Regional Grain Import Insurance Program

Grain supplies may be unstable if countries are unable to import the desired or necessary level of grains. This occurs because of a downward domestic production shock, an upward world grain price shock, or a combination of these two events, which leads to prohibitively expensive grain imports. In this section, a regional model is developed to examine the feasibility of creating a new grain import insurance program. A regional grain import insurance program would stabilize aggregate food supplies very differently than a stocking program. With this approach, countries would pay annual premiums according to a predetermined risk profile and then receive occasional compensation whenever import costs exceeded a threshold for a pre-selected consumption target. The risks would be shared in such a way as to facilitate an actuarially sound fund that stays solvent by diversifying risks over the region and over time.

With this approach, it is important to note that import costs can vary according to the interaction of two independent events: country level production deviations and world grain prices.[10] Import costs would not necessarily be significantly above average if, for example, a large production deficit happened to coincide with below-average world prices, or conversely, above-average world grain prices coincided with a large production surplus. The worst possible interaction is for a country to have a severe production deficit (and therefore large import needs) in a year of high world grain prices. To varying degrees, the SADC countries all have been affected over the past few decades by this combination of a production deficit and high international grain prices.

For this approach, we adapted and modified the modeling structure developed by Kondreas, Huddleston, and Ramangkura (1978). The principle of their model remains the same: for each country and each year, determine the food gap (the difference between the average supply level and random production), then determine if the combination of this food gap and international grain prices leads to import costs that are unusually high. When this situation occurs, the country receives financial compensation. Depending on the frequency of occurrence and the level of insurance chosen, each country pays a different premium level.

Again, one would assume that a regional authority would implement a regional program using the model outlined below. The program would be implemented on the basis of historical data.

Stage 1:

- Set the uniform target supply level policy;
- Set the uniform import cost threshold policy;
- Calculate each country's supply trend;
- Calculate each country's import cost trends.

Stage 2 (for each country and each year):

- Calculate the food gap for imports (target supply minus random production);
- Calculate the import costs (food gap multiplied by the world grain price);
- Determine if the model import costs exceed the threshold level:

  If yes, receive compensation in the amount;

  Otherwise, do not receive compensation;

Stage 3:

- Determine each country's risk profile based upon frequency and amounts of compensation;
- Set nonprofit premiums for each country based upon its risk profile;
- Set up a regional risk-pooling fund.

In the base case, the supply target is set at 95 percent of trend supply, while the import cost threshold is set at 110 percent of trend import costs. In order to make comparisons later, we employed the same supply trends used for the stocking model, although the trends are set on a per capita basis. The import cost trends are calculated on a per capita basis using statistical analysis of time trends (fit-the-best criterion).[11]

[10] We assumed that these countries, as relatively small players on the world grain market, do not affect world grain prices. This is a safe assumption with the possible exception of South Africa.

[11] Again, sensitivity analyses were performed, but are not presented in this report. The import insurance model is more sensitive to different supply targets (for example, 90 percent of supply trend) than import cost thresholds (for example, import cost threshold of 130 percent of trend costs).

Table 4—Example of import insurance program for Swaziland

Year	Production	Supply trend=$\hat{S}$	Supply target ($0.95*\hat{S}$)	Import quantity gap[1]	World grain price	Cost of import gap[2]	Import cost trend times 1.1[3]	Compensation formula[4]	Population	Total compensation
	Kg/capita				*$/MT*	*$/capita*			*Mil.*	*$ Mil.*
1980	173	240	228	55	148	8.06	8.64	0	0.607	0
1981	158	239	227	69	122	8.39	8.88	0	.625	0
1982	87	239	227	140	157	21.92	9.12	12.80	.641	8.211
1983	50	237	226	176	145	25.42	9.36	16.06	.661	10.618
1984	226	235	223	(2)	121	(.29)	9.60	0	.682	0
1985	253	232	221	(32)	93	(2.97)	9.84	0	.705	0
1986	225	229	217	(8)	86	(.67)	10.08	0	.728	0
1987	132	222	211	79	119	9.37	10.31	0	.763	0
1988	150	218	207	58	124	7.15	10.55	0	.789	0
1989	170	214	204	34	108	3.67	10.79	0	.814	0

[1] Gap is calculated as per capita supply target minus per capita production. [2] Per capita gap multiplied by world price, divided by 1,000.
[3] Import cost trend determined from historical data. [4] If cost of per capita import gap exceeds trend, calculated difference, otherwise zero.

