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Annex B
AGRICULTURE

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**DEVELOPMENT NEEDS
and OPPORTUNITIES for
COOPERATION in
SOUTHERN AFRICA**



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REGIONAL OVERVIEW OF DEVELOPMENT CONCERNS IN
THE AGRICULTURAL SECTOR OF SOUTHERN AFRICA

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Regional Overview of Development Concerns in the
Agricultural Sector of Southern Africa 1/

The nine countries of southern Africa--Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, Swaziland, Zambia and Zimbabwe--cover a land area almost equal in size to all of Europe, but the amount of arable land is only slightly more than in Spain and less than in France.^{2/} While the countries in the region are sparsely populated with only 78 people per thousand hectares, the need for increased agricultural productivity becomes patent when one examines per capita population density of more than 2.25, per hectare of arable land.

The objective of this overview is to examine constraints to increasing agricultural productivity and develop strategies which can be used in preparing efficient agricultural development programs in the region.^{3/} Of special concern are the constraints, strategies and programs that have a potential for being considered at the regional rather than country level.

The organization of the report will be: (1) a brief overview of the agriculture sector; (2) an examination of the regional food balance; (3) an evaluation of constraints to production and development of strategies to limit the negative impact of the constraints; and (4) a summary of programs and activities with significant regional implications.

1/ This paper was prepared by Professor J. Dean Jansma of Pennsylvania State University, editor-in-chief, in collaboration with various members of the SECID-USDA agricultural sector assessment team.

2/ Based on data in FAO; 1977 Production Yearbook.

3/ More detailed, country specific, information on the constraints to increased agricultural productivity and a discussion of potential development strategies is available in the agricultural sector assessments developed for each of the nine countries by SECID-USDA.

I. OVERVIEW OF AGRICULTURE SECTOR

One of the most striking constraints facing the agriculture sector in southern Africa is that every country is experiencing personnel shortages in its agriculturally related programs.^{4/} Although the magnitude of the problem varies--with, for example, the farmer-to-extension-agent ratios ranging from 250:1 in Botswana to more than 1000:1--in Angola and Mozambique the lack of trained personnel is critical throughout the entire region. The problem of the low level of training is equally important with many of the field staff personnel not meeting the minimum criteria established for the position in which they are working. Efforts to increase competency are difficult because of the emphasis on formalistic education, the lack of qualified instructors, and cultural constraints on training females in areas other than home economics.

Much of the traditional farming in the area can best be described as "hoe agriculture" with women and children providing most of the labor input except for plowing. The use of improved cultural practices such as fertilizers, hybrid varieties, insecticides and pesticides is minimal.

Another area of commonality within the region is the lack of economic incentives, which, in turn, is closely linked to the institutional constraint of communal ownership of the land.

An important similarity within the SADAP countries is the need for improved infrastructure in the rural areas. Farm-to-market type roads are not generally available and often in bad repair. Additionally, the development of mechanisms to supply agricultural inputs, provide the

^{4/} The emphasis in this analysis is on problems facing the traditional farmers. The issues discussed here are often less critical for the larger estate type farms which are usually owned and managed by the white minority farmer.

farmer a market for his/her output and administer to their health and educational needs are a prerequisite to sustained progress in agricultural development.

Related to infrastructural development, one must confront the crucial constraint posed by the extant transportation network. There is heavy reliance upon transshipment of goods through South Africa (whose five major ports made up one-half of the ten major ports available to the region). Where other ports exist (Namibia, Angola and Mozambique), recent political and economic dislocations have reduced their capacities to assume a more dominant role. Internal road and rail systems in the region are in need of repair and expansion, yet the high costs of such an effort cannot readily be borne by the states themselves. The effects of this constraint are the reduction of comparative advantage in agricultural production and export, complications in the provision of agricultural inputs, and delays and considerable losses in harvesting and marketing of crops.

While one finds many similarities in southern Africa, there are also significant differences which must be recognized in development planning. For example, although not specific to agriculture, the form of government has important implications for planning. Issues are approached quite differently under Botswana's parliamentary democracy, Malawi's "one-party" rule and Zambia's humanism-socialism system. Minority rule in Namibia and Zimbabwe adds to the complexity of the political environments.

The type of agriculture is also different among the individual nations. Livestock population is the dominant agricultural activity in countries such as Namibia and Botswana, but crops are the more important

farming enterprises in Malawi, Mozambique, Zambia and Zimbabwe. The type of farming is, of course, closely related to the resource base available in each country. For example, Mozambique and Zambia have relatively good soil with large areas of underutilized arable land. In contrast, Namibia has poor soil and little arable land, thus livestock (primarily sheep) is the predominant activity.

There are also significant differences in the availability of mineral resources which can yield tax revenue to help support agricultural development activities. Seven of the nine southern Africa countries have substantial mineral deposits which provide important additions to the GNP. In some countries, Botswana for instance, the stated policy is that income from mineral exports will be used in funding agricultural development schemes. Two countries (Lesotho and Malawi) have few known mineral resources available for commercial exploitation and thus must use alternative approaches to finance agricultural development.

An examination of the countries in southern Africa is incomplete without considering the impact of the most economically advanced nation in the sub-continent, the Republic of South Africa (RSA). The magnitude of the economic ties with the RSA range from almost total independence for Angola to nearly complete domination of the Lesotho economy, including the use of the RSA rand as that country's currency.^{5/}

This general review of the agricultural situation in southern Africa provides the setting for addressing the more focal points of concern -- increasing agricultural productivity and supplying adequate food for the population of the region.

^{5/} See Appendix 1 for a brief description of the economic ties between the RSA and the other southern African countries.

II. REGIONAL FOOD BALANCE

The importance of accelerated agricultural development in southern Africa is supported on the basis of even a cursory review of the food population relationship in the region.^{6/} The basic concern is that increases in population. Although seven of the nine countries in the region have significant mineral resources which can be used to trade for food products, the vulnerability of these minerals to wide price fluctuations on world markets plus the high percentage of the total population in agriculture suggests that this is not a viable long-run strategy for the region.

Consider first the general trends in the characteristics of the population in the nine southern Africa countries and for the RSA (Table 1). The relatively high average growth in population of 3.0 percent per year for the twelve year period is of even more concern when one considers the positive and relatively high correlation between the rate of population change and the per capita GNP estimates. The potential for even higher rates of population growth in the region would seem likely if the income levels in some of the poorer countries improve.

The decreasing percentage of the total population in agriculture is probably related to many factors and an indepth, country by country, analysis would be required to "pin-point" the specific causes in each country. However, it is important to note that the percentage of population in agriculture has decreased by an average of less than one percent a year over the twelve year time period.

^{6/} The heuristic nature of this analysis needs to be emphasized. Calculations of regional food balances are handicapped by inadequacies in the statistical data. The high proportion of subsistence farmers in the region makes the collection of accurate production and consumption data extremely difficult.

Table 1: Changes in Population for Southern Africa
and the RSA, 1965-1977*

Country		Total Population (000)	% Change Total Pop.	Agriculture Population (000)	% Change Agri. Pop.	% Population in Agri.	% Economic Active Pop.	Per Capita (GNP**)
Angola	1965	5,101		3,395		66.6	28.0	
	1977	6,733	2.7	4,010	1.5	59.6	26.8	370
Botswana	1965	554		495		89.3	51.3	
	1977	729	2.6	601	1.8	82.4	47.5	350
Lesotho	1965	954		873		91.5	55.5	
	1977	1,199	2.1	1,028	1.5	85.7	53.5	160
Malawi	1965	3,932		3,570		90.8	47.5	
	1977	5,164	2.6	4,415	2.0	85.5	45.3	130
Mozam- bique	1965	7,449		5,757		77.3	41.2	
	1977	9,705	2.6	6,530	1.1	67.3	38.8	180
Namibia	1965	660		387		58.7	34.8	
	1977	936	3.5	474	1.9	50.6	32.7	980
Swazi- land	1965	361		307		85.1	49.3	
	1977	497	3.1	375	1.8	75.4	46.2	440
Zambia	1965	3,723		2,819		75.7	39.6	
	1977	5,335	3.6	3,658	2.5	68.6	37.1	420
Zimbabwe	1965	4,393		2,921		66.5	36.3	
	1977	6,723	4.4	4,051	3.2	60.3	33.6	550
Total/Ave for:Region		1965 27,127		20,524		75.7	39.3	
		1977 37,021	3.0	25,142	1.9	67.9	36.9	----
RSA	1965	18,337		6,678		31.0	36.4	
	1977	26,124	3.5	9,624	3.7	29.2	36.8	----

