestock holdings is apparent, as is a strong positive relationship between total and per capita arable area. These data thus reflect the joint distributions discussed above and support the conclusion that income producing assets tend to be concentrated in the same hands.

Cropping intensity (C.I.) is defined as the ratio of acres cropped divided by total acres. A cropping intensity of 1.0 indicates full utilization of the land with one crop per year. Cropping intensity provides a useful measure of certain aspects of farm management. For example, higher cropping intensities are found on farms with smaller per capita acreages. This pattern is commonly found where small farms are managed first to meet household food needs. It also reflects the higher labor supply per hectare on farms with limited per capita land supplies. This perspective would reinforce the hypothesis that labor shortages do constrain agricultural productivity. It must be noted that these figures represent cropping activities in 1974 and 1975. As such the intensities measured predate most of the decline in crop acreage that followed the increase of mine wages which is fully discussed in Chapter IV.

One significant conclusion from Table III-3 is the difference in cropping intensity appearing between households with and without cattle. For the population as a whole, C.I. equals .91 and .76 for the two groups respectively. This measure and others lie behind the conclusion that households without cattle constitute a significantly different group, both from farm management and national development perspectives. Finally, the only significant instance of multiple cropping (as shown by C.I. > 1.0) lies in the smallest group of farms with cattle to facilitate cultivation.

Table III-3. Distribution of Thaba Bosiu Households Among Various Possible Combinations of Farm Resources[1]

Non-Land Resources	Farm Size Deciles (Size given in hectares/household member) 0-.12	.12-.20	.20-.28	.28-.32	.32-.40	.40-.52	.52-.64	.64-.85	.85-1.3	1.3-3.8	Row Totals or Averages % of H.H.	Aver. Farm Size	Aver. H.H. Size	% Male Headed	C.I. 73-75	C.I. 75-77
Off-farm job, cattle, yoke, plow, cultivator, harrow, planter	.7	1.1	1.4	1.1	1.4	1.1	1.4	2.1	1.8	1.4	13	3.52	6.7	97	1.02	.80
Off-farm job, cattle, yoke, plow	1.1	1.8	1.8	1.8	1.8	2.1	1.1	1.8	1.4	1.4	16	2.47	6.1	71	.87	.75
Off-farm job, cattle, no implements	1.1	1.1	3.9	2.1	1.4	1.8	2.5	1.4	.4	.7	16	2.02	5.6	65	.89	.72
Off-farm job No cattle No implements	4.2	3.9	2.5	3.9	3.2	4.2	3.2	2.5	2.5	2.5	33	2.27	5.1	77	.75	.61
No off-farm job No cattle No implements	0	.7	2.1	1.1	1.4	2.8	2.8	2.1	2.8	6.3	22	2.11	2.7	30	.81	.66
Column Totals																
Average Farm Size (Ha)																
HH With Cattle	.53	1.01	1.74	2.02	2.27	2.87	2.79	3.74	4.09	5.42						
HH W/O Cattle	.57	.97	1.17	1.70	1.54	1.98	2.02	2.47	3.56	4.00						
Average No. of Cattle per Cattle Owning HH	3.9	4.2	4.1	4.4	5.8	4.8	6.8	5.3	6.0	7.2						
Cropping Intensity[2]																
HH With Cattle	1.16	.96	.99	1.02	.96	.96	.85	.84	.88	.92						
HH W/O Cattle	.84	.84	.92	.88	.67	.74	.72	.66	.81	.71						

[1] Figures in cells represent percentages of total population. Totals may not match exactly due to rounding.

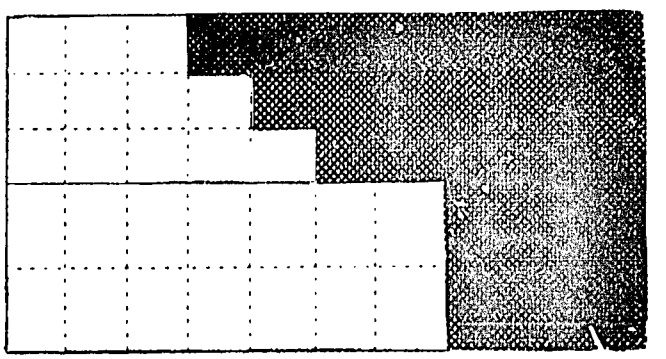
[2] Averaged for 1974 and 1975.

Table III-4. Generalized Resource Groupings of Basotho Farmers

Table III-4 generalizes the data to define basic resource groups. Within the table, block I identifies those households with the resources to farm but without enough land to feed their families through their own production. Block II has both resources and land, the latter in excess of household cereals requirements. Block III has no tillage power in the household and must thus depend on sharecropping or contract plowing and planting to produce. They also do not have the land resources to be self-sufficient in cereals. Block IV contains resource restricted households with land holdings in excess of home consumption needs. The majority of this group is older households, headed by women whose dependents have grown and left the home. Detailed applications to various development policy questions are developed in the following sections.

Household Cereals Self-Sufficiency

In most developing countries household self-sufficiency in basic foodgrains is a primary objective of farm management. In Lesotho, the importance of this factor is reduced by the availability of external income sources. However, farm managers still view the economics of farming differently between production for the market and production for home consumption.

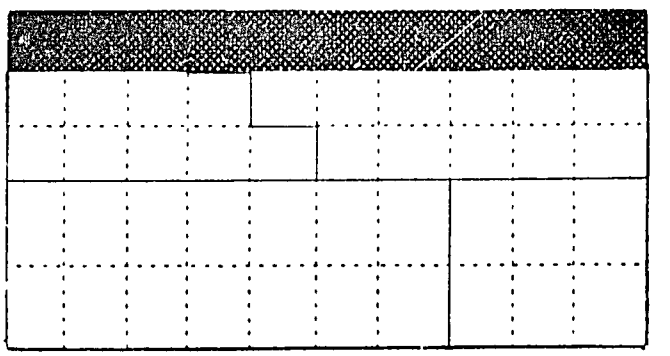


At 1980 yield levels and cropping practices, the average Mosotho farmer requires about 0.4 hectares to produce the cereals required for each member of his family. A per capita land base of 0.4 hectares thus serves as a general rule-of-thumb to identify land resources needed for foodgrain self-sufficiency within the household. However, the more progressive the farmer and the better his resource position, the higher are the possible yields. In this table this difference has been approximated by assuming that farmers in row 1 can meet their foodgrain needs with 0.28 ha/cap, and row 2 with 0.32 hectares.

Conversely, land holders in rows 4 and 5 are constrained by the absence of cattle for tillage. To plant a crop they must either hire tillage services or enter a share cropping arrangement. The costs are either a cash outlay which reduces cash available for food purchase or a reduction in per acre harvest by the amount paid out in crop shares. In either case, the result is that a larger land base is required for household self-sufficiency. To reflect this fact, the amount of land required for subsistence cereals requirements is raised to approximately 0.65 ha/capita.

This reasoning leads to the conclusion that households falling within the shaded area have the land resources to meet or exceed their household needs for foodgrains. This block then becomes a first approximation of the group of farms that could be expected to produce a surplus to meet the food needs of urban and landless households. For reasons presented below, households in rows 4 and 5 of this block are probably not in a position to contribute appreciably to marketed surpluses even though they can probably meet their own needs. Thus, the population of farm households who could be considered potential surplus producers is effectively limited to rows 1-3 in the shaded area of the diagram.

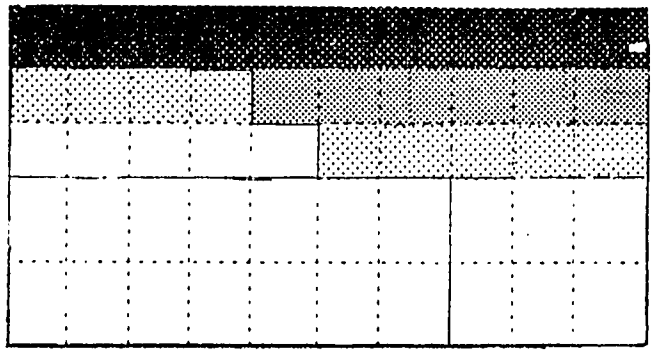
"Progressive Farmers"



Row 1 possesses the characteristics that are generally associated with what has been sometimes called progressive farmers. Farms average nearly 1.2 hectares larger than other rows, families are approximately one person larger and the households in the row are almost entirely headed by males. In these characteristics, this row mirrors the characteristics of progressive farmers as identified by their fellow villagers (Gay and Guma, 1979). Row 1 constitutes 13 percent of total landed households in the sample, consistent with the generally assumed level of "about 10 percent" within this category. Finally, farmers in row 1 are distinguished by having gone beyond simple possession of a plow and yoke. They have accumulated harrows, planters and cultivators in addition, thus increasing their ability to farm well and demonstrating their interest.

This group of farmers will very likely be the innovators and early adopters of packages of new technology. It is important to note that these households occur across the full range of per capita land holdings. Thus, these are "progressive," male headed, farm households with both high and low land:labor ratios.

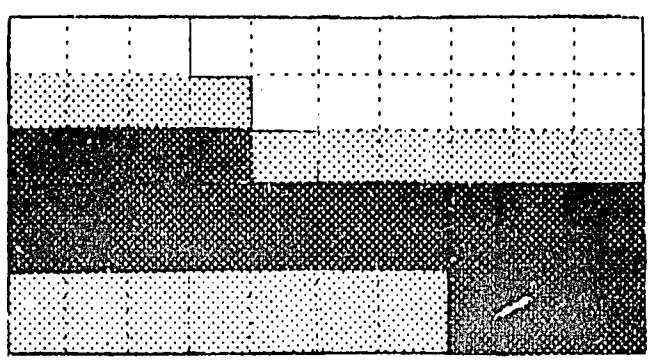
Market Oriented Farmers



Very important for agricultural policy are households which are involved in the market. These farmers purchase farming inputs and produce for sale. They utilize economic principles in making farm management decisions. Therefore these decisions can be influenced through indirect incentives such as price policy, market development, etc. When examining the demand for farm inputs, one must concentrate on farmers likely to make cash outlays. In the main, these farmers will also be those who produce for sale and thereby make their purchase decisions on the expectations of a profitable return.

In Lesotho it appears that one can consider all farmers in row 1 as market oriented. To a slightly lesser extent, farmers in row 2 who have the land resources to produce a surplus can also be considered part of this group. One must also recognize that some farmers in row 3 and some land restricted farmers in row 2 will purchase inputs or may market portions of their crops. The diagram above indicates the probable extent of market involvement through different shading densities. In terms of national cropped area, nearly 20 percent (row 1) can be considered involved in market oriented production while varying portions of an additional 23 percent (row 2 and half of row 3) are involved as well. It is recommended that government attempt to increase the number of farms whose agricultural activities are directly tied into the market system.

Part-Time Farmers



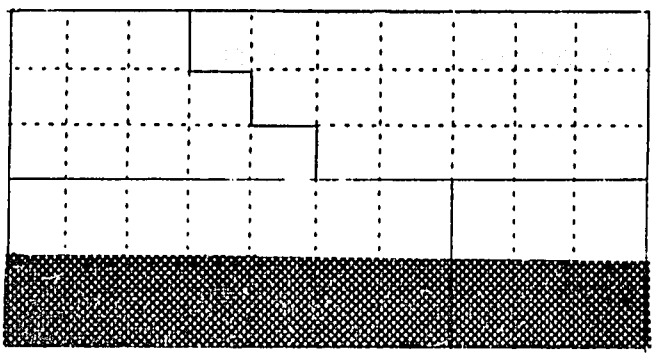
Most of Lesotho's farmers do not consider agriculture to be their primary source of income. While these households engage in farming, they do so to contribute a portion of household foods or to supplement their incomes. This does not mean that farming is not important. Instead, these farmers are characterized by very low market involvement, low input levels and consequently low output. Due to the subsistence orientation of their farming activities these farms are not generally responsive

to market forces and will not generally adopt new technology if it increases risk or requires cash expenditure.

We assume that this group includes the households in the darkly shaded area above, plus about half of those in the lightly shaded areas. The total would thus include approximately 65 percent of Lesotho's landholding households.

One Critical Target Group

The analysis of farm resource positions reveals one group of land holders which deserves particular attention. Row 5 is characterized by the absence of all farm resources except land. To farm this land, these households are nearly completely dependent on others to provide inputs. Data show these households to be older households, past their prime production potential.

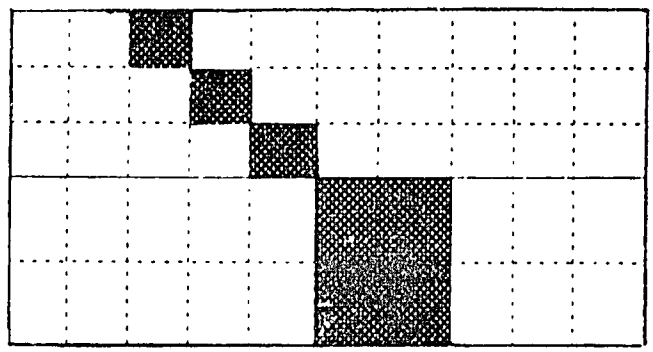


Data show them to be only half the size of other groups, largely headed by women, and without cattle. The average size of the household suggests there is very little labor available as well. The element that makes this group critical is that they also have no direct access to migrant remittances. There is, thus, no alternative source of income with which to either purchase food or relieve farm resource constraints. If these households farm their land, they receive only part of the output since they are essentially forced to sharecrop.

Special development attention is probably warranted for this group. The most important item that could be provided would seem to be an off-farm job. It is unlikely that they would ever be able to farm their land holdings productively. Therefore, in the national interest and to provide rental incomes to the household, it is suggested that programs be developed that would lease these lands to alternative sources of farm management (village level producers associations, better farmers). Either alternative could provide a stream of income to the household while increasing production from the land and marketed (or redistributed) surpluses significantly.

Yield Increases and Household Self-Sufficiency

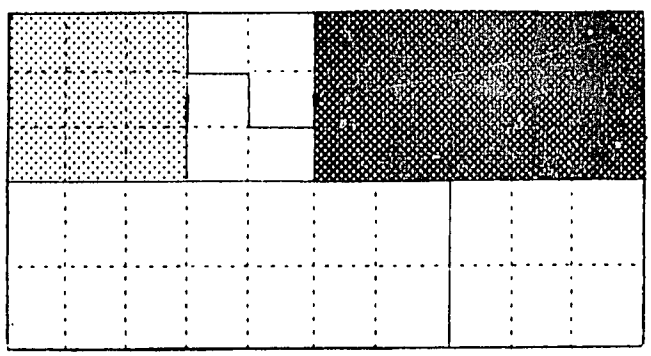
Elsewhere in the analysis the point is made that the nation must increase the amount of food reaching the market over the next 20 years. Such a development objective is absolutely necessary if growing urban and landless rural populations are to be fed without increasing Lesotho's dependency on imported foodgrains.



Analysis of resource positions identified groups of households which could potentially produce surpluses beyond household needs. This analysis, and the resulting division of households, was based on yield levels and farming practices prevailing in 1980. Any technological change that raised yields would permit meeting family foodgrain needs with fewer hectares. The darkly shaded area in the present mini-diagram indicates additional groups of households that could become self-sufficient and produce a surplus if higher crop yields could be obtained. Of course higher yields would also affect land abundant households, increasing the surpluses presently produced.

Crops Specialization

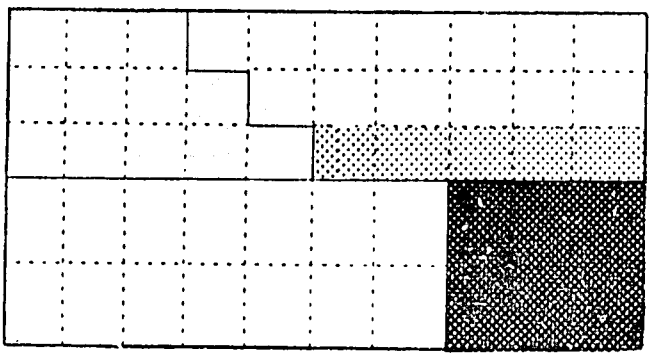
Differing cropping programs can, and probably should, be developed to fit farmers' resources. Vertical columns in the resource graph indicate the amount of land held per household member. Households falling to the right in the diagram have larger amounts of land per labor unit. Conversely, households falling toward the left side have larger labor supplies per land unit. Automatically, this suggests two different development strategies. For those with abundant land resources, modern cereals farming seems advisable. For those with higher labor supplies per hectare (the left side of the diagram) the more labor intensive activities are suggested. Many of these enterprises involve livestock. However, specialty crops such as asparagus, fruit,



vine crops and beans with their high harvest labor requirements would seem suitable. Commercial vegetable production is a high priority possibility for the more advanced farmers in the labor intensive category.

The diagram above indicates farm households suited to land using, labor saving crop mixes with dark shading. These constitute some 22.5 percent of rural households. Labor intensive cropping is especially suited to those with light shading, some 13.5 percent of all farms. A group of farm households falls between these two groups yet above the tillage power threshold. In these households resources would support mixed enterprises, blending labor based activities with land based activities as personal preferences and market influences dictate. If commercially viable agricultural enterprises are developed for both land and labor using groups, those with a balanced resource mix, such as this middle group, can choose among them.

Probable Source of Fallow Land



The diagram opposite identifies with various shadings groups of households which probably do not make full utilization of their land resources. These households hold land in excess of home consumption needs. They do not have draft power to till the land and must resort to sharecropping. These households are predominantly headed by older women, and for those falling in row 5, have no outside source of income. It is understandable that they will seek to cultivate enough land to provide their basic food supply.

However, production beyond this level is probably uneconomic. Regardless of which sharecropping partner provides production inputs, they receive only a portion of the returns under the sharecropping arrangement. With the marginal product of investment thus reduced (often to half), it is doubtful that inputs such as improved seed, fertilizer, weeding labor and the like are applied. In fact, cultivation is generally not extended beyond minimum acreages needed for home consumption.

One would, therefore, expect to find surplus acreage held by this group lying fallow. Efforts to reallocate land management responsibility should concentrate on shifting unutilized lands from within this segment to the management of more advanced farmers, possibly those who are presently "land restricted."

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PART TWO

TECHNICAL ANALYSES

Four chapters in Part Two provide detailed analyses of many different aspects of the agricultural sector. Analyses of issues which affect the direction or strategy of agricultural development are stressed. Much of the data or analysis appears here for the first time. In all cases, the underlying assumptions and all data sources are explicitly provided, should the analyst wish to test the conclusions against alternative assumptions. Policy recommendations occur throughout each chapter.

CHAPTER IV

CROPPING IN LESOTHO: INTERNAL DYNAMICS AND FUTURE DEVELOPMENT

Section 1

The Sector During the 1970s

Introduction

Chapter I developed an analytical picture of the national environment for planning and development activities. National priorities were identified for employment, income generation, income distribution and a restructuring of the economy and government. The remainder of this study focuses on the agricultural sector explicitly. Agriculture remains the largest single domestic sector in terms of contribution to GNP and the number of people employed. The country remains essentially rural with less than 75,000 urban residents out of a total resident population of 1,150,000 in 1980. Eighty-three percent of rural households are land holders and thus, in one way or another, involved in cropping. Forty-nine percent of the rural households own livestock and thus receive income in cash or kind from this source. While migration may provide more income to the household, of the domestic sectors agriculture affects the broadest range of the population. And given the very low returns currently obtained,[1] this sector provides substantial potential for future contributions to national growth. Indeed, given the extent of involvement in agriculture and the relative scarcity of alternative sources of incomes, growth in agriculture is imperative. It can be argued that without rapid growth in agriculture, progress toward any of the major national goals will be extremely difficult if not impossible. Continued stagnation in rural areas will further complicate development by creating the severe distortions in the economy and society normally associated with two sector polarized growth patterns.

The present chapter deals with the subsector of cropping and the use of arable land. Section 1 reviews the events affecting crop production during the last ten years. Section 2 provides several new detailed analyses, each of which contains data or conclusions not previously available. Section 3 integrates these findings into a discussion of several recommended strategies for crops development.

The Data Base on Cropping

Analysis of agricultural trends is hampered in Lesotho by incomplete data, particularly the absence of long-term annual time series information on cropping. In an effort to solve this problem, many analysts

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[1]Gross annual returns are estimated at M120/ha, and M27 per large stock unit in 1980 (CPDO, 1979).

have indiscriminately combined all available data in order to maximize the number of years with which to work. Since this procedure results in pooling noncomparable data, including some that can be shown to be in error, the resulting analyses are variable and confusing. In some cases, as with the allegation that long-term declines in crop yields have characterized Lesotho, the conclusions reached can be proved wrong. For these reasons it is important to review briefly the existing data base on cropping. Hopefully, the thoughts that follow will prevent errors or questionable analytical methods in the future.

Pre-independence Annual Reports: Crop production figures are available from Department of Agriculture Annual Reports for the period preceding Independence in 1966. These figures were not derived from farmer sampling or crop cutting procedures. Various methods were used, but all involved subjective estimation procedures. Changes in methodology in 1949 and 1959 created breaks in continuity. These early efforts are reviewed in detail by Morojele (1963, Part I, pp. 22-25). For several reasons these early data are acceptable only as approximations and are then useful primarily for relative comparisons between crops rather than as indicators of absolute levels. Production levels only are given; the absence of area estimates prevents calculating yields.

Agricultural Censuses:[1] Three such censuses are available and a fourth is being tabulated by the Bureau of Statistics. The first census (Douglas and Tennant, 1952) filled an important void by providing the first-ever set of data drawn from a national sample survey. Understandings of the agricultural sector moved forward appreciably with its publication. Most of the data have stood the test of time with the unfortunate exception of maize yield and production estimates. For reasons now believed to be the weighing of wet, unhusked maize, these figures are inexplicably high and totally inconsistent with other early figures. This fact, plus methodological criticisms advanced by Morojele (1963, Part 4, pp. 55-57) have cast doubt on the utility of these first figures as part of a long-term consistent time series. For these reasons, plus the methodological changes instituted by Morojele in 1960, Douglas and Tennant's work is better left out of trend analyses (Eckert, 1980a).

Both methodological quality and comprehensiveness increased markedly under the direction of C. M. H. Morojele in 1960. In addition to directing the 1960 effort, Dr. Morojele served as technical advisor for the 1970 and 1980 censuses. Methodologically, then, these three efforts are fully comparable and constitute three cornerstones in the

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[1]All agricultural censuses in Lesotho are "sample censuses" in that they rest on carefully designed nationwide samples rather than complete enumeration.

foundations of Lesotho's agricultural data.[1] The 1960 Census of Agriculture (Morojele, 1962, 1963) is further distinguished by its extensive interpretive text. The census report for 1970 contains a more complete collection of data but almost no text (BOS, 1972).

Analysts interested in computing rates of change between censuses should be aware of the intervals involved. Although popularly called the 1950, 1960, 1970, and 1980 censuses, the crop years of enumeration were in fact 1949/50, 1960/61, 1969/70 and 1979/80. Intervals, therefore, are 11, 9, and 10 years respectively.

Annual Production Surveys: Douglas and Tennant made a strong case in their report for continuing an agricultural survey on an annual basis. Morojele repeated this plea with emphasis noting that lack of financial resources had prevented annual samples during the intervening decade. The same conclusion was again reached in 1970 after a second decade had passed without annual data collection.

Beginning with the 1973/74 crop year, following the establishment of the Bureau of Statistics as a separate unit with financial assistance by UNDP, an Annual Agricultural Production Survey was conducted. Methodologies used were essentially those of the 1960 and 1970 censuses although sample size was somewhat smaller (BOS, 1975). The resulting data can be considered a consistent extension of a series that began with the 1960 census.

Several methodological changes were instituted in 1976 at the same time that significant transitions were underway in the farm sector. Several critics have asserted that the post-1976 yield estimates, which differ strikingly from earlier data, are affected by the methodological revisions of 1976. After considerable research it has been shown that this assertion is not true and the net effect of the changes was to increase precision and not to affect accuracy. In other words, there was a lower chance for statistical error after 1976 but figures before and after 1976 reflect yield levels occurring in the countryside without bias (Stefinovic, 1980; Eckert, 1980a).

Estimates Without Field Measurements: Cropping statistics are confused in Lesotho by the presence of several other reports purporting to contain crop acreage, yield or production data. The reports referenced below provide data for years other than those discussed above.

In each case, however, no field sampling was involved, nor was a statistical basis established for the inductive expansion used to derive national level figures. This is unfortunate because these reports are widely available in Maseru. The numbers contained cannot be combined with the more systematic data based on crop cutting within a formal sampling procedure. The reports involved include Tadic, 1972; BOS, 1973; Giri, 1976.

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[1]Note that the 1980 Census of Agriculture is not yet released from the printer as of this writing.

The Basic Data Set: The above discussion suggests that only those estimates drawn from crop cutting measurements as part of surveys conducted with consistent methodologies can be useful to the analysis of Lesotho's agriculture. By this criterion only the agricultural censuses of 1960 and 1970 plus data from annual production surveys can be combined. The first five years of the latter are assembled usefully in BOS, 1979 and BOS, 1980. The 1980 census should provide the ninth year in the series, the seventh successive year. Because the series has now reached this length, a wide range of analyses are becoming possible that could not be accomplished earlier. Much of this analysis provides the core of subsequent sections in this chapter.

One word of caution is in order for the prospective analyst. It has been strongly suggested that the data in this limited series accurately reflect events in the cropping sector (Eckert, 1980a; Stefinovic, 1980). However, the incentive situation facing farmers in crop years 1974/75 and 1975/76 was quite atypical. In those two years, the rural economy, households and farm managers were caught up in the process of rapidly adjusting to dramatic increases in mine wages and remittances then underway. There is considerable quantitative evidence to suggest that while household incomes doubled and tripled and crops income sank relatively to only six percent of total, crop agriculture languished through a period of short-term neglect (Eckert and Wykstra, 1980). As a result, acreages planted, fallow, yield and production levels reflect this situation. In addition, 1975/76 was affected by excessive rainfall which further reduced farmers' cropping results through a variety of agronomic causitive factors. In analyzing the dynamics of Lesotho's agriculture, it is often best to ignore these two years, not because the data are questionable but because the events depicted by the data are atypical and do not represent normal situations.

Cropping Trends

The dominant single factor influencing cropping during the last decade has been, without doubt, the mine wage increase in South Africa. This factor directly influenced crop area in terms of a marked decline in planted area. In the case of yields, the influence was indirect but significant nonetheless, operating through a rapid change in relative factor proportions. Each is discussed in turn below.

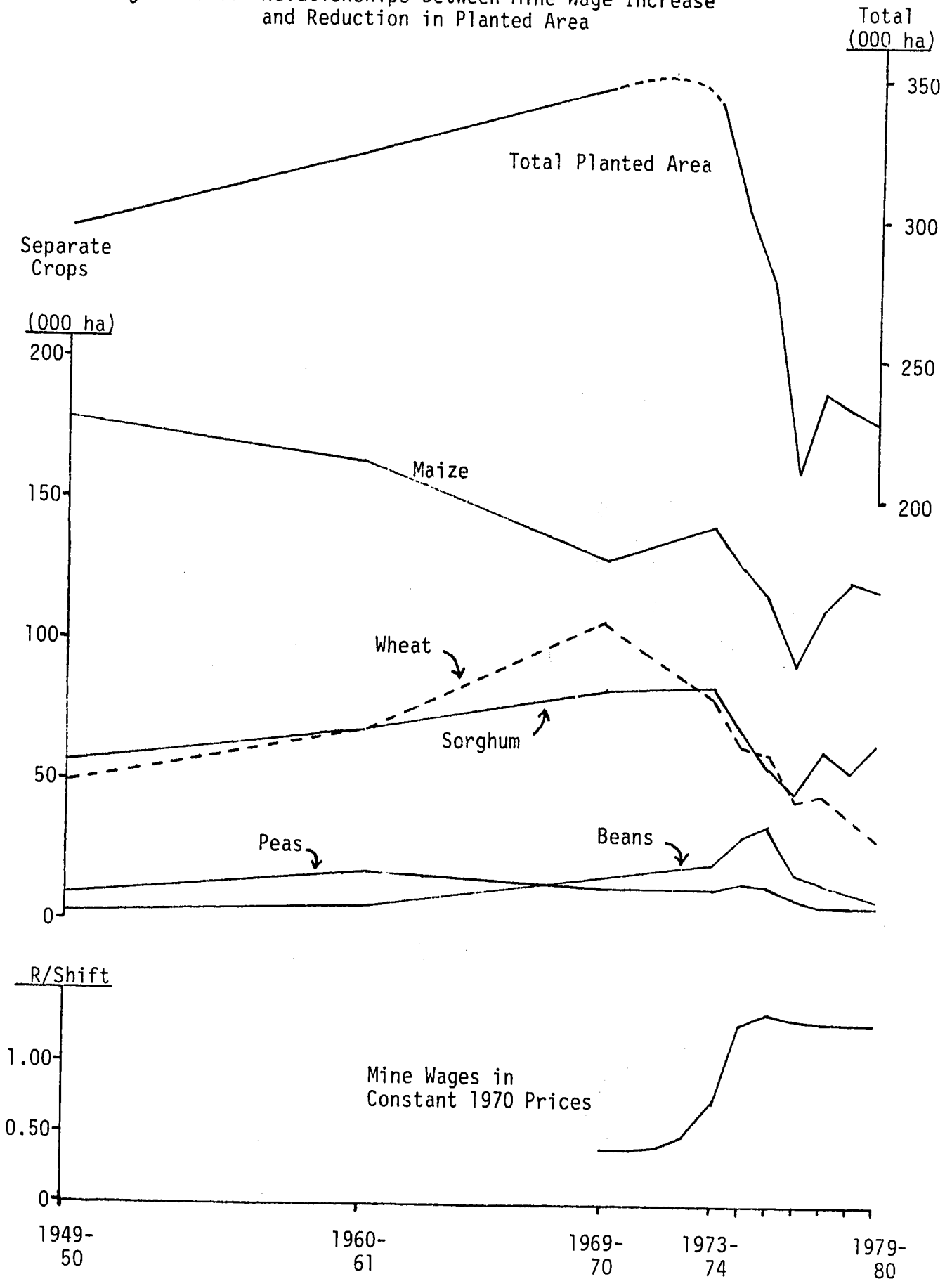
Changes in Area: Table IV-1 draws together available national area estimates for Lesotho's five major crops. Several observations are possible. Most significant of these is the abrupt change in planted hectarage occuring in the mid-1970's. Area cultivated increased during the first two intercensal periods by the constant rate of 0.8 percent annually. This trend is consistent with expectations in a nation with a growing population of rural residents who depend to a

Table IV-1. Area Planted to Field Crops in Lesotho (All data from field surveys, in 000 ha)

Crops	1949/50	1960/61	1969/70	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80
Maize	179.4	163.4	129.3	140.9	126.4	115.5	92.6	111.5	122.3	118.5
Sorghum	56.2	68.4	82.6	84.8	68.4	55.4	46.8	62.0	54.1	64.5
Wheat	49.2	67.7	106.4	82.1	63.4	59.7	43.9	45.6	38.0	30.6
Peas	8.5	17.6	12.2	11.8	14.4	13.1	9.7	5.7	6.6	6.6
Beans	2.5	5.6	16.4	21.3	30.7	35.1	17.3	14.3	11.9	8.2
Area Planted	295.8	322.7	346.9	340.9	303.3	278.8	210.3	239.1	232.9	228.4
Area Harvested	NA	309.8	296.5	319.5	255.8	224.7	186.2	219.0	214.7	213.4
Area "Failed"	NA	12.9	50.4	21.4	47.5	54.1	24.1	20.1	18.2	15.0

Sources: 1949/50 - Douglas and Tennant, 1952;
1960/61 - C.M.H. Morojele, 1963, Vol. 4;
1969/70 - Bureau of Statisitics, 1972;
1973/74 to 1979/80 Annual Statistical Bulletins of the Bureau of Statistics.

Figure IV-1. Relationships Between Mine Wage Increase and Reduction in Planted Area



large extent on home produced food. That growth in area planted did not match growth in population could reflect the scarcity of virgin arable land, gradual increases in migration and total remittances, an increase in crop yields or some combination of the three. It is shown below that yield increases were probably not a significant factor although the 1.2 percent annual growth in yields needed to raise production to match population growth would have been difficult to measure in a crop environment of considerable annual variability.

A reduction of planted hectarage began between 1969/70 and 1973/74. Data through 1976/77 show an abrupt decline of 40 percent from peak levels.[1] Planted area increased slightly thereafter and has apparently stabilized at a lower level. This pattern affected all crops and indicates a generalized de-emphasis of cropping activities. The timing and nature of these shifts strongly suggest the main causitive factor to be the dramatic increase in mine wages that occurred from 1972 to 1976. Figure IV-1 shows acreage trends for all five crops plus the pattern that occurred in migrant remittances. A mirror-image, inverse relationship between planted area and remittances, indicates a direct substitution between remittance income and crop husbandry as the source of household food supplies.

During the 1973 to 1976 period migrant remittances per household rose from R152 to R554 and real household income nearly doubled in current value. Growth in income from remittances during these three years (R400) exceeded total income at the start of the period (ca. R360). The purchasing power of one underground shift in the mines rose from 10 kg. of maize in 1970 to over 43 kg. in 1976. Since the average Mosotho is employed at 1.25 times the entry shift rate, he could, in 1976, earn enough to purchase the annual cereals needs of one dependent family member with 4.8 shifts of mine employment.[2] In 1970, the equivalent figure had been 20.1 shifts.

For comparison, to achieve the same objective through home production would require an input of 14.2 mandays in cropping activities.[3] Furthermore, the home production alternative entails the substantial added risk of crop failure or yield reduction due to Lesotho's uncertain climate and other factors.

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[1]The 1976/77 level would constitute a 40 percent reduction from 350,500 hectares, a realistic peak figure if one assumes that planted area was increasing slowly in 1969/70 and declining in 1973/74.

[2]Assumes weighted average of prices for maize, sorghum and wheat.

[3]Table II-2 indicates that 210 kg. of grain consumed in the household requires production of 365.8 kg. At weighted average current yields, this would require .29 ha. Traditional cultivation practices requires 48.9 mandays per hectare (Wykstra, 1978).

The affects on incentives for household resource management should be clear from these comparisons. Farmers apparently acted rationally by de-emphasizing crop production and substituting greater reliance on migrant remittances for household food supplies.

Figure IV-2 relates migrant remittances as a percent of household income to planted area. The data suggest that a permanent change in this relationship occurred in 1977 and that rural residents have made a shift to lower reliance on domestic production (whether for cash or home consumption) which may be long lasting. Even as remittances decline as a percent of total incomes it is questionable whether area planted will expand to previous levels. An apparently permanent reduction of plantings by 60,000 ha occurred in 1976/77.

Figure IV-2. Relationships Between Planted Area and Migrant Remittances

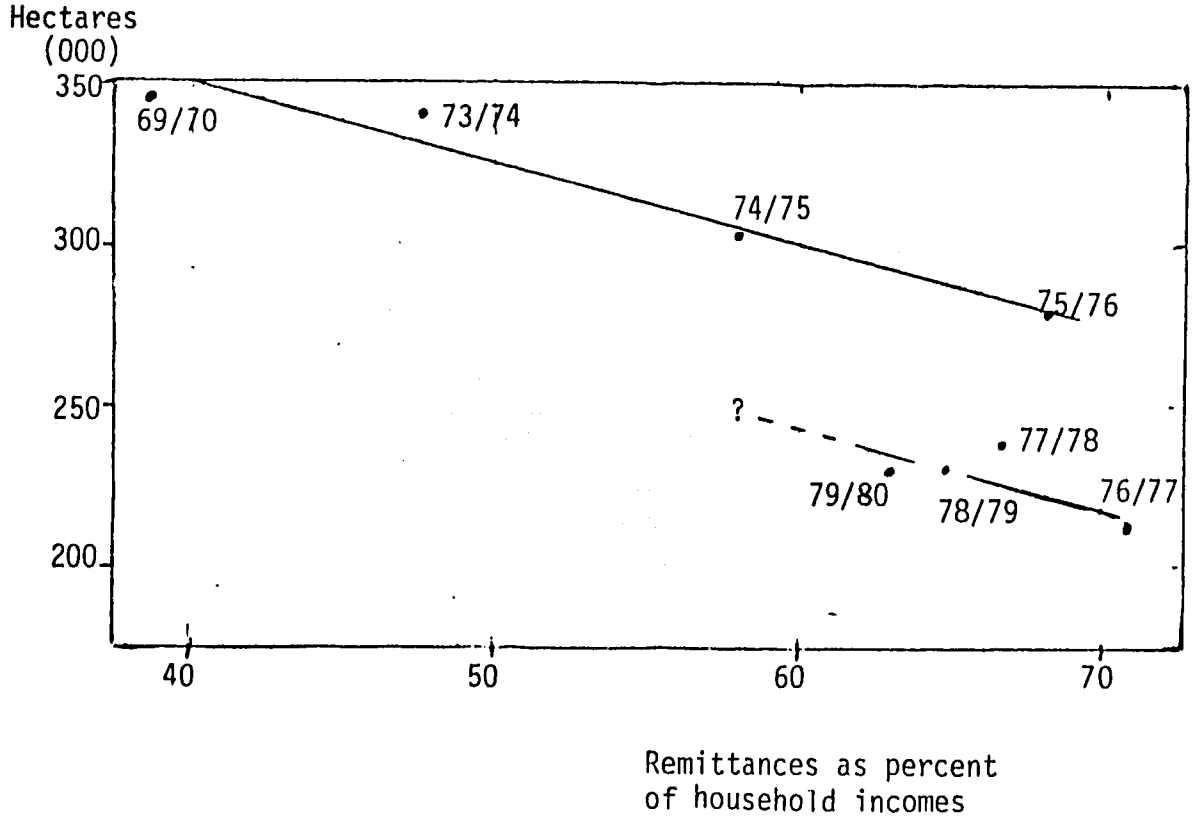

Table IV-1 suggests a different pattern and consequently different motives for the cash crops, peas and beans. Neither crop experienced a decline in planted area until 1976/77, the last year of rapid change in remittances. Bean hectarage, in particular, had continued its historic expansion and was emerging as the nation's most significant

cash crop. The sharp drop evident in the last three years reflects a collapse in effective marketing options as much as it does the relative incentive situation affecting cereals production. It is known that expected international marketing arrangements for the 1975/76 crop fell through resulting in a glutted domestic market and a seriously depressed price. While the Produce Marketing Corporation has tried since to correct this situation, their price setting attempts and procurement practices have been occasionally overturned by unavoidable factors with the result being unnecessary variability in the bean market.

It would thus appear that cash cropping is not so directly affected by trends in alternative income sources as it is by uncertainities in the market. This conclusion would strengthen recommendations for an expansion of cash crop agriculture. Despite off-farm opportunities, the serious farmer will apparently pursue cash cropping if his income potential is not eroded by market or climatic induced uncertainty. Phororo's analysis of farmer responsiveness to attractive prices for pulses would tend to confirm this finding (Phororo, 1979, p. 14).

Changes in Yields: Table IV-2 presents the complete series of usable national data on crop yields to date. Considerable annual variation is evident as is an apparent jump in yield levels in 1976/77 and afterwards. Until recently these factors were unexplained and raised considerable doubt as to the reliability of the estimates. As mentioned above, however, recent research has confirmed the data's probable accuracy by identifying causes underlying their variation. Most of the annual variation can be explained by environmental factors, of which rainfall is the most important, as one would expect in a rainfed agriculture. A detailed analysis of these relationships is presented in Section II of this chapter.

The yield increases of 1976/77 require explanation in order to clarify trends apparent in the 1970's. Undoubtedly, the underlying cause was, again, the abrupt mine wage and remittance increase. In the case of yields, however, the affects occurred indirectly, operating through the acreage reduction. A situation in which new incentives de-emphasize cropping and cause a reduction of planted area by 40 percent should operate in the following manner in Lesotho. First, less productive fields will be left uncultivated where farmers have a choice between good and poor soils. Second, poorer farmers who receive lower yields, normally will cease cultivation sooner than their more successful neighbors, assuming that migrant remittances are available to both. Third, those fields that are more difficult to manage such as fields distant from the household will be fallowed before those which are more conveniently situated. For the same reason (their inconvenience) these same distant fields are probably less well tended when cropped and thus lower yielding.

Table IV-2. Crop Yields Recorded by Uniform Crop Cutting Field Surveys in Lesotho. (yields in kg/ha)

Crop Year	Maize	Sorghum	Wheat	Peas	Beans	Comments	
						Rain	Evaluation
1960/61	687	783	850	683	243	+15%	Normal-good
1969/70	514	688	544	365	224	-30%	Severe drought
1973/74	945	1,008	745	706	381	+ 3%	Normal
1974/75	652	684	823	580	477	+10%	Normal-good
1975/76	579	555	799	569	292	+39%	Too much rain
1976/77	1,568	1,467	1,373	991	143	+15%	Normal-good
1977/78	1,408	1,447	1,359	1,018	974	+14%	Normal-good
1978/79	1,058	1,345	952	1,204	822	-16%	Oct-Nov very dry
1979/80	957	981	974	775	520	-19%	Dec-Jan very dry

Sources: Same as Table IV-1.

These three reasons would result in the lower yielding fields being left idle while higher yielding fields remained in cultivation. It is not necessary to base this case on the assumption that poorer soils were abandoned although this is one of three possibilities. Fallow land is scattered more uniformly throughout Lesotho than are poor soils. But by including other reasons for the presence of low yields, it becomes realistic to assert that one important cause of higher yields was the abandonment of the below average fields. Averages calculated from fields remaining in use would naturally be higher.

Even more significant is the affect of declining acreage on relative factor proportions in crop production. While planted hectares declined steeply there was both an increase in domestic labor force and, since 1977, a decline in migrants. Table IV-3 shows the affects of these trends on the supply of labor per planted hectare. By this measure, male labor supply since the 1976/77 harvest has averaged 82 percent higher than during the first five years of the decade and female labor has averaged 70 percent higher.

Most analysts concur that the absence of males has been a serious constraint to farm productivity (Phororo, 1979, p. 22; Wykstra, 1978, p. 39; World Bank, 1975, 1980). Their absence affects decision making, labor inputs and the timeliness of field operations. Scarcity of female workers affects several field operations but most importantly weeding and harvest. Table IV-3 makes a strong case that there has been a significant relaxation of this constraint in recent years. Certainly not all of the available labor is applied to agriculture;

however, if the proportion devoted to farming remained constant, then the percentage increases noted above would have applied to farming as well as to the total. Should there be any doubt that labor inputs to agriculture increased, one need only consider that for labor inputs to have remained constant, some 35-40,000 males and 95,000 females would have had to leave the agricultural sector. These numbers equal twice the number of males and ten times the number of females in domestic wage employment in 1976. Had such an exodus from rural employment occurred it would have been a major national phenomenon, noticeable to all.

Finally, the two changes, acted together with a much higher labor supply being applied to the more productive fields that remained in cultivation. Yields would be expected to rise to reflect the multiplicative nature of these two factors.

Table IV-3. Estimated Recent Changes in Approximate Labor Supply per Planted Hectare (data in thousands)

Year	Male Labor Force	Migrant Workers	Domestic Male Labor Supply	Rural Female Labor Force	Hectares	Person-Years Per Hectare	
						Male	Female
1970	245	134	111	199	346.9	.32	.57
1971	251	129	122	203	345.4[b]	.35	.59
1972	257	147	110	208	343.9[b]	.32	.60
1973	263	155	108	212	342.4[b]	.32	.62
1974	269	142	127	216	340.9	.37	.63
1975	275	154	121	220	303.3	.40	.73
1976	281	160	121	224	278.8	.43	.80
1977	287	160	127	228	210.3	.60	1.09
1978	294	155	129	232	239.1	.58	.97
1979	301[a]	150[a]	151	236	232.9	.65	1.01

[a]Provisional.

[b]Approximated by linear trend from 1970 to 1974.

Sources: Data on males from Eckert and Wykstra, 1980. Data on females from LASA, 1978 assuming a 1.75 percent annual rate of change from a 1975 estimate.

Thus there are three coincident factors which taken together offer more than enough justification for a sudden 50 percent rise in yields. In summary, they are:

a. An arithmetic increase derived from averaging yields only on the more productive fields.

b. An increase of 82 percent in the availability of male labor and 70 percent in female labor per planted hectare.

c. Higher average production per labor unit as mandays are concentrated on the more productive fields.

This analysis would confirm that the absence of males as workers and farm managers, plus the scarcity of females relative to planted area has been a definite constraint to agricultural progress. When labor force and migration trends foreseen in Chapter I occur, the additional farm labor force should permit further progress in yields per hectare over time. It is this possibility which raises the hope that Lesotho's crop subsector may at last begin to modernize and to increase its contribution to food supplies and national incomes. Simultaneously, identifying the importance of the male work force also highlights the constraints faced by households without a resident adult male. It is suggested that households with farm assets but without an adult male may constitute a particular target group in the rural population, one requiring special attention within the development effort.

Crop Production: Total quantities produced are determined by the interaction of factors affecting acreage and yield. During the 1970s the principal determinants were the decline in planted area and the resulting increase in yield per land unit. Table IV-4 shows the overall results. The precipitous drop in cereals production in 1974/75 and again in 1975/76 is the result of the fact that during those two years of rapid change both area and yields declined together as agriculture was de-emphasized. In 1975/76, as already noted, yields were further depressed by excessive rainfall.

It is apparent that per capita production, as measured standing in the field, usually exceeds consumption requirements derived in Chapter II. Table II-2 showed that various sources of loss plus alternative uses reduce standing crop volumes by just over 40 percent before final consumption. One of the higher priority strategies toward food self-sufficiency must be reducing losses in harvesting and processing systems. Complete elimination of these losses is impossible. However, import requirements will change in response to improvements in the loss picture with an elasticity of 0.45. That is, every 10 percent reduction in losses within the domestic economy will reduce import requirements by 4.5 percent, assuming substitutability among cereals.[1] First priority in a program of loss reduction must be efforts to control harvest, storage and transportation losses from domestic production.

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[1]Total losses in the system equal 101,340 MT (from Table I-2) which is 81.3 percent of total imports expressed as grain equivalent (124,656 MT).

Table IV-4. Production of Field Crops in Lesotho.[a] (000 MT)

Crop	1960/61	1969/70	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	1979/80
Maize	120.6	66.5	122.5	70.3	49.1	125.9	143.2	124.9	105.6
Sorghum	53.6	56.9	84.0	37.4	24.5	62.3	85.8	69.0	59.3
Wheat	57.5	57.9	57.0	45.3	44.6	61.4	57.9	33.6	28.2
(Sub-Total, Cereals)	231.7	181.3	263.5	153.0	118.2	249.6	286.9	227.5	193.1
Beans	1.4	3.7	7.5	13.4	8.7	20.9	10.8	8.4	3.6
Peas	12.0	4.5	7.2	5.8	5.8	7.0	4.4	3.5	4.6
Resident Population (000)	760	886	980	995	1017	1049	1081	1114	1141
Cereals Production per capita.[a]	305	205	269	154	116	238	265	204	169

[a]These figures represent the weight of grain standing in the field and do not account for harvest loss, post-harvest losses in storage or transport, milling percentages, cooking losses or use for feed and seed. An adjustment methodology is presented in Chapter II.

Section 2

Detailed Analyses of the Cropping Subsector

A Critical Analysis of Dryland Crop Husbandry

The Production Environment

Before proceeding to a descriptive analysis of farming practices it is important to review the environment within which farming takes place.

Resource Scarcities: Farming in Lesotho is characterized by scarcity. Many of the problems developed below can be traced to the scarcity or complete absence of one or another factor of production. Tillage power is one of the most critically scarce factors. Only 28 percent of farm households have a pair of draft oxen (Guma, 1978). Others must use cattle of all descriptions, including young and old, male and female. Due to the animals' small size and generally weakened condition in the spring, it is commonly necessary to yoke together two or more pairs of animals especially for initial ground breaking. Approximately half of the rural households do not have livestock. In 1980, 87,000 households held land but had no livestock. As a minimum this large group must obtain plowing services from others, through sharecropping or hiring of oxen or tractor services.

In 1980 the number of "privately" registered agricultural type tractors was 1,422 based on a tabulation of district registers. Many were used for non-agricultural purposes or out of commission. There were perhaps an additional 10 percent which were not registered but the analyst states that these were probably more than offset by tractors out of commission (Minto, 1980). Government maintains a fleet of more than 160 with approximately 130 in working order (Phakoana, 1980). Thus the total tractor numbers in Lesotho in 1980 appear to be approximately 1,725 units. Phakoana shows about 20 percent of government tractors to be out of service at any one time and Minto postulates 15 percent for the private sector which is probably low. Deleting an additional 10 percent for non-agricultural private tractor use, the total number of tractors available for farming approximates 1,200 in 1980. Given a fleet of this size, it is possible that some 40 percent of the area planted each year could receive one tractor plowing. However, 30 percent is probably a more realistic current assumption.[1]

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[1] To achieve the 40 percent figure requires every operating tractor to plow 80 separate hectares (200 acres) during the plowing season. If each tractor plowed 62.5 ha (150 acres) 30 percent of total planted area would be covered.

There is a documented scarcity of tractor services relative to demand. BASP shows that tractor plowing is concentrated in the lowlands and especially in the northern districts and that the foothills, mountains, and southern lowlands receive considerably fewer such services (Steele and Winch, 1981).

A second critical scarcity is that of males in the household. The extent of migration to South Africa for employment was described in Chapter I. That their absence has constrained crop yields was clearly shown in the section on yield trends above. Phororo (1979) characterizes the results as a vicious circle, with males being forced to migrate due to inadequacy of domestic income opportunities, agricultural yields being depressed by their absence thereby reinforcing the incentive to migrate. It should be noted that the next 10 years should eliminate this constraint fairly completely as labor force grows and migration opportunities hold constant or, more probably, decline.

Equipment, tools and machinery are relatively absent in Lesotho. Analysis of household asset positions developed in Chapter III shows that while only half of the rural households own cattle, a small fraction of these own a yoke and plow as well and only 13 percent had ancillary equipment such as harrows or planters.

Finally land must be considered a scarce farm resource. The average holding in 1980 should measure 1.8 hectares when the agricultural census becomes available. There is an appreciable distribution around this mean with large numbers of holdings below the mean. An equally serious picture develops when farm size is examined on a per capita basis. One must conclude that, as presently distributed, land is sufficiently limited in most holdings to make farming only a supplementary source of food or income.

Farmer Incentives: Where farming is only supplementary and households rely predominantly on other sources for survival, the incentives for aggressive, serious farming are reduced. The situation is complicated in Lesotho where land has been allocated rather than purchased or leased and there are no sunk costs to recover. During the mid-1970's as mine wages rose, farm incomes declined significantly as a percent of household totals. Crop incomes fell especially sharply due to several factors including unfavorable rainfall, reduction in acreage and other production disincentives. In 1976 crop incomes had fallen to only six percent of household income and combined agricultural incomes (including livestock sources) stood at only 17.5 percent. This situation has improved slightly since with crops now providing 12 percent and livestock an additional 13 percent (van der Wiel, 1977; Eckert and Wykstra, 1980). Nevertheless, the incentive structure is obvious. It is difficult to justify allocating much time or money to

an activity (cropping) that provides only very small contributions to the household. In addition, cropping in Lesotho faces considerable uncertainty which further depresses incentives for producing a marketable surplus, for adopting new technology, for investment in improvements and the other characteristics of modern farming.

Climate: Lesotho's climate has been characterized as hazardous, variable and marginal for cropping (World Bank 1980, Vol. 1, p. 7). Both variability and marginality are asserted to reduce incentives for modern farming. Early studies recorded the farmer perception that out of every five years, one would be a good year, two would be average and two would be poor (Sheddick, 1954). Recent research has developed much more precisely the farmers' perception of climatic risks (Wilken, 1980; Guma and Gay, 1978).

Climatic hazards may be anticipated from precipitation events, hail, temperature, and wind and climate-related events such as erosion and pest outbreaks. Farmers rate drought as the worst such hazard in Lesotho followed closely by worms which in their perceptions are associated with drought. Too much rain, hail and frost, in that order, complete the list of major hazards. Wind is not considered a major threat. Basotho farmers view erosion as a hazard; however, they do not give it the high priority assigned by government. Wind is apparently recognized as a hazard to crops only in isolated areas, and then only by a few people.

Our analysis shows that the climate itself, while variable, does not create serious impediments to cropping potential, except perhaps in the farmers' view. We suggest, instead, that many of the problems encountered by agriculturalists are caused by low levels of management which leave the farmer unnecessarily vulnerable. For instance, rainfall totals during the growing season are generally adequate for cropping. They exceed rainfall figures for the Orange Free State to the west where modern cropping practices are followed and high yields obtained. Dry seasons and dry spells within seasons are no more severe in Lesotho than they are elsewhere. It is suggested that dry periods may affect cropping in Lesotho more severely because of excessive competition for moisture from weeds, lack of attention to plant population, and planting and spacing techniques designed to withstand moisture shortfalls and other managerial factors.

Similarly rainfall intensities are no more severe than occur in the American mid-West, an area of intense crop production. The effect on erosion, however, is severe due to overgrazing and the absence of conservation cropping practices; both factors are human induced. Climate related pest and disease outbreaks affect cropping but their severity could be reduced by plant protection measures, use of resistant varieties and other management improvements.

In short, climate and climate related factors are recognized as hazards to cropping by farmers. However, the management practices that would reduce the impact of this uncertainty are not in wide use. Risk avoidance strategies are now accepted as an objective of the Research Division. There have been many field trials in the past of drought resistant varieties, both at the Maseru Research Station and in the area-based projects. Yet much more work remains to be done before a comprehensive set of recommendations for minimizing the effects of natural hazards is available for extension to the farmer.

Soils: The soil resources of Lesotho have received a great deal of attention. Until recently soil evaluations in Lesotho were mostly subjective-descriptive, of limited use for land use planning. The excellent reconnaissance surveys and maps of Carroll and Bascomb (1967) provided the first nationwide overview. Although certain emphases and terminologies have since been questioned (Binnie and Partners, 1972, Vol. 3, pp. 19-20), these surveys remain useful for general patterns of soil types. More recently, the Conservation Division has completed a major work providing a soils classification system for interpreting soil surveys in Lesotho (MOA, 1979).

The soils of Lesotho are generally characterized by their variability. This variability occurs in parent material (sandstone or basalt), texture, organic matter content, moisture holding capacity, root zone depth, erodibility, slope and several other characteristics affecting plant growth. The range in overall productivity is extreme, varying from excellent to very poor. Attention correctly focuses on the shallowness of many of the soil series, their erodibility and their low fertility.

Several management problems can be isolated. Erodibility coupled with overgrazing and stubble removal accentuates the problem of shallow soils. While gullies (dongas) are the most evident form of erosion, sheet and rill erosion are the most serious threats to existing farm land. Erodibility of certain soils presents an additional problem in that they are completely unsuitable for conducting irrigation water in surface ditches. Shallow soils result in shallow root zones, limits to the water that can be effectively stored and a consequent vulnerability to extended periods without rainfall.

Many of Lesotho's soils combine three characteristics; moderate slopes, low organic matter content and a relatively impermeable B-horizon. The result is considerable lateral movement of soil water with a consequent displacement of soluble nutrients. Much of the nitrate nitrogen applied at planting has been leached laterally by the time the crop begins to flower and set grain.

