U.S./Canadian Agricultural Policies and Effects on Western Hemisphere Markets Since 1995, with a Focus on Grains and Oilseeds

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Department of Agricultural and Resource Economics

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Abstract
U.S. and Canadian agricultural support policies for grains are reviewed, focusing on changes since 1995. Estimates of effects on acreage and production from the literature and from acreage data for the U.S. are estimated. Likely further effects of the U.S. 2002 Farm Act are discussed, including discussion of the likelihood of breaching Uruguay Round Agricultural Agreement limits for domestic support in the WTO.

Keywords
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U.S./Canadian Agricultural Policies and Effects on Western Hemisphere Markets Since 1995, with a Focus on Grains and Oilseeds*

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Contents

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Introduction

This paper reviews and analyzes agricultural commodity support policies of the United States and Canada since 1995. This is a period of major changes in U.S. policies. The 1996 FAIR Act opened up new possibilities in farm policies, and subsequent debate about those policies culminated in 2002 with a new farm bill whose consequences may be quite significant. In Canada the period is more a consolidation of major changes in policy that had been made earlier. In both countries, the main issues addressed are the extent of income transfer to producers, and the market distortions created by those transfers. In particular, supply response to subsidies influences the production-consumption balance, commodity prices in the North American market, and, through price transmission, commodity prices as well as trade flows elsewhere in the world. The paper reviews the available data and research findings on the extent of these effects.

The first section recounts the recent history of the policies. The second section addresses the effects of the policies on commodity prices and trade flows. That section is focused on U.S. policies for the grains and oilseeds. The third section provides a prospective analysis of the commodity titles in the recently enacted 2002 U.S. Farm Bill.

Policy Review

United States

Beginning with the New Deal programs of the 1930s, the emphasis in U.S. commodity programs was supply management, mainly by taking stocks off the market and requiring farmers to idle acreage during low-price periods. Production controls gained ascendancy during prolonged price depressions because those policies involve smaller budgetary outlays than stockpiling, and does not accumulate stocks that must be disposed of later at the risk of further depressing prices. Acreage idling can be considered a stabilization program, since cropland can be brought back into production in high-price periods, thus increasing supplies if shortages appear. However, unlike a buffer stock, acreage idling increases the <u>average</u> level of prices over the years the program operates, and so it is not purely a stabilization program.

Acreage idling cannot work for an open economy too small for its output reductions to influence world prices, unless the country cuts itself off from world markets. The United States in the past has essentially isolated its market for some imported commodities. And for export crops where the U.S. has a large world export market share, such as corn, wheat, and cotton, the acreage controls were at times successful in raising prices. Over the longer term, however, especially in the 1980s, the view became widely accepted that U.S. acreage idling mainly encouraged commodity production by export competitors abroad, and could not for long be effective in placing a floor under the U.S. farmer's price. So, beginning in the Food Security Act of 1985, the role of acreage idling was reduced, and USDA stocks (usually called CCC stocks) of

grain were gradually eliminated and not replaced.[1] By the mid-1990s U.S. agricultural policy had largely abandoned both government-held stocks and acreage set-asides. The last grain set-asides occurred in 1995.

The Agricultural Market Transition Act (AMTA) title of the 1996 Federal Agriculture Improvement and Reform (FAIR) Act entrenched these ideas. Its fixed payments, no acreage set-asides, and avoidance of CCC commodity stockpiles provided a possible means of transition to a market-based agriculture that would not require governmental intervention to prop up the agricultural economy. The fixed payments, known as Production Flexibility Contract (PFC) payments, were made in proportion to what producers had received in 1990-95, or could have received if they had enrolled in the programs available then. Each participating producer received a fixed schedule of payments that gradually declined through 2002. The aggregate of these payments left the 2002 level well below historical payment levels, but after initial hesitation farm groups came to support the legislation when it became clear that the initial payments of 1996 would be well above what producers could expect to receive under the pre-1996 programs (because 1996 commodity prices were above the supported levels).

However, in 1997 prices headed lower, mainly because of weakness in world demand for U.S. grain. Grain and soybean prices have remained at historically low levels ever since. Congress responded by supplementing the fixed payments with emergency market loss assistance payments approximately equal to 50% of PFCs in 1998 and 100% in 1999, 2000, and 2001. The result was CCC outlays that far exceeded those expected in 1996 and used by the Congressional Budget Office (CBO) to "score" the FAIR Act. Figure 1 shows actual and projected outlays.

Table 1 shows outlays for each major commodity, and the percentage of the market value of each commodity accounted for by those outlays. This is a measure of the percentage subsidy for each product, a limited version of the producer subsidy equivalent (PSE) as calculated by the OECD. The payments grew phenomenally in 1999-2001 as commodity markets weakened. The payments varied from year to year not only because market prices changed but also because of the timing of payments. In FY 2000 payments were especially high because the market loss assistance payments that supplemented the PFCs were made for two crop years in the same fiscal year.[2]

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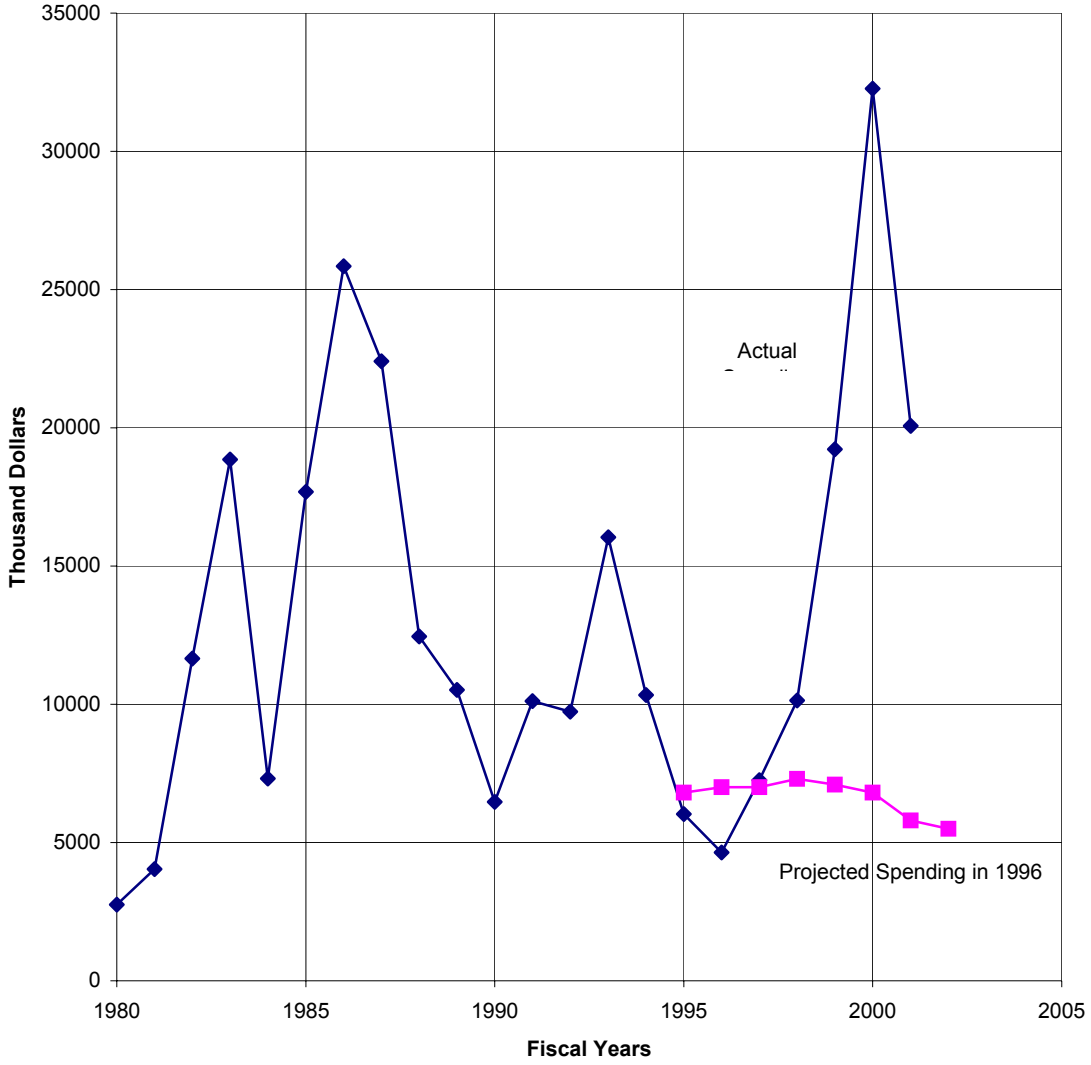
[1] The terms USDA and CCC (Commodity Credit Corporation) are roughly interchangeable in discussing commodity policies. The CCC is a government owned corporation charged with implementing commodity market interventions. Its officers and Board of Directors are USDA officials. The CCC structure provides flexibility in that it can spend funds on commodity support without explicit advance budget appropriations from Congress.

[2] The reason is said to be that the supplementary payments on the crops harvested in the fall of 2000, which normally would have been paid in Fiscal 2001 (that began October 1, 2000) were instead rushed ahead through authorities of the Agricultural Risk Protection Act of 2000 (enacted in June 2000) to be in farmers' hands before the November 2000 Congressional elections, so payments for both 1999 and 2000 crops were made in FY 2000.

Figure 1. CCC Outlays (USDA Commodity Programs)



Payments to farmers under commodity programs are important in determining output, trade, and market prices to the extent they induce farmers to increase production. In this respect, it is necessary to distinguish two separate payment mechanisms: the fixed PFC payments and payments under loan programs.

PFC payments are fixed in the sense that a farmer could do nothing to increase them once the farm was signed up in 1996. But the farmer could lose the payments by selling the farm with the land going into uses other than the permitted crops – for example, the land being developed for commercial purposes. Also, PFC payments are lost if the program acreage is planted to fruits or vegetables. So, while PFC payments are unlikely have caused acreage or yield increases, the payments may have forestalled reductions in acreage that might have taken place with the low prices of 1998-2001 in the

Table 1. CCC Outlays: Amount and Percent of Crop Value

CCC Outlays ($ millions)

Fiscal Year	Corn	Soybeans	Wheat	Cotton	Rice
1996	2021	-65	1491	685	499
1997	2564	5	1332	561	459
1998	2873	139	2187	1132	491
1999	5402	1298	3435	1882	911
2000	10135	2839	5320	3808	1774
2001	4355	3029	1645	1095	950
1999-2001 ave.	9,117	2,415	5,137	3,054	1,695

CCC Outlays as Percentage of Commodity Value

1996	8.4%	-0.4%	15.2%	10.4%	31.4%
1997	10.2%	0.0%	13.6%	8.8%	27.2%
1998	12.8%	0.8%	26.4%	18.9%	27.9%
1999	28.6%	10.1%	50.7%	45.8%	55.2%
2000	59.3%	23.3%	95.2%	99.9%	144.2%
2001	23.4%	23.2%	27.6%	22.9%	88.8%
1999-2001 ave.	47.5%	19.0%	76.2%	68.9%	124.9%

absence of the payments.

Under the 1996 FAIR Act (continuing provisions that had been in law, but little used, since 1986 for cotton and rice, since 1991 for soybeans, and since 1993 for wheat and feed grains) the traditional commodity price support mechanism through CCC loans is replaced by the marketing loan program. The marketing loan program has a direct impact on production. Each county has a "loan rate" for each program crop, a price which USDA will guarantee the producer. If the local market price is below the loan rate, the producer has the option of placing the crop "under CCC loan." The producer then receives a sum of money equal to the loan rate times the quantity placed under loan. The producer may settle an outstanding loan by repaying the loan (plus interest and other charges) within a 9 month period, or by delivery of the commodity to the CCC. Delivery is accepted by the CCC in full repayment of principal plus interest. Because delivery takes the commodity off the market, the loan program has traditionally been used as a means to support the market price at the loan level. However, delivery also results in CCC ownership of commodity stocks. Storage costs have become large in past programs, and the CCC stocks must at some point be sold, depressing market prices.

In the marketing loan program, in order to avoid the accumulation of CCC stocks, the farmer is given the option of repaying CCC loans at the "loan repayment rate." This is a price per bushel announced each day for each county, adjusted daily for movements in market prices relevant to that county. As long as market prices are below the loan rate,

the loan repayment rate will be less than the loan rate, so the producer will obtain a "marketing loan gain" if a CCC loan is redeemed on such a day.