* Source: FAO, 1977 Production Yearbook

** From material prepared by Peter Koffsky of OICD, USDA, from 1975 data

Table 2. Comparison of Food Production Indices
for Southern Africa (1969-71=100)*

	<u>Food Production Indices</u>			<u>Per Capita Food Production Indices</u>		
	1967	1972	1977	1967	1972	1977
Angola	93	97	105	99	93	88
Botswana	97	102	113	104	97	110
Lesotho	99	87	112	104	84	97
Malawi	100	118	121	106	113	103
Mozambique	88	105	100	93	100	85
Namibia	90	119	132	98	113	108
Swaziland	89	117	128	96	111	106
Zambia	94	108	132	102	102	107
Zimbabwe	86	121	125	97	114	99
Republic of South Africa	107	120	118	118	113	97

*Source: FAO, 1977 Production Yearbook, Tables 4 and 6.

It is also useful to note that the proportion of the population defined as being economically active has decreased in all nine countries. Although the change is small on an absolute scale, the consistency of the decrease illustrates the point that a smaller percent of the total population will be asked to supply agricultural products for a growing population.

On the other side of the food balance equation, it is necessary to examine the trends in food production in the region (Table 2 above). All the SADAP countries had a higher level of food production in 1977 than a decade earlier; when a five year period is used only Mozambique had a lower level of production in 1977 than in 1972. It is also a significance

that the absolute level of food production in the RSA decreased slightly during the 1972-75 period.

Although indices of the total level of production are useful, the more insightful measures are the indices of per capita food production. During the 1967-77 decade, food production per capita decreased in four of the nine countries in the region. A similar comparison for the five year period 1972-77 indicates that food production did not keep pace with population growth in six of the nine countries. The problem is exacerbated by the fact that the per capita indices of food production in the RSA declined in each of the two time periods.

In summary, this brief examination of the food balance equation indicates that population increases are exceeding productivity gains in agriculture.^{7/} The widening gap between population and productivity changes is even more serious in the RSA which traditionally provided food exports to many of the countries in the region. In order to prevent a food crisis in the region, a strategy is needed which realistically evaluates the area's development constraints and designs programs based on systematic and sequential approaches to increasing agricultural productivity.

In addition to examining the basic food-production balance equation, it is also necessary to discuss three related concerns which will continue to need to be addressed in the region: 1) the movement of people between countries; 2) the potential decline and recovery of agricultural production resulting from political instability in the region; and 3) the current level and pattern of consumption in the area and the potential for intra-regional agricultural trade.

^{7/} A recent study by the FAO (Regional Food Plan for Africa, Tenth FAO Regional Conference for Africa, Tanzania, 1978), provides a comprehensive evaluation of current and projected food balances for five subregions of Africa. The regional boundaries were delineated in such a way that no direct comparisons can be made between the statistics in the FAO study and the data used in this analysis of southern Africa.

The data relationships previously discussed assume a stationary population in each of the countries when in fact, major short term migration flows are occurring within the region. The largest flow of people consists of refugees from Rhodesia, Namibia, and South Africa, followed by large numbers of farmers abandoning the border areas near these trouble spots, and finally, with the men from Mozambique, Lesotho, Malawi and Botswana working under contract in the RSA mines. In 1974 there were nearly 400,000 miners in the RSA with more than 75 percent of them being citizens of one of the other southern African countries. If a significant number of these men are replaced by machines or by workers from within the RSA, the additional demand for food in their home country will be significant. In some countries, Lesotho for example, it would simply be impossible to meet the food needs of the nation without foreign assistance if all the miners returned home.

Another area of concern is the potential for a major refugee problem if political conditions deteriorate in the RSA. Based on experiences in Rhodesia, it has been estimated that a significant number of RSA nationals would leave if the country's political situation reached the crisis stage. Most of the refugees would probably choose to go to one of the three countries of Botswana, Lesotho or Swaziland. Considering the potential impact of a sizeable refugee group entering countries with a current population base of less than 2.5 million leads one to conclude there would be a high probability of a major food crisis in the area if this eventuality became a reality.

The impact of political instability in the SADAP countries on the region's food supply must also be taken into account. Will the dramatic decreases in agricultural production in Angola and Mozambique during and following independence be repeated, or be even more severe, in

Zimbabwe and Namibia? As a guide, it is useful to note that the index of per capita agricultural production in Angola in 1977 is 88 compared to 1969-71 base of 100. The comparable index for Mozambique in 1977 was 85. Estimates of the potential declines in countries currently facing unrest, as well as the "turn around" time in the newly independent nations depend on an extremely complex set of variables which have not as yet been clearly defined, but would include the agricultural development strategy employed and the level and type of foreign assistance available.

As Zimbabwe moves toward majority rule, the probability seems very high for decreases in agricultural production levels. The magnitude of the expected decrease in production will depend, to a large extent, on the manner in which the transition to majority rule occurs. However, even under a "peaceful" transfer of power, some "slippage" will occur due to temporary disruptions in management and transferring land to smaller size units.^{8/} Conversely, the relatively small group of Africans with Master Farmer Certificates will provide the potential for an important cadre of well trained farmers in a majority ruled Zimbabwe, and thus help to maintain a productive agricultural sector.

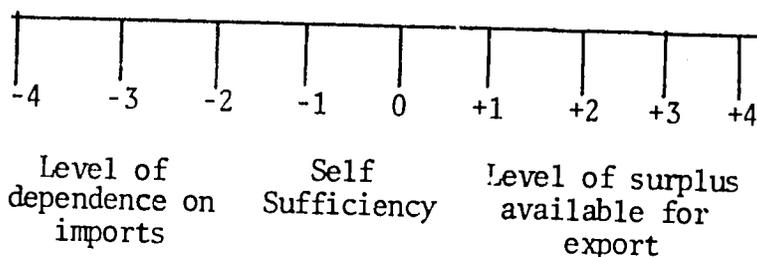
A third concern which needs to be considered is the level and pattern of food consumption in the area and the potential for increased intra-regional trade in agricultural products. The level of consumption in 1974, measured in calories, ranged from 77 percent of the world average in Botswana and Mozambique in 101 percent in Zimbabwe.* Based on an unweighted average, the region consumed about 84 percent of the world average level of calories. Additionally, the diet of the people in the region consists of a higher

^{8/} The magnitude of the transfer of control is suggested by the fact that in the mid-1970's, the European farmers accounted for less than 1 percent of the total farming population, but owned nearly 50 percent of the nation's farmland.

* This figure is, of course, misleading, including as it does the European population. Consumption patterns of black Zimbabweans would more nearly mirror that of Zambia.

percentage of vegetable products (90%) than is generally consumed in the world (83%). Thus it is difficult to realistically assume a decrease in demand for food resulting from decreased in the level or pattern of consumption.

Additional insights can be gained by determining the food surpluses and deficiencies in each country in the region. Using calories as the standard of measure, the three vegetable products and one animal product providing the highest percentage of total calories in each country was developed from the FAO provisional food balance sheets. This information was then used to analyze imports and exports to determine the level of self-sufficiency in each country for the four major food items. A rating, based on continuum ranging from total import dependence to large surpluses available for export was developed as follows:



A subjective determination, based on the level of exports and imports of both the raw material and the food product, was used to assign a scale number to each country for the four major food commodities (Table 3). The interpretation of the column entries indicate, for example, that Swaziland has a large surplus of sugar available for export, needs to import a significant percentage of its maize, and is generally, self-sufficient in sweet potatoes and beef. In comparison, Botswana has large amounts of beef available for its cereal grains and sugar products.^{9/}

^{9/} Changing socio-economic conditions and fluctuations in production change these relationships from year to year. For example, more current information indicates that Angola does not currently have a surplus of maize available for export.