One of the most discussed soils problems in Lesotho is that of "duplex soils." There has been some controversy regarding the extent of their presence, but the Conservation Division feels they are "the most extensive soils in the Western Lowlands and present the most perplexing problems in cropping management and erosion control" (MOA, 1979, p. 20).

The term "duplex" refers to claypan soils consisting of a light colored surface layer underlain by strongly contrasting and usually darker and strongly-structured lower layers. The distinct discontinuity between upper and lower layers limits root and moisture penetration and facilitates lateral leaching under sloping conditions. The upper layer is usually largely depleted of clay, organic matter, bases and available plant nutrients. The absence of vertical drainage leaves these soils characteristically wet during the rainy season creating an unfavorable environment for microbiological activity. In the wet or waterlogged condition surface intake of water can be slowed to nearly zero, thus increasing runoff.

Duplex soils are generally less than favorable for crop growth. Tilth is generally poor in that they are structureless, highly compact, with low porosity, organic matter and nutrient content. They are very hard to plow when dry. A-horizons are generally shallow (< 100 cm.) and roots largely confined to this level. All duplex soils are highly erosive with B-horizons being more so than A-horizons. Once the surface layers are cut through, undercutting in the B-horizon creates gullies rapidly. While "they are not among the more fertile soils nor the ones best adapted for agricultural development, their extensive nature makes them among the most important for cropping" (MOA, 1979, p. 20).

The Input Market: One final attribute of the production environment for cropping is a factor usually overlooked. Lesotho is the only developing country in the world completely surrounded by a fully developed supply system for modern farm inputs. While the difficulties of dealing with South African suppliers are recognized, it is suggested that this situation can offer partial relief for some of the most pressing constraints facing Lesotho's agriculture. One of the more significant opportunities lies in the use of agricultural chemicals. Herbicides are a direct substitute for weeding labor where the latter is scarce. Insecticides can reduce some of the variability associated with climate, as in the case of cutworms.

One word of caution is needed. It would be easy to rely on the South African market for too much, thus increasing dependency. Selective use of the South African market with the intent to relieve critical constraints, can contribute in major ways to Lesotho's self-reliance for both food and employment.

Crop Husbandry Practices

Much of the available literature on cropping practices deals with the experience of modern technology trials. This is particularly true of those references containing data that could be used for analysis. The Research Division has recently begun to identify farmers' problems by surveying production agronomy as it is achieved in the field by average farmers. This is important because it is at this level that programs to raise output must be defined. One of the chief reasons for the lack of effective programs for technological change in agriculture has been the relative absence of this type of information. The analysis presented below is limited for the same reason.

We focus, in what follows, on perceived cropping practices in use by average, rather than better, farmers, in the belief that programs of change must be designed for broad participation. One of the distortions in development projects has been their focus on advanced rather than intermediate technology. This concentration in Lesotho has acted to negate any possibility of widespread adoption, and therefore has concentrated much of what little progress has been made in the hands of a few participants. We attempt below to show that improved cropping practices are available for all, including the resource-poor small farmer.

Seedbed Preparation: A number of the soils series in Lesotho are difficult to plow unless rains have moistened the soil. Plowing before the rains is energy consuming even though doing so can increase the soil's capacity to capture early spring precipitation. This operation is a logical point for tractor hire services. As pointed out above there are not enough tractors to plow more than about 30 percent of the planted area each spring. Farmers do try to obtain tractor services for the first and most difficult plowing each year. However, due to the scarcity of the tillage power of all types, much of the early preplant plowing is foregone or improperly done. This, then, becomes the first in a sequence of events in which resource constraints impede crop productivity; in this case through reduced soil moisture supplies and a missed chance to reduce weed populations.

Whether or not fields are plowed early they must be replowed immediately prior to planting. First, the date at which sufficient soil moisture has been stored to permit plowing and planting is often quite variable. This variability limits the farmer's ability to contract for plowing services in advance. Second, a great many households cannot organize the plow, oxen and labor needed from their own resources. They are thus forced to arrange these services through

cash hire or some form of sharecropping. Sharecropping arrangements vary widely in form and relationship between participants. Almost all are negotiated arrangements arrived at by social transactions rather than more formal contracts.[1] Sharecropping permits cultivation by land holders who could not otherwise farm their land. The cost to the individual is that a portion of the crop or the land base is given up. Those who must sharecrop to farm receive only a fraction of the normal output expected from land resources. In addition, their cropping activities must be scheduled at the convenience of the person providing services, often after his own fields are taken care of. The result is a partial loss of control over the timing of operations. Costs to the nation include a greater concentration of land use and incomes than suggested by the skewed distribution of land allocations itself, and possibly lower yields on sharecropped fields.

One of the serious consequences of loss of control over timing of field operations is the possibility of summer plantings being delayed until December. When this happens too much of the plant's life is shifted into the period of decreasing solar radiation. Maize will react to shortening day lengths by entering its reproductive phase prematurely. Without full development of roots and canopy, lower yields will result. Maize yields in Lesotho have been shown experimentally to decline significantly the longer planting is delayed after December 1 (Powell, et al, 1979).

Stand Establishment: Controlling plant populations and establishing a uniform stand are top priority problems in Lesotho. Even casual observation will show that plant populations vary widely and in general are much too low.

Several causes may be cited. Farmers without access to planters cannot control seed rate or depth of placement. Depth of seed placement in relationship to soil moisture is a critical determinant of germination and emergence (Eckert, 1977). Given the scarcity of tillage power, seedbed preparation is often poor, leaving soil conditions that hinder uniform germination. Sharecroppers who must depend on others for planting face difficulties in timing their planting dates to coincide with optimum soil moisture. Again germination is affected.

This situation generates several negative consequences. In many fields plant populations are well below optimum. In these fields weed populations flourish for lack of effective competition.

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[1] For a detailed and authoritative discussion of sharecropping see Judy Gay, 1980, pp. 192-197.

This problem is particularly acute in Lesotho where scattered fields are often surrounded by grassland which provides grass and weed seed in abundance. It is not unusual to see fields in which approximately half of the plant material is composed of weeds. Under these circumstances poor stand establishment may increase the severity of the weed problem to the point where available labor cannot meet the need.[1]

Poor stand establishment lowers yields in several ways. Sparse stands can affect pollination in cross-pollinated crops such as maize. While other factors (rain, temperature) may be involved as well, it must be admitted that incompletely filled maize ears are a common occurence. Variable seed placement can cause germination to occur at different times. In the case of tillering plants (wheat) variable seed density can result in spots of moisture stress within a field which hinder tillering. Both factors can operate to give a crop that ripens at different times within the same field. Shattering losses are then experienced on those plants maturing early while harvesting is delayed until the whole field is ready.

Subnormal stands create other disincentives. Fertilization, for example, cannot return maximum profits if the crop for which it was intended is sparse and much of the nutrients applied are utilized by noneconomic plant growth. Low plant populations are believed to be a significant cause of the farmer's inability to perceive benefits to fertilization, even after one or two trial applications.

Weed proliferation also creates competition for soil moisture which can develop quickly in Lesotho's shallow soils. Scott (1973) suggests that on duplex soils maize can suffer moisture stress in as little as five days following a soaking rain.

On the other side of the coin, many fields are planted too densely, thus creating their own excessive moisture demands and lowering yields. Modern farming requires very carefully adjusted plant populations, and plant and row spacings to match expected precipitation. By so doing, farmers can achieve relatively high yields while reducing the risk of complete disaster in the case of prolonged dry spells. There are two elements of farm management control that are achieved when establishing a crop stand. These are control over the complex of plant-soil-water relationships that occur within the root zone and control over space and shading above ground. The absence of control over these two dimensions, caused by difficulties in achieving controlled crop stands, is one of the most serious impediments to future

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[1] See Wykstra, 1978 for estimates of the inadequacy of labor supply during peak weeding requirements.

progress in crop agriculture. If control of planting, germination and emergence were obtained, the farmer could then manage according to whatever objective he wished; e.g., high yields, risk minimization, etc. Control does not require heavy capital investment. The missing element would seem to be information on appropriate management techniques, developed to fit Lesotho's conditions, and extended widely to farmers. The only collateral requirement is a bit of appropriate technology--improved planters suitable for oxen and, where needed, for tractors.

Weed Control: Weed control is often inadequate in Lesotho. Several contributing factors are mentioned above. One should expect weed control to be a serious problem where cropping occurs in the middle of the Highveld, one of the world's most prolific grasslands. As might be expected, the principal problem is grass invasion. Broadleaf weeds are amply present as well.

Weeding is done both by hand and by mechanical cultivation. Given the restricted labor complement of the average rural household, there is not enough labor to weed all fields adequately (Wykstra, 1978). Chemical herbicides are generally not used, even though they have been tried and proved in field demonstrations at the present stage of Lesotho's development, researchers feel that there are serious problems in the use of chemical herbicides by the common small farmer. For example, the poisonous nature of herbicides and their selective nature cause complications when used by intercropping small farmers. Weed control technologies have not been actively researched at the Experiment Station but plans are underway to correct this.

Crop Rotations: Little is known by planners about crop rotations in use by Basotho farmers. Traditionally, an association between certain soils and crops suggested that rotation was not widely practiced. Each of the agricultural censuses except 1970 has provided one or two tables on crop sequencing. The most thorough analysis appears in Morojele, (1963, Part 4, pp. 43-49) and applies to the crop year 1960/61. In that year only 1.3 percent of all fields (a total of 4,674 ha.) were double cropped while 8.6 percent were not cropped at all. Of the remaining 90.1 percent, 84 percent was planted with summer crops and 6.1 percent with winter crops. Eighty percent of the double cropped land lay in the Border Lowland ecological zone. However, the presence of substantial winter cropping in all other zones except the mountains suggests that double cropping is possible elsewhere.

Cropping patterns in 1960/61 showed some association with farm size. Smaller farms (under 1.6 ha. or 4 acres) reported almost no double cropping and considerably less year-long fallow than the national average. The absence of fallow would be expected as land restricted households attempt to achieve food self-sufficiency. However, the same rationale would encourage double cropping as well. That double

cropping is concentrated in larger farms (4 hectares and larger) suggests that only these farms have a labor or asset position which makes double cropping possible. Larger farms show a higher percentage of year-long fallow as well.

In Morojele's census, 45 percent of the limited amount of double cropped area was planted to winter wheat followed by maize. An additional 36 percent was in wheat and beans. Only 2,300 hectares of double cropping sequences utilized a legume, equal to only 0.6 percent of all planted area.

One must conclude that neither legume rotation nor fallowing for one or more consecutive years are in widespread use to improve soil fertility. Morojele's data suggest that smaller farms, through their almost exclusive focus on single cropped summer cereals and their absence of fallow are depleting the soil the most severely. Intercropping is not widely practiced either. The only significant example in 1960/61 was interplanting of beans on some four percent of the nation's maize acreage. Yield estimates obtained do not suggest that maize yields were improved as a result.

During the 1970's the extent of fallow rose sharply nationwide. Much of the abandoned land returned to natural grass. It is not known with certainty whether this development occurred with some fields being dropped from cultivation semipermanently or whether all fields are being used with longer fallow periods between use. In many instances the former is apparently the case. However, where the latter practice prevails, some improvement in soil fertility can be expected. It must be noted, however, that improving fertility was <u>not</u> the motivation causing the reduction in planted area.

This analysis suggests that another opportunity for increasing incomes and crop production is being missed. Not only are crop rotations not designed to enhance soil fertility but the additional incomes of a second crop are foregone. Opportunities missed for interplanting vegetables, lentils, pulses and other legumes must also create constraints to dietary diversity.

<u>Use of Purchased Inputs</u>: Last, but still important, the use of purchased inputs is particularly low. The absence of pesticides and herbicides has already been mentioned. In the context of modern farming, fertilizer applications must be considered minimal. Expanded fertilization has the potential to spur significant growth for at least ten years, longer if more intensive cropping patterns emerge.

Several factors impede the use of fertilizers in Lesotho. Partially beyond human control is variability in the production environment, although improved crop management could reduce this influence. The severe scarcity of household fuels in Lesotho causes most dung to be gathered and applied to this purpose. Livestock husbandry by open grazing rather than confinement prevents the accumulation of manure in quantities needed for fertilization. These factors will be difficult to reverse.

Several additional factors are more amenable to program action. First, as mentioned above, sparse plant populations seriously reduce the expected increase in output from fertilization. In addition, the problem of lateral leaching in the soils and slope conditions of Lesotho creates a special fertilization issue. Nitrogen fertilizer applied at planting is generally leached out by the time maize enters its most critical growth stage, pollination. While some increase in early plant growth is probably obtained, nutrients are again scarce for the grain filling growth process. Top dressing with nitrogen is not generally practiced in Lesotho. However, given the conditions described here it is worth further attention.

A recent survey identified a great deal of confusion among farm managers concerning the use of chemical fertilizer.[1] Most respondents could not name the fertilizer they had used. Less than five percent could identify the nutrient(s) contained. The large majority had not noticed an increase in crop growth from fertilization. Others, who did, referred to a "poisoning" of the soil causing yields to decline in subsequent years unless fertilizer applications were sustained.

These farmer concerns are completely justifiable. The absence of visible crop response is explained by the factors of poorly timed application, lateral leaching and suboptimal crop stands already mentioned. An additional factor is significant. Historically, Lesotho has imported large volumes of low analysis material including quantities of fertilizers containing only phosphorus or potassium. Most soils in Lesotho are not deficient in these two nutrients at present yield levels. Even much higher yield levels are possible without potassium constraints.

Many farmers in the survey experimentally adopted this new technology. Those who applied phosphorus or potassium to low yielding fields were understandably disappointed and took a financial loss. Others who obtained nitrogenous fertilizer applied perhaps one bag per field. The standard mix only 2-3 years ago was 2-3-2(15) which contained less than 2.5 kg of nitrogen.[2] No farmer in the world would notice a crop response to nitrogen applied at this insignificant level.

The World Bank (1980) reviewed fertilizer recommendations that prevailed until 1980. They found the situation extremely confusing, with five sources issuing 14 different recommendations by nutrient content. This was observed in an environment in which Co-op Lesotho offered 17 different types of fertilizer bags.

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[1] M. Qacha, unpublished survey data from 1978, LASA Project, Maseru.

[2] 2-3-2(15) in southern African terminology indicates 15 percent active ingredients with N-P-K in the ratio of 2-3-2.

> "For the same crop and soil type there is up to a twelve fold variation in the recommended quantity of nutrients to be applied. There is also no agreement as to the ratio of nitrogen to phosphorus. Some sources give an N to P ratio of 3 to 1 for cereals whilst others urge 2-3. Given the variety of fertilizer types on sale with various combinations of nutrients, it is hardly surprising if the staff have no clear idea of what to recommend." (Annex 11, p. 10).

Lesotho's response to this observation was to standardize all recommendations on those contained in the Cropping Guidelines (MOA, 1979). The Bank questions whether these guidelines and their very high fertilizer recommendations are realistic for most Basotho farmers. However, these recommendations reflect successful experimentation by the Ratau Cropping Scheme, the Chinese Agricultural Mission and others and are periodically revised by the Crops Division as new information becomes available.

Crop Cultivars: More effective control over varietal selection, seed multiplication and distribution is an important priority. In the case of several crops, the main seed source is home produced quantities of varieties introduced years ago. These varieties are generally resistant to environmental fluctuations and at the same time not responsive to modern farming practices or inputs. Attempts to provide modern seed have not fully taken account of Lesotho's conditions. For example, hybrid maize seed from South Africa was selected at its source for a maturity of 125-150 days. Under Lesotho's somewhat cooler conditions, maturity for these same seeds can take 8-9 months, exceeding the growing season in many locations (Powell, 1979). Although Lesotho cooperates in international yield trials from CIMMYT and other sources, the seed multiplication program is not effectively getting selected seed to the farmers. Cropping systems considerations such as the characteristics of a cultivar that adapt it to multiple cropping, erosion prevention, labor and fuel shortages and other needs are not generally used as criteria in variety testing.

Conclusion: The above analysis finds that Lesotho's crop agriculture faces a very wide range of interrelated constraints. The elements of modern farming, however defined, are not in general use by Basotho farmers. In some cases the constraints are inherent in the environment. However, in most instances, the problem could be overcome through more sophisticated farm management coupled with effective government development programs. This conclusion is not new.

Many of the cropping techniques that would improve Lesotho's agriculture are known and are not very complex or capital intensive. Much is in the pipeline to the farmer; however, there is a great deal more that he could be made aware of. If a small farmer, participatory, appropriate technology approach is adopted, it would then form the

dominant priority for extension, research and other MOA agencies. If such a choice is made, questions needing urgent reassessment revolve around choice of technology. The farmer's resource position and his ability to understand, adopt and manage technological change should become the "razor's edge" against which appropriateness is defined. Agricultural change to date has not yet reached large numbers of farmers in Lesotho. We are convinced, however, that the solutions are available and that widespread participation in agricultural change is possible. The sections that follow attempt to develop the analysis and rationale for such a strategy.

Determinants of Acreage and Yield

Planners must understand farmer decision making if they hope to encourage change in agricultural production. Two key decisions which development hopes to influence are the allocation of acreage among different crops and the adoption of yield increasing technology. In order to establish the environment for future planning it is important to identify the factors influencing these decisions at present.

The Allocation of Acreage

During the 1970s the most common acreage decision was a generalized reduction in the amount cultivated. Reasons leading to this decision were discussed fully above. For several reasons, this decision was probably more prevalent among larger farmers. First, the land restricted farmer needs to maintain most of his land in cultivation to meet household food needs. Second, migrant remittances are received predominantly by households with larger acreages (van der Wiel, 1977). Thus, these households had both the extra acreage to fallow and a greater capacity to rely on remittance income for food purchases. When the 1980 agricultural census is published it should show the greatest increase in fallow during the 1970s to have occurred in the larger farms.

Table IV-5 examines in more detail the distribution of crop area. Striking contrasts are apparent between the 1960s and the subsequent decade. The 1960s decade was marked by a dramatic expansion of cash cropping and winter season cropping. Cash crop acreage increased 50 percent while winter crop acreage trebled. The principal contributor was an increase of 40,000 hectares of wheat continuing the trend evident since 1950 and a significant shift from summer to winter wheat.[1] Beans continued their growth as a cash crop, adding 11,000

[1] In 1960/61, 30.7 percent of 67,700 hectares of wheat were grown in winter. In 1969/70, 66.9 percent of 106,400 hectares were planted in the same season.

hectares during the period. Cropping intensity hit the highest level ever recorded in Lesotho, a respectable 95 percent in 1969/70.

These developments reversed sharply during the 1970s. Table IV-1 showed that the decline in wheat acreage was well under way by 1973/74 when the first annual survey was conducted. Bean acreage, on the other hand, continued to rise until the market collapse of 1976. Comparing 1969/70 with 1978/79, the acreage decline has affected winter crops more than summer; cash crops more than cereals. Winter cropping has nearly ceased as an activity while cash cropping has declined 59 percent. Again the strongest factor has been winter wheat cultivation, which dropped from 71,235 hectares in 1969/70 to merely 7,870 hectares nine years later.

Table IV-5. Trends in Land Allocation Between Related Uses. (000 ha)

Crop Year	Winter Crops[a]	Summer Crops[b]	Cash Crops[c]	Subsistence Cereals[d]	Cropping Intensity[e]
1960/61	25.7	296.9	90.8	231.8	.89
1969/70	75.3	271.6	135.0	211.9	.95
1973/74	52.8	288.1	115.2	225.7	.94
1974/75	37.5	265.8	108.6	194.8	.83
1975/76	20.9	257.9	107.9	170.9	.77
1976/77	16.2	194.2	70.9	139.4	.58
1977/78	17.3	221.9	65.6	173.6	.66
1978/79	8.5	224.3	56.4	176.4	.64
1979/80	12.2	216.3	45.5	183.0	.63

[a]Winter wheat and winter peas.

[b]Summer wheat and peas plus maize, sorghum and beans.

[c]Wheat, peas and beans.

[d]Maize, sorghum.

[e]Total area of crops planted divided by total arable area (assumed constant at 900,000 ac or 364,372 ha).

The trend in winter wheat area suggests a farmer response to price or market conditions which were favorable during the 1960s and unfavorable thereafter. Certainly, the trend in beans reflects a continued

strong market until 1976. There is some evidence that the stagnation in pea area reflects constant or slowly eroding prices. Therefore, one must conclude that cash crop area responds to market incentives and will expand when these are favorable. Cereal plantings, on the other hand, fluctuate primarily in response to the comparative economics of obtaining household food supplies from alternate sources. Hectares planted to cereals as well as overall cropping intensity held relatively steady until after migrant remittances began to escalate in 1973/74.

Phororo notes: "The farmers' motives in allocating arable land to various crops are complex and cannot simply be ascribed to better prices or yields." To support this contention he cites the association of particular crops and soils in the farmers' minds. Further, beans and wheat are said to be associated with larger fields and mechanical equipment. The absence of either factor of production is said to cause the cultivation of maize. Certainly climate is an important determinant of crop mix, leading to a concentration of wheat in the mountains, sorghum in the drier southern districts, etc. Finally, he recognizes the importance of family self-sufficiency in food production as a farmer motive (Phororo, 1979, pp. 14-16).

Despite these and other similar complications, the conclusions reached above are probably valid generalizations. They are important for development planning because of the implied differences in response to technical change. Yield increasing technology in the case of cash crops should increase profitability and lead to increases in planted area. Increased yields for maize and sorghum should permit feeding the household from fewer acres. Further acreage reductions for these crops could follow successful introduction of improved technology. Ultimately, cereals self-sufficiency should be possible with reduced cereals acreage. This could offer significant opportunities for diversifying the crop mix and expanding cultivation of cash crops without necessarily increasing overall planted area and increasing erosion risks. Yield increasing programs for maize and sorghum would thus be complementary to programs to increase rural incomes through cash cropping.

Determinants of Yield

It has long been asserted that crop production in Lesotho is at the mercy of the weather. Rainfall and temperature are the two principal climatic determinants of yield. Climatic hazards such as drought, hail and pest attack cause most of the annual crop failures. Several unsophisticated attempts have been made to quantify these relationships. Most have only reinforced the impression that yield-rainfall or production-rainfall relationships exist. None have provided quantifications of sufficient accuracy to stand as working tools for planners and analysts.

Only recently has a breakthrough been attained, made possible in part by the presence of several years of annual cropping data. Establishing defensible quantitative relationships contributed significantly to validating Lesotho's official crops statistics. Results of this recent analysis are summarized below in order to establish a basis for several of the analyses which follow. A complete presentation is found in Eckert, 1980a.

The analysis concentrated on relationships between rainfall and yields of maize and sorghum. Although temperature is recognized as very important, insufficient long-term temperature records prohibit including this factor quantitatively. Wheat yields could also not be analyzed because of variation in the percent of winter wheat and because of the influence of the CCPP on wheat yields in recent years.

Preliminary analyses showed quite similar relationships between maize yield and rainfall in each Lowland district, but that yields varied around different average figures for each district. Accordingly, district influences were included in the equations. While included as a single term, these influences stem from a combination of sources such as soil type, soil depth, precipitation timing (as distinct from quantity), temperature and relative humidity. District differences in these factors are discussed below in the section on regional differentials. Data do not exist to permit analysis of the effects of each causitive factor. 1974/75 and 1975/76 were excluded from the analysis because of the unusual incentive situation prevailing. Table IV-6 presents the resulting regression equations for maize and sorghum.

Several conclusions result from this analysis.[1] First, the accuracy achieved strongly validates the accuracy of Bureau of Statistics cropping figures. This conclusion is significant because of the additional analyses thus permitted using these data. Second, crop yield figures can be estimated with some accuracy for years in which no surveys were conducted. This permits extending the time series of data for analysis. Third, the fact that 85-90 percent of the variation in yields can be explained by rainfall and district differentials is strong quantitative evidence that no technological change has occurred in cropping during the last decade. Programs of change and yield improvement have not had sufficient impact to affect national data. Fourth, the equations in Table IV-6 permit estimating national yield levels as soon as March rainfall totals are received. By estimating output before harvest, planners have advanced information on shortfalls or surpluses in cereals production and can adjust food import and storage programs accordingly. For example, the original analysis estimated, in May 1980, that 1979/80 maize yields for seven Lowland districts would average 1,012 kg/ha, or 23 percent below long term averages (Eckert 1980a, p. 17). Official data which became available in January, 1981 showed actual weighted average yields of 934 kg/ha, or 29 percent below normal.

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[1] For a detailed exposition of these conclusions refer to the original source.

Table IV-6. Relationships between Rainfall and Yield for Maize and Sorghum.

Eq. No.	Crop	Constant (b_0)	Rainfall (b_1)	Districts D_1 (b_2)	D_2 (b_3)	D_3 (b_4)	D_5 (b_5)	D_6 (b_6)	D_7 (b_7)	R^2	SE_y
1.	Maize	477.2	1.60	439.3	72.0	-157.4	-288.0	-158.7	-177.5	.90	155.0
2.	Sorghum	1143.0	0.36	66.0	-108.0	-37.7	-138.0	196.1	-40.8	.83	141.6

Notes:

1. Figures given are regression coefficients for the equation:
   $\text{Yield} = b_0 + b_1 (\text{Rainfall}) + b_2 (D_1) + b_3 (D_2) + b_4 (D_3) + b_5 (D_5) + b_6 (D_6) + b_7 (D_7)$
2. Yield is estimated in kg/ha, rainfall is entered as the six month (October - March) total in millimeters as measured at the district headquarters station.
3. These equations estimate yields for Maseru district when Maseru rainfall is used and all $D_i = 0$. To estimate yields in another district set the relevant $D_i = 1$, use rainfall from that district and hold all other $D_i = 0$.
4. All coefficients in these equations are significant at the 95 percent level or higher.

Regional Differentials Affecting Cropping

The analysis immediately above shows subtantial differences in productivity levels between districts. A combination of soils and climatic factors are believed responsible. Differences in these causitive agents are briefly discussed below as a prelude to the regional differentials in development strategies which are contained in Chapter IX.

Climatic Differences

While there is always a need for more exhaustive meteorological coverage, the existing data are sufficient to indicate several interdistrict differentials. These are summarized in Table IV-7.

Butha Buthe and Leribe districts receive significantly more rainfall than do the rest of the Lowland districts. Of particular interest for cropping, rainfall during the summer six months averages 80-100 mm more in these two than in other districts. While southern districts have higher annual totals than Berea and Maseru, precipitation in the summer months is nearly identical from Berea district southward.

One of the characteristics of Lesotho's climate is that several important parameters show a north to south gradient when Lowland districts are examined. These gradients appear in Table IV-7 in the percent of total rainfall occuring during summer, in the length of growing season, in the number of days and percent of growing season before the December solstice and in annual average relative humidity. In general, the farther south the station, the lower is the summer share of total precipitation, the more variable is summer rainfall, the shorter the growing period before day length begins to reduce and the lower is relative humidity.

None of these differentials is considered large. Most important among them is probably the summer rainfall and the various growing season parameters. However, all these factors should contribute somewhat to poorer growing conditions in the south. The fact that they all operate in the same direction suggests that even though individual influences are small, when taken together their cumulative influence could be considerable.

An examination of long-term average temperature records indicates no visible difference between district headquarters stations in the Lowlands (Wilken, 1978). Temperature gradients are more significantly associated with elevation in Lesotho and their principal impact on cropping would be found in distinctions between the Lowland, Foothill and Mountain ecological zones which are delineated primarily by elevation (Douglas and Tennant, 1952).

Table IV-7. Selected District Climatic Measures in Lesotho

District	Precipitation[a]				Growing Season[c]			Growing Season before solstice		Annual Average Relative Humidity
	Annual Total	Summer								
		Total	% of Annual	C.V.[b]	Start	End	Days	%	Days	
(Lowland Districts)										
Butha Buthe	780	626	80	.51	-	-	-	-	-	60
Leribe	819	656	80	.52	14/9	10/5	237	41.4	98	61
Berea	698	554	79	.55	24/8	2/6	281	45.6	126	59
Maseru	682	536	79	.55	6/9	18/5	254	41.7	106	57
Mafeteng	711	546	77	.61	20/9	19/5	240	38.3	92	53
Mohale's Hoek	731	563	77	.57	26/9	11/5	226	38.1	86	49
Quthing	725	541	75	.52	-	-	-	-	-	51
(Mountain Districts)										
Qacha's Nek	900	739	82	-	-	-	-	-	-	60
Mokhotlong	526	474	81	-	13/10	9/3	146	46.6	68	55
Thaba Tseka	575	454	79	-	21/10	3/5	193	31.1	60	-

[a]Averaged over 50 years, 1920/21 to 1969/70.

[b]Coefficient of variation calculated as mean monthly rainfall in summer divided by standard deviation.

[c]Determined by average last and first days of frost as defined by temperatures below 0°C, taken from records of various lengths, the shortest of which is 22 years.

Soils Differentials

Soils of Lesotho vary considerably, as noted above. The different classification systems (Bawden and Carroll, 1968; MOA, 1979) have been tabulated to identify the distribution of soils types among districts (MOA, 1980). Unfortunately an exhaustive attempt to relate these various soils to crop productivity has proved inconclusive. Data is missing that would associate present cropped area with soils series.

This research has developed a quantification of the moisture holding capacity of the effective root zones of Lesotho's soils. The range is wide, from 25 cm to 2 cm. Although this point cannot yet be proved, it is generally agreed that there is a predominance of deeper, richer soils with higher moisture capacities in the northern Lowlands while the converse is felt to be true for the southern districts. Western portions of Mafeteng district were originally classified as a separate ecological zone due to the presence of a high proportion of sandy soils coupled with limited and variable rainfall (Douglas and Tennant, 1952). It was this same area that Binnie and Partners (1972) found to contain the largest concentration of "duplex soils" with their poor suitability for cropping.

Table IV-8 shows the manner in which soils and other differentials combine with rainfall to produce significant differences in yield potential for two cereals. In the case of maize, the differences are additive. Higher rainfall in the north combines with higher inherent productivity to increase the difference between highest and lowest yielding districts. The pattern is less decisive with sorghum; however, differentials do exist and tend to run counter to those found in maize yields. Mohale's Hoek district produces the nation's highest sorghum yields, while ranking second from lowest in maize yields. These data seem to provide a clear-cut case of comparative advantage which should lead to regionally distinct cropping recommendations.

Variability and Risk in Cropping

Much has been written asserting that cropping in Lesotho is risky business. Variability has been blamed as a disincentive preventing investment in modern farming. Part of the inducement to migrate is believed caused by the variability in farm incomes. Until recently there was not enough data to permit quantitative analyses of these factors. While the data base remains incomplete, we attempt below to identify the major sources of risk and to show their impacts on agriculture.

Table IV-8 Differentials in Maize and Sorghum Yield Potential for Lowland Districts

District	Differences From Factors Other than Rainfall[a]		Growing Season Rainfall[b]	Expected Yields (kg/ha)		Yield Differences[a]	
	Maize	Sorghum		Maize	Sorghum	Maize	Sorghum
Butha Buthe	+250	+ 66	625	1,656	1,435	+361	+ 98
Leribe	+110	-108	656	1,546	1,272	+261	- 65
Berea	- 86	- 38	554	1,221	1,306	- 64	- 32
Maseru	Base	Base	537	1,285	1,337	Base	Base
Mafeteng	-121	-138	548	1,178	1,203	-107	-134
Mohale's Hoek	-151	+196	562	1,166	1,542	-119	+205
Quthing	-214	- 40	540	1,075	1,298	-210	- 39

[a]Expressed as differences (in kg/ha) from Maseru yields.

[b]Based on 50 year average, 1920/21 to 1969/70, figures in milimeters.

Source: Eckert, 1980a.

Sources of Variation

It has long been asserted that the "variable" climate of Lesotho stands as a significant obstacle to agricultural modernization. The regression analyses summarized above confirm the dominant role of rainfall in influencing crop yields. It was also suggested above that at least a portion of this variation could be eliminated by the use of selected, risk-minimizing cropping practices.

The influence of rainfall arises from several sources. Annual variation in rainfall totals is perhaps the easiest to examine. Within the growing season the timing of precipitation is an important factor. For example, October and November of 1978 were dry enough to depress yields of summer crops by as much as 400 kg/ha even though heavy rains in December restored seasonal rainfall to normal levels. Farmers have identified too much rain and too little rain as climatic risks with the latter the most significant hazard.

Rainfall intensity, the amount of water in a particular time period, can also create problems. Where crop canopies are incomplete, as they are in many fields, intense rains can result in surface erosion, exposing roots to the air, washing off nutrients and even removing young plants. Partial control is possible through controlling plant population, surface residues and soil textures and avoiding cultivation of slopes.

Considerable evidence has accumulated to suggest a periodicity in Lesotho's rainfall, with alternate above and below normal periods of 9-10 years in length (Tyson and Dyer, 1978; Zinyowera, 1978; Eckert, 1980b). Implications of this oscillation for agricultural planning are developed in Chapter I. Two points relate to variability. First, annual variations in total rainfall have shown larger than normal fluctuations in the 2-3 years surrounding a change from above or below normal to the opposite phase. The next such change of phase is expected to begin approximately 1982. Second, over time the wet and dry periods are becoming more consistent, with fewer deviant years.

One factor essentially beyond human control is hail. Schulze (1972) estimates that most points in Lesotho can expect hail seven to eight times per year. This is equivalent to the most severe incidence rate occuring in the United States (Brinkmann, 1975). Basotho farmers perceive the frequency, and thus the risk to be higher (Wilken, 1980, p. 17).

Temperature variations are also significant. Frost has been recorded during all months of the year in the mountains. In the Lowlands, cool weather can slow growth and affect yields particularly if it occurs during a sensitive growth stage. The last frost in spring and the first in fall circumscribe the growing season. Of the two, the greater variation is found in spring with recorded last frost dates ranging over 73 days (August 8 to October 19) in Maseru.

Crop Failures

The most apparent manifestation of severe variability is crop failure. Analysis of crop failures, their causes and implications for agriculture is difficult due to incomplete data and varying reporting procedures. Despite this obstacle, Wilken (1979) has presented a preliminary evaluation.

Except for extreme events crop failure normally affects 20-25,000 hectares each year. This has been 8-10 percent of planted area in recent years. Extreme events such as the drought of 1969/70 or the excessive rains of 1975/76 can raise this total to 50,000 hectares. The traditional ecological zones defined by Douglas and Tennant (1952) suffer differentially from crop failure. The Lowlands and the Orange River Valley are normally the hardest hit while the Mountain zone is the least affected.

Available data prevent definitive analysis of the importance of various causes of crop failure. In several years half or more of the failed fields were classified under "other causes" and thus were not specified.

Different crops show different levels of susceptibility to crop failure. In descending order of susceptibility, the major crops rank as follows: 1) peas, 2) beans, 3) maize, 4) wheat and 5) sorghum. The apparent resistance to crop failure shown by sorghum is consistent with the finding of Table IV-6 which showed sorghum much less susceptible to the influence of rainfall.[1]

Losses from crop failures affect the nation in terms of crops foregone that could have been harvested. At recent yields and prices, a potential production of approximately 25,000 tons is lost annually with a value of some M 3.5 million. Lost production of the three cereals has averaged 22,500 metric tons, sufficient to meet the annual food needs of over 62,000 people. At the national level risk minimizing cropping practices could make a major contribution to food grain self-sufficiency. At the level of the household, crop failures can cause serious food shortages. In addition out-of-pocket losses are experienced to the extent of field preparation costs incurred.[2] These losses may have exceeded M 1.0 million in value in most years.

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[1] In comparing equations 1 and 2, one finds that each additional millimeter of rainfall in the six month total results in 1.60 kg/ha increase in maize yield but only 0.36 kg/ha change in sorghum yield.

[2] Calculated from Table IV-1.

Annual Variation in Yields from Harvested Area

To examine annual variation in yields requires a time series of reasonable length. There are not yet enough official yield estimates in Lesotho to constitute such a series. In addition, yields after 1976 reflect a different mix of fields and factor proportions than in earlier years.

To provide a series of sufficient length, crop yields were estimated for all years from 1955/56 to 1972/73 for which official figures do not exist. Equations 1 and 2 from Table IV-6 provided the estimation procedure. The choice of period was intended to avoid those years falling during or after the mine wage increase and to include an equal number of years falling within wet and dry periods as defined by Dyer and Tyson, (1977). Table IV-9 presents the results for maize, separately for each district along with weighted average yields for the seven Lowland districts. These estimates assume that no significant technological change occurred during the period as concluded earlier.

Differences in long-term average maize yields are apparent. It must be remembered that these yield levels characterized the period before the structural changes occuring during the mid-1970's. For each district, variation around the mean is indicated by the standard deviation, expressed in kg/ha. The coefficient of variation (c.v.) expresses the standard deviation as a percent of the mean, thus providing a relative measure of variability for interdistrict comparison. The two districts with the lowest maize yields (Mafeteng, Quthing) also show the highest relative variability. Both factors should operate to reduce the attractiveness of commercial maize production in these districts. Conversely, districts in the northern and central Lowlands show a relatively lower variability in maize yields. Leribe is an exception; however, the disincentive of higher risk is partially offset by higher average yield levels in the district.

Table IV-10 shows summary rows for similar calculations of sorghum yields. Interdistrict yield differences are clearly apparent. However, sorghum's much lower sensitivity to moisture variation results in essentially identical variance estimates. Again, Leribe district provides the only modest exception in that it combines the second lowest sorghum yield average with the highest variability.

Table IV-9. Estimated Historic Maize Yields for Lesotho: 1955/56 - 1972/73[a] (kg/ha)

Year	DISTRICT							Weighted Average[c]
	Butha Buthe	Leribe	Berea	Maseru	Mafeteng	Mohale's Hoek	Quthing	
1955/56	1019	1208	899	986	917	871	768	993
1956/57	1484	1334	874	897	742	818	813	994
1957/58	1229	1294	1087	857	757	913	670	1007
1958/59	893	783	730	716	611	828	576	728
1959/60	1313	1226	811	855	555	878	688	906
1960/61[b]	1051	929	699	657	656	804	779	776
1961/62	1112	858	753	936	845	868	769	858
1962/63	1046	976	746	885	814	790	668	857
1963/64	1220	834	787	783	698	708	565	782
1964/65	968	863	773	645	507	480	453	688
1965/66	937	763	632	642	558	707	444	665
1966/67	1251	1294	771	897	754	767	708	945
1967/68	903	687	504	664	378	439	307	560
1968/69	876	855	534	698	490	631	489	663
1969/70[b]	828	618	615	603	272	458	283	523
1970/71	1047	784	616	745	716	501	604	707
1971/72	1071	903	994	934	846	811	689	901
1972/73	1040	821	671	549	499	470	481	643
Mean	1070	946	750	775	645	708	597	789
S.D.	174	224	150	133	174	167	159	151
C.V.	.16	.24	.20	.17	.27	.24	.27	.19

[a]Calculated with Equation 1, Table IV-6.

[b]Official data from agricultural censuses.

[c]Weights taken from actual distribution of harvested area, averaged from 1960 and 1970 census measurements.

Table IV-10. Summary of Estimated Historic Sorghum Yields for 1955/56 to 1972/73 (kg/ha)

	Butha Buthe	Leribe	Berea	Maseru	Mafeteng	Mohale's Hoek	Quthing
Mean	931	756	824	862	708	1062	809
S.D.	49	61	47	47	45	47	43
C.V.	.05	.08	.05	.05	.06	.04	.05

Economic Implications

In commercial farming, variability in yields affects farmer's expectations of profits and thus his choice of crops. Unfortunately it has not been possible to develop yield-rainfall equations and variability estimates for the cash crops.

In the case of cereals grown primarily for home consumption, yield variability affects the certainty of household food supplies most directly. The result should be an increase in the incentives to migrate off-farm for work in order to supplement home production with purchased foods. Table IV-11 below illustrates the effects of yield and variability differences on selected economic measures. In the first column the probability of producing at a profit is calculated as though maize were a commercial crop. Costs of production are taken from 1973/74 (FAO, 1979) and adjusted to 1976 when maize grain prices also become available in the data. Since that time factor prices have risen 31 percent more than grain prices (DAMR, 1980). In addition, the analysis above suggests that labor inputs have risen 80 percent, thus further raising production costs. Simultaneously yield levels rose from their pre-1976 levels. Column two presents probabilities based on these alterations to more nearly reflect 1980 conditions.

Table IV-11. Selected Economic Comparisons of Maize and Sorghum Production in Lowland Districts[a]

District	Probability of Maize Production Exceeding Break Even Yield Level		Average 1980 Cost of Home Grown Crop	
	1976[b]	1980[c]	Maize	Sorghum
Butha Buthe	.89	.99	M0.060	M0.069
Leribe	.66	.98	M0.064	M0.078
Berea	.24	.89	M0.081	M0.076
Maseru	.27	.97	M0.077	M0.074
Mafeteng	.11	.80	M0.084	M0.083
Mohale's Hoek	.19	.79	M0.085	M0.064
Quthing	.05	.60	M0.092	M0.076

[a]Assumes production costs equal in all districts.

[b]1976 production costs at R55.58/ha and maize price at 6.5¢/Kg. At these levels 855 Kg/ha were required to recover costs.

[c]1980 production costs at R99.26/ha and maize price at 9.6¢/Kg. Yields of 1034 Kg/ha recovered costs.

Section 3

A Program for Developing Lesotho's Cropping Subsector

General Approach and Philosophy

A viable Lesotho requires a viable rural sector. It is true that the country will gradually transform into a mixed economy with greater balance between multiple lifestyles and economic activities. However, almost any measure used would define Lesotho as overwhelmingly rural in character in 1980.[1] It follows that for the present and at least for the rest of this century, a strong development emphasis on rural areas must dominate national planning. Any progress, even toward diversifying the economy, will be constrained unless rural resources, both human and natural, participate fully in their many potential roles. Neither the modern sector nor the urban places can carry the development load alone. Even if they could, destablizing stagnation would affect much of rural Lesotho and tens of thousands of households.

Within the broad framework of rural development several options exist not all of which are agricultural. Off-farm employment in Lesotho and in RSA today provides the bulk of rural incomes. And while wage employment will continue to be very important, there are definite upper limits to the contributions possible from this source. For the next 20 years there will likely be little increase in total wage employment as domestic employment struggles to offset projected declines in migration (Eckert and Wykstra, 1979). Consequently agricultural development must form the core of rural growth efforts at least for the next two decades.

Given the structure of Lesotho, the inequalities that exist and the national objective of equitable growth, a broadly participatory development effort is mandatory, especially in rural areas. While certain objectives such as reducing food imports can be achieved faster by concentrating high level technology among the best farmers, short term gains would be outweighed by the longer term consequences of ignoring most of the population. There really can be no question on this point. Conditions exist which could permit a highly inegalitarian growth process if it is not checked as a matter of policy.

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[1]Over 90 percent of the population live in rural areas, 82 percent hold arable land, 48 percent own livestock, and contact with urban places remains an infrequent event for most rural residents.

Participatory growth processes are not hard to define. They must be based on increasing productivity of the most widely distributed resources. In Lesotho's rural sector, this means, very simply, labor and land. Options for increasing productivity must be feasible within the resource constraints of the average or below average participant, within his or her management capabilities and economically and socially attractive. It is this context which defines "appropriate" technologies and growth strategies.

One of the hard lessons of development history is that technological packages designed for advanced, progressive entrepreneurs can only rarely be utilized by less advantaged firms. On the other hand, technological change designed for the poor can almost invariably be modified and adopted by firms with ample resources as well.

Implementing participatory development is often more difficult than strategies based on resource or technology concentrations. The chief difference lies in the extent and nature of delivery systems needed to reach large masses instead of limited clienteles. Participatory development must rely heavily on indirect incentives. In Lesotho this capacity is limited by low levels of involvement in the market, which is the usual channel through which indirect stimuli are transmitted. The process rests heavily on communication. Even with various extension methods for spreading the message efficiently, reaching the bulk of the small farmers will require a greatly enhanced national commitment to communication. The amount of effort required will seriously strain the supply of trained persons for the job.

If broad based participatory agricultural growth is to be achieved, programs must be developed for each of the major resource groupings identified in Chapter III. This will require altering the balance of programs within the Ministry. At the present time much of the effort is concentrated on capital intensive agriculture which is appropriate primarily for the better farmer group and to a limited extent for the rest of the market oriented farmers. An additional major emphasis within Government efforts aimed at the small farmer deserves highest priority. A proportional priority concept is recommended in which development programs receive an emphasis in direct proportion to the number of households in the target resource group for which those programs are designed. This concept would not eliminate the further advancement of high technology agriculture. It would, however, insure that strong programs emerge for farm households which are restricted in either land, labor or assets.

A broadening of Ministry efforts, based on proportional priority for all farmer groups is now of greatest priority, so as to include technology packages for small landholders and part-time farmers as well. Fortunately, several program elements for inclusion in these delivery packages are already underway in various individual programs; e.g., the Egg Circle program, elements of BASP, etc. What is still needed, however, is an integrated commitment throughout the Ministry to focus

on the proportional priority principle for designing various delivery packages in order to recognize and include each of the farmer clientele groups. Efforts of the various divisions and sections need to be focused so as to be mutually reinforcing rather than operating in isolation. It is not sufficient to simply reduce conflicts and duplication among programs. Given the scarce resources of the country and within the Ministry itself, a rapid move toward a farming systems approach, based on the principle of proportional priority, is urgently needed.

It follows from the above set of recommendations that a period of program consolidation with the Ministry is now needed. It is clearly evident that in the relatively brief period since independence, the multitude of individual programs and projects undertaken have increasingly overextended the Ministry's capacity for effective management, given its critical manpower and budget constraints. It is essential therefore to combine the reorientation of farmer delivery packages with a period of program consolidation over the next two or three years during which time the number of individual programs is reduced and those remaining are integrated in ways that emphasize complimentarities.

Such a consolidation effort will necessarily have to address the logistics of reaching a much larger number of individual farm families than has previously been achieved. One needed adjustment will be a shift from programs of direct delivery of goods and services to more indirect stimulation of private enterprise serving the agricultural sector in Lesotho. By necessity, those programs in which the Ministry is the main source of farmer inputs, technology and marketing can reach only a small proportion of total farmers because of the Ministry's very limited physical and financial resources. Equally important, such programs of direct intervention place the greatest demands on the Ministry's limited personnel and management capability. The approach suggested here will involve redirecting these limited resources to reach a much larger number of farmers.

In summary, the rapid increase in the number of individual programs in the Ministry, and in particular the emergence of a number of direct intervention type programs during the 1970's, has severely hindered the Ministry's capability to effectively manage all the diverse programs in its portfolio. Efforts to correct this situation necessarily rest on the implementation of two sets of recommended policies. First: consolidate and therefore reduce the number of programs and projects within the Ministry. Second, government must find alternative delivery mechanisms, including more emphasis on the private sector, thus minimizing the input of government personnel, funds

and management time per contacted farmer. In many ways, indirect controls and stimuli for development, as embodied in these two policy recommendations, are more cost effective than direct intervention and management efforts by government itself.

Objectives for Crops Development

National development objectives include 1) generating employment, 2) raising well-being through improvement in incomes, 3) progress toward self-sufficiency in strategic foods and 4) preserving or increasing equality within the economy. The agricultural sector can make significant contributions to each of these goals. In fact, as long as agriculture remains the domestic sector with the broadest participation, these national objectives cannot be met unless agriculture leads the way.

This section presents the elements of a development plan for crops agriculture in capsule form. Sections that follow address several development issues in greater detail.

Derived from national goals, specific objectives can be identified for the crops subsector. These are as follows:

1. Increase the marketed surplus of crops produced. This objective must receive very high priority for three reasons. First, the number of rural households will increase by as many as 117,000 in the next 20 years. Under the Land Act of 1979 nearly all of these will be landless and therefore dependent on buying the food they consume. Second, urban population should reach at least 100,000 people by 2000 AD. A steady flow of food commodities through the market for urban consumption is a necessary component of urbanization and development. Third, progress toward food autonomy will require a considerably expanded internal trade in food with much larger numbers of farms producing for sale to the market.

2. Increased employment in crops production, related agricultural industries and marketing. As the nation's largest domestic sector, agriculture must contribute as fully as possible to this top national development priority. Careful policy and program decisions are needed because agriculture is one sector in which output can be raised a great deal without necessarily generating new employment.

3. Increase the number and percentage of rural households that are self-sufficient in basic food commodities. More than half of the nation's rural households produce less cereals

than they consume at present. Yet at current yield levels some 70 percent of these households could be self-sufficient through fuller utilization of the soil. This figure could easily be raised to 75, possibly 80 percent through reduction in harvest and post-harvest losses. And the yield increases believed possible in Lesotho can make food grain self-sufficiency possible even while freeing land and resources for other activities.

Self-sufficiency in basic commodities is stressed at the household level for two reasons. First, progress toward national food autonomy must begin with self-sufficiency among landholding households. Second, internal self-sufficiency is a valid objective for a large group of landholding households even though their resource position may prevent commercial production.

4. Increase incomes derived from land resources. The sector must contribute to growth in GDP and has a significant potential to increase its current contributions. Without growth in the productivity of agriculture the sector will act as an intolerable drag on the national economy. At present the nation's arable land contributes only M120/hectare (M50/acre) toward GDP. (Lesotho, 1979.)

5. Dietary improvement specifically targeted toward existing imbalances and deficiencies. Specific nutritional objectives include:

   a. Gradual reduction of the preponderance of low protein cereals in the diet through dietary diversification.

   b. Increases in consumption of protective foods such as fruits and vegetables. Vegetable production, in particular, should be viewed as an area in which rural household self-sufficiency is definitely possible and desirable.

   c. Increased yields and diversification of types in pulse production to provide a cheap source of protein for poor households in which protein deficiencies are concentrated.

Operational Strategies

Development strategies are statements of the general means to be used in pursuit of development objectives. Programs and policies constitute the tools with which strategies are implemented.

The objectives given above will not be easy to meet. They will require generating a vigorous farm sector from a situation now characterized by slow growth and constraints. Success will not be easy, will take time and will require simultaneous progress on many fronts. In brief summary the foregoing analysis suggests the following strategies for the crops subsector.

1. Relieve resource constraints now slowing further progress.

2. Increase the potential productivity of agriculture by developing appropriate technological packages for the identifiable needs of specific farm groups.

3. Improve the profitability of agriculture to create an environment in which better technology is feasible. This includes:

   a. Significant increases in the availability of farming inputs.

   b. Reduction of both risk and costs in product markets together with making these channels more accessible to farmers.

   c. Selected pricing interventions in order to provide extra incentives for certain improvements in farming.

4. Reduction of risk in cropping.

5. Reallocation of the management responsibility for selected lands that are presently underutilized.

Relieving Resource Constraints

Consistent with the philosophy developed above, this section identifies a number of constraints which can be solved by intermediate technologies which could be considered appropriate to Lesotho's small farmers.

It has been shown that one major constraint to cropping is the absence of draft power. Less than half of the landholding households have cattle. An additional 16 percent do not possess the yoke and plow that would translate their cattle into draft power. Some 1,200 working tractors may provide the initial plowing to as much as 30 percent of the nation's cultivated area. However, despite these resources, there remains a serious shortage of tillage power and this, therefore, becomes top priority among improved cropping strategies.

Relieving the draft power constraint requires careful planning. Tractors and oxen are often used complementarily with tractors breaking the ground and oxen providing draft for secondary tillage. Programs for ensuring draft power supplies must recognize both roles. One important factor to consider is the source of energy. The presence of abundant solar energy and ample rangeland to capture it and convert it to stored renewable energy suggests certain priorities for ox drawn technology. Similarly the comparative economics of oxen vs. tractors will probably ensure that both will be necessary throughout the next twenty years. Tractors have received considerable attention in government programs, as they should. But oxen draft has received almost no developmental support. This suggests that a balanced program will include a priority to stimulating oxen contractors, development and marketing of ox drawn implements and research on cropping systems tailored to the peculiarities of oxen draft power.

Examining Table III-3, some 34,000 households (16%) have land and cattle but lack the yoke and plow which integrate the two into a production system. Certainly many of these households would make the investment if ox yokes and improved ox drawn implements were readily available at attractive prices and the other components of profitable farming were in place. By investing in yokes and plows a household would shift up from row 3 to row 2 in Table III-3 and benefit from the higher productivities and incomes associated with row 2. Similarly, a ready market of ancillary ox drawn equipment, e.g. planters, cultivators, harrows, would permit some row 2 households to shift to the resource position now characterizing the best farmers. There are 34,000 households in row 2. If only half of them ultimately invested in planters, for example, the number of households capable of controlling plant populations through controlled seed depth and spacing would increase from 28,000 to 45,000. Similar calculations can be made showing the increased capacity for weed control associated with cultivators and harrows.

An industry producing and marketing ox drawn implements is thus very relevant to participatory agricultural development. It also emphasizes the employment potential of a carefully designed agribusiness thrust as part of the overall strategy. This industry would be relatively labor intensive as opposed to the much higher capital and energy intensity necessary to produce tractor drawn implements. It would be import substituting and thus increase the value added captured within Lesotho's economy.

Such a domestic assembly and manufacturing capacity has recently been shown to be feasible and profitable in its own right without regard to its effects as a stimulus to agriculture. A phased implementation program has been recommended to allow management and marketing skills to grow apace with demand (UNIDO, 1979).

Unfortunately the UNIDO report has not yet been implemented. To do so would require developing and testing improved ox drawn equipment. Some of the equipment presently on the market is obsolete or inappropriate for Lesotho's conditions. BASP has recently been examining alternatives from Europe. The UNIDO proposal suggests that local production begin in partnership with a South African firm which has agreed to assist in the development until it is replaced in the Lesotho market by domestic production. Such a program would provide a good example of the possibility of capitalizing on the developed nature of the surrounding economy to build self-reliance in Lesotho.

Ox power and oxen contractors cannot meet all of agriculture's needs. Tractor tillage will remain optimal for the heavier soils, for initial plowing and for multiple cropping rotations in which a very quick turnaround between crops is required. Tractor contractors can provide much needed services to a growing agriculture. Yet this enterprise has suffered from neglect and disincentives recently. In general this has not occurred intentionally but rather due to the absence of policies to strengthen the private sector. Part of the problem lies in the fact that very little is known about tractor contractors, their numbers, operations and contributions to development. Government intervention can only be an interim measure, private and cooperative tractor ownership must be encouraged.

It is apparent that private tractor contractors could fill a vital role in relieving the absence of draft power for a large portion of Lesotho's farms. It is essential that these operators be supported rather than suppressed and that their numbers be expanded. Certainly the few small policy and program actions needed to make tractor contracting attractive as a private enterprise will require much less government cost than running a large tractor fleet. And in terms of accessibility to large numbers of farmers, timeliness and cost, private operators can probably do a better job than can government, provided the industry is competitive.

One final option for relaxing the draft power constraint involves village level provision of tractor services. Purchase, operation and maintenance of a tractor would make a logical activity for a farmer's or village organization, especially in villages where cattle populations are low or the number of households with a resident female as household head is large. Village tractor cooperatives are particularly recommended where a village possesses large numbers of households in row 5 of Table III-3, since these have no migrant income with which to contract for private services.

A strategy of relieving resource constraints must ultimately face two other critical scarcities: labor and farm management decision making skills. Labor constraints occur at several places in the production process. Labor demand at plowing and planting can be eased for smaller households if either oxen or tractor contractors were available

from whom they could hire these services. This would be particularly true of younger households with some land, but not enough to prevent a family member from having to migrate. With a migrant being absent, the household is partially without labor yet has the cash income to permit hiring needed services.