Source: Authors' calculations based on import insurance model.

Consider how this program might have worked in the case again of Swaziland for the years 1981 and 1982 (table 4). In 1981, per capita production was slightly above average, leading to a relatively normal import quantity gap (69 kg/capita). However, real world prices were below average, so that import costs ($8.39/capita) did not exceed the cost threshold (110 percent of trend, $8.88/capita). However, 1982 was very different. Per capita production was significantly below average (87 kg/capita), leading to a large import quantity food gap (140 kg/capita). In addition, real world prices that year were relatively high at $157/MT. Together, these forces led to a high import bill ($21.92) that was above the threshold level ($9.12/capita). So in this year, Swaziland would have received compensation of $12.80/capita, which, when multiplied by the population leads to total compensation of $8.21 million. These ideas are illustrated for Swaziland in figures 4 and 5.

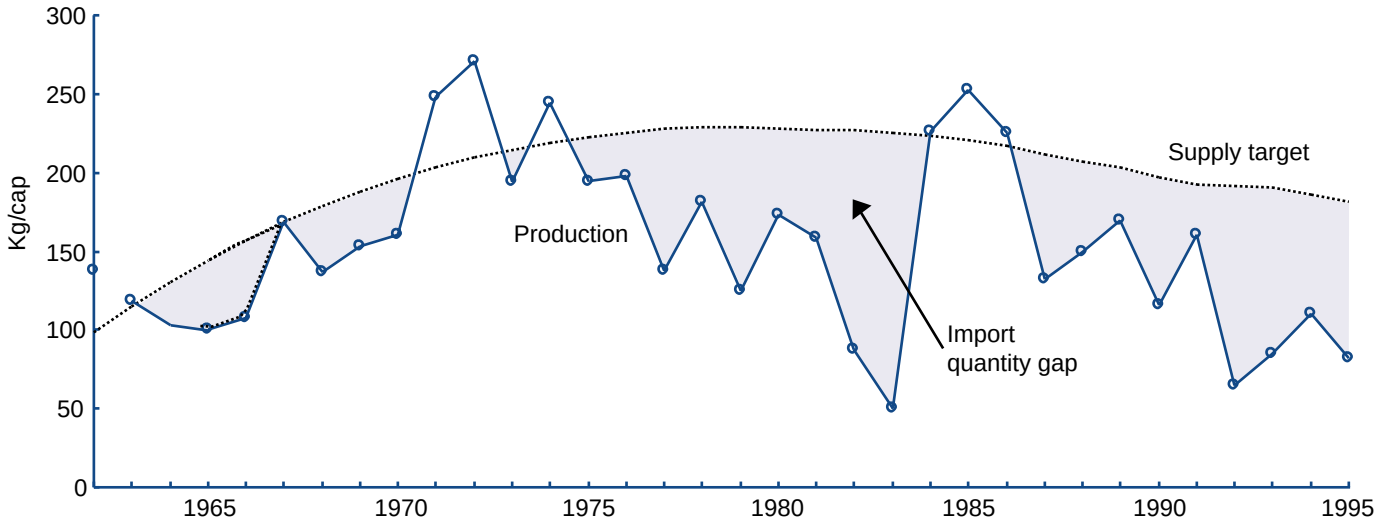
The overall insurance model results are shown in table 5. The largest absolute amounts of compensation in real 1990 U.S. dollars over the 1963-95 period would have gone to South Africa ($1.37 billion, a little over 50 percent of the regional total). This total compensation reflects South Africa's relatively large population compared with its neighbors as well as its occasionally large import needs. However, on a frequency basis, South Africa would have received compensation only 5 times (albeit large amounts) over the 1963-95 period, compared with 13 times for Zimbabwe, 12 for Zambia, and 11 for Swaziland. The average frequency of compensation for all 12 SADC countries was 7.58 times. On a per capita basis, the share of regional compensation differed substantially across countries. Zimbabwe emerges as the largest recipient on a per capita basis, about $85 per person over the 1963-95 period. Next is Swaziland at about $58 per person.