An analysis of Table 3 indicates there are few opportunities for developing direct bi-lateral trade links. For example, Botswana is totally dependent on imports for sugar and Zambia is slightly import dependent. Conversely, Swaziland has large and Zimbabwe has moderate levels of surplus sugar available. However, Botswana has only beef in surplus which is not an import item in Swaziland or Zimbabwe. An additional important consideration here is that Table 3 refers largely to commodities which undergird rural consumption patterns. The growing urban agglomerations of the region have developed consumption patterns that are quite distinct. The satisfaction of these new consumption patterns has resulted in heavy dependence upon food imports.

This admittedly simplistic evaluation provides only a first step in developing a framework for analyzing the potential for intra-regional trade in food products.^{10/} Although one can not neglect the potential for improvements in the regional food balance by intra-regional trading, the designing of programs to remove production constraints and increase productivity seems to have a higher probability of satisfying the long run food requirements in the region.

In the next section the major constraints to increased agricultural productivity are discussed and strategies developed for limiting the negative impacts of these constraints will be discussed.

^{10/} Indeed the whole question of the potential for intra-regional and intra-Africa trade requires a more in-depth analysis before making program recommendations. The FAO's Regional Food Plan for Africa, 1978, lists several obstacles to intra-country trading. Specifically, the importance of: 1) transport geared to overseas rather than domestic markets; 2) storage facilities; and 3) tariff and non-tariff barriers such as taxes, currency conversion and credit are listed as important impediments to trade.

Table 3. Measures of Self-Sufficiency in
Major Food Commodities *
1972-1974

Commodity	Angola	Botswana	Lesotho	Malawi	Mozambique	Nambia	Swailand	Zambia	Zimbabwe
Cassava	0				0				
Cereals, NEC						0			
Millet						0			-1
Maize	+2	-3	-2	0	+1		-2	0	+1
Sorghum		-3	-2	0	0				
Sugar		-4		0			+4	-1	+2
Sweet Potatoes							0		
Tubers						0			
Wheat	-3		-3					-4	
Beef	0	+4	+1		0	+4	0	-2	+1
Pork				0					

Source: FAO, 1972-74 Provisional Food Balance Sheets, Rome, 1977.

* Missing from this table are the important commodities of fish and rice.

III. CONSTRAINTS TO AGRICULTURAL PRODUCTION AND DEVELOPMENT STRATEGY

As indicated in the previous section, the agricultural population accounts for more than two-thirds of all the people living in the nine SADAP countries. Reliable information on the percentage of all farmers which are considered to be at the subsistence level is not available. However, by inference one can judge that perhaps upwards of three-fourths of all farm families live at or near subsistence levels. Thus, strategies designed to emphasize increasing agricultural productivity in the traditional farming sector seems the most appropriate method of enhancing agricultural development in the long run.

The production constraints facing the southern Africa subsistence farmer are similar to those faced by many farmers in less developed countries. That is, a farmer and his/her family have their labor, a few simple hand tools, native seed and an unpredictable level and distribution of rainfall.^{11/} Further obstacles to production are the unavailability or the lack of adequate credit to purchase inputs such as fertilizers and pesticides, if, indeed they are even available, and a reliable market system to purchase surplus production. The widespread system of communal land ownership in the region plays a dual role in

^{11/} Although "improved varieties" of seed for food crops are available in some areas (hybrid seed for cash crops such as tobacco is more common) the adoption rate remains low. For example, the belief by Malawians that the "eating quality" of hybrid maize is inferior causes farmers to plant native varieties for the portion of the crop planned for home consumption.

limiting production--it greatly limits the farmer's incentive to improve the land to gain higher yields and causes cattle to be used at less than their full potential. ^{12/}

In several countries, traditional farmers are not permitted to produce the lucrative "Virginia type" tobacco as a cash crop. Available constraints, such as the high level of profits extracted from the farming sector in Malawi by the ADMARC marketing system or the low agricultural prices in Zambia designed to control urban food costs, play a negative but undetermined role in limiting productivity gains in the agricultural sector. ^{13/}

The strategy for development, therefore, is to remove or limit the negative impacts of the constraints to production in an efficient manner. The organizational approach to be used in this discussion is to first develop a conceptual framework which examines the interrelatedness of the various components of the strategy and then evaluates each of the components in somewhat more detail.

^{12/} The potential for increasing returns from cattle include improvements in using this important resource as an input source of energy, nutrition and organic fertilizer. There has been a recent empirical test of the hypothesis that cattle are used as a "store house of wealth" in Southern Africa. This relationship is discussed by Doran, Low, and Kemp in an article entitled "Cattle as a Store House of Wealth in Swaziland: Implications for Livestock Development and Overgrazing in Eastern and Southern Africa." (American Journal of Agricultural Economics, Vol. 61, February 1979, pages 41-47). The study found that the independent variables of cattle prices (adequate by a cost living index) and rainfall were inversely related (highly significant at the 99% level) to off-take (percentage of herd sold). The rationale for this finding are: 1) as cattle prices increase, less of the herd needs to be sold to meet specific expenses and more retained as part of the owner's wealth; and 2) "when the risk attached to holding wealth in the form of cattle is increased in times of drought, stock owners will become more willing to sell". The authors also argue that the off-take rate seems to increase when land ownership becomes a viable alternative to cattle for storing wealth.

^{13/} Additional constraints of importance to specific countries are addressed in SECID-USDA agricultural sector assessments for each country.

The development of a set of criteria which help to delineate the constraints to be included in a regional strategy resulted in the selection of the following guidelines:

1. the constraint was considered an important factor in limiting agricultural productivity in two or more of the nine countries;
2. it seemed, on the basis of evidence available, that it would probably be efficient to address the constraint at a regional level; and/or
3. the results of a demonstration or pilot project in one country could be generalized to other countries with only minimal adjustments.

An examination of the nine individual country agricultural sector assessments prepared by the SECID-USDA team suggests that there are three general levels of constraints which satisfy the above criteria. The three levels in turn, generally correspond with short, intermediate and long range planning strategies. The conceptual relationships linking the strategies are shown in Figure 1:

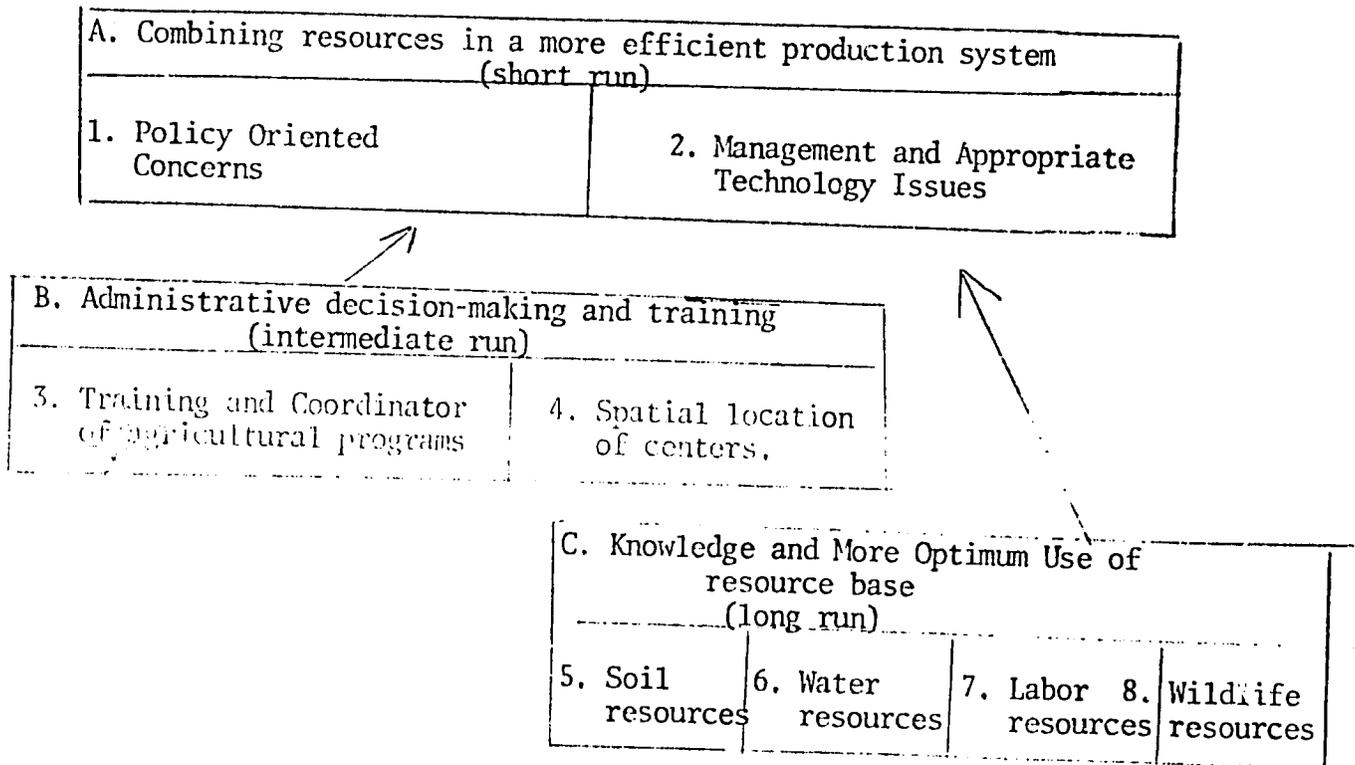


Figure 1. Conceptual Interrelationship among Regional Strategies

The conceptual framework provides an organizational approach for initiating a development strategy. Briefly, this approach suggests the central goals of development are: 1) increased efficiency in production of food commodities for intra-regional consumption and cash crops and livestock for export through improved management and technology; and 2) a restructuring of policies which impede productivity gains. Inter-related with these primary objectives is the need for increased knowledge of the region's resource base and improved administration of agricultural and agriculturally related policies and programs.

In the short run, programs designed to encourage innovation modifications in present farming practices through a system of incentives should receive top priority. The reason for this high ranking is related to the incremental nature of the program-- it does not require massive changes in the traditional farming methods and provides for a "demonstration" effect by program innovators to other farmers in the local area. Although implemented somewhat differently in each country, the adoption of this strategy would require: (1) a system to supply critically needed inputs on a timely basis; (2) incentives to increase production; (3) improved means of collecting and marketing the surplus; and (4) assurances of at least minimum level of return to the program innovators. The incentive-risk questions are of paramount importance and serve as the base for the agricultural development strategy.

In the intermediate time dimension, the emphasis of the strategy could shift to increasing the quantity and quality of supporting personnel, supplies and facilities in the agricultural sector. At this point, substantial, rather than incremental, changes in farming practices could be considered. This phase of the strategy subsumes the first in that adequate incentives are the catalyst for implementing program changes. Dissimilarities among the "Southern African" countries may require quite different implementation strategies, but sufficient commonalities exist to gain efficiencies through the

use of planning with a regional perspective. Of chief importance here should be resolution of problems leading to improved risk taking.

Basic information about the region's resource base is essential in the early phases of program planning, but the more comprehensive resource data can be evolved through a series of incrementally more sophisticated procedures. The long range increase in knowledge about the resource base would allow for the introduction of needed adjustments in the more micro-level program activities at the local level.

A. COMBINING RESOURCES IN A MORE EFFICIENT PRODUCTION SYSTEM

1. Policy Oriented Resource Use Constraints

The goal of increased agricultural productivity will probably not be achieved unless programs are designed which provide for a real increase in the economic welfare of the local people in the short run. Thus a prime consideration in any development strategy is the need for economic incentives which will encourage farmers to adopt new farming practices.

Before discussing specific approaches for enhancing economic incentives it is necessary to address the more fundamental question of risk aversion behavior by traditional southern African farmers. The reason is that a significant amount of the available evidence seems to indicate that most of these farmers are acting as rational economic decision-makers. Indicative of the negative impact of a risk constraint is illustrated in the following sequence which has occurred in several of the southern Africa countries. A farmer agrees to plant a new variety or use commercial fertilizer on the recommendation of an extension agent. A lack of rainfall at the appropriate time or some other unexpected event causes the yield to be less than would be attained under traditional

farming practices. The result is the farmer and his/her family must face a year with less-than-normal low level of subsistence. The longer-run impact will be an unwillingness on the part of many farmers in the area to adopt new farming practices.

Thus, programs must be devised that will 1) increase the economic incentives to the farmer for trying new practices, and 2) provide for offsetting the farmer's losses which occur because recommended cultural practices were followed.

The development of a "risk aversion" program of this kind is, conceptually, not too difficult, but the scope of programs such as this is such that its development must be seen as a medium to long range task, an example of which will be elucidated in the final section of this analysis.

Alongside the issue of risk aversion is the equally important policy constraint related to subsidization via pricing and marketing. In Zambia until recently, for example, government policies holding down prices in order to subsidize urban consumers, acted to reduce productivity and goad rural dwellers to leave farmsteads for higher paying urban-based jobs. In Zambia, as elsewhere, uniform pricing policies and lack of attention to seasonal variations in prices have tended to act as a brake insofar as those farmers closest to means of transport and/or markets receive considerably higher profits than those who are in more remote areas and who must shoulder the higher costs of moving their goods to markets, and little incentive exists for development of storage facilities for surplus that might be sold at times other than harvests at higher prices.

related to this issue is that of government policies supporting transport and infrastructural development in urban areas while allowing the rural areas to languish. Additionally, failure or inability to

establish better marketing infrastructures in rural areas disinclines farmers so situated to increase productivity. Mozambique and Angola are experiencing the results of these lacunae.

Finally, inattention to systematic distribution of agricultural information to farmers deprives them of means to increase productivity through improved farming and husbanding practices along with the absence of incentives to develop more appropriate technologies.

2. Management and Technology Constraints

In addition to the previous activity which examined the problem of risk and economic incentives, a related need is for data on costs of production under alternative technologies and resource situations. Rational economic decisions on whether to change production practices, either as fixed or variable inputs, requires benchmark data on response rates and cost-price relationships. The importance of management and technology constraints are so numerous that one runs the risk of limiting the scope of this activity by citing examples.

The application of commercial fertilizer is often touted as the solution to the low yields and income of the traditional farmer. Yet the evidence on fertilizer response rates is sufficiently diverse to make blanket recommendations for increased use of commercial fertilizers problematic. For example, it has been reported that certain studies in Botswana and Lesotho found that commercial fertilizers were not a cost effective input when used with native varieties on certain crops. Yet the soils are quite different in these countries and output is also affected by subsidization of South African maize in Lesotho. Conversely, in Zambia, studies have shown a significant increase in returns associated with the joint inputs of hybrid seeds and proper levels of commercial fertilizer for selected crops. Thus country-specific information on production and

price relationships limits the regional application of such programs even as it underscores their importance.

Another example relates to the question of the level of investment which can be justified for capital improvements. A decision waiting to be made is whether land clearing is "worth" \$125-\$180 per hectare in Angola or \$50-\$100 per hectare in Mozambique. Similarly, the fact that most areas of Namibia need water for a viable agriculture does not provide enough information to determine if it is efficient to construct irrigation facilities that cost "30 to 500 times" the "normal" cost of these types of facilities, as noted in the agricultural sector assessment for Namibia.

The number of tractors per thousand hectares of arable land is much lower in southern Africa than the rest of the world (Table 4). However the question of whether this is too few, the right number or too many tractors, or even the appropriate kind of tractors, can not be answered unless farm management information is developed.

A final example is concerned with the determination of the structure of the livestock disease control programs in southern Africa. Although the decision here may be less difficult (if the alternative to control is the loss of the asset), the question of the appropriate level of control must remain unanswered unless cost-price information is available.

The point of emphasis in each of these examples is that it becomes very difficult, if indeed not impossible, to make rational economic decisions about whether and at what level current and new technology or practices should be used if basic farm management type data are not available.

