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A Market Analysis

of a Set-aside Program by the
Five Major Grain and Oilseed
Exporting Countries

Canada

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September 2002

A MARKET ANALYSIS OF A SET-ASIDE PROGRAM BY THE FIVE MAJOR GRAIN AND OILSEED EXPORTING COUNTRIES

Authors

Pierre Charlebois
Mitch Wensley

September 2002

Research and Analysis Directorate
Strategic Policy Branch
Agriculture and Agri-Food Canada

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Knowledge Dissemination Unit
Research and Analysis Directorate
Strategic Policy Branch
Agriculture and Agri-Food Canada
Building 74, C.E.F.
Ottawa, Ontario K1A 0C6
Tel: (613) 759-1865
Fax: (613) 759-7090
E-mail: kdudist@agr.gc.ca

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Table of Contents

Executive Summary	v
Foreword	vii
Introduction	1
Background	3
Scenario development	5
Model and baseline	7
Results	9
Conclusions	17
Appendix A	A-1
Appendix B	B-1

Figures

Figure 1: Nominal and real Canadian wheat prices at port	1
Figure 2: Major exporters' (big five) share of world harvested area and production.....	3
Figure 3: Supply shifts introduced in 1999, 2000 and 2001	5
Figure 4: Price impact of set-aside program on major crops.....	9
Figure 5: Effectiveness of set-aside program accounting for slippage and free riding.....	12

Tables

Table 1: Price impact resulting from a 10 percent set-aside program for wheat, coarse grains and oilseeds in Argentina, Australia, Canada, the European Union and the United States (% from baseline)	11
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Table 2:	Set-aside area and actual percentage reduction in grain and oilseed area and production (%).....	13
Table A1:	Impact on price (% from baseline)	A-1
Table A2:	Impact on production (% from baseline)	A-2
Table A3:	Impact on Canada (% from baseline)	A-3
Table B1:	Impact on crop prices	B-1
Table B2:	Impact on livestock prices.....	B-2

EXECUTIVE SUMMARY

The objective of this market analysis is to estimate the impact of a set-aside program where five of the major grain and oilseed producing countries/regions of the world agree to reduce their area dedicated to grains and oilseeds by 10 percent of a historical base. The five countries are Argentina, Australia, Canada, the European Union and the United States. The main focus of the analysis is two scenarios where we simulate a shift in supply by reducing the area available for production in these countries/regions:

- from 1999 through 2001 in the first scenario
- from 1999 through 2006 in the second scenario.

However, we examine four scenarios to give an indication of the sensitivity of the results when some participants are removed from the program.

Because of the relatively low demand elasticity for food, the price impact on grains and oilseeds resulting from the introduction of a 10 percent set-aside program by these five major exporting countries/regions is significant in the short term. In the second and third years of the set-aside program (2000 and 2001), the prices for wheat, corn and soybean range from 26 percent to 32 percent above baseline levels but are still below the high levels observed in the mid-1990s. Following the removal of the set-aside program, all the major grain and oilseed commodity prices return to baseline levels relatively quickly. **The results suggest that a permanent set-aside program would be necessary to keep prices from returning to relatively low baseline levels.**

To get some indication of the impact of a permanent 10 percent set-aside program on international markets, we undertook the second scenario. With the set-aside program in place until 2006, the average impact is obviously stronger but **the results show a declining effect over time.**

Two factors limit the size of the price increase under a permanent set-aside program — slippage and free riding. Introducing a 10 percent shift in supply (through reduced area) will not necessarily translate into a 10 percent reduction in the quantity of grains and oilseeds produced by these five countries—slippage. Increasing production above baseline levels by non-participating countries also undercuts the program—free riding. On average, over the last five years of the permanent set-aside program scenario (2002–2006), **because of slippage and free riding only 32 percent of the original shift in supply is reflected in the world harvested area of those commodities.** When higher yields are taken into account, only 27 percent of the potential production reduction materializes on average in the last five years of the scenario.

Free riding has been the major cause of failure of past supply reduction initiatives (and/or public stock holdings) experience—from maple syrup in Quebec and cocoa in Ivory Coast to cereals in the United States and wool in Australia. The results of this analysis are consistent with these past experiences.

The impact on world prices is considerably less if the European Union and the United States were unwilling to participate because they already have substantial land diversion

programs. The impact is further lessened if Canada were the only country to undertake the 10 percent set-aside program.

The large increases in feed prices resulting from a set-aside program would have a negative global impact on the profitability of livestock producers. The benefit of a set-aside program to agriculture as a whole would be seriously mitigated by this increase in cost to livestock producers.

FOREWORD

Nominal grain and oilseed prices have declined dramatically from the high levels observed in the mid-1990s. As a result, it has been suggested by some industry stakeholders that measures should be taken to limit world crop supplies to raise prices.

One such measure is a set-aside program involving a number of participants that would significantly reduce the quantity of land in production over a certain period of time. In fact, the European Union and the United States currently have set-aside programs that, together, already have had a positive effect on crop prices. Set-aside programs could also become relevant if the use of the World Trade Organization blue box is extended to more countries after the next round of negotiations.

This analysis focuses on the quantitative aspects of a substantial multi-country, multi-commodity, set-aside program and its impact on major agricultural commodity prices. Three main conclusions can be drawn from the analysis:

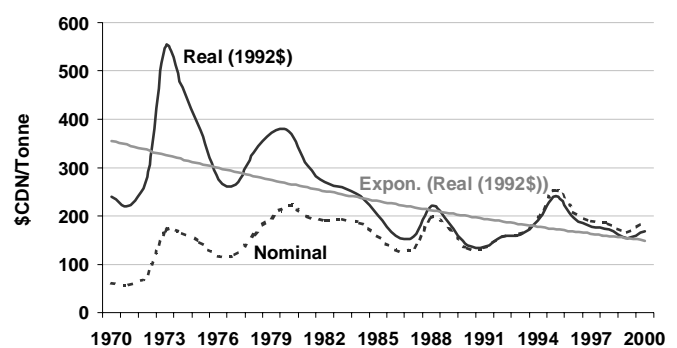
- A permanent set-aside program would be necessary to keep prices from returning to relatively low levels
- Even with a permanent set-aside program, the results show a declining effect over time mostly because of additional production by non-participating countries and because of crop substitution in favour of cereals and oilseeds and higher yield in participating countries.
- For a set-aside program to have any significant impact on prices, the program must include many commodities in many countries.