Agronomic practices designed to better control plant populations can ease labor demand for weeding. Furthermore, chemical herbicides offer an alternative to manual weeding. Their effectiveness has been demonstrated in Lesotho. Agricultural chemicals offer another excellent instance where the South African market can be exploited with very minimal effort to contribute significantly to Lesotho's growth. Stationary threshers could significantly relax labor demand at harvest, particularly for wheat and beans. Harvest losses can be dramatically reduced where this technology is employed. And producing threshers domestically could emerge as a significant component of a domestic agricultural implements industry.

Effective farm management decision making is constrained by two factors: the part-time nature of many farms and the absence of technical information on farm management options. The latter can only be improved through effective agricultural research and extension services. Several options are available to shift management responsibility for arable land to better managers or to cooperative management. These are discussed in depth in a subsequent section.

Increasing the Productive Potential of Agriculture

The productive potential of cropping begins with the field. Even simple modern technology such as fertilization will not prove profitable unless a productive environment is present. The two major dimensions considered appropriate and essential to this strategy are soil fertility improvement and plant population control.

Given the demand for dung as fuel it is unrealistic to expect significant increases in the use of manure in the near future. There are alternatives, however. Crop residue management including plowing under stubble is already part of the Cropping Guidelines. Adoption of the practice is constrained by winter fodder needs and to a lesser extent by draft power constraints. The latter can be solved with the ox and tractor draft programs suggested above. The more important constraint can really only be solved through livestock reductions or increases in the production of storable fodders or both. For several reasons, major increases in fodder and hay production are recommended in the livestock chapter which follows. If that program is adopted and succeeds to the point of meeting winter feed needs then returning stubble to the soil becomes a realistic option.

Another program emphasis can contribute significantly to this strategy while meeting one of the nutritional objectives as well. As legumes, pulses possess the capacity to fix nitrogen and thus enrich the soil. The analysis in Section 2 showed that crop rotation or intercropping for the explicit purpose of increasing fertility is not widely practiced. One of the higher priorities in agricultural policy should be to encourage a major expansion of pulse acreage and yields. Direct contributions would appear in cash incomes and in more widely available supplies of cheap vegetable protein. Expanded pulse acreage would also create the real possibility of fertility building crop rotations. In addition to monocropped beans, peas and lentils, intercropping of pulses with maize should also receive research attention.

The second major thrust recommended as part of this strategy is plant population control. Resource constraints which must be solved include the draft power problem and the relative scarcity of planters and seed drills. Solutions to the former have been discussed. If adopted, one impact will be better control over seedbed preparation and timeliness of planting, hence better germination and emergence.

Full control can only be achieved with appropriate mechanical planting equipment. That this equipment is so infrequently owned (and thus seldom used) is unfortunate. Ox drawn planters, especially those that have been tested and found acceptable under Lesotho conditions, deserve the highest priority on the list of products for the domestic tools and implements industry. Planters appear to have such a significant potential that the question of subsidizing their price should be explored. Secondly, any village institution managing a tractor should be encouraged or required to have planting equipment as well. Third, the Thaba Bosiu Project proved the existence of a very strong demand for planter repair services and parts supply. The program is to be continued under BASP with the additional component of a training program for village level maintenance mechanics.

Regardless of the availability of planters and other forms of plant density control, little change will occur unless information is also available on optimum dates of planting, varieties and plant populations for Lesotho's conditions. It is while choosing his plant density that the farmer basically determines the productive potential of his field as well as its ability to survive moisture stress. Such information is well known for the traditional varieties but as new varieties and farming systems are adopted this type of information must be refined to fit these new technologies.

Improving the Profitability of Agriculture

The thoughts in this section are drawn largely from the analysis of Lesotho's dryland crop husbandry appearing on pp. 88-100 above. As in

any planning situation, a clear description of the problem is half of the solution. Thus, the deficiencies noted above reappear here in the form of suggested corrective programs.

Purchased Inputs: The principal factors to consider in attempting to increase the use of purchased farm inputs are:

a. widespread availability through an adequate input supply.

b. prices that permit profitable use given expected productivity levels.

c. stability in both supply and price.

d. uniformity in the product marketed to avoid the need for multiple confusing recommendations.

The first two market characteristics are well understood in Lesotho, and much of the BASP effort is targeted at meeting these needs. The third and fourth characteristics are intended to minimize market induced risk and uncertainty. Where agriculture is not fully "market-oriented," market stability and reliability are absolutely essential before farmers will commercialize their production.

Much has been said above about tillage and draft power services. At the national level these are essential to widespread improvement in cropping. At the household level, they represent an input that can potentially be purchased. Recommendations above for strengthening oxen and tractor contracting industries were designed to increase the availability of the services and to develop an industry that is sufficiently competitive to ensure low and relatively uniform prices.

It must be emphasized that in addressing the supply of draft services, emphasis was placed solely on two institutional forms: the private sector and village level cooperatives or producer's associations. Government provision of these services was not considered a viable alternative in the long run. While the case is less distinct for other inputs, it is an issue that must be raised and carefully examined. The operational question would be, "How can government ensure an adequate supply of purchased inputs and yet minimize the drain on government manpower and resources in the process?" In most cases the answer will be indirect stimulation of nongovernment enterprise.

Four types of inputs are worthy of major attention. All are divisible, meaning they can be used in any quantity, small or large, depending on individual needs. All have been proved potentially profitable under Lesotho's conditions provided that an adequate plant population is established first. All will require that farmers receive considerable information on their proper use.

a. Fertilizer: Problems in the fertilizer supply picture were discussed at length above. Fertilizer response will vary by

soil, crop, climatic events, cultural practices used and other factors. The research program has not yet had extensive enough trials to be able to sort out all these factors. One unnecessary complication has been the generally poor design of fertilizer experiments conducted in the last five years.

Yet enough is known to begin to develop viable recommendations for particular farming situations. The Thaba Bosiu project proved that most field crops in Lesotho respond significantly to fertilizer (Bredemeier, 1978; Powell, et al, 1979). It is suggested that a thorough review of all existing data on fertilizer response is urgently needed with the intent of developing recommendations that would be profitable for small farmers. Simultaneously, some deep thought is required on the associated methods of application (including top dressing) with the intent of increasing fertilizer utilization efficiency. Since the Cropping Guidelines are periodically revised, they should incorporate specific recommendations for the small resource-poor farmers as well as for the better farmers.

b. Agricultural chemicals: Little systematic research has been undertaken on either herbicides or pesticides. Several of the area based projects used one chemical or another as part of improved cropping packages. For example, the Ratau Cropping Scheme, in 1977-78, averaged R17.20/ha for chemicals (both pesticides and herbicides) and an additional R10/ha for application costs. Agricultural chemicals thus accounted for 8.8 percent of total costs (15.8% of purchased inputs) for maize production that averaged 21.3 bags per acre (4,788 kg/ha), approximately three and one-half times the national average. While no specific evaluation is possible of the contribution from chemicals, the overall operation averaged a net profit of over R200/ha (Hurelbrink, 1978).

As mentioned earlier agricultural chemicals would seem to offer an excellent opportunity to exploit the well established input market for the purpose of relaxing constraints to production (especially weeding labor) and raising farm output closer to self-sufficiency levels.

c. Crop cultivars (varieties): One of the more significant findings from the Thaba Bosiu research program has gone largely unnoticed. In the case of nearly all major field crops, they have showed that improved cultivars are available that can vastly out yield varieties in common use. Yield differences of from 200-800 percent were found among

varieties tested for maize, sorghum, wheat and beans (Bredemeier, 1978). With the exception of some hybrid maizes, most of the best varieties are not in use in Lesotho. Powell (1979, p. 15) shows that yield nurseries received from the International Centers have yet to result in new varieties entering widespread use by farmers.

Review of available data strongly suggests that considerable progress could be made in field crop production by relatively simple varietal substitution programs. To mount such a program requires screening of cultivars under farmer conditions, an official approval process, a seed multiplication program and a distribution channel.

Several additional criteria should be incorporated into the varietal selection process. For different regions, farm sizes, cropping patterns, etc. the following may be as important as yield potential in screening cultivars.

1. resistance to moisture shortfalls.

2. resistance to pests and diseases.

3. short growing seasons to escape frost or to fit within a multiple cropping system.

4. grain that the farmer can save and replant (select for heterosis rather than hybrid vigor).

5. resistance to shattering.

Powell makes the point that when choosing an improved maize, reliance is often placed on hybrids. The result is the need to purchase new seed each year since a hybrid crop cannot be replanted without severe loss of yield. Farmers cannot save and replant their own seed. Furthermore, South African hybrids may require an extended growing season under Lesotho's cooler conditions in certain locations. As a consequence yields can be reduced significantly. It has been concluded in cereals programs the world over that hybrids are not optimal for traditional small farmers. Synthetic and composite varieties are now available for most ecological conditions with yield potential equal to hybrids and with much greater yield stability. Lesotho would profit by making the shift as soon as reasonably possible.

d. Farm management knowledge: The last farm "input" in short supply is not available through the market. This missing input is knowledge, knowledge of techniques necessary to

farm at high levels of productivity. One would expect that Basotho farmers know well the techniques involved in traditional subsistence or supplementary farming. However, the next two decades will see a mandate emerge for more productive, more modern farming systems. The incentives facing farmers will change rapidly and they must bear a major share of Lesotho's development burden. Their need for knowledge of new technologies, of how to get the most from their few resources, will grow dramatically.

The types of information needed were identified in the analysis of dryland crop husbandry. Primarily it is knowledge of how to better integrate available resources, how to get around certain constraints and how to avoid losses. Some of this information is in the Extension delivery pipeline but the flow of information could be enhanced. Similarly there is an inadequate flow of information from farmers to researchers that would convey to them villagelevel problems and priorities. Developing such a circular flow of communications must receive top priority if Lesotho is to strive for participatory agricultural growth. Both extension and research need a very clear statement of priorities among their various possible clienteles. This report obviously recommends that small farmers be reached in proportion to their numbers in the Basotho farm population.

Market Development: A key strategy for improving the profitability of farming is the development of reliable, efficient product and input markets. Several thoughts on this topic have been expressed above. A more thorough and systematic treatment is provided in Chapter VI below. Therefore, market development is only mentioned here to indicate its importance as a component of the overall strategy.

Price Intervention: Commodity prices and input prices are basically set in the surrounding South African economy and reflect the resource mix and policies of that economy. For example, cereals prices reflect a land extensive, capital intensive agriculture which is managed generally to maximize total revenue. Basotho farmers, however, operate with limited capital inputs, with limited land, limited labor and often limited management skills.

While we are extremely hesitant to recommend subsidies, there may be a few carefully selected instances where government price intervention is advisable. Our hesitation arises from the fact that subsidies tend to become entrenched and very hard to repeal. One of the last things Lesotho needs is a perpetual drain on its budget trying to alter market prices of major commodities. MOA must develop careful analyses

of the pros and cons of price interventions on a case by case basis. Illustrative examples, not necessarily in order of priority, are given below to show the types of considerations that should enter into these analyses.

It is generally neither possible nor advisable to attempt to alter the prices of major cereals. The case is made in Chapter VI, however, that some price subsidy on pulses may be needed as a short-term policy to stimulate cash cropping, technological change and an increase in domestic protein supplies.

Similar logic with respect to inputs suggests that subsidizing widely used inputs may be beyond the scope of government. Exceptions could, however, be considered in special circumstances where the need is critical yet restricted to only a few locations. More feasible options for a short term subsidy policy could be pesticides and herbicides. Providing these inputs at somewhat below cost would facilitate their adoption as farming modernizes. Required budgets would initially be very low due to the small quantities involved. And the need for subsidy would phase out over 5-10 years as increased yields and better crop husbandry make it profitable to use these chemicals even at commercial cost.

Another option deserving consideration is some form of intervention to keep the price of ox-drawn implements, especially planters, at low and attractive levels. Such a price policy could be seen as an attempt to match Lesotho's resource situation with an appropriate price structure. Even if this equipment were sold at below cost, increases in production could vastly offset government outlays.

The above are merely suggestions. The several considerations listed above provide the recommended criteria when considering price intervention of any type. In brief, they are that price intervention through subsidy should only be considered in cases which meet the following conditions:

a. Limited drain on government budget.

b. An identifiable need where a small change will have significant impact overall.

c. Changes occurring as a result of the subsidy or concurrently with it will eliminate the need for subsidy within a relatively short period.

Reducing Risk in Cropping

Variability and risk are definite deterrents to modernizing Lesotho's agriculture. Risk acts primarily to reduce the incentive to invest in

modern farming requisites. As long as farming is only a supplemental activity, there is little that can be done to increase investment. But for those serious farmers, who would otherwise expand their use of purchased inputs and their market involvement, reduction of the risks they face can be among the most significant strategies.

Two types of risk affect Lesotho; market risk and climatic risk. The first can be reduced by effective government policy while the second can only be reduced by farmer adoption of risk avoidance management strategies.

As in most development programs, a range of program and policy choices are possible. The analysis in this chapter strongly suggests that solutions to cropping risk lie in several risk minimizing agronomic practices. Many are within the Mosotho farmer's capacity if he only had information on the techniques; for example, the whole complex of practices involved in managing soil moisture. Other solutions can occur as certain resource constraints are overcome. For example, more widely available tillage power can permit planting to be better timed with respect to soil moisture, thus reducing the probability of poor germination. Leroy Scherer (1980) has provided an outstanding and detailed analysis of the many techniques available under Lesotho's conditions for better management of soil-plant-water relationships.

Varietal change offers another major opportunity to reduce variability. Enough is presently known about Lesotho's production environment to screen for varieties that are relatively high yielding and at the same time tolerant of drought or other climatic extremes.

Environmental modification at the field level is possible using some of the techniques discussed by Scherer such as residue management and mulching. Irrigation is another form of environmental modification which has application to Lesotho. However, given its cost and technical complexity, the use of irrigation must be very carefully analyzed. In Lesotho it is probably more suited to specialty crops than it is to cereals. Irrigation is examined in more detail on pp. 140-144.

Finally, the potential of certain forms of crop insurance warrant further investigations. Issues involved include 1) how to spread the risk, 2) how to minimize the supervisory field inspection and administration requirements, 3) pricing and compensation levels and 4) crops and risk events to receive coverage. Obviously, high value specialty crops will have particular insurance needs.

Improving Farm Management Through "De Facto" Reallocation

The analysis of the resource positions of farmers above showed that most of Lesotho's cropland is held by households which either cannot

manage it effectively or do not do so because it provides only a supplemental (even inconsequential) addition to the household's resources. Development programs to make small farm agriculture a viable option will encourage some households to become better farm managers. Hardship, as from loss of off-farm incomes, will force others to make the same change. Yet large numbers of landholders will remain unable to manage their farm resources, especially land, well. The result is a nationally underutilized resource, low incomes, low employment and food deficiencies. Farmers themselves are acutely aware of the neglect of the land characterizing their country (see the proceedings of the January 1979 National Farmer's Conference).

With imagination it is possible to correct this situation without altering the fundamental roles of land in rural society. To do so within the Sesotho context requires realization that land holding and land management are not inextricably associated as many Western observers believe.[1] In fact rural Lesotho offers several examples in which management or labor inputs are disassociated with resource "ownership."

What is suggested is that institutions be developed that permit the better farm managers to make the cropping decisions with respect to land held by households which cannot or will not manage it intensively. And just as "ownership" need not automatically necessitate owner-operators, so management responsibility does not imply that the manager gets all the profits. Lesotho is blessed with a communal rural structure in which it is possible to allocate management responsibility and the product from land as separate decisions.

The Land Act, 1979 provides the basic enabling legislation (GOL, 1979). Most significant in this regard are the provisions for leasing, which will permit leasing land from poorer to better farmers. At the individual level somewhat larger and more viable operational units could be aggregated, thus permitting adoption of more advanced technology. Across the nation, the average level of management would increase and with it average yields and total production. Given the proper combination of lessor and lessee, the latter should be able to raise yields enough to reward himself while increasing the landholder's net returns from his or her acreage at the same time.

However, it is at the village level that opportunities exist for exciting innovation. Villages possess the capacity to aggregate lands, employ a farm manager, purchase on cooperative account the necessary implements and inputs, and to distribute the proceeds in whatever fashion the village decides. An important institutional innovation occurred in 1979 when government recast the official concept of "cooperatives" to emphasize a more holistic development role for these

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[1]Failure to appreciate this fact is the principal cause of the irrelevance of the advice from most Westerners who suggest changes in Lesotho's land tenure.

agencies (Kingdom of Lesotho, 1979). Under this new policy the cooperative institutional form has the capacity to perform a number of village resource management roles. These could include management of land, either with or without consolidation, management of equipment that might be communally owned and others. Certainly in every village there are a number of hectares that are held either surplus to household needs or by families without other farm resources. For example, 50 such hectares would constitute a very attractive management unit for a village producers' association, one which would support limited capitalization and high yielding technologies. Given a diversified cropping pattern, such a management unit could employ several people year 'round. And a 50 hectare base could offer M750 per year as salary to a qualified farm manager with an annual charge to owners of only M15/ha (M6/ac). For specialty crops, 5-20 hectares might be a more appropriate initial size.

Such a program of community resource management could be facilitated by government in several ways, each of which do not require exhaustive inputs of government services. First is provision of a satisfactory framework of enabling legislation. Such legislation should firmly establish the rights and responsibilities of such associations, both with respect to their members as well as the broader economy in general. Second would be the provision of special credits for purchase of tractors and related equipment, plus annual credit for operating expenses. Third would be training programs for persons involved in administering and staffing producers' associations. Fourth could be a priority for such associations in the receipt of extension services.

Jenness (n.d.) examines several forms of communal farming under experiment in Lesotho (sometime in the 1970s?). He examines both inputs of services and division of product and concludes "that the various forms of consolidation (cooperative management) which we are trying at present will provide a long-term answer for Lesotho." However, he goes on to state "greater flexibility in approach to consolidated farming operations may develop forms superior to the rather extreme type of land consolidation being tried at present."

This analysis would strongly support a much stronger role for villages in resource management. We are convinced that much of Lesotho's arable land must be shifted to the management of better farmers. National imperatives of food, income and employment leave no alternative but to increase the contribution of the nation's land base. Yet we are concerned that excessive shifts of land to energetic (and affluent) individuals could result in the emergence of a landed elite, and contribute to the spread of rural poverty. The village management alternative offers the possibility of boosting output dramatically while distributing the benefits in a socially acceptable way, thus preserving important elements of Sesotho society. Implementing such a program will require a vision, and courage, and a sustained effort in pursuit of that vision.

Dryland Cropping Potential

The Ratau Cropping Scheme provides an excellent illustration of potential productivity from improved dryland agriculture. The Scheme operated much as one would expect a village producers' association to function. Land was rented for the year from cooperating farmers for R37/ha. A farm manager was hired to supervise operations. High levels of fertilizer were applied including a mid-season top dressing with nitrogen. Chemicals were utilized for control of weeds, grasses, and all types of plant pests. Seedbed preparation and planting were accomplished with excellent results using tractor draft and related equipment. Plant populations were optimal.

Nine different fields totaling 10.2 hectares were planted to maize. Yields averaged 4,675 kg/ha, returning a net profit of R200 per hectare. Table IV-12 summarizes the costs and returns for these nine fields.

As noted in Table IV-2, 1977-78 was perhaps slightly better than average due to the adequacy and distribution in rainfall. National average yields might be some 10-12 percent lower in a completely normal year. It should be noted, however, that even if yields at Ratau had been 15 percent lower, profits would have remained respectable at R123.80/ha (R50.12/ac).

This profit margin is based on mechanical completion of nearly all field operations and includes explicit costs for rent and management. If one were to assume a village producers' association with one tractor and associated equipment, it is likely that the association could handle all of the above operations on a minimum of 50 hectares. If the results matched those of Ratau in 1977-78, except with 15 percent lower yields, the impact on the village economy would be as follows:

a.	Land rent payments, primarily to households headed by women or without farm resources except land	M1,852.50
b.	Payments to hired labor (lines 4a + 4b in Table IV-12)	M3,017.50
c.	Wage for hired farm manager(s)	M1,476.00
d.	Profits for distribution in village in pattern determined by the village	M6,188.79

The above scenario would generate the following employment needs:

1 manyear of farm manager @ M1,476.00

1,509 mandays casual employment @ M2.00 each

Table IV-12. Cost and Returns Summary, Ratau Cropping Scheme, 1977-78

COSTS	M/ac	M/ha
1. Land Rent	15.00	37.05
2. Equipment Costs		
a. Plowing	8.00	19.76
b. Discing	4.00	9.88
c. Spiking	1.00	2.47
d. Planting	4.00	9.88
e. Spray herbicide	1.00	2.47
f. Herbicide incorporation	2.00	4.94
g. Spread cutworm bait	1.00	2.47
h. Spray insecticide	1.00	2.47
i. Cultivation	4.00	9.88
j. Sidedress fertilizer	1.00	2.47
k. Harvesting	4.65	11.49
SUBTOTAL (Equipment)	31.65	78.18
3. Seed and Chemicals		
a. Seed	4.60	11.36
b. Fertilizer	30.57	75.51
c. Herbicides, pesticides	8.48	20.95
4. Labor		
a. Pre-harvest	11.95	29.52
b. Harvest	12.48	30.83
c. Farm Manager	11.95	29.52
TOTAL COST	126.68	312.90
INCOME		
Yield: 20.8 bags/ac = 4,675 kg/ha		
Price: R10.00/bag		
TOTAL RETURNS	208.00	513.76
PROFIT	81.32	200.86

Source: Hurelbrink, 1978.

Note: This tabulation excludes the lime which was applied at Ratau but subsequently found to be unnecessary. Under some conditions of soil acidity, liming may be necessary to achieve these yield levels and costs would be slightly increased.

If casual employment and profits were distributed among participating farmers in proportion to their contribution of land, the results, as viewed from the household's perspective, should be as follows:

	Per Hectare
Rental income	M 37.07
Wages received	M 60.35
Distribution of profit	M123.78
TOTAL (income/ha)	M221.20

The average field in Lesotho is 0.91 hectares (LASA, 1978, p. V-20). Therefore, on average, the participating household could look to an income of just over M200 per field for participation in a community producers' association operating as described above. This figure is 5-10 times net returns now being received.

The schedule of operations used at Ratau involved just over 30 mandays of hired labor inputs per hectare. In the interests of increasing employment, it should be possible to perform all operations numbered 2e.-j. on Table IV-12 by hand using knapsack sprayers and simple tools rather than tractor-mounted equipment. Such a decision would reduce equipment costs by M24.70 per hectare but would add another 20 mandays per hectare, which we have valued here at M2.00 each. Profits for distribution would be reduced slightly because of the higher wage bill and yields might decline by as much as 10 percent due to greater variability in application of plant protection materials. Under these more labor-intensive assumptions, the results to the household would alter as follows:

	Ratau Technology	%	Labor Intensive Adjustment	%
Rental income/ha	M 37.07	(16.8)	M 37.07	(17.8)
Wages received/ha	M 60.35	(27.3)	M100.35	(47.9)
Profits/ha	M123.78	(55.9)	M 72.42	(34.5)
TOTAL Income/ha	M221.20		M209.82	

The point to be emphasized is that management has the capacity to make two important decisions:

1) Through selective choice of technology, the proportion of the benefits accruing to various sources can be changed significantly.

2) The allocation of jobs created and the allocation of profits within the village will determine the final distribution of benefits among households. Program management thus has the ability to determine the extent to which this type of activity meets both employment and income distribution objectives.

To illustrate this point, if a village were composed largely of households having one or more fields, the village producers' association might decide to distribute all jobs, profits and rents in proportion to land contributed. They should thus use the full range of equipment as at Ratau, maximizing profits and return M221 per hectare to participants. On the other hand, if a village had a serious problem with landlessness and/or unemployment, they might accept slightly lower total profits in order to use the labor-intensive alternative. Jobs could then be reserved for the landless or unemployed and each hectare would provide roughly M100 for wages and M100 for landholders, assuming profits and rents were distributed to the latter. Alternatively, profits could be divided equally (or in some other proportion) among landholders and workers. Raising field workers' wages to M3.00 per day would still leave M59 per hectare for landholders, approximately twice what most farmers currently receive per hectare planted to maize.

One final consideration is needed. Yields per hectare achieved at Ratau were 4,675 kg/ha. Assuming that village management were to achieve 85 percent of this figure, yields would average 3,974 kg/ha, some 2,724 kg/ha higher than expected national averages under present technology. Assuming that the village households are average in size (4.3 resident members) and in food deficiency (40%), a 50-hectare program could provide enough maize to provide food grain self-sufficiency for 242 households.[1] If the village did contain 242 households (large by Lesotho standards), total arable landholdings should approximate 321 hectares.[2] The 50 hectares needed to achieve foodgrain self-sufficiency would constitute only 15.6 percent of the village's landholdings. It should be noted, however, that if the food self-sufficiency objective is pursued fully, all payments for rent, wages and profit will be made in kind, not in cash.

Innovations in Agriculture

The strategies outlined above (pp. 119-132) dealt with increasing production and incomes from traditional crops without dramatic changes in technology. The most significant modifications discussed were institutional, with the emphasis on village management of resources. The above recommendations contain a great deal of potential and are felt essential to permit broad participation. Planners must realize, however, that improvement of traditional crops will not reach all people nor will it fully meet all of the country's priority needs.

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[1] 50 hectares x 2,724 kg/ha additional production is 136,200 kg. After losses and seed use as shown in Table II-2, this results in an extra 87,237 kg of cereals cooked and ready to eat. Households of 4.3 resident members consuming 210 kg/capita but deficit by 40 percent require 361 kg/household of additional consumed grains.

[2] 242 households x .82 (the percent of landholders nationally) x 1.62 hectares/landholding household.

Specifically, traditional crops will be limited in the following respects:

a. Employment generation--while additional jobs may arise in production, marketing and processing, major expansions in production are possible using existing family labor without additional hirings. The limits to employment expansion through traditional crops, even with modernized technology, are quantified in Chapter VIII.

b. Income generation--as long as cereals prices are basically determined by the very land-extensive, mechanized farms of South Africa, they will never rise to the level that an adequate wage can be made from cereals on farms of average or smaller size in Lesotho. The analysis above showed that even using Ratau's technology, farming only begins to compete with off-farm incomes when size of holding reaches 4 hectares. Smaller farms, no matter how industrious, cannot rely on traditional crops alone for an adequate income.

c. Many "land-restricted" farms will have family labor in excess of the needs of traditional crops. Without alternatives this labor will remain under-utilized and probably poor.

Non-Traditional Crops

For these three reasons, Lesotho must look to non-traditional crops to broaden agriculture's contribution to national growth. Most important would seem to be the large untapped potential for horticultural and specialty crops, including vegetables. In addition to employment and income potentials, several additional considerations reinforce this conclusion. These are:

a. Some horticultural crops can meet specific nutritional needs. Vegetables, in particular, are in deficit supply nationally resulting in seasonal and regional nutritional disease. The potential of vegetable production for both income and employment generation is discussed in the following section on irrigation.

b. Lesotho is surrounded by an existing market (South Africa) for many of the specialty products that can be produced.

c. Some specialty crops and wild plants are indigenous to southern Africa and Lesotho and are not found elsewhere. Furthermore, Lesotho's climate is felt to provide a comparative advantage in producing certain crops.

d. Tree, vine and bush crops do not require annual plowing and are thus of considerable interest for sloping lands where other climatic factors are favorable. Many of these same crops require a period of vernalization (cold weather) for optimum yields, thus possibly giving Lesotho a comparative advantage with respect to South African producers.

e. Several of the specialty crops require acreages larger than most Sesotho farms but small enough to be efficiently operated by village cooperatives.

f. Most such specialty crops are highly labor-intensive and, by the nature of the crop, resistant to excessive mechanization.

g. Portions of the necessary marketing and processing infrastructure are already in place (e.g., Sunripe-Lesotho) and require only an organized increase in production.

The list of possible specialty crops that are known to grow well in Lesotho is extensive. Included are:

Deciduous fruits
Nut crops
Grapes, for table or raisin use
Most berries
Flowers for seed or as fresh-cut or dried flowers
Selected essential oils
Ornamentals, such as aloes
Selected spices
Grass seed crops
Vegetables, as vegetables or for seed.

With the exception of the fruits, grapes, berries and vegetables, none of the above are perishable commodities. They thus lend themselves to storage, accumulation and orderly marketing. Some fit particular ecological niches in Lesotho. In the case of others, comparative advantage would result from low labor and land costs in production. High value to weight ratios open the possibility of shipment to distant markets.

With the perishable commodities there are existing markets in South Africa and processing that could absorb additional volumes of raw produce until such time as Lesotho's production levels justified domestic processing.

Although specialty crops have been frequently recommended, only a few studies have provided estimates of net returns or labor requirements. These can be summarized as below:

Indications of Net Income: An economic analysis prepared in 1971 calculated costs and returns for fully commercial establishment of cherry plantations. Due to long maturation times plus the assumed need to pay off all accumulated loans prior to distributing profits, net returns to producers were zero until the 13th year of the program. Thereafter, very high net returns are possible, estimated to average R1,600/ha. Recognizing the need for earlier returns, similar analyses were prepared for alternative crops. Strawberries returned R67/ha in the first year followed by R605/ha in years 2-4. Raspberries returned R432/ha in the second and subsequent years (Radford, 1971). All such crops would capitalize on the existing investment in the cannery. Given trends during the 1970's in production costs and produce costs these profit margins should have remained relatively constant. As recently as 1980 asparagus was returning an average of R1,370/ha as the program is presently operated.[1]

Indications of Labor Requirement: This is one of the least adequately researched subjects in Lesotho when compared to the need for this type of data. One estimate suggests that a hectare of year long irrigated vegetables will generate one full man year of employment (Chinese Agricultural Mission, 1978). One hectare of asparagus requires approximately 350 days of harvest labor and 260 days of labor in the cannery.

Government has recognized the feasibility of fruit orchard programs. Citing annual imports of 550 tons of apples, 30 tons of pears and 10,000 young fruit trees, Government once stated its intention to establish a fruit tree industry with the dual objectives of import substitution and employment generation (MOA, 1977). Although this program was not started, the need for it has not abated but becomes more urgent with each passing year.

Lead times will be long in developing specialty crop production. Careful market analyses are necessary. Varietal testing and selection will be needed. Consistent with the philosophy of reliance on villages and individuals, suitable village organizations will have to be developed and their staffs trained in horticultural crop management. Mechanisms must be developed to sustain interest through the start-up period when costs are high and receipts low or non-existent.

All of this suggests government must be capable of mounting and sustaining a concerted program of testing and production support. Close coordination will be necessary between MOA and LNDC if the latter agency assumes responsibility for needed agri-business developments. Undoubtedly, MOA will have to strengthen its commitment of staff, organization and funding if these future options are to move forward.

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[1]Unpublished data from MOA.

Irrigation

A national program to stimulate specialty crop production will raise the question of irrigation as perhaps a necessary environmental modification. This possibility must be considered in selected cases and, indeed, much experience has already been gained in the Phutiatsana Valley and elsewhere. The need for irrigation arises from Lesotho's variable monthly rainfall pattern. While annual or seasonal rainfall may be adequate for most crops, short droughts in mid-season can be disastrous for high-value crops. And high-value crops are usually high-investment crops as well, meaning that one or two missed crops can spell financial ruin for fledgling enterprises.

There have been many experimental irrigation projects in Lesotho as well as fairly exhaustive studies of water resources (Shand, 1956; Binnie and Partners, 1972; SWECO, 1977; LASA, 1978). The general conclusion, based on the best information available to date, is that Lesotho's irrigable area is limited to no more than 16,000 hectares, and that irrigation is possible only from river or stream flows, not from ground water.

Several experimental irrigation projects have been mounted in Lesotho but their success rate has not been high. While attractive on paper, most of these efforts have failed to gather sustained farmer support. It would seem worthwhile to commission an ex-post socio-economic evaluation of both the successes and failures in Lesotho's irrigation experience in order to better design future efforts.

The potential of irrigation as a major component of Lesotho's agricultural development cannot be denied if recent estimates are accurate. The Crops Division of the Ministry has completed an analysis of profitability of irrigation applied to vegetables (MOA, 1979/80) which is summarized in Table IV-13. Each of the options is labor intensive with M618/ha being spent on wages. Most of these activities require a high cash outlay but generate incomes that would compete well with off-farm wages.

Table IV-14 presents additional data for selected vegetables and conventional field crops under irrigation. These figures differ slightly from those of Table IV-13 in that costs of handling, packaging and transport to market are included in total costs, as is a small contingency.

The Phuthiatsana and Crops Division data provide for interesting comparisons. Profitable irrigation would appear realistic for high value, perishable vegetables. Annual return on investment is high to very high. Jobs created per hectare of vegetables are several multiples of those needed for conventional field crops. Total wages paid will reflect this fact. Irrigated vegetables would thus possess

significant income multipliers throughout the village and an irrigated vegetable emphasis would also be consistent with nutritional priorities developed in Chapter II.

Among non-vegetables, the picture is not so clear. Table IV-15 contrasts irrigated versus mechanized dryland technologies. For maize, the Phuthiatsana data are compared with those from Ratau and from the CCPP. In most cases examined, the comparative advantage lies with mechanized dryland cultivation. This is true even for beans, peas and wheat where, for lack of data, national average yields were used. Certainly with modern dryland cropping technologies, the yields received will exceed those assumed for these three crops in Table IV-15. One must also question whether yields of 6 tons (66 bags) per acre are, in fact, possible on a sustained acre basis for maize and sorghum, even under irrigated conditions.

The conclusion of this brief analysis is that the role for irrigation in Lesotho is selective, and concentrated on high value commodities, not the traditional cash or foodgrain crops. But given national deficits in vegetables and fruits, seasonal and regional vitamin deficiencies, the employment crisis and the critical need for high profit cropping options for land restricted-labor abundant households, irrigation as a strategy must receive further serious attention.

Table IV-13. Comparative Costs and Returns for Irrigated Vegetable Production.

Crop	Production Cost (M/ha)	Wages (% of Cost)	Gross Returns (M/ha)	Returns Net of Cost M/ha	Returns Net of Cost % of Cost
Beets	1,450	42.6	5,738	4,288	296
Carrots	1,450	42.6	5,738	4,288	296
Onions	1,559	39.6	2,869	1,311	84
Pumpkins	1,494	41.3	2,988	1,494	100
Radish	1,484	41.6	1,614	129	9
Swiss Chard	1,460	42.3	1,614	154	11
Tomato	1,964	31.4	7,173	5,209	265

Source: MOA, 1979/80.

Table IV-14. Comparative Costs, Returns and Labor Utilization for Selected Vegetables and Field Crops Under Irrigation

Crop	Field	Processing and Marketing[a]	Total	Labor[c] (days/ha)	Gross Sales (M/ha)	Returns Net of Cost (M/ha)	Returns Net of Cost % of Cost
Asparagus (1st yr.)	868	122[b]	990	100	1,375	385	39
Asparagus (2nd yr.)	1,034	176[b]	1,210	200	2,750	1,540	127
Asparagus (Mature)	1,100	200[b]	1,300	240	3,300	2,000	154
Beans	549	91	640	12 + 5	800	160	25
Cabbage (Summer)	1,142	798	1,940	80 + 20	3,150	1,210	62
Cabbage (Winter)	1,051	699	1,750	60 + 20	280	1,050	60
Lucerne	815	95	910	20 + 5	1,400	490	54
Maize	582	208	790	20 + 5	870	80	10
Peas	485	105	590	10 + 5	900	310	53
Potato	1,630	850	2,480	50 + 30	3,360	880	35
Sorghum	501	129	630	5 + 5	660	30	5
Wheat	477	143	620	0 + 5	840	220	35

[a]Includes a contingency factor of approximately 10% of actual costs.

[b]Only minimal processing costs included to prepare crop for pick-up by cannery.

[c]Mandays given (e.g., 12 + 5 for beans) are field labor and processing/marketing labor which cost M1.50 and M2.00 per day respectively.

Source: MOA, 1979b.

Table IV-15. Comparative Production Costs: Irrigated Versus Mechanized Dryland.

Crop	Production and Marketing Costs		Irrig. as % of Dryland	Yields (Kg/ha)		Irrig. as % of Dryland
	Irrig.	Dryland		Irrig.	Dryland	
Maize[a]	790	336	235	6000[c]	2200	273
Maize[b]	790	313	252	6000[c]	4675	128
Sorghum[a]	630	336	188	6000[c]	2200	273
Beans	640	209	306	1200	615	195
Peas	590	184	321	2000	997	201
Wheat	620	172	360	3500	1164	301

[a]Dryland costs for technology used by CCPP.

[b]Dryland costs for technology used at Ratau and reported in Table IV-12.

[c]Sustained yields at this level are considered highly doubtful on anything but very selected areas.

The question of irrigation raises interesting technological choice issues. Most of Lesotho's experimentation has utilized pressure pipe and sprinkler technology while little comparative analysis has been done with gravity flow and "trickle" alternatives.

Among the potential drawbacks of pressurized sprinkler systems are the following: Irrigation will probably never be extensive enough in Lesotho to justify a domestic equipment manufacturing industry. Therefore, sprinkler technology creates a permanent dependence on South Africa for all equipment, parts and supplies. Coupling this system with petrol or diesel pumps to lift water and maintain pressure increases the need for costly imported fuel. Sprinkler systems represent a high level of mechanical technology, one quite possibly beyond the maintenance capacity of village organizations or individual farmers. Finally, the technology is very capital-intensive, thus raising per acre costs substantially. In this situation costs can be recovered and a profit realized only if nearly everything else in the production system functions very well. In other words, the principal irrigation method tried to date is a high-cost, high-risk system.

What is surprising is that less sophisticated systems have not received more extensive trials. While soils and slope conditions create serious obstacles to gravity flow systems, it seems possible to define at least some combinations of circumstances under which these systems might be feasible. Similarly for some pressure needs, differences in elevation between storage reservoir and irrigated area could suffice, replacing the need for pump-driven water pressure. Lesotho averages a very high 70 percent of available sunshine (Wilken, 1978). Solar-powered pumps have been developed in the United States, proved in developing countries, and could be available for testing in Lesotho through USAID.

Finally, perhaps the most appropriate technology for Lesotho's conditions, especially in conjunction with horticultural crops, is trickle irrigation, which has not yet been fully tested. Trickle irrigation consists of a water source and a series of hoses and/or pipes conveying precious water to individual plants (such as fruit trees, berry bushes) or rows of plants (vegetables) where it is released at very low rates to meet the plant's consumptive use. A single system will not handle large acreages. But then Lesotho's topography and much fractionated system of catchments and sub-catchments strongly suggest that the appropriate strategy is one of multiple small systems rather than fewer large irrigation works. Small systems known as "tank irrigation" are one of the fastest growing dimensions of irrigation in India and have proved viable as village-level alternatives to large government-operated schemes. Given the resources available to Lesotho and the special needs of agricultural development, an "appropriate" irrigation technology would seem to be a small hand-dug reservoir, filled by diverted stream flows or a solar powered pump and delivering carefully controlled water supplies through hoses to individual fruit trees in orchards planted on hillsides too steep to permit cultivation, the whole operation managed by a village producers' association. Such a program would be very novel in Lesotho in that it differs from standard practice in almost all dimensions. Yet it seems to capture high potential for significant contributions to most development objectives now facing agriculture.

Supportive Land Use Policies

The Land Act, 1979, offers several possibilities for integrating land use policy with programs development of the crops sector. One of the deciding factors in ultimate success is the extent to which the Ministries of Agriculture and Interior can interact to jointly create the land use institutions needed to encourage modernization of farming. Possible uses of the Land Act which deserve attention now are:

a. Associating the leasing provisions of the Act with those villages which seek to form producers' associations for the

utilization of improved technology either with traditional or specialty crops. This could be done by assigning priority to such a village area for receipt of all government services (survey, organization, registration, etc.) that must be completed before leasing becomes an effective reality.

b. Early implementation of the leasing provision in areas characterized by large numbers of resource-poor households or extensive fallow areas.

c. Identify selected specialty crops programs as one of the specific uses of the Special Agricultural Areas provisions. Then utilize these provisions of the Act for establishing orchards, related irrigation and land improvement works, exclosing livestock and other needed changes.

d. Develop an extension and public awareness campaign stressing both the private and national benefits to be had from leasing. Give emphasis to leasing arrangements that provide for equitable distribution of these benefits along patterns consistent with Sesotho culture.

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CHAPTER V

LIVESTOCK AND PASTURES: LESOTHO'S UNIQUE SUBSECTOR

The livestock subsector including range management has received considerable research attention in recent years. Six significant analyses have appeared since 1978. The first is a partial review of existing literature prepared by the Lesotho Agricultural Sector Analysis Project (LASA, 1978). The second is a detailed set of recommendations for livestock development in the Phuthiatsana River Valley (Binnie and Partners, 1978). The significance of this report is that it contains data from a sample of 14,500 animals in the area. The recommendations based on this sample are well developed.

The most thorough volume is the work of Dr. D. R. Phororo, former Permanent Secretary of Agriculture. His writing is in response to a Cabinet Directive of 24 October 1978 calling for a "policy paper intending to revolutionize the whole agricultural system in Lesotho." Phororo drew on his 15 years in the MOA, most of which was in the Livestock Division, plus his professional specialization in veterinary medicine and livestock systems to produce the most comprehensive analysis to date (Phororo, 1979).

In 1979 the World Bank commissioned an Agricultural Sector Review in an attempt to find more effective means of assisting Lesotho's agricultural development. Their report (World Bank, 1980) became the technical basis for an agricultural donor's conference in October 1980. Two other analyses dealing with livestock were prepared for this conference. A Multi-Donor Mission examined policy and organizational needs for agricultural growth (MDM, 1980). And a team of FAO livestock specialists developed very detailed proposals for modernizing the livestock industry (FAO, 1980).

Given this wealth of information and recommendations, there is limited new material that can be added by the present chapter. Our purpose, then, is to organize the available material and bring it selectively to bear on an appropriate strategy for livestock development. A few information gaps are filled. However, the major thrust of what follows is to expand the range of considerations influencing livestock development. In so doing certain emphases appear which have not previously received much attention. Finally the many existing recommendations are compared for their internal consistency and for their ability to meet all major national and sectoral objectives.

The Setting for a Livestock Development Strategy

The livestock-pasture sector can contribute significantly to the major national development objectives of employment, income growth, income distribution, self-sufficiency and nutritional improvement. However, the particular characteristics of the livestock sector result in developmental roles which differ in important aspects from those expected of the crops sector. First, livestock, as productive assets, are not as widely distributed as is land. At least half the rural population will not receive direct benefits from livestock improvement programs. Second, and conversely, livestock production has potentially much stronger forward and backward linkages to related enterprises than does field crop production. Rapid change in livestock productivity and output could, therefore, stimulate much higher employment generation. Third, livestock are deeply imbedded in the culture and social mores of Lesotho. This provides additional factors, not present with crops, which bear on, and often constrain, programs of change. Fourth, livestock husbandry in Lesotho is inextricably intermixed with management and use of range resources. Given that land tenure practices treat pasture and arable land differently, the institutional setting for change differs between the two. Specifically the communal nature of pasture use rights presents additional complications to development planners dealing with livestock programs.

The analysis and recommendations below are developed within the same general philosophy applied to cropping above. That is we seek the means by which large scale participation in growth is possible. To do so requires strategies based on the resources and skills of multiple groups and larger numbers of farmers. Furthermore, significant roles for village decision making and enterprise are sought in association with livestock systems. Finally, it is felt that government must seek indirect methods of stimulating improved livestock and pasture management systems as a cost effective alternative to direct government delivery systems.

Livestock Numbers and Trends During the 1970s

An examination of the size and composition of the national herd provides a useful starting point for livestock analyses. Livestock numbers have been estimated for odd-numbered years since 1935 by the Department of Agriculture. Total large stock units (LSUs) averaged 797,000 from 1935 to 1969.[1] A low figure of 692,000 was recorded in

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[1] Large stock units represent a conversion of various types of livestock to standard units based on grazing demand. Conversion factors are: cattle-0.8, horses-0.7, donkeys-0.5, sheep and goats-0.2.

1935 following the disasterous drought of 1933/34 and a high of 916,250 occurred in 1947 (LASA, 1978, p. VII-5). Livestock numbers (in LSUs) have thus remained relatively constant for several decades prior to the 1970s (World Bank, 1980).

In 1970 livestock were enumerated in the agricultural census which involved a radical change in method of measurement. Previous estimates were based on counts at dip tanks. The census relied on stratified random sampling with nationwide coverage. Since 1973 annual statistics have been developed using the census methodology. Comparable methodology was also used in the agricultural census of 1960/61.

The difference is important because of the inconsistency in the data that appears between the two methods. Table V-1 presents selected years for comparison. When the present methodology was first used in 1960 the results showed fully 31 percent more LSUs than the average of estimates based on the dip tank count for years immediately before and after the census. Partially because of this inconsistency the livestock chapter (Agricultural Department, 1963) of the 1960 census was never officially released. Again in 1970, the census methods resulted in 34 percent greater LSUs than dip tank estimates made in 1969. In both censuses significantly higher figures were recorded for all classes of stock.

Clearly the two statistical series are inconsistent with each other and cannot be combined without adjustment. The present census methods utilize a well developed statistical methodology, were found accurate with respect to crops data in the previous chapter and undoubtedly are the more accurate of the two series of livestock figures. Dip tank data have historically underestimated livestock numbers by some 25 percent.

Consequently Lesotho has historically carried approximately one million LSUs on its range and pastures. Stocking at this level continued into the mid-1970s. In the last five years, a significant decline in numbers has occurred, concentrated in sheep and goats. One consequence has been a significant shift in composition by species of the national herd. With small stock declining and cattle increasing slowly, cattle now account for 51 percent of total LSUs, considerably above the historic average of 39 percent which prevailed with some variation through 1975.[1] Several implications of this transition are developed below.

As with crops the principal factor affecting Lesotho's livestock activities during the 1970s was the mid-decade increase in off-farm wage earnings, especially the mine wage increase. One of the more

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[1]This comparison assumes that the older data uniformly under-reported all species. It is also possible that by counting at dip tanks sheep and goats were better enumerated than cattle and the cattle percentage historically could have exceeded 39 percent.

important consequences was the reversal of Lesotho's historic role as a net exporter of livestock. Table V-2 presents relevant data.

The trade balance shifted abruptly in 1975 when cattle imports hit an historic high, fueled by new purchasing power from rapidly escalating off-farm earnings. The trend continued, reinforced by a similar pattern in small stock beginning in 1977. By the end of the decade Lesotho was a net importer of nearly 100,000 live animals per year.

Table V-1. Livestock Numbers in Lesotho.

(Thousands)

Year	Cattle	Sheep	Goats	Horses	Other Equines	LSU[a]
1935-1969 Aver.[b]	397	1,437	586	90	24	797
1959	388	1,301	594	85	60	779
1960	546	1,466	672	135	104	1,011
1961	377	1,227	632	89	57	764
1969	393	1,438	632	88	46	814
1970	552	1,655	974	110	94	1,091
1973/74	466	1,557	962	114	106	1,006
1974/75	512	1,577	886	115	104	1,035
1975/76	502	1,520	835	100	93	989
1976/77	486	1,128	618	104	89	855
1977/78	526	943	582	104	86	842
1978/79	560	974	618	102	88	882
1979/80						

[a]Large Stock Units computed by cattle x 0.8, sheep and goats x 0.2, horses x 0.7, other equines x 0.5.

[b]Excluding data from 1960 Agricultural Census. These early years plus 1959, 1961 and 1969 are based on dip tank counts while all other table entries are based on agricultural censuses or annual surveys.

Sources: odd years through 1969 from LASA, 1978; 1973/74-1977/78 from BOS, 1980; 1960 from Agricultural Department, 1963 and 1978/79 from IMF, 1980.

Table V-2. Imports and Exports of Livestock from Lesotho (live animals).

Calendar Year	Cattle			Equines			Sheep and Goats			Net Total	
	Imports	Exports	Net	Imports	Exports	Net	Imports	Exports	Net	Actual	LSU[a]
1970	4,730	11,408	- 6,678	4,287	29	4,158	12,862	16,143	- 3,281	- 5,801	- 3,088
1971	6,869	8,656	- 1,787	4,842	67	4,775	16,253	10,867	5,386	8,374	2,990
1972	5,028	8,918	- 3,890	1,966	80	1,886	6,326	31,766	-25,440	-27,444	- 6,880
1973	4,067	12,894	- 8,827	2,867	132	2,735	3,691	31,211	-27,520	-33,612	-10,651
1974	3,046	9,225	- 6,179	502	120	382	3,205	19,141	-15,936	-21,733	- 7,863
1975	31,756	3,503	28,253	1,752	-	1,752	6,365	7,035	- 670	29,335	23,695
1976	33,821	1,250	32,571	2,086	-	2,086	9,236	2,267	6,969	41,626	28,911
1977	47,673	1,223	46,450	2,446	-	2,446	17,698	533	17,165	66,061	42,305
1978	57,787	592	57,195	4,569	-	4,569	36,361	486	35,875	97,639	56,129
1979	50,133	793	49,340	2,932	-	2,932	44,051	402	43,649	95,921	50,254

[a]Large stock units (LSU) calculated using following conversions: bovines = 0.8, equines = 0.7, small stock = 0.2.

Source: Livestock Division, Ministry of Agriculture.

One is left with the conclusion that the mine wage increase generated a fundamental shift in livestock trade for Lesotho similar in scope to the apparently permanent reduction in cropped acreage. By 1977 exports had dropped to inconsequentially small numbers as the trade balance shifted to imports.

The question of the destination of these massive imports requires explanation. From 1975 through 1979 Lesotho imported a net total of 330,600 live animals. Concurrently national statistics showed a decline in total numbers, comprised of a small growth in cattle and a large decline in small stock. Increased mortality among imported, unacclimated animals has been suggested as an explanation for this dichotomy. While it is accepted that imported animals suffer in Lesotho's harsher environment, death loss can only explain a small portion of the discrepancy.

A more plausible explanation is that meat consumption has risen sharply in response to higher incomes. Meat invariably has a relatively high income elasticity as shown in the nutrition chapter. That meat consumption may have increased markedly is supported by the fact that the quantity of slaughtered meat imported increased 359 percent in three years, 1973-1976. While this latter phenomenon reflects a demand particularly concentrated in Lowland urban areas, it is probable that meat consumption rose in rural areas as well, drawn from domestic slaughter.

Basotho prefer to consume sheep and goats while they hold cattle as their store of wealth. This simple difference provides an explanation of the different trends in small stock and cattle. Faced with a sudden increase in their income, Basotho increased their consumption of meat, drawing down the small stock population. Simultaneously they increased their savings held in the form of cattle. That the cattle herd did not grow to match cattle imports is evidence that consumption of beef rose as well. These conclusions are reinforced by detailed data from the Livestock Division. Actual counts of imports during 1979 show that 83 percent of cattle were imported for inclusion in resident herds while 99 percent of all small stock imports were for slaughter.

The Phuthiatsana sample found that of all cattle purchases, 73 percent were female and nearly half of these were heifer calves (Binnie and Partners, Appendix 4, p. 8). In addition, Basotho stockmen generally sell or slaughter older animals (Phororo, 1979, p. 28). These two influences acting together should have lowered the average age of the nation's herd, shifted the sex balance somewhat toward females and eliminated a portion of the older, unproductive stock. The overall mix should thus have become more productive. One caution, however. The increase in females, especially heifer calves, provides the basis for rapid population growth in the near future. The number of calves

born annually could rise significantly, at a time when climatic oscillations will probably depress range productivity. An increase in mortality is thus a realistic possibility in the near term.

Rapid changes in livestock numbers during the 1970s had differential impacts on the various species and on the different ecological zones. Tables V-3 and V-4 provide detailed tabulations using 1977/78, the year of lowest animal numbers for comparison. Numbers of all species have risen somewhat since then.

The decline in small stock numbers plus near constancy in cattle changed the percentage composition of the herd in all ecological zones, except the foothills which remained essentially constant. By 1977/78, for the first time in recorded history, cattle exceeded 25 percent of the ruminant population and 50 percent of the total grazing pressure as measured in LSUs.

The differing trends are shown dramatically in Table V-4. In the foothills zone, not only was the smallest reduction recorded but it was spread fairly uniformly over the ruminant species. The Lowlands experienced a 38 percent decline overall, but with the reduction concentrated in small stock. More remote regions, the Mountain and Orange River Valley zones, experienced similar overall declines while increasing their cattle populations. This phenomenon probably reflects the growth in human populations and villages in these areas which continued a long term trend toward diversified use of higher elevations and away from their fairly exclusive use for grazing.

Sheep, goats and cattle graze different grass and shrub species. Bawden and Carroll (1968) have identified several range ecotypes within Lesotho that are considered most suitable for either cattle or small stock, but not both. Taking elevations of 1830 and 2240 meters (6000 and 8000 feet) as the approximate upper boundaries of the Lowland and Foothill zones respectively (Douglas and Tennant, 1952), one can make rough judgments about recent shifts in grazing pressure. In the Foothills (ca. 1830-2240 m.) grazing pressure declined by some 20 percent during the 1970s with no change in selectivity among the various forage and browse species. Below 1830 m. grazing by cattle declined by 15 percent while grazing small stock dropped by at least 45 percent. If grazing pressure is measured by LSU equivalents, it declined 28 percent in the Lowlands. However, those range species selectively grazed by cattle were spared less than those consumed by small stock. In the mountains LSUs dropped by 26 percent, however, grazing by cattle increased nearly 20 percent. The result should have been a significant change in the type of grazing as measured by the forage and browse species receiving the greatest pressure.

To summarize, Lesotho enters the 1980s with the following setting in livestock. Small stock numbers stand at 60-65 percent of levels

Table V-3. Livestock Numbers and Changes in Composition of Herd, 1969/70 to 1977/78.

Ecological Zone		Cattle	Sheep	Goats	Total
		1969/70			
Lowlands	No.	191,557	345,917	241,934	779,408
	%	24.6	44.4	31.0	100.0
Foothills	No.	165,636	216,819	237,910	620,365
	%	26.7	35.0	38.4	100.0
Mountains	No.	151,206	960,557	366,149	1,147,912
	%	10.2	65.0	24.8	100.0
Orange River Valley	No.	43,121	131,835	127,774	302,730
	%	14.2	43.5	42.2	100.0
Total	No.	551,520	1,655,128	973,767	3,180,415
	%	17.3	52.0	30.6	100.0
		1977/78			
Lowlands	No.	162,288	187,711	134,821	484,820
	%	33.5	38.7	27.8	100.0
Foothills	No.	132,818	164,185	185,443	482,446
	%	27.5	34.0	38.4	100.0
Mountains	No.	179,297	513,605	190,947	883,849
	%	20.3	58.1	21.6	100.0
Orange River Valley	No.	51,778	77,332	71,288	200,398
	%	25.8	38.6	35.6	100.0
Total	No.	526,181	942,833	582,499	2,051,513
	%	25.6	45.9	28.4	100.0

Sources: 1969/70 from BOS, 1972.
1977/78 from BOS, 1980.