The introduction of farm management data series for several types of farming systems, under various resource situations and alternative technologies, would provide valuable benchmarks for guiding enterprise combination selection in specific regions.^{14/} Due to resource constraints, a comprehensive program to collect production response data will need to be introduced in a coordinated and sequential manner. As a first step, a systematic search of what information (published and unpublished) is currently available would provide the "base level" from which more comprehensive programs could be planned.

Table 4. Number of Tractors Per 1,000 Hectares of Arable Land and Land Under Permanent Crops 1976

Angola	5.2	Swaziland	11.3
Botswana	1.4	Zambia	0.8
Lesotho	2.8	Zimbabwe	7.8
Malawi	0.4	-----	
Mozambique	1.8	Republic of South Africa	12.9
Namibia	3.6	World	12.3

Source: FAO, 1977 Production Yearbook, Table 1 and 100.

^{14/} For many years the USDA supported a small group of economists who were responsible for developing and distributing cost-of-production estimates for various types of farming activity in 10 to 12 regions of the U.S. The work of this group has been criticized by many researchers because the results of their analyses were often reported in terms of averages or ranges. However, until more comprehensive, and correspondingly more costly, studies have become available, these estimates have (and continue to be) widely used in evaluating management performance and as a basis for estimating the impacts of the introduction of new technology.

In the short run, the development emphasis should be directed toward working on constraints at the farm level with strategies designed to combine the farmer's inputs in a more efficient production system and provide economic incentives to increase production.

Since the labor input is normally the single largest factor available to the farmer, strategies to increase labor productivity should receive high priority. However, the potential for increases in labor productivity will depend on the associated inputs available to the farmer. Further, it is not only necessary to determine the preferred mix of currently available inputs, but also how labor could be used to increase the production responses if more appropriate technology were made available. The most successful approaches in the short run will probably be associated with rather small incremental changes in the traditional farming practices.^{15/}

The introduction of farm or even village gardens would generally meet the objectives of a short run program. The major advantages of a gardening program are: 1) relative ease of implementation; 2) labor intensive; 3) provide "demonstration effect" with only a few plants; 4) low risk because of small investment; 5) improve diet of subsistence farmer; 6) would not require major changes in current farming practices; and 7) tends to be compatible with most political systems.

More traditional farm management programs, such as that conducted on a demonstration basis as part of the Thaba Bosiu Project in Lesotho, are more realistically considered with the intermediate length time horizon.^{16/}

^{15/} The performance characteristics of the new technologies should be closely compared to the returns expected from proven traditional methods. The degree to which new technology increases the countries' dependence on imports (motor fuels, for example) should also be explicitly considered.

^{16/} The relatively low economic returns suggested by preliminary evaluations of the "successful" Thaba Bosiu reaffirms the extremely difficult and complex problems being faced by farmers in the region.

B. ADMINISTRATIVE DECISION-MAKING AND TRAINING

1. Training and Coordination of the Agricultural Delivery System

The quantity and quality of formal agricultural education opportunities varies widely throughout the region. This summary of findings will concentrate upon common constraints. Those areas specifically examined include services to farmers, formal agricultural education, and execution of national development plans.

Government Personnel Constraints in Agriculture

A review of the region discloses that every state in Southern Africa is experiencing personnel shortfalls in agriculture and in agriculturally related government programs. In no state are these shortfalls insignificant, but their seriousness is greatest in Angola and Mozambique where ministerial staffs were largely European and at independence were virtually emptied of their occupants. Of the specific units most adversely affected by the lack of personnel throughout the region, those impacting most directly upon rural smallholders were thought to be critical and included extension services, parastatals, cooperative management, credit officers, youth services, veterinary officers, and research teams. In extension, for example, the farmer to extension agent ratio varies from 250:1 in Botswana and in the best comprehensive development project in Malawi--the LLDP--to 600:1 and more in Zimbabwe; more than 1,000:1 in Swaziland and Zambia, and even greater ratios in Angola and Mozambique. Specialized services in research and veterinary

medicine, forestry, fisheries, horticulture, and small ruminants continue to be staffed by large numbers of expatriates, further underscoring the extent of the regions' personnel needs.

Exacerbating the problem of personnel shortfalls is the issue of the quality of the extant personnel. With the notable exception of Malawi, employment in agricultural services is perceived in the region as having low prestige. Accordingly, the best young men and women opt for alternative employment, an option that will remain viable for the near future and adversely impact upon the sector. Many of the entrants into agricultural service thus do so as a last resort and often because their formal education performance didn't enable them to seek other, more attractive alternatives. Situations wherein present agricultural field staffs do not meet established minimal criteria to hold their positions are found throughout the region. This extends to managerial positions as well as in the case of parastatal management in Zambia where 40 percent of the managers were not qualified to hold the posts they occupied.

Improvement of quality in personnel through in service training and upgrading continues to be a nettlesome problem. Quite simply, there is little such training or upgrading occurring. At the junior levels, training continues to be both too brief and too narrowly focused, while at the middle levels, agricultural training is characterized as too technical and lacking provision of education and communications skills. At the degree levels training is seen as too general and formalistic. In Anglophone Southern Africa, the establishment of a credentialed pecking order militates against in service training, or giving individuals with lower skills credit for previous training when they desire advanced preparation.

The provision of food in the region is still very much the province of women, particularly in the BLS countries where large numbers of men are employed outside the countries, and in Angola and Mozambique where employment on estates was widespread, or in Zambia where males gravitate to the mines or urban areas in search of more lucrative employment opportunities. Yet there are few women found in field services other than home economics-related ones. Cultural constraints regarding male field workers interacting with women farmers are significant in some parts of the region and the need for greater numbers of women filling service roles is patent. Prospects for meaningful increases remain dim, however. As much as anything this is an outgrowth of the limited educational attainments of women in the region which circumscribes their qualifying for such training. For those women who do qualify for agricultural training, their very qualifications make them able to opt for more attractive and higher paying urban alternatives.

The Formal Education Sector

The quality and quantity of formal agricultural education opportunities varies widely throughout the region. Key problem areas disclosed are those concerning teaching, curriculum, and research.

Throughout the region there is a serious problem of low prestige for teacher which unsurprisingly extends to the agricultural education sector as well. This is exacerbated by low pay for teachers and heavy contact hour workloads. Further, teacher training in agricultural education is not well phased with other disciplines, a problem that is especially critical at the primary and secondary levels. At the secondary level and beyond, indiginization of the

teaching staffs is proceeding very slowly.

A related cultural problem is that teachers receive little support from parents who see formal education as an opportunity for their children to move upward in socio-economic status through urban employment. As such they perceive formal agricultural education as an impediment, a return to farming being seen as an admission of academic failure. Teacher morale as a result of these issues remains very low and a high rate of abandoning the profession undercuts government efforts to prepare students for the likelihood that they will in fact return to farming.

Although all countries in the region vociferously support the idea of the primacy of agriculture, few have in fact developed a formal agricultural education curriculum, let alone a general education curriculum to reflect this position. Within the technical schools keyed to agriculture, present training often endows the system with individuals lacking practical preparation, individuals who enter the service with a "new language" and attitude that leaves them ill prepared to communicate with their clientele in the field. The manner of instruction in the classroom is often authoritarian and straight lecture, leaving few opportunities for interaction with staff. There are few texts written or published in the region--the relevance of materials is often questionable. In fact, lack of equipment in all schools is a serious problem. In states such as Namibia and Zimbabwe, the differences between the institutions for whites and blacks with regard to these issues serves to heighten political tensions.

As mentioned above, women have little preparation in natural sciences leaving them at a considerable disadvantage regarding

entrance requirements for post secondary training. Once having qualified for such training, most women are directed into home economics courses rather than into full fledged extension tracks.

Upon completing one's formal agricultural education at home, there are few further opportunities for follow up education or graduate training. Such opportunities are available only if foreign scholarships are provided.