A program involving Canada alone is doomed to fail. And given that the United States and the European Union—two large producers—already have their respective set-aside programs, it might be difficult to convince them to participate in an international effort.

Introduction

Nominal grain and oilseed prices have declined dramatically from the high levels observed in the mid-1990s (Figure 1). Real prices continue to exhibit the downward trend that has been present through much of the 1900s. While it is debatable whether or not current real prices of grains and oilseeds are below the trend, it is apparent that grain and oilseed prices have declined considerably and that nominal and real cash receipts obtained from the same volume of grain sold today are generally much lower than that received in the mid-1990s.

Figure 1: Nominal and real Canadian wheat prices at port



Given the relatively sharp decline in grain and oilseed prices that was observed in the latter half of the 1990s, it was suggested that measures should be taken to limit world crop supplies to raise prices. One such measure is a set-aside program involving a number of participants that would significantly reduce the quantity of land in production over a certain period of time. The program could be removed after crop prices returned to a level that was deemed reasonable. Set-aside programs could also become relevant if the use of the World Trade Organization blue box¹ is extended to more countries after the next round of negotiations. This analysis focuses on the quantitative aspects of a substantial multi-country set-aside program and its impact on major agricultural commodity prices.

The objective of this analysis is to estimate the impact of a set-aside program where five of the major grain and oilseed producing countries/regions of the world agree to reduce their area dedicated to these crops by 10 percent. The five countries are Argentina, Australia, Canada, the European Union and the United States.² In the first scenario, we used the

1. The blue box designates direct payments involving production-limiting features if such payments are based on fixed area and yields or are made on 85 percent or less of the base level of production.

average harvested area in a recent historical period to determine the base area for each region. We then assumed that each region would commit to removing 10 percent of this historical base area from production for three consecutive years (1999–2001). In 2002, all parties exit the set-aside program and allow the area to come back into production. We quantitatively assessed the impact of the set-aside program on international agricultural markets using the AGLINK model.³ We simulated a second scenario, involving the same assumptions but over an eight-year period (1999–2006). Finally, we examined two alternative scenarios to give some indication of the sensitivity of the results when some participants are removed from the program.

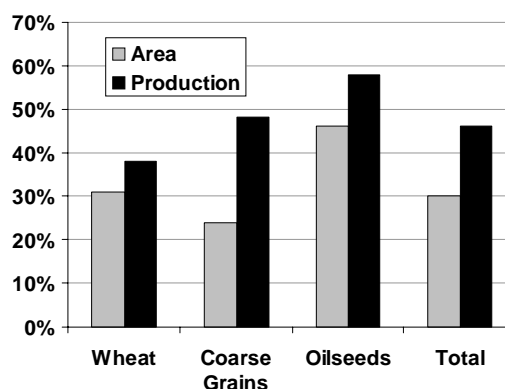
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2. These five countries/regions were consistently used for wheat, coarse grains and oilseeds. For oilseeds, this choice resulted in the exclusion of three major exporters: palm oil from Indonesia and Malaysia and soybeans from Brazil.
 3. AGLINK is a multi-commodity, multi-country, policy-specific dynamic model of the international agricultural markets built by the OECD with member countries.

Background

The five major exporters included in this analysis account for a significant share of world agricultural land used in the production of grains and oilseeds. The average share (1996–1998) of world harvested area and production for wheat, coarse grains and oilseeds of these major producers is shown in Figure 2.⁴

For the wheat harvested area, the five major exporting countries accounted for 31 percent of the world total over the 1996–1998

Figure 2: Major exporters' (big five) share of world harvested area and production



period but 38 percent of world production because of relatively higher yields than the world average. For the coarse grains, the big five accounted for only 24 percent of the world harvested area on average. However, dramatically higher coarse grain yields result in 48 percent of world production. For the three major oilseeds which dominate the international oilseed trade, these five countries accounted for 46 percent of harvested area and 58 percent of world production.

In total, these five countries accounted for 30 percent of world harvested area and due to the substantially higher average yields in these countries, they accounted for 46 percent (almost half) of world production of these major commodity groups. Given that the production shares vary across commodity groups, one would expect that the initial price impact would be the largest on those commodity groups for which these five countries occupy the largest share of world production (i.e. coarse grains and oilseeds).

4. The commodity aggregations used are found in the AGLINK model. The aggregates for wheat, coarse grains and oilseeds, respectively, include all wheat including durum; corn, barley, sorghum, oats, rye and other coarse grains; and soybean, canola/rapeseed and sunflower seed.

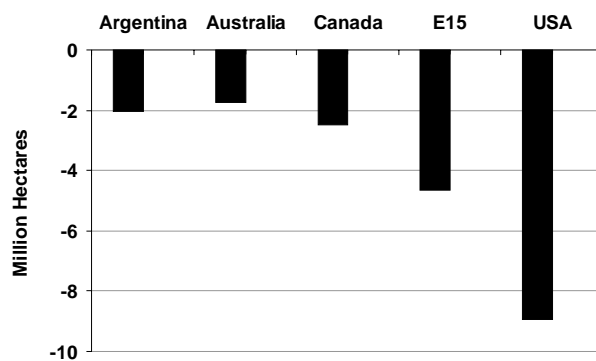
In addition to the big five accounting for a significant proportion of world harvested area and production, their relative shares of world grain and oilseed trade is even more substantial. They accounted for 85 percent, 84 percent and 69 percent of world wheat, coarse grain and oilseed exports, respectively. Based on the relative area, production and export shares of the big five exporters, a 10 percent reduction in land available for grains and oilseeds production would translate into a significant reduction in production and exports and would positively affect world grain and oilseed prices.