Table V-4. 1977/78 Livestock Populations as a Percentage of 1969/70, by Species and Zone

Zone	Cattle	Sheep	Goats	Total
Lowlands	84.7	54.3	55.7	62.2
Foothills	80.2	75.7	77.9	77.8
Mountains	118.6	53.5	52.2	59.8
Orange River Valley	120.1	58.7	55.8	66.2
Total	95.4	57.0	59.8	64.5

Source: Calculated from Table V-3.

measured in 1970; an estimated reduction of over one million animals. Lesotho's wool and mohair industry must have declined accordingly as a source of both national and household incomes. Cattle numbers are at, or near historic highs. The shift in herd composition suggests that over the last decade livestock have come to play a larger savings role and a smaller role for providing recurrent incomes. Grazing pressure has been reduced especially in those areas primarily grazed by sheep and goats. However, numbers and percentages of cattle in the Mountains and the Orange River Valley have increased significantly and probably permanently.

One reason for identifying these major trends and adjustments is to emphasize the flexibility livestock holders apparently have in response to economic incentives. It would appear that government has the capacity to alter herd size and composition within limits through the use of indirect incentives. Therefore a choice exists between small stock and large stock programs. Each will impact target groups and regions differently. Care in selecting a balanced program will be essential to ensure a maximum contribution to development from the livestock sector. Finally, it would seem that the present period of reduced grazing pressure would be an opportune time to step up efforts of range restoration.[1]

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[1]Note that we have not discussed other livestock species in this section. For the years 1960/61 to 1978/79 for which data are available, there was essentially no change in numbers of pigs, the total number of chickens grew 5 percent (0.2%/yr.) and the number of horses is shown in Table V-1.

Distribution of Ownership

The structure of asset ownership is important in determining who will benefit from development efforts based on increased productivity of assets. In the present context planners must ask whether livestock improvement programs will benefit small or large numbers of farmers, whether livestock programs can benefit groups who receive little income from crops and what the regional impacts of various types of livestock programs will be. This section examines several associations between livestock ownership and other factors that affect these questions.

Research by the ILO has examined the distributions of land and livestock separately, finding livestock much less equitably distributed than land. Gini coefficients were presented in Chapter III confirming this comparison. Part of the severity of concentration of livestock ownership results from the fact that significant numbers of rural households do not own animals. Table III-1 estimates that half of the 1980 rural households own no stock. This proportion has held constant since the 1970 Census of Agriculture. However, foreseeable trends suggest that by the year 2000, only just over 30 percent of the rural households will own stock. If the nation embarks on a significant stock reduction program, that percentage could be even smaller.

Table V-5 presents additional details drawn from 1970 data. Even among livestock owning households, actual animal numbers are concentrated into relatively few hands. The situation is particularly noticeable in sheep and goats where half of the national flock is owned by 2.1 and 3.8 percent of the farm households respectively. Programs to improve small stock productivity may be important sources of export earnings and national income but planners must realize that at the farm level the benefits will be very highly concentrated. As presently distributed, small stock cannot be a vehicle for significant improvement in rural income distribution except as they create off-farm jobs in marketing and processing industries. The situation is only slightly better in the case of cattle.

An alternative planning perspective is the view that given these concentrations there are at least a number of owners with herds or flocks large enough that they might be considered commercially viable. These larger holdings could be looked to as potential adopters of modern technology. If their output of livestock and livestock products could be increased, it is these larger operations that will be able to contribute to employment and incomes in secondary industry. However, these larger holders are not necessarily those with the highest interest in modern livestock husbandry. It is felt that their interest could be stimulated with proper incentives. But for the present, there is a problem in that the bulk of the range resource is utilized

by large herd owners who are not commercially motivated. Soliciting their interest is important. When less than 10,000 households (5%) control 60-70 percent of the small stock, their active commercial participation is essential to any successful wool, mohair or small stock fattening program.

Table V-5. Livestock Distributions Among Farm Households, 1970.

	Cattle	Sheep	Goats
Farm households with:	93,669	54,289	54,353
Percent of total farm households with:	50	29	29
Percent of farm households without:	50	71	71
Percent of national herd/flock held by specified percent of total farm households[a]			
largest 2% (3,748 H.H.) owns:	16.8	45.4	33.9
largest 5% (9,371 H.H.) owns:	31.8	69.4	57.7
largest 10% (18,742 H.H.) owns:	47.5	84.1	77.8
largest 20% (37,484 H.H.) owns:	71.5	95.1	91.8
largest 30% (56,226 H.H.) owns:	81.0	100.0	100.0
Percent of farm households owning half of national herd/flock	10.9	2.1	3.8
(Number of Households)	(20,429)	(3,936)	(7,121)

[a]"Largest" defined by households owning largest flocks or herds of specified animals. For example, of 187,421 farm households, the "largest 10%" are those 18,742 households with the largest holdings of cattle, sheep or goats.

Source: Calculated from BOS, 1972.

Social Factors That Spread Livestock Wealth

The analyst that stops with a description of the distribution of ownership per se, stops short of an accurate description of the meaning of livestock to the rural economy.

> It cannot be denied that domesticated animals hold a special place in the Basotho culture. There is a blending of uses and purposes to holding livestock, part economic and part

> social, and herein lies an important concept which developmental policies must contend with. To presume a western standard of incentives--production and economic rationalism--as somehow embedded in and negating the social function which livestock fulfill, is an error. (Phororo, 1979, p. 16.)

Phororo continues to say that livestock, as found in the Basotho culture, permit "reciprocity, sharing and redistribution of the benefits and burdens of agrarian life." "...the function of livestock must be interpreted in terms of particular roles which different animals play in the social environment of community responsibility." He then proceeds to detail several ways in which livestock form an integrative component of society. In addition to reinforcing networks of social relations and responsibilities, all of them redistribute the output of livestock in patterns that differ from those indicated by ownership alone. Major redistributive activities are summarized below with a brief analysis of their development implications.

Sharecropping

Analysis in Chapter III shows that nearly half of Lesotho's landholding households do not own livestock and an additional 16 percent have cattle but no yokes or plows with which to use them for tilling the soil. The common traditional solution is sharecropping in which plowing and planting are provided by someone from outside the immediate household. Payment is generally a portion of the crop although alternative payment methods (e.g., use of a spare field) are sometimes found.

Sharecropping in Lesotho has been studied periodically. Sheddick (1954) provides an anthropological perspective of sharecropping as it relates to land tenure. Judy Gay (1980) completed a detailed study of women's activities including sharecropping by female headed households in a village near Mohale's Hoek. Perhaps the best analysis on a national basis was contained in the 1960 Agricultural Census (Agricultural Department, 1963, Part 5). Some data were collected in the 1970 census (BOS, 1972) but no analysis is included and the data are difficult to interpret.

In 1960, 18 percent of landholders reported sharecropping on their lands. This figure had declined to a reported 13 percent by 1970. Lack of oxen and lack of seed were the dominant reasons for sharecropping in 1960. By 1970 this pattern had broadened with labor being the most commonly supplied item (89% of cases), followed closely by farm equipment and oxen (84% and 81%) with seed being the least common (69%). In 1960 more than 85 percent of the sharecropping arrangements split the produce into equal shares. Unfortunately this tabulation has not since been repeated. An alternative form of sharecropping,

believed to be growing in popularity, involves the sharecropping partner plowing and planting one field for the landholder in return for one season's private use of a second field.

From a development perspective, sharecropping permits some landholding households to farm despite their lack of tillage power, seed or labor. The services of livestock are extended beyond the farms of their owners. Morojele presents a balanced picture of landholder and partner meeting each other's need. Those with inadequate land seek to expand their land base through sharecropping and those with adequate or surplus land but requiring draft animals or implements effectively meet these needs (Agricultural Department, 1963, Part 5). Looking to the future, the more important dimension is probably the ability of livestock owners to expand their de facto landholdings through sharecropping. While the tenure system places some limits on the ability to accumulate land, there are no similar restrictions on cattle accumulations. Therefore, cattle ownership has represented a feasible means of bypassing the egalitarian provisions of the Laws of Lerotholi as they have governed actual land use.

Finally, as it does the world over, sharecropping acts to reduce incentives to invest in modern farm inputs, especially the longer term types of investments. Dividing the crop reduces the return expected by whichever party considers purchase of a new input.

Bohali

Traditionally, marrigage in Lesotho involves transferring livestock from the groom to the family of the bride. Marriages are not fully legitimized until payment of an agreed minimum number has been completed. Data from Thaba Tseka quoted by Phororo indicate that bohali payments are quite extensive. During the sample year (1975) some 22 percent of all households in the sample area made bohali payments. Contrary to popular belief, sheep, not cattle, constituted the most common animal given. This may, however, reflect the mix of animals available at Thaba Tseka's mountain location. In total, averaged for the entire population of the sample, an average of .65 LSUs per household per year were given as bohali, or three LSUs per household actually making payments during the year.

Bohali transfers are transfers of ownership and the current status at any point in time should be reflected by livestock ownership statistics. Normally the groom purchases bohali stock with cash derived from off-farm incomes. Consequently, in this case livestock become a vehicle for income transfer from an income earner to households with daughters.

Mafisa

Another traditional institution among Basotho, and the one which most directly alters the pattern of livestock use rights, is the practice of loaning cattle. Under mafisa cattle owned by one individual are held on loan and used by another. The borrower receives tillage draft and milk. Wool, mohair, young stock born and the hides of animals that die usually belong to the owner.

Independent estimates made in the mountains and lowlands in the mid-1970s both identified that approximately 20 percent of farm households managed mafisa livestock and that some 15 percent of the national herd was on loan under such an arrangement. This participation level differs slightly from that measured in 1960 when 22-25 percent of the households participated but with less than 12 percent of the nations ruminant animals.

Foreigners to Basotho culture tend to view mafisa narrowly as a means by which the owners of large herds obtain command over a disproportionate share of the nation's communal range resource. In contrast, the Mosotho views mafisa as a means of helping others or as a necessity to solve a labor constraint within one's household. One must add that mafisa offers a wider distribution of tillage power and raises milk consumption, especially among poor households. The latter is significant particularly with respect to nonfarm rural households, one-fourth of which manage grazing stock on loan.

Ceremonial Slaughter

The slaughter of stock for various ceremonial purposes provides another instance of redistribution of livestock products or services. Data from Thaba Tseka suggest that different types of stock are slaughtered for quite different purposes. Eighty-five percent of the sheep and goats slaughtered are directly for home consumption and thus do not represent a redistribution outside of the household. Conversely, of cattle slaughtered, 52 percent were for use at funerals and 26 percent at weddings. Thus eight out of ten cattle slaughtered, at least in Thaba Tseka project area, are for ceremonies at which the meat is distributed widely throughout the community. Village slaughter thus results in meat consumption patterns that differ from livestock ownership patterns in the case of cattle. With small stock the two distributions are very parallel.

Social Roles and Development

Phororo makes a persuasive case that it is extremely difficult for a non-Mosotho to fully understand livestock within the Sesotho culture.

He sees the complex of man-animal-pasture relationships as "contributing significantly to the survival of the Basotho as a nation in that the society's cohesiveness and its members' sense of responsibility to the community have always been maintained and promoted."

There are also the occasional detrimental aspects. The social requirement for bohali leads to the importation of low quality animals or the transfer of cull animals. Sharecropping, as mentioned, leads to reduced incentives to purchase modern imports. Phororo summarizes the complexity of the situation with the following:

> The development implications of socioeconomic factors related to livestock farming are considerably challenging. The impact of socioeconomic factors is illustrated by the way in which the cattle (traditional) industry has virtually remained static since the turn of the century, despite the continuing efforts to commercialize it.

Phororo's articulate advice: "There is a great requirement for developers to understand and appreciate the interplay of factors in livestock owning and proceed with developments that will be consistent with the understanding and perception of the society." This, however, will be a difficult maxim to follow. Modernization will provide strong incentives for farmers to manage their stock for individual gain and to gradually slight social and distributive aspects. If productivity of livestock, in an income producing sense, is to be increased as a development goal there will be a natural tendency for livestock owners to become more commercial in their orientation and management practices. Diminution of the importance of the social roles of livestock will be inevitable. Planners must recognize this and, rather than cling to a system that has "virtually remained static," proceed with development while taking pains to cushion the adjustment for those households who are presently dependent on the distributions embodied in livestock's social roles.

Population Dynamics

It is extremely difficult to come to definite conclusions regarding the population parameters governing Lesotho's livestock herds. During recent years for which annual data are available, the livestock sector has been in the process of rapid adjustments to major changes in incentives. Historic relationships have been completely disrupted. Unprecedented increases in imports have been offset by dramatic increases in off take, presumably for consumption. With annual imports toward the end of the 1970s equaling ten percent of the herd, "the herd structure is no longer the product of its internal mechanisms of reproduction, maturation and mortality, but is artificial and probably

temporary," (Binnie and Partners, Appendix 4, p. 8). Various estimates of one or another population parameter exist but they reflect different points in the recent upheaval, different climatic years and other sources of variation. The data below are presented with these qualifications. They are very rough approximations, but must serve until events in the livestock sector normalize and better data can be had.

Management of Herd Size

Historically, Lesotho's livestock herds have shown the influence, directly or indirectly, of ecological influences. Poor climatic years can increase mortality, very sharply in the case of goats, while favorable climate permits a growth in numbers. Livestock farmers have adjusted their herd size through exports or imports in relation to perceived climatic events. The "quasi-20 year" rainfall oscillation (see pp. 9-11) has been mirrored in the net trade pattern for animals, especially cattle. Some two or three years after the onset of a below normal rainfall period the balance of cattle trade has generally shifted to net exports. Once the climatic oscillation reverses, and with the same lag, the balance usually shifts to net imports as the range improves to the point where it can carry an increased population. This observation implies that stock owners are sensitive to carrying capacity, albeit within the matrix of all management factors they consider. While total stock numbers are considered too high by scientists, the Mosotho stock owner apparently chooses the stocking level and adjusts it up or down as range conditions permit.

This finding conflicts sharply with the interpretation offered by Binnie and Partners (1978, Appendix 4). Among their conclusions are: "Under present conditions PRV (Phuthiatsana River Valley) herds are not naturally viable units ...", "The PRV, in common with the rest of Lesotho, has been sustaining its (cattle) herd for decades with imported cattle ...". This perspective leads to the conclusion that animal mortality is a strong inducement to further imports. The suggested cure is to improve management so that mortality declines, which will in turn induce farmers to "invest available funds in one's present herd or flock, rather than by inexpensive and often poorly adapted animals from RSA".

By contrast, this analysis concludes that stockmen do not always import, but adjust their livestock transactions to maintain a desired combination of numbers, quality and output. If stock numbers are considered too high, then the program approach must be to elevate the quality and output (income) dimensions as priorities in the stockman's thinking, which would allow him to de-emphasize animal numbers as the object of maximization. We return to this thought in a subsequent section of this chapter.

Livestock Population Parameters

Phororo (1979, pp. 25-29) reviews evidence from several sources concerning those factors influencing size and structure of livestock herds. Among the most critical is the calving or lambing percentage, a figure that shows the number of liveborn young per mature female in the herd.

The first parameter indicates the statistical diversity faced by the livestock analyst. Calving/lambing/kidding rates are given below from three sources.

	Cattle	Sheep	Goats
Jensen, 1976	60	71	68
Binnie & Partners, 1978	50	65	57
BOS, 1972	28	30	30

Figures reported by Jensen reflect the mountain herd at Thaba Tseka in 1976 which had exceptionally favorable rainfall. Binnie and Partners' data came from the Phuthiatsana River Valley in 1978. Their original report suggests that their estimates reflect a climatically optimum year, rather than a long run optimum. On the other hand, the 1969/70 agricultural census was conducted during a severe drought and livestock reproductivity should have been depressed accordingly. A long term national average figure probably lies between these extremes.

Table V-6 develops selected parameters for the cattle herd in the middle of the last decade. The table uses a 40 percent calving rate as a conservative assumption.

These calculations illustrate several points. First, the percent of females in the national herd is rising, as was suggested by the PRV import data cited earlier. Second, imports have risen from 1-2 percent of the herd to 10-11 percent. The age, sex and condition of imports, therefore, is now a significant factor in determining these characteristics in the overall herd. Exports have dropped to inconsequential levels, leaving all off take to mortality and slaughter. Fourth, in the face of a relatively constant herd size, off take has more than doubled. Unfortunately no basis exists for apportioning the total disappearance among slaughter and mortality. Farmers have mentioned higher mortality among imported animals. Simultaneously, rainfall was above normal during the 1970s, so that excessive mortality among domestic animals probably did not occur. Note that the balance between mortality and slaughter may change, perhaps significantly, when Lesotho enters a below normal rainfall period.

Table V-6. Cattle Demography: Selected National Statistics.
(Numbers Given in Thousands)

Item	73/74	74/75	75/76	76/77	77/78	78/79
Herd size[a]	466	512	502	486	526	560
Net change		+46	-10	-16	+40	+34
Adult females[b]						
Number	196	214	220	209	238	333
% of herd	42.1	41.8	43.8	43.0	45.2	59.6
Birth rate (calves/cow)[c]	.4	.4	.4	.4	.4	.4
Calves born	78	86	88	84	95	133
		(18.4)	(17.2)	(16.7)	(19.6)	(25.3)
Imports[a]	3	25	33	44	55	52
		(5.4)	(6.4)	(8.8)	(11.3)	(9.9)
Total additions	81	111	121	128	150	185
		(23.8)	(23.6)	(25.5)	(30.9)	
Total deletions (Additions - net change)		65	131	144	110	151
		(13.9)	(25.6)	(28.7)	(22.6)	(28.7)
of which Exports[a]		10	5	2	1	1
		(2.1)	(1.0)	(0.3)	(0.2)	(0.2)
Net for slaughter and death loss		55	126	142	109	150
		(11.8)	(24.6)	(28.4)	(22.4)	(28.5)

Sources: [a]Table V-2 which is drawn from Livestock Division official data.

[b]BOS, 1980, and preliminary data for 1978/79.

[c]A conservative mid-range figure based on Phororo, 1979; LASA, 1978 and Binnie and Partners, 1978.

Note: Numbers in parentheses are percentages of the previous year's total herd.

In Table V-6, data on herd size, imports and exports are considered relatively accurate. Therefore, the derived figures for off take rest critically on the assumption of a 40 percent calving rate. It is unlikely, however, that off take remained constant. Had off take remained at, say 12 percent, calving rates would have had to fall to 8-9 percent during the last few years in the table.

Total off take from all sources has been previously listed at 10.7 percent (BOS, 1972, adjusted to exclude thefts), 12.8 percent (LASA, 1978), 12.2 percent by Binnie and Partners (1978) and 12.5 percent (Phororo, 1979, p. 31). In an attempt to provide more current estimates FAO (1980) adjusted this upward to 19 percent. Thus the observation from Table V-6 that off take has recently risen to approximately 25 percent is significant. It would appear that off take has more than doubled over the last decade. It was further concluded that most of this increase was due to slaughter and consumption rather than death loss. If true, this constitutes a major step towards a commercially responsive livestock sector meeting consumer demands. If, in fact, off take is 20 percent or more annually, mostly to consumptive uses, then development planners have a powerful tool with which to increase overall productivity. By meeting slaughter requirements with unproductive, off-type and cull stock, the quality of the remainder can be improved very rapidly. As was suggested earlier, most of this improvement has probably occurred without policy intervention. By importing predominately heifers and slaughtering predominately old stock, farmers have probably shifted the composition of their herds to a younger, more productive mix. In this case, the environment for modern livestock programs has improved, possibly significantly. Measures of the extent of the change await release of the 1980 census of agriculture.

Similar calculations for small stock, which would lead to similar conclusions, are not presented. Data on cattle contain several gaps which must be filled by assumptions. Sheep and goat statistics contain even more missing elements. If the calculations could be completed, one would identify a de-emphasis of income generating roles of small stock and a strong increase in their roles as a source of consumable meat. Binnie and Partners (Appendix 4, p. 10) suggests that small stock owners may now be breeding for hardiness and meat production and that this may be the cause of the very marked decline in the quality of the wool and mohair clip.

One final word of caution is needed. Two sources contain detailed data on the population dynamics of various livestock species. LASA (1978) provided the initial tabulation in their Chapter 7. Unfortunately the table suffers from mathematical errors and is based on the 1969/70 census. These original data represent an atypical year in an earlier era and are a poor base for contemporary planning. FAO (1980) adjusted LASA's figures but changed off take assumptions rather than

birthrates. Thus to the extent that LASA (and BOS, 1972) figures are too low for birth, the FAO analysis will include the same errors.

Matching Livestock Numbers and Feed Supplies

> Of factors influencing animal production - nutrition, disease, breeding, management and marketing - nutritional inadequacies are primary causes of low productivity in Lesotho. (All other improvement programs) are highly ineffective, if not a wasted effort and dissipation of meagre financial resources, unless preceded by or simultaneously applied with measures aimed at improvement of animal nutrition. (Phororo, 1979, p. 228.)

In Lesotho, at present, solutions to the animal nutrition problems must lie predominately in bringing the livestock herd and range resources into balance. Agriculturally produced fodders and industrially produced feeds have important roles to play in the future. However, for the next decade they must be regarded as only supplemental to natural grazing.

Carrying Capacity and Stocking Rate[1]

Lesotho's rangelands have been studied at several points in the past (Staples and Hudson, 1938; Acocks, 1953; Binnie and Partners, 1978). Very regrettably, however, the quantitative base for sophisticated range management programs has not yet been developed. Even on the question of an overall national stocking rate, there exists some variation in the recommendations. Alternative views follow:

Staples and Hudson (1938) provided estimates of carrying capacity for each ecological zone, yielding a national weighted average of one LSU/2.85 ha. Van Rensburg (1973) estimated the carrying capacity of the southern districts of Quthing and Mohale's Hoek at one LSU/3.5 ha. Actual stocking rate in these two districts was one LSU/2.0 ha. Binnie and Partners (1978) suggest that actual stocking rate on the upper catchment of the Phuthiatsana Valley was one LSU/7 hectares. The World Bank (1980) states, "It is our opinion that the level of stocking in 1978 (approximately 1 LSU/3 ha) should be attainable when the grasslands of Lesotho are in a satisfactory condition." FAO (1980, p. 77) states, "It is estimated that there are

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[1]Carrying capacity is defined as the maximum stocking rate or the number of animal units that can be supported on a unit of land without ecological damage. Stocking rate is the actual number of animals per land unit and may be more or less than carrying capacity.

2,700,000 hectares of rangeland, the carrying capacity of which is reckoned to be 1 LSU to 7 ha under present conditions --." The Multi-donor Mission observed that "the general conclusion of these studies is that the present stocking rate is about 1 LSU to 2-3 hectares while the recommended stocking rate is 1 LSU to 7 hectares" (CMDM, 1980, p. 88).

Thus, there is little agreement on optimum stocking rates in Lesotho. There is even less agreement about how stocking rates should vary to accommodate different livestock species under Lesotho's conditions. There are no systematic estimates of regional differentials in carrying capacity. Although this information is urgently needed, planning for the livestock subsector must proceed. Therefore, in lieu of facts, the following widely held beliefs form the basis on which range-livestock planning must be based at present.

1. The range is overstocked. Government scientists and foreign experts universally concur in this belief although the extent of overgrazing varies in the estimates above. Their views are based on productivity criteria measured by output of animal products, animal health, and long-term effects on the range. Farmers, with a perspective that places a higher value on the social roles of livestock, are even more varied in their beliefs concerning stocking rates. Many view the "deterioration of the range" with alarm and support pleas for grazing control. Others feel that present livestock numbers are within acceptable limits especially since larger herds have existed in the past.

2. The range is deteriorating due to overgrazing. The Multi-Donor Mission states that excessive overgrazing "has degraded the land resource to such extent as to hazard the basis of the economic and social system of the Basotho people" (MDM, 1980, p. 9-9). Deterioration is seen in the disappearance of some of the more palatable grass species and their replacement by encroaching woody shrubs, particularly bitter bush (Chrysocoma tenuifolia). Data to support this hypothesis are scarce and spotty. Much of the support for this belief comes from comparisons of contemporary range observations with those of Staples and Hudson (1938), from heavy sediment loads in the rivers and other visible signs of gully and sheet erosion, plus the substantial areas now covered in woody shrubs but believed formerly covered in grass. There is limited evidence that the deterioration has not been a steady phenomenon but rather occurs in spurts. For example, Staples and Hudson suggest that the first major expansion of bitter bush occurred between 1920 and 1930, a period of below normal rainfall in Lesotho, and record levels of livestock (1.55 million LSU in 1931, measured by dip tank survey methods).

3. Lesotho's range has an exceptional ability to recover if protected. Again, since there are very few exclosures in the country there is little quantitative proof of this belief. Yet where grazing has recently been prevented, regrowth appears phenomenal. Average annual precipitation of 600-900 mm, which is high compared to most of the world's grasslands, undoubtedly permits rapid regeneration. Some modification of this conclusion may be necessary in the coming decade to allow for the probability of prolonged below normal rainfall.

4. Rainfall in Lesotho oscillates regularly with alternate 9-10 year periods of above or below the long-term mean. Productivity of a rainfed biological system such as rangeland should vary accordingly. Most research shows that a period (perhaps 10 years) of below normal rainfall has begun and will continue throughout the 1980s. Therefore, if the range is overstocked relative to carrying capacity and the range is deteriorating, these pressures can be expected to worsen for the next two five-year planning periods.

A Synopsis of Available Recommendations

World Bank: The Bank starts from the quantitative assumption "that more than a quarter (25%) of the total grazing land requires rehabilitation measures which include the removal of stock" (World Bank, 1980, Annex 8, p. 28). They further see the remaining area as fully utilized so that the stock to be removed cannot be simply shifted to another region. Slaughter or export is needed to effect the net removal of 150,000 LSUs for a period of four to five years. The Bank asserts that "the planned throughput of 30,000 LSUs per year at the abattoir will not be sufficient to reduce livestock numbers" (p. 29). If livestock numbers are successfully reduced for five years there could follow a controlled buildup of numbers to 0.85-1.0 million LSUs which, on a rehabilitated range with controlled grazing, could produce 30-40 percent more per animal than at present.

The Bank sees a fundamental need to capitalize on individual profit-making incentives as the basis for improved livestock management. Accordingly, they strongly recommend allocation of exclusive grazing rights to individuals or groups. They would require compliance with certain range management and livestock husbandry practices as a condition for maintaining exclusive use rights. Recognizing that some livestock owners or potential owners would be excluded from the range which is presently treasured as a communal asset, the Bank's analysis suggests an explicit concern for equity in the allocation of grazing rights. This concern grows out of their view that present range use practices, whereby a few large owners utilize most of the nation's pasture resources, are unfair and could become worse with exclusive grazing rights.

They propose a grazing fee, assessed on a per head basis, as one means of compensating those who would be excluded. Such a tax would encourage farmers to emphasize economic rather than social roles of livestock, and should create an incentive for reducing numbers of nonproductive animals.

FAO: More explicit and detailed recommendations were prepared by FAO (1980) as part of their efforts to develop a viable set of dairy and meat production schemes for donor assistance. Their livestock development plan proposes to equate livestock populations to feed resources, restore rangelands to former productivities and simultaneously raise farmer incomes from livestock production.

FAO would rely on regulation as the principal method of reducing animal numbers. They suggest that the permit system, legally enforced and administered through the Chieftainship, would be used to control summer grazing in the mountains. Their plan is divided into three phases as follows:

1. Phase I, (1981-1989) - reduce livestock numbers to 1 LSU/ 7 ha through heavy culling plus sharp increases in the use of crop residues and forages to supplement range grazing. At the same time, the number of livestock migrating to the Mountains would be gradually reduced to zero at the end of Phase I.

b. Phase II, (1990-1992) - stocking rates maintained at 1 LSU/7 ha; transhumance maintained at zero; continued rapid expansion in production of cultivated forage and use of criop residues. "At this time, allocation of rangelands to livestock associations can commence."

c. Phase III, (1992-2000) - stocking rates gradually restored to 1 LSU/4 ha. In the Mountains this expansion will be tied to the expansion of livestock associations and their ability to manage grazing effectively. Livestock in the Mountains will grow from 353,800 to 710,700 LSU while only modest expansion (244,400 to 281,000 LSUs) will be permitted in the Lowlands and Foothills. The latter is to be achieved simultaneously with a marked reduction in small stock. Thus, significant restructuring of the Lowland and Foothill herds is recommended.

The FAO plan is quite explicit in its proposals to substitute crop by-products and forage crops for rangeland. Animals thus supported on feed increase from zero in 1980 to 227,100 LSUs over two decades. To accomplish this the "utilization" of these two sources of feed are projected to increase by 10 percent/year in the Lowlands and Foothills and by 5 percent/year in the Mountains, both for ten consecutive years.

In summary, the FAO proposals are distinguished by the following:

a. They would not allocate grazing land to private use except to association or other groups, and this not until 1990.

b. Livestock numbers would be controlled stringently by a permit system, reduced to nearly half of present levels and then expanded to one million LSUs by the year 2000.

c. Small stock would be phased out in Lowlands and Foothills.

d. Transhumance would be phased out over ten years.

e. Major attention in the crops sector would be given to the provision of feed from crop by-products and cultivated forages. The authors propose to support 23 percent of the nation's animals in this way by the end of the century. The program recommended by FAO presupposes that the Land Act of 1979 will be utilized to permit harvesting of crop residues and fencing of cultivated pastures and fodders. Without this change production of feed cannot expand rapidly enough to permit the necessary reduction in pressure on the range.

Multi-Donor Mission: This mission of foreign experts was charged, *inter alia*, with reviewing communal grazing practices and livestock overstocking and with suggesting solutions to the problem. Their report states that the fundamental issue is "the will to contain the livestock population within the carrying capacity of the land" (MDM, 1980, p. 9-1). The implication is that the will does not exist within government to take necessary action. They then suggest that donors "defer assistance to activities designed to increase production until a national will to correct the present situation has been demonstrated by enactment of the proposed Grazing Control and Range Management regulations and restriction of imports (p. 94)."

To increase fodder and pasture production on arable land they recommend implementation of the Land Act of 1979. In addition to fodder production, pastures in rotation with crops can improve soil fertility. Several proposals under consideration in 1980 were endorsed. Among them were the establishment of Grazing Management Areas surrounding the Livestock Improvement Centers and the use of grazing permits which had been suggested with the MOLDEC program. To control importation the Mission suggested a levy on privately imported animals other than those intended directly for slaughter. To provide an outlet for remittance incomes used for imports, a program to supply domestic stock for sale to migrants is suggested. Finally, a progressive livestock ownership tax is recommended with the revenue to be devoted to improvement of the grasslands and the livestock industry.

In addition to generating revenue, such a tax would contribute an incentive toward overall livestock reduction.

Phororo's Recommendations: The most comprehensive treatment is in Phororo's detailed analyses. Being a Mosotho he fully recognizes the difficulties inherent in attempting major change in the case of livestock practices so deeply embedded in Sesotho culture. Consequently, the proposals offered attempt to provide a culturally acceptable solution.

Phororo accepts that "it is of paramount importance that the excessive animal pressure on grazing be reduced." He notes that incentive structures work against stock reductions. Communal grazing provides relatively costless benefits in proportion to the number of animals owned. Therefore what incentive can be created other than national identity and a concern for national/regional/village resources.

Others suggest a livestock levy or grazing fee levied in some fashion aganst livestock owned. The Multi-Donor Mission calls for an escalating levy with higher fees per animal charged against larger herds (MDM, 1980, p. 9-9). While less definitive the World Bank team mentions a flat rate, a sliding scale (presumably progressive), and a tax on potential profits. They state that the main justification would be equity and that the tax base "would fall (or could be made to fall) principally on upper income Basotho" (IBRD, 1980, p. 8-9). Both sources point out such a levy or tax would be unpopular and MOA professionals doubt that it would create an effective incentive for stock reduction.

Phororo suggests that the assessment be couched in terms of payment for "stockmen's" services, that training programs be geared to produce trained adult livestock herders to replace herdboys, and that livestock owners pay for their services with livestock at something like a controlled minimum rate. The cattle thus collected by the "Stockman's Fund" would be converted to cash through slaughter or export and stockmen paid in cash. Significantly, Phororo calls for a pro rata destocking which is undoubtedly more politically acceptable than a progressive reduction.

To control grazing he notes that a grazing permit system exists but is ineffectual due to the incapacity of the Ward Chief's offices to handle the work load. His solution is to recommend reinforcement of their administrative capacity.

To control imports by migrants, very heavy import taxes are suggested. For cattle he suggests a levy of approximately one-third of its purchase price (R50/animal in 1979 when prices were R1~~5~~40-180).

Phororo finds the farmers in the Lowlands and Foothills aware of having too many small stock. Accordingly, one focus for destocking is to reduce small stock holdings in these ecological zones. Substitution for small stock by other "confined husbandry" livestock enterprises would prevent farm incomes from being depressed.

It is noted, almost incidentally, that successful development of feed, pasture and forage production in the Lowlands would partially relieve the necessity of sending stock to the Mountains for summer grazing. An emphasis on feeding of confined animals is a major point in Phororo's paper as well as that of FAO (1980).

Finally, Phororo finds group or communal ranching ventures as filling several needs in Lesotho. In particular, communal ranching offers the small livestock owner the chance to obtain improved management of his stock without excessive expense.

An Integrative Approach

Many of these recommendations are valid, several of them are being implemented at the present time. Others attack symptoms rather than root problems. Some of the recommendations fail to recognize basic foundations of livestock husbandry in Lesotho. What follows attempts to provide an overall strategy within which several of these various program or policy suggestions can be integrated.

The Central Issue

The central factor governing livestock husbandry practices and causing serious pressures on the range is the perceptions held by farmers concerning these two resources. Livestock are held for a variety of social and economic reasons. Sheep and goats provide annual incomes, meat for home consumption and a capacity to meet various social obligations. Cattle contribute directly to cash and kind incomes through their draft power roles, sale of animals and hides, as well as meat and milk consumed in the household. In addition, perhaps the major role of cattle is to serve as a living bank account, storing wealth when savings occur yet providing a source of emergency cash in times of hardship. Finally, the roles played by cattle in cementing social relationships are significant as noted above. The store of wealth function (highly developed for cattle, less so but still noticeable for small stock) is more closely associated with numbers of animals rather than quality or productivity. This is the first half of an incentive structure leading to serious overgrazing and range deterioration.

The second factor is communal use rights of the range resource as correctly pointed out by Phororo (1979, p. 228-229). Under communal grazing tenure, benefits accrue to the individual in immediately visible fashion and in direct proportion to the number of livestock owned. Costs, in the form of erosion, rangeland deterioration and reduced animal productivity, are longer term phenomena, much more difficult to perceive and they are broadly spread across society. Some of the costs are not even currently important but will fall on future generations.

These two factors taken together encourage accumulation of large numbers of livestock on a finite range. The concepts of livestock as a form of wealth and communal land tenure have had an important role in Sesotho culture and have contributed to economic well being and equity in past times. It is clear, however, that the pressures of human density on the land and on the limited supply of jobs in Lesotho have irreversibly altered the socio-economic environment. Urgent needs for protein and for employment and incomes from agriculture prevent the continuation of earlier value systems and tenure institutions. This fact has been recognized politically with respect to tenure by passage of the 1979 Land Act. The rationale behind the Land Act must now be spread widely throughout government programs and the thinking of the rural population.

That rationale is simply this: modernization, which is so urgently needed in Lesotho's agriculture, requires new institutions and new concepts. Useful as the old ways were in their time, and however revered they may have become through centuries of use, the needs of the future dictate selected changes.

It is recommended, therefore, that livestock development efforts start with explicit attempts to develop an appreciation among farmers for the commercial roles of livestock, for livestock as sources of recurrent income and to increase their appreciation of the non-monetary costs of present husbandry practices and management perspectives. Only if this concept is widely accepted will farmers become concerned with quality and productivity rather than numbers. And unless maximizing recurrent output is the dominant management objective in the minds of farmers, allocation of private control over grassland will only restrict the number of owners, it will not increase the productivity of the livestock sector. Development, almost by definition, is aimed at increasing productivity. It serves no purpose to have government programs seeking this end while farmers seek others.

Convincing farmers to view livestock primarily as productive assets will not be easy. The concept is widely understood. Our concern is one of priorities in the farmer's mind. During the 1970s as income from non-agricultural sources escalated, farmers apparently de-emphasized the income generating roles of livestock in their farm enterprises. Small stock, sources of recurrent income, were reduced in

number by over one million head. Cattle, as savings, increased moderately. This recent trend, and the management perspective embodied in it, must be reversed if livestock production programs are to succeed. In part, such reversal will occur naturally as per capita migrant remittances decline slowly and underemployment rises. Government should speed and guide the process whenever possible.

Several of the recommendations found in the reports discussed above would be helpful. Livestock levies and grazing fees can both be seen as means to attach an annual cost to animal ownership. Presumably farmers would then manage their herds and flocks to at least return enough to pay the amount of the levy. Fees for grazing permits are probably most suitable because of their implications that the range has an economic value.

We propose the following as a culturally acceptable possibility for further consideration. First, the grasslands need to be demarcated, at least along Ward Chief jurisdiction lines and grazing control assigned to some form of local authority. Carrying capacities should then be estimated and an appropriate number of permits issued for each region. The permits would be distributed in some equitable manner that reflects the common claim on range resources. But the permits would be leasable for an annual fee in much the same way that arable land can be leased under the Land Act, 1979. Thus, farmers for whom livestock are a commercial venture could lease enough permits for their herds. And those households with little interest could obtain rental incomes for their "share" of the nation's rangeland. Use rights to rangeland plus the livestock themselves would accumulate gradually to those individuals who are most interested in productivity, not sheer numbers.

The above suggestion implies some regional controls over livestock numbers. Administratively a system must exist to issue permits and to restrict grazing to permitted animals. Such a system is envisioned under the Grazing Control Regulations which shifts principal responsibility for control to local, social and administrative units.

Leasable grazing permits would establish a market in grazing rights which would ultimately replace mafisa as the principal form of livestock transaction between households. It would firmly establish a value for grassland access. It would discourage the holding of cattle for their numbers alone and encourage a concern for productivity per livestock unit. If grazing permits were issued only for the carrying capacity of each region and allocated only to residents of each region they could effectively reduce transhumance from Lowlands and Foothills to the Mountains. Finally, the program would place minimum requirements on the already over extended Livestock Division of the MOA. Most allocative functions and routine transactions would occur within the market for grazing rights. Government would only be responsible

for enabling legislation (Parliament), inital distribution of grazing permits (the Chieftainship, working through legal committees), initial and recurrent surveys of carrying capacity (Range Division/MOA) and enforcement. The latter function, enforcement of permits, would be most acceptable if delegated under the enabling legislation to regional authorities or possibly village or grazing associations. Provisions will be needed for backstopping by the police and the legal system, however, the requirement for such actual intervention could be minimized. A pilot project could be given an excellent trial utilizing the Special Agricultural Areas provisions of the 1979 Land Act (MOA and MOI).

A major program for strengthening ox contractors was recommended in the crops chapter. If this program included a transition to cash payment for contract plowing rather than sharecropping it would further strengthen the appreciation of livestock as an income earning asset.

Finally, extension has an important role to play to communicate and reinforce this concept. Their success will be determined by the extent to which Government makes public and stands behind the policy that livestock will be considered economic assets. A firm national policy in this regard will find many forms of reinforcing expression in various types of programs.

Selective Stock Reduction

Four ideas mentioned in recent analyses are worth attention and probably implementation. They are:

a. Concentrating stock reduction efforts in the Lowlands and Foothills.

b. Special efforts to reduce the number of small stock more than large stock in the Lowlands and Foothills.

c. A substantial reduction or perhaps elimination of the seasonal movement of cattle from Lowlands and Foothills into the Mountains for grazing.

d. Selective culling of unproductive animals as a second important focus of stock reduction efforts.

These recommendations follow from the following beliefs or analyses. First, stock numbers are highest relative to feed and pasture supplies in the Lowlands and Foothills. Were it not for mountain pasture, many of these animals would not survive. Second, grazing resources in the Mountains are generally considered adequate for the livestock populations currently resident there. It is the annual influx of stock from

lower elevations that pushes grazing demand above carrying capacity in the Mountains. The system of summer cattle post grazing was established decades ago in an era of practically no permanently resident Mountain population. That era has closed, the Mountains are relatively well settled and this former grazing custom is no longer optimum. Third, supplies of arable lands are quite limited in the Mountains, relative to population. Agricultural incomes to Mountain villagers must come largely from livestock. Lowlands and Foothills, however, have their arable areas for income. To permit large numbers of animals as well, which must utilize part of the Mountain range for survival, permits income growth in the Lowlands and Foothills at the expense of Mountain residents. Phororo's call for a reduction in small stock in the two lower ecological zones is based largely on these types of equity considerations. Small stock are held primarily for their contribution to diets and incomes. Yet the incomes thus derived in the Lowlands are extracted directly from the high mountain pastures which form the principal productive resource for Mountain area dwellers.

Finally, all analysts concur that livestock herds contain high proportions of unproductive animals. With accumulation rather than production as a management objective there are excessive numbers of male animals and old stock of both sexes. It would be possible through selective culling to reduce the national herd by at least 20 percent without reducing the livestock sector's contribution to GNP. In fact, if such a reduction were to occur, livestock production and incomes would probably rise as better nutrition created positive change in calving rates, rates of gain, milk output, draft power and a reduction in mortality.

Mechanisms for stock reduction remain problematical. The abattoir and other marketing and slaughter programs offer potential although the World Bank feels this alone will be inadequate. An important aspect, however, is that procurement can be concentrated in areas and for types of stock for which policy suggests maximum reduction.

One important mechanism which has been recommended is livestock levies. The precedent exists; wool and mohair levies have been in existence for many years. One very significant value in addition to possible stock reductions would be the contribution toward perceiving cattle as economic, rather than social, goods.

In the longer run an enforced grazing permit system has great potential. Most effective ultimately will be the farmer's acceptance of the ideas that livestock are productive assets, that the range has commercial value, and that excessive stocking rates lower productivity. At that point farmers themselves will seek to match stocking rates and carrying capacity.

It should be noted that imports have contributed substantially to maintaining high stock numbers in recent years. Furthermore, it is generally believed that quality control has effectively been lost as imports rose to nearly 100,000 head annually. Furthermore, there is some subjective evidence that animals imported are the culls from herds in the RSA.

Measures to control this problem have not yet been effective. Phororo admits that a massive campaign to persuade migrants to cooperate by not importing cattle failed. His recommendation for an alternative with more clout is a duty of M50 per bovine animal and a proportionally high rate for small stock. Many societies rely on such duties as a means of raising the price of certain actions to disincentive levels. Such a policy in Lesotho would be unpopular but it would probably be effective. As the country enters a prolonged dry spell of perhaps ten years duration, short-term unpopularity may be necessary to provide long-term protection to Lesotho's vital range resource.

Much of the incentive to import cattle comes from the social need for bohali payments. And a considerable portion of the quality problem stems from the importation of cull animals for this purpose. Cash payments for bohali are becoming more frequent but this is probably a trend over which government planners have little control. For the foreseeable future the bulk of these transactions will continue to be made with livestock. Therefore, control over imports must be achieved within this setting.

The World Bank analysis proposes a program in which Government would provide controls over the type of cattle in which migrant earnings could be invested. These could include imported stock provided certain quality specifications were met. The program would attempt, however, to channel much of this purchasing power into the domestic market. Domestic stock would be purchased by government and made available to returning migrants and others seeking investment in cattle. Through differential pricing and strict quality control on imports, the program could, conceivably, stimulate a domestic cash market for cattle and improve quality in the national herd simultaneously.

Two problems are obvious. First, the program assumes that government can, and will, control imports of low quality animals. Second, it is the type of program which, through direct governmental intervention, will require heavy operational and managerial costs. Thus, such a program runs counter to our own recommendation for using indirect stimuli for development as a means of reducing governmental costs. However, the potential contribution to the goals of controlling cattle numbers, improving quality and stimulating a commercial domestic market appear sufficient to offset these concerns and recommend this program be implemented.

Removing Stock from the Range through Confinement

An important alternative to reducing stock numbers is to partially remove them from the range through stall feeding. Several reasons lend this strategy a significant priority:

a. Cultural obstacles to large scale stock reductions are significant.

b. Livestock overpopulation and arable acres for forage and fodder production are both concentrated in the Lowlands and Foothills.

c. Lesotho has large areas of sloping land which should not be plowed annually but would appear optimum for establishment in permanent, fertilized pasture and hay crops.

d. Hay and fodder production can be labor intensive.

e. Finally, and most important, 2.5 LSUs can be supported on one hectare of forage crops (FAO, 1980, p. 16) compared to LSU/¼ hectare on open range once it has been rehabilitated. Effectively a 20 percent reduction of grazing pressure on 2,700,000 hectares of rangeland (170,000 LSUs taken off the range) can be achieved by utilizing 34,000 hectares of fodder crops.

To implement a major forage and fodder production program will probably require two institutional changes with respect to Lowland areas. The first is fencing and the second is to allow farmers to harvest and store their own crop residues and stubbles. The 1979 Land Act can be implemented to achieve the former. The latter, already being done in some areas, would require little more than agreement by the Chieftainship and widespread encouragement by Livestock Division and Extension Division personnel.

These two adjustments to custom should be seen as part of the overall effort to restructure incentives. Communal grazing of stubbles has played a valuable social role in the past by contributing in a small way to equitable distribution of resources. In the context of a modernizing agriculture, however, to continue the practice pre-empts part of a needed shift to individual initiative as well as most of the reductions in grazing pressure that would be possible through stall feeding and supplemental feeding programs. Grazing stubbles also constrain winter cropping and prevent soil improvements such as plowing in crop residues. For the future these costs are too high a price for maintaining a culturally embraced but very low productivity management system. When sources of income are scarce, it makes little sense to persevere with a system that can feed only 25 LSUs on 100 hectares when through fencing and storage of fodder 250 LSUs can be maintained on the same area and in a more productive condition.

Two government decisions could contribute significantly to a rapid increase in stall feeding. First, assuming that a system of grazing permits were in force, confined animals could be excluded from the permitted number. Therefore, if a farmer wished more livestock than his permits allowed, he could either lease additional permits or expand his stall feeding operations. Second, government currently requires an appreciable tonnage of fodders and hay for government owned livestock. Most of this is imported at present. To create a local cash demand for fodders and thus to stimulate a commercial haying industry which could then grow to meet private needs, Government should seek its hay and forage within Lesotho. Given that little hay is now grown commercially in Lesotho, and that farmers will likely not make the investment without a market, some form of forward contract will likely be needed to initiate production.

Livestock Activities for the Very Small Operator

The concentration of most livestock wealth in a few hands is a point of concern. Most households do not have livestock. Of those that do, many own only a few animals. World Bank recommends pooling of these small holdings into communal herds or flocks and allocating grazing areas for their use. Phororo recommends elimination of small stock from the Lowlands which would affect many households with minimal holdings. His recommendation is followed by one for substituting pigs, poultry, rabbits and other forms of confined animal enterprises which do not utilize range resources.

Livestock programs for the common man are very hard to define. However, a major effort to discover "appropriate technologies" for widespread application at the village level seems warranted.

Of primary concern is the balance of government programs between those aimed at large commercial operations and those aimed at the smaller stock owners. High technology livestock production has definite contributions to make to Lesotho's development. These are illustrated in the next section. Here we are concerned with options for the farmer with limited livestock numbers yet an interest in increasing his livestock activities. Many of these households may well be of the "land restricted" group.

What follows are brief descriptions of improvements possible within the resources and management capacity of the smaller livestock owners.

Poultry provides an excellent example of the dual focus being recommended. In 1970 there were some 840,000 birds in Lesotho of which 35,000 were listed as "improved". Unimproved birds were owned by over 132,000 households with small flocks of six on average (BOS, 1972). Surveys in the Thaba Tseka area show that rural poultry keepers both consume and sell eggs, even from small flocks, and thus profit in both an income and nutritional sense.

Since 1970, dramatic growth in the poultry industry has raised the number of improved birds to 150,000 layers and a sizeable number of broilers. A profitable industry has sprung up in response to rapidly growing urban demand. However, little has happened with respect to the productivity of unimproved, farmyard chickens. "Very little attention has been given to these farmers in respect to increasing their production even if the effort is directed to increasing consumption and improving the nutrition of the rural population" (Phororo, 1979, p. 56).

Little is known about the egg production of the indigenous village chicken except that it probably falls in the range of 50-70 eggs per year. Modern layer flocks can consistently produce 220 eggs per year but require high investment, high operating cost, sophisticated management and high risk. At the level of intermediate technology is a village flock managed with somewhat better techniques that produces 120-140 eggs per bird annually. To achieve this would require better health protection (especially against Newcastle disease) and supplemental feeding. Substitution of breeds may also be advisable to establish a variety that combines hardiness with productivity. This type of intermediate technology poultry program has been implemented successfully in a number of developing countries, including several where disease is a more severe problem than in Lesotho. It is suitable for holders of 10-100 birds meeting egg and meat demands largely from within the village.

Milk goats have been suggested as an appropriate household technology. While milk goats can be imported such practice has not been encouraged due to concern about crossbreeding with mohair goats. Nevertheless, such animals offer an interesting alternative. They are more easily kept tethered near the house than cattle. A good milk goat can produce up to two liters daily, which exceeds the average for Lesotho's cows. And they can be fed a wider variety of materials.

Rabbits have been shown to be economically feasible in Lesotho as a source of household meat or for sale. Rabbits can be raised with minimum cash outlay. And a breeding pair under good management can produce more consumable protein per year than a cow, even including both calf and milk. Rabbits and milk goats are both feasible household activities for landless rural residents.

Phororo examines pig raising as an enterprise. At a net profit (1976 prices) of M14.83 per weaner he concludes that production of 100 weaners would provide an income equal to mine wages. Thus as an income source, pigs are better considered in the large operation categories. One or two sows, however, if properly protected against disease can provide valuable meat supplies to land restricted households.

Very small pig groups are common in Lesotho, 86 percent of all pigs were in holdings of one or two animals only, with over 60 percent being single animals (BOS, 1972). Phororo (pp. 61-62) examines evidence showing that nutritional factors cause four times as much variation in growth rate as other factors and concludes that the "best approach should be (nutritional) upgrading of indigenous stock" rather than introduction of exotic varieties.

In earlier analyses (Table V-5), it was emphasized that commerical incomes from livestock will be concentrated in the hands of the limited number of owners of large herds or flocks. This section has turned to the other side of the coin to stress that there are a great many rural households with only a few animals but that Lesotho's development requires programs that would enable these few stock to make their maximum contribution to household nutrition and well being. Much of what has been mentioned is feasible for landless or land restricted households. Most of these options draw on feed supplies other than hay, stover, grazing and other conventional sources. Most are amenable to management at, or near, the homestead and therefore can be undertaken by women without disrupting their other household responsibilities.

To highlight the importance of the small owner in the livestock sector, Table V-7 presents data on the number of households involved in very small scale livestock management. In an income sense these holdings will generally be insignificant. In a nutrition sense they can be very important. And in the case of the resource poor, especially in female headed households, it is possible that the small incomes provided could be significant.

Table V-7. The Extent of Involvement in Small Scale Livestock Enterprises.

Species and Size of Holding	Number of Households	Percent of Farm H. H.	Number of Animals	Percent of Animals
Cattle (5 or less)	59,600	32	167,040	30
Sheep (10 or less)	26,390	14	130,405	8
(20 or less)	36,700	20	287,812	17
Goats (10 or less)	30,150	16	146,355	15
(20 or less)	38,600	21	277,271	28
Pigs (one)	40,522	22	40,522	61
(one and two)	48,747	26	59,972	86
Horses (one)	30,343	16	30,343	28
(one and two)	45,346	24	60,349	55
Unimproved chickens[a]	132,079	70		
Improved chickens[a]	2,858	2		

[a]Data are not available on the distribution of poultry ownership by flock size.

Source: Calculated from BOS, 1972, based on 187,421 farm households.

High Technology Livestock Enterprises

Over the years nearly all forms of modern livestock enterprises have been tried in Lesotho. Circumstances have ranged from small village programs to large national endeavors to tightly controlled experimental conditions. Some efforts have been commercial, others have been subsidized. Results have covered the entire range from glowing successes to complete failures. As important as livestock are to Lesotho, it is appropriate that all possible modern technologies be examined, tested, adapted and those found suitable extended wherever possible.

An economic analysis of alternative high technology livestock options would be desirable if it were possible. Most projects begin with a detailed financial appraisal, but generally do not contain an analysis of employment generation or distribution of benefits, two critical factors for project planning. Actual experiences with costs and returns frequently differ from pre-project expectations. Uniform post-project evaluations have not been completed. In short, the data do not exist to develop comparative budgets or profitability analyses of modern livestock enterprises. Phororo attempted such a review and was only able to present net profit figures from a single case each for dairy, pig raising and improved layers.

We are left, therefore, to rely on generalizations to assess the appropriate development roles for modern technology in livestock production. The main such enterprises being developed in Lesotho today include caged layers, broilers, cattle and small stock fattening in feedlots, fish culture, dairying, pig raising, an abattoir with tannery and the beginnings of a feed and supplement industry. The following general thoughts characterize these activities, with perhaps some exceptions in each case.

1. These activities require a substantial investment at the outset. Therefore, if they are designed for individual entrepreneurs, there will only be a limited number who can participate.

2. Substantial levels of operating funds are required in most cases.

3. These two cost factors imply:

    a. A need for an effective credit system for individual farmers.

    b. High levels of risk with the prospect of large losses.

4. The above factors necessitate skilled management, in part because of the risks involved and in part due to technological complexity.

5. Most of these programs can, if everything goes well, generate substantial amounts of wages and profits, as well as making major contributions toward self-sufficiency in selected products.

6. To be profitable, relatively high volumes of output will be required. Large volumes of product require an effective marketing system. Hence one of the largest obstacles at present is not the technology, which Basotho farmers have proved they can manage, but the market.

7. Most of the enterprises will require a few years to become fully and profitably operational. With high initial investments and a real price of capital of 15 percent or higher, one must expect relatively low internal rates of return.

8. Until domestic sources of supply for production inputs (feed, supplements, minerals, medicines, equipment) are developed, high technology livestock production can increase dependence on South African markets for these inputs.

9. Most of these enterprises offer extensive forward and backward linkages. Profitable growth in primary production could stimulate the production of inputs as well as the processing and marketing of outputs.

10. Employment and incomes generated in input and processing industries could easily be as significant as that in primary production itself.

11. As presently handled, these programs of modern husbandry involve a high level of government commitment in terms of time, management and resources per participating farmer.

12. To the extent that profitability requires high output, and this latter requires large numbers of stock, these programs will generate improved incomes for a relatively few farmers.

13. Conversely, these larger stock owners hold the bulk of the nation's animals in herds large enough to have commercial potential. Modern husbandry programs for these herds are essential if the nation's livestock are to make their maximum contribution.

From the above list, items 5, 9, 10 and 13 are the principal reasons that these enterprises should be considered as part of an overall agricultural development strategy. The remainder of the list are sources of concern that must also be weighed. Each program suggestion must be evaluated on its own merits. With appropriate care, planners can minimize risks and costs, broaden the number of beneficiaries and limit the recurrent drain on government services.

The Importance of Village Management

The Sesotho culture embodies a highly developed sense of equity which underlies many traditional resource management practices. Grazing permits, fencing of Lowland pastures and private rights to stubble run counter to traditional ways and can be viewed as a threat to Sesotho norms. Yet these and other practices are imperative as part of an effective modernization program. We are convinced that new management methods must be adopted while minimizing the violence done to established values, especially the concern for equity. As was recommended for crops, resource control and management decisions can be separated from income distribution decisions. If treated as conceptually distinct modernization can occur while equity is preserved. Western patterns, in which ownership and management and profits are all inseparably combined, offer serious adjustment problems if transferred directly to Lesotho. For this reason we have disagreed with those experts who recommend private ownership or control of grazing areas.

