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REGIONAL COOPERATION TO IMPROVE FOOD SECURITY IN SOUTHERN AND EASTERN AFRICAN COUNTRIES

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FOREWORD

Success in ensuring a continuous, adequate supply of food is one of the most important bases on which governments of low-income countries are judged by their people. This is because downward fluctuations in food supplies wreak great privation on low-income people and redistribute real income away from them. In view of this, the International Food Trade and Food Security Program at the International Food Policy Research Institute (IFPRI) has undertaken a series of studies of food supply management in developing countries.

Among the policies considered have been schemes to compensate for fluctuations in food production and supply and in foreign exchange availability at the national, regional, and international levels. IFPRI's studies of food management policies in individual countries have included *Government Policy and Food Imports: The Case of Wheat in Egypt,* Research Report 29, by Grant M. Scobie, and *Policy Modeling of a Dual Grain Market: The Case of Wheat in India,* Research Report 38, by Raj Krishna and Ajay Chhibber. Work on food security policies in Pakistan is under way.

The continuing difficulty in establishing a world grain reserve suggests that such a scheme is impractical. However, regional cooperation may provide a viable means of improving Third World food security. In Research Report 26, *Food Security in the Sahel: Variable Import Levy, Grain Reserves, and Foreign Exchange Assistance,* John McIntire looked at possibilities for regional cooperation among the Sahelian countries.

This research report focuses on the potential for improving food security among nine Southern and Eastern African countries that joined together in 1980 to explore regional cooperation by forming the Southern

African Development Coordination Conference (SADCC). Ulrich Koester, a professor of agricultural economics at the University of Kiel, Federal Republic of Germany, was asked to undertake this research because he has spent many years studying the effects of the food policies of the European Community. In 1982 IFPRI published his work *Policy Options for the Grain Economy of the European Community: Implications for Developing Countries,* Research Report 35. Because he is so thoroughly versed in the successes and failures of the EC and other regional cooperation schemes, he was particularly qualified to evaluate the possibilities and pitfalls that face the SADCC countries in pursuing regional cooperation to ensure food security.

Koester shows that considerable savings are possible from regional cooperation, due substantially to the circumvention of extraordinarily high transport costs that so insulate the bulk of the countries from international trade. However, he also points to the difficulty in obtaining cooperation on exchange rates and other macro policies, though this is essential if regional cooperation is to achieve its full potential for providing food security.

Besides the substantial research project under way in Pakistan, IFPRI has plans for comparative analyses of food security issues in several other countries. When these studies are completed, a broad picture will be available as to the varying needs for achieving food security in the Third World.

John W. Mellor

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SUMMARY

Food security continues to be a major concern in developing countries, particularly in Africa. Despite a strong desire for autonomy, developing countries are becoming increasingly dependent on world markets for their food supplies; they trade more with developed countries than with each other. Moreover, trade barriers are often a major deterrent to intraregional trade. This report investigates whether regional cooperation can improve food security. It identifies the determinants of successful cooperation schemes, and it develops a methodology for quantifying the potential benefits. In 1980, nine African countries agreed to join the Southern African Development Coordination Conference (SADCC), primarily to explore ways of becoming economically independent of developed countries, particularly the Republic of South Africa. The SADCC countries, which include Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia, and Zimbabwe, are exploring possibilities for integration of their agricultural markets, taking a project-oriented approach. It is hoped that some guidelines will be provided here for SADCC and other groups considering regional cooperation.

A number of regional schemes have been undertaken over the years, many of them unsuccessful. This report examines the pitfalls and pluses of five of them: the European Community (EC), the Latin American Free Trade Association (LAFTA), the Caribbean Community (CARICOM), the East African Community (EAC), and the West African Economic Community (CEAO).

The major drawback of the EC is its tendency to increase agricultural protection, thus thwarting its objective of ordering trade according to each country's comparative advantage.

Results of cooperative efforts among the developing countries have been mixed. Increased trade between LAFTA countries has not developed, but prospects for growth in food trade among the CARICOM countries appear to be promising. The short-lived EAC integration scheme could have been successful, but national intervention and ideological differences led to its demise. In West Africa, a regional cooperation tax is the primary instrument of CEAO. This system of special duties on intraregional trade and uneven duties on other trade has undermined trade flows within the region. The most significant obstacle to all intraregional trade, however, is the uneven distribution of costs and benefits among the countries. In general, developing countries are reluctant to give up national autonomy in policy planning on critical food issues.

Based on the economic theory of integration, there are two arguments against regional cooperation. First, regional cooperation could detract from worldwide integration, which is seen as economically more efficient. Second, it implies discrimination against other possible trading partners. It is argued in this report, however, that the SADCC countries are too small to have any significant effect on international trade. And, because there is little trade at present among the countries of the region, efforts to encourage trade between member countries could eventually lead to expanded trade with other African countries.

Moreover, the potential for regional cooperation to improve food security seems favorable for a number of reasons. First, in landlocked countries like those of SADCC, the difference between import and export parity prices for trade outside the region is large because transport costs are high. Second, risk pooling strategies such as stockholding or foreign exchange stabilization schemes are more feasible for the region than for the world or individual nations. Finally, political will must be considered: countries may be more willing to cooperate on a regional level.

To indicate whether a country would

benefit from regional integration, coefficients of variation are used to measure fluctuations in cereal production, creating an instability index based on 1960-80 production data for the SADCC countries. Each country's share of regional production and a matrix of the correlation between fluctuations of the countries are also calculated. In seven of the nine countries production fluctuates more than 10 percent. All countries stand to gain from regional cooperation, but the degree varies greatly, with Botswana gaining the most and Tanzania the least. Then, several indexes are calculated to investigate whether production patterns in the SADCC countries are too much alike to afford opportunities for intraregional trade. All of these tests clearly support the hypothesis that there is ample potential for trade if barriers could be removed.

When exports and imports of SADCC countries are matched, the products with the greatest potential for intraregional trade are live animals, meat, maize, vegetables, sugar and honey, vegetable oils, and animal feeds. Intraregional trade could account for 11 percent of total trade in agricultural products, but this is probably underestimated.

Trade in maize is especially important because white maize is preferred in the region, but only yellow maize is traded on world markets. In a hypothetical example, it is shown that if in 1981 Zambia imported maize and wheat from Zimbabwe, which had surpluses, instead of buying it on the world market, it could have saved about U.S. $14.5 million because of the difference in transport costs. And this does not take into account the premium on white maize.

The basic idea underlying the cooperation approach of the SADCC countries is, by and large, economically well-founded. Priority is placed on projects and activities that have external effects across national boundaries. Among the objectives of this study are to identify the kind of joint activities that might be promising, what their benefits could be, and what institutional framework might be needed to exploit potential benefits. The study finds that it would be most reasonable for the region to cooperate in risk-reducing activities because fluctuations in cereal production, cash crop production, and export earnings are smaller on the regional than national level. The countries also have at their disposal alternative strategies toward achieving stabilization. First, fluctuations in the supply of cereals among the SADCC members could be synchronized. Second, a regional stockpiling system for grains is a strategy that would not require the sacrifice of national autonomy but would allow for increased food security. Hence, this alternative is investigated in detail. Based on past fluctuations in cereal production and import prices, the amount of stocks needed for each country to stabilize cereal consumption is calculated, and this is compared to the stocks required by the same countries cooperating regionally. Results show that regional stocks could be about 41 percent less than the sum of national stocks without cooperation.

However, national interests in such a scheme may diverge considerably. Some countries believe that food security is not necessarily threatened by occasional fluctuations in cereal consumption. They assume that incomes are sufficiently high to compensate for cereal price fluctuations or that cassava consumption could be increased during periods of cereal shortages. Other countries may consider regional stocks as a form of insurance to which they can subscribe as much or as little as they like. A formula is developed here to specify the premium that a country would have to pay according to the amount of insurance chosen.

In general, it will be costly if stockpiling is the only risk-reducing strategy used. Instead, a portfolio approach is suggested, which, in addition to the holding of stocks, might include strategies aimed at changing production patterns to stabilize foreign exchange earnings. Results show that there is potential for reducing overall variability in production and income both nationally and regionally. A foreign exchange stabilization scheme could also be promising.

The SADCC countries are not yet prepared to exploit the full potential for intraregional trade among their members. Instead they prefer to resort to counterpurchase trade under which the value of exports must

equal the value of imports on a bilateral basis. It is argued in this report that such an agreement may be welfare-decreasing if the currencies of any of the trading partners are overvalued more than the others. Therefore, any such transactions should be made in international prices denominated in U.S. dollars.

The results clearly indicate that the SADCC countries could be better off if they cooperated efficiently. However, to exploit potential benefits is not only a question of economics, it is a challenging political task. The partner countries will need strong po-litical will, and countries must be prepared to give up some autonomy in designing and implementing their domestic food policies. Moreover, exploitation of the benefits of comparative advantage could be achieved if market forces were allowed to direct not only intraregional trade flows but also trade flows within the cooperating countries. There is no evidence or indication that countries are willing to take this road. Hence, it seems reasonable to start with a more modest approach to cooperation, as the SADCC countries are doing.

2

INTRODUCTION

Despite extensive efforts in recent years, food availability in developing countries is still inadequate. Moreover, it is highly probable that the dependence of developing countries on world food markets will increase in the decade ahead, thus increasing food insecurity. Food security has been defined as the ability of food-deficit countries, or regions, or households within these countries to meet target consumption levels on a year-to-year basis.[1] Consequently, food insecurity has two facets: first, real income may be too low to provide target consumption for all groups of the society even in years of normal or above-normal domestic production, and second, real income may fluctuate as the result of variations in domestic production of food and nonfood products or of import and export prices or both.

The purpose of this study is to explore the potential for regional cooperation among developing countries to improve food security. At present, developing countries are more integrated with developed countries than with each other. This is especially so in their trade patterns, monetary relations, and credit flows. The current pattern of international economic relations is only partly the result of differences in comparative advantage between developed and developing countries. Trade barriers and distortions may also be responsible for the meager trade among developing countries.

The need for greater cooperation among developing countries has been widely recognized by international organizations.[2] The European Community (EC) has offered to provide financial assistance for promoting integration schemes. Developing countries themselves recognize the potential for development through cooperation, as can be seen by the recent establishment of two new schemes, the Southern African Development Coordination Conference (SADCC), which includes nine countries, and the Preferential Trade Area for Eastern and Southern African States (PTA), which includes 15 countries, 6 of which are also members of the SADCC.

The objectives of this research are partly general and partly specific. More specifically the study concerns the SADCC countries, which include Angola, Botswana, Lesotho, Malawi,Mozambique, Swaziland, Tanzania, Zambia, and Zimbabwe. Figure 1 is a map of the SADCC countries. This cooperation scheme was chosen because it is a new scheme, founded in 1980, and hence is still in a preliminary phase and conceivably open to changes in its structure and direction.

The study first investigates the conditions under which regional cooperation among developing countries might contribute to food security and delineates the fields of cooperation that are most promising. Second, the determinants of success or failure of other cooperation schemes are examined. Third, a methodology is developed to quantify the effects of integration. It is hoped that the results of these three tasks will serve as guidelines for any future cooperation schemes and that the information provided may also help revitalize present schemes by changing their focus.

To achieve the study's objectives the report is organized as follows. The third chapter provides information about the approach to cooperation taken by the SADCC countries. In Chapter 4, the economic theory of integration is examined to see if the goal of food security is better met through regional

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[1] Alberto Valdés and Ammar Siamwalla, "Introduction," in *Food Security for Developing Countries,* ed. Alberto Valdés (Boulder, Colo.: Westview Press, 1981), p. 2.
[2] See United Nations Conference on Trade and Development, *Economic Cooperation and Integration among Developing Countries* (Geneva: UNCTAD, 1976).

Figure 1—Map of the Southern African Development Coordination Conference countries

or global cooperation. The determinants of success or failure of regional cooperation schemes are also investigated. An assessment of other integration schemes and an overview of obstacles to integration are presented in Chapter 5.

It is widely believed that developing countries should try to make themselves less dependent on trade with industrialized countries, either by striving for increased import substitution and autarky, which could be costly, especially for the African countries, or by increasing trade between developing countries. Chapter 6 explores how a regional integration scheme for the SADCC countries could contribute to stabilizing consumption, to expanding trade, and thus to improving income growth and food security. The approach chosen should be of special interest to small African countries because it tests the hypothesis of production complementarity among African countries.

Chapter 7 deals with alternative arrangements for stabilizing food consumption within the SADCC region. Regional cooperation can contribute to stabilizing consump-

tion if patterns of fluctuations in production among basic food products (subsistence crops) and cash crops differ among the countries of the scheme. For instance, countries could attempt to synchronize fluctuations in supply, thereby achieving a higher degree of stability. However, it may be that this option, in that it requires a high degree of harmonization of national policies, is not politically feasible. Instead, countries could establish a regional stockpiling system for cereals. In finalizing this alternative, particular emphasis is given to the basic institutional framework that would be required.

However, regional stocks alone are unlikely to be an optimal solution for increased stability; first, because fluctuations in production are exogenous and cannot be changed through policy changes, and, second, because the reasons for variability in overall consumption may be numerous, but regional stocks for cereals only deal with variability in cereal consumption. To incorporate these considerations, whether a change in production patterns can reduce overall instability in income is investigated. Finally, the scope for a regional foreign exchange stabilization scheme is analyzed.

3

THE COOPERATION APPROACH
OF THE SADCC COUNTRIES

It is no wonder that African countries are more prone to cooperate than countries on other continents. As Domenico Mazzeo claims, "Africa is a relatively balkanized continent. With only 10 percent of the world population, Africa numbers one-third of the countries of the world."[3] Most countries have a population of only 5-15 million people. Most national African markets are inadequate to meet the requirements of modern economic development, which is especially true for the nine SADCC countries.

Development policies in the nine countries have, with few exceptions, promoted agricultural and agroindustrial exports to earn foreign exchange for development. These policies have of necessity increased the dualism of agriculture. A relatively few capital-intensive commercial farms or estates have benefited at the expense of a multitude of small and undercapitalized farms, which mainly produce for their immediate subsistence with little or no marketable surplus. As a consequence of past policies, SADCC countries are increasingly less able to feed themselves and progressively more reliant on food imports. The rising reliance on food imports might be acceptable if the countries had a comparative advantage in nonfood production, especially industrial production. But this is not the case. Agriculture in the region is highly important for achieving both food self-sufficiency and foreign exchange for investment in economic development. It provides a livelihood for 60 percent of the population. Hence, much of the industrial development is in agroindustries or the processing of local agricultural products.

A higher dependency on agricultural imports hardly seems acceptable for the SADCC countries from a political point of view, considering that the main supplier has thus far been the Republic of South Africa (RSA). This dependency has further opened the door for the RSA to penetrate the economies of the region. Hence, if the SADCC countries want to become economically and politically independent, they have to free themselves from ties with the RSA. The countries hope that regional cooperation may stimulate a move to more independence.

In addition, there are other good arguments for cooperation. The total population of these countries was only 63.7 million in 1982 (see Table 1); that is, an average population of 7.08 million per country. In other parts of the world individual countries of a similar size have felt the need for economic cooperation. The EC is a case in point. Hence, their small populations should be an incentive for the SADCC countries to cooperate.

Of course, population size is only a crude indicator for measuring the economic size of a country's market. Total GDP per capita can serve as an additional criterion. Both indicators support the conclusion that the economic size of these national markets is very small and that cooperation among these countries would certainly not create a large trading bloc that might monopolize world markets or adversely affect the chances for multilateral trade liberalization.

Apart from the small size of national markets, the SADCC countries may have additional incentives to cooperate economically because six of the nine countries are landlocked, and therefore, they must depend at least in part on transport facilities in neighboring countries.

Finally, economic cooperation is not always based on pure economic reasoning. Political factors are often more important.

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[3] Domenico Mazzeo, "Conclusions: Problems and Prospects of Intra-African Cooperation," in *African Regional Organization,* ed. Domenico Mazzeo (Cambridge: Cambridge University Press, 1984), p. 225.

Table 1—Population and GDP, total and per capita, SADCC countries, 1982

Country	Population[a]	Total GDP[b]	GDP Per Capita
	(millions)	(U.S. $ million)	(U.S. $)
Angola	8.0	5,700[c]	713[c]
Botswana	0.9	722	802
Lesotho	1.4	300	214
Malawi	6.5	1,320	203
Mozambique	12.9	4,465[d]	356
Swaziland	0.7	429	613
Tanzania	19.8	4,530	229
Zambia	6.0	3,830	638
Zimbabwe	7.5	5,900	787
Total	63.7	27,196	427

Source: Joseph Hanlon, *SADCC: Progress, Projects, and Prospects,* The Economist Intelligence Unit Special Report No. 182 (London: *The Economist,* 1984), p. 13.

[a] 1982 midyear estimates.
[b] GDP at current factor cost.
[c] 1981.
[d] 1981 market prices.

The SADCC countries have the political will to become less dependent on the RSA. They were chosen for this study because their cooperation focuses on positive policy integration, that is, emphasis has been placed on joint activities that are ostensibly to the advantage of all member countries. It was not founded for the purpose of forming a common market.

The formal foundation of the SADCC scheme is unusual. There is no treaty where the objectives are articulated and where the strategy and instruments chosen are specified. Instead, there is a declaration, which was formulated when the leaders of the nine states first met in Lusaka in 1980 to agree on a cooperation scheme.

In the Lusaka Declaration, SADCC set four development objectives:

1. the reduction of economic dependence, particularly, but not only, on the Republic of South Africa;

2. the forging of links to create a genuine and equitable regional integration;

3. the mobilization of resources to promote the implementation of national, interstate and regional policies; and

4. concerted action to secure international cooperation within the framework of our strategy for economic liberation.[4]

Tables 2 and 3 indicate the direction of trade of the SADCC countries in 1981 and trade flows. The evidence reveals that trade is mainly with the RSA and the countries with which the SADCC countries formerly had colonial ties. It is unlikely that these trading patterns reflect comparative advantages. According to Table 3, there was almost no trade among the SADCC countries in 1981.[5] However, as distance and transport costs are important determinants of comparative advantage and trade flows, a potential for increasing intra-SADCC trade seems reasonable to assume, especially since SADCC countries are already fairly open. Table 4 shows that exports and imports account for 63 to 95 percent of GDP for Botswana and an average of 19 to 26 percent of GDP for all SADCC countries. Redirection of trade flows and possibly trade expansion seem feasible.

The second objective emphasizes equitable regional integration. The SADCC leaders are aware that unequal distribution has been the most important cause of poor performance of other integration schemes. The form of integration chosen seems to deter-

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[4] Quoted in Joseph Hanlon, *SADCC: Progress, Projects, and Prospects: The Trade and Investment Future of the Southern African Development Coordination Conference,* The Economist Intelligence Unit Special Report 182 (London: *The Economist,* 1984), p. 3.

[5] The only significant intraregional trade flow is that between Tanzania and Mozambique, which is due to a bilateral trade agreement concluded at the end of 1981. This clearly indicates that there is a potential for intraregional trade expansion. See W. Zehrender, *Cooperation versus Integration: The Prospects of the Southern African Development Coordination Conference (SADCC)* (Berlin: German Development Institute, 1983), p. 15.

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Table 2—Direction of SADCC trade, 1980

Country	Exports			Imports		
	Total	Major Suppliers	Share of Total	Total	Major Suppliers	Share of Total
	(U.S. $ million)		(percent)	(U.S. $ million)		(percent)
Angola	1,766.2	United States	40.1	1,359.1	Portugal	14.3
		United Kingdom	9.9		Brazil	9.6
		Japan	5.3		United States	9.0
					Germany, Federal Republic of	8.3
					France	7.5
Botswana[a]	508.0	Europe	63.0	679.9	Southern Africa[b]	87.0
		Western Hemisphere	20.0		Western Hemisphere	3.0
		Southern Africa[b]	7.0		Europe	2.0
Malawi	249.9	United Kingdom	28.1	438.8	South Africa	37.1
		United States	16.4		United Kingdom	18.1
		Netherlands	8.2		Japan	7.1
		Germany, Federal Republic of	7.4		Germany, Federal Republic of	5.0
Mozambique	487.6	United States	21.0	673.7	United States	11.3
		Kenya	9.4		France	8.3
		Singapore	8.8		Japan	5.8
		Indonesia	6.4		Germany, Federal Republic of	5.4
Tanzania	510.8	United Kingdom	15.3	1,226.6	United Kingdom	16.3
		Germany, Federal Republic of	14.4		Germany, Federal Republic of	9.9
		Netherlands	5.4		Japan	8.8
		Italy	5.1		Iraq	6.5
Zambia	1,520.4	Japan	17.9	912.7	United Kingdom	26.5
		France	13.6		United States	10.8
		United Kingdom	13.1		Bahrain	7.5
Zimbabwe[c]	1,360.4	South Africa	22.7	1,638.0	South Africa	25.1
		United Kingdom	9.4		United Kingdom	9.8
		Germany, Federal Republic of	8.3		United States	7.4
		United States	7.9		Germany, Federal Republic of	6.9

Source: *The Economist Intelligence Unit Quarterly Economic Review,* various issues.
Note: Data for Lesotho and Swaziland were not available.
[a] For Botswana, data were only available for trade destination by region.
[b] Southern Africa includes Lesotho, Swaziland, and the Republic of South Africa.
[c] Data for Zimbabwe were from 1981.

mine whether uneven distribution will be a problem. In general, market integration is more likely to create uneven distributional effects than cooperation in joint activities. Market integration could be a concern from a distributional point of view if the degree of development differs significantly among integrating countries.

Table 5 supports this concern. The level of per capita income varies widely among countries. In U.S. dollars, it is only $214 for Lesotho, but $802 for Botswana. Zim-babwe, with a per capita income of $787 and 26 percent of GDP originating in manufacturing, has the highest potential for expanding intraregional trade in manufactured products and is probably most attractive for investments in industry. But, although it is likely that distribution will be unequal given these differences, this does not imply that all countries will not gain in absolute terms.

The third and fourth objectives of the Lusaka Declaration are well founded if the present geographical and economic situations

Table 3—Trade among the SADCC countries, 1981

Country	Exports to SADCC Countries (U.S. $ million)										Exports to SADCC as Share of Total Exports (percent)
	Angola	Botswana	Lesotho	Malawi	Mozambique	Swaziland	Tanzania	Zambia	Zimbabwe	Total	
Angola	...	...	...	...	...	...	...	...	...	...	...
Botswana	...	...	...	...	8	...	...	2	23	36	9
Lesotho	...	...	...	...	...	...	...	...	...	...	...
Malawi	1	...	...	...	1	...	3	...	22	24	10
Mozambique	...	...	...	4	...	1	...	...	22	31	9
Swaziland	...	...	...	...	5	...	...	...	4	10	3
Tanzania	...	...	...	...	3	...	...	2	...	5	1
Zambia	1	2	...	...	...	...	3	...	36	40	4
Zimbabwe	3	42	2	21	16	2	2	51	...	138	10
Total intra-SADCC imports	7	44	2	25	33	3	8	55	107	284	

Source: Joseph Hanlon, *SADCC: Progress, Projects, and Prospects*, The Economist Intelligence Unit Special Report No. 182 (London: *The Economist*, 1984), p. 68.

Notes: The ellipses indicate nil or negligible trade between countries. These data are for total trade, not trade in agricultural products alone.

Table 4—Trade values of the SADCC countries, 1982

Country	Exports	Imports	Exports as Share of GDP	Imports as Share of GDP
	(U.S. $ million)		(percent)	
Angola	1,483	1,115	26.0	19.6
Botswana	456	686	63.2	95.0
Lesotho	35	527	11.7	175.7
Malawi	246	294	18.6	22.3
Mozambique	137	836	3.1	18.7
Swaziland	315	519	73.4	121.0
Tanzania	432	944	9.5	21.1
Zambia	1,061	999	27.7	26.1
Zimbabwe	1,065	1,091	18.1	18.5
Total	5,230	7,011	19.2	25.8

Source: Derived from Joseph Hanlon, *SADCC: Progress, Projects, and Prospects,* The Economist Intelligence Unit Special Report No. 182 (London: *The Economist,* 1984), p. 13.

of the individual countries are taken into consideration. First, because so many of the SADCC countries are landlocked, cooperation in developing a regional transport and communication system seems reasonable. Second, all countries have long borders with

Table 5—Sectoral shares of GDP, SADCC countries, 1981

Country	Agriculture	Manufacturing	Mining
	Sectoral Share in GDP		
	(percent)		
Angola	42	3	25
Botswana	12	6	26
Lesotho	27	5	9
Malawi	39	11	. . .
Mozambique	43	9	1
Swaziland	25	20	3
Tanzania	51	9	1
Zambia	18	18	8
Zimbabwe	18	26	5

Source: Derived from Joseph Hanlon, *SADCC: Progress, Projects, and Prospects,* The Economist Intelligence Unit Special Report No. 182 (London: *The Economist,* 1984), p. 13.

neighboring countries. Conducting national policies, especially price policies, without taking policies of neighboring countries into consideration would either lead to illegal trade or would demand high administrative costs for controlling border trade. Third, cereal production is unstable in the SADCC countries but probably less so on the regional than the national level. Hence, joint actions to stabilize cereal consumption could be highly profitable. Finally, countries as a group are certainly stronger in international negotiations than the sum of the individual countries would be. This is especially true for attracting investment aid from developed countries.