Scenario development

We used a baseline as a benchmark from which to compare the scenarios undertaken in this analysis. This baseline is a slightly modified version of Agriculture and Agri-Food Canada (AAFC) September 2000 Medium Term Policy Baseline⁵. Since we wanted to measure the effect of the set-aside program over the longest period possible, the starting year for the analysis was 1999. As such, the absolute values returned by the analysis should not be interpreted as a forecast for the future. Instead the focus should be on the relative size of the changes when comparing the simulation to the original baseline.

A main focus of this analysis is the first scenario where a shift in supply was simulated by reducing the area available for production in the big five exporting countries/regions in 1999, 2000 and 2001. The size of the shift in area corresponds to 10 percent of the average grain and oilseed harvested area in those five countries over the 1996–1998 period. See Figure 3 for the absolute size of the supply shift introduced for each country. The total area reduction is about 20 million hectares and represents three percent of the world harvested area of these commodities over the 1996–1998 period.

Figure 3: Supply shifts introduced in 1999, 2000 and 2001



In addition, we undertook three other scenarios. The second scenario extends the 10 percent set-aside program over the duration of the baseline (1999–2006). The third scenario reduces the number of countries and assumes that the European Union, through its 10 percent mandatory set-aside program, and the United States, through its Conservation Reserve Program, have already met their 10 percent commitment. The situation for Argentina, Australia and Canada is unchanged (i.e. they each apply the 10 percent set-aside program).

5. Provisions of the 2002 USA Farm Bill are not included in the model and the baseline.

The fourth scenario measures the relative impact at the world level if Canada undertakes a set-aside program on its own.

To summarize, we have four scenarios with 10 percent set-aside programs:

- Argentina, Australia, Canada, European Union and the United States, three years (1999–2001)
- same five countries/regions, eight years (1999–2006)
- only three countries (Argentina, Australia, Canada), three years (1999–2001)
- only Canada, three years (1999–2001)

Model and baseline

We used the AGLINK model with minor modifications to estimate the international impact of a set-aside program introduced by the five largest exporters. AGLINK includes coverage for Argentina, Australia, Canada, China, the European Union, the Former Soviet Union, Hungary, Japan, Korea, Mexico, New Zealand, Poland, the United States, and a rest of the world component. The economic variables covered by the model include 50 market clearing prices at the world, regional and national levels, production, consumption, trade and stocks. Commodities covered at an aggregate level include wheat, rice, coarse grains, oilseeds, oilseed meals, vegetable oils, beef, pork, sheep meat, wool, poultry, eggs, milk and a variety of dairy products.

Before a discussion of the results from the analysis, we provide some background regarding the baseline from which we compared the scenarios. The international baseline is generally characterized by modest nominal grain and oilseed prices in the near term with prices rising over the medium term. Although nominal prices are rising in the baseline, they are still well below the levels observed in the mid-1990s. Given the absolute price levels in the baseline, two policies influence the international grain and oilseed markets. The first is the US loan rate for soybeans which results in a continued US oversupply due to favourable program payments (i.e. significant soybean loan deficiency payments through 2004). The second is a relatively weak euro which allows the European Union to export wheat without subsidy starting in 2001 and continuing over the duration of the baseline (until 2006).

The question of whether the European Union is exporting with or without subsidy ultimately has implications for the scenario results. If the European Union is exporting with subsidy, the domestic price is effectively higher than the world market price and thereby disconnected from the supply and demand signals in the international market place. As such, an increase in the European Union set-aside program does little to help reduce supplies on the world market. However, if the European Union is exporting without subsidy and thereby effectively tied to the world market, a reduction in supply will contribute to reducing supplies on international markets and increasing world price levels.

Given these two situations, one might question the value of including the European Union in the set-aside program since their wheat exports without subsidy is only possible in the final year of the set-aside program (2001). Since the differential between the world and the

European Union wheat price is relatively small, a change in the supplies of the other four major exporting countries could influence the European Union trade position. Thus, the inclusion of the European Union in the set-aside program is essential.

As an additional point, we made a modification to the European Union beef component of the model which assumes that beef prices remain at the purchasing price of the intervention system over the duration of the baseline. This modification is more consistent with the new market realities emerging as a result of the bovine spongiform encephalopathy (BSE) crisis that spread to a number of European Union member countries.

Results

Six subjects are addressed in this section:

- price impact
- supply response
- livestock sector
- number of players
- limitations
- past experience