In Lesotho these two must be separated if national goals of production and equity are to be met. Production increases alone will not automatically bring equity because the economic network of transactions and relationships that would spread wealth widely does not exist in the villages. Present mechanisms for redistribution in the village (bohali, mafisa, sharecropping, herding and brewing) are tailored to a traditional, low income environment and will not suffice in an environment of rapid income growth. With a highly concentrated productive resource such as livestock and few effective social diffusion mechanisms, the incomes from rapid growth, especially through modern technology, will be highly concentrated as well.

Group husbandry of livestock and/or production of fodders offers a culturally compatible solution ot the growth vs. equity question. As with crops, community resources can be pooled and managed collectivey by trained Basotho farm managers. This permits applying improved management to a greater number of production units and capture of certain economies of scale. Separate decisions taken by the community with respect to distribution of wages and profits will determine the resulting distribution of incomes.

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CHAPTER VI

MARKETING OF AGRICULTURAL PRODUCTS IN LESOTHO

Introduction

A rather well accepted goal of development is "the realization of the full human potential". This goal is often defined in more concrete terms of nutritional status, health, education, social progress and technological and economic activities. The premise underlying this chapter is that marketing of agricultural products is a component part of national development and contributes directly to many of the conventional indicators of development.

Marketing of agricultural products functionally involves storing and selling products as they are needed during the year, transporting products to where they are needed, and processing raw produce into finished consumer items. As storing, transporting and processing develops, jobs are created and value added to agricultural output. One of the most important functions for marketing in Lesotho is to contribute where possible to national and regional nutritional needs. This chapter provides an overall agricultural marketing strategy intended to strengthen the agricultural sector's contribution to national goals.

The Marketing Environment

The setting in which agricultural marketing must be developed in Lesotho can be described by several characteristics. In brief, these are as follows:

Farm Differences: Elsewhere in this report differences in the distribution of farm resources are analyzed. For marketing purposes one significant difference appears between those farmers who are market oriented and those, generally part-time farmers, for whom non-agricultural incomes are more important. The number of market-oriented producers is at present limited to perhaps 25-30 percent of rural, landholding households (see Chapter III). The 50-60 percent who are part-time farmers will not respond as readily to market incentives or price signals. The analysis above suggests that less than half of the rural households are presently capable of cereals self-sufficiency. Therefore, this proportion, in their role as consumers rather than

producers, will require a market to facilitate food purchases. Finally, farmers have widely differing sets of productive resources and will require different marketing strategies to meet their marketing needs.

Production Variability: Production is shown to vary significantly from year to year suggesting that the market must be capable of operating efficiently with a variable level of commodity flows. Production also varies regionally so that some districts (notably Qacha's Nek) are chronically deficit while others are normally surplus producers. A legitimate maketing function, therefore, is to shift food supplies from surplus to deficit areas in response to supply and demand.

Price Variation: There has in the past been considerable variation in prices from year to year, thus creating uncertainty in the farmers minds. Part of the strategy to commercialize agriculture must include definite attempts to achieve reasonably stable price expectations for farmers. It is particularly important at planting time for farmers to have some reasonable assurance of the prices at which they will be able to sell their crops.

Remoteness: Much of Lesotho's agriculture is in remote areas without easy access to transportation or to market centers. Costs of marketing, whether for inputs or products, are very high in this situation. Communications are irregular and until the infrastructure of a logistics system is much better developed, an efficient marketing system will be exceedingly difficult.

Organizational Variation: In recent years multiple marketing agencies have existed with only limited coordination. As problems arose there was a tendency to create new organizations. Recent government efforts to streamline the parastatal marketing system offer the potential to relieve this source of confusion. However, these plans have not been completed yet. Once completed and implemented, there will be a definite need for a sustained period of stable operation in order to establish farmer confidence in the market system.

Price Determination in RSA: Given the present extensive trade with South Africa plus the sheer size of that country's economy relative to Lesotho's, most price levels for inputs, outputs, and food will be determined in South Africa based on economic conditions there. Lesotho can alter domestic price relationships only slightly. Any major effort to create a significantly different price structure is probably infeasible due to the scarcity of funds for subsidy and difficulties in controlling unrecorded trade.

Development Objectives for Agricultural Marketing

Within the above environmental setting several objectives can be identified for marketing. These are listed below. Each is intended to contribute to or reinforce objectives and recommendations of other chapters.

1. To make it possible and attractive for a larger number of farmers to become commercially oriented and produce for the market. By so doing farm incomes will rise as will the marketed surplus needed to meet food needs in deficit areas.

2. To expedite movement of surplus production to urban areas and export markets.

3. To relieve regional and seasonal food scarcities.

4. To generate employment and incomes directly through jobs created in the marketing sector.

5. To increase GDP by capturing increasing portions of the value added in processing of agricultural products and manufacture, assembly and packaging of farm inputs.

Each of the above deserves high priority. It was shown in the nutrition chapter that many of Lesotho's nutrition problems are the result of maldistributions of food, either regionally or through time. Market development can contribute in important ways to relieving these distribution problems. Simultaneously, large numbers of Lesotho's farms are at or below subsistence while the country as a whole remains about 40 percent deficit in food production.

Progress toward a more productive agriculture requires a shift toward market involvement through the use of purchased inputs and sale of products. Both input and product markets in Lesotho are in need of considerable strengthening before farmers can confidently shift to a commercial basis. Finally, the need for employment and incomes at the national level is critical. In the face of this national priority, one must look to each sector for its maximum contribution. Given that Lesotho imports many commodities, including food and farming inputs, in finished form and exports most agricultural products in raw form, there is considerable scope for increasing the value added captured within the domestic economy. Agro-industries can and should play a major role.

Current Structure of Agricultural Marketing

Lesotho has just begun to emerge from a prolonged period of search for an acceptable and effective marketing structure. Over past years a large number of different organizations have been tried, and from the experience several lessons have been learned. Policies and organizational forms currently being implemented are built on this accumulated wisdom.

The government has accomplished a great deal since independence by establishing agencies to facilitate the marketing of nearly all major agricultural products. Several of these agencies have met with some success. However, as the newly established agencies have embarked on their separate missions, a number of problems have emerged--not particularly uncommon when such a massive effort is undertaken.

The current position recognizes a need for consolidation. Accordingly government has reorganized Co-op Lesotho to be the national "apex" organization with broad responsibilities for management, operation and coordination of agricultural marketing. Co-op Lesotho was formerly one of several marketing organizations responsible for running a series of cooperative stores handling supply and marketing functions. In its new form, Co-op Lesotho is being expanded in its number of stores and in its coordination roles with respect to private traders and others.

The choice of Co-op Lesotho as the apex organization reflects government's decision to rely on the cooperative movement as a central thrust for development. Under this policy village based cooperatives are seen as the institutional form permitting cooperative initiative and action toward solution of local problems. These village level groups are affiliated with district level cooperatives and then ultimately with a national body.

Co-Lesotho formerly operated 33 stores throughout the country. Some 45 additional stores and warehouses, constructed by the Basic Agricultural Services Program (BASP) were to have been operated by the Produce Marketing Corporation (PMC). Under the present policy of consolidation, Co-op Lesotho is to take over those BASP/PMC stores which are commercially viable. As of June 1, 1981, Co-op Lesotho will be operating 27 stores in total. More will be added as appraisals show their commercial viability.

Some of the present stores are too small in volume of trade or have other reasons for which they will not be selected for incorporation under Co-op Lesotho. Following the model developed in the Hololo Valley (Butha Buthe District) most of these will be assumed by village based cooperatives and operated as a village level institution. Experience has shown that these small stores can be operated successfully by villages and through more simplified management and staffing

can achieve an economic viability even though the volume of business is low. Village based cooperative stores will be affiliated to Co-op Lesotho through the cooperative movement and will receive some inspection and supervision services from both the Ministry of Agriculture and the Ministry of Cooperatives and Rural Development.

Stores in the Co-op Lesotho network will sell agricultural inputs as well as buy produce. They also sell certain foodstuffs, (mainly mealie meal) coal and building materials. At present buying operations are restricted to the major crops. It is government's intent to further expand Co-op Lesotho's "apex" responsibilities to cover marketing of livestock and livestock products. However, definite plans for this expansion have not yet materialized.

Credit will be provided primarily through the Lesotho Agricultural Development Bank (LADB). Medium and long term loans for the purpose of longer term investments will be available to individual and group applicants. Seasonal credit for operating capital will be available only to organized groups such as farmers associations or village based cooperatives.

Private traders continue to operate stores throughout the country. Their activities are focused primarily on food retailing. As government has expanded the range of farm inputs offered through official marketing channels, these stores have generally curtailed their activities in these lines of goods.

In livestock the situation is much less organized. The Livestock Marketing Corporation (LMC) was organized in 1973 to purchase livestock, predominately cattle, which it then consigned to abattoirs in Durban. Initially LMC was to handle wool and mohair as well. Various problems forced LMC to cease purchasing cattle in 1977. It also stopped importing young stock and steers which it had sold to farmers as replacement stock.

The Livestock Products Marketing Service (LPMS) was formed in 1978 to take over wool and mohair marketing from LMC. LPMS supervises the classing of wool and mohair, inspects shearing sheds and acts as a financial intermediary between farmers and brokers. It is estimated that LPMS handles some 50 percent of the mohair crop with traders handling the other 50 percent. Brokers, after selling the mohair and wool, remit sales proceeds less their commission to LPMS which then pays the farmers. LPMS thus functions as a clearinghouse for funds and provides accounting services to the farmers.

Egg marketing is facilitated by the Ministry of Cooperatives and Rural Development (MCRD) through the establishment of egg gathering points (Egg Circles) which provide collection, cleaning, grading and retail services. The Ministry of Agriculture has, in the past, also assisted

with egg transportation, price setting and the development of new markets.

In 1981 the PMC and LMC acts were repealed as part of the move toward consolidation. Explicit plans are being implemented, as mentioned above, for produce marketing responsibilities to be assumed by MCRD and the strengthened Co-op Lesotho system. The absence of similar plans for livestock products and live animals creates something of an institutional vacuum with the normal uncertainties that result when clear policy and direction are unknown. With LMC no longer existing it is assumed that livestock marketing functions will remain at least temporarily in the MOA; LPMS continued to function but under uncertainty as to whether they will ultimately be associated with MCRD or MOA; an abattoir is being constructed in Maseru by MOA and will ultimately be handed over the LNDC for operation. Marketing arrangements between MOA and LNDC must then be developed with respect to the flow of animals to the abattoir.

Policy and Program Issues

Institutional Stability

Agricultural marketing in the last decade has been characterized by rapid institutional change. Many new organizations have arisen, multiple ministries have been involved and major responsibilities and functions have been transferred from agency to agency. Being in a state of rapid flux, policies have at times been conflicting or unclear. Government with the assistance of the International Fund for Agriculture Development (IFAD) has taken steps to streamline and stabilize agricultural marketing. First efforts have been directed at crop produce. There remains an urgent need to extend these consolidation efforts to livestock and livestock product marketing.

From the farmers' perspective it is not surprising that he hesitates to develop commercial agricultural enterprises. The rapidity of institutional change in the marketing system plus variable prices offered to farmers have created considerable market induced uncertainty for farm operators. Therefore, now that a permanent and better defined structure is emerging, the first priority in market development must be to maintain it in operation long enough without major change to regain the farmer's confidence.

Consolidation of Responsibilities

Decisions taken to date have not fully streamlined the marketing system. One of the principal problems remains the multiplicity of agencies involved. For example, livestock marketing and fattening are under MOA while operation of the abattoir and presumably retail and

export marketing are under LNDC. Technical advice to farmers for asparagus production falls under MOA while procurement from the farmers is LNDC's responsibility. Pricing and other decisions taken by the latter in recent years have at times worked against farmer incentives for asparagus production. As yet another example, two price stabilization schemes are in use in Lesotho for livestock products. One is handled through LPMS and the other by the marketing section of the Planning Division, MOA. Price control and issuance of trading licenses are written in the objectives of LPMS and the terms of reference of the marketing section of the Planning Division as well.

As a streamlined marketing system is established, clear definitions of responsibility must be specified for each agency involved. It also seems important to reduce the number of institutions involved.

Consistent with the need for consolidation in livestock marketing is the clear need for some form of an apex organization. It is, however, less clear that livestock marketing should be merged under Co-op Lesotho. Livestock and livestock product marketing requires skills and facilities that are quite different from those required for crop products. It is not evident that combining the two would capture any economies of scale. Rather it might spread management more thinly resulting in less efficient marketing systems for both types of products.

It is therefore suggested that this question receive intense study and planning before a final decision on a livestock marketing apex arrangement is made. It is further recommended that once an appropriate apex form is determined, that it have responsibilities for both livestock and livestock products marketing. The separation of these two into separate agencies appears to be a major impediment to coordination at present.

Updating the Statutory Base

Once final marketing structures are designed complete with clearly defined, well integrated assignments of responsibility it will be necessary to give them a foundation of enabling legislation. Institutional forms have changed so rapidly in recent years that the legal basis for marketing has not kept pace. The repeal of the PMC and LMC Acts has left an unfortunate vacuum. In the interests of avoiding a complete collapse, some marketing functions are being continued by various agencies at present even without legal backing. To continue in such an *ad hoc* manner not only places the individuals and their agencies in a vulnerable position but also in the event of serious problems will contribute to the farmer's lack of confidence in the marketing system.

Price Policy

Once an appropriate institutional mix is established the single most important marketing tool is price policy in most countries. As mentioned above there are various limits in Lesotho to the ability of government to significantly alter relative price structures from those established in the RSA. However, given the logistics costs of marketing to and from remote areas there is always the question of how much of these costs should be borne by government. As was recommended for government programs in crops and livestock, it is suggested that government would do well to establish pricing policies and marketing procedures that minimize the drains on government staff, resources and budgets. Table VI-1 presents a general pattern of price policy options for consideration which illustrates the cost to government factor.

Lesotho has very sensibly avoided price subsidy programs to date. Inputs, with one exception, are priced at CIF Maseru price plus costs of transportation to point of sale. The exception is fertilizer, in which case national policy specifies a uniform price nationwide. This price is set to represent an average level of distribution costs. Therefore, buyers near the railhead pay slightly more than actual delivery cost while those in remote areas pay slightly less. A relatively minor use of subsidy with respect to food products is the two percent price discount applied to wheat flour from Lesotho Flour Mills which is applied to sales in remote areas to partially offset transportation costs.

In setting commodity prices two sets of criteria are employed. First are costs of production as calculated by the Crops Division of the MOA. Generally these are then inflated by 20 percent to provide a margin of profit to the farmer. A small additional premium is sometimes paid for extra clean and well bagged produce. The resulting price applies at the point the produce enters Co-op Lesotho.

An additional criterion is the price prevailing in South Africa. In the interests of supporting the viability of a young marketing system, Government planners seek to maximize the amount of Lesotho's farm output flowing through domestic markets. Therefore to prevent direct sales by farmers to South African markets, prices offered cannot be above or below RSA prices except by the amount of transportation costs. In the recent past this latter basis has occasionally prevailed over the cost of production method.

Table VI-1. Relative Costs of Alternative Pricing Strategies

Price Payment by Government Agency	Items of Cost to Government	Ranking of Government Costs
Product Marketing		
Export parity, Import parity or Equilibrium Price minus full cost for handling	Advisory and analytical staff costs	LOW
Export parity, Import parity or Equilibrium Price minus full cost and handling plus transport and gathering subsidy for outlying areas	Advisory and analytical cost and transport and gathering subsidy for outlying areas	HIGHER
Price supports above export parity, import parity or equilibrium price	Advisory and analytical staff costs, all line agency costs, all price support costs	HIGHEST
Input Marketing		
Acquisition cost plus handling (all line agency costs)	Advisory and analytical staff	LOW
Acquisition costs plus handling less transport subsidy to remote areas	Advisory and analytical staff plus subsidy to remote areas	HIGHER
Acquisition cost plus handling less price subsidy and transport subsidy to remote areas	Advisory and analytical staff plus subsidy to remote areas plus price subsidy	HIGHEST

Redirecting Commodity Flows

At the present time many of the inputs to agriculture as well as many of the products traded with South Africa simply cross the border through the nearest border post. The result is a dispersed market with modest volumes flowing in and out on multiple routes. Simultaneously most of the present and planned future agro-industries are tentatively sited in Berea and Maseru Districts. As the number of these firms grows there will arise a need to redirect commodity flows toward these two districts simply in order to provide enough throughput to guarantee viability. In effect, current market planning will lead toward concentrating marketing channels along fewer routes with much of the marketing activity located in only two districts. One result could be serious congestion and pollution in the Maseru and Teyateyaneng areas. A second could be an undesirable concentration in these two districts of rural to urban migrants seeking jobs. Third, transportation costs will be higher in many cases than direct export or import through the nearest border post. This fact will cause potentially severe complications for pricing policy.

It is suggested, therefore, that a master plan be prepared for long term agro-industry development. Such a plan would take account of regional development priorities, present and future road networks, probable sources and destinations of major commodity flows and the nationwide need for employment. Agro-industries would then be optimally sited, most probably at dispersed locations which would be selected according to sound economic and marketing logic.

Recommended Future Marketing Developments

Institutional Organization

Much has been done to streamline, consolidate and strengthen the marketing system in Lesotho. The most definite steps have been taken with respect to produce marketing and continued progress along current lines is a high priority. Given that remedial changes are well underway in produce marketing, the priority must now shift to systematizing the marketing of livestock and livestock products.

The marketing of live animals and livestock products requires central coordination through some form of livestock marketing apex organization. Whether or not Co-op Lesotho can be adapted to serve this function for these commodities is a serious question worthy of intensive study. At the operational level, skills and especially facilities required to market livestock and livestock products are quite different from those required for crops. At the management level there are considerable benefits to be had from specialization. The

economic answer will ultimately rest on whether there are sufficient economies of scale to be had from a combined, all commodity apex organization to offset the benefits that might otherwise be had from specialization.

Part of the strengthening program must include the elimination, where possible, of multiple overlapping responsibilities. Clear lines of responsibility must be defined and reinforced by a legal basis. Finally, the market research and information function requires strengthening.

Agro-Industries

Agro-industries are often considered part of the marketing channel and are thus appropriate for discussion in this chapter. In the Lesotho context, agro-industries offer considerable potential to provide jobs and incomes based on the primary output of the agricultural sector and on food demand of the population. Potentials for agro-industry are discussed below in separate sections covering the food system and the agricultural inputs system.

Food Marketing: Emphasizing the development of food processing and food distribution industries in Lesotho is very timely at present. Current mining and the urban wage earnings provide the purchasing power to support an effective demand for processed food. The developing road system will provide for wider distribution and more readily accessible food products. Currently, nearly all of the processed and convenience foods sold in Lesotho, except baked goods, are processed and imported from South Africa. The vast importation of foods as well as other finished consumer goods is an important deterrent to employment generation programs in Lesotho today.

The possibilities for development of food processing in Lesotho depend on basic time, place, and form utilities that are not now being fully satisfied by the domestic food marketng industry. Examples, with possible relevance for Lesotho, of businesses that could solve a time or seasonal problem include potato storage (potato sheds), apple storage, chilling facilities for meat, and additional canning and freezing operations for both fruits and vegetables. Examples of activities that would contribute to value added in the form or acceptability of the product include: joala (sorghum beer) manufacture, papa (a corn meal staple) processing, ice cream manufacture, flour milling, baking, egg cracking for industrial baking and ice cream manufacture, egg drying, bottling and meat processing. The distribution (place) industries include central warehousing and wholesale distribution facilities for food and food products, established truck freight lines and additional retailing operations. Each of these offers potential for new industries or expansion of existing industries as food demand grows and becomes more sophisticated. Such

comprehensive development is, at this time, impeded by land allocation problems, finance availability and the availability of Basotho entrepreneurs. Land allocations have been made available in the past for central government approved projects. Both bank and Lesotho government financing are limited due to the limited resources of banks in Lesotho and the commitment of Lesotho government finances to on-going operations and development programs. Since Lesotho is developing from a predominantly agrarian base there is presently a shortage of managing entrepreneurs who might provide leadership in the growth of commercial marketing functions.

The financial limitations could be overcome through donor financing or through the attraction of multinational corporation investment. Currently, the Lesotho National Development Corporation has been organized to some extent to attract foreign aid capital and multinational investments. Example companies that have invested in similar operations in other countries and might be contacted with respect to Lesotho's opportunities include:

Ball Agricultural Systems, Inc.
P.O. Box 589
9300 West 108th Circle
Westminster, Colorado 80030

Kane-Miller Corporation
555 White Plains Road
P.O. Box 7
Tarrytown, New York 10591

Associated British Food
London, England

H. J. Heinz Company
Box 57
Pittsburgh, Pennsylvania 15230

Ralston Purina Company
835 South 8th Street
St. Louis, Missouri 63199

Mitsubishi
Tokyo, Japan

The deficit of entrepreneurial managers might be partially overcome through training programs. The capital problem might be partially solved by issuing bonds or corporation stocks through international markets--a task that the Lesotho National Development Corporation or other appropriate body may wish to explore.

Besides becoming more food self-sufficient, development of the food marketing sector would increase employment and increase domestic value added to the food product. A completely developed food sector might employ 20 percent or more of the labor force as is the case in other comparable countries. In addition, the Lesotho economy could capture a portion of the added value of the processed or manufactured food product. The marketing activities of slaughter, butchering, packing and distribution may provide a value added between farm and retail of

40-60 percent over the farm gate price. For vegetables and fruit, marketing activities may generate a value added equal to the producer price, and for grain these activities may triple the producer price. Further, an expansion of canning and freezing operations, possibly through Lesotho Food Industries, Ltd., could make available foods that would help reduce the chronic nutritional deficiency in vitamin A, riboflavin and niacin, both through enhanced shelf life and through vitamin additives to the basic food product.

Some development in the food processing industry has already begun, primarily through the Lesotho National Development Corporation. These include Lesotho Food Industries, Lesotho Milling Company, Metro Cash and Carry, Optichem and Maluti Skin Products. There are also numerous privately owned small food businesses and some beginnings of the fast food service with Kentucky Fried Chicken. In short, part of the infrastructure for further development of the food processing industry is in place.

Marketing for Specific Target Groups

An appropriate organization for marketing farm inputs and agricultural commodities in Lesotho is complicated because of the wide variation in farm characteristics in terms of financial resources, cropping patterns and farm family objectives. Information in Chapter III, shows two categories of market-oriented progressive farmers that own land, machinery and cattle and have at least one member of the household earning an off-farm wage. These two categories of farmers are apparently the major purchasers of farm inputs and the important sellers of agricultural commodities. The market-oriented farmers with less than .3 ha per capita could easily become producers of more labor intensive crops as vegetables and specialty crops. Those with more acreage than .3 ha per capita appear by observation to be more extensive grain producers. The farmers described here are roughly the same group that McKee refers to as farmers with "cash resources" who "purchase fertilizer regularly". The market-oriented progressive farmers described here make up about 20 percent of the total households.

Other farm producers are for the most part undercapitalized and use their farms for supplemental food supplies and subsistence living. This larger group--approximately 70 percent of total rural households--are for the most part not purchasers of farm inputs or sellers of agricultural commodities.

In view of the dichotomy in financial and management characteristics between market oriented and subsistence farmers, it is suggested that the two receive different foci within marketing strategies. For subsistence and sub-subsistence farmers, who presently rely on off farm income for purchase of supplemental food, food distribution and food processing appear to be the highest priority. An employment preference might also be considered for members of these households as

jobs open up in a growing marketing system, Conversely, the needs of market oriented producers will be best met by development of input and product markets.

With respect to farm inputs, extension of marketing services beyond market-oriented groups will probably not meet with commercial success. This concept has been confirmed by past experience. A major part of the losses incurred by past and present marketing agencies resulted from attempts to extend marketing services into more remote areas and to nonmarket-oriented households, where such services were not economically viable.

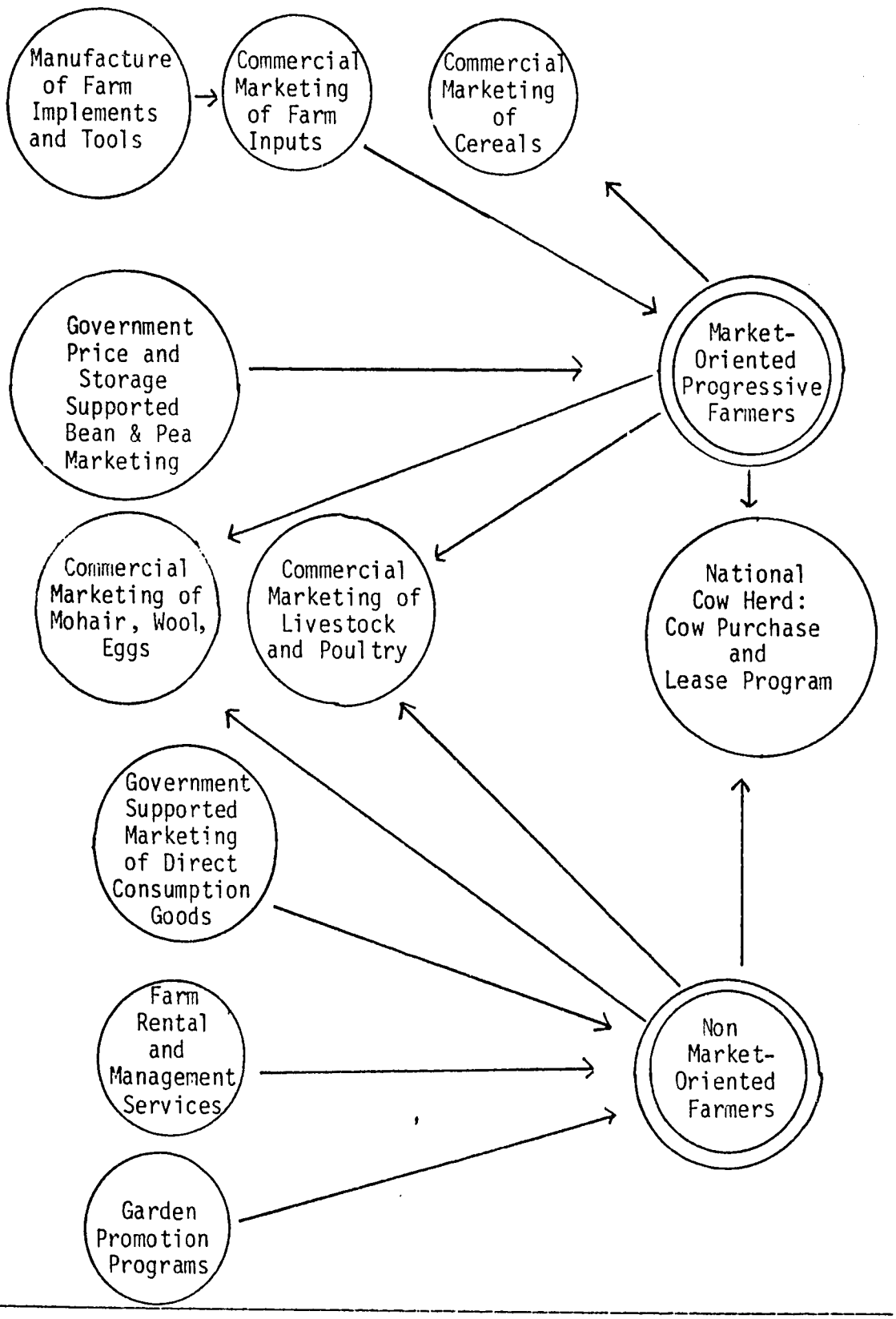
As agricultural marketing is organized to service diverse groups, it must also be directed to a number of goals including decreasing the nutritional deficiency in calcium, vitamin A, riboflavin, niacin and possibly protein, promoting a balance between cattle numbers and the available grazing, improving food self-sufficiency and generating employment. Details of nutritional objectives and the employment problem are discussed elsewhere in this report. The grazing problem is discussed in Chapter V.

New Program Ideas in Agricultural Marketing

Marketing in Lesotho could be directed more to the goals above by making several changes including: (1) development of the manufacture of selected farm implements and tools; (2) extending commercial marketing of farm inputs and cereal grains, without price controls, through privately owned firms and cooperatives; (3) developing a government program for pulses (beans and peas) which would include redistribution and storage and might include some subsidy; (4) further extending the marketing of direct consumption goods, with government funding, to the outlying areas; (5) organizing a cattle purchase-lease program. The elements of the suggested marketing program are shown in Figure VI-1 and are discussed below:

Manufacture of Farm Implements: A major part of the tools used for farming in Lesotho are imported. Most are tools that can be manufactured with little capital invensive technology. However, different levels of labor skills are required. Examples of tools that could be manufactured or assembled are shovels, plows, cultivators, planters, yokes and selected hand tools. The initial operation could begin with assembly in an effort to train labor for the eventual manufacture of farm implements. Except for yokes and other adaptations for animal power, most farm implements can be purchased from manufacturers in unfinished or unassembled form at reduced rates. Yokes and harnessing mechanisms may not be available from outside manufacturers. Further, the manufacture of yokes and harnessing mechanisms requires relatively high labor skill levels. For yokes, balance, wood grain and fit

Figure VI-1: Suggested Orientation of Agricultural Marketing Programs in Lesotho



require skills gained through experience. Harnessing mechanisms require both mechanical and leather craft skills.

Marketing of Cereals and Pulses: Goals in this area are somewhat in conflict. On the one hand, production of cereals should be increased to meet self-sufficiency goals, and on the other hand, the proportion of acreage devoted to pulses should be increased to improve the quantity of protein in the national diet. In this case it is suggested that a rental services and management program be used to encourage the rental of land held by the nonmarket-oriented farmers to the market-oriented farmers as a means of increasing production. It is further suggested that pulses could be supported through a price and storage program to encourage additional production; a program similar to the 1971 proposal for the improvement of the marketing of grains and pulses made by the Planning Unit (19). Floor prices could be set higher than low harvest prices and possibly higher than the yearly average price. Prices of beans and peas fluctuate widely over time, sometimes almost doubling during the year. As a result governmental price support and storage operations have a relatively high probability of capturing storage costs--even within the year. This option needs thorough examination by looking at the relevant production and price data. This type of activity requires great skill and Lesotho is not in a position to subsidize the cost of mistakes.

South Africa produces an exportable surplus of most cereal grains that largely determines the "market price". As a result floor prices set for cereal grains in Lesotho, regardless of the level, will be largely ineffective. Due to this major barrier government price support programs in Lesotho for cereal grains could probably never be operational without substantial amounts of government subsidy. However, the maintenance of cooperative marketing without subsidy could be a very useful means of preserving competition in the commercial sector.

Marketing of Direct Consumption Items: As food processing and the manufacture of direct consumption items expand, an attempt to market domestically produced items could be extended along the developing road network. Due to the "untried" nature of new products and brands, subsidization may be required to extend sales of the products to the new and more outlying areas. However, subsidization is probably beneficial as a means of introducing the new domestically produced products. In addition, it is a way of establishing a "habit of consumption" that will provide long term effective demand.

Cow Purchase-Lease Program: Cattle are vital to the survival and self-sufficiency of Basotho small farmers. Cattle provide power for farming and meat and milk for the family. Cattle are a source of cash when sold and as a capital resource play a strategic role in the survival of the subsistence farmer. As a store of capital, cattle are more desirable than bank deposits that lose value with inflation.

During bountiful years cattle consume (besides common held pasturage) crop residue and crop roughage. During leaner years they can be sold, traded or slaughtered. Cattle are the shock absorbers of the variances of the environment. Cattle are also deeply involved in local culture.

The object of establishing a national cow herd from a purchase-lease program would be to draw cows from the common pasturage to dairy herds, and confined herd operations. The operation of the program would be difficult because of the symbolism and many roles of the cow. The basic operation of the program would involve selling cattle to farmers that would then be rented or leased to dairies or confined herd operations.

The advantage to the Mosotho is that he could obtain cows that would be cared for by the renter or leasee--so that he could work off-farm without arranging for care of the animals. The size of his herd would not be limited by feed from his farm and nearby common pasturage. In addition, he would receive an annual cash return. Further, he could call for the return of his animal and receive it from a common pool if he desired. The major advantage to the dairy or the confined herd operator would be the important reduction in required capital that is tied up in the cow inventory. The major advantage to Lesotho would be the potential for removing cattle from overgrazed common pasturage. In addition, another source of investment would be provided that would keep a larger amount of current cash flows in Lesotho. The problem centers around developing a trusted agency which could organize a common pool from which cows could be drawn when requested, to manage the rented cows (protecting interest of the buyers) and collect rents and to provide selling services (proof of ownership) to potential buyers or cow providers.

The agency would have to be carefully chosen. If done correctly, such an agency could extend the symbolism of cattle even further as an investment in the national economic security. Also these business operations should probably be run as a cooperative so the buyer is a participant in the operation. In addition, a bonding or insurance program may be necessary to guarantee some cash value if the animal is stolen or dies. It is suggested that this forms another logical option for village management.

Summary

Marketing is an essential component of an overall agricultural development strategy. Without adequate, efficient marketing, modernization of agricultural production is not possible. After a period of experimentation Lesotho is now consolidating and unifying its marketing strategies. Considerable progress has been made. Several issues

remain for attention before adequate marketing institutions are in place for all major agricultural products.

Several themes run throughout this chapter. First, is that the critically needed developments at present are largely of an institutional nature. Organizational structures, assignment of clear responsibilities, relationships between ministries, and enabling legislation are among the priority items in need of further planning. Second, the simple economics of market activities suggest that government cannot be responsible for each and every marketing function in Lesotho. Government has its legitimate roles but so do other forms of marketing firms and agencies. These latter entities will require particular encouragement if marketing is ultimately to reach every farmer. Third, agricultural marketing can contribute to a number of developmental objectives, including better nutrition, employment generation, income redistribution, agricultural modernization and regional development. Fourth, special attention is warranted to managing the marketing of processed food. Much of the present volume flowing through marketing channels is imported food. The market is essentially providing "time" and "place" services with respect to these commodities. Until Lesotho comes closer to food self-sufficiency, carefully integrated planning and management of food reserves, food aid and commercial food wholesaling and retailing is defnitely in the national interest. Last, marketing strategies, just like production strategies, must be differently developed to meet the special needs of different groups within the population. Urban consumers, subsistence farm households and farms producing a surplus all have different priorities with respect to marketing services. Defining and then fulfilling these represents an important near-future task for agricultural planners.

CHAPTER VII

SOIL AND WATER CONSERVATION PROGRAMS

Introduction

Publicly funded soil and water conservation projects have historically constituted the largest (both financially and in area covered) and longest (in time span) set of agricultural development programs in Lesotho. Commencing with a major British countrywide effort in the mid-thirties, these projects have been continually pursued up to the present. Much has been written about the individual components of these soil and water conservation programs, ranging chronologically from the Pim Report (1935) to the recent AID-funded LSCE contract report (Seckler and Nobe, 1978).

Diaries, journal entries and technical writings by missionaries and other early visitors to Basutoland show that almost all of the visible signs of soil erosion, such as donga (gully) formation and exposure of bare rock surfaces in areas, occurred after the mid-1800's (Stockley, 1947). Stockley, Pim, Fitzgerald-Lee and other observers of the early settlement and erosion patterns of Basutoland quote the technical writings of the Rev. S. S. Dornan, an early missionary of the French Protestant Mission who worked in and observed the local conditions around the turn of the century, one such quote from his paper published in 1908, (Dornan, 1908) cited in Stockley's 1947 work, is particularly revealing:

> Recent and superficial deposits cover the low grounds, and consist of stratified clay, sand and gravels . . . The rivers in the course of ages have cut their way through them, and as they are loose and easily removed, the amount swept away by every storm is considerable. . . The dongas everywhere intersect the country. . . The destruction of the wood and bush of the country, together with the increase of cattle that eat off the grass, has powerfully assisted the formation of the dongas. They not only reduce the area of arable land, but also drain off the water and disfigure the country. If nothing is done to check their formation, they will render the water problem a very serious one at no distant future. When the first missionaries came to Basutoland <u>about 75 years ago multitudes of these dongas did not exist</u> (emphasis added). A deep donga 40 years ago was a small stream, that one could step across: now it is a trench 15 feet deep and 20 feet wide.

Despite the evidence that erosion had been a problem since at least 1850, the British administration made no serious remedial attempts until the early part of the twentieth century. Hailey reports that the first evidence of official attention to the soil erosion problem in Lesotho dates from 1902, (Hailey, 1953). It included some crop management advice but, according to Dornan, (1908) focused primarily on tree planting recommendations. Although the Department of Agriculture was established in Basutoland in 1910 its work prior to the mid-1930s was directed primarily to providing veterinary services. Its limited soil and water conservation activities were concerned primarily with tree planting and limited donga control efforts, rather than with reducing the rate of runoff and sheet erosion on crop and rangeland. It is apparent from reading the literature reporting on this period that early education oriented conservation efforts were sporadic, small scale, and largely unsuccessful.

According to Fitzgerald-Lee, the British government only began to get really concerned with Basutoland's dependence on its agricultural resource base in the early 1930s, at which time accelerated soil erosion was already clearly evident (Fitzgerald-Lee, 1951). He states in part:

> Twenty years ago it became obvious that in such a small agricultural territory as Basutoland, with no industrial population, all suitable land should be used to the full if the population was to support itself. Soil erosion had by this time assumed threatening proportions, especially in the lowlands: deep, wide gullies scarred most of the landscape and the crop yields diminished in the eroded soil. Yet the population was increasing and with it the cattle, sheep and goats, and the hillsides over which these animals roamed were becoming bare and brown.

Following the severe drought in 1932-33 and the devastating rate of donga formation during the next year of very heavy rainfall, the Secretary of State for Dominion Affairs appointed a Commission "to inquire into the position of Basutoland from the financial and economic points of view and to report thereon" (Pim, 1935). A three-man team, under the direction of A. W. Pim, arrived in-country in 1934 and in 1935 published what is now referred to as the Pim Report. Immediately thereafter, the British government initiated a major soil conservation program which continued in one form or another until Lesotho achieved Independence in 1966. A series of area-based rural development projects with major soil and water conservation components have been funded by various international donors during the first decade of the post-independence period. Within the last five years, the Ministry of Agriculture has been increasing its internal capability to operate Lesotho's soil and range conservation programs, primarily in the Conservation Division, but now also with the new Range Management Division and in the Extension and Research Divisions.

Starting in 1975, with initiation of the U.S. AID-funded Land and Water Resource Development Project (LWRD) in support of the Conservation Division, the Ministry began to implement a major institutional and technical manpower development effort for dealing with soil erosion problems, operating under its own direction. Since 1975, the MOA has continued conservation work begun earlier in donor-funded area-based projects, has initiated a regionally oriented Basic Agricultural Services Program, and has established new Research, Planning and Evaluation, and Range Management Divisions. In addition, elements of the 1979 Land Act have provided economic and inheritance incentives for farmers to more actively participate in the modern soil and water conservation programs.

Statement of the Problem

Conservation practices are tied to agricultural productivity in two important respects. First, they are physically tied since ground cover and soil and water management in agriculture affect both the degree of soil erosion and maintenance of installed conservation works. Secondly, they are tied economically since the primary justification for the conservation of agricultural lands is higher agricultural productivity of those lands, now and in the future, than would occur without the conservation efforts.

Under present conditions, the agricultural output per hectare of land in Lesotho is so low and farming units so small, that the economic conditions of a conventional conservation program do not adequately exist. Even with the best possible conservation works, under present farm practices the land and the conservation works themselves continue to erode. Second, the annual aggregate agricultural productivity of land is so low that it is questionable if present and immediate future net returns are sufficient to cover even the maintenance costs of the conservation works, much less their total costs. Hence, the installation costs of major conservation works remain a public responsibility.

While most people familiar with agricultural conditions in Lesotho would perhaps agree with this description of the problem, there is some disagreement over the cause. Some observers attribute a decline in agricultural production in Lesotho over the past few decades to soil erosion. Some have attributed it to sociological factors such as the propensity of the Basotho to be herdsmen rather than farmers. Others state that low agricultural productivity in Lesotho is primarily due to inadequate labor inputs to agriculture (Wykstra, 1978 and Seckler, 1979). Furthermore, absence of effective commodity price policies, especially those that would control excessive price variability, has been a disincentive in the past to commercial agriculture

and to the adoption of yield increasing technologies. Farmers tended to concentrate their cropping on home consumption needs only. All of these factors likely are interacting in Lesotho at the present time.

Lesotho finds itself in a particularly vicious cycle. Under present conditions of low labor inputs to agriculture and low productivity, conservation efforts are hardly viable, if they are to be justified on the basis of short-term returns. But if conservation efforts are not carried out on a continuous basis, the land will continue to erode which in turn will adversely affect its future productivity. However, with the likelihood of a more plentiful supply of labor in the future, agricultural productivity could rise to levels where it would be very profitable to conserve the soil. Unfortunately, at that point it may likely be too late to initiate an effective soil conservation program. Hence, the justification for a continuous conservation program within the Ministry of Agriculture is clearly established on the criterion of future, rather than present, productivity.

Because of the rather unique nature of the problem outlined above, conservation is tied to agriculture, and agriculture is tied to the labor supply and through it to the economic infrastructure of Lesotho. Within this complex arises the dilemma described above. In economic parlance, Lesotho's soil conservation problem is one of providing in the short run an option for the future, which may not necessarily all be used, but for which one is willing to pay some amount now, rather than do without later. Yet, present conservation efforts are constrained by budget and manpower limitations. The solution to the problem, therefore, is to provide for this option in the most cost-effective manner possible.

Technical Parameters of Soil and Water Resources Management

Any review and analysis effort brings with it an accepted set of concepts on which judgments are based. The approach taken here is to view conservation as a series of actions to provide for the protection, improvement and use of land and water resources according to principles that will assure the highest possible net economic and social benefits over time. Several of the concepts underlying this evaluation effort are presented below to help the reader gain an initial perspective of the processes involved.

Conceptual Framework and Physical Criteria

Conservation programs deal basically with management of physical resources and are designed to reach stated objectives. For example,

in the case of soil conservation as addressed in this study, the objective may in part be stated as holding erosion losses below some pre-specified level; say "X" tons of soil per acre per year. In designing such programs, several physical based concepts are particularly relevant. Among the more important of these are: (1) a watershed management approach, (2) vegetative control, and (3) land use capability. These concepts are discussed in turn, along with a review of data needs for evaluating the effectiveness of conservation efforts which requires the translation of physical parameters into economic evaluation procedures.

Watershed Management Approach: The watershed management approach to developing and evaluating conservation programs focuses on the watershed or catchment area as the natural unit for soil and water conservation activities. The approach implies that any conservation treatment should be considered in its relationship to the entire drainage area, both in how the watershed will impact the treatment and how the treatment will impact the watershed. In practice this means that no conservation practices are to be planned for any part of a watershed without considering the entire catchment. An example of failure to use this approach would be constructing terraces without considering runoff contributed by nonterraced areas or without considering disposal areas and downstream channel effects. The ranking of watershed areas against specific criteria will also assist the manager in the selection of those areas requiring intensive investigation, analysis of alternatives and treatment.

An intimately related concept is that the primary control of soil and water is exerted by vegetation, and that all efforts at management are ultimately aimed at increasing vegetative control of erosion and runoff. Therefore, the watershed management approach favors land treatment practices in conjunction with capital intensive structural methods in situations where the latter can significantly contribute to reducing soil losses in Lesotho.

Watershed management emphasizes the study of hydrologic principles as applied to the watershed ecosystem. The major concerns of watershed management may be divided into four categories: (1) surface runoff or water yield from the watersheds, (2) erosion and sedimentation, (3) quality of water, and (4) occurrence of groundwater. The reason for being so interested in water is that it is the primary mechanism for detaching and transporting soil pa ticles. Soil particles become sediment when they are detached and moved from their initial resting place. This process, which is called erosion, is accomplished for the most part by the impact of falling raindrops and the energy exerted by moving wind and especially water. A reduction in erosion rates (soil loss) is accomplished by protecting the soil with vegetation or other cover, and/or by reducing the velocity of moving water and wind by various land treatment measures. A management system embodies a balanced application of these two management tools.

In a developing country, such as Lesotho, the necessary data for watershed analysis is still relatively limited. As a general principle, however, it is important to realize that the greater the distance a raindrop must travel, the less chance it has of becoming discharge from a watershed. Runoff from high mountain watersheds is used by riparian (streambank) vegetation, evaporated from stream surfaces, used for crop growth or goes into groundwater storage. Most sediment produced is deposited at some lower point in the watershed rather than reaching the stream outlet at the lower end of the drainage area. These conditions make the evaluation of runoff, sediment production, and the benefits of the conservation program very difficult to measure accurately but, nonetheless, important.

Vegetative Control Concept: The vegetative control concept derives from the fact that man-caused increases in soil erosion and runoff result from an imbalance between vegetative cover and the soil-climate-landform conditions. The corollary to this fact is that the most effective treatment of accelerated erosion and runoff is the restoration of the proper balance between vegetation and site conditions. Vegetative control of runoff and erosion may be achieved either directly by improving natural ground cover or indirectly by effective management of crop residues on cultivated areas. Therefore, even where structural measures are employed, they should be considered as adjuncts to vegetative control methods.

Wischmeier and Smith (1965) found four factors important in rainfall erosion (climate, soil, topography and plant cover as reflected in land use patterns) that interact to cause the total erosion effect. To a limited degree, one can modify the micro topography with structures such as terraces, diversions or even land smoothing; but, these methods are expensive and have high maintenance costs. Fortunately, improving vegetative cover is relatively simple under Lesotho conditions, providing sufficient soil remains at most eroded sites to provide an effective rooting depth and water holding capacity for plant growth.

It should be noted that some depletion of cover through grazing or cropping may result in very little change in erosion or runoff rates until a critical minimum cover density is reached, after which they tend to increase at accelerating rates. The objective of conservation then becomes one of managing the ground cover so that this critical point is not exceeded. An increase in vegetative cover and underground root mass, particluarly fibrous roots as with grasses, tends to increase infiltration rates rapidly. For example, under U.S. conditions, range sites in good condition have been found to absorb moisture five to six times faster than range sites in poor condition (Seckler and Nobe, 1978).

Land Use Capability: Closely related to the vegetative control principle is the concept that every unit of land has a specific physical capability for use without permanent or reversible damage. Land use capability is an expression of the physical productivity conditions when using the land, without damage, for crops that require regular tillage, for grazing, and for other uses.

If land is used beyond its capability, natural relationships are unbalanced and accelerated erosion and runoff occur, along with the consequent loss of soil productivity and soil moisture storage capacity. Contained within the concept of land capability is the possibility of adding conservation practices so that land with known physical limitations may be used for crop production without intolerable damage. In some cases, the land use capability limitations may be so minor that only limited conservation practices or dense growing crops are required. Conversely, limitations may be so severe as to require slope modifications by the use of diversions, terraces and grassed waterways to safely use the land for crop production. It should also be noted that the application of structural measures does not necessarily change the capability of the land area. And, without continual maintenance of such structures, there is always the danger of structural failure and resulting damage. Unfortunately, damages from structural failures on protected lands are almost always more serious than those for unprotected lands, because the structures concentrate the water in a single place. Therefore, concern with long-term maintenance of installed conservation works is crucial to the effectiveness of the program.

Necessary Conditions for Determining Effectiveness

In theory, conservation is practiced to maintain or improve the quality of the land resource for both short-term and long-term use. Ideally, those practices are applied which allow achievement of long-term national public welfare goals while maintaining or enhancing the short-term productivity of the land for the resource user. Evaluation of conservation efforts must, therefore, consider both the contribution of a program to long-term national goals and the short-term effects on resource users. Defined national goals for agricultural development serve as the criteria for measuring the effectiveness of individual programs in achieving these long-term goals. Objectives of the individual villager, which are largely profit or home consumption oriented and which may in some cases conflict with long-term public welfare goals, are of paramount importance in the short run, because without his cooperation little progress in conservation programs can be achieved.

Physical data collected for evaluation needs to be compatible with the data requirements of economic evaluations. There should, thus, always be close coordination between the physical data collected and the

economic and sociologic studies being conducted. Costs must be identified in such a way as to permit the allocation of administrative, planning and installation costs for each practice applied to achieve some measure of protection to the land. Cost effectiveness should be indicated by the relative budget and manpower requirements to achieve adequate levels of protection for various land capability classes in specific uses, and in the alleviation of special problems such as gully stabilization.

One final point to consider is that in many instances under Lesotho conditions, there is a mixture of land use. As a result, the interaction of these uses complicates the application of the physical concepts outlined above. Further, because a combination of conservation measures will likely be involved, unit data for these practices, e.g., length of terrace, number of acres protected in each land use, etc., are needed. Without such information it is not possible to determine whether conservation objectives are being achieved in a cost-effective manner.

Agricultural Land Resources

For an agrarian nation such as Lesotho the land resource is one of its most fundamental assets. Not only the types of agricultre but also general levels of activity and prosperity depend upon the natural soil endowment, and upon the management which maintains and improves this endowment, or alternatively, degrades it.

Farmers, range managers, foresters, soil conservationists and land use planners need information about the productivity, erodibility and other problems of the land in order to manage it more efficiently. This information is usually obtained by either reconnaissance or detailed soil surveys.[1] Detailed soil surveys are now being made by the Office of Soil Survey, Conservation Division with the goal of providing coverage for all of Lesotho as quickly as budget and manpower constraints will permit.

Soils: The erodibility of specific soils is very important in planning soil conservation practices. Table VII-1 provides a ranking by K factor[2] values and erodibility ratings for Lesotho soils which can be used to indicate potential problem soil series.

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[1] Several reconnaissance soil surveys have been made in Lesotho. Included are Notes on the Soils of Lesotho by Carroll and Bascomb (1967), together with the associated Land Resources of Lesotho, by Bawden and Carroll (1968), and the Binnie and Partners (1972) "Inventory Report on Soils," Volume 3 of their study report series, Water Resources Development of Lesotho.

[2] K, the soil erodibility factor, is defined as the relative average soil loss under standard conditions, calculated originally on a 72.6 ft. 9-percent slope in tilled continuous fallow.

Table VII-1. Ranking by K-factor Values and Erodibility Ratings for Lesotho Soils

Ranking	Soil Series	K-factor by Nomograph	Qualitative Expression of Erodibility	Erodibility Rating (Conservation Division, MOA)	Erodibility Rating (Handbook for Soil & Water Mgmt. & Conservation)
1	Maseru	0.60	Very High	Easily	Severe
2	Tsiki	0.56	High	Easily	Mod. to Severe
3	Bosiu	0.55	High	Easily	Severe
4	Thoteng	0.49	High	Moderately	Moderate
5	Phechela	0.45	High	Moderately	Mod. to Severe
6	Thabana	0.42	High	Moderately	Moderate
7	Ntsi	0.42	High	Moderately	Moderate
8	Kolonyama	0.41	High	Moderately	Mod. to Severe
9	Ralebese	0.40	High	Resistant	Mod. to Severe
10	Theko	0.40	High	Moderately	Mod. to Severe
11	Sephula	0.39	Medium to High	Easily	Mod. to Severe
12	Rama	0.36	Medium to High	Easily	Mod. to Severe
13	Berea	0.32	Medium to High	Moderately	Moderate
14	Matela	0.32	Medium to High	Resistant	Mod. to Severe
15	Mats'aba	0.30	Medium to High	Resistant	Mod. to Severe
16	Leribe	0.28	Medium	Resistant	Moderate
17	Popa	0.28	Medium	Moderately	Moderate
18	Machache	0.27	Medium	Resistant	Moderate
19	Kuba	0.23	Medium	Resistant	Moderate
20	Khabos	0.22	Medium	Moderately	Mod. to Severe
21	Mailele	0.22	Medium	Moderately	Moderate
22	Matsana	0.21	Medium	Resistant	Moderate
23	Fusi	0.21	Medium	Moderately	Moderate
24	Caledon	0.18	Low to Medium	Moderately	Moderate
25	Sefonia	0.18	Low to Medium	Moderately	Moderate

Source: Guide to Engineering Uses of Soils in Lesotho, 1977. Ministry of Agriculture, Conservation Division.

The Maseru, Sephula and Tsiki soils are duplex or claypan soils with sharply separated A and B horizons; all of these are highly erodible with the Maseru series being a particular problem. The A horizon in these series consists of friable to firm, permeable loamy textured sediments that rest abruptly on a very firm, relatively impermeable and generally clayey sediment layer. These lands account for the majority of the gullied lands of Lesotho. Where the A horizon has been eroded away in the claypan areas, it is nearly impossible to grow any vegetation.

Table VII-2 provides the surface soil properties and available water holding capacity (cm) in 100 cm soil depth where this depth is commonly available. Based on the available soil survey reports, the most desirable soils for crop production are the Berea, Khabos, Leribe, Machache, Matela, Matsaba and Sofonia soil series, both because of their soil characteristics and the gentler slopes they commonly occupy. Most of these soils have available water holding capacities of 14-16 cm in a 100 cm soil profile.

Soil Groups: Soil analyses and surveys are absolutely essential for establishing an objective inventory and evaluation of the soil resource and are, thus, indispensable for sound agricultural planning. But soil science has its own technical language that often is unintelligible to the uninitiated. Therefore, efforts are made to simplify detailed technical descriptions of soils and processes by grouping soils according to general characteristics. Such an approach was used in the Lesotho Cropping Guidelines (MOA, 1978), in which soils were grouped according to general characteristics and crop suitability. These groups include the main agricultural soils from the lowlands and foothills regions where most farming takes place. Full details of soil series and soil groups are contained in the volume, Soils of Lesotho (Conservation Division, 1979).

The chemical and physical analyses that are used to differentiate soil series do not by themselves necessarily indicate suitability for any particular use. Therefore, soils must further be evaluated for use purposes. Two of the most common uses are for civil engineering, as in foundation material for roads or buildings (see Conservation Division, 1977) and for agriculture (see MOA, 1978). Suitability for agriculture commonly is indicated by Land Capability Classes.