Alternatively, producers who are eligible for a CCC loan, but who agree to forego the opportunity to put the crop under loan, may obtain a "loan deficiency payment." This payment is the difference between the county loan rate and the county loan repayment rate times the quantity eligible to be placed under loan on the day the producer commits to forego the loan. With either the marketing loan or LDP mechanism, the producer is guaranteed the loan-rate price for the output produced. The program is therefore a production subsidy whose monetary value per unit output is the expected value of the payment. This is analytically the same as the value of a put option with a strike price equal to the loan-rate price.

Table 2 shows a broader picture of US federal government activity in support of agriculture. It shows federal spending on abroad range of U.S. Department of Agriculture activities. In addition to the commodity programs there are conservation programs, export programs, governmentally underwritten loan programs for farmers, crop insurance, research funding, and marketing and regulatory programs. These additional activities have a price tag of $18 ½ billion annually in 2001-02.[3] The sum of $38 billion for FY 2001 amounts to 18 percent of the market value of U.S. farm cash receipts for all crops and livestock.

Which governmental expenditures count as support of agriculture is itself a difficult analytical question. The preceding accounting leaves out the big domestic food assistance programs – the Food Stamp Program, the School Lunch Program – which had FY 2001 outlays of $34 billion, almost as much as all the other programs listed in Table 2 combined. These programs are omitted on the grounds that they do not distort markets, but are analytically comparable to welfare programs that transfer cash to poor households. Because lower-income households spend higher budget shares on food, these transfers may be expected to increase the domestic demand for food products. Empirical estimates of the effect on demand have been difficult to pin down, and generally are small; but it is likely that the whole welfare system (including state and local programs like soup kitchens and "meals on wheels" for the elderly) does provide some support for agriculture.

The only food programs included in Table 2 are those that explicitly attempt to support agricultural markets where surplus production is a problem. The major programs in this category are P.L. 480, where a mix of foreign need and domestic political interests come into play (spending about $800 million), and "Section 32" purchases by USDA, a program under which USDA, at the discretion of the Secretary of Agriculture, purchases

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[3] "Price tag" is a vague term and is used because the figures shown in table 2 are not all derived from a consistent set of U.S. budgetary concepts. Most notably, the export credit guarantees are not the expenditures of the government on these guarantees; rather they are the value of loans guaranteed. Unless there are defaults on these loans (funds borrowed by foreign importers to buy U.S. exports are not repaid to the U.S. lenders) the actual outlays on these programs is negligible. In fact, defaults are rare. In U.S. budgetary parlance, the value of loans guaranteed is the "program level," and this is what the USDA budget summary shows.

commodities deemed to be in surplus for use in school lunch or other feeding programs (spending about $700 million).

Table 2. USDA Budget Data (million dollars)

Fiscal Year*	2001	2002 (estimated)
Commodity Programs Outlays(CCC) (subtotal):		
Contract Payments (1996 Act)	4,105	3,962
Supplemental Payments	5,455	4,200**
Loan Deficiency Payments	5,293	5,201
Price Support Loans and Sales	1,377	3,276
Disaster Assistance	3,146	133
Other***	3,168	2,295
Conservation Programs (subtotal):		
Conservation Reserve	1,358	1,821
EQIP and other	288	292
Export Programs (subtotal):		
Export Credit Guarantees****	3,227	3,926
Market Development Programs	119	120
Export Subsidy Programs	15	539
Foreign Food Assistance	1,659	1,613
Farm Loan and Grant Programs (Budget Authority)	171	217
Crop Insurance, net indemnities paid	2,200	1,690
Administrative costs, above programs	2,223	2,440
Federal Research Funding	1,999	2,196
Marketing and Regulatory Programs	1,279	1,357
Natural Resource Management Programs	1,000	1,198
Total activity in support of agriculture	38,082	36,476

*Fiscal years are Oct-Sept., e.g., FY2001 is October 1, 2000 to September 30, 2001
**Expected to be funded by 2002 farm bill (CBO estimate of May 2002)
***Includes cotton user payments, interest expenses, and "Section 32" commodity purchases (the last not in the CCC budget but included here).
****Amount of loans guaranteed, not the government's costs

Source: U.S. Department of Agriculture, FY 2003 Budget Summary

For an independent attempt to measure U.S. activity in support of agriculture, consider the calculations of the Organization for Economic Cooperation and Development (OECD). They developed the Producer Support Estimate (PSE),[4] defined as follows: "An indicator of the annual monetary value of gross transfers from consumers and taxpayers to agricultural producers, measured at the farm-gate level, arising from policy measures that support agriculture, regardless of their nature, objectives or impacts on farm production or income" (OECD 2001). The focus is on payments that go to producers and programs that support market prices directly, so they exclude food assistance programs and also activities such as research and extension programs that do not involve payments to producers. The OECD estimates a PSE of 23 percent of U.S. gross farm receipts for 1999-2001 (25, 22, 21 percent for each year respectively).

The question for analytical purposes is what the effect of this activity is on U.S. agricultural output and trade. As the OECD definition of the PSE makes clear, this issue is sidestepped in measures like the ones just calculated. The issue has been confronted most directly in the context of international trade negotiations. The World Trade Organization (WTO) aggregates "all domestic support measures considered to distort production and trade" (World Trade Organization, 2002) as the Aggregate Measure of Support (AMS). Under the Uruguay Round Agriculture Agreement (URAA) of 1994, the members of the WTO agreed to discipline their spending on these "amber box" programs, with some exceptions. The exceptions are "de minimis" provisions that exempt spending that is less than five percent of a commodity's value (for commodity-specific programs) or five percent of all agricultural commodities produced in a country (for programs not tied to a specific commodity), and a "blue box" of programs that provide subsidies that are linked to production limitations.[5]

Each WTO member country is charged with notifying the WTO of its actions as related to URAA commitments. The United States, according to its notifications, has not provided support at levels that have reached its AMS commitments, and so has not had to undertake reductions in support under the URAA agreement. The biggest component of support up to 1996, deficiency payments, were in the blue box and so not disciplined. Since 1996, the biggest component of support, production flexibility contract payments under the FAIR Act, have been placed in the "green box," defined as program outlays

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[4] Formerly known as Producer Subsidy Equivalent.

[5] With the product-specific de minimis provision, it makes a difference how products are aggregated. For example, if butter receives support worth 10 percent of its value and cheese and other milk products receive no support, it is still possible not to exceed the de minimis level of support for dairy products as a whole. Therefore a country has an incentive to define commodities broadly. In fact the US spreads its support for all dairy products over a single aggregate dairy category (which is appropriate since what is being supported at the farm level is the underlying raw material, milk). But fruits and vegetables are not aggregated. U.S. submissions to the WTO report product-specific support for the following commodity categories: barley, beef, corn, cottonseed, cotton, dairy, pork, honey, canola, flaxseed, mustard, rapeseed, safflower, sunflower, mohair, oats, peanuts, rice, rye, sorghum, soybeans, sugar, tobacco, wheat, wool, potatoes, apples, cranberries, and lamb.

that do not have the effect of supporting prices and "have no, or at most minimal" trade-distorting effects on production.

The latest notifications tabled by the United States are those for 1998. They are as follows (in billions of dollars):

	URAA Commitment	Amber Box Total	Amber Box net of de minimis
Product-specific		10.55	10.39
Non-product-specific		4.58	0
Total	20.70	15.13	10.39

The product-specific items include dairy price supports ($4.33 billion), loan deficiency payments and marketing loan gains ($3.82 billion), sugar support ($1.04 billion), and several lesser programs. The non-product-specific items include Market Loss Assistance payments ($2.81 billion), benefits from crop insurance programs ($0.75 billion), and input supply subsidies, mainly irrigation and grazing rights, $1.04 billion.

In addition, the United States notified WTO of $9.11 billion in 1998 green box support, including $5.66 billion in Production Flexibility Program payments, $1.69 billion in Conservation Reserve Program payments, $1.41 billion for relief from natural disasters, and other environmental and credit programs of $0.35 billion: all adding up to $9.11 billion in the green box category (data from Nelson 2002).

As analytical categories, the amber box and green box raise several questions. The most obvious is how can Production Flexibility Contract payments be green, and at the same time Market Loss Assistance (MLA) payments, which provided a 50% supplement to PFC payments on exactly the same payment base, be amber. Since both are decoupled from the farmer's production decisions in the sense that they do not change if the producer increases or decreases acreage or output of the covered crops, why are not both equally green?[6] The answer in the URAA text, as cited in USDA's explanation to Congress of why the U.S. notified the WTO that MLA payments fall into the amber box, is that MLA payments, as a Congressional policy response to low prices, are in fact

[6] This is the key issue behind the dispute between the House Agriculture Committee leadership and the Bush Administration (who made the decision to notify market loss assistance as amber – a decision that a year earlier had been postponed by the Clinton Administration) that surfaced in spring 2001. It became serious because House Agriculture Committee Chairman Combest expressed the view that in the circumstances it would be difficult for him to support "Trade Promotion Authority" legislation (formerly known as "fast track" authority) under which Congress agrees to vote up or down (rather than amend) WTO agreements negotiated by the President (only the Senate votes on such agreements as treaties, but both Houses vote on enabling legislation needed to implement the agreement). Subsequently Trade Promotion Authority passed the Senate and the House (by a single vote) but, as of July 2002, there has been no House-Senate Conference to reconcile differences in their bills. The residual effect of this dispute in 2002 is that USDA continued holding back WTO notification of the U.S. AMS for 1999 and 2000, out of concern, it is said, for further political fallout that would come if, as they feel they must, the Bush Administration sticks with the finding that market loss assistance is amber.

"coupled" to market conditions and are therefore amber. The URAA is taken to require this even though the fixed payment base for the market loss assistance payments makes these payments not notably more production distorting than the PFC payments.[7]

The other main puzzle from an analytical perspective is how to treat crop insurance and disaster relief, or more broadly agricultural risk management policy. This topic is discussed separately below for both the U.S. and Canada, after now turning to an overview of recent Canadian policies.

Canada:

Canada's agricultural policies for grains and oilseeds have followed a path similar in some respects to those of the United States, but with less reliance on supply management through acreage controls even before 1995, and more reliance on collective marketing, most notably through the Canadian Wheat Board.[8] The CWB has an export monopoly for Canadian wheat and barley -- all exports must be sold through that agency. Farmers then get a pooled price depending on the receipts the CWB is able to earn from the exported commodities. This removes a large element of price risk management from farmers' hands. There has been a relatively low guaranteed price in the past, and today the CWB provides no significant price insurance for producers. Canadian grain producers in the past benefited from substantial subsidies of rail transportation to export ports. But these have been phased out.

Canada has undertaken far-reaching experimentation in its series of grain programs in the 1980s and 1990s. The Western Grains Stabilization Program (WGSP) made payments from a fund partly financed by growers when their aggregate cash receipts from grains fell below a 5-year moving average. After accumulating large deficits without providing satisfactory income protection to producers, the WGSP was abandoned.

The year 1995 was a watershed in that, under pressure of federal budgetary deficits and the Uruguay Round Agriculture Agreement's disciplines on export subsidies, transportation subsidies under the Western Grain Transportation Act were ended. These had cost an average of about $(US)12 per ton of grain and their elimination was estimated to have saved the federal government about $(US) 400 million in 1995.

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[7] The URAA has two requirements for payments to qualify for the green box. First, there is the basic criterion that payments "shall have no, or at most minimal, trade-distorting effects or effects on production" (Annex 2, Paragraph 1). The second is a policy-specific requirement that "The amount of such payment in any given year shall not be related to, or based on, the prices, domestic or international, applying to any production undertaken in any year after the base period" (Annex 2, Subparagraph 6(C). It would be possible to read this second requirement as pertaining to production <u>over and above</u> that of the base period (otherwise why use the term "undertaken," which could be omitted if all production is meant). This interpretation preserves the sense of the basic criterion, and the Bush Administration's unwillingness to embrace this plausible way of notifying MLA payments as green may be a reason why agricultural interests in Congress were irritated.

[8] With respect to supply management, livestock policies are another matter. Here Canada has maintained a strong presence in supply control measures for dairy, poultry, and eggs, while in the U.S. supply management in livestock has been entirely absent since the Dairy Herd Buyout Program of the mid-1980s.

The Farm Income Protection Act of 1991 introduced the Gross Revenue Insurance Program (GRIP) and the Net Income Stabilization Account (NISA). These programs were tuned to each producer's situation, with GRIP making crop-specific payments to producers when their production times the market-wide average market price fell below that producer's established average yield times a "target" price. The program was packaged as insurance in that each producer paid a premium for this coverage (but about two-thirds of the premium cost was paid by a combination of provincial and federal funds).