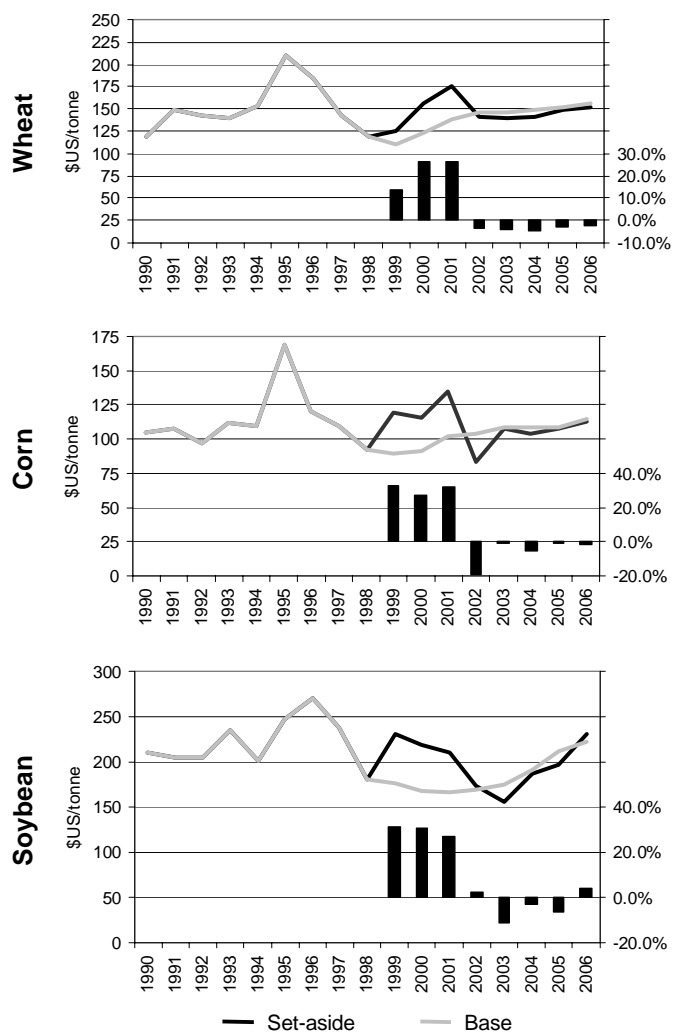
Price impact

As one would expect, the impact on grain and oilseed prices resulting from the introduction of a 10 percent set-aside program by the five major exporting countries is significant in the short term. See Figure 4 for the impact on grain and oilseed commodity prices of maintaining such a program for three years.

In the first year (1999), wheat, corn and soybean prices would increase 14 percent, 33 percent and 31 percent,⁶ respectively.

A key factor influencing the lower impact on wheat price in the first year is directly related to the

Figure 4: Price impacts of set-aside program on major crops



relative wheat prices in the international and European Union markets in 1999. Since European Union wheat prices are higher than international prices in 1999, their wheat market is disconnected from the world grain market. As such, the additional set-aside area in the European Union acts as an increase to the EU internal wheat price and does not reduce the available supplies on the international market.⁷ In effect, only Argentina, Australia, Canada and the United States contribute to the reduction of the available supply of cereals in the world market in 1999. Considering the importance of the European Union on the world wheat market, one would expect a smaller price impact.

In the second year of the set-aside program (2000), increased wheat production in the European Union (due to higher relative wheat prices in 1999) dramatically reduces internal prices. The reduced internal prices in combination with the increase in world prices, due to reduced production in other parts of the world,⁸ allows the European Union to export without subsidy and effectively links their wheat market to the world market. In the second and third years of the set-aside program, prices for wheat, corn and soybean range from 26 percent to 32 percent above baseline levels.⁹ In Figure 4, it is apparent that although the set-aside program acts to raise prices, it does not return them to the high levels observed in the mid-1990s.

Following the removal of the set-aside program, all the major grain and oilseed commodity prices return to the baseline price levels relatively quickly. In the first year following the program (2002), coarse grain prices adjust most dramatically—falling well below baseline levels—as favourable returns in 2001 and increased available area result in a substantial increase in supply. Also, the decline in demand caused by less livestock also contributes to this reduction. Livestock producers react to the lower level of profitability—a result of higher feed prices caused by the set-aside program in 1999–2001 (the first three years). Similarly, wheat prices decline below baseline levels as favourable returns spur increased production. While oilseed prices decline in 2002 relative to 2001, they are still slightly above baseline levels but they continue to decline well below baseline levels in 2003. By 2004, most of the shock has filtered through and major grain and oilseed prices are generally close to initial baseline levels and consequently are still well below the high level of the mid-1990s. These results suggest that to keep prices from returning to low baseline levels, a permanent set-aside program would be necessary.

-
6. The impact on the canola price is smaller because most of the oilseed land set aside in this program concerns soybeans since the United States and Argentina are key players on the world oilseed market. As a result, the world oilseed meal market experiences a more severe shortage than the vegetable oil market since soybean has the highest meal content of all the oilseeds. For that reason, the world price of vegetable oil is less affected and as a result, the price of canola does not increase as much as the price of soybeans.
 7. The model is built on the implicit assumption that the European Union will not reduce subsidized exports below WTO limits to protect local consumers when prices reach a level well above the intervention price. If on the contrary, they decided to reduce subsidized exports to moderate the increase in the internal price, then the local consumption would be higher, production would be lower, and the world price impact would be stronger.
 8. Wheat production outside the European Union falls in 2000 in the set-aside scenario because of higher relative returns in 1999 for coarse grains and oilseeds.
 9. Readers should not extrapolate these price increases directly into farm income gains in Canada because production would be lower under this scenario and farmers would incur costs to maintain a permanent cover.

To show the impact of a permanent 10 percent set-aside program on international markets, we extended the set-aside program through 2006. Since this scenario is simply an extension of the initial shock, the results in the first three years (1999–2001) are identical. In Table 1, we present the impacts on world prices in the first three years and then show the difference between the three-year and eight-year scenarios for the average price changes of major commodities. In the first scenario, the average price for wheat, corn and soybeans actually falls 3.5 percent, 5.3 percent and 2.7 percent, respectively, below baseline levels over the 2002–2006 period (i.e. after the completion of the set-aside program). Over the same period, because the set-aside program is maintained in the second scenario, the average price is higher than in the baseline by 15.4 percent, 16.9 percent and 25.4 percent, respectively, for wheat, corn and soybeans. For the average price increase over the entire scenario period (1999–2006), the three-year scenario results in a 6.1 percent, 8.3 percent and 9.4 percent increase in wheat, corn and soybean prices, respectively, while the eight-year scenario results in an increase of 17.9 percent, 22.1 percent and 26.4 percent, respectively.

