

CHAPTER SIX: “Policy Simulations” Analysis of Results

Based on the estimated model equations, simulations for plausible policy scenarios were performed in this chapter. First, a baseline simulation was generated following which two policy scenarios were evaluated. The first policy scenario evaluated the possible effects on SADC of a large decrease in area harvested in Zimbabwe given the current land restitution policies. The second scenario evaluated the effects of a two-year decrease in yield in South Africa, Southern Africa’s breadbasket, on the region.

6.1 Baseline Forecast

The baseline forecast was generated for the period 2002 to 2007 based on several assumptions. Theoretically, the baseline can be considered as a plausible market outlook for the period 2002 to 2007, rather than as a forecast *per se*. In other words the baseline forecast can be considered as a benchmark for the SADC market outlook. The main assumptions of the baseline forecast were: no further expansion of SADC, SADC trade protocol of 1994 is yet to be implemented i.e., full implementation of the trade protocol will be achieved by 2004 by all member countries (no restrictions exist on the trade in maize), thus domestic maize price react to changes in world price. Values of the relevant macro variables for the forecast for South Africa were taken from FAPRI Outlook 2002, for the remaining countries it was assumed that exchange rates will follow the same trend as in South Africa as in FAPRI Outlook 2002 forecasts. All other relevant macro variables were assumed to have a growth rate equivalent to the average of the last five years. Forecasted U.S Gulf port maize price was from FAPRI Outlook 2002. For population it was assumed that population will grow at the average of the past five years growth. Finally, it was assumed that normal weather conditions will prevail during the forecast period.

Based on the above assumptions, total area harvested and production are expected to

increase by approximately 3% over the five-year period, while consumption is expected to increase by approximately 6.5%. The net trade positions of Malawi, South Africa and Zimbabwe remained positive (Table 6.2), indicating that they are net exporters of maize. Although the net trade position of the region also remained positive, it decreased from 1.45 million ton to only 0.99, a definite downward trend. This is due to the fact that FAPRI forecasted a decrease in the supply of world maize for that period. However from table 6.2 some results do not meet our a priori expectations. The most obvious discrepancy being the Malawi producer price of maize, which decreases by almost 60% in the baseline period. These results do not fit with the theoretical discussion and it is clear that these results are at variance with the other countries examined. The reason for this discrepancy is unclear however it is likely that with more reliable data for the region, this problem could be overcome.

Table 6.1: Baseline Forecast: SADC

YEAR	2002	2003	2004	2005	2006	2007
Total Area (Hectares)	10391423	10490551	10570704	10646137	10718543	10789693
Total Production (Tons)	18602297	18720511	18812384	18897307	18977931	19056585
Total Change in Stock (Tons)	1472553	1514689	1564389	1607650	1647984	1682544
Total Food Use (Ton)	16254528	16479338	16708528	16929507	17149961	17379199
Other Uses (Tons)	2367436	2367437	2367438	2367439	2367439	2367439
Net Trade (Tons)	1452886	1388426	1300807	1208011	1108514	992489

NB: Total food use includes animal feed use

The reader should note that production plus change in stocks less consumption less other uses yields exports less imports, thus net trade is defined as exports minus imports.