Whether these realistic objectives can be achieved largely depends on the organizational framework and the strategies chosen. The SADCC approach is also unusual in these respects.[6] SADCC did not start by establishing supranational institutions, as did most of the older integration schemes, and so far it has avoided this step. The supreme body of the organization is known as the Summit. This organization consists of heads of state of the nine member countries. The Summit meets once a year for a day. Its purpose is to rededicate the support of member states

[6] The description of the organizational structure is based on P. Murphy, "The SADCC Food Security Programme," in *Executing Food and Nutrition Programmes in East, Central, and Southern Africa: Experience and Practice,* ed. F. van der Haar, proceedings of a workshop held in Harare, Zimbabwe, August 22 to September 2, 1983 (Wageningen: Netherlands International Nutrition Institute, 1983), p. 213.

to the objectives of SADCC, to review the progress made in achieving those objectives, and to lay down guidelines on where emphasis should be placed in the SADCC programs of action for the subsequent year.

Subordinate to the Summit is the SADCC Council of Ministers, which meets three times each year. The first meeting is held immediately before the Summit in order to approve the progress report to be submitted to the Summit. A second meeting is held midyear to accept the progress reports from member states who are responsible for different portfolios. At this meeting the Council of Ministers also prepares for the annual conference of SADCC leaders and representatives from donor countries. The council meets for a third time immediately before the annual SADCC-Donor Conference, principally to resolve any problems that may have arisen after the midyear meeting and before the SADCC-Donor Conference begins.

Supporting the Council of Ministers is the Standing Committee of Officials. This organization consists of senior government officials from the nine countries. The main work of the standing committee is to receive progress reports from countries with responsibility for different portfolios and to prepare new proposals for inclusion in the SADCC programs of action. Records of the meetings of the standing committee are forwarded to the council for approval. These records provide the principal working documents used by the council.

The SADCC countries tried from the beginning to keep the executive structure for administering the SADCC program of action at an absolute minimum. There is only a small secretariat whose main function is to make the administrative arrangements for holding the annual summit meeting, the annual SADCC-Donor Conference, and the various meetings of the Council of Ministers and the Standing Committee of Officials. The responsibility of implementing the programs of action is not given to the secretariat but to individual member states. Every member state is responsible for at least one portfolio.

The portfolios address the following economic issues: energy development; agricul-tural research; animal health; soil and water conservation and land utilization; wildlife conservation and fisheries; forestry; transport and communications; industrial coordination; mining; manpower development; and food security.

Each country is responsible for preparation of proposals for a program of action in the sector assigned to it. The proposals are then submitted to the council through the standing committee and, if approved, become the SADCC program of action in that area. Each country is also required to further the program of action in the sector for which it is responsible and to provide regular progress reports both to the standing committee and to the council.

SADCC's refusal to build a huge bureaucracy implies that the countries have not agreed on a detailed regional development strategy. Instead, they prefer to follow a step-by-step process. The council sets overall priorities. Countries in charge of the individual portfolios present proposals to support those national projects that have a regional impact. Because development of the regional transportation system was considered first priority in the first phase, most project proposals so far have been in this area. There is no doubt that cooperation on transportation is to the advantage of all countries. Moreover, improvement of the transport sector may stimulate cooperation in other sectors, especially in the food sector, because many food products are bulky and of low value per unit.

Because an overall assessment of the SADCC approach is not an objective of this report, only SADCC's activities in the food security field will be presented in detail. The original Food Security Program consisted of the following eight projects: to establish and develop coordination and cooperation on all agrarian issues; a regional early warning system; a regional resources information system; a regional inventory of the agricultural resources base; a regional food reserve; a program to reduce regional postharvest food loss; a more efficient food marketing infrastructure; and regional food aid.

Principal elements of the strategy for the achievement of SADCC's food security

objectives are reinforcement of national food production capacity; improvement of the food storage, marketing, and distribution systems; development of skilled manpower; development of intraregional trade; establishment of systems for the prevention of food crises; establishment of programs for the control of major pests and diseases; development of national food policies; and development of institutions and mechanisms for the exchange of information on all these issues.[7]

The SADCC countries began by approaching donor countries and asking for financing for prefeasibility studies. The principal source of funding for operational coordination for the period June 1982-December 1985 was a U.S. Agency for International Development grant of U.S. $675,000 in support of the Regional Food Security Programme, a general technical assistance program designed to achieve coordination and cooperation on all agrarian issues. By 1985, seven projects under the Regional Food Security Programme were being implemented with external assistance. Hence, a real test of regional cooperation has not been faced yet. It is easy to cooperate if activities are financed with external funds, and individual countries can only gain—never lose. Self-sustained cooperation, however, inevitably implies that some countries may lose in some areas or at least in some years to the benefit of partner countries. Whether the individual SADCC countries are really prepared to accept even temporary losses has not been proven yet.

SADCC's objectives and approach seem to be realistic and well-founded, but this does not mean that the international community should assess all aspects of this integration scheme positively. There are two arguments against all regional market integration efforts. First, regional cooperation could undermine the prospects for worldwide cooperation. If global trade is considered a realistic objective, regional cooperation could be opposed for that reason. The EC serves as a case in point. It is not unlikely that liberalized trade within the EC has diminished the prospects for worldwide trade liberalization. This is especially true for trade in agricultural products. However, this reasoning can hardly be applied to SADCC because of the difference in the size of the two blocs. The total population of the SADCC countries is about the same as that of the Federal Republic of Germany, and their economic potential is much smaller. It is hardly conceivable that the creation of such a scheme could actually impede chances for worldwide integration.

Second, it could be argued that cooperation among the SADCC countries implies discrimination against other neighboring countries. If the objective is to stimulate trade among all developing countries, regional cooperation could be counterproductive. This argument cannot be easily discarded. But up to now, most African countries have not traded with each other. It seems quite unrealistic to expect that individual countries could develop strong trading relations with a large number of potential trading partners simultaneously. Perhaps African countries should begin trading with each other gradually. Regional cooperation could serve as a medium for this purpose: as countries gradually become open economies, they might start to trade with countries that were not members of the original integration scheme.

[7] Southern African Development Coordination Conference, Regional Food Security Programme, "Strategies to 1990," Harare, SADCC, 1985, p. 4.

4

ECONOMIC THEORY OF INTEGRATION AND THE PROSPECTS FOR INTEGRATING DEVELOPING COUNTRIES

Traditional Economic Theory of International Integration

Common sense alone indicates that regional cooperation among the SADCC countries could result in high economic benefits. However, it should be clear that prospective benefits are somewhat uncertain, and their magnitude will depend on the selection of specific fields of cooperation, on a proper functioning of the scheme, and thus on how it is implemented.

The SADCC countries are in a comparatively favorable position. First, they can learn which integration strategies are more promising from the extensive literature on economic integration. Second, they can learn from the experiences of other countries that have already initiated integration efforts. This chapter focuses on the first. It investigates whether the economic theory of integration offers useful guidelines for setting up an integration strategy.

The focus of regional cooperation has mainly been on integrating the industrial sectors of developing countries.[8] Hence, to deal with prospective schemes for integrating the food economies of developing countries, the international integration theory needs to be modified to cope with the specifics of the food economies in developing countries.

The first bias in economic integration theory arises from a narrow definition of integration. Machlup points out that the term

economic integration only came into existence in 1942.[9] Until 1950 the term was used to refer to a wide range of international economic relations, including trade, monetary relations, and even cooperation among nations for purposes such as pollution control, exploitation of seabeds, and regulation of international air transportation.[10] According to Peter Robson, "Since 1950, the general concept of economic integration is basically concerned with efficiency in resource use, with particular reference to the spatial aspect. Necessary conditions for its fullest attainment include: a) the freedom of movement of goods and factors of production, and b) an absence of discrimination."[11]

This narrow definition implies that regional integration is a move toward less discrimination among partner countries through border regulations. As discrimination is always the consequence of governmental market intervention, less discrimination stands for less market intervention. Hence, regional integration only asks for what has been called "negative policy integration." Thus, economic integration theory widely neglects the idea that regional integration may depend on modifications of existing instruments and institutions and the creation of new ones. This is called positive policy integration.[12] It is assumed here that positive policy integration, especially if the objective is to improve food security, should be an integral part of any integration effort.

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[8] For a review, see Constantine V. Vaitsos, "Crisis in Regional Cooperation (Integration) Among Developing Countries: A Survey," *World Development* 6 (June 1978): 719-769.

[9] Fritz Machlup, *A History of Thought on Economic Integration* (London: Macmillan, 1977).

[10] See Peter Robson, *The Economics of International Integration,* Policy Studies Institute Studies in Economics 17 (London: George Allen and Unwin, 1980), p. 1.

[11] Ibid.

[12] See Jacques Pelkmans, "Economic Theories of Integration Revisited," *Journal of Common Market Studies* 18 (June 1980): 333.

Second, in line with the narrow definition of integration, traditional economic theory of integration focuses on market integration and classifies these stages of integration: free trade area, customs union, common market, economic union, and complete economic integration.[13]

In a free trade area there are no tariffs on trade among member countries, but external tariff rates among the countries differ. A customs union differs from a free trade area because there is harmonization of external tariff rates as well as free intraregional trade. A common market, in addition, allows for free movement of factors. In an economic union all economic policies are in harmony. In complete economic integration, each country is equivalent to individual provinces in a national state. These forms of integration indicate a declining degree of discrimination against partner countries. Thus there should be no need to consider problems of positive policy integration. But this classification is not consistent. The individual stages not only differ in the degree of governmental market interference, that is, negative policy integration, but also with respect to positive policy integration.[14] Whereas the first three stages imply pure market integration, the rest clearly imply positive policy integration. Hence it is not reasonable to consider market integration merely a question of negative policy integration.

To concentrate on market integration alone may be acceptable for integration efforts in developed countries, but it is less adequate if the potential effects of integrating developing countries' food economy are explored. It may well be that there are national public goods, such as transport services, that could be produced cheaper on a regional level. There may also be regional public goods that could be produced more cheaply if countries cooperated, but the typical integration form classified by traditional economic integration theory may not be necessary.

Third, traditional economic integration theory has developed as a branch of the pure theory of international trade. Thus, it is assumed that only real factors matter and that private marginal costs are equal to social marginal costs and private marginal returns to social marginal returns. As a consequence, it is assumed to be proven that regional integration may have positive welfare effects but they will always be less than those of worldwide integration.[15] Moreover, regional integration is labeled a second-best solution, even if external effects and economies of scale are considered.[16] Thus, Krauss concludes that economists have failed to develop a general argument for customs union on economic grounds.[17] However, these findings will not hold if there is a regional public good that can be produced more cheaply through cooperation than through either autonomous national policies or worldwide integration. Apart from that, traditional economic integration theory assumes that external effects arise only within a country and not across the border. It may well be that individual countries' agricultural policies affect the outcome of the agricultural policies of other countries much more on a regional level than worldwide. Hence, the best policy may be to cooperate on a regional rather than a worldwide scale.

Fourth, because traditional economic integration theory identifies economies of scale and external effects as the most promising determinants of successful regional integration schemes, it has had much greater effect in the industrial sector, where these determinants play a more dominant role, than in agriculture. So far, the effects of regional cooperation on national and regional food security have not been investigated. Perhaps this explains why the food security objective

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[13] Bela Balassa, *The Theory of Economic Integration* (Homewood, Ill.: Richard D. Irwin, 1961), p. 2.

[14] Pelkmans, "Economic Theories of Integration Revisited," p. 334.

[15] C. A. Cooper and B. F. Massell, "A New Look at Customs Union Theory," *Economic Journal* 75 (December 1965): 742-747.

[16] Melvyn B. Krauss, "Recent Development in Customs Union Theory: An Interpretive Survey," *Journal of Economic Literature* 10 (June 1972): 413-436.

[17] Ibid., p. 434.

is seldom mentioned as a general objective of established integration schemes.

Finally, most of the findings of traditional economic integration theory apply to one specific form of integration—customs union. However, it cannot be taken for granted that the economic effects of the other forms, as classified by Balassa,[18] are comparable on welfare effects.[19] The direction of welfare changes may differ, as well as their size. A free trade area might for example, have negative welfare effects even though a customs union had positive ones.[20] Moreover, the efficiency of specific integration forms largely depends on the complementary institutional framework, which can differ for individual integration schemes.

This short summary of some deficiencies of traditional economic integration theory leads to two conclusions. First, if one of the objectives of an integration scheme is improvement of food security, it is not advisable to accept the narrow definition of integration incorporated in traditional economic integration theory. It may well be that positive policy integration could improve food security more than negative policy integration. Focusing on positive policy integration requires investigation of joint actions or cooperation by a group of countries, which could increase food security either nationally or regionally or both. Thus, market integration, which is the only concern of traditional economic integration, is just one of several strategies that should be investigated.

Second, integration theory can be helpful in exploring the potential for positive integration effects, but it does not indicate whether the potential is likely to be exploited. This depends largely on the institutional framework that is set up. Hence, this study considers the institutional arrangements needed to exploit a given potential for positive integration effects and the implications of such arrangements from regional and national points of view. The last point is of special concern. Experience with past integration schemes has shown that distributional effects among cooperating countries are highly relevant for the viability of any integration scheme.

Following this line of argument, a broad definition of integration is used. The terms "integration" or "cooperation" label any joint action among partner countries that has an impact on economic activities in the cooperating countries. This broader definition seems especially justified for this study because the integration scheme for the SADCC countries focuses on joint actions, whereas market integration in the sense of the traditional theory of integration is only seen as a future possibility in these countries.

Benefits of Integrating Food Economies of Developing Countries

It is assumed that one of the objectives for integrating the food economy of developing countries is to improve food security. Alberto Valdés and Ammar Siamwalla define food security as "the ability of food-deficit countries, or regions, or households within these countries, to meet target consumption levels on a year-to-year basis."[21] Consequently, food insecurity may have two facets: first, real income may be too low to provide target consumption for all groups of the society even in years of normal or above normal domestic production, and second, real income may fluctuate due to variations in domestic production of food and nonfood products or import and export prices. Integrating the food economy of developing countries could contribute to both aspects of food security.

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[18] Balassa, *Theory of Economic Integration.*

[19] Actually, Dosser has argued that "standard customs union theory can be seen as a special case" (D. Dosser, "Customs Unions, Tax Unions, Development Unions," in *Modern Fiscal Issues: Essays in Honor of Carl S. Shoup,* ed. R. M. Bird and J. G. Head [Toronto: University of Toronto Press, 1971], p. 103).

[20] This may be because a customs union provides a larger gain in terms of trade than a free trade area. See S.W. Arndt, "On Discriminatory Versus Non-preferential Tariff Policies," *Economic Journal* 78 (December 1968): 971-979.

[21] Valdés and Siamwalla, "Introduction."

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Income in the overall economy—not just the farm population—could be increased through market integration. Cooper and Massell show quite convincingly that preferential trade liberalization among selected countries will only increase national incomes if nonpreferential trade liberalization would lead to even higher increases in income.[22] They argue that any increase in income from regional cooperation arises solely from the exploitation of comparative advantage. Worldwide integration—global liberalization—would allow exploitation of differences in comparative advantage among a larger number of countries and therefore would probably lead to higher welfare gains than regional integration. Thus Cooper and Massell argue that preferential trade liberalization can only be considered a second-best alternative. However, taking into account conditions in African countries, preferential trade liberalization may be superior to nonpreferential or global liberalization.

Since six of the SADCC countries are landlocked, transport costs are especially relevant,[23] which implies a large differential between export and import parity prices for bulky products. Muir presents calculations showing that the import parity price for maize meal is more than double that of the export parity price for landlocked Zimbabwe.[24] Given such a wide price differential between c.i.f. and f.o.b. prices, the activity becomes a nontradable, and thus by definition the best alternative for countries might be to pursue a policy of self-sufficiency for major agricultural products. Unilateral trade liberalization in agricultural products might not affect domestic production and consumption of those products if the price differential is very high. However, if there is preferential trade liberalization among neighboring countries, the domestic production and consumption patterns could be changed in accordance with comparative advantage.

Obviously, whether the existence of a differential between export and import parity prices points to preferential trade liberalization depends on the size of the differential and whether individual countries would have different optimal price ratios without nonpreferential trade liberalization. Table 6 gives some information on how price ratios among individual countries may differ depending on whether countries accept export or import parity prices as the relevant opportunity cost. The data reveal that price ratios for agricultural products would vary widely among countries, even if free trade were to prevail.

The free trade model applied by Cooper and Massell does not take into account stochastic elements.[25] Thus risk that may arise from integrating the domestic economy into the world economy has been neglected. This might be acceptable if individual countries were risk neutral. In this case, only expected values are relevant for policy decisions, and the deterministic free-trade model can be applied. However, the assumption of risk neutrality is probably more realistic for developed countries than for developing ones. The latter are less equipped to bear risk; it is reasonable that they value the risk element quite highly in determining their policies.[26] Thus it seems rational for developing countries to prefer regional cooperation over worldwide integration. The risk of adjusting the production pattern in accordance with comparative advantage in a region may seem less risky than worldwide integration if coun-

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[22] C. A. Cooper and B. F. Massell, "Toward a General Theory of Customs Unions for Developing Countries," *Journal of Political Economy* 73 (October 1965): 461-476.

[23] It was Wonnacott and Wonnacott who challenged the findings of the up-to-then well-established traditional theory of economic integration by stressing the relevance of transport costs (P. Wonnacott and R. Wonnacott, "Is Unilateral Tariff Reduction Preferable to a Customs Union? The Curious Case of the Missing Foreign Tariffs," *American Economic Review* 71 [September 1981]: 704- 714).

[24] K. Muir, "Crop Price and Wage Policy in the Light of Zimbabwe's National Objectives" (Ph.D. thesis, Harare, 1984).

[25] Cooper and Massell, "Toward a General Theory of Customs Unions."

[26] Cathy L. Jabara and Robert L. Thompson, "Agricultural Comparative Advantage Under International Price Uncertainty: The Case of Senegal," *American Journal of Agricultural Economics* 62 (May 1980): 188-198.

Table 6—Typical maize/beef price ratios

Maize Price	Beef Price	Price Ratio for Maize/Beef	Countries
Export parity	Import parity	1 : 10 – 12	United States, Canada
Import parity	Import parity	1 : 7 – 8	European Community
Export parity	Export parity	1 : 4 – 5	Australia, Argentina
Import parity	Export parity	1 : 2 – 3	Ethiopia, Tanzania, Madagascar

Source: W. Schaefer-Kehnert, "Economic Aspects of Intensive Beef Production in a Developing Country," *Zeitschrift fuer Auslaendische Landwirtschaft* 17 (No. 4, 1978): 347.

tries feel that it is easier to cope with adverse conditions in a regional scheme. This may be true because mutual control and reliability could be easier to achieve among neighboring countries in a regional scheme than in a worldwide scheme. The free-rider problem, which is a predominant concern for all international integration schemes, as well as the problem of uncoordinated actions of individual nations, are more likely to be solved within a regional integration scheme.

H. G. Johnson and Cooper and Massell justified the foundation for a customs union with what was then a new argument.[27] They found that customs unions could be superior to worldwide integration if broader political objectives were taken into account. If nations feel the need to support industrialization of their countries by protecting their industries, welfare losses to achieve this objective might be less if countries cooperate than if they pursue autonomous national policies. This view has been generally accepted, but the same reasoning has not been applied for justifying regional integration of food industries among developing countries.

The arguments of Johnson and Cooper and Massell imply that a divergence exists between private and social marginal costs or returns in industry. Such divergences may also exist in agricultural production. It is quite evident that governments, especially governments in developing countries, give food security high priority. Obviously, agriculture's contribution to GNP is taken into account, as well as its contribution to food supply stabilization objectives.

Arguing on the marginal cost curve in industrial production, Johnson and Cooper and Massell contend that a specific contribution to industrialization could be achieved more cheaply if countries were to cooperate. The same holds true for the food security objective on two grounds: first, as argued above, adjusting the pattern of agricultural production among integrating countries in accordance with comparative advantage would allow production of the same volume of products and hence would result in the same degree of food security as without integration but at lower costs. Second, some developing countries aim at self-sufficiency (food security) because they feel it is too risky to rely on food imports under adverse conditions. It is likely that supply will fluctuate less for a group of countries than for individual countries. This empirical question is investigated in more detail later in this study. If it can be proven that production fluctuates less regionally than nationally, integration may help to reduce risk.

The assumption of externalities plays a major role in economic integration theory. However, only national externalities have been considered. As far as food production and food policy are concerned, externalities may also play a role across national borders. Take, for example, national development projects that not only improve the national infrastructure of the food industry in a coun-

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[27] H. G. Johnson, "An Economic Theory of Protectionism, Tariff Bargaining, and the Formation of Customs Unions," *Journal of Political Economy* 73 (June 1965): 256-283; and Cooper and Massell, "Toward a General Theory of Customs Unions."

try but also have an impact on the food marketing systems of neighboring countries, such as harbor facilities and road networks that give neighboring countries faster and easier access to food imports in emergency situations.

External effects of national food policies are of special importance for relatively small countries in Africa. Food shortages in one country will inevitably affect the food situation in other countries because trade across borders cannot be controlled efficiently. Thus, coordination of policies could help to make all countries participating in an integration scheme better off.

Whether to create a regional cooperation scheme is certainly not just an economic question: it is also a matter of political concern. Comparing regional schemes with worldwide cooperation on economic grounds alone could bring about misleading policy recommendations. Policymakers often renounce policies that are best from a purely economic point of view because of political constraints. A country's pattern of protection can only be explained if the political market for protection is taken into consideration. The argument for worldwide integration is mainly based on economic reasoning, but the arguments for regional integration are also founded on political considerations. Political will is likely to be stronger for regional than for worldwide integration. Moreover, worldwide integration reduces protection without visibly compensating producers. Regional integration, instead, changes the pattern of protection, helping some producers and hurting others, and it has the potential to improve the region's terms of trade. It may be, therefore, that producers will be less opposed to regional integration, making regional schemes more politically feasible than worldwide cooperation.

Integration's Potential for Increasing Consumption Stability

Cooperation in risk-reducing activities could be the main focus of regional integration schemes among developing countries.

Risk reduction is a public good that is cheaper on the regional level than on the national, if appropriate measures are chosen. Food security in individual countries is impaired from time to time because of fluctuations in either domestic production or in import or export prices or both. Activities to mitigate either the size of fluctuations, their predictability, or their effects on production and import or export prices imply an insurance approach. Hence, the question arises whether the premium paid by individual countries for a specific degree of food security would be lower if countries were to cooperate.

Regional cooperation may be superior to national strategies for reducing fluctuations in agricultural production for two reasons. First, fluctuations in agricultural production are mainly caused by adverse weather conditions, but weather is less likely to affect production over an entire region. If past experience supports this presumption, food security could be improved through regional cooperation.

Second, for food security, not only fluctuations in production of individual crops are relevant but also fluctuations in agricultural production as a whole. However, instability in aggregate production depends on the composition of production as well as instability in the production of individual crops. Individual countries might affect aggregate instability by changing their production patterns. Of course, there will probably be a trade-off between expected income and instability, which will be different on the regional level than on the national. It may be that all integrating countries would be better off if they used a regional portfolio approach to determine the production pattern.

Through cooperation, countries could mitigate fluctuations in production by initiating an early-warning system and by exchanging information on crop prospects, actual harvests, and the amount of stocks held. Such information could also help rationalize the trade flows of agricultural products within the region. Thus food crises on a subregional level could more than likely be avoided. Early information about the food situation in the near future could also con-

tribute to better timing of food imports. If port facilities and the transportation network are a bottleneck in coping with actual food crises, regional cooperation in providing information could make the constraints less binding. Moreover, supply would fluctuate less if private or public stockpiles were available. Private stockholders are more likely to fulfill this function, the less risky the storage activity is. By providing early information about the prospective market situation, governments could make private stockholding less risky. The amount of private stocks would increase, and markets would be more stable.

Actually, stockpiling to even out year-to-year fluctuations is mainly a public concern in most developing countries and is seldom performed by private stockholders. Cooperation in building a regional food reserve system could be a promising activity for a regional integration scheme.

Finally, regional cooperation could be used to cope with fluctuating export and import prices. Two strategies could help to achieve this objective. First, developing countries—especially in Africa—have so far widely neglected the use of futures markets to reduce risk from changes in export and import prices, perhaps because knowledge about the functioning of futures markets is not common. Moreover, the advantages of futures trading may be less for small coun-

tries with risks in both production and prices because futures markets can only reduce risk in the latter. Regional cooperation, however, may make futures markets more profitable in several ways. First, setting up a marketing unit that carries out transactions on futures markets may be less costly per unit marketed for a region than for a nation. Second, if cooperation is also used to reduce risk in production, it will make activities on futures markets more profitable. Futures markets could be used to stabilize short-run fluctuations in export revenue and in the import bill and to provide a better basis for planning, and they could also be used to rationalize national and regional stockpiling. Futures trading could partially substitute for stockpiling.

It is true that futures trading is more appropriate for evening out short-run fluctuations and for improving the monthly timing of exports and imports than for coping with year-to-year fluctuations. A regional stabilization scheme of export earnings and import expenditures could be used to alleviate long-term fluctuations. The principal idea behind the EC's export stabilization scheme (STABEX) and the International Monetary Fund's Compensatory Financing Facilities can be used to justify a regional foreign exchange stabilization scheme.