Table 1: Price impact resulting from a 10 percent set-aside program for wheat, coarse grains and oilseeds in Argentina, Australia, Canada, the European Union and the United States (% from baseline)

World prices	Percent						
				3-year set-aside program		8-year set-aside program	
	1999	2000	2001	2002-2006	1999-2006	2002-2006	1999-2006
Wheat	14.0	26.3	26.1	-3.5	6.1	15.4	17.9
Corn	33.1	27.3	32.2	-5.3	8.3	16.9	22.1
Soybean	31.1	30.8	26.9	-2.7	9.4	24.5	26.4
Soybean meal	25.6	31.1	24.4	-2.6	8.5	21.0	23.3
Soybean oil	4.9	4.4	4.5	0.1	1.8	5.1	4.9
Crushing margin	-37.7	-10.8	-15.6	3.5	-5.8	-30.6	-27.1

Supply response

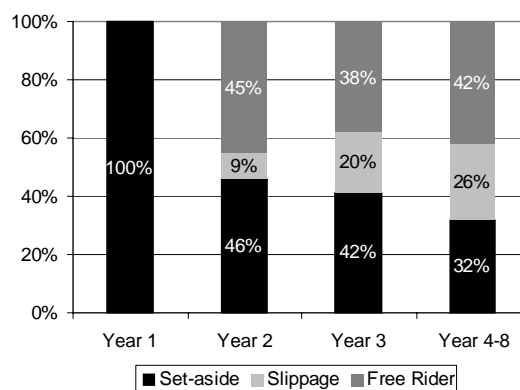
Two factors limit the size of the price increase—slippage and free riding. Slippage is the difference between the 10 percent shift in supply (through area) introduced in the model and the effective reduction of grain and oilseed production in the five major countries. The reasons for slippage are numerous. Producers first remove marginal lower-yielding land from production which results in a lower than average drop in production. They intensify their production practices (e.g. increase fertilizer and other input applications) on remaining land to take advantage of improved returns. They shift land that was previously not dedicated to grain and oilseed production (e.g. special crops, pasture, fallow) to grain and oilseed production.

Free riding corresponds to the additional production above baseline levels from non-participating countries (Brazil, Mexico, Russia and many other developing countries). The higher prices resulting from the set-aside program will obviously encourage the non-

participating countries to expand production of these commodities through either increased land use or increased yields. Both of these situations will moderate the effect of the area reduction in the five major exporters on world grain and oilseed prices.

See Figure 5 for the impacts of slippage (from area allocation only) and free riding on the effectiveness of the set-aside program. In the AGLINK model, the producer's decision-making process is one of naive expectations (i.e. the prices observed last year influence this year's planting). This representation of expectation explains why the reduction in grain and oilseed area in the first year (1999) is exactly equal to the full amount of the set-aside program.¹⁰ With the reduction of grain and oilseed production in 1999, prices rise substantially.

Figure 5: Effectiveness of set-aside program, accounting for slippage and free riding



In 2000, producers who are affected by world prices begin to react to the much stronger returns associated with grain and oilseed production. Only 46 percent of the initial set-aside area gets reflected at the world level. Slippage occurs in the participating countries as producers re-allocate land that is still available for crop production to grains and oilseeds, reducing the effective set-aside area by 9 percent. In addition to slippage, free riding of the non-participating countries increases the land dedicated to grain and oilseed production, reducing the effective set-aside area by 45 percent.

In 2001, only 42 percent of the set-aside area gets reflected at the world level as increased slippage in the participating countries and continued free riding by non-participating countries (mostly from developing countries) reduce the effective amount of set-aside land by 20 percent and 38 percent, respectively.

On average over the 2002–2006 period, because of slippage (26 percent) and free riding (42 percent), only one third (32 percent) of the original shift in supply is reflected in the world harvested area of those commodities.¹¹

In addition, the increase in yield in many countries of the world reduces even more the effectiveness of the set-aside program as can be seen in Table 2. The potential world production reduction in 2001, for example, was 80 million tonnes but the effective decline was only 26 million tonnes because producers in many parts of the world reacted to the higher prices of cereals and oilseeds and adjusted area and yield.

The level of area slippage varies by country (Table 2). In Argentina, there is no area slippage since the amount of grain and oilseed land set aside over the three-year period remains at

10. In reality, producers would probably react in the first year because they would be expecting an increase in prices from the set-aside program.

11. Brazilian oilseed supply response has increased recently. This increase is not well captured in AGLINK because the model is based on time-series econometric estimation. The free riding effect would be even larger with an up-dated Brazilian component.

100 percent of the 1996–1998 average. The reason for this limited amount of slippage is tied directly to the competition for land between the cattle and crop sectors. In the MERCOSUR¹² region, the large increase in feed prices has a considerable impact on poultry prices which ultimately leads to an increase in beef demand (largely from Brazil) and higher beef prices in the region. Being a member of MERCOSUR, Argentina experiences higher beef prices which ensures that the relative returns from crop and cattle production remain relatively unchanged and thus none of the pasture area is converted to crop production. But production in Argentina does not fall by the full amount of the area reduction since yields are higher under those more favourable world prices (see Table 2).

In Australia, Canada and the United States, the increase in cattle prices is much smaller than in Argentina and this increase partially explains why the level of area slippage is higher in these countries. In the European Union, the level of area slippage is even more pronounced due to the absence of an increase in cattle prices. Because of the BSE crisis in the European Union, we assume that the increases in pork and poultry prices resulting from higher feed prices would not shift beef demand sufficiently to allow for an increase in the beef price above the purchasing price under the private stock holding scheme. Since European producers would also adjust yields, the production of cereals and oilseeds would decline on average by only 44 percent of the potential reduction from that set-aside program in 2000 and 2001.

Table 2: Set-aside area and actual percentage reduction in grain and oilseed area and production %

	Set-aside area (mHa)	1999	2000	2001	Average 2000 and 2001 area	Average 2000 and 2001 prod.
Argentina	2.1	100	100	101	100	70
Australia	1.7	100	87	79	83	83
Canada	2.5	100	93	81	87	87
European Union	4.7	100	83	68	75.5	44
United States	8.9	100	94	80	87	81
Big Five	19.9	100	91	80	85.5	71
World	19.9	100	46	42	44	37

Livestock sector

The large increases in feed prices from 1999 to 2001 that are the result of the set-aside program have a negative global impact on the profitability of livestock producers. The increase in cost leads to an upward shift in supply which results in a decline in livestock production and an increase in the prices of livestock products. Larger impacts are observed for non-ruminants (hogs, poultry and layers) than for ruminants (cattle and sheep) in the first three years of the scenario as cereal and oilseed protein meals represent a much larger share of the variable costs of non-ruminant production. Due to the dynamics in the livestock sector,

12. MERCOSUR is the common market of the South and involves four countries: Argentina, Brazil, Paraguay and Uruguay.

production remains lower than the baseline level when the set-aside program ends. The resulting lower demand for feed explains, in part, why grain and oilseed prices in 2002 are lower than in the baseline. The decline is particularly strong for coarse grains which are the major feed ingredient for livestock.