GRIP combined features of the U.S. deficiency payment and subsidized crop insurance programs, and its comprehensive approach has attractive features. But it proved to have too little political support from farmers to justify its budgetary costs in the belt-tightening environment of the mid-1990s, and GRIP expired after 1995. NISA, a more broadly conceived (avoiding support of specific commodities) and less costly program, continues. It is essentially a subsidized savings account into which producers can contribute 2 percent of the value of qualifying grain sales, to be matched by 1 percent each from provincial and federal governments. The producer can withdraw funds from the account if either annual farm operating income or family income falls below established triggers. NISA is the main remaining farm income protection program in Canada (see Huff, or Gray and Smith (1997) for further discussion). In addition, in 1999 Canada introduced the Agricultural Income Disaster Assistance (AIDA) program, now called Canadian Farm Income Protection (CFIP). Under that program, funded 60 percent by federal and 40 percent by provincial governments, anyone who files income tax returns as a farmer can get an indemnity payment if their gross returns fall below 70 percent of the similarly calculated returns over the average of the three preceding years. The budget for this program has exceeded that of NISA since its inception (Edelman, 1999; Schmitz, Furtan, and Baylis, 2002).

The OECD's average PSE for Canada for 1999-2001 is 18 percent (support as a percentage of gross farm revenues), less than the 23 percent estimate for the U.S. Even more impressive is the reduction in Canada's PSE from an estimated 33 percent in 1986-1988 (see OECD 2001, p. 27 and OECD 2002, p. 41). Agricultural support payments declined from an estimated 16 percent of gross cash receipts in 1992 to 6 percent in 1999 (with a 55/45 split of the cost between federal and provincial governments).

Risk Management Programs:

A set of risk management programs in both Canada and the United States warrant special consideration because of the ambiguous position they hold in WTO categorization, and more fundamentally because their production effects are particularly difficult to estimate while at the same time these programs are increasing in importance in both countries.

Neither country's commodity programs never completely removed price risks for farmers. The programs themselves changed over time and were sometimes ineffective,

and many specialty crop and livestock commodities were not covered by these programs. It is helpful to review a risk management problem that has remained for the producers of supported commodities, namely yield risk. Indeed, the presence of price stabilization increases farmers' vulnerability to yield risk. The reason is that poor crops tend to occur over large geographical areas in a given year. Therefore, if a farmer suffers low yields it is likely that a general crop shortfall is occurring. This means higher prices, which can offset a substantial part of the yield loss in the farmer's income calculation. But if prices are stabilized, this "natural hedge," as it is referred to in the literature, is eliminated or at least reduced in effectiveness. Therefore farmers have more to worry about from yield fluctuations when prices are stabilized.

In the United States, the Crop Insurance Act of 1980 inaugurated a push to expand crop insurance that farmers would pay for, and to do so with more private sector involvement than had formerly been the case. A series of experiments in insurance offerings has continued through the 1980s and 1999s. Under the Federal Crop Insurance Reform Act of 1994, USDA's Risk Management Agency does not itself issue insurance policies but acts mainly as a regulatory and support agency for private providers of insurance and farmers who buy such insurance. The 1994 Act increased premium subsidies from about 25% of premiums paid to an average of 50%. Because of increased sales of insurance, federal outlays for premium subsidies increased even more from about $250 million to $900 million annually. But the 1994 Act also tightened indemnity procedures so that the ratio of indemnities to premiums declined. Still in 1995 to 1998 overall, crop insurance programs paid out $1.77 in indemnities for each $1 received in premiums from farmers – a sharp contrast to homeowners' or other normal commercial insurance where the buyer pays for risk reduction rather than earning an expected profit. (For the data in this paragraph, and other program details, see Schnepf and Heifner, 1999.)

Even with expanded coverage under the 1994 Act, Congress felt impelled in 1998 and 1999 to appropriate $4 billion for various forms of disaster relief for farmers.[9] This led to another round of legislation, the Agricultural Risk Protection Act of 2000. That Act further increased subsidies on crop insurance. For example, for an insurance policy that provided indemnity payments when a farmer's yield fell below 75% of the established yield for the farm, under the 1980 Act the federal government paid 16.9 percent of the premium. In the 1994 Act the subsidy rate was increased to 23.5 percent, and in the 2000 Act the subsidy for that insurance policy rose to 55 percent of the premium. The overall cost to the government of the crop insurance program as of 2001 is placed at about $3 billion annually (Glauber and Collins, 2002).

[9] Legislation of 1998 provided $2.4 billion for financial assistance to farmers who had crop losses due to drought or other natural disasters and reached new levels of generosity in two respects. First, it covered losses not only in 1998 but retroactively provided assistance to producers who had crop losses in three of the preceding five years. Second, under the 1994 Act, producers who had declined to purchase subsidized crop insurance had to sign waivers indicating they would be ineligible for disaster assistance; but nonetheless the 1998 legislation made such producers eligible.

Given that crop insurance is a good deal for so many farmers, it is perhaps surprising that only 56% of eligible field crop acreage was insured in 2000 above the "catastrophic" coverage that USDA gave away with no premium charge (but a $60 processing fee). One reason may be that in every year between 1988 and 1994, and again in 1998 and 1999, the federal government has enacted ad hoc disaster relief payments to producers in areas where yields were low. In discussing the market for commercially supplied insurance, USDA analysts have asked: "Why pay a premium for something that you would likely get for free?" (Schnepf and Heifner, 1999, p. 18). In response to this concern, and in order not to discourage farmers from purchasing insurance, the 1999 disaster bill made disaster payments even to farmers who had their yield losses covered by crop insurance; so these producers could well end up better off with disaster than if they had a normal crop – a sure invitation to moral hazard for producers who live in risky production areas.

Another reason many farmers do not buy crop insurance is that the premium rates are much more favorable for some crops and regions than for others. In the Eastern Corn Belt rainfall is very seldom disastrously low, and while insurance premiums are low, the fact of their being low means that a 35% premium subsidy does not mean much in dollar terms. Moreover, because the area is the nation's breadbasket, if yields were disastrously low there would very likely be a sufficiently widespread loss of the crop that the natural hedge provided by higher crop prices would cushion the financial loss to a substantial extent. In these circumstances, many farmers are not sufficiently risk averse to buy crop insurance coverage. These considerations led to a proposal in 1999, favored by Corn Belt representatives, to replace crop insurance subsidies by a broader of risk management policy approach in which funds used for crop insurance subsidies could also be used to subsidize other risk management practices, including price insurance through put options, special farmers' savings accounts, or even paying down existing debt.

The FAIR Act authorized several programs that experiment further with market-based risk management. They expand upon federal crop insurance programs, which have since 1980 been increasingly marketed through private sector insurance companies, with federal subsidies and oversight. Companies can propose policies that cover combinations of price and yield risk. Since 1996, three variations on the theme of revenue insurance have been introduced, and two more were approved for sale in 1999. In 1998, roughly 10 percent of U.S. grain and soybean acreage was insured under some form of revenue insurance (for more detail and helpful discussion of this and other elements of the crop insurance picture, see Glauber, 1999 and Glauber and Collins, 2002).

In Canada, there has been a trend toward more flexible and more market-oriented risk management policies. Canada has established a pilot program of put options for livestock producers, and the NISA and AIDA programs are basically government-run and subsidized income insurance policies.

Perhaps the most interesting of the new insurance products is "crop revenue insurance," an elaboration of the existing U.S. federal crop insurance program developed by a private company, American Agri-insurance, and offered so far principally in Iowa

and Nebraska. It provides insurance coverage to farmers similar to that afforded by the Canadian GRIP program. Here the farmer selects from a schedule of yield and price protection options, paying a higher premium the higher the protection. An indemnity is paid if actual yield times the harvest-time price in the producer's county falls below the insured price times yield. The government pays an average of about 30% of the premium cost.[10]

In these policies the yield and price options are well below mean yields and prices so that all policies contain a substantial deductible. 1998 was the first year large numbers of crop revenue insurance policies were sold, and some problems occurred that are illustrative of pitfalls that await the retailing of price insurance options in developing countries. These tend to occur when overly generous policy terms are offered on near in-the-money strike prices and producers, having better information than the rate-setters, buy these policies. For example, in 1999 crop revenue insurance policies were available on durum wheat with an unusually favorable price option (apparently because the insurance company miscalculated the basis between the North Dakota durum price and prices of the exchange-traded wheat on which they based the premium schedule). This not only resulted in large sales of the policies but seems even to have caused substantial numbers of North Dakota growers to plant durum so they could buy the insurance. USDA's September 1999 survey of acreage harvested found that North Dakota durum acreage increased 12% from the previous year, despite market weakness. At the same time, other spring wheat acreage in North Dakota declined by 15% in 1999 as compared to 1998, and durum acreage in Arizona and Canada also declined substantially. Thus the pricing of insurance in this case also appears to have significantly affected farmers' planting decisions.

The present thrust of policy is toward continued development and expansion of efforts to use subsidized revenue, yield, and price insurance as the primary means of risk management in U.S. agriculture. A striking aspect of the present U.S. and Canadian risk management policy debates, in the context of the long history of experiments in agricultural policy, is that most parties have come to a position that the most promising way to deal with the economic and political situation of agricultural producers facing market risks is to assist them using a combination of lump-sum payments and subsidize privately-provided risk management tools. The hope has been expressed that in future farmers will be willing to pay the full cost of such insurance. There is some evidence from experience that farmers are in fact willing to pay for insurance; but as long as it is politically possible to maintain subsidies, producers will naturally prefer that alternative.

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[10] The government also subsidizes the insurance companies by covering some administrative costs and by offering reinsurance to the companies on favorable terms. The overall budget cost of the crop insurance program is about $1.7 billion annually (compared to $5 billion in the fixed "transition" payments and about $2 billion in the "loan deficiency payments" triggered by exceptionally low 1998/2002 prices). The aggregate market value of the crops covered (grains, oilseeds and cotton) is about $60 billion.

Market Effects of Policies

Measuring the transfers to producers that result from commodity policies is not straightforward, as has been discussed. Effects upon land and labor use, input purchases, and consequently upon commodity output are impossible to estimate with confidence. Nonetheless, the direction of output effects generated by policies in both the United States and Canada is clear; namely, the policies increase production over the quantity that would have been produced in the absence of the policies. The overall direction of effect was not so clear under the pre-1995 U.S. policies, because of their reliance on acreage set-asides. Economic analysis of the those programs typically found that they reduced U.S. grain production, and indeed in years of surplus production provided some support for worldwide grain prices.[11]

A substantial production control policy remains in place with 34 million acres idled in 10- to 15-year contracts under the Conservation Reserve Program. Nonetheless, the absence of annual acreage reduction programs since 1996 changes the focus to supply-increasing effects of commodity program payments and subsidies. The effects to be considered, for the major crops of grains and oilseeds, arise from three main sources, all of which have been described above: the loan program, PFC and market-loss assistance payments, and crop insurance programs. The effects to be considered are those during the 1999-2001 marketing years (rather than the first years under the 1996 FAIR Act) because the market conditions of 1999-2001 are reasonably close to those of today. Following the analysis of recent past program effects, we will undertake a prospective analysis of the likely consequences of the new farm bill replacing the FAIR Act that became law in May 2002.

Loan Programs:

The most important element of USDA's commodity loan programs since 1996 has been loan deficiency payments. The key analytical issue for purposes of estimating market distortion is determining what the expected producer price is, including the subsidy (the LDP). The simplest approach would be to just use the loan-rate levels ($1.89 for corn, $2.58 for wheat, $5.26 for soybeans, and 51.92 cents per pound for cotton during 1998-2000). But that approach would be mistaken. One reason is that the loan rate is a price floor, but if market prices rise above that level, the farmer gets the market price. So the appropriate price expectation is the probability of market price being at or below the loan level times the loan level plus the probability of price being above the loan level times the expected price given that outcome. This latter outcome did not occur in any of the years 1999-2001, but that does not mean the probability was zero *ex* ante (although it may reasonably be taken as small).

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[11] The situation in Canada is complicated by supply management programs for livestock products, which continue to the present. By holding down livestock numbers, they tend to reduce the demand for feed; but by increasing livestock product prices, they increase the marginal value of feed fed per animal. This provides no incentive to increase grain production, but may nonetheless place marginal downward pressure on world grain prices by reducing total feed demand.