5

OTHER REGIONAL COOPERATION SCHEMES

The SADCC countries are latecomers to economic integration efforts. On the one hand, they may already have forgone considerable benefits. On the other hand, the experiences of other integration schemes indicate that they may confront obstacles. There is a danger that integration efforts may fail, and integrating countries may face economic costs that outweigh benefits. By studying past integration efforts, a new integration scheme such as SADCC can decrease the probability of failure and increase the chances for success. Hence, this chapter reviews some representative integration schemes.

The European Experience

There are several good reasons for including a short summary of the European experience in integrating food industries. First, the European Common Market, founded in 1957, is the oldest integration scheme, and it has included agriculture from the beginning. The Common Market provides a resource for realistically evaluating the costs and benefits of such a scheme. Second, outside observers, especially from developing countries, tend to rate the success of the Common Agricultural Policy (CAP) too high. Because they are deeply concerned with food deficits in their own countries, they are impressed by the evolution of the EC from food importer to major food exporter. It is necessary to review critically the actual experience of the EC to gain a more realistic, if somewhat pessimistic, perspective. Third, the experiences of the EC may help identify the crucial determinants of a successful integration process, that is, the political and institutional arrangements that are decisive for the viability of an integration scheme.

From its inception, the Common Market's six founding members (the Federal Republic of Germany, France, Italy, the Netherlands, Belgium, and Luxembourg) agreed to include agriculture. They saw economic integration as a process that would eventually remove any remaining obstacles to political integration. Rosemary Fennell writes, "The whole concept of the EC is built on four freedoms: the freedom to move goods; the freedom of workers to move; the freedom to exercise a trade or profession; and the freedom to move payments and capital."[28] These principles could only be achieved if all sectors of the economy were included in the integration scheme. However, it was necessary to find a special scheme that would be adequate for the agricultural sectors of the member states because of the wide differences that existed in economic environments, policy objectives, and instruments applied. Hence, integration of agriculture implied something more than trade liberalization (negative policy integration); it asked for positive integration.

The treaty of the EC was vague on the precise nature of the CAP. It could set forth common rules for competition, or coordinate national market organizations, or develop a European market organization. Eventually, it was decided that common market organizations would be established for most agricultural products. Ten years after the treaty was signed, common market regulations were set for cereals and cereal-related products, such as pig meat, poultry, and eggs, and for fruits and vegetables. Common prices for milk and milk products and beef and veal followed a year later.

The first decade of the EC's existence clearly indicated that integrating agricultural

[28] Rosemary Fennell, *The Common Agricultural Policy of the European Community* (Montclair, N.J.: Allanheld Osman, 1979), p. 6.

sectors was a very sensitive task. Only the strong will of the member countries to achieve a politically united Europe made it possible to agree on common prices. Believing that long-term benefits would compensate for short-term welfare losses, member governments agreed to policies that seemed to be to their disadvantage. Eventually, their compromises resulted in increased protection for European agriculture. Because it was easier for countries with low prices to agree on higher prices than it was for high-price countries to lower their agricultural prices, EC prices were set higher than the average prices prevailing in the member countries prior to the agreement.

The Community was expected to gain in efficiency if the agricultural sectors of the member countries could be forced to adjust production patterns based on comparative advantage. However, the form of policy integration chosen tended to increase the overall degree of protection and to make protection rates less uniform for different agricultural products.

When the EC expanded from six to nine countries in 1973, the new members—the United Kingdom, Ireland, and Denmark— had to bear 100 percent of the adjustment of their lower prices to EC levels, an average increase of about 30 percent (see Table 7). The EC never contemplated averaging the degree of protection among old and new members.

This tendency toward higher protection is also the outcome of annual decisions made by the Council of Agricultural Ministers. As the CAP is organized, the agricultural ministers of the member countries are part of the EC Council and must decide about annual price changes for those products for which there are market organizations. The value of these products accounts for more than 90 percent of the total value of agricultural production of the EC countries. Clearly, administered price changes for those products are of crucial importance to the incomes of the farming population. Agricultural ministers in EC countries have always been more committed to farmers than to consumers, and they believe that farming interests can be better served by the EC than by individual countries. Thus, the council has been able to increase agricultural prices more than

Table 7—Level of protection for agricultural products in EC countries, various years

Country	1966/67	1968/69	1973/74	1979/80	1982/83
France	43	66	51	49	47
Germany, Federal Republic of	58	69	88	84	34
Italy	73	78	77	76	64
Benelux	51	74	73	72	22
EC-6	. . .	69	71	68	29
United Kingdom	32	31	29	64	32
Ireland	17	22	66	69	14
Denmark	12	19	27	59	17
EC-9	. . .	. . .	55	67	29
Greece	44	82	57	30	52
EC-10	. . .	. . .	. . .	. . .	29

Sources: For 1966/67 and 1968/69, Odd Gulbrandsen and Assar Lindbeck, *The Economics of the Agricultural Sector* (Stockholm: Arnquist and Wiksell, 1973); for 1973/74, 1979/80, and 1982/83, author's calculations based on data from European Community, Statistical Office, *Yearbook of Agricultural Statistics, 1984* (Luxembourg: EUROSTAT, 1984); European Community, Statistical Office, *Agricultural Prices, 1972-1983* (Luxembourg: EUROSTAT, 1984); and World Bank, *Price Prospects for Major Primary Commodities,* No. 814-84 (Washington, D.C.: World Bank, 1984).

Notes: The Benelux countries are Belgium, the Netherlands, and Luxembourg. The first year that common prices were in effect for the six original European Community countries was 1968/69. In 1973/74 common prices were initiated for three more countries, the United Kingdom, Ireland, and Denmark. By 1982/83, Greece was included.

Only wheat, sugar, beef, pork, and eggs are included in these calculations.

might have occurred on the national level. Individual countries have accepted price increases for products that they do not produce in order to win higher prices for products that they do. This is an unavoidable by-product of the unanimous decision rules that prevail in the council.

This price-escalating process lasted for nearly the first decade of CAP without violating budget constraints. During that time the EC was still a net importer on major agricultural markets. Hence, price increases that widened the gap between EC and world market prices affected the revenue from levies (EC border taxes) and could reduce expenditures for market support.

It is clear that this tendency to increase agricultural protection has countermanded the EC's objective of adjusting agriculture according to comparative advantage. The same forces have also caused protection among agricultural products to be less uniform. Protection has increased more for products that are mainly produced in the northern part of the EC, such as cereals, milk, beef and veal, and sugar beets, and less for southern products, such as fruits and vegetables, partly because it is less feasible and more costly to intervene in markets for the latter products. The southern countries may gain from an increase in their milk production, even though they have a clear comparative advantage in the production of fruits and vegetables. Thus, the burden of financing the CAP, particularly the escalating agricultural protection, has widened differences rather than improving political unity.

This is the rationale for the CAP's common financing: the CAP is a European public good, which serves the interests of both European farmers and consumers, and therefore it should be financed by European taxpayers. In actuality, consumers in food-importing member countries pay high food prices to the benefit of producers in food-exporting countries, which implies an income transfer from the importing to the exporting countries.[29] Balance-of-payments effects go in the same direction as transfer flows, but they may be even more of a problem because changes in common prices for individual commodities can affect the individual country's transfer position significantly. A country can lose in average net transfers but gain in marginal changes.[30] Thus, the institutional arrangement has caused national interests to conflict even more than is natural given national economic circumstances and policy preferences. The annual decisions of the Council of Agricultural Ministers have rarely been consistent with EC welfare, but instead they have been a compromise of divergent national interests.

The common financing system has had another negative effect. From the national point of view, it generally pays to increase agricultural production, but not from the EC's viewpoint. The EC finances disposal of surpluses, but the benefits of production growth accrue to the member countries. It is no wonder that individual countries continue to stimulate production growth while the EC is having serious problems financing the surpluses. It is important to note, however, that these divergent interests are not the consequence of surplus production but of protectionism and the common financial system.

The experience of the CAP reveals the importance of coordinating national monetary policies and paying attention to the linkages between monetary and agricultural policy. If a single administered agricultural price level is established to prevail for all member countries, real agricultural producer prices and food prices will differ considerably if the rate of inflation varies widely among those countries. Thus, equal nominal administered farm prices will have unequal effects on the income of the farm population and on the welfare of consumers. As agricultural ministers in Europe are concerned primarily with the real income of

[29] Ulrich Koester, "The Redistributional Effects of the Common Agricultural Financial System," *European Review of Agricultural Economics* (No. 4, 1977): 321-345.

[30] This is analogous to the situation of a private company. The company may run at an overall loss, but certain marginal activities may be profitable and may help to reduce the loss.

farmers, the member countries' demand to increase common prices will differ more, the higher the variance in the national rates of inflation. Furthermore, these conditions act against the objective of adjusting the agricultural production pattern of the community according to comparative advantage.

Divergent monetary developments among the member countries will either require a periodic realignment of exchange rates or they will eventually lead to an equalization of national rates of inflation. The Community's choice of the first alternative has had significant implications for the functioning of the CAP. First, a differential between spot and futures exchange rates normally arises prior to an expected realignment in the exchange rates, which in turn gives rise to a monetarily induced distortion in agricultural trade flows among member countries. Second, realignment of exchange rates has direct implications for administered farm prices if national markets are expected to remain unified. Countries that devalue their currency have to accept an increase in farm prices, whereas countries that revalue have to lower farm prices. Thus, the change in national farm prices is strongly determined by exchange rate variations. If a system of flexible or floating exchange rates prevails, farm prices must also be flexible in order to enforce agricultural market unity.

When the European Common Market introduced unified prices in 1967, it was hoped that a system of fixed exchange rates among the member countries would prevail indefinitely. However, an exchange rate realignment became necessary as early as 1969 and has many times since. Governments have preferred to protect their farmers from price fluctuations through revaluation of their domestic currencies and to protect their consumers through devaluations of the same. As a result, monetary compensatory amounts were introduced in 1969, which have driven wedges between the national agricultural prices of member countries. Thus, a true common market in Europe can be said to

have lasted no longer than two years, and indeed farm prices among member countries have differed more in recent years than in the first few years of the EC's existence.[31]

The experience of the EC indicates that integrating agricultural markets among a group of countries is only likely to succeed if there is either monetary unification or if member countries are willing to subsume their national interests to the interests of the community by adhering to common agricultural prices. However, as both agricultural policy and monetary policy are sensitive areas, it is unlikely that integration of the food sector will be successful.

Thus, integrating the food sectors of several countries implies that there will be policy integration and that policy decisions will be made at a supranational level. The EC's experience shows that the viability of the integration scheme depends largely on what decisions are made on the supranational level, how often, and by what process.

The pressure of policy decisions on prices and incomes can be avoided only if the policy activities integrated are those where national interests do not diverge widely and if discretionary policy decisions are replaced by well-defined rules agreed upon in advance.

Conflicts in national interests are unavoidable whenever decisions are made by a multinational body. However, the outcome of the decision is affected by the way that decision comes about. The EC applies the unanimity rule to any decision that may conflict with essential national interests of any member country, and these are typically inconsistent with the Community's welfare. Bearing in mind that most of these decisions, at least those in agriculture, concern price policies, it would indeed be unreasonable to apply the majority rule as considered by the Treaty of Rome because it is likely to violate the interests of specific member countries and to make membership too costly for them. However, it would not be unreasonable if the guidelines for common financing were changed and if a conscious effort were made to avoid employing price policies that

[31] Ulrich Koester, "The Role of the CAP in the Process of European Integration," *European Review of Agricultural Economics* 11 (No. 2, 1984): 129-140.

pursue national agricultural income objectives. If it is agreed that the application of the majority rule would better serve the general objectives of an integration scheme than would the unanimity rule, the Community should be freed from decisions about those areas in which national interests diverge widely.

One last point should be made concerning the timing of the integration process. The European experience has shown that timing is important both in starting the scheme and in its progress and development. By definition, the integration process involves structural changes within the participating countries, which are bound to exert pressure on some economic sectors and groups of people. The immediate burden of this adjustment can be minimized and thus more readily accepted if it is smooth and gradual.

When the EC abolished tariffs for internal trade in industrial and agricultural products in the 1960s, French industry and the German farm sector bore the greatest burden of adjustment. Because a healthy economic environment with high growth rates existed in both economies, they adjusted without suffering either an increase in the rate of unemployment or undue social hardship. However, this was not the case when the United Kingdom, Ireland, and Denmark entered the Community. The economic adjustments to a series of oil price hikes and worldwide recession were compounded by the imposition on these economies of much higher EC prices for agricultural products, thereby fueling inflation. Unfortunately, the public was not able to separate the causes and effects of these different factors and probably attributed sharp increases in food prices to the CAP. This would explain why public opinion in the newly joined countries, especially in the United Kingdom, was much less in favor of membership in the EC than was the case with the original member countries. It seems obvious that conditions for the timing of the first enlargement of the Community were not favorable.

The EC was well-advised to allow integrating economies a transitional period whereby the rules set forth in the treaty could be adopted gradually. The time span for a transitional period should be determined by the general economic environment of each individual country and the degree of adjustment required.

In summary, the EC experience in integrating the agricultural sectors of its member countries has not been completely successful. Indeed, as Balassa has suggested, "It may perhaps be said that the single greatest achievement of the European Common Market has been that it has survived."[32] This is especially true for the CAP. Nevertheless, the experiences of the EC can serve as a guide for establishing new integration schemes in developing countries. The first rule should be "less ambitious may be more realistic."

Developing Countries' Experience

SADCC policymakers can probably learn the most from studying the experiences of other developing countries. Although they may be interested in assessing all of the developing-country schemes that have operated during the last three decades, there are far too many to give a detailed performance record of each in this report. Moreover, even though each scheme has some unique aspects, the main determinants of success do not differ greatly among the schemes. Therefore, detailed assessments are given of only four schemes: the Latin American Free Trade Association (LAFTA), the Caribbean Community (CARICOM), the East African Community (EAC),and the West African Community (CEAO).

LAFTA

Created in 1960, LAFTA is one of the oldest schemes. Member countries include

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[32] Bela Balassa, "Introduction: the Common Market Experience," in *European Economic Integration,* ed. Bela Balassa (Oxford: North-Holland, 1975), p. 9.

Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Paraguay, Peru, Uruguay, and Venezuela. LAFTA's experiences should be of special interest to the SADCC countries, because LAFTA has focused completely on trade liberalization.

In Table 8, three-year averages show that trade in agricultural commodities between LAFTA countries expanded significantly between 1962-64 and 1977-79. However, growth rates of different products varied considerably. Trade in fruits and vegetables increased the most in absolute terms, reaching their highest point in 1977-79. Trade in cereals was most important in 1962-64, but it grew by only 2.1 percent a year. Growth rates were remarkable for vegetable oils, with a 16.7 percent annual increase, and oilseeds, with a 21.6 percent annual increase.

Data presented in Table 8 are not suitable for assessing the impact of LAFTA on trade expansion because it is not known how trade would have developed if LAFTA had not been created. If liberalization of trade among LAFTA members contributed to growth of overall trade, intra-LAFTA trade should have performed better than LAFTA trade with the world and with other developing countries.[33] To test this hypothesis, a market share analysis was applied to data on 49 agricultural products exported from and imported by LAFTA countries during the period 1962-64 to 1977-79.

First, the market share analysis was designed to determine how LAFTA's exports to LAFTA member countries fared in comparison with LAFTA's imports from the world as a whole and from other developing countries.[34] This is called the *import growth effect.*

Second, the analysis examines LAFTA's imports and exports by commodity groups and individual commodities to see if LAFTA's exports to LAFTA countries expanded as much as LAFTA's imports of these commodities from the world and from other developing countries. This is called the *commodity composition effect.*

Finally, it analyzes what share of the market LAFTA exporters would have captured if it is assumed that they started out with the same share of the LAFTA market as world and developing-country exporters. This is the *competitive effect.*

The calculations in the Appendix, Tables 28 and 29, indicate that: first, LAFTA exports to LAFTA countries would have been considerably higher in 1977-79 if they had maintained their 1962-64 market share of LAFTA's exports. Moreover, LAFTA exporters could not even increase their total exports to LAFTA countries relative to other developing countries. Second, the loss of market shares by LAFTA exports does not reflect a lack of export potential because LAFTA countries exported significant shares of goods to countries that were not LAFTA members. Third, the commodity composition effect indicates that intra-LAFTA exports performed better compared with the exports of developing countries than with world exports. Fourth, most striking is LAFTA's loss of competitiveness for total agricultural products in 11 out of 21 markets, compared with other developing-country exports. LAFTA exporting countries were more competitive in only a few markets, mainly in oilseeds.

Thus, based on these calculations, one must conclude that the LAFTA trade agreements did not promote intra-LAFTA trade in agricultural products.[35] Obviously, the creation of a free trade area does not necessarily mean that such trade will increase. What were the obstacles? Unfortunately, it is not possible to give a complete answer

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[33] Actually, this is a necessary but not sufficient condition, because other factors, such as increased protection of other trading partners or slower economic growth rates in other parts of the world may have contributed to increased intra-LAFTA trade.

[34] This approach is based on earlier works by Barend DeVries, Stephen Magee, Vittorio Corbin and Oli Havrylyshyn, and more recently Alberto Valdés. See Alberto Valdés, "Trade in Agricultural Products Between Developing Countries: Latin America Exports During 1962-1979," *Materie Prime* 3 (June 1984).

[35] Brada and Mendez found that neither LAFTA nor the Andean Pact has had any effect on trade between their members. See J. C. Brada and J. A. Mendez, "Regional Economic Integration and the Volume of Intra-Regional Trade: A Comparison of Developed and Developing Country Experience," *Kyklos* 36 (No. 4, 1983): 589-603.

Table 8—Principal products exported by LAFTA countries to other members

Commodity	1962-64	1967-69	1972-74	1977-79	Growth Rate Per Year
		(1975 U.S. $ million)			(percent)
Fruits and vegetables	81.6	147.4	157.9	287.6	8.4
Cereals	205.8	269.7	184.0	281.7	2.1
Coffee	102.7	123.5	138.4	125.0	1.3
Vegetable oils	8.6	34.2	26.6	105.5	16.7
Meats	22.3	39.9	61.3	76.7	8.2
Sugar	30.8	18.3	52.3	61.6	4.6
Textile fibers	96.0	95.4	86.3	36.2	−6.5
Oilseeds	1.4	0.8	10.3	36.0	21.6
Dairy	8.0	3.1	13.5	30.3	8.9
Animal oils and fats	9.7	20.4	12.2	29.6	7.4
Animals	72.9	97.2	26.1	22.9	−7.7
Animal feed	13.4	29.2	30.8	20.1	2.7
Miscellaneous food preparations	5.0	7.2	7.6	13.7	6.7
Alcoholic beverages	0.8	1.1	3.2	13.6	18.9
Manufactured fertilizer	3.2	1.5	11.6	11.1	8.3
Miscellaneous crude materials	8.3	6.9	4.6	6.8	−1.3
Crude fertilizers	4.2	3.5	4.7	6.0	2.4
Crude rubber	4.0	10.9	10.1	5.2	1.7
Processed oils and fats	0.8	4.0	6.0	4.0	10.7
Hides	5.9	11.5	6.1	2.6	−5.5
Tobacco	0.1	1.4	3.4	2.1	20.3

Source: Author's calculations based on data from International Food Policy Research Institute, "Intra-LDC Trade Data Base," Washington, D.C., 1985 (computer printout).

without presenting commodity-by-commodity market analysis. Several hypotheses may be considered, however.

First, it could be that intraregional trade in agricultural commodities did not increase adequately because LAFTA countries focused their development policy on industry and neglected promotion of agricultural production. Although it may be true that agricultural production would have grown much more if actively supported by government policies, this does not explain the poor intra-LAFTA export performance. The data presented in the Appendix, Table 30, shows that exportable surpluses were available because LAFTA exporting countries did export increasing quantities to other regions.

Second, was it the importing countries' unwillingness to import from partner countries or was it the exporting countries' unwillingness to export to partner countries that stifled trade? A free trade area implies discrimination against the exports of nonmember countries and easier access to partner countries' markets. It seems likely that importing member countries would prefer to import from partner countries because of the foreign exchange constraint. Imports from nonmember countries generally have to be paid in hard currencies, but those from partner countries may be paid in soft currencies. Consequently, exporting member countries with foreign exchange constraints would probably prefer to export to nonmember countries in order to receive payment in hard currencies. This could be one reason for LAFTA's poor trade performance. But, if LAFTA importers received easier credit from nonmember countries they may have preferred to import from them.

Third, positive integration among LAFTA countries probably progressed less than expected because developing countries are basically "policy takers" vis-à-vis industrial countries. They react to policy changes in industrial countries, which leaves them little room to maneuver.

Finally, it should be pointed out that trade between member countries could have increased even with the given production

pattern, but it did not materialize. Actual integration of markets should lead to an adjustment in the pattern of production and consumption, thus stimulating trade among member countries. The poor performance here indicates that specialization among the LAFTA countries did not develop.

CARICOM

CARICOM, created in 1973, has replaced and extended the work of the Caribbean Free Trade Association (CARIFTA), which was established in January 1967.[36] The change in name indicates that CARICOM is expected to reach a higher stage of integration than CARIFTA. The treaty establishing CARICOM calls it a "Caribbean Common Market."[37] The treaty also specifies the objectives of this common market as the strengthening, coordination, and regulation of economic and trade relations among member states in order to promote harmonious and balanced development, and the sustained expansion and continuing integration of economic activities, the benefits of which are to be equally shared, taking into account the need to provide special opportunities for less-developed countries. Thus, the treaty clearly states that positive policy integration is envisaged, as well as negative.

CARICOM's development strategy for the Caribbean includes a regional food and nutrition strategy. The major problems concerning food security are perceived to be in the area of production and marketing. Consequently, the food strategy, which has been agreed on at the CARICOM level but is to be carried out largely by individual member countries, encompasses a wide variety of instruments. These include adjustments of consumption patterns to potential supply, activities to promote inputs, and improvements in processing infrastructure, in the transportation system for food commodities, in the facilities available to small trad-

ers, and in regulations affecting trade in agricultural commodities, and establishment of effective market information systems. All these activities can be considered trade-supporting devices. Certainly, their implementation will require time, and trade flows to date can only partly reflect the efficiency of these strategies. But, because their attitude toward intra-CARICOM trade in agricultural commodities has been so positive, their trade performance is of interest.

In a study of the export performances of the four CARICOM members for which the most comprehensive trade data are available—Barbados, Guyana, Jamaica, and Trinidad and Tobago—Bennett finds that food products constitute the most important items traded by these countries regionally.[38] Food exports increased at an annual rate of 19.5 percent between 1969 and 1976. In investigating whether this growth in food exports was due to regional preference, he applies a partial market share analysis model. By comparing actual exports to member countries with hypothetical exports that might have materialized if exporting CARICOM countries had held the same share of imports as in the year 1976, he identifies export changes from regional preference. Table 31, in the Appendix, presents the results of his calculations. Surprisingly, preference-induced exports of agricultural products were generally high; moreover, they were comparable with export growth for nonagricultural products. Hence, he concludes that the potential for growth in agricultural trade is high, and schemes that concentrate on trade in non-agricultural products may not be advisable.

East African Community

The East African Community (EAC), formed in 1967 by Kenya, Uganda, and Tanzania, aimed to set up a common market. It ceased functioning in 1977. Although this integration scheme was shortlived, it

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[36] Twelve countries are members of CARICOM, including Antigua, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, Montserrat, St. Kitts-Nevis-Anguilla, St. Lucia, St. Vincent-Grenadines, and Trinidad-Tobago.

[37] See Caribbean Community, *Regional Food and Nutrition Strategy,* vol. 1, *Policy Statement for the 1980s* (Georgetown, Guyana: Caribbean Community Secretariat, 1982).

[38] Karl M. Bennett, "An Evaluation of the Contribution of CARICOM to Intra-Regional Caribbean Trade," *Social and Economic Studies* 31 (No. 1, 1982): 74-88.

serves as a model for integrating the economies of smaller African countries. A short analysis of its performance and reasons for its breakdown can help to identify important determinants of success or failure of integration schemes.

The history of the three countries seemed favorable for an integration scheme. Under British colonial rule, the three were united in a customs union. They had a common tax collection service and operated joint rail, airport, postal, and telecommunication services.[39] There was even monetary cooperation. When the countries became independent in the early 1960s, it seemed logical to strengthen the union through the formation of an East African Community. The integration scheme intended to set up a common market and to harmonize national agricultural policies.[40] Article 14 of the Community's treaty states that the "Common Market should extend to agriculture and trade in agriculture."[41] However, the general principle of tariff-free, intracommunity trade was broken for the most important agricultural products; maize, wheat, rice, raw coffee beans, meat, milk, and sorghum were excluded.[42] It was argued that basic food products and major export products should be excluded from free intraregional trade because the individual countries managed special marketing institutions (boards) for these products and set official prices in accordance with domestic policy objectives. Intracommunity trade in agricultural products decreased in importance thereafter.[43]

The following example characterizes the situation concerning agricultural trade. In June and July 1961 there was a serious food shortage in Kenya and Tanzania, but a maize surplus in Uganda. The Kenya Maize Board tried to import from Uganda, but the Ugandan Trade Ministry was reluctant to offer export licenses. By the time it did, the Kenyan Maize Board had already imported more expensive maize from overseas. Kenya then refused to grant import licenses because additional imports of relatively cheap maize would have depressed market prices, and the Board would have experienced a loss because of the high-priced imports already purchased.[44]

Contrary to what some authors believe, the contraction of trade is more likely to have arisen from restrictions than from a lack of trading potential because of differences in comparative advantage.[45] Differences in the stability of cereal production among the three countries may have given rise to trade flows even without specialization of production. Whereas cereal production fluctuated only 6.4 percent on the community level for the period 1960-80, it fluctuated 9-10.8 percent in individual countries.[46] Hence, trade among the partner countries would have stabilized cereal consumption considerably. If countries did not choose to trade, it was not for lack of trading opportunities.