Capability is an expression of the effect of physical features, including climate and slope, on the suitability of land for various uses. In concept, Land Capability indicates the most intensive use that can be sustained without permanent damage to the soil resource. Soils are grouped according to their possibilities and limitations, and to their response to similar land treatments. These classes do not, however, take into account modifications such as major slope

Table VII-2. Surface Soil Properties and Available Water Capacity in 100 cm Depth for Lesotho Soils

Soil Series	USDA Class	Permeability cm/hr	Surface AWC cm/cm	Hydrologic Soil Group	Shrink/ Swell Potential	AWC in 100 cm Depth
Berea	L	7-12	0.12-0.16	B	Low	14.0
Bosiu	SiL FSL	0.8-3.5	0.12-0.17	B	Low	15.5
Caledon	LFS	1.5-5.1	0.04-?	A	Low	6.0
Fusi	GCL	10-20	0.15-0.17	B	Low	14.4
Khabos	L	5-15	0.15-0.17	C	Low	14.8
Kolonyama	SiL	0.5-1.5	0.16-0.18	C	Low	16.9
Kubu	CL	5-15	0.15-0.17	B	Low	14.7
Leribe	SL or L	3-6	0.16-0.17	B	Low	15.3
Maliele	L	..5-5.0	0.15-0.17	C	Low	15.9
Machache	SiL	..5-5.0	0.16-0.18	C	Low	14.7
Maseru	SiCL	).8-1.6	0.17-0.18	D	Mod.	12.4
Maseru (Dark Variant)	SiL	..0-5.0	0.16-0.18	D	Mod.	16.3
Matela	SL	..0-5.0	0.10-0.13	B	Low	12.2
Mats'aba	SiL	..2-5.0	0.16-0.18	B	Low	13.9
Matsana	GL	5.0-15.0	0.12-0.14	B	Low	12.4

(Continued - next page)

Table VII-2. Surface Soil Properties and Available Water Capacity in 100 cm Depth for Lesotho Soils (Continued)

Soil Series & Mapping Symbol	USDA Class	Permeability cm/hr	Surface AWC cm/cm	Hydrologic Soil Group	Shrink/ Swell Potential	AWC in 100 cm Depth
Ntsi	LFS	5.0-15.0	0.06-0.09	D	Low	2.0*
Pechela	C	0.15-0.40	0.08-0.15	D	High	11.5
Popa	SiL	5-50	0.14-0.16	D	Low	5.4*
Ralebese	GFSL	8-10	0.07-0.10	B or C	Low	2.7*
Rama	SL	0.2-2.0	0.12-0.15	C	Mod.	14.6
Sephula	SL	0.6-2.0	0.12-0.14	D	Low	9.7
Sofonia	L	3.0-7.5	0.15-0.17	B	Low	16.0
Thabana	C	0.2-0.6	0.10-0.14	D	Low	12.5
Theko	FSL	5-15	0.12-0.14	D	Low	10.9
Thoteng	FS	15-50	0.06-0.08	A	Low	6.7
Tsiki	L	0.5-5.0	0.11-0.14	D	Low	14.3

Source: Guide to Engineering Uses of Soils in Lesotho, Conservation Division, Ministry of Agriculture, Maseru, 1977.

*Limited by average soil depth of less than 100 cm.

modification (e.g., bench terraces) or irrigation. The following classes are included in the classification system.[1]

Class I Land - There are very few soil limitations that limit their use for cropland.

Class II Land - There are moderate limitations in soils or slope that either reduce the choice of crops or require moderate conservation practices.

Class III Land - There are severe limitations in either soils, slope or climate that reduce the choice of crops or require intensive conservation practices for safe use.

Class IV Land - There are very severe limitations in soil and/or slope that reduce the choice of crops or require very intensive land treatment for safe use; (the land should be in grass most of the time).

Class V Land - There are physical limitations that are impractical to remove for cropland use. There is little or no erosion hazard when used for pasture, range or woodlot (to date none of this land has been mapped in detail in Lesotho).

Class VI Land - There are severe physical limitations in either soil or slope that preclude their safe use for cultivated crops and limit their safe use to pasture, range, woodlands, recreation and wildlife.

Class VII Land - There are very severe physical limitations in either soil or slope that preclude their safe use for cultivated crops and restrict their use largely to grazing, woodland and wildlife habitat.

Class VIII Land - There are physical limitations in landforms that preclude their use for commercial plant production. They are restricted to recreation, wildlife, water supply or esthetic use.

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[1] The land capability system in use in Lesotho was previously developed and widely used by the Soil Conservation Service, U.S. Department of Agriculture.

Slope is a basic feature in determining the land capability classification for a specific tract of land. The maximum land capablity for specific slopes is as follows:

Maximum Land Capability Class	Slope Mapping Symbol	Percent Slope
I	A	0-3
II	B	3-6
III	C	6-12
IV	D	12-20
V	E	20-35
VI	F	More than 35

The other factors that affect the land capability are erodibility of the soils, wetness, and soil limitations related to depth, texture or stoniness.

Evaluation of Soil Resources for Use Management

The soil series discussed above can be arranged generally in order of agricultural quality, from the Leribe series, containing some of the better soils in Lesotho, to the Sephula and Maseru soils which are particularly difficult to manage. The correlations are only approximate since any soil group could include soils in Capability Classes I to VII. As a final step, therefore, soil groups are evaluated in terms of specific crops and treatments. Preliminary findings are shown in Table VII-3. These ratings are subject to periodic refinement and should be checked with the Conservation Division before decisions are made with respect to soil suitability and crops in specific locations.

To summarize, individual soils are assigned to a Soil Series based upon chemical, structural, textural, and locational characteristics. Similar series are combined into Soil Groups. Evaluation for a general purpose (e.g., agriculture) results in Land Capability Classes, whereas Cropping Guidelines will relate Soil Groups to specific crops and management practices.

Concern with soils and soil conservation has a long history in Lesotho, in part because of the problematic nature of the soils and the resulting spectacular erosion forms. Thus, although soil analyses and detailed mapping still are far from complete, the general state of soil knowledge is now much more advanced than in many other countries at comparable stages of economic development.

Table VII-3. Soil Crop Guidelines for Lesotho.*

Crop	Soil Group				
	Leribe	Thabana	Mats'aba	Berea	Sephula
Maize	Good	Good	Good	Fair	Fair-Poor
Sorghum	Good	Good	Good	Fair	Poor
Wheat	Good	Good	Good	Good	Fair
Beans	Good	Good	Good	Fair	Fair
Peas	Good	Good	Good	Good	Poor
Potatoes	Good	Poor	Good	Fair	Unsuited
Sunflower	Good	Good	Good	Fair	Poor
Fodder	Good	Good	Good	Good	Good

*Rating applies to Land Capability Classes I to IV only.

Source: Conservation Division, Ministry of Agriculture, Maseru, January 1978.

Climate

Two aspects of climate, temperature and precipitation, are of vital concern for design and management of soil and water conservation programs. These aspects are discussed comprehensively in Chapter IV so will not be repeated here. (See also Wilken, 1978 and LASA, 1978).

Erosion and Sedimentation

Soil erosion is the detachment of soil by the action of water, ice, gravity, or wind. Of these, erosion by water is by far the most important in Lesotho (although some wind erosion does occur in the spring windy periods). Wind erosion is a problem primarily in the Mahkaleng Lowlands and the Dissected Molteno Plains of the south-western portion of the country. Based on historical records, accelerated erosion caused by man's activities has been going on in Lesotho for at least 150 years, and was being recognized as a serious problem by the early 1900s.

Wischmeier and Smith in their pioneering 1962 work emphasize that four factors and their interrelations are the principal determinants of rainfall erosion.

1. Climate - largely rainfall and temperature.

2. Soil - the inherent resistance to dispersion, water intake and transmission rates, and particle size are the important factors.

3. Topography - particularly steepness and length of slope.

4. Plant cover - either living plants or plant residues provide protection against raindrop splash.

More recently, soil scientists have pointed out that surface texture, the action of freezing or thawing, burning rangelands, soil depth, land use and management, and channel development in the watershed also affect erosion rates. These factors are interrelated and very complex, and still only partially understood by most workers in conservation. But only vegetal cover, slope and slope length, and infiltration characteristics of soil are generally subject to change. Plant cover is by far the most important of these, and in Lesotho it is generally easy to establish, given the proper cultural practices and management, including protection from overgrazing.

Sheet, rill and gully erosion are separate phases of the degradation process. The most evident of these are the rills and gullies (dongas). Factors contributing to gully formation are numerous and ill defined, but natural soil erodibility, overgrazing, cropping of natural water channels, trails or roads in natural waterways, intense storms, and general climatic changes from drought to wet cycle are all important factors in Lesotho. Since a watercourse is normally in balance--that is, the size of channel and its shape and gradient are on the whole suitable for the flows the channel normally has to carry--it is in fact in equilibrium within the watershed ecosystem. If this balance is slightly changed by a single food or other factor, the stream will tend to return to its equilibrium position over time. Since gullies are generally created by floods that exceed the carrying capacity of a natural watercourse, it would seem logical that all of the factors listed above have been important in forming specific dongas in Lesotho.

This leaves us with the questions of when most of the 20-30,000 dongas in the Lowlands of Lesotho were created, and are they currently increasing in length or width? Historical references indicate that the problem was first noticed about 150 years ago. But there is little question that the major period of donga formation was in the

early 1900s and particularly in 1933, as the drought of 1932-33 was broken by a period of very heavy rainfall. In the period from November 1, 1933 to January 1, 1944, the Leribe station received 883.4mm (34.8"), Maseru received 746.0 mm (29.4"), and Teyateyaneng received 737.6 (29"). This deluge amounted to 8.0 to 9.6 mm (0.32-0.38") average rainfall per day for the total period, and the resulting heavy runoff over a long period caused severe erosion. Thus, it is reasonably certain that most of the dongas of Lesotho are at least 45 years old. Overgrazing, which produces severe effects during a drought period, and cultivation across natural drainageways were probably the major factors in creating this gully system. Continued overgrazing, particularly of the Cave Sandstone mesas, and consequent floods have caused many donga heads to reach the sandstone escarpment.

Binnie and Partners (1972) concluded that the average gully is slowly widening as its sides collapse, is stabilizing and silting in the lower reaches, and proliferating at the top until it meets a sandstone barrier. Favorable precipitation in recent years has permitted gullies to reach a generally stable equilibrium that will likely continue until the next drought cycle or other major disruption of the watershed ecosystem.

Sediment sampling has been carried out intermittently at 19 different locations in Lesotho's river network. This sediment sampling was carried out by the Hydrological Department in 1970-73 and again during 1976-77. There are, however, only four locations where sufficient information is available to properly evaluate sediment loads (Jacobi, 1977). Binnie and Partners also provide valuable estimates of the probable division of sediment sources in the Caledon River Basin. These available sediment yield estimates for Lesotho are summarized in Table VII-4.

Table VII-4. Sediment Yield Estimates for Selected Locations in Lesotho

Location	Drainage Area sq. km	Runoff $m^3 \times 10^6$	Sediment Yield tons $\times 10^6$	Tons/ km^2 Year	Tons/ Acre Year
Binnie and Partners (1972)					
Caledon River at Jammerdrift	13,320	1,147.9	14.372	1,079	4.8
Caledon Left Bank (Lesotho)	6,570	760.0	11.491	1,749	7.8
Caledon Right Bank	6,750	387.9	2.882	427	1.9
Orange River at Aliwal North	37,200	4,856.5	32.364	870	3.9
Jacobi (1977) Summary of 1971-76 Data					
Puthiatsana at Mapoteng	386	100.2	1.146	2,968	13.2
Little Caledon at Masianokeng	945	191.7	1.870	1,979	8.8
Matsoku at Seshote	662	145.4	0.216	327	1.5
Malibamatso at Paray	3,240	1,006.0	0.710	219	1.0

Summary Analysis of the Technical Parameters

The following generalized statements of conventional wisdom about the physical infrastructure of Lesotho appear to be reasonably accurate and may be accepted as useful guides until the information base is refined:

1. Lesotho is a mountainous country with nearly five million acres, or two-thirds of the country, above 6,500 ft. elevation; almost all of this upland area is suitable only for grazing and watershed uses.

2. Ten of the 25 soil series described for Lesotho are classified as highly erodible, but most of the gully erosion (dongas) in cropland occurs in the duplex or claypan soils (Maseru, Sephula and Tsike series).

3. Statistics indicate there is a total of about 340,000 hectares of cropland, but some of this land is so highly eroded that it should be returned to permanent cover for fodder production and/or limited grazing, and the remainder cultivated under careful land use plans with structural control measures utilized where warranted.

4. Lesotho is fortunate to have normal precipitation rates that range from 500 to 900 mm (19.7 to 35.4") per year for most weather stations, and it is also fortunate that approximately 80 percent of the precipitation occurs during the growing season.

5. The much discussed variability of annual precipitation is not particularly more variable than that found in many other rainfed agricultural areas of the world. Comparatively few storms produce serious surface runoff and channel flow. But, individual exceptional storms in some years produce as much surface runoff and sediment production as several years of normal precipitation.

6. The major dongas of Lesotho are more or less stable at the present time; therefore, sheet or rill erosion is the source of most of the sediment currently being delivered to streams, with both cropland and rangeland contributing thereto.

Assessment of the Impact of Previous Conservation Program Efforts

Pre-Independence Conservation Efforts

The Kingdom of Lesotho was a protectorate of the British government from 1848 to 1854 and again was under British sovereignty from 1884 until granted independence in 1966. Although British agricultural technicians noted soil erosion as a potential problem as early as 1902, little corrective action was taken until after completion of the Pim report in 1935. Various conservation projects were in operation from 1935 to about 1950, focused heavily on structural measures and tree planting. This effort intended to place all of Basutoland's arable acreage under protective measures. Major program objectives were largely met. Phase II began shortly after World War II at which time lack of maintenance on installed structural measures had emerged as a major problem. This phase continued until Independence and was focused primarily on so-called pilot projects with major emphasis on donga (gully) control and extension education. It was not nearly as successful in meeting program objectives as Phase I had been.

The 1935 Pim report provided the first overall assessment of soil and water resource conditions of Lesotho. Pim recommended initiating a comprehensive erosion control program. The report's findings in terms of severity of the erosion problem led to an immediate crash program to combat it. Key phrases from the report that sum up the problem included, "It has been estimated that ten percent of the arable land is threatened by existing dongas, and in the lowlands--it is the best land that is affected--The whole fabric of the land is threatened by the erosion of dongas" (Pim, 1935).

The Pim team recommended a comprehensive soil conservation scheme including contour bank construction, grass buffer trips, returning some high erosion areas (particularly above the heads of dongas) to grass, dam building and tree planting in and along the dongas. A budget of £60,000 was initially made available to carry out the recommended soil conservation measures. In addition to the importation of some mechanized equipment and construction support personnel, the government added a Soil Conservation Section to the Department of Agriculture to assist in managing the schemes. It initially consisted of one engineer and several agricultural officers. "The country was one of the first in the world to combat erosion officially and one of the very earliest to have its own Soil Conservation Department" (FAO/UNDP, 1972).

In adopting the recommendations of the Pim report, the British government had committed itself to a ten-year program to protect some 150,000 acres of badly eroded land (Hailey, 1953). Based on experience gained in soil conservation work in the midwest of the United States during the early 1930s, a system of mechanical structures was

laid out across the arable areas of Basutoland. Work began in Maseru District in late 1935 and proceeded into the mountainous areas only after much of the cropland in the Lowlands and Foothills Regions had been treated (Turner, 1975).

By 1945, the dislocation of the war years notwithstanding, the early goals had essentially been achieved, based on a summary of accomplishments reported in 1946 by the Basutoland Department of Agriculture (DA, 1946). It is not known whether or not a supplemental appropriation was provided to carry out this first ten-year conservation program but if not, as is commonly assumed, the cost effectiveness rate achieved certainly exceeds anything achieved since then in Lesotho. To even have accomplished the physical targets is remarkable. As will be shown subsequently, the picture was not nearly so bright in terms of the long-term soil conservation effectiveness of these structures due to lack of maintenance. But this problem was not to become common knowledge until after Fitzgerald-Lee (1951) and others had already published in the literature about the "success" of this early program.

> By the end of 1948, about 227,000 acres of the densely populated lowlands had been terraced, and in the mountains, 203,000 acres had been protected by grass buffer strips... About 260 earth dams had also been constructed to seal off gullies. Grazing control has been successfully introduced and is being rigidly enforced by many of the chiefs; mountainsides and valleys are being ungrazed for as long as a year, and the ravaged grasslands are being given a chance to recover (Fitzgerald-Lee, 1951, p. 523).

By 1952, the Department reported that approximately two-thirds of the arable acreage in the Lowlands had been protected by terraces and grass strips, about three-fourths of the Foothills had been protected with grass or buffer strips and that the whole Mountain area should be completely protected by 1953. The basic recommendations of the Pim report..."were substantially implemented by the mid-1950s" (Turner, 1975). Future observers should note that in spite of the optimism of outside reviewers who viewed the early works from the mid-1950s on, a new policy direction in the country's soil conservation program was already being started at about that time, (e.g., the 1946-56 ten-year development plan), because of serious problems with maintaining the installed works and structures.

The title of Fitzgerald-Lee's article is in itself indicative of this optimism, e.g., "Basutoland's Success with Soil Conservation". He quotes Dr. W. V. Lambert of the University of Nebraska, who was then head of an ECA agricultural mission to British African dependencies, as follows. "One of the most encouraging things we observed (in Africa) is the great extent to which soil conservation practices are being employed in many areas." Another American, Dr. W. C. Lowdermilk, who visited Basutoland at that time was quoted as saying

that the fight against erosion in Basutoland was the finest work he had seen in Africa south of the Sahara.

It is worth noting that in the early stages of the conservation program very little effort was made to educate the farming community to the dangers of soil erosion and the importance of conservation. Most of the structures that were constructed were carried out under a legal structure which essentially mandated compliance. Little effort was taken to explain to farmers the importance of terraces or contour plowing. Some farm level resentment of the program developed as a result.

A report published by Qalabane K. Chakela (1973) provides a most sobering assessment of the state of affairs at this point of major policy shift in 1950. He stated in part:

> However, the following facts were clear as far as the work launched in the 1930s for stabilization of soil was concerned:
>
> 1. Deterioration of pastures had increased thus endangering soil resources.
>
> 2. The anti-erosion works had a very limited effect and their maintenance was very poor. The erosion was still increasing to harass the land.
>
> Lack of maintenance is the most obvious problem as far as the effect of these measures were concerned.[1] This seems to show very clearly that more education work was required to the local peasants to understand the importance of these groups of progressive farmers. Some of the recommendations of Pim's report and those after him were followed without taking into account local factors.

According to official reports (Chakela, 1973) the major soil and water conservation policy elements during the decade of the 50s were as follows:

1. Demarcation of dongas (equivalent to establishing grass strips along the edges).

2. Dam constructions (mostly for local water supplies).

3. Terracing (mostly through so-called Pilot Projects).

4. Runoff observations under varying soil erosion conditions (although no records exist as to whether or not these were actually carried out).

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[1]Underlining added for emphasis.

5. Rotational grazing and grazing control (for reclamation of pastures and eroded areas).

In an effort to speed up progress, "An anthropologist's services were obtained to investigate the land tenure system which everybody except the peasants thought was a hindrance to agricultural development" (Chakela, 1973, p. 8). Dealing with social change proved difficult so again a shift in policy followed. The method of attack during the second phase scheme is illustrated in the statement of objectives for the Tebetebeng Valley Scheme (1951-1957) which, being the first project during this time period, was known officially as the Pilot Project. The main objectives were: "Construction of roads, protection of land by soil conservation methods, building of dams and establishment of cooperative group farms...it will be stressed throughout that the function of the Pilot Project Team is to work with rather than for the people, and in its larger aspect the project will be an experiment in Community Development aimed at progress through the stimulation of local initiative and self-help" (Department of Agriculture, 1952).

About midway during the 1950-1970 period during which a number of pilot projects were being implemented, another major policy shift was made in the soil conservation program. It occurred at about the time that another thorough assessment by the British was made of the economic situation of the country (Morse, et al., 1960).

The Morse Report was the product of the Economic Survey Mission of 1960. Given the recommendations of this report, and the availability of data from the 1960 agricultural census, the Department of Agriculture once again shifted its policy for land and water resources development and the role of its conservation program. As far as the Soil Conservation Service was concerned, the theme was now changed to what was then called the "model reclamation scheme," of which the Taung Project, (started initially in 1956) became the first unit (Wallman, 1969). In addition, some important work was undertaken for developing the data base required for sound operational conservation programs. A hydrological network was set up for most of the rivers of the country, meterological data was being collected, land resource and soil surveys were undertaken in earnest and a new aerial photographic survey was completed in 1961/62.[1] The state was now set for initiating the series of donor funded projects undertaken during the post-independence period.

While the work on soil resource mapping got off to a good start in the early 1960s and effectively continues to date, the early work in hydrology in general was not clearly so helpful. For example, detailed hydrologic studies of the catchment areas in which projects were being proposed were almost non-existent. Since the mood was again shifting to a concern with an impending crisis, there appeared to be

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[1] The most recent aerial photographic coverage of Lesotho was flown in 1978/79.

little sympathy with taking the time necessary to develop a sound planning information base. As in previous times of perceived imminent danger, most of the emphasis was put on mechanical structures for the conservation of soil and water resources that could be rapidly put into place. In retrospect, too much optimism was directed to the new rehabilitation schemes. Further, there apparently was no serious attempt to learn from the mistakes of the past, and in particular, there was little concern with learning why prior projects had failed; this latter point receives extensive treatment in the Morse Report (Chakela, 1973).

Before leaving this review of the early soil conservation and resource development era (from 1935 to 1966), we quote one more statement in which the need for sound planning information is emphasized. Speaking of this era, Chakela stated:

> From the study of these schemes one thing is very clear... There is very little or nothing ever said about the past projects. It would be of great help to get the materials concerning these former projects and to find how the experience gained therefrom is being applied in the new schemes. From the only two studied projects (Taung and Farmech) it is clear that past experience with the soil conservation schemes was not taken into account. It is clear, despite limited ground material, that the mistakes in the Tebetebeng were reproduced both in Taung and in the first part of Farmech. Another striking feature of these schemes is the lack of hydrological data and analysis. The only thing of main concern seems to be soil, soil and nothing but soil. How the erosional processes can be dealt with without hydrological data is a puzzle as water is the main driving force in this process.

Conventional wisdom about the early conservation era generally holds that the program of soil conservation did check the rapid rate of soil erosion that had been so evident in the mid-1930s, that the loss of topsoil on cropland was significantly reduced, and that most farmers adopted contour farming practice (see Table VII-5 for a listing of installed works). On the negative side, it was generally felt that the program had failed to reach its objective of stabilizing the soil resource and that the rate of erosion, while reduced, was still at an unacceptable level. Blame was placed in part on engineering aspects of works that were installed; they were judged to be less effective, relative to the more modern structures that have been installed in some areas since 1966. In making this judgment, however, it appears critics ignored the fact that the level of soil conservation achieved per unit of money by the British was high and the scheme was reasonably cost effective. Unfortunately, no soil loss records were kept, so even this tentative conclusion cannot be substantiated with empirical data.

Table VII-5. Conservation Works Installed in Lesotho during the Period, 1935-1966

Item	1935-36[1]	1938[2]	1945[3]	1948[4]	1963[5]	1966[6]
Cropland protected--terraces, etc. (acres)	1,569	27,556	154,000	227,000	518,958	547,423
Acres protected by buffer strips (acres)			80,000	203,000	688,064*	188,218
Terraces (miles)	693	1,759			27,295	27,891
Diversions (miles)					3,996	4,067
Grass waterways (miles)						1,409
Reclamation beaconing (miles)						14,040
Dongas demarcated (number)						5,658
Dams constructed (number)	23	49	179	260	690	787
Trees planted (number)	12,070	171,958	822,000	850,000	**	4,500,000

*Note the variation for the buffer strips acreage, particularly the high figure cited in the 1963 column.

**This report cited a figure of "about 50 million," possibly a misplaced decimal point.

[1] A Review of the Position in Regard to Soil Conservation in the Colonial Empire in 1938, Section: "Basutoland," 1939, p. 78.

[2] Ibid.

[3] Quirion, J. M., "The Economics of Ariculture in Basutoland," thesis submitted to the Faculty of Economics, University of London for the degree of M. Sc. (Econ.), 1958, pp. 122-123.

[4] Fitzgerald-Lee, G., "Basutoland's Success with Soil Conservation," New Commonwealth, 1951, pp. 520-523.

[5] Baldwin, M. G. and Carroll, D. M., The Land Resources of Lesotho, Land Resources Study No. 3, (Directorate of Overseas Surveys, Tolworth, Surrey, England, 1958, p. 24.

[6] IBRD, Appraisal of Thaba Bosiu Rural Development Project, Report No. PA-147a, for official use only, Annex 3 (IBRD, Washington, D. C., January 1973), p. 3.

It would also have been useful if one could have related the location of the terraces and other structural works to the acreage of arable land protected. For example, the 1966 figure of 543,423 acres of cropland protected is not directly comparable to an arable acreage figure of 930,000 reported in the 1949-50 agricultural census (Douglas and Tenant, 1952). It is not even realistic to compare it to the figure given by Morojele in the 1960 census of 871,687 arable acres which he explains, "is lower than the 1949-50 figure because of abandonment of land since 1950, due to soil erosion and depletion of fertility" (Morojele, 1962). At a later date, Morojele reported in an unpublished paper, "The Lesotho Five-Year Development Plan, 1967-72," that only 700,000 acres of land remain that are suitable for cultivation. Of perhaps more interest is a statement (Smit, 1967) that "due to excessive slope on the marginal lands, only 540,000 acres in Lesotho should be cultivated". It is not known to what degree the acreage identified by Smit is the same as the 547,423 acres given in Table VII-5 as protected by the British before 1967, but there is likely a high correlation.

A lack of satisfaction with the early British works, as expressed by modern conservationists, was captured in part by Turner (1975) in which he reported on their views, including the view expressed by D. Munk, who worked on the Thaba Bosiu Project during its early years (1973-75). He wrote about Munk's views, as follows:

> A number of more concrete (engineering) failures can be noted. Most important of these was the insufficient installation of diversion works at the break of the slope between the sandstone outcrop so common in the lowlands, and the cultivated pediment. Where these were lacking, the great terrace systems lower down could only be of limited effect. Further a number of technical errors were made in alignment and layout of terrace systems; this compounded with poor maintenance, resulted in some runoff inlets becoming new dongas. The situation in some areas has now so deteriorated that <u>it was felt necessary to destroy all the original works and lay out a more carefully constructed system."</u> (D. Munk--personal communication. Underlining added for emphasis.)

It is also generally recognized that part of the lack of effectiveness of the early soil conservation programs was due to improper management of the structures, cropland and of livestock. Physical evidence was seen in the narrowing of grass strips between fields over time, inadequate maintenance of terraces, waterways and buffer strips (particularly in terms of not rapidly making repairs when breaches occurred), continued movement of people, cattle and farm machinery over the terrace banks, and overgrazing of crop residue in the fields, on the grass strips and in the donga areas. All of these undesirable practices were attributed to a lack of involvement and support of the

program by farmers. Causitive factors were said to include constraints imposed by the land tenure system and simple ignorance of the farmers themselves (Quirion, 1958). Turner has noted that while no accurate records are available, "a malaise must have hung over the last years of British rule, as the colonial conservationists' task became more and more frustrating...Serious fiscal difficulties in 1964 resulted in the retrenchment of the few Extension workers concerned with the maintenance of conservation works; this and the extreme antiquity of the Divisions equipment meant that all aspects of anti-erosion work were at a very low ebb at Independence in 1966" (Turner, 1975).

Post-Independence Conservation Efforts

Several external observers in the mid-1960's and again recently have noted that one of the major constraints leading to a lack of effectiveness in early conservation systems was that no real effort had been made to relate the structural elements of the program to effective conservation farming practices (Nobe and Seckler, 1979; World Bank 1975, 1980). The degree to which erosion losses were checked by the government programs during the British era is unknown because no evaluative research was carried out that would have permitted such measurements. The inability to clearly demonstrate conservation benefits to farmers in terms of increased short-term economic potentials appears to be a plausible explanation for the disappointingly low level of farmer response to conservation programs during that period.

Recognition of these realities by government policymakers in the late 1960's led to large scale, donor funded, semi-autonomous, area-based projects seeking to modernize the agricultural sector. Conservation programs were again included in these packages, often with more reliance on structural measures than before. This approach was illustrated in the following anonymous assessment of the Thaba Bosiu Project: "Implementation of project conservation will involve a heavy component of new construction of terraces, drop structures, grassed waterways, etc., as well as repair and maintenance of existing facilities," (unpublished Project Report, 1974).

Four major area-based development projects were started after Independence: 1) Leribe/Khomokhoana Rural Development Project; 2) Senqu River Agricultural Extension Project; 3) Thaba Bosiu Rural Development Project; and 4) Thaba Tseka Mountain Development Project. All of these projects had broad-based rural development objectives. But they also contained conservation program elements which were to serve as the means of achieving significant increases in agricultural production within an unrealistically short time. These projects are important because they provide recent experience and data on cropping for three major subregions of the Lowlands and one central region in

the mountains. All four projects have been studied in detail in their respective evaluation reports and in a recently completed reconnaissance study of conservation programs (Seckler and Nobe, 1978). Consequently only an overall summary assessment is provided here.

Since Independence in 1966, major rural development projects containing conservation components have been largely funded by international donor agencies. These were area-based in scope and semi-autonomous in administration. Building on a perceived sense or urgency, these projects were implemented for a limited time only. All but one have now been phased out. They were generally designed with over-ambitious goals, targeting either large increases in crop production in the short run or rapid integrated development of the rural sector. Those projects that have ended recently fell short of achieving the objectives stated in original project proposals. Farm labor and institutional constraints were primary causitive factors. Inadequate project management was also a factor leading to less than optimum achievement levels. Conservation and extension program efforts in the project areas have now been transferred to the Ministry of Agriculture and the semi-autonomous project management authorities phased out.

The rationale that all of Lesotho's cropland should be allocated to food crop production and that crop yields had to be raised was used to justify all of these area based projects. In light of the tenure system prevailing at that time, the size of farm units, a preference for livestock enterprises rather than crops, high risks from hail and drought, and the erodibility of soils being cultivated, this objective was highly questionable. While a positive response was received from those few farmers with adequate productive resources, the average Mosotho farmer simply could not afford the risk of high input costs necessary for maximum crop production. Unfortunately, since conservation elements were part of these broad-based projects, they were given a large share of the blame for project failures. In reality, the problem stemmed primarily from the inability of most farmers with limited resources to take full advantage of the increased production possibilities being offered.

All four area-based projects were judged to be making reasonable progress in the physical aspects of their soil and water conservation activities (Seckler and Nobe, 1978). Considering the entire group, it was estimated that about 29 percent of the overall effort was going into increasing the knowledge base, either through applied research and/or through training efforts. An additional 11 percent of effort was directed toward improving the data base. Approximately 22 percent of the effort was on measures to directly increase long term productivity, as contrasted to only about seven percent aimed directly at increasing short term productivity. Dissemination of knowledge to farmers consumed about 18 percent of total expenditure. The remaining

13 percent of the efforts were directed toward natural resource program integration (2%), modification of institutional constraints (10%) and increasing employment opportunities (1%). In total, the conservation activities were of limited value in efforts to increase productivity in the short term. On the other hand, particularly if the installed works are maintained properly, their impact on production levels over the longer term will likely be much more significant.

Some common constraints and problems appeared throughout the projects. These are briefly identified in the following summary evaluation, which concerns only the conservation efforts included in the four area-based projects.

Short Term Productivity

Project plans generally overstated what could be realistically accomplished within the time frame. The individual farmer, attempting high yield farming in Lesotho, takes very high risks. Adequate farming systems that consider not only physical inputs but also provide incentives and minimize risks, have not yet been fully developed and tested. Several projects made a good start on this problem, but comparative analyses of various systems are still needed. One approach worthy of further testing is the use of agricultural contractors who can provide physical inputs (plowing, planting and fertilizers) and also serve as a link between farmers and Extension. Physically, there is a high potential for increased productivity if the institutional and cultural constraints can be removed, and if inputs can be made readily available to all villages. But since such systems were not available at the time, economic justification of projects rested largely on expected short-run yield increases which, as assumed in the project proposal documents, were simply not realistic. It is simply not reasonable to expect significant yield increases in the short-run and certainly not within the very short time frame faced by these projects. The lesson is that expectations should be more cautiously framed and put in a longer perspective in the economic justifications for future conservation programs.

Long Term Productivity

A major constraint to increasing productivity in the long term was the lack of an effective systematic linkage between livestock grazing and cultivated crop production. Some of the projects had personnel who worked on this problem but their efforts were piecemeal and terminated when the project expired. Unless a concerted effort is made to link range management of high elevation grassland, winter grazing and fodder production on cropland and cultivated food crop production, the efforts to increase both short and long term productivity through conservation programs will be of limited effectiveness. Specific recommendations for improved husbandry are provided in the crop and livestock chapters.

Another problem existed in the case of structural erosion control measures because of an unrealistic approach to maintenance. To simply say, as was said at the time, that maintenance is the "responsibility of the farmer" is to ignore the problem. The 1979 Land Act has now made it possible to develop economic incentives for conservation efforts. Extension programs should take full advantage of this recent favorable development.

Increased Technical Knowledge

This objective includes two components: (1) increased staff capability, either in numbers or skills; and, (2) increased knowledge from applied research.

During the era of the area based projects, there was a severe lack of detailed information on the requirements for productive farming systems under Lesotho's conditions. In the few cases where such information was collected, it was seldom analyzed completely. All projects reviewed failed to reach full expectations in this regard, although some farming systems information was collected in each project. While it may have been beyond the project's capability to develop this applied knowledge at the time, a new Research Division has now emerged in the Ministry so the necessary capability is now being developed. Former area-based project sites could make substantial contributions to a research program if they were used as field demonstration units and data collection sites on a long term basis.

In the area of training, several problems were identified. Almost universally there was dissatisfaction expressed concerning difficulties in obtaining sufficient personnel for training and with the timeliness of their availability. There are many reasons for these problems in a developing country such as Lesotho but a master training plan, along with individual training plans, would help to alleviate many of these kinds of difficulties in the future.

Dissemination of Knowledge

The major constraint identified here was the limited number of conservation-trained Extension people available to work in project areas. This is a significant problem for which there is no easy solution then, now, or in the future. Two options are offered for consideration: (1) develop a conservation training focus for Extension people as part of an overall training program in the MOA; and (2), concentrate special Extension efforts on a select group of agricultural contractors who can then serve as effective change agents at the grassroots level.

Creation of Employment Opportunities

Although this area of concern was only a very small part of the overall efforts of the projects reviewed, there nonetheless was substantial labor use as part of direct project operations. In the long run, there is also the possibility of employment opportunities for several thousand persons employed in agriculture and support services, if the agricultural sector in the former project areas continues to modernize. There is also opportunity for a moderate amount of employment in livestock sales and processing if grassland management and commercial livestock production systems are developed. Successful implementation of these potential opportunities will, however, require a concentrated effort on the part of GOL to provide technical and institutional support for the affected farmers in former project areas.

Basic Data Development

All four projects were doing a fair job of basic data development but there still exists a strong need for better records of both financial and physical input/output relationships on all conservation efforts. Research and evaluation personnel at the project level, working closely with Planning and Evaluation Division of the MOA could provide a valuable service by planning and supervising such data collection and analysis. A major constraint in past projects appears to have been lack of a clear identification of data needs. A major future constraint will be manpower. Hence, there is a need for a carefully planned approach to remove such problems in the future.

Reduced Sedimentation

Very little direct attention was given to sediment reduction in the projects reviewed, even though all efforts at soil erosion control directly or indirectly are aimed at this goal. There is little information in Lesotho regarding the sources of large sediment loads in stream and channel systems, let alone about the large potential for additional sediment yield from donga and near-stream deposits. As future demand for water storage, urban and industrial water, and recreational use of streams develops, there will be an increased need for sediment management. A research program for investigating major erosion and sediment source areas, delivery processes, and possible control practices in channel and near-channel areas merits encouragement.

Natural Resource Program Integration

The problem most frequently identified by management personnel in these four integrated development projects was coordination across the several ministries involved in rural development. Planning effective integration of several ministries in relation to conservation in

particular; and agriculture in general, requires considerable direct action by the individual ministers, their permanent secretaries, plus day-to-day coordination and development of good working relationships among delegated officers from separate ministries. Within the MOA, the Planning and Evaluation Division is suggested as the lead group in developing the necessary integrated approach to natural resources program management in these project areas.

Modification of Institutional Constraints

A number of institutional constraints were identified by evaluation. The single greatest problem in range management was believed to be lack of adequate control of numbers, timing, and distribution of grazing animals. In cultivated cropland areas, there was a need for incentives to induce increased production beyond subsistence levels as well as provisions to reduce risks involved. Third, there was a need for institutional measures that would support a shift in the use of marginal cropland to grassland. These three major problems suggest the need for an integrated approach and, as will be shown in the following section, progress in this regard is now being made.

Concluding Comments

The LSCE team evaluation of major post-independence conservation projects was not optimistic about use of capital-intensive structurally-oriented conservation efforts as part of semi-autonomous, area based projects in Lesotho at that time or during the foreseeable future. Since then these projects have been phased out and the Ministry has undertaken direct responsibility for conservation and related extension activities in these former project areas. Initially, these changes in responsibilities severely strained the absorptive capacity of the Ministry but over time the necessary adjustments have been made. Since 1979, several significant improvements in the conservation program delivery system have occurred, as set forth in the following section.

Recent Improvements in Delivery of Conservation Program Components

During the past few years a number of significant improvements have been made in the Ministry's capacity to deliver an effective soil and water conservation program to Lesotho's farmers. Among these improvements have been the adoption of several of the recommendations presented in the LSCE study (Seckler and Nobe, 1978) and continued progress on achieving objectives of several on-going program elements in the Conservation Division.

LSCE recommendations that have recently been implemented, or indirectly achieved in varying degrees, are as follows, stated in terms of the original recommendations and progress achieved:

1. "Obtain legislative action to recognize grass as a crop within the legal context of land use."

The least-cost conservation tool is a complete grass cover on highly erodible soils. Under Lesotho's conditions this requires recognition of grass as a crop. The 1979 Land Act (GOL, 1979) provided part of the institutional framework. Specific provisions are contained in the Range Management and Grazing Control Regulations of 1980, especially paragraph 8(2). Extension efforts and direct assistance programs to farmers now recommend that fallow fields devoted to fodder production be committed to that use for periods of at least five years duration. As a result, not only is a significant reduction in the rate of soil loss being achieved initially on arable fields, but also the land's recovery rate is enhanced because such fields are not open to communal grazing during this period.

2. "Transferring the...conservation management of the mountainous areas under grazing to a new Division of Range Management in the MOA."

Range Management activities have been concentrated in the mountains before the formation of the new Range Management Division. The former Range Management section of the Livestock Division had Range Assistants in every district, whose main activities were on extending range management principles to the livestock owners.

In 1972/73, the cattlepost grazing areas were divided according to diptank area boundaries for rotational grazing purposes, and the grazing capacity of each diptank area computed then. Grazing permits were also initiated at the time and were and still are being issued by the principal chief or a representative since all cattlepost areas fall under the jurisdiction of the principal chiefs only. Therefore, one can generalize to say that management advice for communal grazing land has been provided primarily to farmers with animals in the cattlepost areas.

There is at present no legal protection of grassed waterways, against damage by animals, and there is therefore some legislation being drafted to protect against animal trespass.

The recent establishment of the Range Management Division has created an institutional structure that can significantly strengthen these efforts, particularly in the Mountain ecological zone. As a result a cadre of MOA personnel is now being trained in modern range management techniques. Direct benefits from the new Division's program should

include: 1) increased feed production per hectare for the nation's cattle herds as the carrying capacity of the range and stocking rates are brought more into balance; and, 2) significant reductions in sediment loss through sheet and rill erosion from mountain grazing lands.

3. "Develop a continuing soil and water research and basic data collection network within the MOA."

Research and basic data collection in general have emerged as high priority items within the MOA. The effort includes development of information useful in conservation efforts for cropland and range management. Three organizational changes recently implemented have facilitated this effort: 1) establishment of the Research Division; 2) implementation of the Basic Agricultural Services Programme, focused on regionally oriented units; and, 3) decentralization of some of the MOA personnel to the district level. All three of these developments assist in organizing and refining the data base and extending it to regional levels so that solutions to local problems can be achieved more effectively than is possible by relying on averaged nationwide data could accommodate.

4. "A moratorium should be placed on new area-based conservation projects."

The emergence of BASP and decentralization of the MOA to the district level has effectively replaced the earlier concentration of donor-supported projects. The primary benefit from this change will be continuity for conservation programs, a critical element not previously evident in the post-independence history of conservation efforts in Lesotho. And, with the shift away from a short duration crash project approach to one of long-term objectives; cost effective conservation measures, such as grass cover for fodder production and range management assistance for communal grazing lands, are emerging as important conservation tools within the MOA.

5. "Livestock production should be recognized as an important social and economically viable enterprise that can be supportive of soil conservation objectives."

Progress in this regard and recommendations for future efforts are provided in the Livestock chapter. In addition, it should be noted that the recent MOA reorganization resulting in new Research and Range Management Divisions has facilitated implementation of this recommendation.

6. "The GOL should capitalize on, and (help farmers) maintain, the soil conservation works already installed".

This recommendation is now being rapidly implemented but not by the means envisioned at the time the recommendation was made by the LSCE

team. This earlier recommendation was based on criticisms made of conservation efforts prior to 1978 in which failure to achieve targets in many projects was due in large part to the incorrect assumption that farmers would properly maintain the installed conservation works. Under the land use laws in effect at the time, farmers had no legally assured long-term security for their land holdings so that risks of recovering long-term investments were perceived to be high. Further, since grass was not considered a crop, this cost-effective conservation measure was not readily available to farmers for their exclusive use. As noted above, implementation of the 1979 Land Act and the 1980 Grazing Control Regulations is making grass management possible. Of equal importance, the provision for inheritance now makes it possible for farmers to participate more directly in government's long-term conservation efforts because the risk involved has been considerably reduced. Recognition of this favorable turn of events is being incorporated in farmer assistance efforts of the Conservation, Range Management, and Extension Divisions.

One important technique for maintaining conservation works by villagers themselves is the use of trees and afforestation as a watershed management tool. Over the years, beginning with tree planting by the Department of Agriculture in the mid-thirties, and continuing with periodic concentrated tree planting efforts, a large number of trees were planted in Lesotho. But, few plantations have survived for very long. The reasons for failure of these earlier large-scale efforts are varied but one of the most important was that farmers were generally unwilling and/or unable to protect the sites from grazing during the crucial period necessary for the trees to become established. A related problem in some project areas was that good capability cropland, e.g., Classes II and III, had been designated for woodlots rather than lower capability (Classes V and VI) areas. Farmers, naturally resisted such efforts because it reduced their available arable land base.

With current approaches to land use planning on a watershed basis within the Ministry, there is now clear recognition that trees have a valid role as a management tool in the proper location in the same sense that using grass for vegetative cover or structural measures are valid tools in their proper settings. Therefore, as land use plans are developed, sites for woodlots are identified which are consistent with land use capability classifications. Such areas can be protected under recently developed legislation, especially the Land Act which permits declaration of "agricultural development areas". Use of such a designation for village fuel woodlots which would be placed on lower capability areas (Classes V and VI) adjacent to the villages is meeting with increasing acceptance by farmers. Presently, such woodlots are designed primarily for fuel production while simultaneously providing a watershed management function. The possibility exists, also of including fruit tree plantings in such woodlots.

Gaining farmers' acceptance for designating larger scale woodlots in the mountains and foothills will be more difficult than it has been for the smaller-scale village woodlots, since farmers see such a use as encroaching on their communal grazing areas. Technical changes such as shifting from Eucalyptus in dense plantings to other tree species spaced farther apart, would permit grass growth as ground cover and would allow some controlled grazing, once plantations become established. Multiple use concepts would likely have significant dividends in terms of gaining local farmer support. In addition, the possible feasibility of some form of direct payment to farmer groups to offset loss of grazing area while plantations are becoming established, would also be worth investigation. Farmer education through Extension of the potential economic value of fuel and timber production is suggested as is serious experimentation with some of the new high yielding tree species. The important point here, (as in introducing conservation practices for cropland) is that for such practices to be successful, farmer acceptance and participation in such efforts is crucial.

One final point needs emphasis. Watershed management is of sufficient importance in Lesotho to deserve a multifaceted approach using as many management tools as are feasible for the Ministry. Afforestation constitutes one such programmatic tool which seems particularly suited to lower capability lands. Provided farmers recognize the value of trees as an integral part of their environment and as a source of personal household needs, (fuel, timber) they will protect and maintain such plantings over the long term.

A Policy Focus for the Future

Organizational changes within the MOA during the past five years have now truly focused on means of achieving conservation objectives in a more cost-effective manner. Among the more important elements of this redirection are: 1) programs are now being planned on a long-term basis, utilizing to a greater degree such cost-effective measures as vegetative control; 2) a division of responsibility along technical lines of specialization, through the emergence of the new Range Management and Research Divisions; 3) a more direct focus on local problems and solutions facilitated by the regionally oriented BASP and decentralization programs of MOA; and, 4) enactment of legislation in 1979 and 1980 which facilitates farmer participation in conservation by providing an economic incentive for production of fodder on highly erodible fields and reduction of risk in making long-term investments through recognition of inheritance from father to senior son (or, in his absence, another designated heir).

But, given the enormity of the soil erosion problem that remains and the critical importance of Lesotho's land resource base for developing

a viable economy, the Ministry must continue to move vigorously forward in achieving its conservation objectives. Due to the unique characteristics of the soil erosion problem discussed earlier, this is one area of activity in which government must maintain a central role. Farmers acting individually cannot ensure the regional application of practices necessary for success, the recent incentives provided for them notwithstanding, nor is this an area of endeavor that the private sector would find attractive (as contrasted to marketing, for example), because of the lack of profit potential.

Given then that government necessarily retains a crucial central role in soil conservation efforts, but is constrained by budget and manpower limitations, it follows that its conservation objectives should be achieved in the most cost effective manner possible. This is certainly a difficult situation because the conservation mission must comprehensively cover all land resources in the country; it affects all farmers regardless of their relative resource endowments. But many farmers will still not find high levels of economic incentives because of the part time nature of their farming efforts.

This point of the critical role of all farmers is an excellent starting point for a policy focus. Not only is it necessary, it is also consistent with a national policy focus on equity and widespread citizen participation. From this flows a concern for efficiently achieving the long-term objective of reducing soil losses to acceptable levels. Corrective efforts must focus on the local level to the maximum degree possible. Even support programs such as research and extension can be more directly focused on critical local problems that would be the case when viewed only in terms of broad-based national perspectives.

In summary, control of soil erosion is a critical problem of national dimensions. Government must take the lead but it cannot solve the problem without the active participation and support of farmers. While other programs of the Ministry can be focused on particular farmer groups because of their specialized nature, the Conservation program must be broad enough to cover all farmers, while at the same time be tailored to the unique resources endowments of individual farmers. Achieving success in this difficult endeavor will necessarily involve cooperative efforts by all elements in the Ministry, either directly or indirectly, and at all levels, from national to local. Effective coordination of an integrated Ministry approach will require agreement on the high priority to be accorded to conservation over the long run, and the technical and management expertise to do the job. Recognizing this fundamental fact is important to the Ministry at this point, rather than provision of the programmatic details of day-to-day implementation which by necessity will have to vary over time as does the economic and agricultural environment.

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PART THREE

RECOMMENDATIONS

The three chapters which follow develop a series of recommended agricultural development strategies based on the analysis in Parts One and Two. Chapter VIII emphasizes employment generation, one of the most critical of all development priorities in Lesotho. The recommendations presented were originally developed and approved by the Ministry of Agriculture in 1980. Chapter IX examines regional implications of the various differentials discovered earlier. Lesotho has committed much effort to decentralization in recent years. This chapter provides the beginning basis for locally distinct agricultural strategies. Chapter X draws the whole volume together, presenting an integrated agricultural development program. Interrelationships between the different program possibilities and development objectives are stressed. The development strategies suggested are many and diverse and will be a challenge to implement. Yet, only with this or a similar program can Lesotho's rural resources make their maximum contribution to national growth.

CHAPTER VIII

STRATEGIES FOR EMPLOYMENT GENERATION

Introduction

Employment generation in the short run is one priority objective in Lesotho. The growing labor force and the probability of declining migratory employment require that employment be a focal point to development planning. Hence the adoption of short term labor utilization measures and a viable long-term employment strategy is critical.

Each sector of the economy must contribute to the solution of Lesotho's employment problem. No one sector can resolve the problem itself. Nevertheless, agriculture probably bears the largest residual burden for meeting Lesotho's employment needs during the rest of this century. The modern sector, even with rapid relative growth, cannot absorb more than a portion of the prospective labor supply. Government must, therefore, make every effort to stress labor using technologies and to pursue complementary goals such as selective import substitution policies. This means that a cohesive employment strategy in the agricultural and agri-related sectors must be both developed and implemented.

In what follows we first examine selected aspects of the labor supply and employment dilemma, including migratory employment impacts. Next, attention is focused upon some major dimensions to manpower planning in Lesotho, with special emphasis upon a fuller utilization of the agricultural labor force.

Labor Supply and the Need for Employment

Previous estimates of population and labor force growth clearly identify the general character of the agricultural labor problem confronting Lesotho (Eckert and Wykstra, 1979b). Some of the most relevant data were presented in Chapter I and are summarized in Table VIII-1.

Table VIII-1. Estimated Labor Supply in Lesotho (in 000 persons).

	Total Population	Work Age Population	Labor Force	Migrant Empl.	Modern Empl.	Agric Empl.
2000						
Total	2,267	1,239	1,005	100	106	799
Male	1,108	604	515	72	80	363
Female	1,159	635	490	28	26	436
1980						
Total	1,338	765	612	188	40	384
Male	648	369	311	160	30	121
Female	690	396	301	28	10	263
Probable Change	+929	+474	+393	-88	+66	+415

Source: Eckert and Wykstra, 1979b.

Based on these data the major dimensions of Lesotho's forthcoming population and employment crisis between 1980 and 2000 AD are:

a. Lesotho's de jure population will increase by approximately 900,000 persons to more than 2 million.

b. The dependent (non-working) population will approximate 1.2 million persons in 2000 AD, up by one-half million persons over 1980.

c. Lesotho's active labor force will increase by over 60 percent and will probably exceed 1 million persons in 2000 AD.

d. Probable migrant employment in South Africa is likely to decline by 50 percent leaving only 100,000 such jobs as of 2000 AD.

e. The probable supply of labor requiring employment within Lesotho's economy will increase by nearly one-half million persons to a total of some 900,000 persons.

f. The modern sector (including government) may be able to increase its total employment to just over 100,000, but probably not much more--an increase approximately equal to or below migrant employment decreases.

g. Consequently, it appears most likely that there will be a 60 percent increase in the number of households that must rely on agriculture (and other traditional activities) for their livelihood.

h. The number of workers that must be absorbed in agricultural employment likely will increase by 415,000 to almost 800,000 persons, a compound growth rate of 3.7 percent annually.

i. Unfortunately, the need for agricultural work may not be gradual but could rapidly arise in the immediate future if migrants return faster than the modern sector grows. Overall, some 100,000 new agricultural jobs are needed in each five year period between 1980 and 2000 AD.

There is an element of approximation in the calculations shown here. However, the order of magnitude depicted is sufficiently accurate to provide the basis for policy analysis. Even the use of alternative, more conservative assumptions makes it difficult to escape one conclusion: the number of new jobs needed in agriculture and traditional nonformal activities for the balance of this century is vast indeed. A serious employment situation looms in the near future.

The availability of labor to agriculture is best placed in perspective by examining the labor/land ratio. Some likely approximations are shown in Table VIII-2 for alternative combinations of area planted and agricultural labor supply. The rural labor force per planted hectare stood at 1.6 persons in 1980. This should rise to three or more per hectare in 20 years even allowing for some expansion of cropping.

These added labor supply pressures may bring marginal land under cultivation, with its lower yield and unfavorable erosion impacts. The additional labor applied to presently cultivated areas will raise yields per hectare on these lands. There remains nonetheless one inescapable need: to provide meaningful work and adequate incomes for a doubling of labor involved in crop farming in Lesotho.

Table VIII-2. Estimated Labor/Land and Ratios (persons/hectare).

	Agric Labor Force	Area Planted Alternatives (000 ha)			
		200	240	280	320
1980 Labor Supply Alternatives	370,000	1.8	1.5	a	a
	385,000	1.9	1.6	a	a
	400,000	2.0	1.7	a	a
2000 Labor Supply Alternatives	760,000	3.6	3.2	2.7	2.4[b]
	800,000	4.0	3.3	2.9	2.5[b]
	840,000	4.2	3.5	3.0	2.6[b]

[a]Planted hectares stood at 227,000 in 1980/81 and will not likely reach these levels in the near future.

[b]Planted areas in excess of 300,000 hectares would necessitate considerable cultivation of hillsides and thus could create serious erosion problems.

Labor Absorption in Agriculture

With present technology, cropping in Lesotho requires an approximate average of 62 labor days per hectare (Wykstra, 1978). Thus the median farm of 1.8 hectares requires labor inputs of 112 man-days per year at a cropping intensity of 1.0. Some 230,000 hectares of crops have been harvested annually in recent years and an additional 20,000 hectares are planted but not harvested due to crop failure. Assuming the latter require only half as much labor, cropping in Lesotho utilizes just under 15 million man-days of labor inputs annually. If this labor demand were spread uniformly through time, some 50,000 year round full time jobs would result.[1]

[1]Assuming 300 man-days per year in a small farming environment.

However agriculture is characterized by seasonal peaks in labor demand. Critical demand months are November-December (plowing and planting) and April-May (harvest of summer crops). Labor shortages can, and do, occur especially during planting. Where farms are unable to muster the required labor, a number of consequences can act to reduce yields. An additional critical period occurs at weeding (January) when labor may be in short supply in many households.

The fact of seasonal labor shortages occurs simultaneously in Lesotho along with very significant underemployment in rural areas. The rural labor force from Table VIII-1 is 384,000 persons. Even if the cropping labor requirement is trebled to include livestock husbandry and all the farm activities that do not take place in the fields, there would be a total labor demand from agriculture of only 150,000 man-years; 40 percent of the needed figure.

For many rural households farming is a full time activity. For the majority, however, farming provides a supplemental source of income. The labor requirement of farming is best considered in this latter context at present. Cropping employment is spread over some 206,000 land holding households in approximate proportion to land cropped. If divided equally 15 million man-days would provide about 73 days of work (and incomes) per household.

The potential for additional employment generation through labor intensive crops, livestock enterprises and technologies is vast. In addition one of the most significant potentials lies in the expansion of cropping intensity. The challenge will not be easy, however. If agricultural production is to provide full time employment for only half of the 800,000 rural workers expected by the year 2000, rural employment must increase at five percent per annum or faster.

Table VIII-3 shows some of the limits to employment generation in agriculture under the assumption that the country continues to produce largely labor extensive field crops. Fairly optimistic assumptions are used: a doubling of livestock employment, a 30 percent increase in cropping intensity and a 25 percent increase in labor used per hectare. Still the number of jobs only rises by three-quarters, a 3.0 percent rate of growth over 20 years.

This table illustrates the absolute necessity of shifting agricultural production to multiple cropping and to labor intensive crops. Data in Chapter IV show that labor utilization per hectare can reach levels of 100-300 man-days with vegetables and perishable high value fruits. If crops are carefully chosen for short growing seasons and intercropping is used, cropping intensities of 1.5 are feasible over large areas of the Lowlands. Increasing production of commodities for which there is a large addition of value added in marketing and processing would extend the employment capacity of the agricultural sector appreciably.

In short, if agriculture is to approach its needed role in employment generation, fairly sweeping changes are required in both technology and crop mix. These changes will not occur without strong government leadership and a well coordinated overall attack. The necessary strategies are discussed in detail in the second half of this chapter.

Table VIII-3. Illustration of Possible Sources of Employment Growth in Agricultural Production.[a]

	Approximate Employment[b]
1980 Situation	
Cropping (230,000 ha @ 62 days ea)	50,000
Livestock	50,000
Non-field activities on farm	50,000
1980 Total	150,000
Possible Changes	
Increase harvested area to 280,000 ha	+10,300
Increase cropping intensity by 25% on 280,000 ha	+14,500
Increase labor use/ha by 30% to 80 days/ha on 350,000 ha of crops harvested	+21,000
Increase non-field activities by 50% as yields increase	+25,000
Increase livestock related employment by 100%	+50,000
2000 Situation	
Cropping 350,000 ha of crops grown on 280,000 ha @ 80 days ea	93,300
Livestock	100,000
Non-field farm activities	75,000
2000 Total	268,300

[a]Assumes that cereals remain dominant crops.