A second reason one cannot take the loan level as the relevant price expectation is that loan deficiency payments and marketing loan gains have provided revenues to producers that exceed the loan rate in each of the last three years, so farmers can be expected to count on this in making their planting decisions. Following are data for the 1999 and 2000 crops, with all data in dollars per bushel, except cotton, which is cents per pound[12]:

1999 Crop	Average farm price	Ave. marketing loan benefit	Ave. farmer revenue	Percentage price wedge
corn	1.82	0.26	2.08	14
soybeans	4.63	0.88	5.51	19
wheat	2.48	0.41	2.89	17
cotton	45.0	19.8	64.8	44

2000 Crop	Average farm price	Ave. marketing loan benefit	Ave. farmer revenue	Percentage price wedge
corn	1.85	0.26	2.11	14
soybeans	4.54	0.92	5.46	20
wheat	2.62	0.37	2.99	14
cotton	49.8	6.7	56.5	13

These calculations indicate corn growers could expect to receive 12 percent more than the loan rate based on 2000 results, soybean growers 4 percent, wheat growers 16 percent, and cotton growers 9 percent. The price wedge between producer price received and buyer price paid is even larger, because farm-level market prices are less than the loan rates. The percentage price wedges, calculated as price differences divided by the average farm price received as estimated by USDA, are shown in the right-hand column.[13]

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[12] The marketing loan benefit is loan deficiency payments plus market gain on quantities placed under loan as reported in "Loan Deficiency Payment and Price Support Cumulative Activity" available on USDA's FSA website http://www.fsa.usda.gov/. The average benefit per unit output is calculated as loan benefits divided by total production of each crop in 1999 as estimated by USDA. This counts in the average a zero benefit for quantities that did not participate in the loan program. The average benefit for those who did participate is slightly higher.

[13] A complication is that an estimated 8 percent of the 1999 corn crop, 2 percent of the soybean crop, and 12 percent of the wheat crop were neither placed under loan nor received a loan deficiency payment for the 1999 crop. These estimates compare USDA-FSA reports of bushels that participated in marketing loan programs with USDA-NASS crop production estimates. There are several reasons these figures might not match exactly even if all 1999 production entered the programs. For example, a farmer might have placed some grain under loan in the 1999-crop program that actually was harvested in 1998 or earlier. Those estimates are quite uncertain, but it does appear that some farm output does not get loan-program support. Some grain and oilseeds are of specialized or high-quality varieties that sell for more than the loan rate; nonetheless, a producer can get an LDP for them (so there is less reason for non-participation than under the old loan program where the farmer actually had to deliver grain to retain the loan-level price). Another factor is payment limits. They could possibly make a large farm ineligible for loan program benefits, but the farm would have to be quite large. The LDP payment limit for 1999 and 2000 was $150,000 ($75,000

Assuming the loan program was expected *ex ante* to generate the *ex post* benefits that actually occurred, these data indicate producer incentive prices an average about 20 percent above the market prices for grains and oilseeds. To see the implications for production, consider the effects of a 20 percent expected subsidy. Assuming aggregate elasticities of supply of 0.2 and of demand of –0.5, the output increase generated by the loan program is .2/(1/.2+1/.5) = 2.9 percent. The implied decrease in the market prices of these commodities is 5.8 percent. Thus, assuming full transmission of the change in the farm price to wholesale prices and hence to prices at port locations, world commodity prices are reduced by about 6 percent under the U.S. loan program compared to the situation if there were no program. That is a short-run estimate, corresponding to a quite low elasticity of demand. Experience indicates that a U.S. drought, for example, raises world prices substantially, but that reductions in U.S. output over many years, such as occurred under set-aside programs, has much smaller price effects as other countries adjust production (i.e., the longer-run elasticity of demand for U.S. commodities is substantially larger). Suppose the long-run elasticity is –1.5 instead of 0.5. The output effect is .2/(1/.2+1/.5 = 3.5 percent and the market price decrease is 2.4 percent instead of the 5.8 percent calculated above.

Westcott and Price (2001) made a more detailed and refined estimate of the effects of the FAIR Act's marketing loan provisions under market conditions of 1998. They remove price wedges attributable to LDPs and other marketing loan provisions as of 1998 and then simulate the effects for each commodity in the FAPSIM model that USDA uses for its baseline commodity market projections to 2005. This model embodies a complete set of commodity supply and demand elasticities and cross-elasticities, with baseline projections of yields and export demand (so it is not a comparative statics exercise like the crude calculations above, but rather an exercise in comparative dynamics). Taking an average of their results for 1999-2001, i.e., two to four years after the loan program is taken away, they estimate the following percentage changes in prices and quantities attributable to the program:

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doubled under provisions of the Agricultural Appropriations Act of 2000) and a "person" for payment purposes can be benefit from up to a 50 percent interest in two additional farming entities, so the effective limit is typically $300,000, and a farm jointly owned by husband and wife could double this. For the crop with the highest average LDP per bushel in the program, wheat, the average 1999-crop payment was $0.47 per bushel. To obtain the maximum payment a producer would need a beneficial interest in 638,000 bushels, which would require an operation of 15,000 acres at the US average 1999 wheat yield (42.7 bushels per acre). Moreover, in February 2000 the Secretary of Agriculture ruled that LDPs could be made in certificates that can be used to acquire commodities placed under loan, which can then be sold and not count against payment limits. This made payment limits essentially a dead letter as far the marketing loan program was concerned, although amounts that can be taken in the form of direct cash payments that do not require physical dealing in commodities remains limited at $150,000 (see Womach 2000).

Commodity	Market price	Acreage
Wheat	-2.2	1.5
Corn	-1.4	0.4
Soybeans	-3.7	1.4
Cotton[14]	-9.0	6.0

These estimated price effects are smaller for short-run effects on the grain prices as calculated above, but close to the long-run effects. Note that the base (no-program) prices were higher estimated from the 1998 perspective than they subsequently turned out to be.

On May 13, 2002, President Bush signed the Farm Security and Rural Investment Act of 2002, which increases the loan levels by 4.8% to $1.98 per bushel for corn, by 8.5% to $2.80 per bushel for wheat, and reduces the loan level by 5.0% to $5.00 per bushel for soybeans. Extrapolating from the above calculations, this would be expected to reduce grain prices further 2. This topic is discussed further in the following section, on the 2002 Farm Act.

Production Flexibility Payments:

The substantive issue with these payments is their effect on output and hence prices and trade. Because the payments could not be increased by a farmer planting a larger acreage or increasing crop yields, and hence are "decoupled" in the sense of being independent of output increases, as a first approximation the payments have been assumed to have no effects on quantities or prices of commodities. However, several reasons have been given why the payments may nonetheless result in commodity production higher than would be the case in the absence of the program. Most notable among them are (1) wealth effects, (2) insurance effects, (3) anticipatory effects, and (4) absence of complete decoupling.

(1) Guaranteed payments are an annual income flow analogous to what a farmer would receive from an increase in financial or other forms of wealth. If a farmer would respond to a wealth increase by investing some of the gain in the farm operation, then even decoupled payments would have an output effect. Standard theory would say this effect should be negligible, because investment should be governed by the expected rate of return, and decoupled payments do not increase the rate of return to investment. But suppose the farmer was credit-constrained, i.e., the expected rate of return on investment in the farm was higher than the interest rate in credit markets, yet a loan could not be obtained because the farmer had reached the credit limit as seen by the lender (or because

[14] The cotton figures are Westcott-Price estimates only for quantity. I estimate producer price based on a demand elasticity of –2/3.

of some other credit market imperfection). Then quite possibly the farmer would invest decoupled payments in the farm and thereby increase output.[15]

(2) If a farmer is risk averse, and increasing agricultural production increases the variability of income, then a payment program that reduces income variability will tend to increase output. Lump-sum payments add a constant to income and so do not reduce the variance. But, as emphasized by Hennessy (1998), increases in wealth reduce marginal risk aversion for some standard representations of production risk and farmer utility, so the payments might induce more output by reducing the obstacle that risky production would otherwise place in the farmer's way. Moreover, the payments may in practice not be a constant addition to income, but may be increased by Congressional action when commodity prices are unexpectedly low. In fact this occurred with the Market Loss Assistance payments that supplemented the PFC payments in 1998-2001. Payments that are expected to operate in this way will reduce farmers' anticipated risks in farming.[16]

(3) Apart from wealth effects or risk aversion, a farmer might feel impelled to maintain acreage and production levels because at some future date the program is likely to be restructured and the base for payments updated (as is actually happening with the 2002 farm bill). Under current market conditions this incentive is a reason to refrain from reducing output in the face of low prices rather than a reason to increase output because of the payments, but in either case the relevant distortion in the 1998-2001 period works in the direction of keeping production higher than is warranted by market conditions.

(4) The payments are not actually totally decoupled. A producer is not allowed to grow most fruits and vegetables on land covered by the program. So there is an incentive to keep growing program crops even if market conditions indicate higher returns from switching to those alternatives.

Whether any of these effects are quantitatively important is an empirical issue, and one that is difficult to estimate from the data available. Westcott and Young (2001), following up on Young and Westcott (2000), use estimates of wealth effects on planted acreage, developed from pre-1990 data by Chavas and Holt (1990), to estimate that during the period of the FAIR Act PFC payments had "the possible increases in aggregate planted acreage range from 225,000 to 725,000," or about 0.3 percent of total cropland (p. 11). Adams et al. (2001) consider 1997-2000 acreage data directly for 11 major U.S. program-crop states. They find a positive effect of PFC plus market loss assistance (supplemental PFC) payments, but the effect has only marginal statistical significance. Nonetheless, the Food and Agricultural Policy Research Institute (FAPRI), which carries out economic analysis of program alternatives for Congress, has incorporated an effect of

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[15] A story goes that a farmer won the lottery and was asked what he would do with the winnings. He replied: I'll just keep farming until the money is gone.

[16] Evidence that such adjustments were forseen by policy makers comes from a statement by Senator Roberts, Republican of Kansas. He responded to criticism by Democrats that the FAIR Act removed the "safety net" that deficiency payments had formerly provided to protect against low prices by saying: Congress is the safety net.

these payments in its modeling. In view of the weak statistical significance, the estimates should be regarded as an upper limit of the program's effects. FAPRI's simulations imply that $10 billion in payments, about the average level in 1998-2001, would cause about 2.75 million acres of U.S. cropland to be devoted to program crops that would not have been in the absence of the FAIR Act, 1 percent of the acreage planted to those crops. The implied output effect of about 1 percent means the payments introduced in the FAIR Act had about half the downward world price effect of the marketing loan program.

Crop Insurance and other Risk Reduction Programs.

The Federal Crop Insurance Program has increased its subsidies and hence participation in the program since the 1994 Reform Act, as discussed earlier. The subsidies are now sufficiently large to provide a significant incentive to produce crops in locations where production is sufficiently risky that producers would arguably choose to produce less risky crops or pasture the land instead of cropping it, if subsidized insurance were not available. Estimates of the effects are difficult to make with confidence, and attempts to provide such estimates have resulted in greatly varying findings both for shifts among crops and for aggregate crop acreage. Estimates in the literature imply that $3 billion in crop insurance subsidies would increase aggregate U.S. crop acreage by 0.5 to 10.0 percent, a remarkably wide range of uncertainty (see Glauber and Collins 2002, Young, Vandeveer, and Schneff 2001, Orden 2001, Keaton, Skees and Long 2001, Skees 2001). The most careful and detailed of these studies suggest the lower end of this range is most plausible. Young, Vandeveer, and Schneff project average acreages and yields during 2001-2010 in the absence of subsidized crop insurance. They estimate 960,000 acres would be withdrawn from grain, soybean, and cotton production (less than ½ of 1 percent), with more than half of this acreage from the Great Plains, a primarily wheat-growing area. Their implied estimate is that production of wheat would decline about 0.8 percent, cotton 1.7 percent, feed grains 0.2 percent, and soybeans 0.1 percent.

Overall effects from the literature.

Although any estimate is conjectural, the set of most-reasonable estimates indicate that the marketing loan program increases the U.S. output of grains and soybeans by about 2 percent, the direct payment program by ½ to 1 percent, and crop insurance subsidies by 1+ percent, for a total effect of about 4 percent more of these commodities being produced in 1999-2001 than would have been the case in the absence of the programs. But the range of possible effects is large, roughly from 2 percent to 10 percent.