Number of players

Although the central focus of the set-aside program is the inclusion of the five largest exporters, there may be some resistance from the European Union and the United States which already have substantial land diversion programs. The European Union has a mandatory set-aside program which effectively amounts to the 10 percent set-aside calculated for the scenarios. The United States has a significant amount of grain and oilseed land in the Conservation Reserve Program and may be reluctant to set aside an additional 10 percent of grain and oilseed area. Currently, the amount of land in this program is about equal to the 10 percent set-aside area calculated for the scenarios.

Assuming that the European Union and the United States are unwilling to commit additional land to the set-aside program, we produced a third scenario with Argentina, Australia and Canada being the only participants. The impact on world prices compared with the first scenario is much smaller, as one would expect. While the weighted average three-year price effect in the first scenario for the groups of commodities concerned was 27.7 percent, in this reduced participation scenario, the average impact falls to 6.8 percent.

Since there may be limited interest in a set-aside program involving only these three countries, Argentina and Australia may not be interested in participating. For this reason, we simulated a fourth scenario to show the potential impact on world grain and oilseed prices if Canada were the only country to undertake the 10 percent set-aside program. As one would expect, the impact on the weighted average world prices is even smaller at 2.9 percent.

Limitations

Slippage and free riding are partially represented in the AGLINK model and they give some indication of the erosion of the initial effect of the supply shock. However, there are other factors not captured by the model that would likely further reduce the size of the estimated price increase. For example, many of the agricultural policies in the AGLINK model are exogenous and therefore do not react to significant changes in the market situation. In the context of the first and second scenarios which involve the participation of the five largest exporters, it may not be realistic to assume that countries concerned about food security would not react to the set-aside program by modifying their own agricultural policies to stimulate local production. For instance, China moved toward a more self-sufficient grain policy following the 1995/1996 spike in world prices. In addition, the importing countries may adopt new technologies (e.g. GMOs) faster than what is assumed in the AGLINK model if prices increase so dramatically. It is quite likely that adjustments would occur if we had a sustained increase in prices and factors not currently captured by the model would act to erode the price increase even more.

Past experience

An interesting question is whether or not these results are consistent with some of the observed past experience involving similar programs. The main conclusion that we can draw from past experience is this: the larger the elasticity of the excess demand of the non-participating countries, the smaller the degree of success. This elasticity is influenced by the number and the availability of substitutes on the demand side and by the ability of the non-participating countries to increase production of the product(s) subject to the program. At one extreme where failure is impossible, there is the case of a single country having reserves of a non-renewable resource for which there are no substitutes. In general, to the extent that a greater number of substitutes and countries can be included in the supply reducing program, the greater the likelihood of success. That is to say, the probability of success of a single set-aside program for wheat in Canada is much lower than a program involving the five largest exporters of wheat, coarse grains and oilseeds.

In the past, supply reducing programs (and/or public stock holdings) involving agricultural products have not been very successful. Countries (or regions) representing a very large share of world production attempted to use these programs to regulate world agricultural market prices in the last 20 years. Examples as varied as maple syrup in Quebec, cocoa in Ivory Coast, cereals in the United States and wool in Australia have all failed. In all cases, the availability of substitutes and/or the ability of non-participating countries to increase production created the following situation: prices were maintained in the short term which increased the incentive for free riders to increase production. Free riding forced the country operating the program to increase stock holdings and/or to reduce production to support prices. This resulted in a declining market share and eventually this type of program became unsustainable.

Conclusions

In undertaking this analysis, we found that a 10 percent set-aside program introduced by the major five exporters would have a significant short-term impact on world grain and oilseed prices. Over the three years (1999–2001) in which the 10 percent set-aside program is in place, the average prices for wheat, corn and soybeans increase 22.1 percent, 30.9 percent and 29.6 percent, respectively. Following the removal of the set-aside program (2002–2006), prices drop quickly and are on average below the initial baseline levels by 3.5 percent, 5.3 percent and 2.7 percent, respectively. The average increase for wheat, corn and soybeans over the entire scenario period (1999–2006) is 6.1 percent, 8.3 percent and 9.4 percent, respectively. The results from the three-year set-aside scenario appear to indicate that the program has only delayed the return, by three years, to relatively low prices. These results suggest that a permanent set-aside program would be necessary to keep prices from returning to relatively low baseline levels.

We undertook the second scenario to extend the set-aside program to the eight-year period of the 2000 AAFC Medium Term Policy Baseline. While this scenario did increase the size of the average price impact over the entire period—17.9 percent, 22.1 percent and 26.4 percent, respectively, for wheat, corn and soybeans—the impact is nonetheless significantly less than in 1999 due to changes in the world supply and demand. The actual impact on major grain and oilseed prices in the last five years is significantly reduced and is on average only 63 percent of the impact in the first three years.

Two factors which mitigated the size of the price increase were slippage in participating countries and free riding in non-participating countries. In the third year (2001) of the set-aside program, the effect at the world level of the supply shift has been reduced to 42 percent of the initial shock. Slippage accounts for 20 percent as an increasing amount of the remaining land is re-allocated to higher-return grain and oilseed production. Free riding of the non-participating countries who do not offer subsidy to their cereal and oilseed sectors further erodes the set-aside supply shock by 38 percent. The extent to which slippage and free riding erode the effect of supply shock is most apparent when looking at the average levels observed in the eight-year scenario where on average in the last five years, slippage has increased to 26 percent and free riding to 42 percent. The actual reduction in harvested area corresponds to only 32 percent of the initial set-aside shock. Also since yields are higher

under this scenario, the actual reduction in production corresponds to only 27 percent of the potential reduction.