[b]Full time man-year equivalent, assuming 300 working days per man-year.

Migration[1]

Future Prospects

A common response to the suggestion that an employment crisis exists is to presume that it can be solved through increased migrant or modern sector employment. Both sectors are very significant, yet together they cannot create the hundreds of thousands of new jobs needed in the next two decades. Real growth in modern sector employment is generously assumed at five percent annually in Table VIII-1 and yet only 66,000 new jobs result. The future of migrant worker employment is yet another matter.

Both gold and coal mining are in a period of rapid output expansion. Coal output will probably continue to rise well into the next century while gold production may stabilize or decline slowly during the 1990s depending on future price developments. In both cases the relationship between output and employment is also changing rapidly towards a more capital intensive mix. Expansion of mine employment is closely tied to whatever new demand arises less the rate of productivity growth, the rate of capital substitution for labor and the rate at which South Africa substitutes other labor for Basotho. The employment needs of existing mines are essentially saturated, and most of the industry's underground requirements have been met while surface requirements of labor use are at or close to maximum employment levels.

In this setting, projecting the demand for labor is indeed risky business. It would appear, however, that several industry factors are working against a continuation of favorable migrant employment growth prospects for Basotho. These include:

a. The prospect of reserve depletion in several gold mines now employing Basotho.

b. The mechanization of underground coal mining that is a real threat to displacing labor.

c. A geographic shift of the balance of gold output to areas beyond economical reach of Basotho, and closer to other labor sources.

d. A similar phenomenon in coal as open-cast mines are opened in Natal.

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[1]The analysis in this section is drawn largely from Eckert and Wykstra, 1979a.

5. An increasing proportion of coal to be derived from surface operations, which use capital intensive techniques.

It could be asked whether Basotho might be permitted to shift from declining portions of the industry to other mines or other minerals which are now expanding employment. While some small latitude may exist for such transfers it is quite limited and on balance the answer is negative. As gold and coal mines in the Orange Free State close out and new ones open in Transvaal and Natal, transportation costs alone raise the effective price of Basotho labor relative to nearer sources of supply. There are a great many other economic and political pressures suggesting that new mines will tend to employ nearby labor, not the least of which is the critical need for a solution to South Africa's own Black unemployment problem.

The future for continued high levels of Basotho migration to the Republic is not good. South Africa faces domestic unemployment problems of such a magnitude that they now command national priority attention (P.W. Botha, 1979, F. Botha, 1979). The most probable near term prospect is that their own unemployment situation will worsen noticeably (RSA, 1979). Unfortunately, most of this growth in unemployment will be among Blacks. As the South African employment situation deteriorates, pressures will mount for solutions, priorities within employment policy will change rapidly and today's comfortable assumptions will come under intense re-examination. Competition by foreign workers will be under constant scrutiny.

Among Blacks, South Africa's unemployment problem is severe. At least one million persons, and probably more, are out of work; over 80 percent of the unemployed are Black; more than half of the new Black and Coloured entrants to the labor force go unemployed each year. South Africa faces the major challenge of creating 270,000 jobs per year for the rest of the century just to absorb its growing Black labor force. The purpose of highlighting these unemployment figures is to emphasize that solving these problems must inevitably lead to one focus: in South Africa, attention must be directed to the solution of domestic employment issues first while the need for employment by foreign workers will receive secondary consideration.

Data on mine employment confirm the fact of relative if not absolute stagnation and displacement of foreign workers in mining. Only Lesotho has shown a large and sustained increase in mine employment in recent years. In contrast there has been a net decline of foreign workers from all sources <u>except Lesotho</u> of some 100,000 persons. Because of these developments, Basotho now constitute almost one-half of the total foreign labor component employed in mining in South Africa. A concentration of this high a proportion in one nationality can only be viewed as a source of vulnerability to Lesotho.

It appears that employment opportunities for Basotho in South Africa have reached their peak. It further appears that the combination of demographic, economic, technical and policy factors that will prevail in coming years will lead to a substantial reduction in the number of Basotho so employed. The extent of this reduction is difficult to predict. In one context, South Africa's own unemployment problem must vastly overshadow the dilemmas of foreign workers and nations. In only two years, the net new additions to their own Black labor force could replace all present foreign workers. On the other hand, both the mining industry and the South African government are aware of the consequences that a sharp employment reduction will have for Lesotho. One would hope, therefore, that Basotho migrants will be reduced as gradually and with as much advance notice as possible. However, the inevitability of such a reduction cannot be avoided. Our analysis suggests that the most probable outcome is a reduction of Basotho migrants to approximately 50 percent of present numbers by the year 2000.

The timing and speed of this reduction is another source of concern. The unemployment rate in South Africa could increase by 50-60 percent in the next five years (RSA, 1979), and allowing a short lag for this trend to have its effect on national policy priorities, one must admit to the likelihood that the necessary adjustments must be made during the 1980s, rather than the 1990s. Within selected mines of the Transvaal, Orange Free State, northern Cape and the Johannesburg gold fields, two trends are proceeding. One is the employment, almost exclusively, of domestic labor wherever new mining jobs open up. Second the capital intensification of mining is a clear trend, and this process may accelerate in gold and coal as prices of these commodities continue to climb. Many mines currently have increased productivity per worker and a reduced work force as top priorities. These dynamic processes, the result of decisions of individual mines, will have a collective effect on the industry which will tend to reinforce the conclusion above; that migrant numbers will be reduced sooner rather than later.

The Chamber of Mines operates with a five year indicative plan rolled forward each year. Their current estimates, based on a tabulation of member mine's projections, show no appreciable decline or growth in Basotho miner numbers through 1983. However, in looking beyond this horizon, the Managing Director of TEBA[1] states that a decline of 5 percent annually after 1983 "would not be an unrealistic expectation" for the future pattern of Basotho migration. Our judgment of a reduction by one-half for all Basotho migrants would be equivalent to a decline of about 3.1 percent per year.

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[1]TEBA, The Employment Bureau of Africa, is the organ of the Chamber of Mines which recruits labor to meet specified mine requirements.

On balance, both modern sector and migratory employment growth patterns are hazardous to forecast. However, even a favorable estimation error of, say, 100,000 persons means that Lesotho's agricultural labor force will approximate 700,000 persons within two decades. Eight hundred thousand is considered more realistic.

Today's heavy reliance upon migrant remittances suggests that significant changes may occur in the structure of the economy in the near future. At present, about 60 percent of all households benefit from this source of income. In twenty years, it is most likely that one-fourth or even fewer Basotho households will have access to such income.[1] Consequently, the potential for increased income inequality is a real one in Lesotho. Finally, much of Lesotho's real per capita growth in GNI this past decade has as its source increased migrant remittances. A great deal of emphasis must be placed upon new growth sources for the future. Most of that growth may be required in the future simply to offset relatively stagnant migrant worker earnings.

Migrant Income and the Pattern of Growth

During the decade of the 1970s the mining industry in South Africa raised real wage rates dramatically in an attempt to attract higher numbers of South Africans into mining. In the space of 30 months mine wages increased by 500 percent in monetary terms. South Africa's very heavy dependence on foreign mine labor was partially reversed as a result. An unprecedented wage increase of this magnitude was certain to have significant economic implications for those countries supplying migrant workers to the South African mines. The impacts on Lesotho were particularly strong because of this country's very heavy involvement in migration employment.

Available data showed that Basotho have been involved in migration with approximately the same intensity throughout this century. The number of migrants to South Africa is currently almost entirely determined by the employing industries. The availability of male labor for farming and other employment in Lesotho is now at all time high levels, however, primarily due to labor force growth. Migration has become increasingly concentrated in mining since the middle of the century with the result that migrant employment and remittances are now very heavily determined by events in this one industry.

About three-fourths of all increases in real per capita income since independence have been the result of migrant remittances. Much of the increase in government revenues in recent years also has been the result of Customs Union receipts which are indirectly related to the rapid rise in real wages for migrant employees. During the mid-1970s, income rose more rapidly than Lesotho's domestic economy could

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[1]See Chapter I.

accommodate. As a result, there is almost a 1:1 correspondence between increased migrant worker income and increased imports. Recent income increases have generated a serious balance of trade situation with imports recently exceeding exports by over 200 million Rand.

Examination of the impact of migrant remittances on rural household incomes reveals that the trend in mine wages changed the incentives for crop and livestock production markedly. Migrant remittances as a percent of household income rose from below 40 to more than 70 percent in a very few years in the mid-1970s. Planted acreage of major crops declined with the rapid and sudden rise in foreign source income. There also appears to be a reasonable possibility that the recent jump in reported agricultural yield levels can be explained as a response to higher migrant remittances that led to withdrawal of lower yielding land. Mine wage increases also led to net imports of nearly 100,000 animals annually, a level that is totally unprecedented in Lesotho's history, and threatens to strain grazing capacity.

It appears that in real terms, aggregate migrant worker incomes will level off and stagnate at best, and more likely decline, at a rate that may equal 3 percent annually in the near future. Such an event could work to improve agricultural development prospects. Rural residents have adjusted their consumption patterns to the much higher incomes that first appeared in the mid-1970s. As migration options and remittances diminish, households will attempt to preserve these income levels through domestic employment and more serious attention to farming.

Thus Lesotho's rural population is likely to experience a growing incentive to generate incomes from agriculture. The policy challenges before us are to provide the appropriate means and knowledge to support farmers in this effort; deepening the absorptive capacity for agricultural labor; and doing both tasks in a way that meets basic human needs. Considering that a significant level of surplus labor already exists in agriculture, this is indeed a severe challenge to planning and to manpower policy.

Some Dimensions to Manpower Policy

A comprehensive employment strategy for agriculture is a far more ambitious and involved task than can be accomplished here. Nonetheless it is necessary to identify selected dimensions and directions to reinforce recommendations contained elsewhere in this report (see especially Chapters IV and V).

Even if the estimates above were excessive and the agricultural labor force were to grow by only 250,000 instead of the 415,000 projected, the problem does not disappear. To this addition of one quarter million must be added the existing amount of underemployment which was shown to be nearly 234,000.[1] Thus, the full challenge of eliminating underemployment and absorbing new entrants could require nearly half a million new jobs in agriculture. Table VIII-3 clearly shows that this will not be possible using existing crops and husbandry techniques. Emphasis therefore must first be placed upon a highly labor intensive pattern to the future of agriculture in Lesotho.

A second very basic perspective to recognize is that most additional workers must be absorbed in the Lesotho economy within the agricultural and agro-related sectors. There simply is little likelihood that solutions to Lesotho's surplus labor dilemma can be resolved outside of agriculture. There is no other realistic alternative; none, at least short of massive out-migration, which is unlikely, or public works programs on a scale clearly impossible to finance.

A third focal point has to be an unwavering priority for employment-oriented growth strategies. If this perspective implies some sacrifice of maximum output growth, that is quite likely to be immaterial by comparison to the employment issue. The primary priority for a rational development policy in Lesotho is a set of strategies oriented toward employment growth.

A fourth focal point of the employment dilemma is the selective character of employment and income problems in the agricultural sector. For this reason, selective or target group strategies may be required in the formulation of employment development policies. It is well documented elsewhere that one dimension of selectivity is the role and status of women in agriculture. Additionally, and also well known, the migratory worker phenomenon is another very significant and selective dimension to the problem particularly in the event of remigration. Chapter III develops several additional target groups for which special development strategies, including employment strategies, are warranted.

In short, employment policy today must recognize; (a) the magnitude of the problem, (b) the centrality of agriculture, (c) the dominant of need for employment growth, and (d) the need for selectivity of policy to target groups. To insure that these and other related aspects of the problem are fully addressed may require institution building and strengthening.

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[1]Agricultural labor force of 384,000 (Table VIII-1) minus full time employment of 150,000 (Table VIII-3).

Employment Impact Agency

Perhaps the best way to highlight the possibilities for employment absorption is to reiterate one example, familiar to Lesotho's situation; namely asparagus. Current estimates show that asparagus requires approximately two years of labor inputs (600 mandays) per ha of land, including that required in processing. As agricultural development policies are focused intently, if not primarily, upon employment generation the potential exists within a number of cropping patterns to create tens of thousands of jobs. Often, such a direction may require improved or new infrastructure development (e.g., roads, land conservation, irrigation systems), and these also must relate positively to the employment need in Lesotho (Wykstra and Eckert, 1980). Oriented to this purpose, innovative programs often have a capacity to modify existing methods and orient technological change toward employment and away from technology which too frequently is inappropriate for Lesotho.

It is recommended that government establish an agency, possibly an office within CPDO, with full time responsibility for evaluating and monitoring the employment impacts of development programs and policies. Such an institution also would be valuable in the sense of heightening the awareness of technical experts in a wide variety of fields to the need. It is at the level of the technical expert where innovative and appropriate methods of production can and will be developed, including agro-linked sectors. Both awareness and need to comply will enhance the modification of known technologies and the creative adaptation and application of cropping patterns oriented toward employment growth.

We have stressed above that a well integrated national effort is required. Agriculture and agriculturally related business and manufacturing possess probably the largest potential for added employment during the rest of this century. It is therefore appropriate to begin with this sector. The analysis and recommendations below present in outline form, the principal elements of an employment strategy for the agricultural and related sectors.

An Employment Strategy[1] for Agriculture

Employment In Primary Production

The cornerstone of an overall agricultural development strategy as well as for an agricultural employment strategy is increased input

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[1]The remainder of this chapter is a slightly condensed version of the Employment Generation Strategy for Agriculture approved by the MOA in August, 1980.

intensity in crop and livestock activities. An employment emphasis, however, suggests certain definite priorities within agricultural programs. Our purpose below is to present a very brief analysis of major issues and then to recommend policy and program priorities for consideration in; a) crop farming, b) livestock enterprise, c) processing farm output, and d) input supplies to agriculture.

A. Crop Farming

1. Increased acreage:

a. There is only a limited supply of land in Lesotho which should be under plow in terms of accepted land use capability classifications. To extend cultivation beyond these limits risks lower yields, or serious erosion or both. These considerations set an upper limit to the potential for employment through acreage expansion.

b. Planted area is now well below that limit so that, for the near term, some additional acreage could be planted. An expansion of planted acreage, however, could result in a decrease in average yields if labor and other inputs are spread more thinly or if the additional acreage is planted by poorer farmers.

c. Much of the formerly cultivated land which has been fallowed has returned to grass providing an unexpected conservation benefit. There is reason to believe that many of these fields were poorly managed, distant from the household or were on slopes that should not have been plowed. To expand cultivation onto these fields again could conflict directly with conservation objectives.

d. On the other hand, there are certain cropping activities that do not require annual plowing and do not leave the soil uncovered for part of the year. Among them are zero tillage cropping, permanent grass stands harvested as fodder and tree or vine crops. The latter suggest themselves readily because of their high value and labor intensity. In addition, the microclimate on North facing slopes may be thermally optimal for these crops.

2. Increasing yields:

a. There is considerable scope yet for increasing yields obtained from conventional field crops. Additional

labor used for applying extra inputs (fertilizer, pesticides), for better seedbed preparation and stand establishment, and particularly for weeding will contribute measurably to higher yields. Successful farmer adoption of techniques to harness available moisture could contribute markedly to higher yields. Once better farm practices are possible, improved seed would also prove to be a valuable investment. And as yields rise additional labor is required for harvesting, marketing and processing of output.

b. In other countries there is a substantial danger that a program of increasing yield levels achieves only short-term increases in employment. Ultimately higher yields make it feasible to mechanize and mechanization encourages larger farm sizes and labor displacement. Thus, employees are displaced by machines and small farmers are pushed out by the larger operators. The prospects of these developments in Lesotho are remote, however. Farms at present are too small to mechanize individually and the land tenure system prohibits accumulation of land through purchase. The new Land Act establishes a market in land use rights through its leasing provisions. Some displacement of smaller farmers, who must lease out their land is inevitable. The point here is that without some form of controls it will be attractive to some farmers to accumulate enough land to support full mechanization. At that point, when the technology of production changes rapidly, accumulation of land can displace large amounts of labor and concentrate farm incomes into a few hands. If this were to happen, the Land Act would be working directly against an employment strategy. Government should consider placing ceilings on land accumulation as part of their policies governing the structure of agriculture.

c. Ultimately there are limits to labor requirements in the case of extensively grown field crops, especially cereals. A long-term employment strategy suggests considerable diversification of cropping. Progress in this direction can result in a more labor intensive crop mix as well as a more uniform labor demand throughout the year.

3. Increasing Cropping Intensity:

a. Cropping intensity is a measure of the number of crops grown per year per field. Nationwide, Lesotho has been averaging 0.6 which is a remarkably low figure, even for a developing country. This figure is considerably

lower than the environment can support if farmers practice good moisture management.

b. Cropping intensity can be increased in three ways:

- reduced fallow
- multiple cropping
- intercropping

Reducing fallow encounters the same objections raised above with respect to increasing area under the plow. Multiple cropping means growing two or more crops on the same piece of ground in succession during one year. Winter wheat followed by sunflower is an example that is feasible in Lesotho. Intercropping involves two or more crops on the same field simultaneously. Maize and beans can be intercropped in Lesotho with increased total output per acre. While the national average cropping intensity may never exceed 1.0 it could certainly be closer to that figure. And better farmers might attain a cropping intensity of 1.5 (three crops in two years). Through these means the available land base can be much more fully utilized without serious conservation problems.

c. Increasing cropping intensity has several assets as an employment strategy. First is the obvious increase in annual output per land unit. Second is the spreading out of labor demand which helps to make farming a viable year-'round activity. Third is the frequent necessity of hiring labor, particularly at harvest, when it is important to get the next crop in the ground as soon as possible. Finally, many of the crops and cultural practices of multiple- or inter-cropping are hard to mechanize. The cropping intensity approach thus offers the possibility of more sustained employment generation.

d. One of the keys to increased cropping intensity is a capacity for rapid turn-around between crops. Fields often must be harvested, plowed and replanted within the space of a few days. If applied in this context, tractors can be definitely employment generating rather than labor displacing.

e. Labor intensive multiple cropping systems have been tested in Lesotho and found economically viable at that time (in the famous demonstrations of Ntate Machobane).

4. Labor Intensive, High Value Crops:

a. The decision to mechanize or not often depends more on the nature of the crop than on economics. Many crops require human (as opposed to machine) handling. Often these are specialty crops of high value in which case even a small area can employ several people and generate good incomes.

b. Many such crops can be grown in Lesotho, and in fact many do grow but on a noncommercial scale. Examples include:

- most deciduous fruits
- some nuts
- most berries
- flowers (for seed)
- wine and table grapes
- temperate zone vegetables
- essential oils
- selected spices
- range grasses grown for seed.

The question arises as to whether these crops should be produced by government or by private producers. Under Lesotho's economic and social conditions private production initiatives are much preferred even though this means intensive training programs where completely new crops are involved.

c. A number of these could well find an ecological niche in Lesotho that would make them particularly attractive options. The advantages of tree crops for selected sloping lands was mentioned earlier. All except vegetables are high value relative to weight which would permit their being grown for export, including European and North American markets. Most are very hard to mechanize and all are labor intensive.

d. Most of these crops would experience the standard problems associated with the introduction of commercial production of new crops. Adoption will be slow, new techniques must be established, farmers will need training and information, marketing channels must be opened up, etc. In the case of orchards three to five years are necessary before production begins. Yet once established, they have the potential of a long-term contribution to rural incomes and employment.

e. Many of these crops will require substantial investment and long gestation periods. It is important to couple them with efforts such as supplemental irrigation which reduce production risks.

Recommendations

It is recommended that Lesotho seek to increase employment in cropping through the following policies or strategies:

1. Lesotho should give top priority in the near term to programs aimed at rapid and sustained increases in yields of existing crops. The potential for significant near term gains exists and much progress can be made before upper limits are reached.

2. While stressing increased yields, precise policies are needed with respect to mechanization and the application of the Land Act in order to avoid the labor displacement effects of a yields based employment strategy.

3. To provide the basis of longer term employment growth, government should now launch a major program of testing, adaptation and pilot projects with two aims.

   a. Establish viable combinations of cropping practices and crop rotations to increase cropping intensity.

   b. Diversify agriculture to include several new high value labor intensive crops.

4. Multiple cropping packages could be ready for extension to the farmers within one to two years after this effort begins in earnest. Programs involving high value crops should be developed for implementation no later than the end of the Third Five Year Plan.

5. Government should not encourage acreage expansion on severely sloping lands for either employment or self-sufficiency objectives, except in cases where the crop to be established is a perennial which does not require annual tillage and leaves the soil fully protected, or in cases of no tillage cropping.

6. Even though Lesotho is generally characterized as labor surplus, there are points in the production process where labor supply at the farm level acts as an effective constraint. Research and extension should begin a small but active program to identify these points and provide feasible solutions. In this connection the South African market for a

fully developed range of input supplies is to be considered an asset since a small "dependency" for, say, herbicides can make a major contribution toward "self-sufficiency" in food and jobs. Packages of programs utilizing available technologies to relieve seasonal labor constraints should be readied for extension and implementation as soon as possible.

7. A full scale review of government's policies and programs affecting farm mechanization should be undertaken immediately. The objective of such a review would be to assess the extent to which mechanization related programs contribute to or detract from employment opportunities and to make recommendations designed to redirect these programs toward employment creation. This review must embrace programs of at least MOA, MCRD, Agricultural Bank and Commerce and Industry.

8. As a prelude to programs to introduce high value crops, a major market study (or series of studies) needs to be undertaken. Much work has been done but it has not been systematized to the point that program recommendations can be developed. To ensure continuity of effort and drive on this dimension, a permanent intensive cropping subsection of Research Division should be designated and staffed initially with a horticulturalist and a market economist.

B. Employment in Livestock Enterprises

Employment in primary production of livestock products can be increased by: more units of production (animals), higher output per production unit, more labor intensive production methods, and alternative livestock enterprises.

1. Increased livestock numbers:

   a. Given the present imbalance between livestock numbers and range productivity, it is not possible to recommend increasing livestock numbers. Rangelands are already overgrazed and deteriorating, livestock productivity is severely depressed due to poor animal nutrition and livestock induced erosion problems continue. Most specialists concur that some reduction in herd size is necessary; many suggest figures of 25-30 percent. Given these factors an increase in large stock units is out of the question regardless of possible benefits to other development objectives.

b. In theory Government should have the capacity to alter the balance of large vs. small stock, whether total numbers are reduced or remain constant. This factor can have important developmental consequences. The proportions of large vs. small stock affect the distribution of cash incomes, the amount of the livestock subsector's product which accrues as cash wages, the extent to which rural residents participate in the market and the geographical distribution of the participants in the development.

2. Higher yields:

a. Yields per animal are very low throughout the country, whether one speaks of the wool and mohair clip, milk production, carcass weight and dressing percentage on slaughtered animals or eggs per hen. Improvements of 50-150 percent are feasible in each of these measures. The principal constraint operating today is animal nutrition. The second most important factor is poor management while deficiencies in the genetic composition of herds is the third most important constraint. Diseases remain relatively well controlled in Lesotho.

b. The livestock sector is extremely complex and would require elaborate analysis to fully develop an appropriate strategy. If, however, one wished to focus on stock nutrition as a means to increase output and therefore employment, one critical factor is to control and alter the technology of feeding. At present livestock are "fed" through open grazing on a depleted rangeland. Massive stock reductions face serious obstacles in Lesotho. It is felt, however, that with a national demonstration of will and an effective supporting program some progress is possible. Progress will be slower than needed in the foreseeable future. An alternative, therefore, is to take the stock off the range by confining them, growing fodder as an intermediate crop and moving the fodder to the animals. Such a "confinement husbandry" or stall feeding system is much more labor intensive than open grazing, it would release large numbers of herdboys for school, and it provides the raw material for a number of labor intensive processing industries. It also would generate a cash market for fodder crops, thus providing an important source of cash demand for the cropping subsector. It would further enhance production and incomes per animal unit. And, very important, it would markedly reduce pressures on the rangeland. Every 100

hectares of cultivated fodders can feed as many animals as 200-500 hectares (possibly more) of rangeland openly grazed. Confinement husbandry systems are not suitable for everyone, however, they do offer a substantial potential for certain types of production which has not yet been tapped.

c. The above strategy will become even more important during the 1980s when rainfall is expected to average below normal by as much as 13 percent in winter and 20 percent in summer. Natural production of range grasses will decline accordingly and the need for supplemental feeding will increase.

d. Further increases in output can be achieved if the breeds involved in confined livestock production systems are carefully upgraded. Conversely the prospects of breed improvement programs are dim under open grazing systems as long as severe grazing pressures on the range continue. Improved breeds do not produce much better and may be less viable under nutritional stress.

3. Alternative Enterprises:

a. The foundations are gradually developing to support modern livestock products industries. By the end of the Third Five Year Plan, Maseru town will be a city of over 50,000 people. The modern sector of the economy will employ nearly 55,000 people throughout the country. An effective demand for meat, milk, and eggs can be expected based on urban life styles and cash wages. The infrastructure is being created in the abbatoir, tannery, feedlots and other programs. Programs in pig raising, broiler and egg production, cattle fattening, dairying, commercial fish ponds and the like are at various stages of development, with broilers and eggs being the most advanced.

b. These developments can be seen as vital in three dimensions: 1) their high value products can contribute substantially to farm incomes, 2) they are absolutely necessary as part of an emphasis on confinement livestock husbandry, and 3) they are sufficiently labor intensive to offer substantial wage employment opportunities. Some of these types of activities have the additional benefit of being well suited to management by various forms of village organizations.

c. Most of these programs are in their infancy and are still encountering teething problems. Most of the commercial livestock products enterprises (excluding wool and mohair) are concentrated in the hands of a few large influential farmers. Government has not been successful in involving small but interested livestock producers as yet. If livestock production is to form one of the cornerstones of an agricultural development and employment strategy, Government must give serious attention to vastly broadening the numbers of participants in modern livestock husbandry. This effort should be started now, even while the technological base is still being developed and tested.

Recommendations

It is recommended that Lesotho include, as priority components of an agricultural employment strategy, the following livestock development policies and strategies:

1. To reduce as rapidly as possible grazing pressure on open rangeland as a means of improving the nutrition and production of those animals remaining on the range.

2. To improve as rapidly as possible the yields of edible and commercial products per livestock unit. First priority is animal nutrition programs. Second priority is the large list of improved practices that can improve management levels of livestock production systems. Both assume continued effective veterinary services. Only after progress with nutrition and management solutions would it be worthwhile to mount a major breed improvement program.

3. To stress confinement husbandry for animals and the production of fodders as a crop in the context of an integrated program with emphasis on small farmers, at least for fodder production.

4. To capitalize on the above to develop a wide range of animal products industries which would use an intermediate technology wherever possible to produce adequate quality while employing a reasonably high number of workers.

5. To develop the marketing services in both public and private sectors which will transmit urban and foreign demand effectively and efficiently to the farm gate.

6. To develop separate livestock program thrusts based on the following principles:

   a. To distinguish between programs for the large commercial operator and programs of intermediate sophistication for the interested village-based farmer. Without explicit attention to the latter, the highly modernized production systems being tried at present--milking parlors, caged layers, farrowing pens, etc.--will never be adopted by anyone but the already successful; they will not penetrate the rural sector. Both advanced and intermediate technologies should be stimulated through their respective programs simultaneously.

   b. To capitalize on regional comparative advantage by developing regionally distinct livestock strategies:

      i. Small stock emphasis in the mountains.

      ii. Modern commercial enterprises (eggs, poultry) in proximity to urban demand.

      iii. Meat, milk and poultry programs designed for village level management capacities and based on probable home consumption or sale within villages. The exception is meat where there is an identifiable need for both village scale and larger feedlots and feeding technologies.

   c. To develop for the lowlands zone specifically a concentrated program combining herd reduction, stall feeding and significant increases in production of cultivated and natural fodders with the objective of enabling this ecological zone to support its own livestock herds. The ultimate objective would be to phase out the traditional transhumance as a means of restoring ecological stability to mountain pastures, sponges and watersheds.

C. <u>Processing and Marketing of Farm Produce</u>

1. Progress in increasing production along the lines recommended above will make possible a proportional expanded employment in agri-business. The asparagus situation is a perfect example, every four hectares additional acreage provides employment and incomes for 20 farm families plus 15 full season jobs at the cannery.

2. Lesotho's agricultural commodities are exported largely in unprocessed form. There have been many recommendations to

begin several lines of processing in Lesotho to increase domestic value added and create jobs. There is no better time than the present to begin a serious, sustained program. Close coordination will be required between MOA and MCRD, Commerce and Industries and LNDC. Unfortunately, such coordination is poor at present with decisions taken by one Ministry which are not the optimal when viewed from the other Minstry's perspective. Again the cannery provides examples. Farm production is the foundation of a viable agri-business community. Decisions taken in marketing or processing can only be considered short sighted if they work to reduce producer incentives.

3. Only a small portion of Lesotho's farmers produce for the market. Historically cash requirements have been met primarily by migrant remittances. One of the enigmas of Lesotho's development is the high level of cash expenditures coupled with only nominal production for the market. This situation will probably change as migration declines and household numbers continue to grow. An effective market is the mechanism that translates consumer demand into farm income. Unfortunately Lesotho's marketing system has suffered from considerable confusion in recent years. While new marketing institutions are emerging, the process is far from complete. Consequently farmers suffer from the lack of incentives, Government does not have much leverage to influence farm activity and the consumer turns to imported food supplies. This situation must be remedied rapidly.

4. Absolute and comparative advantage differentials exist between regions in Lesotho. It would be in the economic interests of the country for each region to specialize in what can be grown best. Inter-district trade would follow. By releasing farmers from a concern with household self-sufficiency, farm incomes would rise. And considerable jobs could be added in trade and processing. Lesotho is just now embarking on programs of decentralized planning. These two efforts offer the capacity to integrate and strengthen the economy, generating jobs and incomes in the process by building on regional comparative advantages.

5. To shift agriculture more toward a market orientation, farmers must first be able to produce a surplus. Considerable progress is thus necessary in increasing crop and livestock output. Second, for the farmer to rely on the market as a link in his production-consumption chain, the market must function with a minimum of risk. Certainly today this is not true in Lesotho; variation in pricing, supplies and marketing costs could be reduced considerably.

Recommendations

Considerable additional employment is possible in secondary agro-based industries, provided that farm productivity increases and some or all of the following occur.

1. Settlement of the uncertainties now characterizing parts of government marketing policy and programs. A coherent overall marketing plan is needed. Once this is determined, it must be embodied in an appropriate set of marketing institutions, each of which must be made to operate efficiently, with minimum risk and always with an eye to effects on farm incentives. Once such a system is operating, it must be sustained long enough for producers to develop confidence in it.

2. Specialization in primary production, followed by interregional trade. To facilitate this, land use planning and decentralized (district) planning programs should be accelerated.

3. Programs to increase the domestic value added component of Lesotho's export commodities. This will require an effective mechanism for multiple-ministry planning, implementation and management.

4. Explicit programs to encourage greater commercialization of agriculture. These efforts will require success in two dimensions:

   a. surplus production at the farm level.

   b. an efficient low risk marketing system, for both:

      i. farm output
      ii. consumer goods.

5. Due to the effects of multiple instances of poor coordination between MCA and agencies handling agri-business, it is important that the topic be discussed at the interministerial level with a view to:

   a. Reexamine the question of where the control of agri-business should lie.

   b. Develop the means for more effective working relationships where multiple agencies remain involved.

D. Input Supplies to Agro-Related Sectors

1. Purchased farm inputs require that farmers be at least partially commercialized, which suggests a certain level of profitability. The volume of inputs purchased by farmers will grow with growth in output and farm incomes.

2. As demand for inputs grows, Lesotho should attempt to maximize the amount of this demand which is captured within Lesotho's own economy. By this is meant supplying farm needs for input supplies from domestic production rather than imports. Considerable progress could be made immediately simply by a few policy changes. One of the easiest procedures with which to begin is to channel the demand resulting from Government's own expenditures to domestic producers wherever possible.

3. Considerable scope exists for producing farm inputs in Lesotho. Among the possibilities are:

   a. Multiplication of improved wheat and other seeds.

   b. Production of grass seed.

   c. Fish meal, blood meal, bone meal and feed concentrates.

   d. Small tools and implements.

   e. Ox-drawn tillage and planting equipment.

   f. Commercial production of fodders and hay.

4. What is being strongly suggested is a policy of selectively (and gradually) closing the border to farm supplies that can and should be produced domestically. Such a policy would have to be closely coordinated with Ministries responsible for encouraging investment and establishing agri-businesses. And again it requires rapid growth in primary production, stimulated by effective demand through the market.

5. It was pointed out above that certain technical or resource constraints impede farm productivity at present. Some of these constraints could be relaxed through technical change based on domestically produced inputs. For example, chemical herbicides are a direct substitute for weeding labor. Weeding labor is an active constraint to production yet herbicides are not readily available in Lesotho nor is their use well understood by farmers. No one is employed in formulating, packaging or selling herbicides or in manufacture or distribution of application equipment. If the

equipment were a divisible, "appropriate" technology such as knapsack sprayers, probable demand would be large enough to support a small production line.

6. A recent consultancy by UNIDO established the feasibility of a domestic implements manufacturing industry. It further established the willingness of the South African plant which now manufactures Lesotho's plows to assist in developing such an enterprise. The thought is that the Lesotho firm could begin with simple assembly and progress through various manufacturing stages ending with all parts that can be "cold forged" being produced in Lesotho. Not only farm tools but also tools and equipment for industry, commerce, construction, etc. could be manufactured. The report provides an example of a possible program that would reduce dependency on South Africa while generating jobs and profits in Lesotho.

Recommendations

1. Emphasize as a matter of development strategy the domestic assembly, manufacture or production of inputs to farming or agri-business.

2. At the appropriate time reinforce this strategy with selective prohibition of imports.

3. Order of priority suggested:

   a. First, those items for which there is already an established commercial demand in Lesotho and which can be easily produced here. Most important at present are feeds and fodders.

   b. Second, these items which can be identified as effective constraints to primary production at present, chief of which are:

      i. herbicides (formulation, packaging, distribution).

      ii. fertilizers (compounding, packaging, distribution).

   c. Last, less fundamental inputs, the demand for which will arise only as farm production grows (e.g., stationary threshers).

E. Labor Using Methods

The adoption of labor using technologies in appropriate situations has been generally advocated throughout this volume. In that respect a few final observations may be in order.

1. Development projects in Lesotho traditionally are examined in terms of cost effectiveness. Such examinations in the future should overtly reflect direct and individual employment gains as project benefits (or labor displacement as costs). Alternatively, one also might impose shadow prices for labor (typically a surplus factor) and capital (relatively a scarce input). It is most important, however, that alternative technologies be compared and evaluated both in the case of infrastructure works and agriculturally related projects.

2. Part of the viability of labor intensive construction techniques rests on the wage level paid. An excessively high wage resulting from inappropriate minimum wage legislation can reverse the economics of the labor vs. capital tradeoff, causing widespread reliance on machines rather than manpower, and create serious and destabilizing unemployment problems in the long run.

3. Various donors have shown their willingness to fund expanded labor intensive programs. At the present point, however, the limiting factor in the expanded use of such techniques is the supply of trained field crew supervisors and administrators to manage additional units. One of the more important contributions of the existing efforts by the Labor Construction Unit has been to develop effective techniques of field crew organization and supervision that work well in Lesotho. They are therefore in a position to meet this important need.

4. Several labor intensive programs can contribute directly to enhanced employment and productivity in the agricultural sector. These include:

   a. Conservation works, both construction and maintenance.

   b. Tree planting, for fuel, erosion control or orchard establishment.

   c. Reservoir and road construction works related to irrigation.

   d. Range land reseeding and fence building.

Recommendations

1. To develop a five to ten year program of utilizing labor intensive construction programs for rural employment and to utilize this program wherever possible for a) agricultural production, and b) the construction or improvement of infrastructure that will contribute directly to agricultural productivity, or rural levels of living. Where possible every effort should be made to utilize labor intensive works as part of a combined package of programs to stimulate agriculture.

2. Suggested program priorities.

   a. Creation and repair of conservation works.

   b. Rural access roads, bridges, culverts, bridal paths.

   c. Afforestation and range reseeding.

   d. Gardening, and irrigated cropping systems.

   e. Fish ponds and irrigation system construction.

   f. Orchard establishment on commercial scale especially where terracing of steep but climatically favorable slopes is concerned.

3. In the immediate future, priority should be given to those labor intensive works requiring minimum supervision.

4. To adopt the Labour Construction Unit approach as a permanent element of the Ministry of Works and to strengthen efforts in training of field crew supervisors.

5. To provide the legal framework for a rural-urban differential under the minimum wage law such that a lower, but still attractive, rural wage applies to non-urban areas. Not only would this ensure the viability of labour intensive public works but it should also serve as an incentive for decentralization of private sector enterprises. Such decentralization is ultimately essential if crushing urban congestion is to be avoided and if rural areas are to remain economically healthy. This issue is urgent. It must be dealt with at the level of national policy since there are implications for every sector and Ministry.

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CHAPTER IX

REGIONAL PRIORITIES IN AGRICULTURE

Throughout the analysis regional differentials have been shown in productivity of land, in climate, in factor proportions and in other dimensions. Economic theory suggests that where differences exist of the magnitude found in Lesotho, they should result in specialization within the regions. The purpose of this chapter is to summarize those regional differences for development.

Historical Context and the Supply of Regional Planning Materials

Government administration and agricultural programs have had a long history of regional emphases in Lesotho. The first agricultural program to adopt such a focus was the creation of 202 dip tank areas for sheep dipping early in this century. The first major farm survey conducted in 1949/50 established five ecological zones, defined primarily by elevation and climatic parameters with some adjustment to accommodate Chieftainship jurisdictions (Douglas and Tennant, 1952). The zones defined were the Lowlands, Border Lowlands, Foothills, Mountains and Orange River Valley. With one change[1], these zonal distinctions are still used as a basic stratification within agricultural statistics.

As various agricultural programs were mounted, they necessarily selected a site for operations and their efforts became regionally focused. Complications arose because the data generated from individual projects were often specific to their location and could not easily be generalized. As policy issues and development strategies became more complex it became important to develop national comparisons of various agricultural parameters that would systematically portray regional differentials. During the 1970s a number of tabulations and analyses were completed. In addition to those reported or summarized in this document, these include the following. Regional agro-climatology has been surveyed (Wilken, 1978) and differentials in farmer's risk perception surveyed (Wilken, 1980). Crops response to these climatic differences is developed in detail by Eckert (1980a, 1980b), and is used as the basis of some of the recommendations below.

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[1]Lowlands and Border Lowlands were combined beginning with the 1970 Census of Agriculture (BOS, 1972). It now appears that the Border Lowlands may again warrant explicit treatment during the forthcoming dry spell.

Soils represent the next most important agricultural resource and cannot be considered separately from climate. The Conservation Division, MOA is carrying out an extensive program of soil sampling, mapping, and management recommendations. These efforts have provided district soils inventories and detailed maps of soils associations in each area of the country. Much of the work is presented in Conservation Division, 1979. Earlier work by Bawden and Carroll (1968) provided classifications of land use suitability which have now been disaggregated to provide district figures in this regard.

Recently, to provide a data book for District Agricultural Officers, a useful and comprehensive compilation of district data covering physical resources, population, cropping and livestock, land use and social services was prepared (Planning Division, 1980). Since the new Thaba Tseka district was created out of land area from five previous districts, data in the future will reflect ten, rather than nine, districts. However, the above document represents the known situation at the point of creation of the new district.

BASP has completed baseline surveys for each of their administrative blocks. Data included focus on the structure of agriculture, agricultural practices in use, population, household labor force and many other items. Comparisons between BASP blocks made from these data can support differentiations of agricultural programs.

Moody provided early analysis which suggested a spatial or regional emphasis to development (1974, 1975a, 1975b). Wagner (1978) extended the analysis of the role for spatial concerns in planning. More recently considerable work has been accomplished by the Urban and Regional Planning program at the National University (Sterkenburg, 1978; van der Geer, 1978, 1979).

Over the years government has used many institutional and administrative forms in their efforts to reach the various regions of Lesotho. It is beyond the scope of this paper to review the historical record in depth except for those recent developments which set the context for the 1980s. Government's prolonged interest in regionalized programs was considerably enhanced during the last half of the 1970s. The Ministry of Agriculture has provided much of the leadership in this regard as might be expected. The impetus is drawn from a serious concern for greater local participation, especially in planning.

In 1976 a system of District Agricultural Coordinators was established with one such individual at each district administrative center. Subsequently a network of Village Development Committees and District Development Committees evolved as a means of aggregating villager's needs and views on development and expressing them to government. District representation at the 1979 National Farmer's Conference reinforced government's commitment with a strong call to be regionally

specific and offer development programs especially tailored to each area. The Thaba Tseka project, which began simply as a mountain livestock and agricultural effort became the testing ground for new methods of sharpening the regional focus through local input, decentralized administration and new institutional forms. As this effort grew, problems were gradually resolved and the concept broadened until the Thaba Tseka District was finally established.

Interest in decentralization grew rapidly from 1978-1980. Perhaps the most definitive statement prior to the Workshop on Decentralization was included in the Ministry of Agriculture's "Policy Guidelines Emanating from National Agricultural Conference (Lesotho, 1979):

> This policy (decentralization) implies placing highly skilled staff at regional level to support local organizations. It calls for allocating development and other budgets to the designated regions and allowing for decisions and controls on the budget expenditures to be made at that locality. The external aid would also be justified based on regional demands and funds limitations but not exclusively on central government assumptions.

The quotation strongly suggests that decentralization as envisaged by the Basotho is not a simple matter of transferring a certain amount of authority and responsibility from the capital to the districts, but of involving local participation to the village and even family unit level in a process of bottom-up planning and development. The suggestion is reinforced by other passages from the "Policy Guidelines ... paper, e.g.:

> Any support, intervention, and/or technical guidance should be regarded as additional so that an amalgam of these (village) units will form the regional or even country-wide administrative infrastructure for development.

Then in 1980 a National Workshop on Decentralization was convened to fully air this strategy and all its implications for the nation. The conference essentially endorsed the concept and prepared a detailed series of internal recommendations to government for further action (Lesotho, 1980).

Thus there is considerable literature of analysis and raw data that would support decentralized or regional agricultural planning. Furthermore, there exists a reasonably clear concensus that decentralization and increased local participation have much to offer in terms of supporting more effective and more locally relevant development efforts.

Supporting Measures in Agriculture

Many of the recommendations in this volume would support either the justifications or the methods of regionalized growth. In particular, the following items appear in earlier chapters.

1. Logistically the nation will be integrated considerably with the upgrading of the spinal road network.

2. For various social and economic reasons this analysis calls for strong efforts to disperse (or decentralize) the economy. Success will require identifying enterprises that are well enough suited to local conditions to be economically viable.

3. One of the main emphases throughout is participatory growth. To achieve this requires a decentralized planning process that occurs at the regional level, close enough to the unique needs of local groups to be responsive.

A central component of government's support to agricultural change in the future will be land use planning. An agency skilled in these techniques will be absolutely essential for effective implementation of the 1979 Land Act. This function of agricultural planning will be able to provide much of the technical analyses needed for regional development strategies.

In order to more accurately reflect regional needs and priorities, the Ministry is experimenting with placing agricultural officers at the District level. Initial results have been successful enough to warrant strengthening and continuing the effort as well as increasing the responsiveness of Ministry headquarters to ideas and proposals from their district officers. Plans have been finalized and await staff allocations to place one planning officer in each District as well. Close coordination between district level planners and a centralized national land use planning effort should receive a very high priority.

Cropping and Livestock Priorities for the Regions

Listed below in Table IX-1 are several ideas concerning activities that appear to have highest priority in selected areas. The list does not imply that any particular idea might not work elsewhere. Rather it is suggested that these emphases appear to be particularly relevant in the regions for which they are listed. Most of the distinctions listed below are derived from environmental differences known to exist, in particular, the North to South gradient in rainfall, temperature, humidity, season length and soils described in Section 2 of Chapter IV. Other priorities derive from uniquely different resource

Table IX-1. Regional Priorities and Specializations in Agriculture

Activity	Northern Lowlands	Central Lowlands	Southern Lowlands	Mountains
CROPPING				
a. Varietal selection criteria:	-maximum yield		-drought resistance -short season	-cold tolerant -short season
b. Field Crops:	-maize, pulses -hay	-pulses -potatoes	-sorghum -sunflower	-wheat, barley -oats, peas -lentils
c. Intensive Crops:	-commercial vegetables -rainfed fruit and berries	-asparagus -tree crops -household vegetables	-h.h. vegetables -winter vegetables -irrig. fruit	-h.h. vegetables
d. Choice of Technology:	-intensive -mixed draft -labor using	-mixed	-extensive -low risk -tractor draft -labor saving	-ox drawn -labor using
LIVESTOCK				
a. Husbandry method:	-confinement	-confinement	-mixed	-open grazing
b. Commercial Species:	-cattle, pigs, poultry	-poultry -dairy	-cattle, small stock	-small stock

Table IX-1 - Continued

Activity	Northern Lowlands	Central Lowlands	Southern Lowlands	Mountains
LIVESTOCK - continued				
c. Livestock Numbers:	← ← ← stock reduction in Lowlands → → →			-gradually restricted to resident herd
d. Farmyard Livestock:	-poultry	-poultry	-poultry	-poultry, rabbits, milk goats
MARKETING				
a. Cereals Flows:	-maize out -sorghum in	-wheat in	-maize in -sorghum out	-wheat out
b. Pulses Flow:	-pulses out	-pulses out	-pulses in	-pulses in
c. Farm inputs:	-from RSA	-from RSA	-smaller trade	-smaller trade
d. Livestock Products	← ← ← ← ← animals to slaughter → → → → →			-wool and mohair out
OTHER				
a. Irrigation role:	← ← ← supplemental → → →		-primary	-none
b. Orientation of Farmers:	-market	-market	-h.h. demand	-h.h. demand
c. Cropping Intensity:	-multiple cropping	-average	-below average	-high on limited area

Source: Developed in discussions with Division Heads and Section Chiefs of MOA at LASA Mazenod Workshop, May 1981.

situations such as the critical scarcity of arable land in Qacha's Nek or the high labor to land ratio in Butha Buthe. Farm sizes are distinctly larger in Mafeteng and Mohale's Hoek but this is offset in part by the less favorable rainfall and soils. Climatic variability is highest in the southern Lowlands, especially in the former Border Lowlands of Mafeteng District.

Finally, Chapter IV presented quantitative data on the yield differentials of major crops. While the data were not exhaustive they were sufficient to clearly establish that there are significant instances of comparative and absolute advantages between the districts. Specialization in production followed by trade in the products will maximize the incomes of all regions. This strategy, however, requires a smoothly functioning market that will move commidities from producing to consuming regions without undue costs or risks.

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CHAPTER X

AGRICULTURAL DEVELOPMENT STRATEGIES FOR THE REMAINDER OF THIS CENTURY[1]

The Development Environment

Lesotho is entering a period of severe challenge to development in general and to agriculture specifically. The last decade has seen changes in all sectors of unprecedented magnitudes. The pace of growth has quickened, a modern sector has emerged, incomes have shot up, urbanization is becoming a significant phenomenon and modernization is beginning to touch ever larger portions of the country. However, recent changes are but modest indicators of the challenges of the next twenty years.

Looking toward the future, several trends are apparent which must set priorities and development goals. The need for useful employment is a current crisis, particularly in urban areas but of growing urgency in rural areas as well. The problem will get considerably worse before it gets better. It will be roughly 20 years before the modern sector will be large enough to absorb more than just the new entrants to the labor force and begin to reduce the backlog of unemployed and underemployed. Until then the bulk of the employment mandate will fall to the agricultural sector which must generate 20,000 jobs per year if underemployment is not to rise (see pp. 5, 16-18). The significance of this challenge is highlighted by the fact that the upper limit of employment generation from the current cropping mix and open grazing livestock production is probably just under 6,000 new jobs per year (Table VIII-3).

Closely related is the near term challenge of raising per capita incomes. Part of the employment analysis suggests that an actual decline of 20,000 jobs in modern sector wage employment may occur over the coming two decades. Population growth continues at a 1980 rate of approximately 2.4 percent annually. Given the fixed limits to Lesotho's arable land and its rangeland, income growth must come from changes in productivity, not from new production units. Technological change in agriculture must bring productivity increases which exceed the rate of population growth if per capita incomes are to grow. No

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[1]This chapter is written in the form of an integrative executive summary of the entire monograph and may be used as a short version of the whole.

amount of growth in the small off-farm employment sector can significantly alter this conclusion for the next twenty years. For most of the agricultural sector this rate of growth has not yet occurred on a sustained, widespread basis.

The hidden crisis in Lesotho is the distribution of income. Neither productive assets nor wage employment are uniformly distributed among households. Rather the distributions tend to coincide with access to all sources of income being concentrated in the same groups of recipients. Furthermore, analysis of probable future trends suggests that this situation will worsen over time unless very careful policy and program preventatives are implemented. The issue has been largely ignored in the past, partly due to an erroneous belief that incomes were extremely equitably allocated. However, equity is a major principle in Sesotho culture, implying that the will to preserve or enhance equality exists once the problem is recognized. Again much of the burden will fall on policies affecting the rural sector and to agriculture specifically. Explicit new policies will soon be needed concerning the allocation of wage employment and access to income generating assets (see pp. 21-27). Within the agriculturel sector, it appears feasible to separate the distribution question from the question of ownership and management and to rely on village institutions for socially acceptable distributions of the benefits of development (see, for example, pp. 130-136).

These three near term crises, employment - incomes - distribution, are significant issues now and will become more serious over the next 10-15 years. Affecting their solution will be the following:

a. The country will rapidly become more integrated in a logistics sense as road networks and other infrastructures are completed (pp. 11-12, 27-28).

b. The tenurial setting of agriculture will be significantly altered by the implementation of the 1979 Land Act. The Act provides for inheritability of allocations, leasing of selected arable lands, stops the fractionation of holdings and permits considerable non-traditional innovation regarding land use (pp. 13-14).

c. The next decade should be one of below normal rainfall on average. Crop harvests, range productivity and both rural and national incomes should be depressed as a result (pp. 9-11). It is expected that the livestock sector, in particular, will come under severe stress during the 1980s.

d. One source of government revenue, that being Customs Union revenues, will likely not grow as rapidly in the future as it has in the recent past. This will happen at a time when

foreign assistance funds will probably also see only slow growth. Unless alternative sources of revenue are found which are tied to a growth base, the period of financial stringency which has already begun could last the next 5-10 years.

Objectives for Agricultural Development

National Priorities

The analysis of Chapter I, summarized above, identifies four critical goals for the nation. The agricultural sector has a major responsibility, if not the principal role, to contribute toward these goals. They are:

1. Employment Generation: As developed above the bulk of this burden must fall to agriculture, including farm production and agro-industries, for the rest of this century.

2. Increasing Incomes: While incomes from farm sources are not now the main source, even for rural households, the low levels of productivity currently achieved suggest a major capacity for expansion. Urban wage incomes will be limited by the rate of growth of a small modern sector. Agriculture, on the other hand, is characterized by widespread resources which are not producing up to potential. For the near term most of Lesotho's potential for income growth lies in these resources.

3. Improving Income Distribution: A potential crisis in this respect threatens to undermine whatever development progress is made unless that progress is equitably distributed. Income generating agricultural resources are not equitably distributed as previously thought. Therefore, development programs for the sector must give explicit, policy level attention to the distribution of growth. With carefully chosen allocative policies the sector can contribute significantly to equity.

4. Economic Dispersion: To avoid a polarized economy, with stagnation in rural areas and rapid growth in urban or near-urban areas, it is vital that productive enterprise and jobs be developed across the country and not concentrated in present growth points. Since land, cattle and people are the principal resources of rural and remote areas, farm production and agro-industries are the logical core of an economic dispersion strategy (see pp. 27-28).

Nutritional Priorities

Chapter II examined the known facts concerning nutrition. Modest levels of vitamin deficiency disease as well as protein and calorie deficiency occur. In part, the cause is a diet that is heavy in cereals and light in vegetables, fruits and meat. The most serious nutritional problems are not average national intake levels, which are generally adequate, but rather the distribution of food. Households most prone to nutritional shortfalls include low income households, families in remote areas, households without an adult male, and land restricted households. In addition, serious seasonal shortfalls occur, especially in the Mountains.

Nutritional objectives of development, with the exception of food aid and trade, are among the responsibilities of the agricultural sector. Thus, Lesotho's nutritional priorities add the following to the goals challenging farmers and agricultural planners (from pp. 53-54).

4. Dietary Diversity: A reduction in the proportion of the diet devoted to cereals and an increase in the protective foods, e.g., fruits and vegetables, would have a significant impact on vitamin deficiency disease and obesity.

5. Increased Protein Supplies: The principal protein problem is among children of low income households. To solve it, cheap sources are required. Pulse production programs have the widest applicability while an appropriate dairying technology is also needed for households with only one or two cows.

6. Marketing system improvements and infrastructure which are now being developed are very important to easing regional shortages of food. To be truly effective they will have to be coupled with income growth in remote areas so that purchasing power exists at the end of the marketing channel. Storability is equally important. Some items, e.g., pulses for protein, store well without processing. Others, such as fruits and vegetables require various forms of processing (canning, freezing, drying) industries.

The "Blueprint" Objectives

The Ministry of Agriculture, in their Blueprint for Action[1] of November 1980, put forward for adoption as official policy seven "objectives and priorities" for agricultural development. These seven represent the official view of the objectives facing the Ministry.

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[1]This report was prepared by a working group as a result of the Multi-Donor Agricultural Sector Conference held in Maseru, October 20-24, 1980.

Since they are compatible with this analysis and reinforce it, they are appropriately included here. In a direct sense, these objectives from the Blueprint contain an operational emphasis that is a significant addition to the purely analytical objectives listed above. Blueprint objectives include:

1. To Secure the Commitment of the People: The Ministry calls for a greater involvement of the people in charting the course of development, and in managing the various programs to be mounted.

2. To Increase Agricultural Production: This objective derives its priority from the urgency of self-sufficiency, which will bring food security and economic independence from surrounding nations. Crops, livestock and marketing emphases are mentioned.

3. To Expand Gainful Employment Opportunities In Agriculture: As spelled out in the document this objective seeks jobs returning enough income to be competitive with migrant employment. A shift toward larger farms is advocated as well as labor intensive farm technologies, agro-industries and collective farming.

4. To Rehabilitate and Stabilize the Land Base: This is seen as a long term, continuing priority.

5. To Use the Land Wisely: This objective is seen as leading toward a fundamental reform of land use and management.

6. To Provide Efficient Support Services: Mainly to strengthen the Ministry's capacity to deliver needed services to all relevant clienteles.

7. To Mobilize Financial Resources: This objective focuses not so much on the quantity of financial resources as on the effectiveness with which limited funds are utilized in development programs.

Synthesis of Objectives

Thus there seems to be relative agreement on the overall direction of agricultural growth programs. First, the protection and stabilization of the nation's resource base is essential. The conservation mandate has been recognized and accepted for 45 years (Pim, 1935). Yet erosion and environmental degradation continues (LSCE, 1979), justifying a continued long term priority to its control. Second, the productivity of the nation's limited resources must be increased if

the economy of Lesotho is ever to emerge as independently viable. Whether one speaks of human resources, arable land, rangeland, watersheds or water, all are being utilized at well below potential. Third, the concept of equity is fundamental to Sesotho culture. Whatever growth is achieved must therefore be experienced in some measure by all. As the country modernizes, the traditional mechanisms for equalization of both hardship and prosperity become less effective. Consequently, equitable distribution of growth must be explicit as a development objective.