Given elasticities of demand for these products in aggregate that range from possibly –0.4 (short run) to –1.0 (intermediate run), an argument could be made for world commodity price effects ranging from a decline of 2 percent to a decline of 25 percent. The latter figure, however, would only be at all plausible for a short-run (a year or less) scenario. Considering adjustments in supply and demand in both the United States and in other countries, the most likely point estimate from the literature taken together, for impacts two to three years after a policy shock is about a 4 percent output effect with a demand elasticity of –0.7, giving a world price decline of 6+ percent for the average of

grains and soybeans, attributable to U.S. commodity support policies in place in 1998-2001.

For a full long-run picture, one ought also to include the effects of the ongoing Conservation Reserve Program (CRP). If the 34 million acres enrolled in that program (10 percent of all land used for crops) as of 2001 were to be released from it, what would the output effects be? Most land in the CRP is designated as highly erodible or having other characteristics that make cropping it more than usually threatening to water quality (such as land within 100 feet of a stream or lake). These lands are expected to have lower than average yields when cropped, but analysis by the Economic Research Service of USDA has estimated that yield capacities of CRP land are not far below corresponding cropped acreage on average; but 58 percent of CRP land is in the relatively low-yielding Great Plains states and only 18 percent is in the Corn Belt. So bringing this land back into production would have a disproportionately large effect on wheat production (ll million acres of wheat base under former programs). Assuming two-thirds of CRP land would return to crop production with 85 percent of the yield of average U.S. cropland, assumptions consistent with USDA-ERS analyses, a reasonable estimate of the effect on aggregate grain and soybean output is that the CRP has decreased output by the equivalent of ($34 \cdot 0.67 \cdot 0.85$=) 19 million U.S. average cropland acres, for about a 7 percent reduction due to the Conservation Reserve Program. This the CRP slightly more than offsets the production increasing effects of marketing loans, crop insurance, and direct payments as the operated in 1998-2001.

In its benefit-cost analysis of the CRP, USDA estimates imply that 34 million acres in the program would raise the prices of wheat, corn, and soybeans by 11 percent, 13 percent, and 12 percent respectively (USDA, 1997, p. 7602).[17] These estimated effects are probably too large as long-run impacts, but even if the long-run effects are only half as large, they still roughly offset the effects of the FAIR Act's production-increasing programs as of 1998-2001.

However, if one is going to include the production effects of the Conservation Reserve Program in assessing U.S. policy consequences for world markets, one ought also to consider research and extension programs that generate new technology, which has increased total factor productivity (TFP) and thus increased output. TFP in U.S. agriculture has increased about 1.8 percent annually over the last fifty years, but we have no reliable evidence on how much lower that rate of increase would have been in the absence of publicly supported research and extension. Even if only ten percent of TFP growth is attributable to U.S. policies, the cumulative effects by 2000 could easily be enough to offset the land idling of the CRP.

Data Evidence

In order to provide an informal reality check for the preceding estimates of commodity program effects (not counting long-term effects of conservation or research

[17] USDA provides point estimates for 28 and 36.4 million acres in the CRP. The estimates for 34 million acres are my interpolations. Wheat has a smaller price effect despite its large production effect because the demand for U.S. wheat is assumed to be more elastic than for corn or soybeans.

programs), consider the time series data on corn, soybean, and wheat acreage, as shown in Figure 2. The period between 1970 and 1981 is one in which a huge increase in plantings of these crops occurred, from 160 to 240 million acres, a 50 percent increase. This expansion was induced by price rises in which farm-level corn and soybean prices more than doubled and wheat prices tripled. During the commodity crash and consequent farm income crisis of the 1980s, this acreage fell back, partly in response to lower prices and partly because of federal acreage-idling programs of pre-1996 legislation. The acreage reductions of 1983, 1986, and 1987 are specific consequences of these programs. By 1990-1995 relative stability in acreage emerged for aggregate grain and soybean acreage, but with a moderate continuing trend away from wheat and into soybeans. In this context the FAIR Act of 1996 was intended to let farmers respond more fully to market prices rather than deficiency payments (a goal already partly achieved in the 1990 Farm Act and likely responsible for some of the move to soybeans in 1990-1995).

What are the apparent consequences of moving to "freedom to farm" in the 1996 Act? What was most clearly expected was a further shift to soybeans, and indeed this shift occurred. Beyond price incentives, one reason was the desire of some Corn Belt growers to introduce a two-year corn-soybean rotation for pest control purposes, but who had been trapped into continuous corn or nearly so by the loss of corn deficiency payments if they shifted to soybeans beyond the limits allowed under the limited flexibility provisions of the 1990 Act. However, regional data make it clear that the move to soybeans was not just a Corn Belt adjustment. Table 3 shows planted acreages for the main regions comparing the two years just before the FAIR Act (1994 and 1995 average) with the last two years (2000 and 2001 average). Soybean acreage increased by about the same amount (6 million acres) in both the Corn Belt and Great Plains, and by a much larger percentage in the latter.

Aggregate acreage for the three crops increased most in the Corn Belt. As Figure 2 shows, the main jump in acreage occurred in 1996. The predominant causes were the high commodity prices that persisted over a year from mid-1995, and the end of legislated acreage reduction programs. The effect of the FAIR Act's marketing loan, PFC payment, and crop insurance programs was to maintain that higher acreage. This can be seen most clearly by plotting the data in price-quantity space. Figure 3a shows corn acreage planted and the average price received by farmers for the preceding crop.[18] It is noteworthy that the 1998-2002 levels of plantings are clustered in the lower right-hand corner of price-quantity space. This means that the acreage-response supply function lies below the supply function of earlier years. Why? One reason is that the real cost of producing corn has declined (note that prices are deflated to give real values),

[18] This price is called the lagged price in the diagram, because it is received in marketing the crop preceding the crop whose planted acreage is shown. But the time is which the prices are observed actually coincides with the planting period. For example the price that corresponds to planted acreage in 2001 is the average price received for the 2000 crop. Most of the crop is sold in the months immediately following the harvest, in October 2000 to January 2001, just a few months before planting the 2001 crop; but some sales whose prices make up the season average price of 2000-crop corn occur throughout the marketing year, which goes through August 2001. Therefore, it is possible that observation of plantings could influence the "lagged" price to some extent, and we would not be able to identify the acreage-proxied supply function exactly.

Figure 2. U.S. Acreage Planted, 1970-2001

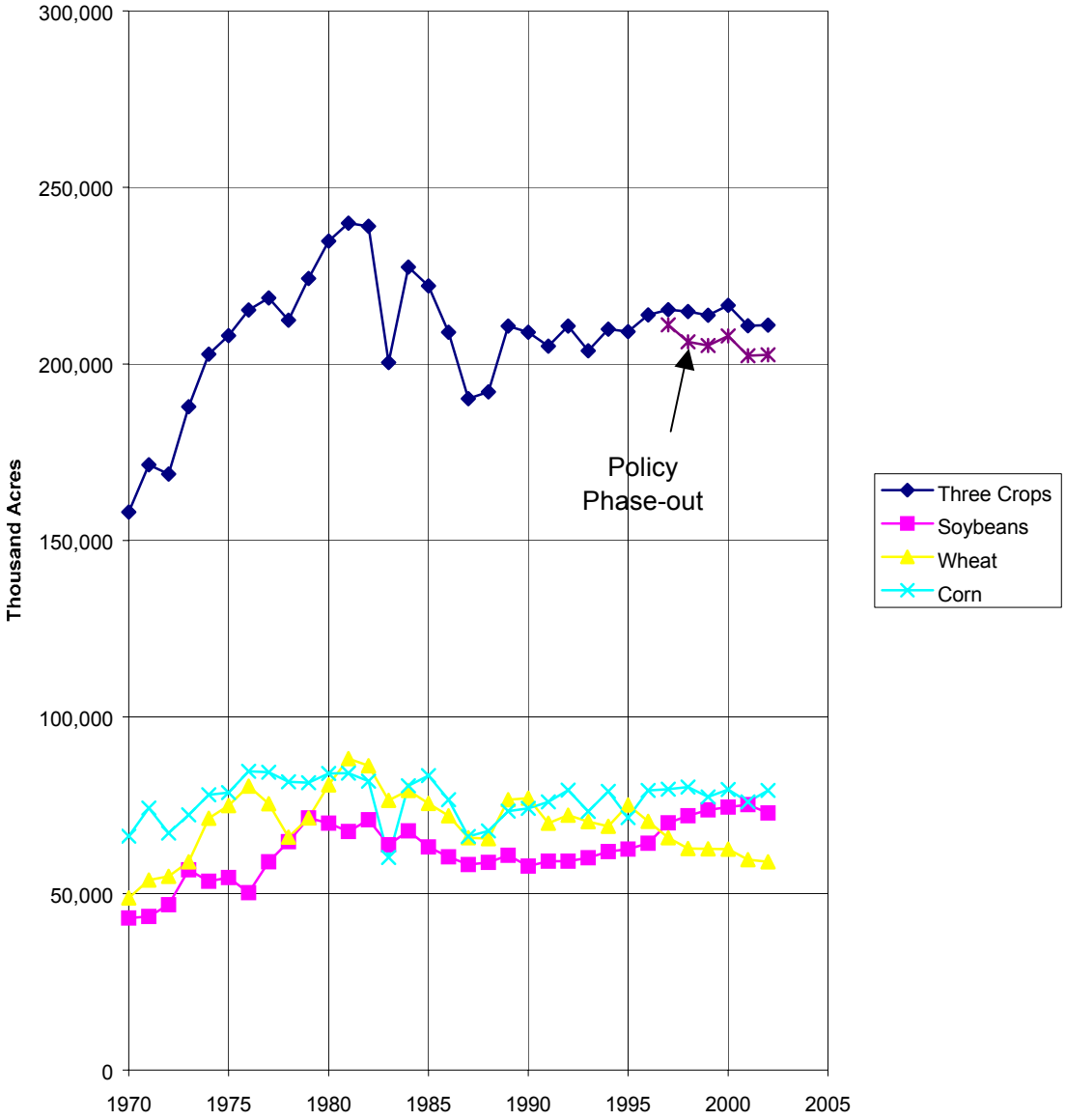
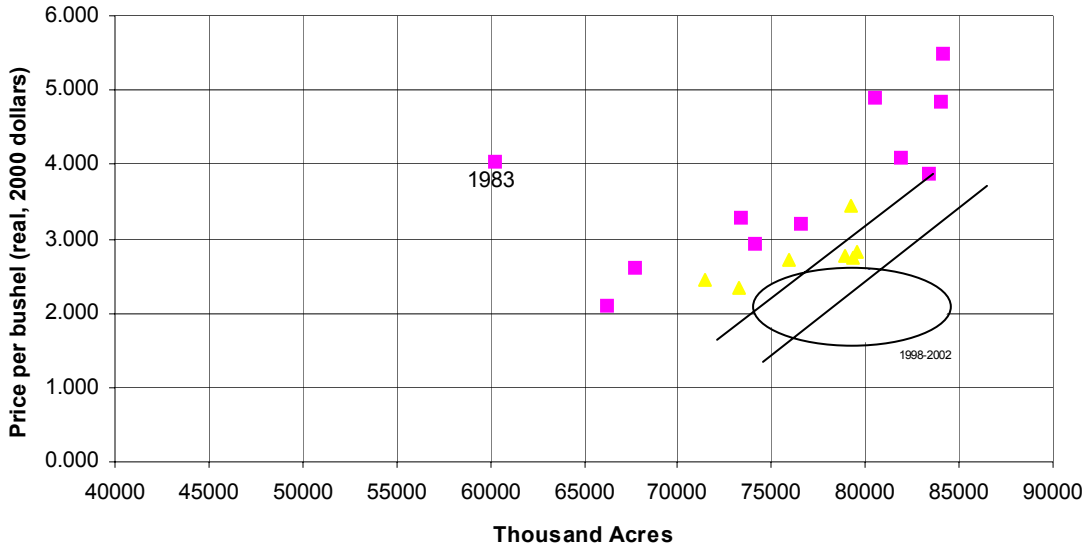


Table 3. Increase in Crop Planted Acreages, 1994/95 to 2001/02*

	Corn	Soybeans	Wheat	3 crops
change in million acres (percentage change below each entry)				
Midwest	150	6,550	-1,802	4,897
	0.3%	16.6%	-23.1%	5.2%
Plains	2,030	6,083	-5,462	2,651
	12.0%	69.2%	-13.2%	3.9%
South	-293	-1,380	-49	-1,721
	-5.6%	-11.8%	-1.1%	-8.1%
All other states	564	876	-1,255	185
	10.2%	41.8%	-7.8%	0.8%
US Total	2,452	12,128	-8,567	6,013
	3.3%	19.5%	-12.3%	2.9%

* Averages of two crop years.
Midwest: IA,IL,IN,MI,MI,MN,MO,OH,WI
Plains: KS,ND,NE,OK,SD,TX
South: AL,AR,FL,GA,KY,LA,MS,NC,SC,TN,VA

Figure 3a. Corn Acreage Planted and Lagged Price, 1980-2002



attributed to technological advances -- improved seed, machinery, etc. There is an overall tendency for successive observations to lie lower and to the right, as the division of the data into the 1980s (squares), early 1990s (triangles), and 1998-2002 (diamonds) indicates. In addition, corn programs, particularly set-asides, make a difference. This is most obvious in the case of the Payment-in-Kind acreage idling program of 1983, which brought planted corn acreage down to 60 million. The 7.5 percent corn acreage reduction in the 1995 program in responsible for the left-most triangle in the 1990-1997 data and the only such year in which corn had an acreage reduction program.