Trade-eroding interventions appear to be the culprit in the demise of the EAC; domestic agricultural trade was highly regulated, parastatal trade organizations played a major role, and economic systems varied widely. Some countries were more market oriented and others more oriented to social planning. These ideological differences contributed to the final collapse of the EAC,

[39] See Harold K. Jacobson and Dudan Sidjanski, "Regional Pattern of Economic Cooperation," in *Comparative Regional Systems. West and East Europe, North America, The Middle East, and Developing Countries,* ed. Werner J. Feld and Gavin Boyd (New York: Pergamon Press, 1979), p. 85.

[40] Gunther Friedrich, "Gemeinsamer Markt in Ostafrika und Zentralamerika ein Vergleich," *Beiheste zu Verssasung und Recht in Übersees* (No. 6, 1975), p. 119.

[41] Quoted by Adolf Weber and Thomas T. Hartmann in "A Comparative Study of Economic Integration with Special Reference to Agricultural Policy in the East African Community," *Festschrift fuer auslaendische Land-wirtschaft* 15 (No. 2, 1976): 110.

[42] See Friedrich, "Gemeinsamer Markt in Ostafrika und Zentralamerika," p. 117.

[43] Weber and Hartmann, "Comparative Study of Economic Integration," p. 119.

[44] Friedrich, "Gemeinsamer Markt in Ostafrika und Zentralamerika," p. 119.

[45] Weber and Hartmann, "Comparative Study of Economic Integration," p. 120.

[46] Ulrich Koester, "Regional Cooperation among Developing Countries to Improve Food Security," *Quarterly Journal of International Agriculture* 23 (No. 2, 1984): 105.

although they were not the only cause. Ravenhill identifies five principal reasons for the breakdown: different economic conditions at the start, poor institutional infrastructure, imbalances in capturing integration benefits, different external trade relationships, and ideological divergences and political volatility.[47] The uneven distribution of benefits has often been identified as the most important factor. Actually, it is this aspect that has been a dominant factor in the failure of many integration efforts in developing countries.

West African Economic Community

The West African Economic Community (CEAO) is an old scheme that has had a peculiar evolution. CEAO is the successor of the Customs Union of West African Countries, which was established in 1959 by the Ivory Coast, Mali, Mauritania, Niger, Senegal, and Upper Volta (now Burkina Faso). A new convention was signed in 1966, and the present name was adopted in 1970. The CEAO treaty was activated in January 1974. Its declared objective is to promote balanced economic development of member states with a view to improving living standards as quickly as possible. According to the treaty, "The instruments for achieving this general objective are to be active policies of cooperation in a variety of policy areas including steps to develop trade in agricultural and industrial production on an organized basis."[48] A preferential import duty regime, termed the regional cooperation tax (TCR), was instituted as the primary instrument. As Peter Robson describes it, "The level of the TCR is separately determined for each enterprise, product, and country by the Council of Ministers, and that body only considers applications that are put forward by the government of the country in which the enterprise seeking TCR status is domiciled."[49]

How such a system could affect the allocative efficiency of market integration can be shown. A system of special duties on intraregional trade and uneven duties on extraregional trade is likely to undermine intraregional trade flows. This will occur if the price level in each country is determined by the supply price of countries outside the region, and if the domestic price increased by the TCR rate of one country is greater than the domestic price in the partner country.

Hypothetically, import prices from nonmember countries would almost always be lower than import prices from partner countries. But there would be a few exceptions. In these cases transport costs would probably discourage trade flows because the countries are not neighbors.

Of course, such calculations do not rule out all possibility of intraregional trade in these products. Some external tariffs could be redundant as the countries become self-sufficient or even exporters. Or transport costs could make intraregional supply cheaper than extraregional supply, even with lower tariffs for the latter. Nevertheless, institutional arrangements to avoid undesired distributional effects can completely counteract market integration.

Obstacles to Integration

The experiences of developing countries in integrating their food economies have been somewhat different from those of the EC. Nevertheless, there are common causes for the often disappointing progress in these schemes. The EC started with a high degree of formal integration but had to postpone actual progress in integrating the food economies of the member countries two years after the formal integration agreement was concluded. Most developing countries' schemes were intended to promote actual

[47] John Ravenhill, "Regional Integration and Development in Africa: Lessons from the East African Community," *Journal of Commonwealth and Comparative Politics* 27 (No. 3, 1979): 227-246.
[48] Quoted in Peter Robson, *Integration, Development, and Equity: Economic Integration in West Africa* (London: George Allen and Unwin, 1983), p. 42.
[49] Ibid, p. 45.

integration but have not succeeded because of divergences in national interests, as the result of differences in policy objectives and economic and political environments in the countries. In every country that belongs to an integration scheme the government intervenes significantly in the economy. Countries have felt the need to achieve policy objectives and to remain autonomous in designing their food policies, rather than accepting the rules of a regional integration scheme. Conflicts of interest are partly due to variations in the design of overall economic policy and partly to the specifics of national food policies.

The economic and political systems in developing countries range from the completely market-oriented economies to the centrally planned socialist economies. It is quite obvious that such a mixture does not favor agricultural trade liberalization among countries. A centrally planned economy implies that the government will at least set official prices on markets and control production. Opening up the borders would weaken the central planning authority. Moreover, uncoordinated central planning in some integrating countries is not feasible. Hence, a strong commitment to central planning acts against integration of national markets.

Planning elements dominate developing countries' food policy. Most governments intervene in agricultural markets in order to achieve food policy objectives. In addition, they may intervene because of budgetary needs. Export taxes on agricultural export crops are a special case in point. If agricultural price policy is considered the most important instrument for achieving policy objectives, it is likely that optimal prices will differ from country to country. Liberalized intraregional trade is not compatible with autonomous national price policies; it seeks to coordinate and equalize national prices. However, these equalized prices cannot serve all national policy objectives equally well, because objectives may differ as well as the opportunity costs for achieving these objectives.

A major reason that integration efforts have been only marginally positive or negative is the general inefficiency of economic policies in developing countries. Integration will only function if specific policy instruments are applied. If they are not, integration may be as ineffective as any other measure.

In addition to harmony in food policies, free trade in agricultural products within a region demands harmony in monetary and exchange rate policies. If governments intervene in the foreign exchange market—as is done in most developing countries—prices for foreign exchange are distorted. Countries may therefore be reluctant to accept partner countries' currencies in exchange for their products. The greater the overvaluation of currencies within a specific integration scheme, the more this concern is justified, especially if monetary policy varies greatly among the member countries.

The bias in development policy in most developing countries is a special obstacle. Countries most emphasize development of their industrial sectors, often at a cost to agriculture. Agricultural prices may vary considerably among neighboring countries. If countries were to open their borders for liberalized intraregional trade, they would not be allowed to tax agriculture differently than partner countries. However, the loss in achievement of development objectives—promotion of industry—will vary from country to country. From this viewpoint, countries' unwillingness to liberalize intraregional agricultural trade may be understandable.

Again, the reasons mentioned so far for the reluctance of developing countries to free intraregional trade can be summarized in one specific effect of trade liberalization—the uneven distribution of benefits and costs among partner countries. The more developed the country, the more it probably stands to gain from the enlargement of markets. The concern about uneven distributional effects has led some integration schemes to make specific institutional arrangements to avoid unwanted distributional effects. Unfortunately, these arrangements can also have detrimental effects on efficiency.

Negative policy integration—reduction of trade barriers for intraregional trade—will most likely not be sufficient to promote intraregional trade in agricultural products. Apart from necessary food and monetary

policy harmonization, marketing infrastructure should be improved. Coordinating policies possibly contributes more to intraregional trade promotion than reducing trade barriers.

Finally, political tensions among partner countries or animosities between political leaders have contributed to the slow progress of some integration schemes or have even led to the suspension of a scheme, as in the case of the EAC.

This short review of the experiences of some older integration schemes may lead to the conclusion that the prospects for any new cooperative endeavor, such as SADCC, are bleak, and hence any further research is useless. This is far from the truth, however. First, the SADCC approach is somewhat unusual; therefore, the experiences of other integration efforts are only partly relevant. Second, identification of possible integration obstacles may help to avoid or overcome them. Third, cooperating countries may be better prepared to overcome obstacles the more they are informed about potential benefits. If these benefits are minor, it would hardly pay to start a new cooperation scheme, but if research indicates high potential benefits, a new integration scheme could succeed.

6

REGIONAL MARKET INTEGRATION AND FOOD SECURITY

Although the SADCC countries do not intend to set up a free trade area in the near future, they are aware that "increasing trade between SADCC members is essential if SADCC is to develop regional cooperation."[50] So far, regional integration schemes have mostly promoted trade in industrial products, perhaps because food policy is considered a sensitive national policy issue requiring a high degree of autonomy. The SADCC countries agree, however, that regional cooperation should contribute to food security in the region.

The SADCC position on liberalizing trade is somewhat ambiguous. On the one hand, leaders of the member countries argue for postponing trade liberalization, on the other hand, six of the nine SADCC countries—Lesotho, Malawi, Swaziland, Tanzania, Zambia, and Zimbabwe—are also members of the Preferential Trade Area for Eastern and Southern Africa (PTA). PTA's ultimate objective is to establish a common market by the year 2000, whereas SADCC's aim is to foster joint actions, such as regional stockpiling. PTA's 15 member countries made the first cut in tariff rates on July 1, 1984. Thus, market integration has already started for many SADCC countries. The following analysis may help assess market integration as a means of improving food security within SADCC and PTA regions, and it may help in assessing other integration efforts.

Trade in agricultural products serves three functions. First, trade can contribute to stabilizing supply when national fluctuations in production are greater than the fluc-tuations in the region. Thus, free intraregional trade among the SADCC countries could be an efficient substitute for national stockpiling and might be used to even out fluctuations in national production. Johnson shows that worldwide free trade in grains would drastically reduce the need for holding carryover stocks, because fluctuations in world cereal production are minimal compared to fluctuations in national production.[51] The same may hold true if variability in production in individual member countries is greater than variability in production for the SADCC region as a whole. However, if production in all countries were perfectly correlated, intraregional trade could not help stabilize consumption.

Second, trade in agricultural products may partly substitute for working stocks if the harvesting calendar differs somewhat among trading partners. Third, trade may allow countries to specialize in production in accordance with comparative advantage. Thus, trade may help to increase national income and improve food security. In this chapter, the potential for trade expansion based on the first and third functions of trade in agricultural products will be investigated.

Cereal Production Variability and Intraregional Trade Potential

Empirical evidence provided by Valdés and Siamwalla leads to the conclusion that food consumption in a region will be more

[50] Hanlon, *SADCC: Progress, Projects, and Prospects,* p. 67.

[51] D. Gale Johnson, "Grain Insurance, Reserves, and Trade: Contributions to Food Security for LDCs," in *Food Security for Developing Countries,* ed. Alberto Valdés (Boulder, Colo.: Westview Press, 1981), pp. 255-286; and D. Gale Johnson, "Food Reserves and International Trade Policy," in *International Trade and Agriculture: Theory and Policy,* ed. Jimmye S. Hillman and Andrew Schmitz (Boulder, Colo.: Westview Press, 1979), pp. 239-252.

stable if its production is more stable than that in individual countries and if trade between countries is allowed.[52] Instability is measured with the Cuddy/Della Valle index.[53] This index is based on the coefficient of variation, corrected by the fitness of a trend function. Thus,

$$I = CV\sqrt{1 - \bar{R}^2}, \qquad (1)$$

where CV is the coefficient of variation and $\bar{R}^2$ is the adjusted coefficient of determination of an arithmetic linear or log-linear trend function.

An instability index based on coefficient of variation is superior to one based on variance, which is often chosen as an instability indicator. Variance does not take into account that the quantity produced or consumed varies among countries.

To derive the relationship between national and regional instability, the variance in production of a region is given by

$$var\left(\sum_{1}^{n}Q_i\right) = \sum_{1}^{n} var\,(Q_i)$$
$$+ 2\sum_{i<j}^{n}\sum^{n} cov\,(Q_i,Q_j), \qquad (2)$$

or

$$var\left(\sum_{1}^{n}Q_i\right) = \sum_{1}^{n} var\,(Q_i)$$
$$+ 2\sum_{i<j}^{n}\sum^{n} r_{ij}\sqrt{var(Q_i)\,var\,(Q_j)}, \qquad (3)$$

where

$var\left(\sum_{1}^{n} Q_i\right)$ = variance of regional production (around the trend),

$1,\dots,n$ = number of countries,

$var\,(Q_i)$ = variance in production of country i and country j, and

cov (Q_i,Q_j) = covariance in production of country i and country j, and

r_{ij} = coefficient of correlation between deviation from trend production of country i and j.

From equation (2) the coefficient of variation can be derived. This results in:

$$cv^2\left(\sum_{1}^{n} Q_i\right) = \sum_{1}^{n} s_i^2\, cv\,(Q_i)$$
$$+ 2\sum_{i<j}^{n}\sum^{n} s_i\, s_j\, r_{ij}\, cv\,(Q_i)\, cv\,(Q_j), \qquad (4)$$

where s_i is the share of country i in regional production.

Equation (4) allows the following conclusions to be drawn. Even if fluctuations in national production among cooperating countries are independent, the coefficient of variation in the region's production may be lower than the coefficient of variation in any individual country. The region's coefficient of variation is not equal to the weighted sum of the individual countries' coefficients of variation but to the square root of the weighted sum raised to the power of two. A schematic example will clarify the point.

Assume there are two countries with production shares of 0.6 and 0.4. The respective coefficients of variation are 0.08 and 0.06. Fluctuations in production are assumed to be independent. According to equation (4), the region receives a coefficient of variation of 0.0537, which is lower than that of either country. Hence, cooperation to reduce supply fluctuations in the region may be reasonable even if fluctuations in production are independent or somewhat positively correlated. Of course, the stabilizing effect will be greater if the countries' fluctuations in production are negatively correlated.

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[52] Valdés and Siamwalla, "Introduction."

[53] The application of this measure implies that instability or variability are interpreted as deviations of actual data from expected data (J. D. A. Cuddy and P. A. Della Valle, "Measuring the Instability of Time Series Data," *Oxford Bulletin of Economics and Statistics* 40 [February 1978]: 79-85).

Even if the coefficient of variation is rejected as a measure of instability in favor of the variance, regional cooperation may be shown to be reasonable even if fluctuations in production are independent. Take, for example, a two-country case, and assume that country A's production is 100, 110, or 90 with equal probability. For country B, production is assumed to be 50, 60, or 40, again with equal probability. The expected value of production is 100 and 50. The variance of production is the same for both countries—66.67. But the coefficients of variation differ: they are 0.086 for country A and 0.163 for country B. In deriving the data set in Table 9, it is assumed that fluctuations in the production of both countries are independent. Hence, there are nine possible outcomes with equal probability. The variance in the region's production is, of course, equal to the sum of individual variances, that is 133.3. But the coefficient of variation is only 0.07689, which is less than the individual coefficients of variation.

Because integration is thought of as a means of stabilizing consumption, consumption data are also given in Table 9. It is assumed that regional consumption is always equal to regional production, and that an individual country's share in consumption is equal to the country's share of expected regional production. This rule guarantees that the coefficient of variation in the individual country's consumption is the same and equal to the coefficient of variation of regional production. But for both countries variance in consumption is smaller as a result of integration. This example illustrates that integration may not only reduce the coefficient of variation in consumption, but the variance as well. This can happen even if fluctuations in production are independent. Hence, negative covariances between fluctuations in production are not a necessary condition for stabilizing consumption via integration.

Instability indexes w, which are corrected coefficients of variation, have been calculated for total cereal production on the basis of data from 1960-80 for the SADCC countries. The individual countries' share in regional production and the matrix of the

Table 9—Fluctuations in regional production and individual countries' consumption

Proba- bility	Joint Pro- duction	Con- sumption in Country A	Con- sumption in Country B
1/9	170	113.3	56.7
1/9	160	106.7	53.3
1/9	150	100.0	50.0
1/9	160	106.7	53.3
1/9	150	100.0	50.0
1/9	140	93.3	46.4
1/9	150	100.0	50.0
1/9	140	93.3	46.4
1/9	130	86.7	43.3
Variance	133.30	59.23	15.27
Coefficient of variation	0.07689	0.07689	0.07689

coefficients of correlation between the countries' fluctuations in production are also shown. Thus one can see the relationship between the region's instability index and those of the individual countries and the rest of the world, which indicates whether an individual country would be better off by integrating regionally or with the rest of the world. Information about the matrix of correlation coefficients and a country's share in regional production allows the calculation of the integration effect of any subgrouping.

Cereal production is volatile in the SADCC countries (see Table 10). Botswana has an unusually high instability index of 68.8. For seven of these nine countries production fluctuates more than 10 percent. Regional cooperation could reduce the instability index to 9.0. All countries would gain, but Tanzania, which has an instability index of 9.2, would gain the least. This indicates that national incentives to cooperate regionally can vary widely.

Although the empirical results indicate that regional cooperation would be a reasonable strategy for achieving greater food security, the instability index is higher for the region than for the rest of the world. Perhaps on these grounds it would be better to integrate national markets directly into

the world market. In reality, however, this may be less advisable than the instability indexes indicate.

If the world grain markets were ruled by free trade, year-to-year price fluctuations would be quite moderate even without any carryover stocks. According to the calculations for this study, world grain production fluctuated by only 2.4 percent during the period 1960-80. Given a world price elasticity of demand of about −0.5, prices would vary by about 4.8 percent. An integrated world grain economy would need no carryover stocks in most years. Carryover stocks only pay if the grain prices expected for the next year are about 15 percent higher than present prices. The probability of such a situation would be slight in an integrated world grain economy. The production shortfall would have to be three times larger than the standard deviation. But according to Tchebycheff's theorem, this would be likely to occur only once in 10 years.[54] If price fluctuations are pronounced, it indicates that individual countries are not allowing trade to compensate for fluctuations in production. Moreover, national stocks are not being managed to stabilize world market prices efficiently. Hence, national stocks are needed, and regional cooperation may be considered a rational strategy.

Comparative Advantage and the Potential for Trade Expansion

Global Trade Performance

So far, trade among the SADCC countries has been minimal (see Chapter 3, Table 3), but international trade of individual countries has been quite significant. This could support the widespread opinion that because the countries have similar factor

endowments and climatic conditions, their production patterns are too similar. With only limited complementarity, the potential for intraregional trade could be small.

To test this hypothesis, a production similarity index is calculated.[55] This index is defined by the formula:

$$S^Q(ab, c)$$

$$= \{\Sigma_i \text{ Minimum } [x_i(ac), x_i(bc)]\}\, 100, \quad (5)$$

which measures the similarity of the production patterns of countries a and b. $x_i(ac)$ is the share of commodity i in a's agricultural production, and $x_i(bc)$ is the share of commodity i in b's agricultural production.

Product	Country a	
	Value	$x_i(ac)$
1	$ 400	0.4
2	$ 600	0.6
Total	$1,000	1.0

Product	Country b	
	Value	$x_i(ac)$
1	$ >0	0.7
2	$ 30	0.3
Total	$100	1.0

Thus,

$$S^Q(ab, c) = 100[\min 0.4, 0.7 +$$
$$\min 0.6, 0.3] = 70. \quad (6)$$

The example clearly shows that the index will be 1 if the production patterns of the two countries are completely similar. The index will be 0 if the production patterns are completely dissimilar.

Table 11 presents empirical results for the three-year average, 1977-79. There are

[54] Tchebycheff's theorem states that it is possible to determine what proportion of a distribution lies within specifiable ranges of its mean. This information can be derived if the variance and the mean of the distribution are known.

[55] This index is completely analogous to the export similarity index developed by Finger and Kreinin. See J. M. Finger and M. E. Kreinin, "A Measure of 'Export Similarity' and its Possible Uses," *Economic Journal* 89 (December 1979): 905-912.

Table 10—Instability in cereal production, SADCC countries, 1960-80

Country	Production Share	Instability Index	Correlation Coefficients								
			Angola	Botswana	Lesotho	Malawi	Mozambique	Zimbabwe	Swaziland	Tanzania	Zambia
Angola	0.0779	9.8120	1.0000								
Botswana	0.0082	68.8476	0.2114	1.0000							
Lesotho	0.0315	19.6511	-0.4517	-0.1322	1.0000						
Malawi	0.1782	11.6434	0.0292	0.0986	0.2541	1.0000					
Mozambique	0.1008	12.7504	0.2638	0.2563	-0.1770	0.5577	1.0000				
Zimbabwe	0.2496	22.3248	0.2796	0.6722	-0.0878	0.1533	0.1533	1.0000			
Swaziland	0.0109	26.4070	0.3907	0.6331	-0.2191	0.4021	0.4021	0.7947	1.0000		
Tanzania	0.1962	9.2383	-0.2381	-0.2786	0.0448	-0.1822	-0.2432	-0.1697	-0.2908	1.0000	
Zambia	0.1467	12.6643	0.2832	0.7444	-0.0584	0.3779	0.3451	0.6367	0.6002	-0.2908	1.0000

Note: The instability index for the region was 9.0222 and that for the rest of the world was 2.3999.

Table 11—Production similarity indexes, 1977-79

Country	Angola	Botswana	Lesotho	Malawi	Mozambique	Swaziland	Tanzania	Zambia	Zimbabwe
Angola	...	18.22	11.33	62.07	85.90	17.74	37.63	53.18	68.95
Botswana	...		62.19	29.36	15.66	97.38	6.86	34.26	12.56
Lesotho	...			18.26	9.73	63.86	4.26	21.31	7.81
Malawi	...				53.30	28.59	23.36	85.68	42.80
Mozambique	...					14.91	43.81	45.68	80.27
Swaziland	...						6.68	33.40	12.25
Tanzania	...							20.01	54.58
Zambia	...								36.67

Source: Author's calculations based on the data for 47 products from the Food and Agriculture Organization of the United Nations, *FAO Production Yearbook* (Rome: FAO, various years).

Notes: An index of 100 shows that the patterns of the two countries are completely alike; an index of 0 shows them to be completely dissimilar.

significant differences in the production patterns of the countries, especially of Tanzania. The smallest countries in the region, Botswana, Lesotho, and Swaziland, are the most similar. This could be because their resources and climate are similar or it could be the consequence of similar agricultural policies aimed at autarky. The actual cause may be revealed when the export patterns of the countries are investigated.

Similarity of production patterns can also be examined with the help of a comparative production performance coefficient (CQP), which is defined as

$$CQP = Q_{ij}/Q_{iw} : \sum_{i=1}^{49} Q_{ij}/\sum_{i=1}^{w} Q_{iw}. \quad (7)$$

Q stands for quantity produced, and the subscripts i, j, and w refer to the type of product, the country in question, and the world, respectively. An index value of more than unity means that the particular commodity has a larger share in total agricultural production of the individual country than it has in world production.

If the hypothesis is correct that the nine SADCC countries have similar resources and climates, the CQP coefficients for individual products of the countries will vary only a little, if at all. Since it is not possible to present the coefficients for all 49 products included in the calculations, Table 12 gives only the three products with the highest coefficients for each country. Some products are obviously much more important for individual SADCC countries than for world agriculture. But a different set of products is of major interest for the individual countries. Eighteen products rank among the top three from the point of view of the individual countries. Only five products are ranked more than once. This clearly indicates that the agricultural production pattern differs considerably among the SADCC countries.

Differences in the production pattern will most likely be reflected in differences in the export patterns of the individual countries. To investigate this hypothesis some additional indexes have been calculated. In Table 13 export similarity indexes are presented.[56] This index is defined by the formula:

$$S(a, b, c)$$

$$= \{ \sum_{i=1}^{49} \text{Minimum } [x_i (ac), x_i (bc)] \} 100, \quad (8)$$

which measures the similarity of the export patterns of countries a and b to market c. x_i (ac) is the share of commodity i in a's exports to c and x_i (bc) is the share of commodity i in b's exports to c. If the export patterns of countries a and b are the same, it holds that x_i (ac) = x_i (bc) for each product i. In this case, the index will take on a value of 100. If the export patterns are completely dissimilar, the value of the index will be zero.

In carrying out the calculations, world exports of SADCC countries are also compared by pairing countries that are most similar. The generally low indexes indicate that for the most part the export patterns are dissimilar. The exports of Zambia and Malawi were most alike, followed by those of Zambia and Zimbabwe, but even indexes around 50 do not support the hypothesis that there is limited scope for trade within the region because the countries are too similar. Finger and Kreinin found similarity indexes around 50 for U.S.-EC exports in the early 1970s, but there has since been a significant expansion in U.S.-EC bilateral trade.[57] Dissimilar patterns of agricultural exports among the SADCC countries raise expectations for expanding intraregional trade in agricultural products through market integration. Other indicators support these expectations, too.