There is little time for students or faculty to become engaged in research. Further, there are few cases of governments utilizing universities to undertake research to meet needs in agriculture and in general the research facilities at agricultural education units are (with the exception of Zimbabwe where adequate research facilities are utilized to assist European but rarely African farmers) in need of equipment and staff. Beyond research, formal training in management and agricultural economics, are constantly stressed needs that extant education facilities in the region are not meeting.

Coordination of Agricultural Development

An ongoing problem in the region is that respective ministries that are involved in agriculture-related activities rarely coordinate their efforts, thereby squandering their available manpower capabilities. Within the agriculture ministries themselves, planning capabilities are often limited and the presence of expatriate staff is particularly conspicuous. Further, data upon which coordination and planning depend is often unreliable when available and more often simply unavailable. As mentioned above, the continuing autonomy of universities denies research and teaching skills to other government agencies greatly in need of such assistance. Finally, but importantly,

coordination with and among international donors is often lacking. The unique characteristics of individual donor assistance programs usually result in a congeries of bilateral projects that compete with one another and strain the absorptive capacities of the recipient states to the utmost.

This lengthy but realistic list of constraints to development indicate why strategies for improving the training and assignment of agricultural personnel should receive a high priority ranking.

The gains in agricultural productivity which can be realized from the short run strategies and programs in the previous section are small because of the limited set of resources available to the farmer. However, significant productivity gains are possible within the intermediate time horizon because of the increased flexibility in terms of the potential for increased availability of inputs (to be discussed in the next section) and the advice from trained personnel on how these inputs can be combined in an efficient manner to increase production.

4. Spatial Location of Agricultural Service Centers

The lack of public and private infrastructure is an important constraint to development in all the SADAP countries. Admittedly, the level of concern is not the same in all the countries. Malawi, for instance, is making substantial progress in providing service centers under the auspices of their AFWARC program. Conversely, Zambia is attempting to determine the appropriate spatial configuration for self-contained estates of various sizes and outgrower schemes.

A basic constraint to increasing agricultural productivity is the lack of locally appropriate and cost effective technological inputs in the rural areas. These would include facilities to improve:

- 1) provision of inputs (seed, fertilizer, etc.) to agriculture;
- 2) buying, storing and transporting agricultural output; 3) delivery of community services such as basic health and educational programs, and
- 4) the location of the "grass-roots" level representatives of the appropriate government organizations.

The strategy for "modernizing" the agricultural service sector requires that two related issues be addressed. The first is where the services should be located and the second is what services should be made available in these locations.

The great difference in the density of the agricultural population in the region makes the first decision especially difficult (Table 5). For example the spatial location criteria would be quite different for Botswana and Zambia, with extremely low densities, and Lesotho and Malawi which have a relatively high density of farming populations.

The relative low density per hectare of total land and the rather small percentage of arable land indicates a related area of concern-- farm to market roads. The increasing of agricultural productivity requires an adequate rural road system to transport inputs to and the marketable surplus from the rural areas in an efficient manner. Thus, it is necessary to consider a total system which includes the spatial interaction effects. The point of emphasis is that a system of distribution of inputs and collection of outputs is not only a necessity, these activities must be done in the right place and at the right time.

Table 5. Population Density in Southern Africa, 1976

	Agriculture Pop. 1976 (000)	Arable Land (000 hec)	Total Land (000 hec)	Agricultural Population Per	
				hectare arable land	000 hectare total land
Angola	3,948	1,280	124,670	3.1	32
Botswana	589	1,360	58,537	0.4	10
Lesotho	1,013	355	3,050	2.9	332
Malawi	4,334	2,270	9,408	1.9	461
Mozambique	6,454	2,850	76,553	2.3	84
Namibia	467	654	82,329	0.7	6
Swaziland	368	170	1,720	2.2	214
Zambia	3,575	5,000	74,072	0.7	48
Zimbabwe	3,947	2,465	38,767	1.6	102
Regional Total/Avg.	24,695	16,404	469,106	1.5	53
Republic of South Africa	7,491	13,420	122,104	0.6	61
World	1,930,560	1,397,734	13,078,328	1.4	148

Source: FAO, 1977 Production Yearbook

A substantial conceptual and analytical literature is available which focuses on the problem of the optimum location of rural service centers. Some of the most useful work, in addition of European experiences, can be drawn from the Malawian and Kenyan experiences to provide insights which would lead to substantial savings in designing and locating rural service centers in the region.

The question of what type of services should be provided at various types of centers is also difficult. Perhaps the experiences gained in locating ADMARC service centers in Malawi would be the appropriate starting place for determining the most useful mix of service at each location. These "first round" estimates would then be subject to revision on the basis of the needs of individual countries or areas within countries.

C. KNOWLEDGE OF RESOURCE BASE

This final set of constraints and strategies relate to increased knowledge about the resource base. Although certain information about the region's resources must be known during all phases of program development, the more comprehensive resource studies are additions to basic knowledge which require long term investment commitments.

5. Soil Resources

An understanding of the characteristics of the region's soil is a prerequisite to developing a more productive agricultural sector and to providing long term protection for one of its important natural resources. Development projects to promote activities such as irrigation, drainage and erosion control require reliable soil information. Answers to questions such as the adaptability of new varieties and the probable response of other cultural practices such as fertilizers, insecticides

and cultivating equipment can only be attempted if accurate information about the basic soil resource is available. The SECID-USDA agricultural sector assessments for each country have revealed a serious lack of detailed information on soil characteristics for most countries in the region.

At a more macro level, a soil survey will provide information necessary to conduct comparative advantage studies. Although basically an economic concept, the preferred location of a production system depends to a large extent, on physical input-output relationships. The measures of these relationships, in turn, are highly dependent on specific knowledge about the soil resources in the areas being compared.

Experiences drawn from soils analyses in Zimbabwe, Swaziland, and Malawi should help serve the development of further undertakings.

Reconnaissance mapping might be useful as a sorting device to delineate areas as to the degree of detail needed. For example, detailed soil information for the mountainous areas of Lesotho, or the desert lands in Botswana and Namibia would, in all probability, cost more than the expected benefits. Conversely, the areas with high potential for agricultural development would be targeted for a more detailed evaluation.

The use of "stereo pairs" from aerial flights for photo-interpretation would probably be the most efficient approach for mapping the region's soil resources. However, the potential for imagery and/or digital readouts from a land satellite system should be investigated as a potential primary data source.

6. Water Resources (1)

The need for an institutional framework to define water rights within the region is readily apparent. Much of the region is arid or semi-arid with wide fluctuations in rainfall. Thus, one of the inputs

with the potential for increasing the productivity of agriculture in the region is water for irrigation. Additionally, several of the more important continuously flowing rivers pass through two or more countries and in numerous situations serve as international boundaries. The existing situation, then calls for the development of basin planning and riparian agreements.

The intra-nation concerns focus on the need for guidelines in addressing technical-legal issues such as water rights (riparian or appropriation), consumptive use and quality and quantity of return flows.^{17/} Most of these questions are of only limited interest when the resource is available in abundance, i.e., a free good. This is the stage at which states of the region find themselves, affording them the opportunity to develop equitable sharing arrangements.

A prerequisite to designing a procedure for allocating water resources is the development of an adequate data base. A major component in the data base is hydrologic information on such characteristics as the rate and continuity of water flow at specific locations, quality parameters of the resource, and interconnections between surface and ground water systems. As suggested above in the design of the soil survey, the hydrologic information should only be as comprehensive as necessary to provide the benchmark data for allocating the water resources.

^{17/} Water rights is an extremely complex subject and each of the major doctrines for allocating water--riparian or appropriation--are subject to variations and exceptions. The riparian doctrine (traditionally used in the eastern part of the United States) is based on the premise that the owner of the land bordering a waterway has a right to the "reasonable" use of the water on the adjoining land. Thus the right to the water arises from its relationship to the land and there is no priority of rights between land owners. Under the appropriation doctrine (used in the western United States) the water right is acquired by use--not its relationship to the adjoining land. Thus the earliest water right on a stream has preference over all later uses.