The data suggest that the loan deficiency payments and perhaps the market-loss assistance payments of 1998-2001 also have played a role. Sketching in supply functions (adjusted for acreage reductions in years when they occurred) as shown in Figure 3a indicates that the curve shifted down by about 65 cents per bushel between 1991-97 and 1998-2002. If technical progress reduced costs by 2 percent per year during this period (USDA's estimate of the long-term average total factor productivity growth for US agriculture), this could have accounted for a shift of about 12 percent over the six years from the midpoint of the 1991-97 period to the midpoint of the 1998-2002 period, which at an average price of $2.50 would amount to 30 cents. This leaves a 35-cent apparent supply shift unaccounted for. That is, in 1998-2002 farmers are planting an acreage of corn that, based on farmers' historical behavior, would have required a price 35 cents per bushel higher than the actual price we observe in 1998-2002. (If there were no cost reductions, and the underlying real cost situation has remained the same since 1991, then the apparently missing price incentive is 65 cents per bushel.)

Recall from the earlier discussion of marketing loans that the average marketing loan benefit for 1999-2000 was 26 cents per bushel. This explains a substantial part of the apparent supply shift – if producers expect a 26-cent marketing loan benefit, they will commit acreage to corn that they would commit if the market price (which doesn't include the marketing loan benefit) was 26 cents higher and there were not marketing loans (as there were not in the higher-priced years of 1991-1997). Since the total apparent supply shift (measured vertically) is 65 cents, this leaves a 9-cent (if corn production costs were reduced 12 percent) to 39-cent (if costs were not reduced at all) shift to be explained by other factors. The prime candidate is the Production Flexibility and Market Loss Assistance payments made under the FAIR Act.

To estimate the additional corn production created by the policies, we need to convert the vertical shift to a horizontal one. For this transformation only one parameter is necessary, the elasticity of supply. Assuming it is 0.3, the horizontal shift is 1.2 (12 percent cost reduction) to 4.5 percent (no cost reduction). Taking the midpoint, and assuming no yield effects, the implication is that policies in place under the FAIR Act generated about 3 percent more corn than would have been the case under pre-1996 policies.

The preceding calculations can be carried out statistically by means of a linear regression estimating the inverse (price dependent) supply function, explaining prices during 1980-2002 as a function of time period (1991-97 or 1998-2002, with 1980-1990

being the intercept), time trend (for technical change over time), and acreage. The resulting equation has a trend decline in real price of 5.0 cents (1.7%), a FAIR Act effect of 59 cents (compared to 1991-1997), and an elasticity of supply of 0.32. All the variables are statistically significant at the 5 percent level and the adjusted R^2 is 0.85. Carrying out the calculation of the preceding paragraph, we have an estimated acreage effect of the FAIR Act on production of $59/302 \cdot 0.32=0.06$, i.e., six percent more output than would have occurred under pre-FAIR Act policies.

A problem is that with errors in variables, the inverse estimating equation overstates the elasticity. Estimating the same equation with acres as dependent variable and price on the right-hand side gives an elasticity of 0.20, which would imply a FAIR Act effect of four percent. This is a lower bound for the elasticity (because of the possible identification problem mentioned above as well as errors in variables).

Figure 3b provides a similar set of data for soybeans. These data indicate an even larger soybean acreage effect in 1998-2002. Despite record-low real prices, acreage keeps increasing. In part, following the discussion earlier, this is attributable to the FAIR Act's removal of previously existing disincentives to grow soybeans. This effect is not a matter of subsidies on soybeans. Since our means of identifying the FAIR Act's production effect was simply to use a dummy variable for the 1998-2002 period, we cannot sort out the two effects by the method used above for corn. Indeed, the soybean data call into question the estimate of the corn effect as estimated, because it too could be in part a result of corn acreage moving to soybeans as a result of FAIR Act soybean provisions rather than corn subsidies. Moreover, we cannot use the regression analysis to correct for the problem by using soybean prices in the corn equation, because what we are hypothesizing is not a market-response phenomenon, but rather the result of the removal of a prior policy disincentive to plant soybeans.

The most straightforward way to avoid the problems of corn-soybean entanglement is to look at the acreage of corn and soybeans together, as a corn-soy aggregate. Figure 3c shows these data. Applying the procedures used above, I obtain an elasticity of aggregate corn-soybeans supply of 0.2 and a production effect of the FAIR Act of 6 percent.

The data of Figure 2 and Table 3 indicate that even a corn-soybean aggregate does not tell the whole story, because there has been a substitution of both of these crops, but especially soybeans, for wheat. For the three-crop aggregate, the data indicate an acreage effect of about 4 percent, which would imply a slightly smaller production effect because in substituting corn and soybeans for wheat we are getting more yield per acre. Earlier, based on other studies, I conjectured an output effect of the FAIR Act for these three crops ranging from 2 to 10 percent, but with a point estimate of 4 percent. The analysis of the raw data in Figures 3a to 3c, without any specific analysis of the policy instruments used, gives a quite similar estimate of effects, providing more confidence that the true effect is not at the extreme high end of that range, and most probably in the 3 to 5 percent range. Accordingly Figure 2 plots the path labeled "policy phase-out" as an estimated 4 percent less during 1999-2001 as the difference between the U.S. acreage actually planted to corn, soybeans, and wheat and the acreage the would have been planted in the absence

of the PFC payments, market-loss payments, marketing loan payments, and added crop insurance subsidies that were paid in those years.

Figure 3b. Soybean
Acreage Planted and Lagged Price, 1980-2002

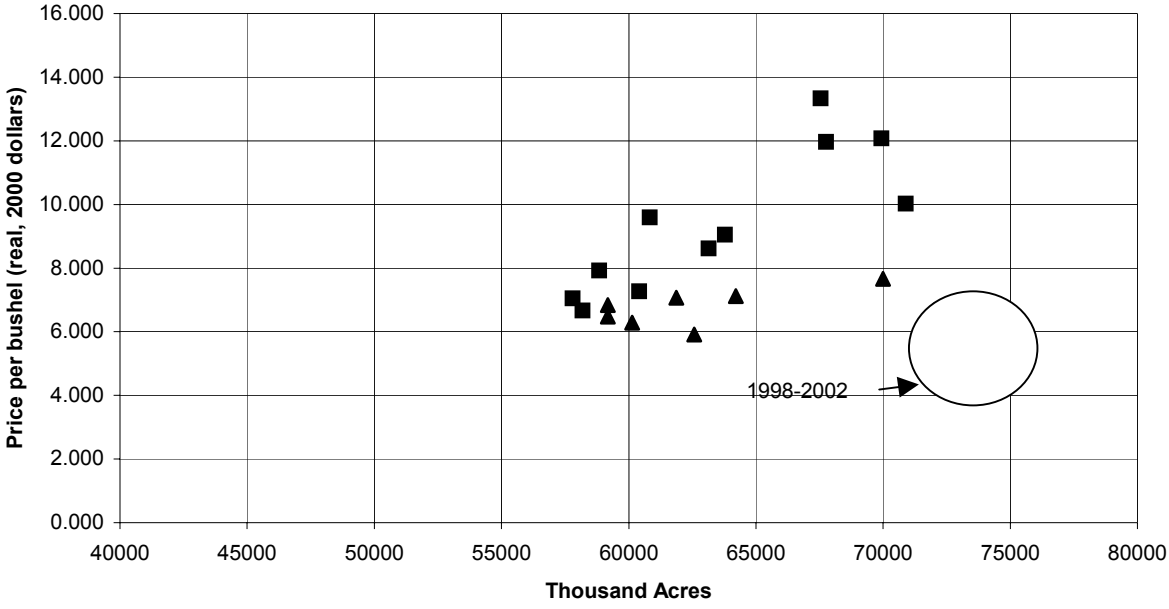
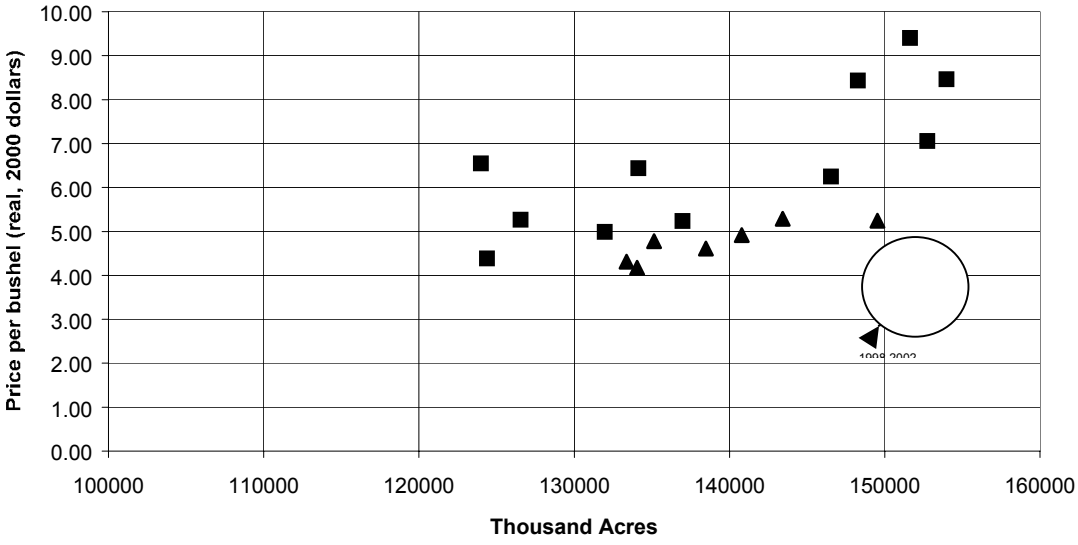


Figure 3c. Soybean and Corn (Aggregated)
Acreage Planted and Lagged Price, 1980-2002



Consequences for international trade and prices:

Given the acreage, output, and U.S. market price effects just discussed, the consequences for trade are generated by the excess U.S. supply created by the policies that have been discussed. Of course, the level of excess supply also depends on production and demand in the world as a whole, and the prices that result from the overall supply-demand balance. The end results of the confluence of all the relevant causal factors for U.S. exports of grains and oilseeds are shown in Figures 4a and 4b. For grains, despite the movement away from a supply management policy regime and the increase in payments in the late 1998-2001, we do not see an appreciable increase in either the quantity of exports or the US share of world exports. For soybeans, we do see an increase of about three million metric tons in 1999-2001 as compared to the mid-1990s, but this has only slowed the decline in the US share of soybean trade, as other countries exports have increased faster than US exports.

The "bottom line" of U.S. influence on the world grain and oilseed markets, and upon producers who sell into those markets, is given by transmission of U.S. prices to internationally traded prices in the countries of interest, here other countries in the Western Hemisphere. In principle, the effects of U.S. policies on exports and world prices could be quite different from the production and domestic price effects, if border measures on the one hand kept U.S. products at home, or on the other hand the U.S. subsidized the shipment of commodities abroad. But in fact the prices U.S. exporters receive at borders they ship to (prior to tariffs or other import barriers), and the market prices other agricultural exporters must compete with, are U.S. border prices that move practically dollar for dollar with U.S. internal market prices. Thus, the price effects that have already been discussed essentially measure the impact, in terms of revenue loss per unit of quantity exported or revenue gain per unit of quantity imported, of U.S. policies on other countries.