If the countries under consideration were really similar in production and trade patterns, coefficients for comparative advantage (RCA) and comparative export perfor-

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[56] Ibid.
[57] Ibid.

Table 12—Comparative production performance indexes, 1967-69, 1972-74, and 1977-79

Country	Product	Index		
		1967-69	1972-74	1977-79
Angola	Coffee	21.23	32.54	17.20
	Palm oil	10.84	20.34	12.70
	Cassava	7.22	11.03	19.13
Botswana	Beef	6.67	8.29	6.44
	Maize	5.59	1.88	2.32
	Groundnuts	2.64	2.76	2.66
Lesotho	Mutton	9.63	11.55	7.24
	Wool	8.90	9.09	5.65
	Maize	2.59	5.08	4.09
Malawi	Tea	20.58	26.49	37.14
	Groundnuts	16.80	18.38	19.14
	Tobacco	4.69	11.32	19.51
Mozambique	Cashew nuts	0.91	188.67	351.92
	Copra	8.62	9.65	18.79
	Cassava	11.34	12.78	15.37
Swaziland	Sugar	14.02	10.70	21.06
	Oranges	11.80	n.a.	10.10
	Cotton	1.58	1.30	3.19
Tanzania	Sisal	n.a.	80.22	102.91
	Cassava	5.33	11.97	17.63
	Banana	6.48	7.02	9.54
Zambia	Groundnuts	8.95	n.a.	9.56
	Millet and sorghum	7.29	n.a.	2.44
	Maize	5.95	n.a.	5.13
Zimbabwe	Millet and sorghum	n.a.	n.a.	20.60
	Tobacco	n.a.	n.a.	14.27
	Groundnuts	n.a.	n.a.	5.74

Source: Author's calculations based on the data for 47 products from the Food and Agriculture Organization of the United Nations, *FAO Production Yearbook* (Rome: FAO, various years).
Notes: n.a. stands for not available. Indexes greater than 1 mean that the commodity has a larger share in agricultural production in the country than in the world. The indexes shown for each country are for the three crops with the highest coefficients.

mance (CEP) would be similar.[58] The RCA indicators have been calculated according to the following formula:

$$RCA = \ln (X_i/M_i; \sum_{i=1}^{49} X_i / \sum_{i=1}^{49} M_i), \quad (9)$$

where X_i and M_i denote exports and imports, respectively, of 49 agricultural prod-

ucts. The higher the RCA index, the more successful is the country in exporting product i. The RCA index will be negative if the country is only importing product i or if the ratio of export and import values for product i is smaller than the ratio of the total agricultural exports and imports.

The measure used for calculating CEP coefficients is

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[58] These and other indexes have been applied by Joürgen Donges et al., *The Second Enlargement of the European Community: Adjustment Requirements and Challenges for Policy Reform,* Kieler Studies 1971 (Tuebingen: J. C. Mohr, 1982), p. 78. Also see J. M. Finger and D. A. Derose, "Trade Overlap, Comparative Advantage, and Protection," in *On the Economics of Intra-Industry Trade: Symposium 1978,* ed. H. Giersch (Tuebingen: J.C. Mohr, 1979), pp. 213-240.

Table 13—Export similarity indexes, 1977-79

Country	Angola	Botswana	Lesotho	Malawi	Mozambique	Swaziland	Tanzania	Zambia	Zimbabwe
Angola	...	0.36	0.00	3.73	9.61	9.09	59.49	3.51	12.33
Botswana	...	...	1.49	2.16	2.27	9.02	2.86	2.39	17.51
Lesotho	...	...	...	1.58	1.14	0.95	2.06	0.11	0.28
Malawi	...	...	...	...	38.43	12.13	20.28	53.98	49.34
Mozambique	...	...	...	...	...	25.31	35.36	12.00	30.48
Swaziland	...	...	...	...	...	...	6.84	5.00	19.52
Tanzania	...	...	...	...	...	...	...	14.09	37.51
Zambia	...	...	...	...	...	...	...	...	51.15

Source: Author's calculations based on 49 agricultural products. Export data were taken from the United Nations Conference on Trade and Development, "Export Value Tape," Geneva, 1980.

Notes: An index of 100 means that the export patterns of two countries are completely alike; an index of 0 means that they are completely dissimilar.

$$CEP = X_i/X_{iw} : \left(\sum_{i=1}^{49} X_i / \sum_{i=1}^{49} X_{iw} \right) , \quad (10)$$

where X_i are export values for product i of the country under consideration and X_{iw} are world exports of product i. An index of more than unity says that the individual country's export values of product i divided by the country's total agricultural export values are greater than the world exports of product i divided by the value of total agricultural exports. Thus, CEP>1 implies that export product i is more important from the individual country's point of view than for the world.

RCA and CEP indicators have been calculated for 49 agricultural products. But for lack of space, Table 14 only gives the results and export shares for the most important products. All countries appear to be highly specialized as far as agricultural exports are concerned. RCA and CEP coefficients are generally high for the dominant export products. However, the pattern of specialization differs considerably among the countries. As a consequence, the SADCC region is much less specialized than the individual countries. Again, this supports the hypothesis that SADCC countries either differ considerably in their production possibilities or they have decided to specialize in different directions. In any event, the potential for expanding intraregional trade is there, even if present production patterns are not changed. That this potential has not been exploited so far is revealed by the trade overlap indicator (Table 15). This indicator is defined as:

$$TO = 2 \left(\sum_{i=1}^{49} \min (X_i, M_i) \right) /$$
$$\sum_{i=1}^{49} (X_i + M_i). \quad (11)$$

The coefficient varies between O and 1 for each of 49 products. It will be zero if the country only exports or imports a product. It will be 1 if a country both exports and imports a product.

It may be argued that trade will overlap only slightly for agricultural products be-cause a country produces either a surplus of a product or it has to bridge a deficit. But this argument neglects the geographical dimension of the countries and their internal heterogeneity. The RCA and CEP coefficients indicate a significant heterogeneity among the SADCC countries. It cannot be expected, however, that the production pattern among subregions within a country will be homogeneous or that national border lines will enclose an area of homogeneous production. Indeed, natural conditions are often similar between subregions that are divided by a national boundary, whereas areas that are not closely related to each other but belong to the same national entity may not be at all alike. Thus one would expect significant trade in agricultural products among subregions within a country, and among neighboring countries as well. But Table 15 does not support these expectations. There is almost no trade overlap for most of the SADCC countries. The only exception is Lesotho where trade flows probably overlap because of Lesotho's membership in the South African Customs Union.

Of special interest are the overlap indexes for the SADCC region as a whole (last line of Table 15). On average, the region spent about 15 percent of the revenue gained from exporting a product for imports of the same product. This clearly supports the hypothesis that there is a potential for expanding intraregional trade. The trade overlap indicator for the region underestimates the potential on two counts. First, it does not take into consideration the trade potential from heterogeneity among subregions within a country, as discussed above. Second, at present the countries are not specialized according to comparative advantage because prices and price ratios differ. Free trade would lead to an equalization of prices and price ratios, it would affect the countries' production patterns, and thus it would enlarge the potential for intraregional trade.

So far, only an aggregate overview has been represented. A more disaggregated presentation follows in order to specify those products for which intraregional trade expansion can be expected to expand the

Table 14—Export performances of main agricultural products, 1967-69, 1972-74, and 1977-79

Country	Product	Years	Export Value as Share of Total Agricultural Exports	Revealed Comparative Advantage Index[a]	Comparative Export Performance Index[b]
Angola	Coffee	1967-69	75.8	76.7	11.5
		1972-74	69.4	8.9	13.8
		1977-79	86.7	16.4	10.5
	Maize	1967-69	5.3	5.0	1.3
		1972-74	2.7	0.2	0.5
		1977-79	0.0	−14.0	0.0
	Cotton	1967-69	4.6	7.2	0.7
		1972-74	6.4	12.9	1.2
		1977-79	5.7	13.7	1.3
Botswana	Live animals	1967-69	55.8	3.4	18.4
		1972-74	5.8	1.4	1.9
		1977-79	0.7	−0.8	0.2
	Fresh, frozen, and chilled meat	1967-69	33.1	12.5	4.4
		1972-74	91.0	4.8	10.7
		1977-79	92.3	3.7	10.6
	Cotton	1967-69	3.0	10.1	0.5
		1972-74	0.4	8.5	0.1
		1977-79	0.3	9.1	0.1
Lesotho	Live animals	1967-69	67.1	0.3	22.1
		1972-74	48.2	0.6	15.7
		1977-79	46.1	0.4	16.9
	Wheat and meslin	1967-69	8.1	10.7	1.0
		1972-74	1.5	9.8	0.2
		1977-79	0.0	−9.7	0.0
	Wool	1967-69	18.7	11.5	4.3
		1972-74	46.5	13.3	15.4
		1977-79	41.8	14.2	19.5
Malawi	Tobacco, unmanufactured	1967-69	40.0	0.2	11.5
		1972-74	50.8	0.7	20.2
		1977-79	58.1	2.4	24.1
	Tea and maté	1967-69	26.1	5.0	14.1
		1972-74	20.5	3.2	20.4
		1977-79	21.3	5.1	16.8
	Oilseeds	1967-69	16.3	5.6	3.4
		1972-74	9.7	5.1	1.7
		1977-79	5.1	4.5	0.9
Mozambique	Cotton	1967-69	31.1	13.7	4.9
		1972-74	27.5	9.2	5.3
		1977-79	22.5	14.2	5.2
	Sugar and honey	1967-69	19.4	3.5	3.7
		1972-74	28.2	6.2	3.8
		1977-79	17.7	14.0	2.9
	Oilseeds	1967-69	12.7	0.5	2.6
		1972-74	11.7	0.7	2.1
		1977-79	15.3	13.9	2.7

(continued)

Table 14—Continued

Country	Product	Year	Export Value as Share of Total Agricultural Exports	Revealed Comparative Advantage Index[a]	Comparative Export Performance Index[b]
Swaziland	Sugar and honey	1967-69	64.2	12.8	12.2
		1972-74	72.0	13.4	9.7
		1977-79	77.0	14.2	12.6
	Fresh fruits and nuts	1967-69	14.8	11.4	2.9
		1972-74	10.3	11.5	2.7
		1977-79	8.5	12.0	2.2
	Live animals	1967-69	8.4	−1.4	2.8
		1972-74	4.0	−1.5	1.3
		1977-79	1.0	−2.5	0.3
Tanzania	Cotton	1967-69	26.9	13.3	4.2
		1972-74	27.2	14.6	5.3
		1977-79	16.8	7.9	3.9
	Coffee	1967-69	26.6	5.8	4.0
		1972-74	29.7	7.8	5.9
		1977-79	50.7	11.6	5.1
	Vegetable fibers	1967-69	18.2	12.9	45.8
		1972-74	19.5	14.3	52.8
		1977-79	8.2	13.3	40.8
Zambia	Maize	1967-69	46.5	2.3	11.3
		1972-74	37.9	2.7	6.9
		1977-79	41.3	1.2	7.4
	Tobacco, unmanufactured	1967-69	37.3	14.0	10.7
		1972-74	47.4	14.8	18.9
		1977-79	45.9	14.8	18.8
	Oilseeds	1967-69	9.8	4.8	2.0
		1972-74	9.8	6.7	1.7
		1977-79	8.2	1.7	1.4
Zimbabwe	Tobacco, unmanufactured	1967-69	42.7	13.1	12.3
		1972-74	45.3	13.6	18.1
		1977-79	35.7	1.9	14.7
	Fresh, frozen and chilled meat	1967-69	25.3	12.5	3.4
		1972-74	16.8	12.6	2.0
		1977-79	14.6	1.7	1.7
	Cotton	1967-69	9.8	11.6	1.5
		1972-74	16.2	12.6	3.1
		1977-79	17.5	12.5	4.0
SADCC	Coffee	1967-69	28.3	4.2	4.3
		1972-74	26.0	4.5	5.0
		1977-79	15.2	4.6	3.7
	Cotton	1967-69	14.4	9.8	2.3
		1972-74	14.8	10.2	2.8
		1977-79	5.6	9.0	2.6
	Maize	1967-69	5.0	0.8	1.2
		1972-74	3.4	−0.8	0.6
		1977-79	1.5	−0.7	0.5
	Tea and maté	1967-69	5.0	1.4	2.7
		1972-74	3.8	1.4	3.5
		1977-79	3.0	2.0	4.8
	Tobacco, unmanufactured	1967-69	12.2	1.5	3.5
		1972-74	17.1	2.1	6.6
		1977-79	9.9	3.5	8.1

Table 14—Continued

Country	Product	Year	Export Value as Share of Total Agricultural Exports	Revealed Comparative Advantage Index[a]	Comparative Export Performance Index[b]
	Vegetable fibers	1967-69	6.3	7.2	15.8
		1972-74	7.2	7.1	18.8
		1977-79	1.3	14.0	13.0
	Oilseeds	1967-69	5.8	1.3	1.2
		1972-74	3.7	1.5	0.6
		1977-79	1.1	1.0	0.4
	Sugar and honey	1967-69	7.0	0.6	1.3
		1972-74	11.1	0.5	1.4
		1977-79	4.6	0.1	1.5
	Fresh, frozen, and chilled meat	1967-69	5.0	0.1	0.7
		1972-74	7.4	0.8	0.8
		1977-79	4.0	1.0	0.9
	Fresh fruits and nuts	1967-69	1.1	−0.3	0.2
		1972-74	2.0	0.7	0.5
		1977-79	0.8	2.8	0.4
	Animal feeds	1967-69	1.5	2.0	0.6
		1972-74	11.7	0.9	0.4
		1977-79	0.5	0.6	0.3
	Wool	1967-69	0.2	10.5	0.1
		1972-74	0.4	11.8	0.1
		1977-79	0.1	11.7	0.1

Source: Author's calculations based on International Food Policy Research Institute, "Intra-LDC Trade Data Base," Washington, D.C., 1985 (computer printout).
[a] The higher the Revealed Comparative Advantage Index, the more successful the country has been at exporting the product.
[b] A Comparative Export Performance Index greater than 1 means that exports of a product are a larger part of the total agricultural exports of the country than of the world.

most. For SADCC, this coefficient has been calculated as

$$TE = [Min\ (X_i,\ M_i)/$$
$$Max\ (X_i,\ M_i)] \cdot 100. \quad (12)$$

This coefficient indicates the percentage of the region's exports that are matched by imports from the region. The results for products with a coefficient greater than 10 in 1977-79 are presented in Table 16. Products with the greatest scope for expanding intraregional trade are live animals, meat, maize, vegetables, sugar and honey, vegetable oils, and animal feeds. In 1977-79, intraregional trade as a percentage of foreign trade for these products ranged from 19.1 percent (animal feed) to 76.2 percent (vege-

Table 15—Trade overlap indicators for agricultural exports, 1967-69, 1972-74, and 1977-79

Country	1967-69	1972-74	1977-79
Angola	0.0306	0.0455	0.0029
Botswana	0.0455	0.0235	0.0598
Lesotho	0.4510	0.3372	0.1984
Malawi	0.1440	0.1357	0.0221
Mozambique	0.1194	0.0984	0.0553
Swaziland	0.1743	0.0789	0.0611
Tanzania	0.0714	0.0350	0.0443
Zambia	0.0785	0.0496	0.1642
Zimbabwe	0.0014	0.0016	0.0212
SADCC region	0.1518	0.1552	0.1643

Source: Author's calculations based on International Food Policy Research Institute, "Intra-LDC Trade Data Base," Washington, D.C., 1985 (computer printout).

Table 16—Potential intraregional trade as a percentage of foreign trade, selected products, various years

Commodity	1967-69	1972-74	1977-79
Live animals	41.0	91.3	33.9
Fresh, frozen, and chilled meat	26.1	13.1	12.4
Dried, salted, and smoked meat	72.0	82.0	14.2
Meat preparations	33.5	39.7	36.4
Cheese and curd	4.1	14.4	12.5
Maize	13.7	71.2	71.8
Cereals not else- where specified	20.4	8.4	87.1
Prepared cereals	0.0	0.0	33.9
Vegetables	57.6	38.8	76.2
Sugar and honey	17.0	18.1	32.0
Cocoa	12.6	14.1	19.7
Spices	100.0	43.9	21.4
Animal feeds	4.2	12.9	19.1
Oilseeds	7.7	6.7	12.3
Soft fixed vegetable oils	54.2	40.0	24.6
Other fixed vegetable oils	16.5	31.2	41.1
Total of min (X_i, M_i) as a percentage of total agricultural exports	9.8	10.1	11.1

Source: Author's calculations based on International Food Policy Research Institute, "Intra-LDC Trade Data Base," Washington, D.C., 1985 (computer printout).

Notes: These values are calculated by taking the lesser between the value of exports and the value of imports of a commodity in a period, and dividing it by the greater, and multiplying by 100:

$$TE = [min\ (x_i,\ xm_i)/max\ (x_i,\ m_i)]\ 100.$$

tables). If the trade pattern for 1977-79 can be accepted as a reference, intraregional trade in agricultural products could account for 11 percent of foreign trade in agricultural products. Again, it must be emphasized that these results underestimate the actual trade potential. Market integration among the SADCC countries would certainly affect the countries' production and trade patterns and thus increase trade more than is likely in the present production and trade situation. Moreover, dynamic effects will help to boost intraregional trade. Trade in meat and animal feed, which is already promising, is likely to have the most benefit. Sarma has observed a strong tendency for growth in livestock consumption and feed use in developing countries.[59] If these trends continue, market integration among the SADCC countries would probably generate more highly positive changes in trade flows than indicated by the past trade pattern. Because RCA and CEP indexes for meat and animal feed vary among the countries, intraregional specialization could give rise to additional intraregional trade.

The impact of market integration on production and consumption of staple foods is of special interest for assessing food security. Therefore, potential trade in cereals as the result of market integration will be explored in more detail.

Transport Costs Determine Benefits

Transport costs are an important determinant of a country's comparative advantage. This is especially true for bulky staples with relatively low production costs but high transport costs per unit. Hence, in identifying a country's comparative advantage, information is needed, not only about domestic costs of production for individual products but also about the distance to the market where the products can be sold abroad and the transport costs from the location of production to the destination of exports. If neighboring countries are not willing to open their borders for foreign trade or if they set up high barriers to external trade, a country may have a stronger advantage in trading with faraway destinations than with neighboring countries. It may also be that a country is not competitive in all staples in overseas markets and may have comparative advantages in selling to and buying from neighboring countries.

[59] J.S. Sarma, "Cereal Feed Use in the Third World: Past Trends and Projections to 1990 and 2000," International Food Policy Research Institute, Washington, D.C., July 1985 (mimeographed); and J. S. Sarma and Patrick Yeung, *Livestock Products in the Third World: Past Trends and Projections to 1990 and 2000*, Research Report 49 (Washington D.C.: International Food Policy Research Institute, 1985).

Thus, if the establishment of a regional integration scheme among previously highly protected countries creates trade, it is definitely welfare-improving. Of course, the size of potential welfare effects from regional integration needs to be quantified with empirical evidence. However, in theory conditions can be specified to increase the probability of positive welfare effects.

First, regional market integration will increase the welfare of the integrating countries the greater the differential between import and export parity prices for trade with third countries and the smaller the differential for intraregional trade. In such cases it is likely that individual countries may have no potential for welfare increases through interregional trade, but they may have a potential for welfare-generating intraregional trade. The differential between import and export parity prices will be greater: the longer the distance from the nearest port to the destination of exports or the origin of imports; the higher the port costs from inadequate port capacity or inefficient port management; and the higher the land transport costs to and from the port.

Second, given these conditions, regional market integration will increase welfare more the higher the variability of production on the subregional level and the lower the variability of production on the SADCC level. This could be an additional trade incentive.

These conditions for welfare-generating trade effects certainly exist for the SADCC countries. First, these countries are far away from other exporting or importing regions. Hence, there is a large differential between c.i.f. import prices for cereals and corresponding f.o.b. export prices. To indicate the size of the differential, Table 17 presents results for the period 1977/78-1983/84. It must be noted that these are not observed prices, but hypothetical, because the region seldom exports and imports the same type of grain in the same year. Nevertheless, the data show the significance of the distance of the SADCC region from potential importing and exporting countries. In carrying out the calculation, a port charge for loading and unloading vessels of $10 per metric ton has been assumed. The port charge can be a significant determinant of international trade.

Land transport costs are even more important in the case of the SADCC countries. An Italian research firm hired by SADCC to conduct a prefeasibility study of market integration, Technosynesis, estimated the following costs for transport of cereals: 0.052 to 0.132 cents per kilometer per ton by road, depending on the quality of the road; and 0.06 cents per kilometer per ton by railroad.[60] To assess the relevance of land transport costs in the SADCC region, import and export parity prices were calculated for selected locations, the most important of which are railway or road connections.

The results of the calculations are presented in Table 18. First, the differential between import and export parity prices is large in all locations. Export parity prices are so low that it rarely pays to produce cereals for export to overseas markets.

Second, if no intraregional trade is allowed, it seems likely that each subregion would produce as much as it consumes. Subregions that are the farthest from the port, especially where road transport is a significant part of total transport costs (for example, transport to Maun, Botswana, or Rumphi, Malawi), are most likely to have a policy of autarky for staple foods.

Third, if no intraregional trade is allowed, price ratios between types of grain would probably vary widely from location to location. Price ratios at one location could well be the reverse of those in a neighboring location, and they could be completely different than either the ratio of prices at East African ports or at export locations in countries like the United States. For these reasons, it is not advisable to accept the world market price ratio as a guideline for setting domestic prices in East African countries.

Fourth, if no intraregional trade is allowed and if production of individual grains

[60] Southern African Development Coordination Conference, Regional Food Security Programme, "Regional Food Reserve," main report of a prefeasibility study prepared by Technosynesis, Zimbabwe, January 1984, p. 249.

Table 17—Hypothetical import and export prices for selected grains at East African ports, 1977/78-1983/84

Year	Maize Import Price	Maize Export Price	Sorghum Import Price	Sorghum Export Price	Wheat Import Price	Wheat Export Price
			(U.S. $/metric ton)			
1977/78	125	84	118	77	142	101
1978/79	130	91	123	84	170	127
1979/80	166	98	167	99	221	153
1980/81	200	120	199	119	237	157
1981/82	171	87	167	83	222	138
1982/83	160	86	159	85	203	129
1983/84	192	117	177	102	199	124

Source: Food and Agriculture Organization of the United Nations, *Food Outlook* (No. 10, 1984), pp. 26-27; and International Wheat Council, *World Wheat Statistics* (London: IWC, 1984), pp. 79-81.

Notes: Import prices are c.i.f. and include a port charge of $10 per metric ton; export prices are f.o.b. Calculations are based on wheat shipping rates between U.S. Gulf, EC (Rotterdam), and East African ports, and price data are for U.S. No. 1 hard winter wheat, No. 2 yellow maize, and No. 2 sorghum.

Table 18—Import and export parity prices for maize, sorghum, and wheat in selected SADCC locations, 1977/78 and 1983/84

Year/Country/Location	Maize Import Parity Price	Maize Export Parity Price	Sorghum Import Parity Price	Sorghum Export Parity Price	Wheat Import Parity Price	Wheat Export Parity Price
			(U.S. $/metric ton)			
1977/78						
Botswana						
Maun	203	6	196	−1	220	23
Francistown	164	45	157	38	181	57
Gaborone	177	32	170	25	194	44
Lesotho						
Maseru	160	49	153	42	177	66
Malawi						
Rumphi	222	−12	215	−19	239	4
Lilongwe	157	52	150	45	174	69
Blantyre	146	63	139	56	163	80
Mozambique						
Nampula	165	44	158	37	182	61
Lichinga	189	20	182	13	206	37
Tete	147	62	140	55	164	79
Swaziland						
Manzini	132	77	125	70	149	94
Tanzania						
Arusha	146	63	139	56	163	80
Tabora	153	56	146	49	170	73
Mtwara	182	27	175	20	199	44
Zambia						
Kasema	162	47	155	40	179	64
Lusaka	187	22	180	15	204	39
Ndola	198	11	191	4	215	28
Zimbabwe						
Harare	147	62	140	55	164	79
Bulawayo	159	50	152	43	176	67

Table 18—Continued

Year/Country/Location	Maize		Sorghum		Wheat	
	Import Parity Price	Export Parity Price	Import Parity Price	Export Parity Price	Import Parity Price	Export Parity Price
			(U.S. $/metric ton)			
1983/84						
Botswana						
Maun	270	39	255	24	277	46
Francistown	231	78	216	63	239	85
Gaborone	244	65	229	50	251	72
Lesotho						
Maseru	227	82	212	67	234	89
Malawi						
Rumphi	289	20	274	5	296	27
Lilongwe	224	85	209	70	231	92
Blantyre	213	96	198	81	220	103
Mozambique						
Nampula	232	77	217	62	239	84
Lichinga	256	53	241	38	263	60
Tete	214	95	199	80	221	102
Swaziland						
Manzini	199	110	184	95	206	117
Tanzania						
Arusha	213	96	198	81	220	103
Tabora	220	89	205	74	227	96
Mtwara	249	60	234	45	256	67
Zambia						
Kasema	229	80	214	65	236	87
Lusaka	254	55	239	40	261	62
Ndola	265	44	250	29	272	51
Zimbabwe						
Harare	214	95	199	80	221	102
Bulawayo	226	83	211	68	233	90
Masvingo	237	72	222	57	244	79

Source: Author's calculations based on Table 17; Food and Agriculture Organization of the United Nations, *Food Outlook* (No. 10, 1984), pp. 26-27; and International Wheat Council, *World Wheat Statistics* (London: IWC, 1984), pp. 79-81; and data for transport costs from Southern African Development Coordination Conference, Regional Food Security Programme.
Note: It has been assumed that shipments will be made by train whenever there is a railway connection.

fluctuates significantly, subregional prices would also fluctuate or carryover stocks would be held subregionally to stabilize prices. Because of the large differential between import and export parity prices for interregional trade, it would not pay to export excess quantities in years of good harvests or to import excessively in years of bad harvests. Hence, carryover stocks have to be substituted for trade.