Guidelines for intra-national water allocation will normally be based on: a) hydrologic information; and b) political decisions on whether a riparian or appropriation system will be employed. Volumes have been written on the advantages and disadvantages of each of the two basic systems. A personal view is that the appropriation system generally provides for a more efficient use of the resource, but the riparian system has some distributional advantages. The important point, however, is that once this political decision is made, plans for more efficient long term use of the resource can be developed under either system.

At the international level, the approach is much the same as that used at the national level. There are two general procedures for implementing an international agreement. The first is based on development of an international treaty with all nations, through which the water course passes, being a signatory to the agreement. Alternatively, two countries can enter into a series of bi-lateral agreements, which are easier to implement originally, but tend to cause problems in the long run. However, either system is preferable to the present situation where rights are generally undefined.

6. Water Resource (2)

A finding reported in several of the individual SADAP agricultural sector assessments was the low success rate in drilling of boreholes for domestic, livestock and irrigation water. The hydrologic survey recommended in the basic water resource study in the previous section should provide information that would increase the present drilling success rate which in some areas is less than 50 percent.

The level of interconnection between surface water systems and underground aquifers needs to be investigated in developing a hydrologic survey. A complementary use of the information collected would be to provide well drillers with more accurate data on potential drilling sites.

The potential for using techniques, and even data, from mineral exploration activities should be investigated for possible use in the locating of boreholes. The disclosure problem may be significant, but the potential for using this information should not be overlooked.

7. Labor Resource

The three primary "building blocks" which serve as the foundation of an agriculture development plan are a region's soil, water and labor resources. The previous two sections of the report have discussed activities designed to increase knowledge of and capability for utilizing the soil and water resources. Since "man" is the active agent in combining the three types of resources into a production system, it is of importance that decision makers have useful and current information on the quantity and quality of the region's labor force. The SECID-USDA agricultural sector assessments indicate that such information is readily available for the nine southern African countries, but needs constant updating,

Designs for the quantity-of-labor type studies must be more comprehensive than merely census type head counts. Detailed information on the composition and activities of classes of workers is needed before important questions such as 1) the role of women and children in agriculture, 2) the level of unemployment or underemployment, and 3) the probable impacts of changes in the "factor mix" in agriculture can be answered.

A closely related concern is the need to develop contingency plans for utilizing surplus laborers in the agricultural sector if policy changes severely limit migrant employment in the South African mines. A better understanding of the labor force characteristics in the countries of origin of these workers would permit the development of more realistic plans.

In addition to the need for information on the magnitude and characteristics of the labor force, it is also necessary to develop programs

to increase the quality of the labor resource, with special emphasis on increasing the skill acquisition potential of the residents of the rural areas. The concept of absorptive capacity needs to be evaluated in terms of the quality as well as quantity of labor resources and strategies developed to expand the skill absorbing capacity of the region with respect to rural workers.

There is a substantial literature available which examines the advantages and disadvantages of alternative methods for collecting and analyzing various aspects of the region's labor resources. However, the reality of high migration rates from rural to urban areas necessitates reexamination of these data to develop programs which will promote utilization of the region's labor resources in rural areas as stated above. The need for professional training in agriculture is crucial and has been discussed in a previous section. The need to enhance the technology related absorptive capacity of the farm laborers is an equally important task. Thus, a first priority would be the implementation of non-formal training programs to introduce living and management skills to individuals with little or no formal education.

The potential for adaption of mass communication methods for educational purposes needs to be investigated. Although currently viewed with disfavor by some countries in the region, instruction in practical skills to students in lower grades may be effective. The major limitation, in addition to finances, is the design of imaginative education approaches (non-formal as well as formal), reinforced through a system of incentives and penalties which would upgrade the regions labor resources.

8. Wildlife Resources

Although somewhat outside the normal concern of increasing agricultural productivity, the wildlife resources in the area need to be considered.

because of their interface with the agricultural sector at two important points.

The first area of interface is the potential for the direct use of wild plants and animals as supplements to the region's food supply. For example in Zimbabwe it has been estimated that over 5 million pounds of dressed game was taken under three types of hunting licenses. In addition, an estimated 10,000 animals were harvested by Africans without hunting permits (1964 data). The level of hunting activity and the contribution of game to the diet (especially as a source of protein) in the region is not known, but seems to be of significant magnitude to deserve further study.

The second area of interface is the competition between wildlife and agriculture for the limited grazing areas and the incompatibility between predator game and livestock.

Most of the southern African countries will therefore be forced to make important, and, in many cases, irreversible decisions on the relative emphases they wish to place on agricultural versus wildlife development. As the development process continues, the issue will become more acute because of the direct competition for the limited resources available.

The importance of this issue is apparent when examined within a sequential framework. For example, if agriculture is to be stressed, a substantially different infrastructure is needed than if the decision is to promote wildlife. A most likely plan, which would emphasize a joint development scheme, would need to investigate the areas of complementarity and competitiveness between wildlife development and agriculture.

As in most allocation problems, the potential benefits and costs of using resources in alternative enterprises would need to be evaluated.

A priori, the short run net benefits would probably favor the agricultural sector since it tends to use resources more intensively. Additionally, the infrastructure needed to support the tourist industry would have a high start-up cost.

In the longer run, more emphasis on tourism might be preferred, especially if the resources used in the wildlife sector were of only marginal quality for agricultural production. Thus part of the decision process will require political decisions concerning the preferred development time horizon and the appropriate discount rates to use in evaluating the two sectors.

An added element in evaluating the wildlife sector is that short run decisions may be irreversible. The destruction of habitat, flyways, and feeding grounds may lead to extinction of an entire species.

IV. A REGIONAL PERSPECTIVE ON AGRICULTURAL SECTOR DEVELOPMENT

Differences in the availability of natural and human resources, compounded by dissimilarities in political, cultural and institutional arrangements, precludes the designing of a single objective comprehensive agricultural development strategy. Conversely, it is possible to delineate regional concerns for which generalized schemes can be developed for addressing some of the most serious constraints to increased agricultural productivity in the southern Africa sub-continent.

The first question that needs to be asked is why attempt to design regional rather than county by county development programs. The principal reason is the relatively high level of economic interdependencies between the various countries. Development programs impact on neighboring

countries as well as on the country which is a direct participant in a program. A second reason for a regional approach is the potential for significant economies of size. The "spreading" of the skills of a limited number of people with high levels of expertise over several countries has the potential for large economic gains as well as lowering the fixed costs in program design and implementation. The related concepts of specialization in factor use and comparative advantage in output reinforce the desirability of using, where feasible, a regional approach to development.

Assuming agreement on the advantages of a regional approach, one next needs to define the level of participation in a regional program. The definitions of levels of participation used here will be:

1. Comprehensive regional = programs which involve all nine countries in the region.
2. Comprehensive subregional = programs for two or more but less than nine countries.
3. Country external = programs which are located in a specific country but provide for inputs or outputs to other countries in the region.
4. Country demonstration = activities where program finding in one country can be generalized to other countries.

At present, no programs enumerated below completely fit the first definition, and therefore, concentration will be upon those strategies which relate to the remaining three.

1. Political Constraints: The problem of economic incentives and risks is common to all of the southern Africa countries. However, differences in the political systems in the region suggest the need to address planning and evaluation of programs at a subregional level. In terms of implementation the programs developed will need to be specific to each individual country; thus the regional implementation aspects of the program will be limited to a demonstration effect.

One major strategy may be the development of medium and long term "risk aversion" projects as demonstration programs. The key element in such insurance plans is focused on the questions of risk and risk avoidance. More specifically, a program to "spread risk" could be devised with the following basic features:

First, a system of charges could be assessed (perhaps on a percentage basis) on the increment over the traditional yields which result from using a recommended farming practice. From these aggregated premiums, payments (probably in-kind) would be made to farmers who experience losses (below that expected from traditional practices) as a result of using the new practice.

As an example, if yields increased from 10 to 15 units per hectare because of fertilizer use, a portion of the 5 unit increment (after allowing for the cost of the fertilizer) would be assessed as a risk premium. Hopefully, the percentage assessment could be kept at a low level to increase the incentive for adopting the new technology.