Table 6.2: Baseline Forecast: Country Level

Year	2002	2003	2004	2005	2006	2007
Area Planted (Ha)						
Malawi	1439796	1455561	1468218	1479475	1489726	1499002
Mozambique	1313835	1344560	1375379	1406232	1437099	1467974
South Africa	3474644	3468184	3462612	3457535	3452774	3448259
Tanzania	1855395	1868583	1876044	1881171	1885143	1888471
Zambia	556486	553253	553089	553800	555129	556714
Zimbabwe	1563234	1611948	1646626	1678975	1709648	1740226
Rest of SADC	188033	188462	188735	188949	189024	189047
Production (Ton)						
Malawi	2404459	2430788	2451924	2470723	2487843	2503333
Mozambique	1182452	1210104	1237841	1265609	1293389	1321177
South Africa	8651864	8635779	8621904	8609263	8597408	8586166
Tanzania	3339710	3363450	3376880	3386107	3393258	3399247
Zambia	834729	829879	829633	830700	832693	835072
Zimbabwe	1954042	2014934	2058282	2098718	2137060	2175282
Rest of SADC	235042	235577	235919	236186	236280	236309
Food Use (Ton)						
Malawi	1483646	1484734	1482899	1477895	1469464	1458391
Mozambique	829148	845812	862929	880047	897617	915639
South Africa	3750774	3737011	3716771	3688527	3654901	3618995
Tanzania	2974128	3093797	3218199	3347343	3482006	3622182
Zambia	1538865	1584881	1633606	1682330	1732409	1783841
Zimbabwe	1571552	1603191	1635953	1668662	1702514	1737511
Rest of SADC	441646	452112	462730	473559	484543	495638
South Africa (feed use)	3664770	3677800	3695443	3711143	3726508	3747001
Net Trade (Tons)						
Malawi	834261	868502	902921	936266	970518	1005187
Mozambique	55750	67521	78945	90405	101427	112007
South Africa	1444162	1432177	1420699	1420920	1427835	1432521
Tanzania	-850662	-903164	-952137	-998660	-1045287	-1092654
Zambia	235387	143297	36673	-80783	-206615	-339562
Zimbabwe	134296	190397	233735	269960	301182	326300
Rest of SADC	-400308	-410303	-420031	-430098	-440547	-451310
Maize Price (Local Currency/Ton)						
Malawi	3706	3471	3145	2701	2107	1335
Mozambique	253991	272634	292834	314687	338318	363920
South Africa	1158	1247	1330	1424	1525	1612
Tanzania	463095	511088	564292	622863	687485	758359
Zambia	710822	802882	885942	979713	1080451	1192740
Zimbabwe	12507	12749	13011	13229	13458	13757

6.2 SADC Maize Market Outlook : Effects of the Zimbabwe Crisis

To evaluate the possible impact of the current political crisis in Zimbabwe, the following policy scenario has been assumed: maize area harvested in Zimbabwe will decrease from its forecasted baseline level by 50% in 2002 (781617 hectares), followed by a 20% decrease in 2003 and a 10% decrease in 2004, after which it will return to normal. The remaining assumptions of the baseline were assumed to hold. Table 5.3 reports the SADC maize market outlook for the current Zimbabwe crisis.

Table 6.3: SADC Market outlook For Maize: Zimbabwe Crisis

YEAR	2002	2003	2004	2005	2006	2007
Total Area (Hectares)	9609806	10198465	10444036	10673636	10732584	10795551
Total Production (Tons)	17625276	18368018	18669630	18942710	19000892	19066004
Total Change in Stock (Tons)	1366286	1025019	1372174	1531329	1660583	1688822
Total Food Use (Ton)	16253094	16478224	16708051	16929410	17149968	17379203
Net Trade (Tons)	371033	547376	966316	1177190	1144067	1008182

Table 6.4: SADC Actual and Percentage changes Maize: Zimbabwe Crisis

YEAR	2002	2003	2004	2005	2006	2007
Change in Total Area (Hectares)	-781617	-292086	-126668	27499	14041	5858
Total Area % change	-7.52	-2.78	-1.20	0.26	0.13	0.05
Change in Total Production (Tons)	-977021	-352493	-142754	45403	22961	9419
Total Production % change	-5.25	-1.88	-0.76	0.24	0.12	0.05
Change in Total Change in Stock (Tons)	-106267	-489671	-192214	-76320	12599	6278
Change in Stock % change	-7.22	-32.33	-12.29	-4.75	0.76	0.37
Change in Total Food Use (Ton)	-1434	-1114	-477	-96	6	4
Total Food Use % change	-0.009	-0.007	-0.003	-0.001	0.000	0.000
Change in Net Trade (Tons)	-1081854	-841050	-334491	-30821	35554	15693
Net Trade % change	-74	-61	-26	-3	3	2

Due to the reduction in area harvested in Zimbabwe, the total SADC maize area harvested decreased from 10391423 hectares to 9609806 hectares in 2002, a reduction of 781617 hectares, lowering production by 977021 tons (Table 5.4). Similarly, for 2003 and 2004 total area of maize harvested for SADC decreased by

292080 and 126668 hectares, respectively. Production consequently decreased by 1.88 % and 0.76 % in 2003 and 2004, respectively. As a consequence of the reduced area harvested in Zimbabwe for 2002, 2003, and 2004, regional net trade in these years decreased by 74%, 61%, and 26%, respectively (Table 5.4). The region however, managed to maintain the status of net exporter.

Tables 5.5, 5.6, and 5.7 represent the baseline forecast for Zimbabwe, a market outlook for Zimbabwe given the decrease in area harvested, and the actual and percentage changes of several variables of interest.