The results of the analysis are consistent with past experience. With five countries and more than one commodity involved, the impact on world prices would be significant. If the set-aside program can be maintained on a permanent basis, higher prices can be extended for some time. However, based on past experience and on the result of the eight-year scenario, non-participating countries will substantially increase their share of the world market, eventually making the long-term viability of such a program questionable. The impact on world prices is considerably less if the European Union and the United States were unwilling to participate because they already have substantial land diversion programs. The impact is negligible if Canada were the only country to undertake the 10 percent set-aside program.

Appendix A:

Results of the three-year and eight-year set-aside scenarios of a 10 percent set-aside program for wheat, coarse grains and oilseeds in Argentina, Australia, Canada, the European Union and the United States

Table A1: Impact on price (% from baseline)

	Percent							
					3-year set-aside program		8-year set-aside program	
	1999	2000	2001	2002-2006	1999-2006	2002-2006	1999-2006	
World cereals and oilseeds								
Wheat	14.0	26.3	26.1	-3.5	6.1	15.4	17.9	
EU internal	30.0	14.0	43.9	-3.9	8.5	17.1	21.6	
Corn	33.1	27.3	32.2	-5.3	8.3	16.9	22.1	
Soybeans	31.1	30.8	26.9	-2.7	9.4	24.5	26.4	
Soybean meal	25.6	31.1	24.4	-2.6	8.5	21.0	23.3	
Soybean oil	4.9	4.4	4.5	0.1	1.8	5.1	4.9	
Crushing margin	-37.7	-10.8	-15.6	3.5	-5.8	-30.6	-27.1	
US livestock								
Steers	3.0	7.3	8.4	0.2	2.5	6.5	6.4	
Hogs	2.8	14.8	18.4	-0.3	4.3	10.9	11.3	
Poultry	5.5	10.3	10.6	-0.6	2.9	7.8	8.2	
Eggs	7.1	14.2	12.9	-0.6	3.9	8.4	9.5	
Milk	0.2	2.2	3.0	0.8	1.2	3.1	2.6	
World dairy								
Butter	2.4	2.2	2.8	-0.3	0.8	2.3	2.4	
Skim milk powder	0.8	3.4	4.2	0.8	1.5	3.7	3.4	
Cheese	0.6	2.5	2.6	0	0.7	1.8	1.8	

Table A2: Impact on production (% from baseline)

	Percent						
	3-year set-aside program				8-year set-aside program		
	1999	2000	2001	2002-2006	1999-2006	2002-2006	1999-2006
Big five							
Wheat area	-10.7*	-10.7	-7.3	1.2	-2.8	-6.9	-7.9
Wheat production	-9.2	-8.0	-5.1	1.0	-2.1	-5.5	-6.3
Coarse grains area	-10.4*	-7.5	-7.0	1.5	-2.2	-4.9	-6.2
Coarse grains prod.	-10	-7.1	-6.4	1.3	-2.1	-4.6	-5.8
Oilseed area	-9.6*	-9.7	-10.3	-0.6	-4.1	-11.5	-10.9
Oilseed production	-9.3	-9.5	-9.9	-0.7	-4.0	-11.4	-10.7
Non-participating countries							
Wheat area	0.0	0.7	1.3	0.3	0.4	1.3	1.1
Wheat production	0.1	1.3	1.9	0.4	0.7	2.0	1.6
Coarse grains area	0.0	2.5	1.5	0.0	0.5	1.7	1.5
Coarse grains prod.	0.2	3.2	2.3	0.1	0.8	2.4	2.2
Oilseed area	0.0	2.7	2.9	0.7	1.2	2.8	2.5
Oilseed production	0.5	8.1	8.1	1.0	2.7	6.8	6.4
World							
Wheat area	-3.2	-2.8	-1.4	0.6	-0.6	-1.2	-1.7
Wheat production	-3.5	-2.4	-0.8	0.6	-0.4	-0.9	-1.4
Coarse grains area	-2.3	0.2	-0.4	0.3	-0.1	0.2	-0.2
Coarse grains prod.	-4.7	-1.6	-1.8	0.7	-0.6	-0.8	-1.5
Oilseed area	-4.6	-3.2	-3.2	0.1	-1.3	-3.6	-3.6
Oilseed production	-5.2	-2.2	-2.2	0.0	-1.2	-3.4	-3.3
Non-ruminant							
Milk	-0.1	-0.3	-0.4	-0.1	-0.1	-0.4	-0.3
Beef in Pacific	-0.1	-0.3	-0.6	-0.2	-0.3	-0.7	-0.6

* The percentage reduction in the area of the five largest exporting countries in 1999 may be slightly different than 10 percent because the amount of land set aside corresponds to 10 percent of the average harvested area in 1996-1998.