Fifth, past trade flows may be a misleading indicator of the trade-generating effects of regional integration schemes. For countries that are considering integrating their markets but have not traded with each other

so far because of trade barriers, actual trade in staple foods in the past may have been negligible. Nevertheless, the potential for intraregional trade may be high. The larger the difference between prices at neighboring locations, the higher the potential where there is no intraregional trade.

The empirical investigation of export and import parity prices is based on the assumption that each of the SADCC countries would only trade with overseas countries. Certainly, the differential between export and import parity prices for trade would be much smaller between member countries, indicating that a policy of self-suffi-

ciency in staples would be less favorable from an economic point of view. Whether the large differences between import and export parity prices for interregional trade would actually give rise to intraregional trade if markets were integrated depends on other empirical data.

First, it is presumed that the potential for intraregional trade is higher, the more the region as a whole is self-sufficient in staple foods but individual countries are not. Market integration would help to substitute intraregional for interregional trade provided that exporting countries can receive higher export prices and importing countries can obtain lower import prices.

Table 19 presents the food balance sheet in grain equivalents for the region. It shows that the region would have been more than self-sufficient in grain equivalents in 1980 if production had been the average for the years 1979-81. Of course, this outcome is not only a mirror of the region's production potential and consumer needs, it is also a consequence of the price levels and ratios set by the governments of the individual countries. A different set of producer and consumer prices could also affect the level and pattern of production and consumption. However, the figures indicate that the region could produce enough staple food to feed the region's population. This is quite important for the trade potential of integrating the markets of these countries. Market integration could largely substitute intraregional for interregional trade, which would have welfare-generating effects for the partner countries.

In investigating the potential benefits of market integration from this point on, it is reasonable to consider the region as a nearly closed economy. There would be more trade creation and less trade diversion where terms are used as defined by Viner.[61] Trade creating effects will be greater: the more the food balance of individual countries is unbalanced, either for total staple foods or for individual staples; the more a country's consumption pattern changes from the creation of intraregional trade; and the more the region's products differ in quality from the goods traded interregionally.

Table 20 shows that only one of the nine SADCC countries does not produce a surplus of at least one staple food. The production of the individual country would definitely become more imbalanced if free trade among the member countries were allowed. This presumption is supported by the evidence that where specific staples, such as rice and cassava, are not produced, they are seldom included in the diet. Cassava is a case in point. It is not produced as a main staple food in three SADCC countries. Five countries produce a significant surplus. It is possible that the population in those countries that do not produce cassava might consume cassava if it were available, especially in years when crops of the favored staples of these countries fail. It can be argued, however, that cassava is a bulky product with low value but high transport costs, and therefore it is not an internationally tradable product.

This argument is only valid for interregional trade. Intraregional trade would probably be practiced by private traders. Opportunity costs of these traders could be quite low, which would allow them to transport cassava up to 700 kilometers, as has been reported for Nigeria.[62] Trade in cassava could contribute significantly to food security in the region because this product is more drought resistant than other staples. Moreover, countries could partly adjust the quantity harvested annually to consumption needs. Thus, cassava production can be used to stabilize consumption with fluctuations in production of other staples.

The potential for growth in intraregional trade is higher if countries with surplus production in some staples are bordered by countries with deficit production in the same staples. Table 21 shows that five countries with surplus production in some staples were bordered by countries that im-

[61] Jacob Viner, *The Customs Union Issue* (New York: Carnegie Endowment for International Peace, 1950).
[62] James H. Cock, *Cassava: New Potential for a Neglected Crop* (Boulder, Colo.: Westview Press, 1985), p. 9.

Table 19—Aggregate food production and consumption balance for the SADCC countries, 1980

Commodity	Wheat	Rice	Maize	Millet and Sorghum	Cassava	Total
	(1,000 metric tons of grain equivalent)					
Apparent consumption	679.2	328.9	3,959.5	926.8	2,256.9	8,151.3
Consumption pattern (percent)	8.3	4.0	48.6	11.4	27.7	100.0
Production	305.0	425.4	6,525.9	1,092.4	3,283.8	11,632.6
Balance	–374.2	96.5	2,566.4	165.6	1,026.9	3,481.3
Degree of self-sufficiency (percent)	44.9	129.3	164.8	117.9	145.5	142.7

Source: Author's calculations based on Food and Agriculture Organization of the United Nations, *Food Balance Sheets* (Rome: FAO, various years).

Note: The production average is for 1979-81; consumption figures are for 1980.

ported these products in 1979-81. Thus there is potential for intraregional trade, even with the present production and consumption patterns of individual countries. Because free trade within the region would lead to a change in the price pattern and the availability of specific products, like cassava, the production and consumption patterns in individual countries would adjust and thus increase the potential.

Liberalization of intraregional trade in maize is especially important. Because consumers in the SADCC countries prefer white maize to yellow maize, white maize is mainly produced in the region. International trade is mostly in yellow maize, however. Hence the markets for white maize in Africa are thin markets where prices fluctuate significantly with fluctuations in production or in price policies. Such situations are more likely to occur if individual countries choose not to trade in staples or choose to trade only with overseas countries and not with each other. Intraregional trade would

Table 20—Production and consumption balances for staple foods and shares of consumption patterns, SADCC countries, 1979-81

Country	Wheat 1	Wheat 2	Rice 1	Rice 2	Maize 1	Maize 2	Millet and Sorghum 1	Millet and Sorghum 2	Cassava 1	Cassava 2	Total 1	Total 2
	(percent)											
Angola	14.3	7.4	49.7	3.4	91.9	34.9	119.9	4.3	118.6	50.0	99.3	100
Botswana	2.9	19.2	...	4.5	21.7	51.0	82.5	25.3	...	0.0	32.5	100
Lesotho	32.3	31.5	...	1.0	91.9	47.2	111.7	20.3	...	0.0	76.4	100
Malawi	7.1	0.6	107.2	2.5	121.6	86.4	125.8	8.8	142.9	1.7	121.2	100
Mozambique	3.6	9.9	52.5	7.0	87.4	21.6	122.6	8.8	110.2	52.7	91.7	100
Swaziland	132.1	1.2	139.3	3.6	120.2	88.4	31.5	6.8	...	0.0	114.9	100
Tanzania	93.0	3.7	230.1	6.0	216.6	36.0	118.6	13.8	191.2	40.5	189.1	100
Zambia	6.8	15.4	19.9	1.4	151.2	69.1	89.9	8.4	108.1	5.7	119.6	100
Zimbabwe	131.8	13.2	4.4	0.6	278.8	66.2	129.8	18.3	95.9	1.7	227.2	100
All SADCC countries	44.9	8.3	129.3	4.0	164.8	48.6	117.9	11.4	145.5	27.7	142.7	100

Source: Author's calculations based on Food and Agriculture Organization of the United Nations, *Food Balance Sheets* (Rome: FAO, various years).

Notes: 1 is the average production in grain equivalent from 1979 to 1981/apparent consumption 1980 × 100.
2 is the share of consumption.

Table 21—Staple foods in surplus and deficit in SADCC countries bordering each other, 1979-81

Country	Surplus Staple Foods	Border Countries	Deficit Staple Foods
Angola	Cassava, millet and sorghum	Zambia	Wheat, rice, millet and sorghum
Malawi	Rice, maize, millet and sorghum, cassava	Mozambique Tanzania Zambia	Wheat, rice, maize Wheat Wheat, rice, millet and sorghum
Swaziland	Wheat, rice, maize, sorghum	Mozambique	Wheat, rice, maize
Tanzania	Rice, maize, millet and sorghum, cassava	Malawi Zambia Mozambique	Wheat Wheat, rice, millet and sorghum Wheat, rice, maize
Zambia	Cassava, maize	Angola Botswana Malawi Mozambique Tanzania Zimbabwe	Wheat, rice, maize Wheat, rice, maize, millet and sorghum, cassava[a] Wheat Wheat, rice, maize Wheat Rice, millet and sorghum, cassava[a]
Zimbabwe	Wheat, maize, millet and sorghum	Botswana	Wheat, rice, maize, millet and sorghum, cassava[a]

Source: Classification is based on Table 20.
[a] Consumption of cassava is negligible at this time.

contribute to stabilizing national maize markets and would reduce transport costs. Moreover, exporting countries could capture some of the premium for white maize, which is only traded on African markets. This premium accounts for about 10 percent of the price for yellow maize.[63]

Next, how much could be saved in transport costs if SADCC countries traded intraregionally is calculated. Assuming that Zambia's production of staple foods in 1980 was equal to the average for 1979-81 and assuming that consumption was normal in 1981, Zambia's import needs would have been 96,000 metric tons of maize and 90,500 tons of wheat, both expressed in grain equivalents.[64] Based on the same assumptions as those made for Zambia, the neighboring country, Zimbabwe, would have had an exportable surplus of 46,400 tons of wheat and

341,800 tons of maize. Zambia could have bought all her maize imports and 46,400 tons of wheat from Zimbabwe instead of from overseas. Assuming 1977/78 import and export parity prices for Lusaka and Bulawayo, Zambia would have had to pay U.S. $187 for maize and U.S. $204 for wheat imported from overseas. For imports from Zimbabwe, the prices would have been U.S. $88.56 for maize and U.S. $95.56 for wheat. Hence, Zambia could have saved U.S. $103.44 per ton of grain equivalents. Total savings, which could have been divided between Zambia and Zimbabwe, would have amounted to U.S. $14.5 million ($5.0 million for wheat and $9.5 million for maize) without taking into account the premium for white maize. Certainly, U.S. $14.5 million is not negligible. Zambia's agricultural domestic product in 1965

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[63] World Bank, *Malawi: The Development of the Agricultural Sector*, Report 3459 (Washington, D.C.: World Bank, 1981), p. 52.
[64] All tons in this report are metric tons.

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prices was 158.5 million kwacha in 1980-82,[65] equal to U.S. $179.5 million at the 1981 exchange rate.[66] Trading of maize and wheat between Zambia and Zimbabwe could have led to savings in transport costs equal to 8.6 percent of Zambia's agricultural domestic product.

Of course, these calculations do not quantify the exact gains from savings in transport costs. Some of the gains may have already been captured by trade within the region. Nevertheless, they highlight the comparative advantage of intraregional versus interregional trade.

Savings in transport costs will materialize if one country produces a surplus of a specific commodity and the neighboring country generates a deficit, but transport costs can also be reduced if there are subregional imbalances between production and consumption within countries, and trade is permitted to flow across the border. Thus, a country with a deficit in maize in one year may become an exporter in the next because some subregions within the country may produce a surplus that could be exported to deficit subregions in a neighboring country. This indicates that trade flows among the member countries would be different from the present export and import trade flows.

Liberalized intraregional trade could also lead to a reduction in transport costs in one country if subregional production fluctuates with nonpositive covariances of the fluctuations in neighboring subregions of another country. Subregions near the border are normally remote from central domestic markets. Hence, fluctuations in production will either lead to significant price fluctuations in these subregions or additional transport resources will be required. If, however, these bordering countries are allowed to trade with each other, transport costs may be lower. This is more likely, the more there are negative or zero covariances

between fluctuations in production on both sides of the border. Therefore, these correlation coefficients have been calculated for total cereals.

In Table 22 the coefficient of correlation is sometimes negative, indicating negative covariances, and in all cases it is statistically insignificant, indicating that fluctuations are independent. Hence, free border trade could help to compensate for subregional fluctuations in production.

So far, only the potential savings in transport costs for liberalized intraregional trade in staples have been considered, but the effects would be similar if intraregional trade in nonstaple agricultural products were allowed.

Regional Market Integration and Savings in Resource Costs

The economic theory of market integration mainly deals with the question of whether integration could lead to improved factor allocation and hence to an increase in overall production with a given endowment of resources. It has already been concluded that there could be savings in resource costs if integrating countries differ in comparative advantage and the trade-creating effect outweighs the trade-diverting effect. Trade-diverting effects have largely been ruled out for the SADCC countries and differences in comparative advantage have been established.

Another indicator of differences in comparative advantage is the size of domestic resource costs (DRCs) for individual crops. DRC is the value of the domestic resources used to produce a unit of net foreign exchange. The lower the DRC for a specific product, the more it pays to expand production of this product. Unfortunately, DRCs are not available for production of individual staples in all SADCC countries. However, a rough calculation using DRCs for Zambia

[65] This is a five-year moving average (World Bank, *Zambia: Policy Options and Strategies for Agricultural Growth*, Report No. 4764-ZA [Washington, D.C.: World Bank, 1984], p. 82).
[66] The exchange rate for 1981 was 0.883 kwacha per U.S. dollar (United Nations, Statistical Office, *Monthly Bulletin of Statistics* 39 [No. 1, January 1985], p. 234).

Table 22—Coefficients of correlation between fluctuations in cereal production among subregions

Subregion	Coefficient
Luena, Angola – Mongu, Zambia	0.188
Menongue, Angola – Mongu, Zambia	0.186
Maun, Botswana – Lusaka, Zambia	0.562
Maun, Botswana – Bulawayo, Zimbabwe	0.637
Francistown, Botswana – Bulawayo, Zimbabwe	0.639
Rumphi, Malawi – Lichinga, Mozambique	0.047
Rumphi, Malawi – Mbeya, Tanzania	0.638
Rumphi, Malawi – Mtwava, Tanzania	0.638
Rumphi, Malawi – Kasama, Zambia	−0.099
Rumphi, Malawi – Chipata, Zambia	−0.098
Lilongwe, Malawi – Lichinga, Mozambique	0.046
Lilongwe, Malawi – Tete, Mozambique	0.042
Lilongwe, Malawi – Chipata, Zambia	−0.098
Blantyre, Malawi – Manpula, Mozambique	0.042
Blantyre, Malawi – Tete, Mozambique	0.042
Manpula, Mozambique – Mtwava, Tanzania	−0.470
Lichinga, Mozambique – Mtwava, Tanzania	−0.469
Tete, Mozambique – Chipata, Zambia	−0.012
Tete, Mozambique – Lusaka, Zambia	−0.012
Tete, Mozambique – Harare, Zimbabwe	0.043
Tete, Mozambique – Hasvingo, Zimbabwe	0.043
Inhambane, Mozambique – Bulawayo, Zimbabwe	0.044
Inhambane, Mozambique – Hasvingo, Zimbabwe	0.044
Naputo, Mozambique – Manzini, Swaziland	0.373
Mbeya, Tanzania – Kasama, Zambia	−0.168
Chipata, Zambia – Harare, Zimbabwe	0.534
Chipata, Zambia – Bulawayo, Zimbabwe	0.533

Source: Author's calculations; and Southern African Development Coordination Conference, Regional Food Security Programme, "Regional Food Reserve," prepared by Technosynesis for the Southern African Development Coordination Conference on Regional Food Security, Zimbabwe, 1984, p. 263.

Notes: Values of R > 0.638 are significant at the 95 percent level. Fluctuations around the trend were projected for the period 1985-94 by Technosynesis.

will be used to quantify possible gains from an adjustment of the country's production pattern in accordance with comparative advantage.[67]

According to World Bank estimates, the DRC for producing maize in Zambia is 2.94 and for producing wheat 0.40. Assuming that incentives were given to expand wheat production at the cost of a reduction in maize production,[68] and that the change in the production pattern would be compensated for by corresponding changes in imports from the neighboring country of Zimbabwe, yields for maize were 2.14 tons per hectare and yields for wheat were 3.99 tons per hectare in 1978-80. Hence, increasing the area under wheat by 1 hectare and decreasing the area under maize by 1 hectare would lead to savings in DRC equal to $2.94 \times 2.14 \times P_m + 0.6 \times 3.99 \times P_w$, where P_m and P_w stand for the import parity prices of maize and wheat for imports from Zimbabwe. Taking into account Zimbabwe's export parity prices for exports to overseas' markets and adding the transport costs from Bulawayo, Zimbabwe to Lusaka, Zambia,

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[67] World Bank, *Zambia: Policy Options*, p. 38.

[68] Certainly, this would not be feasible for all ecological zones in the country; however, in 1975-82 wheat production increased from 160 tons in 1965-70 to 1,200 tons (See World Bank, *Zambia. Policy Options*, p. 26).

Zambia's import parity price for intraregional trade would have been U.S. $111.56 per ton for maize and U.S. $118.56 per ton for wheat in 1983/84. Hence, total savings in DRC would have been U.S. $985.72 per hectare. This clearly indicates that an adjustment in the domestic production pattern for comparative advantage can result in high returns. Of course, the size of the total gain depends on the extent of differences in comparative advantage among the SADCC countries, which appear to be significant from the calculations above. These observations go against expectations because these countries are located in the same geographical region, and conditions for agricultural production might be expected to be the same. However, differences in comparative advantage arise mainly from variances in climate, in soil conditions, and in opportunity costs.

There is sufficient evidence that the effects of these determinants of comparative advantage vary widely among the countries of the region. Rainfall, for example, varies from more than 1,400 millimeters a year in the northern areas to less than 200 millimeters in the South. Soil conditions vary too, as indicated by differences in ecological zones and in percentages of arable land, permanent cropland, permanent pasture, and forest in total land (see the Appendix, Table 32).

Variances in opportunity costs are especially relevant for determining comparative advantage. Opportunity costs vary among the countries because national shadow prices for inputs vary. This certainly holds true for the shadow price of land because land availability and yields for competitive crops differ. It also holds true for shadow prices of agricultural products because import and export parity prices vary. Even variances in the national shadow prices for purchased inputs, such as fertilizer or seeds, may be a significant determinant of variations in comparative advantage. A high variance in national shadow prices for purchased inputs is to be expected if these inputs have to be imported. High transport costs, especially for road transportation, will lead to a high degree of variance in shadow prices from place to place. Therefore, the comparative advantage of a country in a specific product not only depends on the physical production possibilities of a country but also on the general economic environment, as indicated by infrastructure, transport costs, distances to markets, and other factors.

Specialization will generate even more benefits if the consumption pattern changes significantly over time. An increasing demand for livestock products and poultry is a case in point. As pork and poultry production is only marginally tied to land endowment, prices for inputs and the final product are most important for selecting the location for production units. In developed countries transport costs are more important in determining the regional price patterns of feedstuffs than of pork and poultry. Livestock industries tend to be located where feed prices are the lowest. Therefore, market integration of the SADCC countries could contribute to reduced costs for the expanding livestock production in the region.

Other positive allocative effects can be expected in the food processing sector from exploitation of economies of scale. It is well known that food processing industries in developing countries rarely use their full productive capacity because the domestic market is so small. Market integration among the SADCC countries could use resources more efficiently in these industries, leading to significant benefits as demand for processed food grows over time. Similar economies of scale could also be gained in production of agricultural inputs, such as fertilizer and farm machinery.

One prospective source of positive integration effects that has been completely neglected by the economic theory of integration concerns savings in administrative costs. If small landlocked countries pursue their agricultural market and price policies autonomously and set domestic prices differently than neighboring countries, incentives for smuggling products across the border are built-in. This illegal border trade can only be avoided if there is efficient control of all border transactions, which could absorb a large amount of manpower—labor that

could be used more efficiently for producing goods and services. Moreover, border trade, whether legal or illegal, increases welfare, whereas avoidance of border trade through effective means of control diminishes it. Border trade increases welfare in the exporting region because the consequential increase in market prices increases producer surplus more than it decreases consumer surplus. The effects are reversed in the importing regions; the positive change in consumer surplus will outweigh the negative change in producer welfare. Thus, liberalizing intraregional trade could have a twofold positive effect on welfare.

Institutional Arrangements to Capture Market Integration Benefits

Removal of barriers to intraregional trade is certainly necessary if all the potential benefits of market integration are to be captured. However, reducing or abolishing these barriers is not enough to guarantee that potential gains will be exploited. Adjustments in the internal and external agricultural trade regimes and in exchange rate policies are also necessary. Merely removing trade barriers may reduce the welfare of some countries if the necessary complementary adjustments in policies are not made. Hence, if countries are unwilling or unable to adjust their domestic trade regimes and exchange rate policies because of political constraints, it might be better for them to postpone complete market integration. Instead, they could undertake partial regional trade arrangements to exploit at least some of the benefits of market integration.

It should be obvious that integrated markets can only function adequately if trade in agricultural products within the countries is ruled by market forces. Uniform prices for all locations within a country (panterritorial) and in all seasons set by individual governments of the SADCC countries are political prices and are obstacles to optimal resource allocation. They do not reflect each country's comparative advantage. It is hard to find empirical evidence to support the allegation that these prices are set in relation to costs of production.[69] If two countries trade freely but set different panterritorial prices, their domestic trade regimes would collapse. Trade would flow from the country with lower prices to the country with higher prices, and this flow would probably have no basis in the comparative advantages of the two countries. Consequently, the country with low prices could not enforce these prices and the country with higher panterritorial prices would have to build up government stocks. Neither consequence is acceptable from a political or an economic point of view.

Coordinating panterritorial prices among the integrating countries is no solution. Common panterritorial prices would partly avoid policy-induced trade flows. They would not, however, allow the countries to specialize according to comparative advantage. Resources can be allocated optimally only if prices between countries that trade with each other are allowed to reflect transportation costs. Transportation costs are important in determining supply prices within the SADCC countries. Hence, prices among the SADCC countries should vary significantly if resources are to be allocated optimally.

Market integration among the SADCC countries means not only that domestic price and market policies must be liberalized, but also that external trade in agricultural products must be harmonized. If integrating countries have different external trade restrictions, regional trade flows could be distorted. Countries with lower tariffs might import from countries outside the region and sell the imported quantities profitably to other countries in the integration scheme, negating the purpose of the higher tariff.

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[69] Food and Agriculture Organization of the United Nations, "Price Policy in Africa," Thirteenth FAO Regional Conference for Africa, Harare, Zimbabwe, July 16-25, 1984.

But even if the integrating countries agree on common external trade restrictions, the viability of the integration scheme might be weakened by trade. Assume that the difference between import and export parity prices is negligible and that countries agree to set a uniform external tariff. Also assume that production in some countries surpasses domestic consumption and that other countries need to import. The importing country, which could buy its imports at world market prices if it did not belong to the integration scheme, would have to buy at higher prices from a country that is a part of the integration scheme. Thus, real income would be transferred from the importing countries to the exporting countries. Such invisible transfer flows will always arise if the integrating countries put restrictions on international trade. In the SADCC countries, however, the borders with neighboring African countries not in the SADCC would have to be controlled anyway, and because the SADCC region is nearly self-sufficient in staple foods, border trade with nonmember African countries could be excluded. Staple foods would only be imported from overseas countries if the entire region experienced a poor harvest not compensated for by stocks. Liberalization of overseas trade should therefore be considered.

Another obstacle to liberalizing trade within the region, exchange rate policies, is much more difficult to overcome. The currencies of most developing countries is overvalued but the extent is hard to quantify. Assuming that in 1970 the exchange market was in equilibrium for all SADCC countries, the overvaluation of purchasing power for the average 1978-80 period was 1.42 in Tanzania, 1.24 in Zambia, 1.15 in Malawi, and 1.11 in Zimbabwe.[70] If these countries were to liberalize trade and to accept the currencies of other SADCC countries in exchange for products, significant amounts of real income would be transferred. For example, from 1970 to 1978-80, Tanzania paid 23.5 percent less for its imports from neighboring Malawi and received 23.5 percent more for its exports to Malawi because of the overvaluation. Clearly, if each country accepted the other's currency in exchange for products, Malawi would lose and Tanzania would benefit. This problem of weak currencies cannot be solved just by asking for a clearing of the imbalance of trade in hard currencies.[71] Transfer effects are generated, even if trade in national currencies is balanced. In general, countries with stronger currencies are penalized to the benefit of countries with weak currencies. This problem can only be overcome if monetary and exchange rate policies are harmonized. It does not seem likely, however, that countries would give up an important element of their autonomous national policies. Instead, international prices denominated in U.S. dollars could be used, but this would not capture all the potential benefits from integration, which demands strict control of all border transactions. Moreover, partner countries would have to agree to use international prices for intraregional trade.

A transition period is needed during which the conditions necessary for a complete liberalization of trade among the SADCC countries can be initiated. This more modest goal is actually the strategy that the SADCC countries are following.

"We believe that there is room for substantial increases in trade among ourselves. To this end existing payment systems and customs instruments will be studied in order to build up a regional trade system based on bilaterally negotiated annual trade targets and product lists," declared the SADCC heads of state at their first meeting in Lusaka in April 1980.[72] The long-standing Mozambique-Tanzania trade agreement, where the two countries agree in ad-

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[70] Ibid.