Continuing the example, if a certain group of farmers experienced losses due to the new technology, the premiums would be used to assure that they received at least as much as if they used traditional methods.

As a side benefit, perhaps some of the hypothesized increases in yields, predicted on the basis of the assumption that "if only they used fertilizer (or better seed or pesticides)", would be tested. Perhaps, but not very realistically, the system might even be supported by suppliers of the commercial inputs.

The problems in moving from the conceptual design stage to program implementation will indeed be formidable. A pilot program--for a single commodity within a fairly limited geographic area--would be one approach to implementation. The advantages of this approach would be a more manageable program in terms of needed capital and labor resources. It should be emphasized, however, that the whole concept of "risk spreading" requires a relatively large population base to "even out" the risk factor. Additional research should precede the setting of parameters for implementing such a program. However, if successful, this approach would serve the dual function of providing economic incentives and protecting against catastrophic losses to the individual farmer. The manageability of such a program would, of course, depend heavily upon the ability of those governments attempting it to provide the necessary additional infrastructural inputs (seeds, fertilizers, extension assistance, markets, storage, and above all transportation). This considerable caveat is meant, however, to point out the difficulties, and not to discourage attempts to actualize what is seen as a strategy of high promise.

2. Management and Technology: Cost efficiencies of employing a regional approach could be realized in at least two areas. First, the basic methodology, including sampling procedures, data gathering techniques and analysis, could be conducted more efficiently at the regional level. Second, the type of farming areas will often extend beyond a single country's boundary but not to the entire region. For example, data on production responses for

irrigated fruits and vegetables may be similiar in several countries. Also low density livestock operations in the more arid areas of several countries could be included in a single type of farming region.

It should be emphasized that these more macro oriented studies are not designed to replace the micro level within-country farm management studies. The goal is rather to provide general guidelines to help prevent the "big mistake" in the preparation and implementation of development plans.

3. Professional Training: Training in the agricultural sciences and the use of the trained personnel to deliver agriculture-related knowledge to the farmer requires a complex and coordinated system. Thus the planning and evaluation of facilities for training of agricultural professionals is well suited to be addressed within a comprehensive regional approach.

However past experience has indicated there are usually problems in the operation of regional colleges and universities. The more appropriate level, at the implementation stage, is that the facilities be under the control of a single nation but provide assured entrance to citizens of other countries in the region. This approach will provide a method for "pooling" the extremely limited number of qualified faculty members in the region and yet develop comprehensive regional programs.

In the longer run, the specialized training centers in the region may evolve to the point that a few of the centers could be designated as M.S. degree granting institutions in selected subjects.

4. Service Centers: The high level of initial "start-up" capital needed to develop rural service centers suggests the potential for significant cost savings if regional models are used to provide information which prevents the location of centers in the wrong place. However, differences in political systems would indicate it is more useful to plan

programs at the subregional level. The operationalization of these programs would need to be at the specific country level and only provide a demonstration effect to other countries.

5. Soil Surveys: The development of soil surveys is perhaps the only activity that can be planned and carried out as a truly regional undertaking. Professionals who specialize in developing soil survey techniques suggest that the procedure is somewhat analogous to putting together a puzzle with many of the pieces being regional in character. Additionally, the individual(s) needed to direct a project of this nature would require a very high level of expertise, but associated tasks could be provided by those with less training and experience. Thus there is potential for realizing significant economies (by spreading the "fixed cost") if the professionals with the highest level of expertise can be used to direct the survey in more than one country. Similarly, there is the potential for significant cost savings in providing the aerial photographs and in training air-photo interpreters. If a satellite approach is feasible, a regional approach becomes virtually a necessity.

Another advantage of a regional approach is related to the joint input characteristics of soil and water resources. The regional nature of the area's water resources (to be discussed in the following activity) indicates the need for regional information on the associated soil resources.

6. Water Resources: There is enough commonality in the basic guidelines, allocative models, and advantages and disadvantages of alternative procedures to suggest the need for a regional approach in planning the use of a nation's water resources. The development of procedures for allocating a resource that flows through more than one country must be planned on a regional basis if an efficient use of that resource is to be realized. However, the

institutional "rules of the game" for within-country allocation will almost certainly be implemented somewhat differently in each country. Hydrologic data would best be developed within a river basin setting which will normally be at the subregional level.

7. Farmer Training: A high level of expertise is required to design and conduct labor force availability studies and develop mass education programs. Thus a major advantage of a comprehensive regional approach is the increased level of specialization which could be employed in designing a regional study. Potential cost saving could also be realized by using centralized data processing facilities to assist in program implementation and analysis. Finally, and perhaps most important, but not amenable to economic measurement, is the "cross-fertilization" of program ideas which would result from data comparisons in a multi-country study.

The actual operationalization of education programs, because of differences in languages, political views and even media distribution constraints, would suggest the individual country as the appropriate programming unit.

8. Wildlife Resources: The need for a regional approach is of special importance when attempting to evaluate benefits from exploitation of wildlife resources. Several of the more important considerations are:

- a) wildlife tends to migrate and in the process cross national boundaries;
- b) the competition for the wildlife tourism "dollar" by one country must be accounted for in planning by other countries; and
- c) from an environmentalist viewpoint the uniqueness of a given species in a specific setting may lead to overall enhancement of wildlife in the entire subcontinent of southern Africa.

Differences in the degree of competition between agricultural and wildlife and the differing political philosophies concerning the role of tourism in the economy suggest that the implementation stage for wildlife programs would best be conducted at the subregional level.

In summary, this brief evaluation of agricultural development strategies from a regional perspective suggest two conclusions. First, there is a potential for significant economies to be gained by using a regional approach in designing, planning and evaluating agricultural development programs. A second conclusion is that the implementation phase of most development activities must be designed for and conducted at the country level. Thus the question is not whether a program should be a regional or country activity, but rather what components of the total programs should be done at the regional, sub-regional, country and even sub-country level. Underlying this analysis is the awareness of the profound growth potential of the region in agriculture. Development of the requisites of sound policies backed by dedicated personnel and undergirded by infrastructures, transportation networks, and the growth of appropriate technologies represents the challenge for present and future generations.

Appendix 1. Relationships between Southern Africa Countries and the Republic of South Africa (RSA)

1. Angola--trade in major exports of petroleum and coffee is outside the region--very little trade with RSA--few if any miners working in RSA--only area of significant contact is associated with Cunene River hydro project on Angola-Namibia border.
2. Botswana--heavily dependent on RSA--significant percentage of adult male wage earners working in RSA mines, with earnings remittances bring an important component in foreign exchange receipts--members of customs union with RSA--heavy reliance on RSA (and Rhodesia) for transport services--joint use of water supplies--although major beef exports outside the region, still large volume of trade with RSA.
3. Lesotho--extremely high level of interrelationship with RSA, including member of custom union, use of RSA rand as currency, and in areas of communication, energy, and transportation--high percentage of citizens working in mines, on farms or as domestics in RSA--imports from RSA exceeds exports to RSA by a wide margin.
4. Malawi--substantial economic consumer and capital trade with RSA--officially recognize RSA--nearly 25,000 miners working in RSA--significant trade with RSA.
5. Mozambique--75,000 Mozambicans in RSA mines (1976 data)--RSA supplies 15-20% of total imports and purchases some 10% of Mozambique exports--RSA rail links to Indian Ocean through Mozambique--Cabora Bassa dam provides hydro power to RSA.
6. Namibia--so closely linked that it is virtually a colony of RSA rather than independent economic unit--over 50% of total exports to RSA

and 65% of imports from RSA, plus additional 15% of imports by RSA firms in Namibia.

7. Swaziland--27,000 men working in RSA--although most exports through Mozambique, some through RSA port at Durban--most of imports from RSA--member of customs union--RSA is major market for cotton, Tobacco and rice.
8. Zambia--of remaining foreign-owned agricultural land, most held by RSA farmers--Zambia permits Anglo-American and Roan Selection Trust managerial personnel from RSA to continue operation of its mines.
9. Zimbabwe--closing of border with Zambia and Mozambique has increased dependence of Zimbabwe on the RSA.