Figure 4a. US Grain Exports and World Market Share

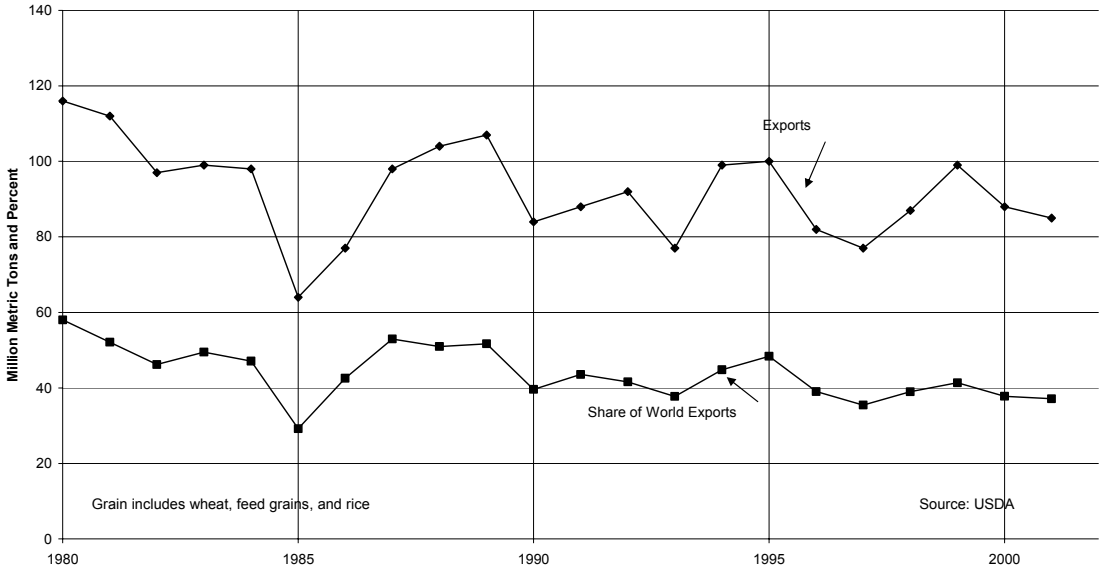
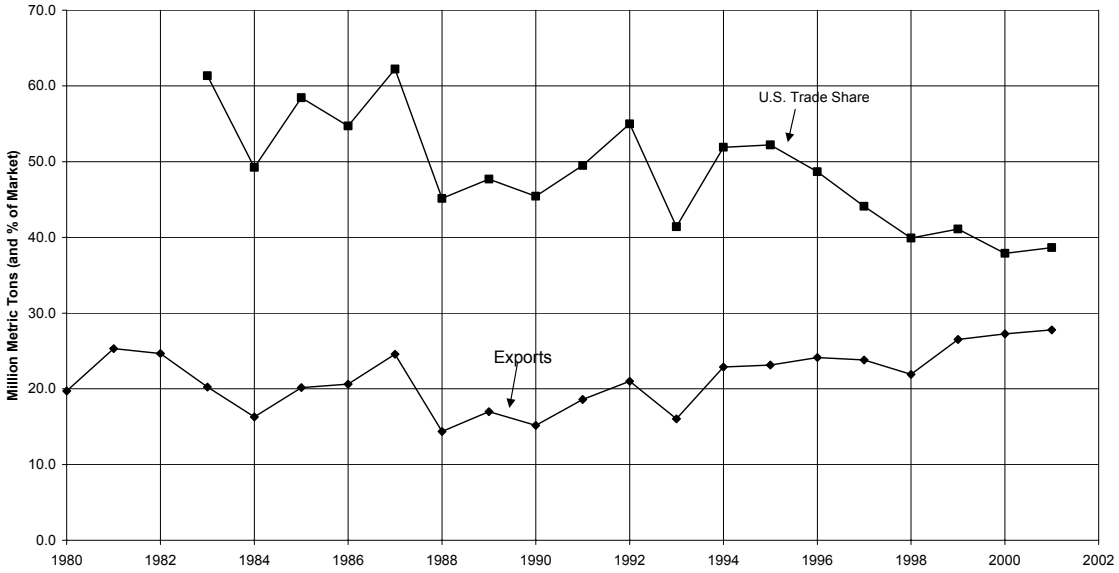


Figure 4b. U.S. Soybean Exports and World Market Share



The 2002 Farm Bill

The Farm Security and Rural Investment Act of 2002 – the Farm Bill – was signed into law on May 13, 2002. It has ten titles in 421 pages of legislative language.[19] It replaces the programs of the FAIR Act that have been discussed above, with extension of some programs and creations of new ones, mostly authorized for the next six years (crops planted in 2002-2007). The Act was popular in Congress, having passed in the House of Representatives by a vote of 280 to 141 and in the Senate by a vote of 64 to 35. The Bush Administration did not raise serious objections and the President signed the bill in the presence of farm-group representatives with words of praise.[20] However, small-farm and environmental advocacy groups were unhappy that amendments failed that would have imposed more stringent payment limits on large farms, redirected some commodity program payments to conservation/environmental programs, and imposed various regulatory restraints on agribusiness.[21]

Outside the community of agricultural interests, the 2002 Act has been widely reviled. *Business Week* magazine said "It's a dreadful piece of legislation – bad for most farmers, bad for consumers, and horrendous for taxpayers" (May 7, 2002). *The New York Times, Washington Post*, and other national media also editorialized against the bill. Most critical of all have been those speaking from the viewpoint of agricultural exporting nations, and economists who take a global view. In an interview with the *New York Times Magazine,* Joseph Stiglitz, Nobel Prize winning economist, former Chairman of President Clinton's Council of Economic Advisers and Chief Economist of the World Bank, said the Act is "the worst form of political hypocrisy…we have been going around the world telling countries that subsidies distort and lead to unfair competition. We've lost all credibility all over the world" (June 9, 2002, p. 25). Confronted with such criticism on a TV interview program, Senator Conrad (D-SD) replied that the criticism was much overblown and that annual CCC spending on commodity programs under the new bill would be less than had been spent in 1999-2001.

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[19] See text at U.S. House Agriculture Committee website <http://agriculture.house.gov/farmbill.htm>

[20] As a reminder that Presidents do not always accept what Congress delivers in support of agriculture, President Reagan in 1985 vetoed a farm bill on budgetary grounds, in the midst of the farm crisis of the 1980s, which was much more severe than today's situation in the agricultural economy. Congress could not muster the two-thirds majorities needed to override the veto, so the President's action was decisive. (On a political note, it has been argued that this veto contributed to the Republicans' loss of Congressional control in the subsequent 1986 elections – perhaps a reason why the Bush Administration was more cautious in 2002, a key election year with Congress almost evenly divided in both houses.)

[21] It is also notable that the more market-oriented members of Congress, even if they represent agricultural constituencies, opposed the bill. Among the opponents were not only the House Republican leadership, but also members of the Agriculture Committee such as Boehmer (R-Ohio) and Dooley (D-California), who wrote a Washington Post opinion piece entitled "This Terrible Farm Bill" (May 2, 2002). Similarly strong opposition was voiced in the Senate by Richard Lugar (R-Indiana) the senior Republican on the Senate's Agriculture Committee.

A full analysis of the 2002 Act is not feasible at this stage, but the following discussion addresses the two main issues that bear on the subjects of this paper: the level of spending on subsidies, and the market-distorting effects of the new provisions.

Commodity program outlays:

The main budget news about the 2002 Act is the projection by the Congressional Budget Office (CBO) that the innovations of the Act will cost $80 billion over the ten Fiscal Years 2002-11.[22] Of this, $45 billion are for direct payments as an extension of current Production Flexibility Contract payments and the new "Countercyclical" Payments (basically a re-institution of pre-1996 deficiency payments but without set-aside requirements). In addition there are estimated 10-year spending increases of $5.2 billion in marketing loans and loan deficiency payments, $4.9 billion for a new peanut program, $1.6 billion for a new dairy program, and $430 million for increasing support in the sugar program, partly offset by savings projected at $260 million from tightening payment limitation slightly, for a total of $56.7 billion in all commodity programs (Title I of the Act).

CBO's cost accounting scores legislation relative to a "baseline" of spending if current law (the FAIR Act) had been continued. After considerable debate in 2001, the budget baseline was constructed to include a continuation of Production Flexibility Payments at the 2002 level, even though those payments were to end after 2002 under the terms of the FAIR Act. The baseline also includes continuation of loan deficiency payments at loan levels of 2002.[23] Projected total spending on commodity, conservation, research, and related programs (but not including food stamp and some other nutrition and health programs) is about $190 billion for the next ten years.

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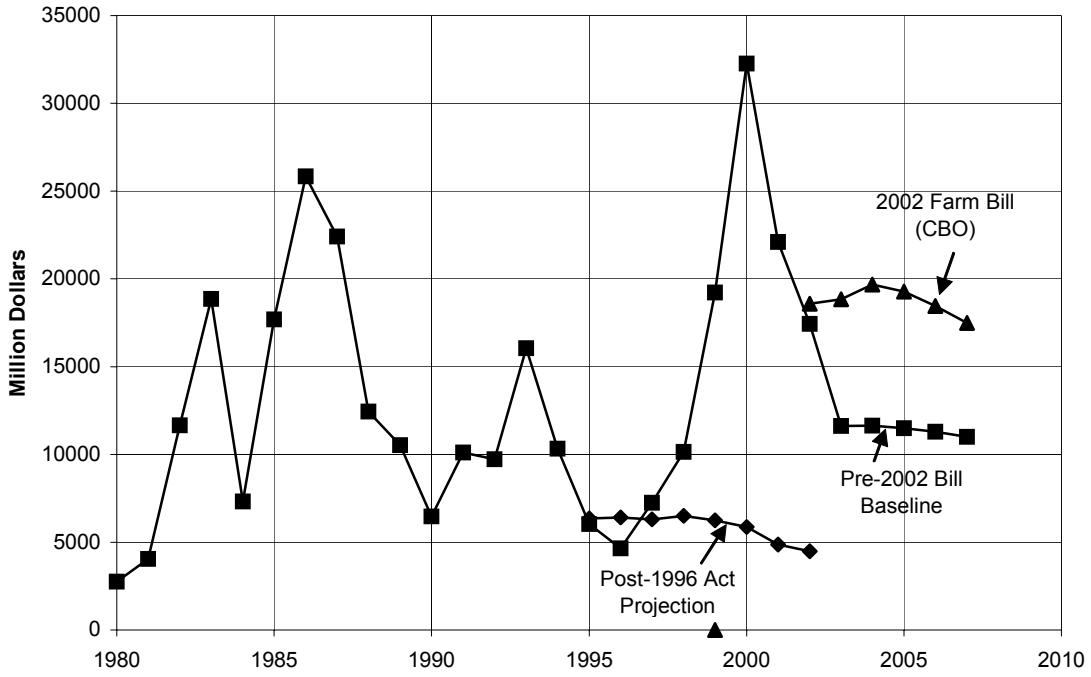
[22] Ten-year projected spending is estimated in accordance with Congressional budgetary procedures, even though the Act only authorizes programs for the next six years. The assumption is that those programs will be reauthorized to cover the ten-year period.

[23] Since budget outlays are determined by the extent to which farm prices received fall below the loan level, a crucial set of assumptions in constructing the baseline concerns future commodity prices, the level of which is needed to estimate future outlays. CBO assumes gradually rising (nominal) prices over the next ten years, which implies gradually declining baseline outlays. Projection of baseline prices is of course subject to huge errors, which is the main reason past CBO budget projections for agricultural programs have been wildly inaccurate (see Figure 5). With respect to CBO's budget scoring of the 2002 Act, uncertainty and mistrust was created because just after the farm bill was passed, at the beginning of May 2002, CBO estimated a ten-year cost of $73.5 billion, and then a few days later raised the estimate to $80 billion. The first estimate used the March 2001 baseline that had been the basis for farm bill budget scoring during the previous year of debate, but in the revised estimate CBO switched to an updated March 2002 baseline, which had lower commodity market prices in future years. Because of the uncertainties in baseline projection as well as what will actually transpire in policy decisions in the out-years of the Act, analysts can easily differ in their assessments of likely spending. The other substantial scoring effort besides the CBO's that has been published since the 2002 Act became law is that of the Food and Agricultural Policy Institute of the University of Missouri and Iowa State University. They estimate 10-year commodity program spending of about $3 billion more than the CBO estimate, apparently because their projection of future market commodity prices is lower.