[71] The Preferential Trade Agreement among the Eastern and Southern African countries asks for a clearing of the imbalances in hard currencies.

[72] Quoted in Hanlon, *SADCC: Progress, Projects, and Prospects,* p. 70.

vance on the amount of trade and a range of products, working out the details during the year, serves as a model. Thus, trade relations are based on bilateralism and countertrade in the form of counterpurchase, where countries have to sell to each other the same value of products. Are trade relations of this type a move toward efficient market integration?

It is certainly true that bilateral counterpurchase efficiently serves two functions. First, by definition, trade is balanced on an annual basis. This seems to avoid balance-of-payments problems, but it is questionable. Second, bilateral counterpurchase helps provide information about market conditions in the trading partner's home markets;

by setting up communication channels, necessary conditions for efficient trade expansion are created. Moreover, it may be argued that multilateral trade relations, although desirable, are not feasible because of balance-of-payments constraints. Therefore, bilateral counterpurchase may only be a second-best solution for generating welfare in the trading partner's country. Unfortunately, it can also decrease welfare and worsen the balance of payments.

It is obvious that counterpurchase is only chosen because foreign exchange markets are not in equilibrium. In reality, domestic currencies are overvalued if a multilateral opening of the economy is rejected. However, given this condition, bilateral pur-

Table 23—Hypothetical comparison of exchange rates and prices under counterpurchase agreements and free trade conditions

Country A		Country B	
	(TSh)		(Mt)
Official exchange rate		Official exchange rate	
Against U.S. $	20.00	Against U.S. $	40.00
Against Mt	0.50	Against TSh	2.00
Shadow exchange rate		Shadow exchange rate	
Against U.S. $	24.0	Against U.S. $	56.00
Against Mt	0.43	Against TSh	2.33
Price for product 1		Price for product 1	
In Tsh	150.00	In Mt	320.00
Official exchange rate		Official exchange rate	
In Mt	300.00	In TSh	160.00
In U.S. $	7.50	In U.S. $	8.00
Shadow exchange rate		Shadow exchange rate	
In Mt	350.00	In TSh	137.34
In U.S. $	6.25	In U.S. $	5.71
Price for product 2		Price for product 2	
In TSh	20.00	In Mt	46.67
Official exchange rate		Official exchange rate	
In Mt	40.00	In TSh	23.34
In U.S. $	1.00	In U.S. $	1.17
Shadow exchange rate		Shadow exchange rate	
In Mt	46.51	In TSh	20.03
In U.S. $	0.83	In U.S. $	0.83
Price for product 3		Price for product 3	
In TSh	60.00	In Mt	110.00
Official exchange rate		Official exchange rate	
In Mt	120.00	In TSh	55.00
In U.S. $	3.00	In U.S. $	2.75
Shadow exchange rate		Shadow exchange rate	
In Mt	139.53	In TSh	47.21
In U.S. $	2.50	In U.S. $	1.96

Source: Author's calculations based on a hypothetical example.
Notes: This hypothetical example is based on the Tanzanian shilling (TSh) for country A and the Mozambique metical (Mt) for country B.

chase trade may give rise to trade flows that do not correspond to differences in the countries' comparative advantage. Table 23 helps clarify this.

Two countries, Tanzania (A) and Mozambique (B), are compared hypothetically. The crucial assumption is that the Tanzanian shilling (TSh) and the Mozambique metical (Mt) are overvalued but at different degrees. The shadow exchange rate of the shilling is assumed to be 24 against the U.S. dollar, but the official rate is TSh 20 for U.S. $1. The overvaluation of the metical is assumed to be greater; an official exchange rate of Mt 40 against the U.S. dollar stands against a shadow exchange rate of Mt 56 for U.S. $1. Given the official exchange rates and given prices for the three products in the two countries, country A would export products 1 and 2 and import product 3. However, if product prices are compared on the basis of the shadow exchange rates, country A would not be able to export any of the products; instead, it would import products 1 and 3, and no trade would result for product 2. This example clearly shows that trade flows under counterpurchase agreements but distorted exchange rates may give rise to a different trade pattern than under free trade conditions.

Moreover, two significant additional effects may arise. First, the foreign exchange situation will deteriorate for some trading partners and improve for others. If, for example, country B has to import product 1, even though it actually has a comparative advantage over country A, it is worse off than if it produced product 1 and sold it on the world market. Second, it can easily be seen that counterpurchase trade, even if it leads to balanced trade between the partners, will nevertheless induce income transfers. If country A sells product 1 and 2 to country B at a total value of TSh 1 million and buys product 3 from country B for TSh 1 million or Mt 2 million at official exchange rates, it has actually sold products at a value of U.S. $41,667 at shadow exchange rates and received a product value of U.S. $35,714 at shadow exchange rates. Thus country A transferred an income of U.S. $5,953—14 percent of its export value—to country B. This clearly shows that counterpurchase agreements will necessarily result in distorted trade patterns and uneven transfer effects. Thus, it is not at all guaranteed that trade expansion will be to the mutual benefit of all countries. It is even questionable whether the region as a whole will benefit from trade expansion.

Therefore, one must conclude that this intraregional trade strategy is not economically efficient and is not likely to be viable. If the SADCC countries wish to expand intraregional trade without liberalizing the exchange rate regimes, there seems to be only one solution. As national prices, equalized at official exchange rates, cannot lead to a rational intraregional trade pattern, world market prices denominated in U.S. dollars should be used to value exports and imports. At first glance, this may appear cumbersome and infeasible. However, because trade flows are negotiated between governmental institutions or parastatals, it may serve as a first step toward liberalizing the exchange rate regimes.

7

ALTERNATIVE REGIONAL COOPERATION ARRANGEMENTS TO STABILIZE FOOD CONSUMPTION

Variability in Food Consumption and Regional Stockpiling

To improve food security, the SADCC countries have considered setting up a regional stockpiling system for grains. Is there a rationale for such a scheme? If so, what are the expected benefits, and what should be the institutional framework for exploiting them?

It is indisputable that national and regional stocks can contribute to food security. Because there are other means of accomplishing the same objective, however, it is not certain that stocks should be the main instrument. Other instruments available include trade accompanied by foreign exchange reserves.[73] In Chapter 6 it was argued that trade can substitute for stocks, at least in part. Hence, whether stocks are needed to stabilize consumption and what level of stocks should be chosen largely depends on the trade regime that is applied. The optimal level of stocks will be lower if a more liberal trade regime prevails. However, countries may be reluctant to liberalize trade in agricultural products for political reasons. Given a political constraint, SADCC countries would be better off establishing a regional stockpiling system for grains, if expected benefits are sufficiently high and if the functioning of the system does not demand the loss of national autonomy in dispersing food.

Holding stock may serve several purposes. Stocks held to guarantee a continuous flow of consumption over time by bridging

gaps caused by time lags or unreliable information in situations where policies have to be devised to meet short-term targets are called working stocks. Working stocks may be fairly small and should not be a concern of public policy if the marketing system functions well and marketing is performed by private traders. Neither condition is fulfilled in the SADCC countries. As six of the nine countries are landlocked, foreign supply is not always quickly available. Hence, working stocks may be needed to bridge the time lags when foreign supply is unexpectedly delayed. Apart from this, working stocks are of public concern in the SADCC countries because the regional supply response to shortages is slow, to some extent because trade in staple foods is performed by public or parastatal institutions.

It is obvious that regional cooperation could help reduce the amount of national working stocks held against the risk of delayed delivery from outside the region. Actually, working stocks held for this reason might be unnecessary if individual countries had access to regional carryover stocks in cases of delayed delivery, although they should be obliged to replace borrowed stocks after the delivery arrives. Thus, regional carryover stocks could, as a by-product, reduce the size of national working stocks.

Regional carryover stocks may be considered a rational policy from an economic point of view if, first, the rationale for national carryover stocks can be proven and if regional carryover stocks can be smaller

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[73] John McIntire, *Food Security in the Sahel: Variable Import Levy, Grain Reserves, and Foreign Exchange Assistance,* Research Report 26 (Washington, D.C.: International Food Policy Research Institute, 1981).

than the sum of national carryover stocks; or second, if there is no rationale for national carryover stocks, but nevertheless there is one for regional stocks.

It is widely believed in developing countries that national carryover stocks are needed to guarantee food security, but this view is not shared by some researchers in developed countries. For tradable commodities, such as wheat and yellow maize, Shlomo Reutlinger et al. find that the cost of a reserve usually exceeds its benefits; trade seems to be most effective in meeting the food security objective.[74] These findings, which are based on the assumption that countries are risk neutral, are confirmed by D. Gale Johnson.[75] John McIntire finds that in the Sahel food reserves can only be justified in exceptional cases in land-locked countries where severe transport constraints exist.[76] In spite of these research results, governments of developing countries express concern about adequate carryover stocks, although strictly speaking these could often be classified as working stocks, or they may entail holding stocks of commodities that are virtually untradable, such as white maize.

It should be clear, however, that carryover stocks alone are not adequate. If a government tries to guarantee food security through reserve stocks alone—with no dependence on trade—these stocks would have to be prohibitively large because of the stochastic nature of domestic production and of world market prices. Even though the probability is small, it cannot be ruled out that there could be extremely bad harvests and extremely high world market prices for several years in a row. No society is likely to be willing to accept high storage costs and real income forgone in order to be insured against such an unlikely series of events. This clearly indicates that there is a trade-off between the degree of food security and the costs of achieving it, not only for carryover stocks as an instrument, but for all other policies to achieve this objective as well.

Risk is a crucial consideration in evaluating alternative policies. One alternative is to consider the governments or societies of developing countries as risk-neutral. In this case, the evaluation should be based on expected values, which implies that carryover stockholding can only be profitable at a point in time when the price differential between expected export or import prices and present export or import prices is larger than storage costs. That such a solution will arise in most developing countries is unlikely. If price expectations were the same for all countries, stocks would be held in those countries where storage costs are the lowest, that is, in exporting countries. It can be expected that the price differential between expected and present world market prices is likely to be higher than storage costs for developed countries than for developing importing countries. Thus, there may be a need to hold working stocks—possibly large ones—but there seems to be no rationale for holding carryover stocks of tradable commodities in developing countries.

It should be noted that the derived conditions for expected profitability of national carryover stocks implicitly state the irrelevance of fluctuations in domestic production for profitable storage. If storage planning is based on expected values, fluctuations in domestic production can only be a determinant of the amount of stocks held if the country under consideration switches from being a net importer to being a net exporter as production fluctuates. This would have an impact on the differential between the present and expected world market price, where the present world market price is the country's f.o.b. price and the expected

[74] Shlomo Reutlinger, David Eaton, and David Bigman, *Should Developing Nations Carry Grain Reserves?* World Bank Staff Working Paper 244 (Washington, D.C.: World Bank, 1976).

[75] D. Gale Johnson, "Grain Insurance, Reserves, and Trade," p. 255.

[76] McIntire, *Food Security in the Sahel.*

world market price is the c.i.f. price. Because there is a wide differential between export and import prices, especially for landlocked Eastern African countries, however, it seems rational to relate stocking up and release of stocks to domestic production outcomes.

This finding has implications for assessing the benefits of regional cooperation in planning carryover stocks. If, as this report has shown, production is more stable on the regional than on the national level, the probability of a switch from a surplus to a deficit situation could be higher for nations than for regions. Therefore, the sum of uncoordinated national carryover stocks should probably be higher than the amount of carryover stocks held under an integrated regional scheme. There is, then, a rationale for integrating national stocks where governments and societies are risk-neutral, but there is also some evidence that developing countries are risk-averse.

If countries are risk-averse, it may be rational to hold some carryover stocks even when the differential between expected and present world market prices does not cover storage costs. Any other alternative for securing food in the future is more risky if there are severe limitations to having rapid access to capital markets. A country can compare alternative risk-reducing strategies, which might include reserves of foreign exchange or reserve stocks. With any of the alternatives, society incurs a loss in present consumption in order to secure a certain level of future consumption. However, a specific loss in consumption at present leads to varying levels of consumption in the future, depending on the risk-reducing strategy chosen and the outcome of the stochastic variables—world market prices and domestic production.

For the sake of simplicity, assume that a country aims at guaranteeing cereal consumption x in period t_1. This could be done by building up grain reserves to x in period t_0. Consumption forgone in period t_0 is x. Alternatively, foreign exchange reserves could be built up in period t_0, which would allow purchase of the quantity needed in period t_1. It is not certain, however, that the amount of foreign exchange needed to buy quantity x in period t_0 will still buy quantity x in period t_1. The outcome depends on the prevailing world market price in period t_1, which is unknown in period t_0. It may well be that by holding foreign exchange reserves the present income forgone may be less than if grain reserves were held. Because actual world market prices may differ considerably from expected ones, however, food supply is less secure in period t_1 if exchange reserves are held. On the other hand, if enough foreign exchange reserves are held to allow purchase of quantity x even under extreme world market conditions, the amount of foreign exchange held would have to be much higher than the amount needed to buy quantity x in period t_0. The two alternatives may lead to different risks and different values of expected consumption in period t_1.

If carryover stocks were chosen, there would be no risk involved. The foreign exchange strategy would lead to a higher expected value of consumption but also to the acceptance of some risk. If the country's risk preferences are not known, it is impossible to rank the alternatives.

Of course, this does not mean that food reserves should be considered superior to foreign exchange reserves. Without a clear ranking, it only helps explain that food reserves can contribute efficiently to food availability. Actually, the premium that has to be paid to cover the risk of a reduction in the expected value of future consumption may be quite high. A portfolio of risk-reducing alternatives might be a better way to secure food availability. Even if the optimum portfolio cannot be determined without knowing the country's risk-aversion parameter, the trade-off for policymakers can be analyzed.

Risk-aversion not only rationalizes national carryover stocks, it also argues for regional cooperation in stockpiling. If the risk of production shortfalls coinciding with high unexpected world market prices is less on the regional than the national level, cooperation in regional stockpiling may be a rational strategy. The next step is to quantify possible gains.

Quantifying the Potential Benefits of a Regional Food Reserve

It should be kept in mind that there is no single measure of actual benefits and costs of any regional food reserve system. The ultimate objective is to calculate the expected benefits and costs for the SADCC region as a whole and for individual countries. A regional food reserve may function as a regional insurance system against shortfalls in food consumption. Actual benefits and costs may differ considerably from their expected values, as is the case for any insurance system.

National expected benefits and costs of a regional food reserve system may differ depending on the size of the reserves and the related question of the agreed-upon rules that allow individual countries to withdraw food from the regional stock and determine when stocks have to be replenished.

Two alternatives are presented. First, it is assumed that the region aims to compensate for regional fluctuations in production by changing regional stocks. This strategy implies that the region is not willing to rely on world markets to compensate for fluctuations in the region's production through variances in import volumes. This strategy, however, does not help stabilize the food import bill because regional stocks and thus import volumes are not related to fluctuations in import prices. Therefore, food security may not be achieved when import prices are high. Hence, the region may pursue a regional stockpiling system aimed at stabilizing the food import bill, which is the second option.

Compensating for Instability in Regional Production

To date, researchers have quantified regional food reserves for the ASEAN countries[77] and the SADCC countries.[78] Although quite divergent in some aspects, all these studies start with one crucial assumption: regional reserves should compensate for fluctuations in regional production. This implies that the region would import only the difference between trend consumption and production. Conjunctural deficits or surpluses, which are defined as deviations from trend production because of crop shortfalls or other contingencies, should be reflected in changes in the regional reserves. Technosynesis calculated that 1.42 million tons of nonintegrated national stocks would be needed in 1985, whereas only 0.7 million tons of regional stocks—less than half—would be required.[79] Thus the gains from regional reserves could be large. Whether these gains actually materialize depends on the rules set up for release and replenishment of stocks and whether they can be enforced.

A regional food reserve to even out the region's fluctuations in production is not the most efficient way to achieve food security. Its contribution could be marginal or even negative. As already explained, both production and import prices may fluctuate, impairing food security. If the coefficient of correlation between fluctuations in production and in world market prices were +1 and both fluctuations were the same, fluctuations in domestic production would not impair food security. A shortfall in production could be offset by an increase in imports without affecting the food import bill.

[77] S. Hanpongpandh, "Modelling the Impact of the ASEAN Food Security Reserve," in *Food Security: Theory, Policy, and Perspectives from Asia and the Pacific Rim,* ed. A. Chrisholm and R. Tyers (Lexington, Mass.: Lexington Books, 1982), p. 281; S. Hanpongpandh and L. Blakeslee, "Rice Marketing Analysis: ASEAN Reserve Stock Model," in *Agricultural Development in Thailand,* ed. K. J. Nicol, S. Sriplung, and E. O. Heady (Ames, Iowa: Iowa State University Press, 1982), p. 164; R. Phillips and D. Jeon, "Simulating the Impact of Alternative Food Reserve Programs: The ASEAN Case," *Journal of Rural Development* 3 (April 1980): 83; and R. Byung-Seo, R. Phillips, and P. R. Kelly, "Feasibility of Food Security Reserves for Korea," *Journal of Rural Development* 5 (December 1980): 197.

[78] Southern African Development Coordination Conference, Regional Food Security Programme, "Regional Food Reserve."

[79] Ibid., p. 21.

Hence, it is reasonable to assume that it is not fluctuations in production but fluctuations in the food import bill that present the food security problem. Using this specification, it is easy to determine what conditions must prevail for the food import bill to be more stable.[80]

Table 24 presents the results of the calculations for the SADCC countries, which are based on actual cereal imports. For six out of the nine countries, fluctuations in import volumes were negatively correlated with fluctuations in import prices, which indicates that countries did somewhat adjust their import volumes to changes in import prices. But if they had imported the actual volumes at trend prices during the period, the variability in the import bill would have still been significant. For the other three countries, the import bill would have varied more with trend prices.

Actual variations in import volumes may have arisen partly from fluctuations in domestic production and partly from variations in import prices. If adjustment in import volumes to variability in import prices were not compensated for by changes in domestic stocks, consumption would have varied and food security would have been weakened. For the calculations of the hypothetical import bill in Table 24, it is assumed that countries vary their import volumes or stocks to offset variations in domestic cereal production around the trend to stabilize domestic consumption at trend values. Thus annual consumption would be equal to the trend value of consumption, and the import bill with stabilization would vary considerably more than the actual import bill. This indicates that countries do not relate cereal imports to fluctuations in domestic cereal production completely. Instead, they may hold national stocks to even out fluctuations in supply, or they may accept some variability in consumption.

It may seem surprising that the food import bill that would maintain trend consumption in all years would be more volatile for SADCC than for the individual countries.

Because some of the countries are only marginal importers or even exporters of cereals in normal years, small fluctuations in domestic production will result in relatively large fluctuations in import volumes. The higher variability of the cereal import bill for SADCC than for any country does not indicate that regional cooperation to stabilize the import bill would not pay, however. It is just the opposite. The region's food import bill is highly volatile because the region is almost self-sufficient, and individual countries produce either a surplus or a greater relative deficit than the region. On this basis, regional cooperation would be advisable.

The results indicate that a stockpiling rule that only takes into account fluctuations in domestic production would have reduced instability in the food import bill, but the stabilizing effect is less than perfect and varies among countries. Hence, a storage rule that relates changes in stocks to changes in production alone is not an adequate means of coping with the instability problem.

Such a storage system implies that individual member countries will draw from the regional stock if production is below the trend value. Other countries whose production is above the trend value will have to replenish it. Instead, the Technosynesis consultants proposed that individual countries drawing from stocks in one period would replenish in the following period. However, this rule would not guarantee that changes in the regional stock would be related to the region's fluctuations in production. But this was assumed when the size of the regional stock and its benefits were calculated.

It is unlikely that individual countries would be willing to adhere to the proposed rule. Assuming there is a production shortfall in country A, a bumper crop in country B, and world market prices are extraordinarily high, country A would, of course, want to draw from the regional stock, but country B may not be willing to replenish the stock.

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[80] Stabilization of import volumes will actually contribute to decreasing the variability in the food import bill if $CV^2(M) + CV^2(P) + 2r\, CV(P)\, CVCM > CV^2(P)$ or $CV(M)/CV(P) > -2r$.

Table 24—Instability of the cereal import bill with and without stabilization of the import volume, corrected coefficients of variation, 1961-79

Country	Actual Instability in Import Bill Without Stabilization			Instability in Hypothetical Import Bill Without Stabilization			Coefficient of Correlation Between Volume and Price of Imports[a]	Import Bill with Stabilization of Import Volumes
	Import Bill	Volume	Price	Import Bill	Volume	Price		
	(percent)							(percent)
Angola	32.6	20.1	28.3	115.1	168.8	28.3	0.23	28.3
Botswana	55.3	45.2	17.9	75.4	62.7	17.9	-0.04	17.9
Lesotho	25.9	16.2	37.5	78.7	74.8	37.5	-0.24	37.5
Malawi	48.4	86.5	17.6	-1,387.0[b]	-945.9[b]	17.6	-0.48	17.6
Mozambique	44.9	34.9	28.4	79.4	72.9	28.4	0.12	28.4
Swaziland	19.4	14.0	20.2	91.7	75.7	20.2	-0.32	20.2
Tanzania	12.3	94.3	31.4	95.4	96.7	31.4	0.48	31.4
Zambia	42.9	49.8	21.8	146.2	142.6	21.8	-0.26	21.8
Zimbabwe	38.2	34.8	29.8	-97.1[b]	-127.1[b]	29.8	-0.27	29.8
All SADCC countries	35.8	20.6	25.0	363.7	471.3	25.0	0.30	25.0

Source: Author's calculations based on Food and Agriculture Organization of the United Nations, "Trade Yearbook Tapes," Rome, various years.

Notes: In the hypothetical case, volume fluctuates to keep consumption constant at the 1961-79 trend.

[a] These are coefficients of correlation between deviations from trend values.

[b] These are exports.

If country B has been a food importer every year, it will want to help stabilize its food bill by importing less than normal in times of high world market prices. Rebuilding regional stocks when world market prices are high would place a burden on country B, and it would not constitute sound economic management. The system would reward country A at a cost to country B. Such distributional effects would probably lead to tension among the cooperating countries.

In summary, it is neither rational nor feasible from the economic point of view to relate the region's food reserve to fluctuations in the region's production alone.

Compensating for Instability in the Food Import Bill

A regional food reserve designed to stabilize the food import bills of the region and individual countries could be an efficient way to reduce risk. The amount of beginning stocks needs to be determined and the rules for a proper functioning specified.

Technosynesis estimated the amount of stocks needed if their proposed storage rule were applied by assuming that the same sequence of deviations from the trend of production will prevail in the future. An assumption about the relationship between past and future fluctuations is needed but, contrary to Technosynesis, it is not assumed here that the same sequence of deviations will prevail. Instead it is only assumed that the variance of fluctuations will not change over time. The sequence of positive and negative deviations from the trend value of food imports cannot be predicted, but the expected sum of the negative values of the random disturbances can be calculated if the random disturbances are normally distributed.[81] Thus,

$$E(S) = E[\sum_{t=1}^{t=n} (-u_t > 0)]$$

$$= (n/2\sqrt{2\pi})\sigma, \quad (13)$$

where

$E(S)$ = expected sum of shortfalls,

u = deviation from the trend,

σ = standard deviation, and

n = number of years for which a short-fall could be compensated.

The following steps are taken. First, the food import bill needed to stabilize national trend consumption is calculated. Second, the standard deviations of fluctuation around the trend of the food import bill—on the national and regional levels—are calculated. Third, the expected sum of shortfalls in foreign exchange over a period of 10 years is specified. This implies that reserves would be large enough to compensate for fluctuations in the import bill for 10 years. And fourth, the sum of shortfalls in foreign exchange is translated into the quantity of cereals needed for a food reserve. This is done by dividing the expected sum of short-falls in the food import bill by the average trend value of cereal import prices. The results are reported in Table 25. The stocks that would have stabilized the food import bill and simultaneously trend cereal consumption vary considerably among the nine SADCC countries. The sum of nonintegrated national stocks would amount to 3.3 million tons, but regional stocks would need to be only 1.9 million tons—41 percent less. This could lead to savings of about U.S. $55 million.

Stocks held to compensate for fluctuations in the cereal import bill are generally larger than stocks that are held to compensate for fluctuations in cereal production because the import bill varies more than cereal production. The relationship between variability in production and import volumes can be derived easily. Consumption (C), which is to be stabilized, is by definition equal to production (Q) and imports (M).

$$C = Q + M. \quad (14)$$

[81] L. M. Goreux, "Compensatory Financing for Fluctuations in the Costs of Cereal Imports," in *Food Security for Developing Countries,* ed. Alberto Valdés (Boulder, Colo.: Westview Press, 1981), p. 315.

Table 25—Instability in cereal production, the cereal import bill, and compensating stocks

| Country | Instability | | Stocks Needed to Compensate For | |
	Production	Import Bill	Production Shortfall	Import Bill Shortfall
	(percent)		(1,000 metric tons)	
Angola	9.8	115.1	100.340	264.4
Botswana	68.8	75.4	73.884	124.3
Lesotho	19.6	78.7	81.205	210.6
Malawi	11.6	−1,387.0[a]	272.358	360.9[a]
Mozambique	12.7	79.4	168.852	447.2
Swaziland	22.3	91.7	31.875	91.5
Tanzania	26.4	95.4	680.635	331.8
Zambia	9.2	146.2	178.008	437.3
Zimbabwe	12.7	−97.1[a]	441.900	1,021.1[a]
Total			2,002.057	3,289.1
All SADCC countries	8.9	363.7	1,176.281	1,933.9

Source: Author's calculations based on data from the Food and Agriculture Organization of the United Nations (FAO): for total cereal production, 1961-80, "Production Yearbook Tapes," Rome, various years; for cereal imports, 1966-80, and for border prices, FAO, "Trade Yearbook Tapes," Rome, various years.