Fourth, maximizing employment generation is among the highest priority objectives for two reasons. Most obvious are the direct income implications of jobs. As critical as is the need for income growth, this one reason is sufficient by itself. The inevitable dynamics of labor force growth make the creation of new jobs perhaps Lesotho's biggest current challenge. More subtle, but equally important, is the dignity that comes from meaningful work, from a stable source of income that allows one to determine his own destiny and from the sense of worth derived from successfully supporting ones dependents. "Self-sufficiency" has many meanings. One of them is the psychological sense of independence that comes from being able to rely on one's own resources. In this context, Lesotho can only achieve self-sufficiency when it has met the challenge of adequate domestic employment. Fifth, there is more to development than income growth and employment. Progress is perhaps more suitably measured in terms of basic human needs. Of primary importance to the agricultural sector are selected nutritional objectives because of their potential contribution to health, productivity and growth potential of the human resource. Sixth, and last, is the objective of improving government's ability to plan and administer the development process.

Behind all of these objectives is the fundamental desire on the part of all Basotho to achieve as much in the way of self-reliance as is possible. It is articulated in programs for cereals self-sufficiency, through the recognition of the need for a domestic solution to the employment crisis, in relationships among nations and in many other facts of life. It is, in fact, the common thread woven through all development programs. Ultimately the strength of the Basotho nation rests on significant progress toward this objective.

General Philosophy and Development

In moving from a general statement of objectives to a detailed presentation of strategies one makes several philosophical choices. These choices determine the balance ultimately struck, the overall tone of

the program and to a large extent its ultimate outcome. Chapter I was an attempt to look twenty years into the future and determine where Lesotho was headed. The potential problems foreseen obviously require specific preventative development efforts. The nature of these issues, together with a realistic view of the resources Lesotho has to work with (Chapter III and elsewhere) have led inevitably toward the developmental philosophies given below. In Lesotho's context, these may be the only approaches which will be viable in the long run.

In view of the social equity norm there is little other choice than to seek a broadly participatory growth pattern. Progress in output or income growth may be easier and more rapid through efforts narrowly focused on large holdings or progressive managers. But short run gains of this nature are invariably arrested by the worsening plight of the non-participants. The "trickle-down" perspective of growth has been universally discredited as inoperable.

A second perspective is that rural Basotho households are not homogenous. Even though most of farms are small and poor by world standards, there exists a mix of significantly different farms, farmers and non-farm households (pp. 63-72). Differences between them are important enough to suggest that there can be no single development strategy or agricultural package. Chapter III isolated many of these differences. The point is that to permit broad participation, target groups of this nature must be identified and a program of change developed that can be realistically adopted within the resources and constraints of each group.

Closely related to this thought is the concept of appropriate or intermediate technology. The resource differentials identified in Chapter III must be viewed as variations within a generally resource-poor environment. Farm sizes, capital supplies and management skills all vary significantly but around very low average levels. In many instances the latest in farm technology may be very inappropriate for these farmers if not totally irrelevant. The thrust of development must recognize these constraints and offer technologies that fit. To do otherwise can create more dependencies (on financing, technicians, etc.) than the resulting output growth would warrant. Two strategies are available as options and both are recommended in selected situations. One is to develop technologies appropriate to the farm management environment of different types of individual operators. The other is to develop the social "technology" that would permit pooling of resources into larger, group managed units for which the constraints to modern technology might not apply.

The participation mandate has a spatial dimension. The various geographic regions of Lesotho have quite different potentials and constraints. Just as different strategies are needed for the various farm types, so also do the different regions require varying programs

if local participation is to be maximized. Growth pole strategies of development have been generally discredited along with trickle-down methods, and for essentially the same reason. Those that are at the center of growth succeed while those at the periphery are left behind.

A final point, again derived from the participation mandate, concerns the methods of program administration by government. Government resources, both human and financial, are extremely scarce relative to need. Government cannot reach and affect very many people through direct, personally involved delivery methods. The only way in which a government of 13,000 civil servants can expect to effectively help over 250,000 rural households is through various forms of indirect stimulation and incentives. At several points in the sections which follow, our recommendations are conditioned by the urgent need to make the Ministry's services more efficient and to multiply their effective contact.

Strategies for Agriculture

We are consciously recommending a multi-faceted approach, selectively applying technologies ranging from the most simple to the most sophisticated, each in their appropriate setting. Much of the volume has been devoted to simple or intermediate options, suitable for large numbers of adopters. This emphasis appeared partly because the appropriate technology focus has not received much attention in the past. Many programs have been designed as if Lesotho's traditional agriculturalists were to shift immediately to front-line modern techniques. Furthermore, when improvements to traditional farming were designed, they were targeted for an average farmer without recognizing the important diversity that characterizes the agricultural sector. Thus our emphasis on resource constraints and appropriate technology is primarily to document the exciting potential that exists at this level. High technology options and their potentials are amply documented elsewhere in literally hundreds of project documents.

Strategies for the Small Farmer

Significant target groups among the rural population include the following:

1. The active farm household for which farming is a major activity, contributing a significant portion of household income.

2. The part time farm household, for which farming is definitely a secondary activty although it probably provides a significant portion of household food supplies. This group constitutes some 65 percent of Lesotho's land holders.

3. Holders of land only, essentially without other productive resources. Many of these households are headed by older women. About half do not have direct access to off-farm wage incomes with which their resource constraints can be relieved.

4. Non-farm rural households, which could be (or are) active participants in the rural economy but not as primary agricultural producers.

For many of these farms, resource constraints form the effective limit to their incomes. For the nation, these constraints will become more critical as labor force and population grow faster than off farm employment. Thus, one of the first strategies is an attack on the supply of inputs of the types shown to be generally missing. Key items include tillage power, seedbed preparation and planting equipment and stationary threshers to control harvest losses. Cultivation equipment and simple tools are also important. Given the existing supply of power sources and its distribution, any concern for appropriate technology will lead to a dual focus with ox drawn equipment receiving fully as much attention over the next twenty years as tractor implements.

In recommending major emphasis on the supply of farm requisites we are assuming that the incentive situation which led to a de-emphasis of agriculture during the 1970s is reversing and will continue to do so without much government intervention. The 1980s should see a return to serious farming out of necessity drawn from shrinking alternatives and this trend will continue with more intensity in the 1990s. We are suggesting, simply, that supply programs, such as BASP and Co-op Lesotho, grow fast enough to keep one step ahead of the demand which will arise.

There are three justifications for the supply program recommended. First, it would permit farmers to shift upwards, in the context of Table III-3, in their resource positions. Such a shift will increase incomes, food supplies and the efficiency with which arable land is used. Second, such a shift will increase the number of market oriented farm enterprises. Since the market is really the only effective way to transmit indirect controls and stimuli, this would increase the proportion if the agricultural sector over which development policy has some influence. Third, manufacture or assembly of the implements, tools and chemicals required is a valid set of agro-industries for Lesotho. Important economic linkages would result, which with a correct choice of labor intensive technology would multiply the job creation effects of growth in primary agricultural production.

As the resource base is being established to support active farming, a knowledge base must be developed sumultaneously. A wide number of

agronomic and livestock husbandry practices were shown to be susceptible to considerable improvement. Perhaps most critical in Lesotho's environment are the concepts and techniques that would permit better management of the complex of plant-soil-water-nutrient interactions that determine yield and profitability. An important dimension will be the farm technologies with which to cope successfully with the forthcoming dry spell. Developing and testing this information is a strong challenge to the Research Division. Transmitting it to farmers falls to the Extension Division.

Part time farmers generally manage their activities as though all resources are fixed. They participate in the market only to a limited extent and are thus not readily influenced by price policy. They generally will not invest in improvements. And in Lesotho their production is primarily for home consumption or at best intra-village exchange.

We expect part time farmers to gravitate into three groups over time. One such group will be those who choose to become more active farmers and possibly more dependent on agriculture. An assured supply of inputs (including knowledge), full implementation of the leasing provisions of the 1979 Land Act and the creation of a stable and attractive price structure through market development and price policy are the key strategies necessary to facilitate this transition. A second group will discover that off-farm employment is their best option. They will seek a stable rental income from their lands and will probably minimize the necessity of investing much time of their own. Again the leasing provisions offer such an option on an individual to individual basis. An alternative which must receive active encouragement is the emergence of village producers associations. These units could aggregate underutilized land into more viable holdings, employ well trained managers, generate much higher output levels and distribute the resulting incomes and profits in socially acceptable means.

The third group will choose neither of these options but will prefer to remain part time farmers as they are now. The size of this group will ultimately determine how much priority should be given to developing programs for them. It is suggested that development planners encourage part time farmers to shift toward one of the first two options to the fullest extent possible, thereby minimizing the amount of land and other resources ultimately managed by part time farmers. However, for those that remain in this category, programs of change must focus on the more efficient utilization of family labor since this is generally the only variable input actively subject to household management decisions.

Perhaps 30 percent of Lesotho's rural households hold land only and do not have draft oxen, implements, or other production requisites. It

is this group of land holdings which provides the urgency for the development of producer's associations as discussed above. There is little opportunity to increase the efficiency with which these lands are utilized if development programs rely solely on the efforts of individual farm owners. Group farming, group ranching, and group pasture management associations are all under active consideration in Lesotho. Analyses presented in Chapters IV and V show that such associations can achieve dramatic improvement in productivity. If they are developed and managed within the village social mechanism, these associations can also make measurable contributions to equity in agricultural development.

In addition, it is vitally important that the government actively pursue policies of economic dispersion so that the jobs and economic activities generated by agricultural growth contine to remain in the rural areas. Finally, there is the group of rural households who have no farm assets. These households are solely reliant on wage employment in migration or the modern sector or else they exist on casual employment in the informal sector. In order that they should participate in economic development, it is essential that every program seek to maximize the number of jobs created, especially in agricultural and related industries. By the year 2000 there could be nearly 120,000 landless rural households containing a labor force in excess of a quarter of a million persons. It is inconceivable that these people should all be forced to move to urban areas in order to find employment. If only half of these households moved to urban areas with their dependents, urban population would swell to nearly half a million people, clearly an impossible task in only 20 years.

Culturally Compatible Growth

For generations Sesotho culture has revolved centrally around communal processes. Range lands have been communally utilized as have crop residues on arable lands. Indigenous species of wild flora have had definite communal roles and have been managed by community leadership. The pitso, or village meeting, has embodied the ethics of the community processes for village decision making. It is through these community processes that the cultural concern for equity has been expressed.

Modernization will bring severe strain to this ancient system and is, in fact, already doing so. Yet the values embodied in earlier ways are still highly revered among the people. It is important therefore that programs of development be designed to minimize cultural disruption. From this general concern we have derived the emphasis on distribution as an expressed objective of development which is found throughout this book.

Consistent with these concerns is the emphasis on village or community organizations as one of the principal local development agencies. Farmers themselves recognized the potential strength of village associations in the 1979 National Farmer's Conference. This emphasis was endorsed as policy in government's recent efforts to renovate and strengthen the concept of Cooperatives. The strength of the idea lies in the capacity of the people and in the strength of social concern which is still significantly intact today. Assigning significant responsibility in the development process to community organizations will maximize the chances for a culturally acceptable growth pattern as well as the sense of participation on the part of every citizen.

To strengthen progress in this direction further efforts at decentralization of government's development administration structures are warranted. We have called for a dispersed economy and for strong roles for community associations. One of the important needs in meeting the objectives of government efficiency is that government should be able to perceive and respond to local initiatives and demands. The communication and service process necessary would be greatly enhanced through a decentralized government structure which brings government closer to the people as opposed to the high level of centralization in Maseru which prevailed during the 1970s.

Choosing an Appropriate Technological Mix

The question of choice of technology has emerged several times in the above analyses. A successful development strategy must address this issue continuously and will ultimately evolve several different choices, each with their own specific setting. To the extent that agricultural change is to be implemented by individual farm managers, the technological packages offered to them must be compatible with their resources and management skills. The point has been made repeatedly throughout that small and intermediate scale technologies are probably most appropriate for the various identified target groups. For a limited number of larger farmers, more modern, capital intensive, high throughput technologies can be considered appropriate. An excellent example in Lesotho is the recently emerged layer and broiler industry which is now making a major contribution to national incomes and protein supplies. The 1979 Land Act promotes the accumulation of land use rights through leasing. It is anticipated by this document as well as the Ministry's Blue Print for Action that leasing will result in a trend toward larger, more economically viable farm units. As this trend develops, it could affect the definition of "appropriate" farm technologies. While a trend towards larger farms can be justified and should be encouraged for several reasons, policies in this connection must recognize that there is an upper limit, perhaps 4 hectares and certainly not more than 10 hectares, beyond which the gains from larger farm sizes will be rapidly offset by labor displacing mechanization and growing landlessness among rural households.

Finally, group farming or ranching derives its economic potential from the capacity to manage large pools of land as a single unit and therefore to implement the types of high yield technology suitable for large scale farming. Production economics clearly suggests certain economies of scale in farming or ranching. The recommended emphasis on group management of larger units rather than individually held large farms is essential if the more negative consequences of high technologies are to be avoided.

Technological choice must also be faced in all programs designed to stimulate small industry, commerce and other economic activities. Investment decisions will determine the extent to which agro-industry and other small businesses translate agricultural growth into additional domestic jobs. The choice of technology also has a strong influence on the extent to which the economy grows into self-reliance or into additional dependence on the economy of Lesotho's neighbor.

Technological choices are not simply economic decisions. We have tried to show that they contain significant social, cultural, and political dimensions, and therefore should not be taken lightly. These choices quite often face direct tradeoffs between the speed of development and the distribution of development. Additional tradeoffs appear in the choice between high volume, low unit production systems vs. labor intensive technology permitting maximum involvement but at the cost of somewhat higher unit prices. As important as the choices are to the ultimate structure of Basotho society, one of the strategies of development must be to generate the mechanisms by which the people themselves can be involved in these decisions.

Systems Linkages

The agricultural sector offers an ideal environment in which to develop an extensively interlocked production system with multiple forward and backward linkages. The livestock sub-sector is particularly suited to such a strategy. Modern livestock husbandry, if profitable, can generate a vigorous commercial demand for several of the products of the cropping subsector. Particularly important in Lesotho is the potential demand for fodders and hays which would provide an economic incentive for the types of crops which are central to biological conservation programs. Similarly, livestock products accumulate considerable value added in processing. Converting live animals into finished meats, raw fleece into high quality consumer items, and similar enterprises may as much as treble the final value. Self-sufficiency in jobs, incomes and related objectives requires that as many of these systemic linkages take place within Lesotho's economy as possible. While a number of such enterprises have been started in recent years, a comprehensive national strategy to increase domestic systems linkages has not been spelled out.

Preserving the Resource Base

A continuing priority for resource conservation is fundamental to long term development in Lesotho. The stock of arable land and ranch land is essentially fixed. Part of a conservation strategy is to concentrate on increasing crop yields rather than increasing cultivated area as the principal means of output growth in cropping. A second strategy is to rely on biological erosion control measures which essentially is to rely on the natural resiliency of the high-veld ecological system to sustain and heal itself. This strategy would be reinforced by programs of stock reduction, the closure of transhumance and confinement husbandry which would generate a commercial demand for grass crops in various forms. Perhaps the highest priority among conservation programs is the protection and restoration of Lesotho's watersheds. While it has been shown that these can be rehabilitated quickly through grazing control, it must also be noted that a climatic dry spell has probably begun while watershed rehabilitation programs remain in the talking stage. All of the livestock programs recommended in Chapter V are designed to be compatible with the strategy of stabilizing and improving watersheds. More than 85 percent of Lesotho's land area is in the mountain pastures that could be included in any watershed improvement program. Given the predominance of this resource, it must be restored to full productivity as part of the near term development effort.

Summary

Throughout this volume we have stressed the interrelationships between various development strategies and programs. A great deal of untapped development potential exists throughout Lesotho's agricultural sector. Many valid programs have been initiated and are beginning to make their impact felt. We have tried to provide the analytical base to justify a number of additional options. And, we have attempted to emphasize how the various components of an appropriate, participatory development process can reinforce and support each other.

The critical need for success in agricultural development cannot be understated. Many difficult decisions must be made, many programs must be implemented in other than the easiest ways if non-economic social benefits are to be maximized. Nevertheless the potential clearly exists for the agricultural sector to lead the development of Lesotho for the next two decades. It is this potential, coupled with the urgent necessity of success in this effort, which will guide planning and implementation efforts of the Ministry of Agriculture. It is hoped that the exciting prospects for future agricultural growth will also bring forth the full commitment and participation of the rural population.

APPENDIX A[1]

MANPOWER DEVELOPMENT IN THE MINISTRY OF AGRICULTURE

Introduction

The development program suggested in this monograph is ambitious and complex. Many of its components are novel to the Ministry of Agriculture and, therefore, will require new concepts and skills as well as applying old techniques to new problems. If Lesotho succeeds in making the agricultural transformations that appear to be necessary, the roles and responsibilities of the Ministry must broaden and become considerably more heterogeneous.

In addition to these expansions, the point was made throughout the text that a vast improvement is needed in the efficiency with which the Ministry delivers development programs. Furthermore, delivery methods must change to permit effectively reaching much larger segments of the rural population.

In short the Ministry faces a period of strong challenges and rapid change. The most important single program to meet the needs of agriculture's future is a sustained, vigorous program of manpower development. Education and training have been given the highest priority since shortly after independence. The priority should be continued as it undoubtedly will be. What is missing is a systematic long term plan for implementing this priority objective and for tailoring the output to specifically identifiable present and future MOA requirements. This appendix attempts to provide the beginnings of a long term manpower development effort. Because it looks nearly 20 years into the future, it is necessarily generalized and confined primarily to identifying major components and priorities. Specific training needs must be identified on a recurrent basis, annually and with each planning period. However, the basic structure of the Ministry's future manpower development program will likely follow that outlined here.

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[1]This appendix is written by Jerry Eckert based on the implications of the main document plus extensive commentary and data collected in Maseru during a visit from April 26 to May 9, 1982. Senior staff of the Ministry of Agriculture have not had the opportunity to review this appendix in its final form. Therefore, they cannot be held responsible for any errors or oversights that may be contained.

General Manpower Considerations

Size of Establishment[1]

Lesotho's establishment presently contains about 13,000 positions. Data are unavailable on the number of vacancies but it is known to be high in some ministries. Several thousand additional persons work for government as daily paid workers. Government is the largest single employer within the wage sector which has been estimated to contain 40,000 employees in 1980 (GOL, 1982). The annual wage bill for government will exceed M55 million during the present fiscal year. Maintaining a civil service of this size is a serious strain on Lesotho's very limited fiscal resources. Salaries, wages and allowances constituted 67 percent of MOA's budget allocation in 1979/80 (World Bank, 1980).

Lesotho is now (1982) experiencing budgetary constraints that can only be described as severe. During the mid-to-late 1970s government expanded the establishment and other programs rapidly, utilizing rapidly growing Customs Union revenues. However, a major portion of the Customs Union formula which determines revenue distributions is dependent on growth in imports. As mine wages rose, imports to Lesotho jumped dramatically and Customs Union's receipts swelled accordingly. Mine wages peaked in real terms in 1976 and the growth in imports, again in real terms, had leveled off considerably by 1979. Following the two year lag built into the formula with respect to the import growth term, a revenue crisis began to develop in 1981 and is particularly severe today. Unless the revenue disbursements formula is renegotiated, budget stringency will continue until alternative revenue sources can be developed. While several options are under consideration, implementation will take time and it could be 1985 or 1986 before an adequate and more stable revenue base is established utilizing domestic sources.

One of the responses to the budget situation has been a hiring freeze with respect to vacant establishment positions which is expected to last for the 1982/83 and 1983/84 fiscal years. The freeze is not total. Exceptions can be obtained for: 1) new graduates from NUL, 2) persons returning from training abroad, 3) secretarial staff, and 4) other carefully justified needs.

The point is this. For the near future growth in the establishment across all branches of government will be constrained. Revenue shortages will force a period of rationalized growth at relatively slow levels. Only the most highly justified posts are intended to be

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[1]The establishment is the set of "established," or sanctioned, posts that constitutes the civil service.

filled. Priority in approving new employment will likely be given to those agencies that deal directly in generating government revenues. The Ministry of Agriculture cannot expect any major staff expansion, probably for a period of three to five years. Their manpower development plans must reflect this situation.

Following the creation of an adequate revenue base, the establishment should resume a more rapid growth. There is a perception held by many in Lesotho that government bears some responsibility to contribute as much as possible to employment generation by direct hiring into the civil service. It will likely be difficult to effectively control the size and structure of the civil service in the absence of budget limitations. Therefore, the period of constrained, rationalized growth in establishment will probably be followed by a return to more rapid and less directed expansion.

Until 1980, the establishment of the Ministry of Agriculture had grown at an annual compound rate of 26 percent. At independence some 125 posts appeared on the staff list of which 18 were listed as vacant (Basutoland Government, 1966). The 1979/80 staff list included 2,802 positions. Even if government in general returns to a period of rapid growth, it may not be either advisable or necessary for MOA to follow suit. In 1982/83 the Ministry has 2,250 established posts or 17 percent of the total civil service. An additional 1,550 persons work as "daily paid" wage earners. Thus the Ministry of Agriculture, if fully staffed, would be employing nearly 10 percent of the nation's total wage earning labor force excluding migrants.

However, the Ministry presently shows a large percentage of vacant posts. The 1979/80 establishment list showed a 27 percent vacancy rate within 2,802 established posts (World Bank, 1980). Unpublished calculations by the National Manpower Development Secretariat, based on the 1981/82 establishment list, show a 38 percent vacancy rate among 2,250 posts.[1] If this latter figure is true it is certainly the highest vacancy rate of any ministry of government. These unutilized posts offer considerable potential for expanded services without further establishment increases. As recommended below they also offer considerable flexibility through internal redeployment and rationalization. This flexibility is a definite asset at the present stage and should be utilized.

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[1]The decline in total MOA posts reflects the transfer in early 1980 of the Cooperatives Division to the Ministry of Rural Development the absorption of the cannery and other agricultural enterprises by LNDC, and other shifts.

Qualitative Factors

The Ministry's leadership benefits from a group of Division Heads and Section Chiefs who are highly motivated and dedicated to their job. Many of these individuals are also well trained as the result of an intensive concentration on undergraduate and graduate degree training in the recent past. There exists widespread agreement, however, that beneath this level (and, in selected cases, at this level) are large numbers of individuals with job responsibilities that would benefit from further training. The Ministry has an acknowledged shortage of trained skills at nearly all levels in their establishment. This shortage is probably most critical relative to need at the top and bottom of the civil service scale. That is, the most critical training needs occur at Grade 8 or higher and in Grades 1-3. In addition, a very high priority can be seen for training those in Grades 4-7 who are in administrative and senior clerical positions.

The Ministry of Agriculture along with all other employers presently faces an apparent deterioration in the quality of education recently available within the country. Two causes can be isolated. First, from 1967 to 1979 an automatic promotion policy prevailed in primary and secondary schools. Performance was not required as a precondition of advancement toward secondary school leaver status. Second, during the 1970s the number of schools was multiplied more rapidly than qualified teachers could be found or trained. One measure of the consequences has been a steady decline in the C.O.S.C. (Cambridge Overseas School Certificate) pass rate which fell below 20 percent in the most recent results.

The immediate results of this phenomenon include the following. The National University of Lesotho (NUL) which generally restricts admission to first and second division COSC graduates is unable to fill their entering classes with this policy. They are now taking "mature entrants" (older people who wish to return to school) and some third class COSC passes provided their aggregate score is 34 percent and they have adequate capacity in English. For entry into the science curriculum it has been necessary to develop a remedial crash course in mathematics. Lesotho Agricultural College (LAC) has historically had to accept third division passes because NUL could admit nearly all of those with higher marks. LAC no longer has any problems filling their diploma candidates since there are plenty of third division passes coming out of the secondary school system. In addition, the Ministry of Agriculture faces growing competition from the private sector, parastatals and other ministries for the limited output of NUL. Agriculture has not been as successful as formerly in attracting the best of each graduating class. As a result, some recent MOA employees are now being nominated for graduate study abroad who are simply inadmissible to most graduate programs in the UK or USA.

Finally, there is no Faculty of Agriculture at NUL although one is under consideration. It has therefore not been possible to obtain degree level education in agricultural sciences from a "local" institution since the dissolution of the University of Botswana, Lesotho and Swaziland in the mid-1970s. Thus, fresh graduates from NUL do not have the agricultural knowledge that is preferred for most jobs in the MOA. The feasibility of the Faculty of Agriculture is examined in a later section.

Structural Variation

It is difficult to specify a long term manpower development plan for an agency without an agreed upon organizational structure. A definitive manpower plan starts with the present structure and identifies the unfilled training needs that exist. Then some projection of future needs is added based on the best possible forecast of future changes in the agency's responsibilities.

The Ministry of Agriculture has been in a state of flux for several years. Various reorganizations have been proposed, either of the whole or its parts. Some have been implemented fully, others partially and some not at all. Sudden expansions of staff have been caused by the absorption of certain "area based projects" while reallocation of key functions to other agencies of government has resulted in the deletion of parts of the organization.

Donors have had significant roles in restructuring the MOA. The Range Division, Research Division, BASP and the proposed Forestry Division are significant examples of institutional change necessitated by foreign assistance initiatives.

The result of this organizational fluidity is that there is no definitive organization chart available for the MOA today. The structure of the agency has changed rapidly and the definition of responsibilities and relationships between components has often lagged behind. Thus the organizational structure on which to base manpower planning is not available.

It is not surprising, therefore, that no long term training program exists which would identify, in timed sequence, the types and levels of training needed. Fresh lists of nominees are put forward each year, without reference to an overall master strategy. Priorities are influenced by the presence of donor projects which frequently build training plans for the MOA component being assisted and back these plans with substantial training budgets. Since training opportunities are often tied to projects, those units of the Ministry without donor assistance generally do not receive a proportionate share. As a result the systematic development of the Ministry as an effective governmental unit has been impaired.

Manpower Planning Strategies

First Steps

The above descriptions identify several items that must be taken as first order of business in developing a manpower and training plan for agriculture.

First, expected limits to growth in the establishment plus the number of posts already assigned to MOA strongly suggest that for the foreseeable future manpower development should be sought within the limit of presently allocated staff. Thus the approach must concentrate on in-service training rather than further recruitment.

Second, to systematize the process it is imperative that the organizational structure of the MOA be finalized as fully as possible. Further changes, insofar as they can be anticipated, must be identified and planned in such a way that they will reinforce rather than distort the agreed upon overall structure. Once an organizational structure is determined, a decision on staffing levels for each subunit will be required. Before this can be determined, clear statements of terms of reference for each unit are needed. These should delineate responsibilities of each unit no matter how small as well as relationships between units. Finally, accurate job descriptions for individual posts should be constructed to reinforce the responsibilities assigned to the unit in which the post lies.

Third, there is considerable scope for a rationalization of the MOA establishment through an internal redeployment. Positions have been established to meet various needs at different times. As the nature of the agricultural sector and the Ministry's workload have changed, the justification for many positions has probably disappeared while the need for other positions has arisen but remained unfilled. Redeploying positions would bring staffing more in line with current responsibilities. In some cases redeployment will be possible within positions requiring similar skills. In others, retraining may be necessary.

One longer term strategy with considerable merit is redeployment through attrition. It is suggested that the numbers of staff in Grades 1-3 could be reduced modestly and selectively through attrition and that the accumulated salary savings could be shifted to provide critically needed clerical, accounting and secretarial support staff in the range of Grades 4-6.

Fourth, the co-existence in the MOA of 896 vacant posts[1] and 1,550 temporary employees receiving daily wages calls for rationalization. The World Bank (1980, Annex 11) found that 64 percent of the vacancies occurred in Grades 1-3. It would seem possible to fill most of these

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[1]NMDS calculations from 1981/82 establishment.

lower grade vacancies with carefully selected daily hire employees. A great many of the daily wage employees have been temporary employees of the MOA for years and might easily qualify for entry at levels above Grade 1 due to their experience. Costs to the Ministry would increase by the amount of civil service benefits. Yet the benefits themselves plus the security of salaried employment could well result in higher motivation levels and reduce the continual loss of trained people to the private sector and to RSA.

The vacancy percentage varies widely between divisions. In 1979/80 LAC was the most completely staffed with a 9.4 percent vacancy rate while vacancies in administration ran to 51.4 percent. This latter observation may account for the urgency which most observers assign to strengthening of secretarial, clerical and administrative support staffs.

Priorities for In-Service Training

Professional Staff: Top priority must continue to rest with completing the education of individuals holding professional assignments or decision making posts in administration. Without skilled scientific and administrative talent (generally Grades 8 and above) no amount of reorganization or training of the lower grades can produce much in the way of improved governmental service.

There exists a very substantial pipeline of persons from the Ministry receiving training at any one time. Table A-1 provides a breakdown by degree and discipline of the 88 people who were abroad for long term training at some point during calendar year 1981. During that year 22 persons completed their course and returned while an additional 39 left for studies.[1] For the 1982/83 year 48 candidates have been proposed which can be compared with the 21 persons who left for long term training during 1980/81 (MOA, 1981). Thus, the numbers involved are increasing sharply, a trend which is consistent with the priority identified here.

For the next four to five years, a training program that produces some 30 B.Sc. and M.Sc. degrees annually would not be excessive when compared to need. NMDS tabulates 160 filled posts and 87 vacancies at Grade 8 or above in the MOA. Thirty degrees per year would, in five years, upgrade essentially all of those presently employed at this level. Alternatively, in-service degree level training could be received by half of the present staff and new recruits could be educated to fill most existing vacancies. The real problem is whether 30-35 candidates can be found for nomination each year who can gain admission to foreign universities and colleges. In view of recent experience, it seems probable that an increasing proportion of the degrees received will, of necessity, come from institutions outside

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[1]Data from Training Section, MOA.

Table A-1. Ministry of Agriculture Employees On Long-Term Training Abroad During 1981[a]

Subject Matter	Cert.	Dipl.	B.Sc.	M.Sc.	Ph.D.	Total
General Agriculture		2	6			8
Plant Sciences						
Agronomy			14	4		18
Forestry			2			2
Horticulture	1	4	2			7
Range Science		4	7			11
Plant Pathology				1		
Animal Sciences						
Animal Husbandry	2	2	5	1		10
Fisheries			1			1
Veterinary Science			1		1	2
Zoology					1	1
Agric. Engineering	1	3	5	1		10
Social Sciences						
Agric. Econ. and Statistics			1	4		5
Home Economics		3	1			4
Rural Sociology			2			2
Miscellaneous	1	3		2		6
TOTALS	5	21	47	13	2	88

[a]Includes anyone abroad on a long term (12 months or more) course for any part of 1981.

Source: Tabulations from Training Section, MOA.

the US and UK. Accepting this as a probable fact of life will facilitate manpower planning and will allow the program to proceed at the rate of approximately 30+ degrees per year.

It is clear, however, that the need for degree and graduate degree education will diminish markedly after four or five years. With little growth in the establishment and a training pipeline producing 30 degrees per year, the various divisions of the Ministry will, one by one, complete their most urgent degree training needs. Conservation Division may well be the first to finish due to the long history of degree training for that division. The Range Division, because it is new, and Crops Division, because it has never had a major foreign assistance program with a training component, may be among the last to saturate these skills needs. However, by 1986 or 1987, the most critical degree training needs of the present MOA organization will have been met. Beyond that point the justification for degree training will become localization, attrition and any further growth in establishment, rather than providing sufficient degree level skills to permit effective MOA operation.

The number of required degrees annually could change although not necessarily so beyond 1987. Assuming that half of the existing vacancies at Grade 8 or higher are filled in the next five years there will then be 200 employees at this level. Attrition is variously estimated at between 2 and 5 percent per annum. Required training for replacement thus equals four to ten degrees per year.

In 1980 there were 128 expatriates serving in the Ministry of Agriculture. Localizing about half of these posts by 2000 AD will require three to four degree trained Basotho per year.

The more important question is whether or not MOA will grow in size and at what rate. It has been said, only partly in jest, that a bureaucracy will expand at 5 percent annually even without increased responsibilities. Such a growth rate would result in 380 employees of Grade 8 or higher, 18 years hence. An average of 27 degrees would be needed yearly, escalating from 10 in 1987 to 38 in 2000. With careful planning it should be possible to meet future needs with an expansion at only half this rate or less.

Combining these figures leads to upper and lower estimates of 41 and 20 degrees required annually after 1987. If the larger of these two is accepted then the case for a Faculty of Agriculture at NUL is considerably strengthened. With such a view of the future it would seem sensible to develop a domestic capacity to produce good B.Sc. agricultural graduates and confine the use of donor funded degrees to graduate level programs.

Administrative Support: Second priority in the Ministry's manpower plans must go to easing the administrative burden affecting senior professional staff in order that they might devote more time and attention to their professional and technical responsibilities. While the MOA leadership cannot delegate their responsibility for management decisions, they could function much more efficiently if supported by skilled typists, stenographers, bookkeepers, and accountants. Skill levels among these positions as well as their motivation and supervision are, with some exceptions, abysmally poor at the present time.

One job classification which proves extremely valuable in much of the world but is generally missing in Lesotho is that of administrative assistant. In practice this person is often a "super secretary," one who is capable of making routine decisions relating to the functioning of the office, supervising the clerical staff, allocating workloads and protecting the bosses' uninterrupted working time. Several of the Division Heads as well as the P.S. and Director of Technical Services could usefully employ such persons.

Strengthening supporting staff can only be partially achieved through in-service training. With more than 50 percent vacancies in administration, additional recruitment followed by training is urgently needed. Government has recognized this critical need by excluding secretarial staff from the current freeze on hirings against vacant posts.

Organization and Management Skills: Degree training to date has focused primarily on technical and professional subjects. As in most developing countries, once an individual becomes well educated he or she is often promoted to a supervisory or administrative position. Workloads in the new post are often very largely administration and management for which the technical education received earlier provides little guidance. The result is administration by persons with little knowledge of administrative or managerial science.

This need suggests several in-service training options. First, senior administrators could profit from exposure to a series of management concepts, ranging from budget control and personnel administration to such seemingly minor skills as how to efficiently chair a meeting or delegate responsibility or how to manage one's own time schedule. There are well developed administrative principles which are easily taught and form the basis of enhanced management skills in each of these areas as well as many others. Given the extremely busy schedules of the Ministry's leadership, perhaps the only workable format would be a recurrent series of weekly late afternoon seminars of not more than two hours duration which would cover one topic per session.

Second, intermediate level staff could profit from a more in-depth exposure to some of the same skills and principles. Since they can probably be available for more time during the week, one or two week short courses meeting one hour daily would provide a suitable format.

Third, selected concepts of personnel management are essential for every employee with supervisory responsibilities. Short training programs should be organized by varying length to suit individuals with different numbers of persons under their supervision.

Fourth, short courses may not be adequate for those selected persons who will be assigned as administrative assistants or office supervisors. A more exhaustive training program to certificate or even diploma level might be essential if the requisite level of skills is to be attained.

A dual approach is therefore recommended. First is to increase management and administrative skills of management level personnel. Second, and equally important, is to provide the support staff that will allow the manager the time to effectively do his or her job.

New Technical Skills: The view of the future projected by this monograph is one of fairly rapid modernization and diversification within the agricultural sector. To provide effective leadership MOA personnel must continually become familiar with new technology and acquire new skills. While there may be little expansion of staff in the MOA, the range of technologies and program options facing agriculture could expand, and it certainly will increase in technical complexity and sophistication.

Thus, one can clearly identify a continued need for existing Ministry staff to become trained in these new dimensions of their work. This need affects all levels but is particularly important for employees below Grade 8. It will be very important for lower and intermediate level employees to keep pace technically as the agricultural sector modernizes.

There are a wide range of short courses and nondegree programs available abroad and the Ministry utilizes them well. During 1981 MOA employees attended 59 short courses of various types which required foreign travel.[1] However, international nondegree training is best suited for senior and upper-intermediate level staff. There are fewer options for employees in Grades 4-5 and practically none for Grades 1-3. Given the number of lower grade employees who should be exposed to "refresher" or "upgrading" courses, it is prohibitively expensive to look abroad for this training. Therefore, an important priority within the overall in-service training program is to develop a

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[1]Tabulations from Training Section, MOA.

domestic capacity to deliver these types of upgrading short courses on an organized recurrent basis. While LAC, with both its Maseru and Leribe campuses, has a definite role to play, additional programs will be necessary if a significant portion of the lower grade employees are to participate.

The need for this type of training will probably increase steadily throughout this century or until agriculture's role in the economy declines significantly. Therefore, a small program begun now will probably see sustained growth.

Summary: The general priorities described above can be summarized as follows:

a. Top priority to completing the degree training program needed to ensure highly qualified people in most of the present upper grade positions. This effort should last about five years. Degree training will be needed beyond 1987 but for less pressing reasons.

b. Second, but very high, priority to recruitment and training of an adequate administrative and clerical support staff. This selective need focuses on Grades 1-6 and should be met concurrently with the degree training of senior staff.

c. Third priority goes to specially tailored short courses in administration and management, including how to manage personnel, for employees in managerial or supervisory positions. Given the nature of these courses, this objective can, and should be, met within the next 24 months. Similar programs could then be repeated as needed in the future.

d. Finally, there is a present need for refresher, reteaching and upgrading courses of study for the existing MOA establishment in Grades 1-7. This need will probably expand throughout the foreseeable future, and should be met by in-country training programs.

Training Implications from the Sector Analysis Perspective

This volume proposes an agricultural development program that differs significantly from many of the existing practices. While a much more comprehensive and complicated set of functions will be required from the MOA, it is believed that the present level of established posts is adequate to the task. This assumes that all vacancies can be filled,

that important redeployments occur to match staffing and responsibilities, that operational efficiency is improved markedly and that in-service training programs proceed in line with the priorities outlined above. The alternative of simply increasing the establishment will be of limited usefulness unless the training objectives are met. Some modest expansions of staff may be necessary for decentralization and to provide special, highly technical skills but the number of additional staff will not be large.

Modernization of agriculture along culturally compatible lines will require embracing several new concepts and program thrusts. Several training or educational needs can be identified from the recommended development program. Significant items are given below in brief outline. These comments emphasize needed disciplinary orientations rather than location or format of training.

Decentralization and Participation: The recommended strategy is based on the belief that Lesotho's stability requires widespread participation in economic development throughout the rural and urban population. Recommendations in each chapter highlighted the need for economic activity and developmental change in each district and especially in rural areas as well as district centers. Government is gradually experimenting with decentralization as one means of administering such a program. This analysis would suggest that decentralization continue and be strengthened with qualified people at district level. It is assumed that district level staffing will be met by a combination of redeployment of central ministry staff plus new recruits. Skills needs at the district or regional level will include:

- economic analysis and planning: all regions
- intensive livestock husbandry systems: lowlands
- pasture/range specialists: mountains
- nutrition and food preservation: mountains and southern districts
- agricultural program administration: all regions
- vegetable production extensionists: each climatic zone.

Decentralization and its manpower requirements raises one question which is worth further consideration. Posting agricultural officers in each district may meet certain desired objectives but encounters two significant costs. First is the monetary cost of supporting, say, ten additional planning officers or like numbers of other specialties when perhaps fewer numbers would suffice. The second is a programmatic cost in that posted officers are geographically removed from

each other and can communicate only with difficulty. Perhaps a more realistic alternative would be to define agricultural administrative regions and co-locate the required staff to serve the region at one regional location. For example, climatic and program similarities might suggest the following regions as part of an agricultural decentralization effort:

Region	Included Districts	Staffed at
Northern Lowlands	Butha Buthe Leribe	Leribe
Central Lowlands	Berea Maseru	Teyateyaneng
Southern (Arid) Lowlands	Mafeteng Mohale's Hoek	Mohale's Hoek
Southern Tier	Quthing Qacha's Nek	Qacha's Nek
Northern Mountains	Mokhotlong Thaba Tseka	Mokhotlong or Thaba Tseka

Such a regionalized strategy would permit meeting regional agricultural administration needs with fewer staff, yet with regional nucleus groups of sufficient size to generate effective interaction and cross-fertilization within the group. For example, government could constitute, at Mokhotlong, a regional team composed of a Regional Agricultural Officer, supported by a Regional Planning Officer, a food storage and nutrition specialist, a range scientist, a senior veterinary assistant and perhaps an extension person specialized in high altitude vegetable production. Four or five such regional nuclei should be sufficiently interesting to attract expatriate assistance during the organizational and start-up phases.

Group Farming: At several points the report recommends that underutilized agricultural resources be shifted to better management under group farming or grazing schemes. These recommendations are attempts to draw on the social cohesion found at the village level and use it to improve the nation's productivity.

- Government will require people skilled at organizing and motivating collective action who are willing to work at the local level for extended periods.

- It will be in the national interest to provide specialized training to the managers that might be employed by a village level producer's association. This is particularly true where a non-typical enterprise is involved such as labor intensive horticultural crops.

Appropriate Technology: The emphasis throughout on choosing technologies that are appropriate to farmers' resources suggests that human resources with the following skills be involved:

- agricultural engineering with practical experience in small farm machinery (design, manufacturing, maintenance, and utilization)

- agricultural economics (feasibility studies, marketing, evaluation).

A call for an "appropriate social technology" appears in the text, showing the need for persons who can help to develop viable organizations for group farming. Knowledge of sociology, anthropology and institutional forms will be required.

Less Direct Government Intervention: In the interests of expanding government's effective contact in support of the participatory growth objective, the volume recommends that government shift to indirect methods of stimulating development rather than direct delivery of government services. To do so will require a viable private sector in marketing and processing as well as a substantial increase in commercial farming. Skills required of government include:

- contract specialists including perhaps a lawyer

- agricultural economists (price and commodity forecasting, price policy)

- market inspectors and graders.

One of the key missing elements of training to support the private sector lies in small scale business management. Those who are to direct large ventures can usually find training either in Lesotho or abroad. There is a dearth of opportunities, however, for small businessmen to learn basic skills in cost accounting, inventory management, purchasing, advertising, personnel, etc. Providing such an education may not be the responsibility of the MOA but there is a strong likelihood that, if it were provided, many of those who enrolled would be directly or indirectly involved in agribusiness.

International Linkages: The complexity of agriculture's future will necessitate much more effective working relationships between the MOA and other ministries and agencies of government. Particularly important will be interactions with agencies responsible for foreign trade and transport, agribusiness, legal matters and domestic manufacture of farm inputs. While the following skills have not been traditional in the MOA, one would expect them to be added as the need arises in the future:

- business administration
- legal/contractual skills
- public administration.

Extension and Information Services: For the agricultural sector to make the progress felt necessary, the Basotho farmers must change from relatively unsophisticated managers of simple cropping systems to good managers of complex systems, possibly including completely new crops or livestock products. To permit this rapid transition to occur, massive amounts of new information must flow to the farmer through extension and agricultural information channels. A substantial modernization is required in communications methods suggesting skills needs in:

- media technology
- communications theory
- extension methods.

The pace of technical change in agriculture may well be rapid enough that Extension personnel themselves will require a refresher or retooling short course as often as every two years.

Coping with Drought: While it may be controversial, the basic report accepts the probability of reduced rainfall over the coming decade and recommends developing drought resistant cropping systems and other forms of retaining agriculture's productivity. This suggests that the Research Division or Crops Division should build professional competence in the branch of agronomy known as plant-soil-water relations. To do so and to apply it to farming systems will probably require graduate degree training in:

- agronomy - soils
- agronomy - plant physiology

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Faculty of Agriculture

One issue with which MOA is directly involved is the proposal for a Faculty of Agriculture to be established within Lesotho. LAS and NUL are jointly exploring this option and will move toward a decision in 1982 or 1983. The analysis above has led to the conclusion that students from Lesotho do not have the opportunity for agricultural degrees locally. As a consequence they must seek training in agriculture abroad, usually after, rather than before, joining government. Concern has been expressed, for example, that the Planning Division is occasionally not asked for input to agricultural program decisions because Planning Officers are generally social science graduates of NUL without basic education in agriculture. Four key divisions; Crops, Livestock, Range and Research, all could profit from between 10 and 20 B.Sc. graduates in the near future and their long term growth will add additional B.Sc. requirements as well as several M.Sc.'s. Extension and Agricultural Information are particularly understaffed by degree holders with respect to anticipated future needs. In addition to these requirements of the MOA directly, there is a demonstrable need for degree graduates in agriculture to teach agriculture in secondary school.

With this very superficial set of considerations it would seem that a definite need exists for a Faculty of Agriculture. There are clearly present and future requirements for degree graduates in agricultural sciences and the need for agricultural economists was described in a section above. Thus, it is recommended that the Faculty of Agriculture proposal be approved with a program comprised initially of three major fields: crop sciences, animal sciences and agricultural economics.

NUL authorities plan to implement a Faculty of Agriculture in conjunction with LAC during the university's present five year planning period (NUL, 1981). Foreign assistance is definitely advisable. For the donor community to generate, say, 50 degrees in agriculture in the next five years would cost a minimum of $2.5 million. Investing the same amount to develop a Faculty of Agriculture would leave Lesotho with a permanent capability in this regard.

Curriculum Concerns

Mathematics: The inadequacy of the mathematics content in Lesotho's educational system affects all ministries. Nominees for graduate training abroad are occasionally inadmissable or, even worse, cannot complete their degree due to mathematical deficiencies. It is possible to graduate from NUL with a B.Sc. in Economics without taking a math course. NUL, itself is faced with critically low mathematics skills among their applicants for admission. The problem is sufficiently severe to have resulted in a special remedial curriculum, the

Pre-Entry Science Course, wherein applicants for admission to the Faculty of Science are given five and one-half months intensive training in maths and science.[1]

This problem must be solved within the secondary and even the primary school systems. Given the lag times between a curriculum correction at the primary level and its impact on persons entering the labor force, making these corrections is of the utmost present urgency.

An Appropriate Curriculum in Primary School: Recent estimates show that for the five years, 1983-87, some 280,000 pupils will leave school at either the primary or secondary level. Of these, approximately 230,000 will be primary school leavers who will not continue their studies. What these children receive in the form of primary school curriculum may well be the only formal education they receive. It is imperative that they receive something in primary schools that will prepare them, however remotely, for gainful employment. Gainful employment must be defined with respect to the probable mix of job openings during the period in which these children are new entrants to the labor force.

Looking to the year 2000, we find the following employment picture:

a. The number of farms will probably decline from 220,000 to about 150-175,000 as a result of the leasing provisions of the 1979 Land Act.

b. The number of landless rural households will grow by 90,000 or more. Members of these households will likely not be employed in agriculture, but more probably in agro-industry and rural commercial enterprise.

c. Growth in wage employment in the domestic modern sector will probably not match the expected decline in migrant employment. The difference will seek jobs in wage employment.

The result of these several observations is that there is a critical need for curricula that teach mechanical and motor skills at the primary level, followed by vocational education at the secondary level. And within this vocational education, planners must be careful not to overemphasize agriculture. Given the mix of jobs facing new workers in the 1995-2000 period, approximately two-thirds of the vocational education offered should be nonagricultural in content.

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[1]Personal Communications with Peter Pitso and Dan Russell of NUL.

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APPENDIX B

WRITTEN OUTPUTS OF THE LESOTHO AGRICULTURAL SECTOR ANALYSIS PROJECT

General Note

This is the final report of the LASA project, terminating an effort that began in August 1976. One of LASA's objectives was to contribute to planning and policy formulation in Lesotho by providing data and analysis concerning the agricultural sector. Listed below are the various written works which constituted our main effort toward this objective. Four formal series were issued, three of a technical nature plus annual administrative reports. Each item in the three technical series was reviewed by professionals in the Ministry of Agriculture and/or the Government of Lesotho and approved for release as a project document.

The general fate of project documents in Lesotho is that they are issued in limited numbers, rapidly find their way into private collections and cease to be available for general use. The purpose of this appendix is to provide a public record of what should be available in Maseru from the LASA effort. All Research Reports, Discussion Papers and Special Bibliographies were issued in 125-150 copies each. Copies of each item in these series were deposited with the following for permanent retention:

National Library
NUL Library, Roma
CPDO Library
MOA Library (now located at Research Division)
UNDP Library

Of the less formalized materials listed below, fewer copies were made. They will be extremely hard to find except from the MOA library or from the authors themselves.

Research Reports

This series was defined as including papers of solid professional research content, which had received peer commentary.

Wilken, Gene C. and Carolyn Amiet. "Bibliography for Planning and Development in Lesotho," LASA Research Report No. 1, Ft. Collins, Colorado, August 1977.

LASA Team. "Lesotho's Agriculture: A Review of Existing Information," LASA Research Report No. 2, Maseru, Lesotho, October 1978.

Nobe, K. C. and D. W. Seckler. "An Economic and Policy Analysis of Soil-Water Problems and Conservation Programs in the Kingdom of Lesotho," LASA Research Report No. 3, Ft. Collins, Colorado, September 1979.

Eckert, Jerry and Ron Wykstra. "The Future of Basotho Migration to the Republic of South Africa," LASA Research Report No. 4, Maseru, Lesotho, September 1979.

Wilken, Gene C., 'Matsaba J. Leballo, Betty J. Eckert, Makhothatsa Motleleng and Kay Bolls. "Catalog of Holdings and Other References in the Lesotho MOA/LASA Library," LASA Research Report No. 5, Maseru, Lesotho, February 1980.

Wykstra, Ron and Jerry Eckert. "Manpower vs Machinery: A Case Study of Conservation Works in Lesotho," LASA Research Report No. 6, Maseru, Lesotho, April 1980.

Eckert, Jerry and Ron Wykstra. "South African Mine Wages in the Seventies and Their Effects on Lesotho's Economy," LASA Research Report No. 7, Maseru, Lesotho, May 1980.

Eckert, Jerry. "Quantitative Analyses of Lesotho's Official Yield Data for Maize and Sorghum," LASA Research Report No. 8, Maseru, Lesotho, July 1980.

Nchapi, 'M'ampiti Francisca. "A Critical Analysis of Manpower Utilization Issues in Lesotho," LASA Research Report No. 9, Maseru, Lesotho, August 1980.

Eckert, Jerry. "Toward the Year 2000: Strategies for Lesotho's Agriculture," LASA Research Report No. 10, with Kenneth C. Nobe, Forrest E. Walters, and Ronald A. Wykstra, Ft. Collins, Colorado, May 1982.

Discussion Papers

This series was intended to stimulate discussion among the planning, policy making and foreign assistance communities in Maseru. In general, items will contain somewhat less analytical rigor than those in the Research Report series.

Wilken, Gene C. "Agroclimatology of Lesotho," LASA Discussion Paper No. 1, Maseru, Lesotho, April 1978.

Eckert, Jerry. "The Supply of Data for Agricultural Administration and Development Planning," LASA Discussion Paper No. 2, Maseru, Lesotho, March 1978.

Hartman, L. M. "Towards an Integrated Perspective on Development Planning in Lesotho" (draft), LASA Discussion Paper No. 3, Ft. Collins, Colorado, December 1977.

Wagner, William E. "The Spatial Context for Integrated Development Strategy in Lesotho," LASA Discussion Paper No. 4, Ft. Collins, Colorado, January 1978.

Wykstra, Ronald A. "Farm Labor in Lesotho: Scarcity or Surplus?," LASA Discussion Paper No. 5, Ft. Collins, Colorado, September 1978.

Anderson, Jim. "Resource Guide for Nutrition Planning in Lesotho," LASA Discussion Paper No. 6, Maseru, Lesotho, October 1978.

Eckert, Jerry and R. A. Wykstra. "Lesotho's Employment Challenge: Alternative Scenarios, 1980-2000," LASA Discussion Paper No. 7, Maseru, Lesotho, December 1979.

Wilken, Gene C. "Profiles of Basotho Farmers: Part I, Images of Basotho Farmers; Part II, Are the Basotho Subsistence Farmers; Part III, Progressive Farmers in Lesotho," (with Martin H. Fowler), LASA Discussion Paper No. 8, Maseru, Lesotho, June 1979.

Eckert, Jerry and Joseph Mohapi. "The Future Environment for Agricultural Planning 1980-2000 AD," LASA Discussion Paper No. 9, Maseru, Lesotho, June 1980.

Eckert, Jerry. "Rainfall Oscillations in Lesotho and the Possible Impact of Below Normal Rainfall in the 1980s," LASA Discussion Paper No. 10, Maseru, Lesotho, August 1980.

Special Bibliographies

This series was designed to provide special compilations of materials from the MOA/LASA library that would be of reference to specific areas of concern. They are, therefore, subsets of Research Reports Nos. 1 or 5. Special Bibliography No. 2 goes beyond simple listings to include annotations, some analysis and a discussion of issues.

Leathers, Roxanna M. and 'Matsaba J. Leballo. "Extension in Lesotho: Bibliography of Materials Available in Maseru," LASA Special Bibliography No. 1, Maseru, Lesotho, February 1979.

Eckert, Jerry. "Lesotho's Land Tenure: An Analysis and Annotated Bibliography," LASA Special Bibliography No. 2, Maseru, Lesotho, October 1980.

Administrative Reports

Prepared as annual progress reports to the Ministry of Agriculture and to the United States Agency for International Development.

Nobe, K. C. and Jerry Eckert. Annual Administrative Reports for the following periods:

No. 1. September 1, 1976 - September 30, 1977
No. 2. October 1, 1977 - September 30, 1978
No. 3. October 1, 1978 - September 30, 1979
No. 4. October 1, 1979 - September 30, 1980

Miscellaneous

This section partially lists written works prepared as part of the project and its daily work within the Ministry.

Eckert, Jerry, R. T. Mochebele and P. Mosebo. "An Employment Generation Strategy for Agriculture," approved by MOA and forwarded to Cabinet. Maseru, Lesotho, 1980.

Eckert, Jerry and Planning Division Staff. Regional Differentials in Lesotho: A Collection of Selected District Statistics, prepared for training of District Agricultural Officers. Maseru, Lesotho, 1980.

LASA Team and CPDO Staff. "Manpower Development and Employment," Chapter Five in Third Five Year Development Plan, Maseru, Lesotho, 1980.

Wilken, Gene C., E. Moyo and N. Mokhoto. "Inventory of Data Available for Districts with Special Reference to Thaba Tseka District," Maseru, Lesotho, July 1979.

Wilken, Gene C. "Decentralization: Existing Policies and Strategies," Maseru, Lesotho, May 1979.

Wilken, Gene C. "Village Based Resource Management and Development in Lesotho: A Preliminary Review of Traditional Institutions and Development Possibilities," Maseru, Lesotho, February 1979.

Wilken, Gene C. "Agroclimatic Hazards and Risk Perception in Lesotho: A Preliminary Review of Traditional Institutions and Development Possibilities," Maseru, Lesotho, July 1978.

Moshoeshoe, Manapo and Jerry Eckert. "An Internal Analysis of the Functioning of the Planning Unit, Ministry of Agriculture," prepared on request of the Permanent Secretary, Maseru, Lesotho, February 1978.

Eckert, Jerry, D. Mosebo, M. Moshoeshoe, M. Morojele, R. Leathers, and M. Madland. "A Functional Reorganization of the Planning Unit," Maseru, Lesotho, November 1978.

Wilken, Gene C. "Environmental Hazards and Crop Failures in Lesotho: A Preliminary Evaluation," Maseru, Lesotho, October 1978.