Table 5—Base case results for SADC (cumulative compensation in real 1990 dollars, 1963-95)

Country	Years receiving compensation	Total compensation		Per capita compensation
	Number	*$ Mil.*	*Percent*	*Dollars*
Angola	3	0	0	0.4
Botswana	10	39	1.4	47.1
Lesotho	6	56	2.0	42.7
Malawi	9	168	6.1	26.3
Mauritius	5	24	.9	26.8
Mozambique	5	42	1.5	3.0
Namibia	5	14	.5	10.8
South Africa	5	1,366	49.7	42.6
Swaziland	11	35	1.3	57.7
Tanzania	7	225	8.2	13.6
Zambia	12	220	8.0	35.0
Zimbabwe	13	558	20.3	85.4
SADC	n.a.	2,747	100.0	418.6

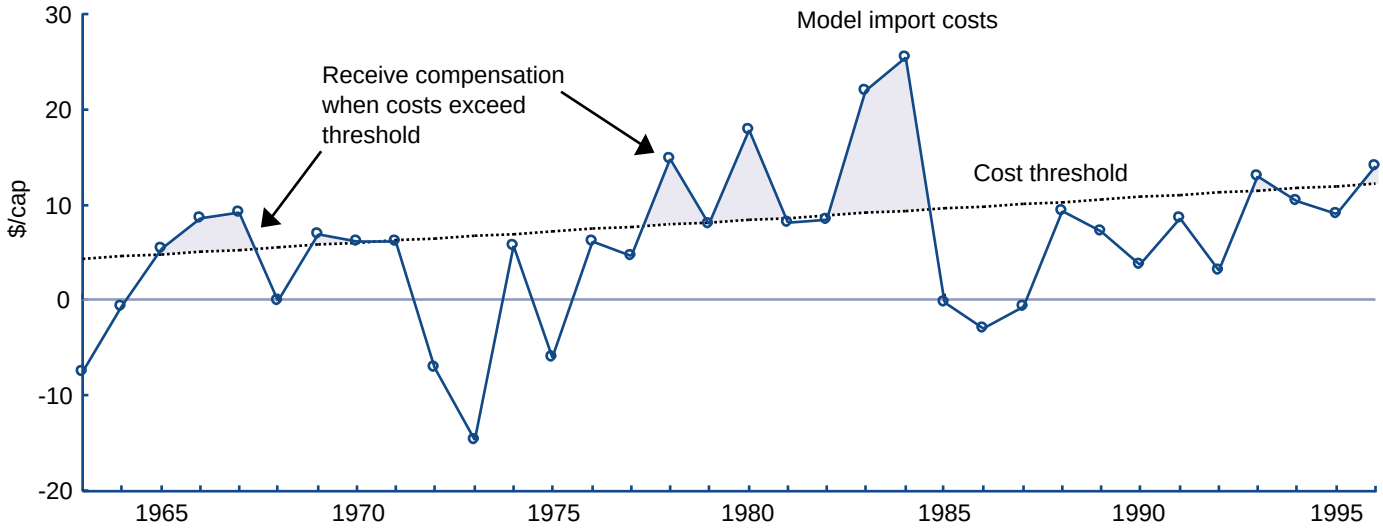
n.a. = Not applicable.
Source: Authors' calculations based on import insurance model.

Figure 4
Swaziland import insurance example: Import quantity gap



Source: Authors' calculations based on import insurance model.

Figure 5
Swaziland import insurance example: Costs of financing import gap



Source: Authors' calculations based on import insurance model.

Botswana, Lesotho, and South Africa have similar levels of about $43-$47 per person.

In order to create an actuarially sound regional fund to handle claims, each country's risk profile would need to be assessed so that annual premiums could be collected. Nonprofit premiums could be calculated by averaging each country's cumulated compensation over the historical period. For example, over the 1963-95 period, Zambia would have received compensation in 12 out of 33 years for a cumulative total of $35 per capita, or about $220 million in total (real 1990 dollars). Averaging that compensation over time, Zambia would have needed to pay in to a fund about $1.06 per person per year. Performing that calculation for each country leads to a regional total of about $11.86 per person per year. This insurance program would need a one-time startup allocation to a fund in order to stay solvent over time, which is discussed later.