Notes: The import bill is hypothetical. The estimate for storage costs is $50.00 per metric ton per year. Based on these calculations, holding regional stocks to compensate for production shortfall would save 41.0 percent or U.S. $41.3 million, whereas those held to compensate for an import bill shortfall would save 41.2 percent or U.S. $67.8 million.

[a] Export revenues.

If C is to be stabilized, the variance of M has to be equal to the variance of Q. Thus,

$$\text{var}(Q) = \text{var}(M), \quad (15)$$

and

$$CV(M) = (Q/M)\,CV(Q). \quad (16)$$

As Q is much greater than M for all countries, the coefficient of variation of import volumes will always be greater than the coefficient of variation of production. This is especially true for countries, such as Malawi, that are almost self-sufficient.

It should be kept in mind that the level of stocks needed, as calculated in this exercise, would completely compensate for fluctuations in the food import bill through changes in stocks. This implies that governments have a highly risk-averse attitude. A government may prefer to take care of fluctuations in the food import bill through reserves of both food and foreign exchange.

This would lead to a higher expected value of consumption but would be more risky. As the risk aversion of individual governments is unknown, the grain reserves calculated represent an upper limit.

Implementation of a Regional Food Reserve System

A regional food reserve system could be implemented without impairing the autonomy of the individual countries in pursuing food policy. However, countries have to agree on the beginning level of regional stocks, on cost sharing, and on rules for releasing and replenishing stocks.

The level of beginning stocks depends on the extent to which individual countries prefer to be insured against shortfalls in foreign exchange to finance the food import bill by holding food reserves. It is likely that interests will diverge as the consequence of different aversions to risk and because of different costs for alternative stabilizing policies. For example, those countries that can easily substitute cassava for cereal con-

sumption or that have less binding foreign exchange constraints will probably not see the need to stabilize cereal consumption totally. Hence, they may be willing to accept some deficit in the food import bill at times of high world market prices or domestic production shortfalls. For this reason, countries should be allowed to select the extent to which they want to be insured. If a country, for example, chooses to be insured by only 80 percent, it would receive only 80 percent of a deficit in food imports. Consequently, the total amount of beginning stocks could be decreased if some countries opt for less insurance.[82]

It is crucial that the costs of holding regional stocks be shared adequately if the regional reserve scheme is to be viable. Some of the starting capital could be funded by external resources, especially by the EC in accordance with the Lomé agreement. The remaining start-up costs and current costs should be paid by member countries in proportion to expected benefits. If all countries want to be insured completely, cost sharing could be based on the ratio of nonintegrated national stocks of an individual country over the sum of nonintegrated national stocks of all nine countries. If a country wants to be insured by x percent, the country's share in costs should be reduced proportionally. In addition, it should be taken into consideration that total stocks needed would be smaller. A cost sharing formula would be:

$$c_i = x_i \, S_i / \sum_{i=1}^{9} x_i \, S_i, \qquad (17)$$

where

c_i = share in total costs of country i,

S_i = storage needed if country i would carry out an autonomous storage policy to cover the risk completely,

$\sum_{i=1}^{9} S_i$ = storage needed to cover completely the risk of all countries using a non-integrated stockpiling system, and

x_i = percentage of insurance that a country selects.

If x_i were 1 for all countries, or if all countries wanted to be insured against shortfalls in the food import bill to the same extent, costs would be based on the ratio of the individual country's national autonomous stocks and their sum. The proposed formula for sharing in costs could guarantee that the benefits of the scheme could be distributed evenly among the member countries.

The table below shows the cost shares when all countries prefer to be insured completely based on the data in Table 25. Those countries that need only small amounts of national stocks to stabilize the national cereal food import bill autonomously would only have to pay a small fraction of the total storage costs for the regional scheme. These are countries that either produce a small share of the region's cereals, such as Botswana, Lesotho, and Swaziland, or those that have less variability in cereal production, such as Angola and Tanzania. Zimbabwe would pay the largest share because its 25 percent share in the region's cereal production is the highest and its variability ranks far above average.

Country	Share in Costs (percent)
Angola	8.0
Botswana	3.8
Lesotho	6.4
Malawi	11.0
Mozambique	13.6
Swaziland	2.8
Tanzania	10.1
Zambia	13.3
Zimbabwe	31.0

Countries will probably be prepared to share in the costs if they can agree upon the rules for release and replenishment of stocks. To clarify the rules for release with a schematic example, assume that the trend

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[82] The idea of an insurance approach for improving food security is well presented by Panos Konandreas, Barbara Huddleston, and Virabongsa Ramangkura, *Food Security: An Insurance Approach,* Research Report 4 (Washington, D.C.: International Food Policy Research Institute, 1978).

value of country I's import bill in year t is $150,000 for the quantity expected to be imported. That is, the trend value of import volume in year t is 1,000 tons and the expected price is $150 per ton. If the country experiences an unexpected shortfall in cereal production of 100 tons, the country would have to import 1,100 tons in year t in order to stabilize cereal consumption. However, if the import price happens to be $165, the trend value of the import bill would allow the country to import only 909 tons. Hence, the country would suffer a shortfall of 191 tons, which could be withdrawn from the regional reserve if the country had chosen to be completely insured. Otherwise, the country could withdraw only $x_i \times 191$ tons.

It is evident that countries interested in withdrawing reserves would be likely to adhere to the stock release rules. They might be less inclined to accept the rules for replenishment. If the reserve system functions as a genuine insurance system, individual countries should not be required to replenish the stocks they have withdrawn. Instead, those countries with a surplus in their food import bill in a given year from low world market prices or bumper crops should help replenish the carryover stocks. This implies that some countries may be required to replenish stocks in a sequence of years even if they have not drawn from the regional stock.

If countries are not willing to agree to this rule and instead enforce a rule that only those countries that have drawn from the stock must replenish it in years when they have a surplus in their food import bill, the system could also function. However, even if the insurance effect was the same in the long run, it is likely that the level of regional stocks under this rule would not be sufficient. Hence, the cost-saving effect of the regional scheme would be less.

Of course, a regional reserve system can only function adequately if every country in the cooperation scheme has easy access to reserves. This is only possible if regional stocks are held in locations scattered throughout the region. Technosynesis calculated where the stocks should be held and in what

amounts. Hence, this problem can be considered to be adequately solved and need not be investigated further in this report.

Variability in Food Consumption and Production

As stated above, variability in food consumption is mainly caused by variability in household income. Variability in farm income is mainly caused by variability in agricultural production and prices. It may well be that variability in the production of individual agricultural products is largely determined by adverse weather conditions and is beyond policy control. Nevertheless, instability can partly be reduced by appropriately adjusting the production pattern. Individual crops are affected differently by weather conditions, and there may be negative covariances in the fluctuations of individual crops. Negative covariances between product prices may also indicate that the variability in the value of agricultural production may be affected by the production pattern. In the following it is assumed that the production pattern can be affected by policy measures, thus decreasing instability in the value of agricultural production. Many developing countries prefer to produce more food than export crops if instability can be decreased. This strategy is pursued even if it means forgoing income.

If a trade-off between instability and income actually exists, it can be hypothesized that the relationship is different for individual countries than for a group of countries. It can be expected that the larger the number of products the more stable the value of production will be. The risk of a failure in individual crops and fluctuations in prices will be diversified. It is more likely that fluctuations in the production and prices of one product will be offset by compensating variations in other products.

In carrying out the empirical calculations the relevant price for measuring the value of agricultural production has to be defined. It is not relevant how the producer perceives instability. Actually, it may be that producers are not affected by price instabil-

ity if the government runs price stabilization schemes. But, for the economy as a whole, prices will nevertheless be unstable. A measure of price instability from a sectoral point of view is needed. In the following calculations the export or import prices of a country or region are used to value production. These prices are adequate because they express opportunity costs from an economic point of view.

The results of the calculations are presented in Table 26. First, they indicate that the variability in the value of production varies considerably among products. Sugar and sisal production are most volatile. Second, instability in the value of cereal production is relatively high for all countries, but significantly less than for sisal and sugar.

Third, four out of the nine countries produce more than one noncereal export crop. The variability in the value of total production was generally lower than the instability in the value of cereal production if the production pattern included several noncereal export crops. The only exception is Mozambique, where noncereal crop production is quite unstable. According to these results, an increase in export crop production may help stabilize sectoral income. This effect will arise if the values of production for individual crops are negatively correlated with each other, and if fluctuations in the value of production are independent.

Fourth, the variability of the three variables, the values of cereal production, noncereal export crop production, and total production, is smaller for SADCC than for individual countries. This lends further support to the idea of regional risk-pooling, which is smaller for two reasons. First, individual crops vary less on the regional than on the national level, and second, variability in the value of total production tends to be less, the more diversified the production pattern.

It is tempting to recommend policy actions on the basis of these results. However,

the following reservations hold: in deriving a formula for the "optimal" shares it must be assumed that the coefficient of variation for the value of a given crop will not change with the share of this production value in the value of total production. This implies that the variability in production is only caused by the variability of yields and not of area harvested.[83] This can be considered a reasonable assumption for most crops; however, an expansion of cultivated area may lead to higher instability for some crops. This will certainly happen if an increasing part of production is grown in areas that are more prone to unstable yields due to specific soil and climate conditions. Because these consequences cannot be observed from the macroeconomic data presented above, direct policy recommendations cannot be made. However, the findings are sufficient to recommend that individual governments should investigate whether a change in the production pattern along the lines of the results presented above is feasible.

The same recommendation applies to a change in the regional production pattern. However, an additional problem will arise concerning the linkage between national and regional instability. A change in the production pattern would affect national instability in the country under consideration, but it would not necessarily affect instability in other countries in the region. This might happen to some extent if the countries in the region were to integrate their markets. An alternative would be to create a regional scheme to stabilize net foreign exchange earnings.

Reducing Consumption Variability by Stabilizing Regional Foreign Exchange

Food insecurity arises not only from fluctuations in production and food import prices, but also from fluctuations in real income

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[83] The formula is based on the assumption that only yields are stochastic, not area harvested. Moreover, it is assumed that fluctuations among individual crops are independent. For the derivation of this formula, see Ulrich Koester, *Policy Options for the Grain Economy of the European Community: Implications for Developing Countries*, Research Report 35 (Washington, D.C.: International Food Policy Research Institute, 1982), p. 53.

Table 26—Instability of the value of cereal and cash crop production, 1961-82

Country	Cereals	Coffee	Tea	Sugar	Tobacco	Sisal	Ground-nuts	Cotton	Total Export Crops	Total Pro-duction
					(percent)					
Angola	29.5	32.6[a]	...	...	...	77.9	...	...	33.5	24.7[a]
Botswana	69.0	...	...	...	...	...	...	...	...	69.0
Lesotho	43.4	...	...	...	...	...	...	...	...	43.4
Malawi	19.9	...	21.0[b]	38.5[c]	24.4	...	35.7	...	21.9	18.2[c]
Mozambique	26.6	...	32.7	38.5[c]	...	...	...	16.9[b]	33.2	33.6[d]
Swaziland	19.5	...	...	36.8[e]	...	...	...	...	36.8	35.8[c]
Tanzania	25.3	25.5	...	...	...	42.3	...	20.3	22.3	20.9
Zambia	30.3	...	...	...	22.1	...	...	...	22.1	33.4[b]
Zimbabwe	45.0	...	...	...	33.4	...	...	35.0[b]	29.7	28.0[b]
All SADCC countries	19.0	...	...	...	...	...	...	...	20.6[c]	18.4[c]

Source: Author's calculations based on data from the Food and Agriculture Organization of the United Nations (FAO): for cereal production, 1961-80, FAO, "Production Yearbook Tapes," Rome, various years; other production data from FAO, *Production Yearbook* (Rome: FAO, various years); for the cereal import bill 1961-80, from FAO, "Trade Yearbook Tapes," Rome, various years; and for other prices from FAO, *Trade Yearbook* (Rome: FAO, various years).

Notes: The ellipses indicate that production was negligible. The figures are corrected coefficients of variation, calculated using import or export prices.

[a] 1962-82.
[b] 1964-82.
[c] 1969-82.
[d] 1963-82.
[e] 1966-82.

within the economy.[84] Hence, it is not certain that stabilizing food supply through a regional stockpiling system will definitely contribute to food security. It cannot be taken for granted that measures applied directly to the food markets will actually stabilize real income and thus food consumption. Variability in real income in developing countries is mainly caused by fluctuations in export earnings and in the food import bill. Hence, "the food insecurity problem of developing countries should be analyzed within the context of their foreign exchange position."[85] Food consumption could be stabilized by stabilizing total export earnings and the food import bill or by stabilizing net export earnings (defined as total export earnings minus the value of food imports). If countries are not totally risk-averse they could complement a food reserve system with a foreign exchange stabilization scheme.

It can be argued that a regional foreign exchange stabilization scheme is hardly needed, as there are already two schemes, the IMF and STABEX, which are supposed to stabilize export earnings and the food import bill of developing countries. However, past experience has shown that these schemes are not sufficient for the task. On the basis of his calculations for the IMF export earnings stabilization scheme, Herrmann concludes, "For the aggregate of payments and repayments in the IMF system, it was

[84] Valdés and Siamwalla, "Introduction."
[85] Alberto Valdés and Panos Konandreas, "Assessing Food Insecurity Based on National Aggregates in Developing Countries," in *Food Security for Developing Countries,* ed. Alberto Valdés (Boulder, Colo.: Westview Press, 1981), p. 41.

not possible . . . to prove stabilizing or destabilizing effects at the 1 percent level."[86] Similar conclusions can be drawn for the STABEX system. It is obvious that the two schemes have not been able to reduce instability significantly for most countries if they have had any stabilizing effect at all. Consequently, there may be a need for a regional scheme, which, however, should not be considered a substitute for the present schemes but a complement. Apart from their stabilization effects, both the IMF and the STABEX systems transfer income to those countries that draw from the fund. Hence SADCC countries could obtain income by using the funds' facilities, and in addition they could further stabilize foreign exchanges through a regional scheme.

A regional scheme can only be recommended if net export earnings—as defined above—fluctuate less regionally than nationally. According to Table 27, this holds true if the coefficient of variation is accepted as an adequate measure.

What funds are needed for a foreign exchange stabilization scheme and how such a system could function has been described by Valdés and Konandreas.[87]

Conclusion

The nine Southern and Eastern African countries that decided to cooperate in 1980 are all relatively small. The total population is only about 60 million. It can be expected that cooperation among such small countries may result in higher benefits than among large countries. Moreover, six of these nine countries are landlocked. Hence, transport costs for exports to markets out-

Table 27—Instability in the cereal import bill and export earnings, 1961-82

Country	Cereal Import Bill	Total Export Earnings	Net Export Earnings
	(percent)		
Angola	32.6	22.1	26.0
Botswana	55.3	18.2	19.8
Lesotho	25.9	38.6	51.9
Malawi	48.4	15.9	71.2
Mozambique	44.9	26.0	29.5
Swaziland	19.4	21.9	15.1
Tanzania	122.7	17.9	15.5
Zambia	42.8	23.5	25.6
Zimbabwe	38.2	24.5	14.7
All SADCC countries	35.8	15.8	16.1

Source: Author's calculations.

side the region are high. Moreover, access to foreign markets depends on road, rail, and harbor facilities in neighboring countries. Thus, regional cooperation may result in high economic returns, perhaps higher than those resulting from unilateral liberalization.

However, it should be kept in mind that most regional cooperation schemes have not met expectations. This does not mean that the potential benefits were minor; it only indicates that potential benefits are not easy to capture. The success of a regional scheme greatly depends on its implementation. In this respect, regional cooperation strategies do not differ from any other policy strategy. Potential benefits can only be captured if policies are adequately administered and implemented.

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[86] Roland Herrmann, *The Compensatory Financing System of the International Monetary Fund; An Analysis of its Effects and Comparisons with Alternative Systems,* Forum Reports on Current Research in Agricultural Economics and Agribusiness Management (Kiel: Kieler Wissenschaftsverlag Vauk, 1983).

[87] Valdés and Konandreas, "Assessing Food Insecurity."

APPENDIX: SUPPLEMENTARY TABLES

Table 28—Changes in the market shares of LAFTA's agricultural exports to member countries in world exports to LAFTA countries, 1962-64 to 1977-79

Commodity	Total Effect	Import Growth Effect	Commodity Composition Effect	Competitive Effect
	(U.S. $ million)			
Live animals	−49.98	−22.22	0.00	−27.75
Meat	54.32	47.85	6.18	0.29
Dairy products	22.23	4.63	7.79	9.82
Cereals	75.86	263.45	−32.62	−154.96
Fruits and vegetables	205.94	117.78	−4.65	92.82
Sugar	30.86	57.57	13.71	−40.41
Coffee, tea, and cocoa	22.33	36.49	−4.39	−9.77
Animal feed	6.69	41.46	0.00	−34.77
Miscellaneous food preparations	8.66	10.88	−3.49	1.26
Alcoholic beverages	12.80	2.53	0.00	10.27
Tobacco	1.95	0.01	0.00	1.94
Hides	−3.37	13.39	0.00	−16.76
Oilseeds	34.61	9.04	0.00	25.56
Crude rubber	1.23	0.79	0.00	0.44
Textile fibers	−59.88	−56.02	3.44	−7.30
Crude fertilizers	1.80	23.91	0.00	−22.11
Miscellaneous crude materials	−1.45	7.63	0.40	9.47
Animal oils and fats	19.89	17.37	0.00	2.52
Fixed vegetable oils and fats	96.90	36.66	−1.48	61.73
Processed oils and fats	3.12	−0.08	0.00	3.20
Manufactured fertilizer	7.89	7.52	0.00	0.37
Total	492.42	620.64	15.16	−113.08

Source: Author's calculations based on International Food Policy Research Institute, "Intra-LDC Trade Data Base," Washington, D.C., 1985 (computer printout).

Table 29—Changes in the market shares of LAFTA's agricultural exports to member countries in developing-country exports to LAFTA countries, 1962-64 to 1977-79

Commodity	Total Effect	Import Growth Effect	Commodity Composition Effect	Competitive Effect
	(U.S. $ million)			
Live animals	−49.98	−49.99	0.00	0.01
Meat	54.32	54.36	0.00	−0.05
Dairy products	22.23	22.26	−0.06	0.03
Cereals	75.86	115.46	−1.67	−37.92
Fruits and vegetables	205.94	208.17	−1.98	−0.25
Sugar	30.86	68.07	0.24	−37.44
Coffee, tea, and cocoa	22.33	19.58	1.83	0.92
Animal feed	6.69	6.98	0.00	−0.30
Miscellaneous food preparations	8.66	8.58	−1.12	1.20
Alcoholic beverages	12.80	12.77	0.00	0.03
Tobacco	1.95	2.15	−0.02	−0.17
Hides	−3.37	−3.34	0.00	−0.03
Oilseeds	34.61	0.58	0.00	34.03
Crude rubber	1.23	0.28	0.00	0.96
Textile fibers	−59.88	−59.06	0.54	−1.36
Crude fertilizers	1.80	44.12	0.00	42.32
Miscellaneous crude materials	1.45	−1.45	−0.03	0.03
Animal oils and fats	19.89	19.89	0.00	−0.01
Fixed vegetable oils and fats	96.90	92.06	5.76	−0.92
Processed oils and fats	3.12	2.71	0.00	0.41
Manufactured fertilizer	7.89	12.90	0.00	−5.01
Total commodities	492.42	577.08	3.49	−88.16

Source: Author's calculations based on International Food Policy Research Institute, "Intra-LDC Trade Data Base," Washington, D.C., 1985 (computer printout).

Table 30—LAFTA's agricultural exports to member countries as a share of LAFTA's exports to the world, 1962-64 to 1977-79

Commodity	1962-64	1967-69	1972-74	1977-79
Dairy products	19.7	18.8	37.0	67.2
Animal oils and fats	19.1	25.2	23.8	63.7
Crude rubber	29.2	38.2	43.2	46.7
Manufactured fertilizer	19.0	19.3	43.3	46.4
Miscellaneous food preparation	76.7	54.0	26.5	38.0
Alcoholic beverages	16.4	10.5	12.3	23.9
Fruits and vegetables	13.5	18.5	16.4	22.5
Crude fertilizers	7.1	12.4	20.6	22.0
Live animals	54.1	61.7	16.8	20.7
Cereals	18.0	20.4	15.8	18.7
Processed oils and fats	2.4	10.3	16.6	16.6
Vegetable oils	3.0	12.7	7.5	14.9
Sugar	5.0	2.6	3.1	10.1
Hides	2.5	4.8	8.8	7.6
Meat	2.4	3.4	4.4	7.4
Miscellaneous crude material	9.3	7.4	4.5	5.8
Textile fibers	6.1	7.8	8.8	5.1
Oilseeds	3.0	1.0	1.8	4.9
Coffee, tea, and cocoa	3.1	3.6	4.4	3.0
Animal feeds	2.0	3.6	3.3	1.4
Tobacco	0.1	1.5	2.1	0.9

Source: Author's calculations based on International Food Policy Research Institute, "Intra-LDC Trade Data Base," Washington, D.C., 1985 (computer printout).

Table 31—Preference-induced exports as a share of total exports, selected Caribbean countries, 1976

SITC Number	Product	Barbados	Guyana	Jamaica	Trinidad and Tobago
01	Meat and meat preparations	94.4	...	90.5	...
02	Dairy products	...	...	16.2	1.9
03	Fish and fish preparations	...	...	16.8	23.9
04	Cereals	48.9	42.6	61.5	77.9
05	Fruits and vegetables	66.9	...	2.3	33.3
06	Sugar and sugar preparations	1.7	...	...	1.4
07	Coffee, tea, cocoa, and spices	...	...	14.5	16.8
08	Animal feed	72.8	...	...	8.2
09	Miscellaneous food preparations	...	83.2	65.7	36.8
50	Chemical elements and compounds	42.3	...	0.6	...
54	Medicinal and pharmaceutical products	...	29.9	49.9	...
55	Essential oils	37.0	14.9	1.3	48.6
59	Chemical manufactures	2.9	75.7	29.2	2.9
62	Rubber manufactures	...	...	23.2	...
63	Wood and cork manufactures	...	...	13.4	3.5
64	Paper and paperboard	...	18.4	59.2	63.8
65	Textile yarn and fabrics	96.7	6.7	54.6	57.8
66	Nonmetallic mineral manufactures	...	48.8	...	...
67	Iron and steel	...	...	74.0	...
68	Nonferrous metals	...	...	46.5	...
69	Manufactures of metals	75.1	99.6	58.2	...
71	Nonelectric machinery	40.2	100.0	92.5	...
72	Electrical machinery	0.0	100.0	79.1	92.1
82	Furniture	78.3	...	73.3	...
83	Travel goods	76.8	95.0	16.9	34.5
84	Clothing	9.1	60.1	...	0.2
85	Footwear	...	86.3	58.6	56.5
89	Miscellaneous manufactures	48.3	99.0	38.3	17.1

Source: Karl M. Bennett, "An Evaluation of the Contribution of CARICOM to Intra-regional Caribbean Trade," *Social and Economic Studies* 31 (No. 1, 1982): 80.

Table 32—Land use in the SADCC countries, 1980

| Country | Total Area | Land Area | Arable and Permanent Cropland[a] | | Permanent Pasture | Forest | Other |
			Total Arable Land[b]	Permanent Cropland			
			(1,000 hectares)				
Angola	124,670	124,670	3,500	550	29,000	54,200	37,970
Botswana	60,037	58,537	1,330	...	43,794	962	12,451
Lesotho	3,035	3,035	361	...	2,000	...	674
Malawi	11,848	9,408	2,273	18	1,840	4,983	311
Mozambique	80,159	78,409	3,080	230	44,000	16,050	15,279
Swaziland	1,736	1,720	164	3	1,224	106	226
Tanzania	94,509	88,604	5,030	1,000	35,000	42,750	5,824
Zambia	75,261	74,071	4,998	7	35,000	20,940	13,134
Zimbabwe	39,058	38,667	2,524	59	4,856	23,810	7,477
Total	490,313	477,121	23,260	1,867	196,714	163,801	93,346

Source: Food and Agriculture Organization of the United Nations, *Production Yearbook*, vol. 36 (Rome: FAO, 1982), quoted in Southern African Development Coordination Conference, *Agricultural Research Resource Assessment in the SADCC Countries*, vol. 1, *Regional Analysis and Strategy*, (Gaborone, Botswana: SADCC, 1985), pp. 2-5.

[a] In FAO statistics, arable land refers to land under temporary crops with multiple cropped areas counted only once, plus temporary meadows for mowing or pasture, land under market and kitchen gardens, and land temporarily fallow or lying idle. Land under permanent crops refers to land cultivated with crops that occupy the land for long periods such as coffee, rubber, and cocoa. It includes fruit and nut trees but excludes trees grown for wood or timber.

[b] This figure includes permanent cropland.

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