To place prospective outlays under the 2002 Act in historical perspective, Figure 5 shows data since 1980. Over the next five years, when the uncertainties of baseline prices, though still substantial, are less egregious than in the 10 year projection, commodity program spending is projected at about $19 billion per year. This is a lot, but as the figure shows it is about $4 billion per year less than the federal government has been spending over the last three years. The reason for the decline is that the market loss assistance and disaster assistance outlays of FY1999-2001, which averaged $8 ½ billion annually, are not in the baseline and are not completely replaced by the new countercyclical payments. So the new 2002 farm bill is not quite the unprecedented bonanza for farmers that it has been portrayed as being. Nonetheless, the level is shockingly high compared to the $10 to $12 billion average annual cost of 1988-1997, or the $11 billion baseline for 2002-05 that was on the books before the 2002 bill was

Figure 5. Commodity Program Outlay Projections



enacted – not to mention the CBO projection of $6 billion and declining outlays forecast in 1996 upon enactment of the FAIR Act (shown also in Figure 5).

An issue raised by the projected spending levels is whether "amber box" outlays will remain within the WTO ceiling of $19.1 billion for domestic support (for all years after 2000). Although the levels shown in Figure 5 are quite close to the ceiling, some of the outlays do not fall into the amber box as defined earlier, namely Conservation Reserve Program payments and the direct payments that continue the Production Flexibility Payments under the FAIR Act. If these continue to be accepted in the WTO as "green box," that will reduce typical outlays subject to discipline by about $6.5 billion ($1.5 billion in CRP payments, and $4 billion in continuation of FAIR Act level plus $1

billion in the expansion to soybeans) to about $13 billion. In addition, it has been suggested that the new Countercyclical Program payments will be notified as non-commodity-specific amber, presumably because those payments perform the same function as the market-loss assistance payments that were notified in that category in 1998. This determination is important because then several billion dollars of payments each year can be used to fill up the roughly $9 billion "de minimis box" of payments not counted against the $19.1 billion ceiling.

It may be questioned whether direct payments will continue to be "green" because of the opportunity given to farmers to update their payment acreage bases to 1998-2001 levels. But the fact that the payments made each year do not vary with the farmer's plantings, nor with market prices, suggests that direct payments might still be successfully argued as green under WTO criteria.[24] Even if this argument prevails, the possibility remains that market prices of the major crops could fall sufficiently below the baseline projections in the next few years such that increases in marketing loans or countercyclical payments could raise outlays above $19.1 billion even excluding direct payments. Babcock (2002), using exchange-traded futures and options prices, estimated a 29 percent probability that the $19.1 ceiling would be exceeded in the 2002/03 marketing year (but this was before the late-summer increases in commodity prices that reduced this probability substantially).

As evidence that Congress took U.S. WTO obligations seriously, the risk of exceeding the $19.1 billion cap is addressed through a provision in the Farm Act, stating that if the Secretary of Agriculture determines that expenditures under the commodity titles of the Act will exceed Uruguay Round Agreement ceilings "for any applicable reporting period," then "the Secretary shall, to the maximum extent practicable, make adjustments in the amount of such expenditures during that period to ensure that such expenditures do not exceed such allowable levels" (Section 1601). The necessary adjustment could be accomplished, for example, by reducing the percentage of production on which countercyclical payments are made. This approach, implemented through a 15 percent "nonpayment base," was used to meet Congressionally mandated budget reductions in the late 1980s. Alternatively, USDA could impose a pro-rata reduction in all payments for commodities in the Farm Act titles covered (grains, rice, cotton, oilseeds, peanuts, sugar, and milk).[25]

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[24] Similarly, it could be argued that Counter-cyclical Payments should not fall into the non-commodity-specific category, since they are in fact allocated according to individual commodity prices and payments bases. The counter-argument though is that with planting flexibility, the payments are unrelated to what the farmer receiving them actually does in growing program crops, or to the prices that farmer receives for commodities produced.

[25] It would make sense to exclude from such reductions any payments for which *de mimimis* exemptions are exceeded, and probably to make the pro rata reductions a percentage of each payment category that is in excess of the relevant *de minimis* exemption. However, there could well be acrimonious disputes among commodities about burden sharing if price declines in only one or two commodities were to be responsible for the Secretary's determination that the $19.1 billion level will be breached.

Market-Distorting Effects:

From an economic perspective, especially from the viewpoint of countries competing with the United States in commodity markets, the issue is not so much the level of budget outlays as the effects of the 2002 Act on production and market prices. Thus, just after the U.S. Farm Act was passed, three western Provinces of Canada, along with a dozen Canadian farm groups, asked for $C 1.3 billion to offset the effects of the new U.S. payments, and an aid package of something like this size is likely to occur (see news story on http://www.cbc.ca/stories/2002/06/11/farmaid020611). The earlier quotation from Joseph Stiglitz addresses this concern more broadly.

Yet it can be argued that market distortions that the 2002 Farm Act creates are actually quite small. One line of argument is that the additional spending on direct and countercyclical payments, though large, is essentially a set of lump-sum payments that farmers cannot change through their decisions about what to produce, how much to produce, or the production practices followed. Therefore there are small if any output effects or price effects, and few if any deadweight losses due to market distortions. This need not have been the case. The bill could have brought back set-asides along with target prices, or re-established export subsidies or CCC purchase and storage programs. But Congress eschewed these possibilities and indeed they replaced market-distorting programs with payment programs in peanuts and dairy (replacing a supply control program and the Northeast Dairy Compact, respectively).

What does this argument miss? One issue is the updating of acreage bases for payments, which blunts the point that the payments do not influence production decisions. Now farmers will have an incentive to maintain acreage in order to be in a favorable position for future updating.

Second, the addition of soybean base into the acreage for direct payments means reduced incentives for farmers to substitute vegetables or other nonprogram crops for grains and oilseeds. This is a subtle point since producers who received PFC payments under the FAIR Act were already restrained from expanding vegetable acreage through loss of all payments if they grow such crops on contract acreage (a disincentive enacted at the behest of vegetable growers). Midwestern vegetable processors have argued that under the 2002 Farm Bill, this provision will more seriously hinder the expansion of processing vegetable acreage. Under the 1996 FAIR Act such expansion could occur because soybean acres were not part of the Production Flexibility Contract payment base, so vegetables could be grown on those acres, typically 40 to 50 percent of a farm's acres in some Corn Belt areas. But under the 2002 Act virtually 100 percent of a farm's acreage will often be in the payment base, and under the rules any expansion of vegetable acreage would cause the loss of all payments. Thus, the 2002 Act incentives to keep cropland in program crops are stronger than was the case under the FAIR Act.

A third issue is a set of individually small but collectively significant changes: the market-distorting sugar support price is effectively increased by one cent per pound (4.5%), the new Dairy Market Loss Program makes payments on a current production

base, projected to be about 50 cents per hundred pounds (5%), part of the new peanut support system is a marketing loan program that makes payments on a current production base, and similar marketing loan programs are introduced for wool, mohair, honey, and pulses (chickpeas, lentils, and dry peas). These are significant new market distorting (production-inducing) subsidy programs.

Finally, the 2002 Act creates new opportunities and incentives to withdraw land from the Conservation Reserve Program and plant it to program crops. The new Conservation Security Act and expansion of the Environmental Quality Improvement Program (EQIP) pay subsidies for investment in conservation practices on cropped acreage (or "working lands") and these investments are unlikely to cause yield reduction, while they may generate some increased acreage by making it profitable to grow crops on marginal acreage that might otherwise not be cropped. Similarly, the Farmland Protection title, whose budget authorization increases substantially, will to the extent its purposes are achieved keep land in farming that would otherwise be converted to nonagricultural uses. However, the Act also has features that may work to reduce crop output. It also raises the maximum land area in the program by 2.8 million acres, and the some of the new programs could encourage farmers to try organic or other low-input production methods that would result in lower yields, at least during a learning period during which new methods are tried out. The likely overall impact of the Conservation Title is quite small and not predictable in direction.

While the provision of the 2002 Act in total will add marginally to the supply of crops and so to excess supplies from the United States on world markets, other provisions will add to the U.S. domestic demand for crops and so reduce U.S. excess supply. USDA is required to increase its purchases of nonprogram commodities for school lunch and other food programs. The dairy title is projected by FAPRI to increase milk production by about 1 billion pounds per year (about 2/3 of 1 percent) in 2002-2005. This will marginally add to U.S. feed demand.

Most important, and perhaps sufficient to offset all the other factors that have been discussed, is a new provision that is not in the Farm Act but rather appears in the Energy Bill that passed in the Senate this spring and as of June, 2002, is in House-Senate Conference. This is a mandate that calls for 5 billion gallons of corn-based ethanol and soy-based fuels by 2010. This would roughly triple the use of agricultural products for fuel products. Since an estimated 650 million bushels of corn were used for ethanol in 2001, tripling the use would add over a billion bushels to corn demand (11 percent of annual production) which would remove from supplies essentially all the additional production plausibly attributable to price supports and other subsidies under the 2002 Farm Act.[26]

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[26] A complication is that added ethanol from corn (under the dry milling process) creates as a by-product distillers dried grains (DDG) that compete with corn and soybean meal, so the net demand effect for U.S. crops is reduced from the gross effect that the billion-plus bushel figure suggests. Each ton that goes into ethanol production results in approximately 0.3 ton of DDG. This product has a feed value that is about the average of corn and soybean meal as used in cattle feeding (based on a protein content of DDG of 27 percent, compared to 48 percent for soybean meal, and 10 percent for corn; and the fact that a 50-50

The regulations that will implement the 2002 Act are not yet in place, and some of them will not affect production until 2003. An early estimate of the production effects of the Act has been made by FAPRI. They estimate that the area planted to the nine major crops (wheat, corn, soybeans, cotton, rice, sorghum, barley, oats, sunflowers) will be increased by 2 million acres (0.8 of 1 percent) in 2002 and 2003 as compared to the baseline continuing the FAIR Act. Wheat and corn plantings are estimated to be increased by about 1 million acres each, and soybean acres decreased by about 1.2 million in each year (because the loan rate is decreased for soybeans and target prices determining countercyclical payments for corn are favorable relative to beans). Correspondingly the estimated price effects of the 2002 Act in 2002 and 2003 are to reduce corn and wheat prices by about 5 cents per bushel and to increase the soybean price by 8 to 9 cents per bushel (FAPRI, 2002, p. 2). These are effects of the commodity titles only and do not include effects of the related programs discussed in the immediately preceding paragraphs.

Conclusions

Both the United States and Canada have enacted agricultural support programs that have distorted their domestic commodity markets. Because their domestic markets for the major crops are largely not insulated from world markets through tariffs or other trade barriers, those domestic distortions have world price effects. Although the United States up to 1990 devoted a lot of policy effort to supply management programs that helped support world prices, since that time both countries' policies have created incentives leading to larger agricultural output, hence lower prices, than would have been the case without the policies. But the impact of U.S. policies has been larger because of its larger level of output.

Both countries have moved in the last fifteen years in the direction of reduced directly market-distorting policies. But they have maintained and in the U.S. case even increased their financial transfers to farmers, and in the face of historically low commodity prices since 1998 have maintained policies that have forestalled output reductions that these low prices would otherwise have induced. This paper provides no quantitative evidence for Canada, but for the U.S. case considers in some detail the effects of policies for grains and oilseeds under FAIR Act of 1996.

The findings are that the combination of loan deficiency payments, direct but decoupled "Production Flexibility Contract" payments, and crop insurance subsidies increased U.S. production of grains and soybeans about 4 percent above what it would have been in the absence of those programs during 1999-2001. The world price effects likely averaged roughly a 5 to 8 percent decline, although this is very difficult to gauge because of uncertainty about price responsiveness to U.S. quantities over a multi-year

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combination of corn and soybean meal also has about the same caloric energy content as DDG). Therefore, USDA analysts consider that each ton of corn used in ethanol production reduces the demand for feed corn by 0.15 ton and soybean meal by 0.15 ton.

period. However, the Conservation Reserve Program is estimated to have had a roughly offsetting negative effect, albeit more pronounced in wheat and less in soybeans and corn, in reducing U.S. output and hence increasing world prices. Still other programs including research and extension, farm credit, and export marketing assistance, contributed to downward effects on world prices. These effects are undoubtedly important, especially in their long-term cumulative effects on the downward trend in real commodity prices, but no attempt was made in this paper to quantify those effects, nor are well established empirical findings on the subject available in the literature.

The 2002 U.S. Farm Act commits substantial sums to commodity support, and does so in ways likely to be more production-inducing than in the FAIR Act programs. But the effects are only marginal, and not commensurate with the huge international outcry that the Act has generated. Moreover, the 2002 Energy Bill, being finalized in Conference as of June 2002, contains in its Senate version an ethanol mandate that would utilize as much corn and soybeans as the farm commodity support programs are likely to generate.

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