Table 6.5: Baseline Forecast for Zimbabwe

YEAR	2002	2003	2004	2005	2006	2007
Area (Hectares)	1563234	1611948	1646626	1678975	1709648	1740226
Production (Tons)	1954042	2014934	2058282	2098718	2137060	2175282
Change in Stock (Tons)	294071	320919	353671	382170	408903	430795
Food Use (Ton)	1571552	1603191	1635953	1668662	1702514	1737511
Net Trade (Ton)	134296	190397	233735	269960	301182	326300
Price(Lc/Ton)	12507	12749	13011	13229	13458	13757

Table 6.6: Market outlook for Zimbabwe.

YEAR	2002	2003	2004	2005	2006	2007
Area (Hectares)	781617	1289558	1481963	1678975	1709648	1740226
Production (Tons)	977021	1611948	1852454	2098718	2137060	2175282
Change in Stock (Tons)	196465	-161504	150729	289019	408903	430795
Food Use (Ton)	1571142	1602903	1635839	1668640	1702514	1737511
Net Trade (Ton)	-939921	-694726	-174921	176832	301182	326300
Price (Lc/Ton)	13951	13975	13594	13366	13458	13757

Table 6.7: Actual and Percentage change on the Market outlook for Zimbabwe.

YEAR	2002	2003	2004	2005	2006	2007
Change in Area (Hectares)	-781617	-322390	-164663	0	0	0
Area % change	-50	-20	-10	0	0	0
Change in Production (Tons)	-977021	-402987	-205828	0	0	0
Production % change	-50	-20	-10	0	0	0
Change in Change in Stock (Tons)	-97606	-482424	-202942	-93151	0	0
Change in Stock % change	-33	-150	-57	-24	0	0
Change in Food Use (Ton)	-410	-288	-114	-22	0	0
Food Use % change	-0.03	-0.02	-0.01	0	0	0
Change in Net Trade (Ton)	-1074218	-885123	-408657	-93129	0	0
Net Trade % change	-800	-465	-175	-34	0	0
Change in Price (Lc/Ton)	1444	1226	583	137	0	0
Price % change	12	10	4	1	0	0

Area harvested and production had the expected percentage decreases. Both stock change and Zimbabwe's net trade position experienced large adjustments. Net trade became negative as the country moved from being a net exporter to net importer. With maize being a staple food, consumption was not severely affected as demand was met through imports. Maize price in Zimbabwe increased by 12%, 10% and 4% from the baseline forecast in 2002, 2003, and 2004, respectively. For the individual countries, prices increase by varying degrees depending on the effect of the regional net trade on individual country prices. The prices increase until 2005, after which they begin to return to normal. From the above tables it is clear that a long term decrease in area harvested in Zimbabwe would have a long standing negative effect on both Zimbabwe and the region as a whole.

6.3 SADC Maize Market Outlook: South Africa Yield Shock

Since South Africa is the largest maize producer in the SADC region, it was important to evaluate the impacts of a severe decrease in its maize yield levels over a few consecutive years. This was considered to be a plausible future scenario of likely impacts of climate change. The following assumptions were made for South Africa's yield decline scenario: a 25% decrease of the baseline forecast in 2002 and a 15%

decrease in 2003. This yield decline may for example be caused by two consecutive drought years caused by El Nino. Tables 6.8 and 6.9 present the market outlook and actual and percentage changes of the endogenous variables, with respect to the whole of SADC, given the above changes in maize yield in South Africa.

Table 6.8: SADC Market outlook for Maize: South Africa Yield Shock.

YEAR	2002	2003	2004	2005	2006	2007
Total Area (Hectares)	10391423	10511214	10597079	10660247	10724540	10792579
Total Production (Tons)	16448018	17474838	18861817	18925005	18990760	19063355
Total Change in Stock (Tons)	1458261	887765	1201827	1615558	1652387	1684514
Total Food Use (Ton)	16236107	16452792	16689110	16916977	17141802	17373888
Net Trade (Tons)	-697264	-457627	1007095	1256147	1133906	1006540