Table A3: Impact on Canada (% from baseline)

	Percent						
				3-year set-aside program		8-year set-aside program	
	1999	2000	2001	2002-2006	1999-2006	2002-2006	1999-2006
Canadian prices							
Corn, Chatham	32.6	23.7	28.4	-4.8	7.6	14.5	19.7
Barley, Lethbridge	29.8	23.7	28.1	-4.4	7.4	15.0	19.6
Soybeans, Chatham	33.8	33.5	29.5	-3.0	10.2	27.0	29.0
Canola, Vancouver	24.6	21.2	19.2	-1.8	7.0	18.7	19.8
Wheat, final realized price	14.3	25.9	26.1	-3.5	6.1	16.2	18.4
Steers	2.9	7.2	8.4	0.2	2.5	6.5	6.4
Hogs	3.3	17.2	21.8	-0.3	5.1	12.7	13.2
Poultry	6.5	14.3	14.3	-0.4	4.1	10.3	10.8
Eggs	5.2	11.4	11.5	-0.4	3.3	8.5	8.8
Milk, P9*	0	2.7	2.7	0.2	0.8	2.2	2.1
Canadian production							
Wheat area	-11.1	-14.8	-7.6	0.4	-3.9	-9.8	-10.3
Wheat production	-11.1	-14.8	-7.6	0.4	-3.9	-9.8	-10.3
Coarse grains area	-11.2	-7.0	-10.2	-0.1	-3.6	-7.2	-8.1
Coarse grains prod.	-10.8	-7.0	-10.3	-0.2	-3.6	-7.8	-8.4
Oilseed area	-8.3	-2.2	-6.0	0.3	-1.9	-6.6	-6.2
Oilseed production	-8.4	-2.7	-5.9	0.3	-1.9	-6.5	-6.2
Beef	0.2	-1.3	1.0	0.2	0.1	0.2	0.1
Pork	0.0	-1.7	-1.7	0.1	-0.3	-0.6	-0.8
Poultry	-1.2	-1.9	-1.6	0.1	-0.5	-1.2	-1.3
Eggs	-0.7	-1.4	-1.5	0.0	-0.4	-1.0	-1.1
Milk	0.0	-0.5	-0.9	-0.1	-0.2	-0.7	-0.6

* P9 is a pool price involving nine provinces.

Appendix B:

Results of the three-year set-aside scenario involving five countries (Argentina, Australia, Canada, the European Union and the United States), three countries (Australia, Argentina and Canada) and one country (Canada).

Table B1: Impact on crop prices

	1999	2000	2001	Average	Difference between scenario and baseline			
					1999	2000	2001	Average
World prices								
<i>Wheat</i>								
Baseline	109.5	124.2	138.9	124.2	—	—	—	—
5 Countries	124.8	157.0	175.2	152.3	15.3	32.7	36.3	28.1
3 Countries	114.2	134.8	152.5	133.8	4.7	10.6	13.6	9.6
1 Country	111.6	128.8	144.1	128.1	2.1	4.5	5.2	3.9
<i>Corn</i>								
Baseline	89.8	91.1	101.9	94.3	—	—	—	—
5 Countries	119.6	115.9	134.7	123.4	29.8	24.8	32.8	29.1
3 Countries	95.5	97.4	107.4	100.1	5.6	6.3	5.6	5.8
1 Country	92.3	94.1	105.0	97.1	2.5	3.1	3.1	2.9
<i>Soybeans</i>								
Baseline	176.4	167.6	166.2	170.1	—	—	—	—
5 Countries	231.3	219.3	211.0	220.5	54.8	51.7	44.7	50.4
3 Countries	191.0	180.0	176.4	182.5	14.6	12.4	10.2	12.4
1 Country	180.9	171.8	169.4	174.0	4.4	4.2	3.1	3.9
<i>Soybean meal</i>								
Baseline	180.7	176.1	173.9	176.9	—	—	—	—
5 Countries	226.9	230.9	216.4	224.7	46.2	54.8	42.5	47.8
3 Countries	193.1	189.3	183.0	188.5	12.4	13.2	9.1	11.6
1 Country	184.7	180.8	176.8	180.8	4.0	4.7	2.9	3.9

Table B1: Impact on crop prices (Continued)

	1999	2000	2001	Average	Difference between scenario and baseline			
					1999	2000	2001	Average
<i>Soybean oil</i>								
Baseline	351.2	352.9	371.7	358.6	—	—	—	—
5 Countries	368.3	368.5	388.5	375.1	17.1	15.6	16.8	16.5
3 Countries	354.6	355.6	375.0	361.7	3.4	2.7	3.3	3.1
1 Country	352.4	353.9	373.0	359.8	1.2	1.0	1.3	1.2

Table B2: Impact on livestock prices

	1999	2000	2001	Average	Difference between scenario and baseline			
					1999	2000	2001	Average
<i>US beef price</i>								
Baseline	232.7	251.3	254.8	246.2	—	—	—	—
5 Countries	239.6	269.7	276.3	261.8	6.9	18.4	21.5	15.6
3 Countries	234.3	255.9	260.0	250.1	1.6	4.6	5.3	3.8
1 Country	233.3	253.2	257.1	247.9	0.6	1.9	2.3	1.6
<i>US pork price</i>								
Baseline	102.6	138.6	126.7	122.7	—	—	—	—
5 Countries	105.5	159.2	150.0	138.2	2.9	20.5	23.3	15.5
3 Countries	103.3	143.5	132.4	126.4	0.7	4.9	5.7	3.8
1 Country	102.9	140.6	129.2	124.2	0.3	2.0	2.4	1.6
<i>Northern Europe cheese price</i>								
Baseline	175.4	179.1	187.5	180.7	—	—	—	—
5 Countries	176.4	183.6	192.4	184.1	1.0	4.5	4.9	3.5
3 Countries	175.6	180.3	188.7	181.5	0.2	1.1	1.2	0.8
1 Country	175.5	179.6	188.0	181.0	0.1	0.5	0.5	0.4
<i>Northern Europe butter price</i>								
Baseline	148.0	149.7	156.3	151.3	—	—	—	—
5 Countries	151.6	153.0	160.7	155.1	3.6	3.3	4.4	3.8
3 Countries	148.7	150.2	157.2	152.0	0.6	0.5	0.9	0.7
1 Country	148.3	149.9	156.7	151.6	0.2	0.2	0.4	0.3
<i>Northern Europe skim milk price</i>								
Baseline	131.5	145.9	150.8	142.7	—	—	—	—
5 Countries	132.5	150.9	157.2	146.9	1.0	5.0	6.4	4.1
3 Countries	131.8	147.3	152.4	143.8	0.4	1.3	1.6	1.1
1 Country	131.6	146.5	151.4	143.2	0.1	0.5	0.6	0.4