Table 6.9: SADC Actual and Percentage changes due to South Africa Yield Shock

YEAR	2002	2003	2004	2005	2006	2007
Change in Total Area (Hectares)	0	20663	26375	14111	5997	2886
Total Area % change	0.00	0.20	0.25	0.13	0.06	0.03
Change in Total Production (Tons)	-2154279	-1245673	49432	27699	12829	6770
Total Production % change	-11.58	-6.65	0.26	0.15	0.07	0.04
Change in Total Change in Stock (Tons)	-14292	-626925	-362562	7909	4403	1970
Change in Stock % change	-0.97	-41.39	-23.18	0.49	0.27	0.12
Change in Total Food Use (Ton)	-18421	-26545	-19418	-12529	-8160	-5311
Total Food Use % change	-0.11	-0.16	-0.12	-0.07	-0.05	-0.03
Change in Net Trade (Tons)	-2150150	-1846053	-293711	48137	25392	14051
Net Trade % change	-148	-133	-23	4	2	1

It is evident that a decrease in yield levels in South Africa will have profound effects on the region as a whole. The region became a net importer of maize for the years 2002 and 2003 and a net exporter again only in 2004. Area harvested increased in the region, but only by 0.2 % in 2003, 0.25 % in 2004, and 0.13 % in 2005, allowing production to recover in 2004. It is interesting to note that the regions' area harvested continued to increase well up to 2007, an almost over compensating effect. Similarly, food consumption continued to decrease due to the increase in prices. Tables 6.10 to

6.12 provide the baseline forecast, market outlook and actual and percentage changes caused by decreased yields for South Africa.

Table 6.10: Baseline Forecast for South Africa

YEAR	2002	2003	2004	2005	2006	2007
Area (Hectares)	3474644	3468184	3462612	3457535	3452774	3448259
Production (Ton)	8651864	8635779	8621904	8609263	8597408	8586166
Change in Stock (Ton)	80613	79309	78898	78623	78430	78232
Food Use (Ton)	3750774	3737011	3716771	3688527	3654901	3618995
Animal Feed (Ton)	3664770	3677800	3695443	3711143	3726508	3747001
Net Trade (Ton)	1444162	1432177	1420699	1420920	1427835	1432521
Price(Lc/Ton)	1158	1247	1330	1424	1525	1612

Table 6.11: Market outlook for South Africa

YEAR	2002	2003	2004	2005	2006	2007
Area (Hectares)	3474644	3469579	3465420	3460583	3455406	3450317
Production (Tons)	6497584	7355508	8628896	8616852	8603962	8591288
Change in Stock (Tons)	69215	69339	78714	81195	80340	79439
Food Use (Ton)	3747641	3732366	3713276	3686260	3653433	3618047
Animal Feed (Ton)	3650708	3656932	3679688	3700861	3719804	3742631
Net Trade (Ton)	-695789	-439605	1079565	1440952	1443352	1443934
Price(Lc/Ton)	1197	1312	1385	1465	1555	1634

Table 6.12: Actual and Percentage change on the Market outlook for South Africa.

YEAR	2002	2003	2004	2005	2006	2007
Change in Area (Hectares)	0	1395	2808	3048	2632	2057
Area % change	0	0.04	0.08	0.09	0.08	0.06
Change in Production (Tons)	-2154279	-1280271	6991	7589	6554	5122
Production % change	-24.9	-14.8	0.1	0.1	0.1	0.1
Change in Change in Stock (Tons)	-11398	-9970	-184	2573	1910	1207
Change in Stock % change	-14.1	-12.6	-0.2	3.3	2.4	1.5
Change in Food Use (Ton)	-3133	-4645	-3495	-2268	-1467	-948
% Food Use change	-0.1	-0.1	-0.1	-0.1	0	0
Change in Animal Feed	-14062	-20868	-15755	-10282	-6704	-4370
Animal Feed % change	-0.4	-0.6	-0.4	-0.3	-0.2	-0.1
Change in Net Trade (Ton)	-2139951	-1871782	-341135	20032	15517	11414
Net Trade % change	-148.2	-130.7	-24	1.4	1.1	0.8
Change in Price(Lc/Ton)	38.66	65.14	55.41	40.98	30.33	22.14
Price % change	3.3	5.2	4.2	2.9	2	1.4

Decreased maize yields caused a 25 % decrease in production for South Africa in 2002 that caused real maize price in that year to increase by 3.3% and 5.2 % in 2003. This increase in price prompted farmers to increase the area harvested by 0.04 % in 2003. However, 2003 also experienced a decrease in yield, and thus production fell again even though area harvested increased. As can be seen from table 5.12 the South African maize price continued to increase from the baseline projection well into 2007, and as a consequence, so did area harvested. This can be attributed to the depletion of stocks and the countries net maize trade position becoming negative.