Free Markets for Agriculture: Issues and Estimated Economic Impacts

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Daryll E. Ray
Professor, Department of Agricultural Economics

Manuel Del Valle
Policy Analyst, Agricultural Policy Analysis Group, Peru Ministry of Agriculture, and former graduate research assistant, Oklahoma State University

Introduction

For over 50 years, farm commodity programs have regulated or intervened in U.S. markets for grains. For nearly as long, there has been a debate on whether to eliminate these programs. This debate intensified during the 1980s, a time when deregulation was especially in favor. The increased preference for free trade could be witnessed by the U.S. position at the Uruguay round of the GATT negotiations. In the Uruguay round, the U.S. position in general was to phase out all trade distorting agricultural policies. The discussion focused attention on the estimation of benefits and costs of free agricultural markets.

What would be the impact on U.S. and Oklahoma farmers if farm programs were eliminated world-wide? What if programs were eliminated only in the U.S.? Since wheat is Oklahoma's largest cash crop, much of the impact of free agricultural markets would be on the state's wheat sector. Cattle, which make up about one-half of agricultural receipts in Oklahoma, also would be affected. Although cattle production and price are directly affected very little by U.S. commodity programs, farm programs affect feed prices and availability and hence the profitability of the livestock sector. Also, in the case of multilateral free trade, in which tariffs, quotas, and trade-distorting farm policies world-wide are eliminated, the livestock industry — the cattle industry in particular — could be affected greatly.

This study evaluates the economic impact of eliminating commodity programs on Oklahoma agriculture with particular emphasis on the state's wheat and cattle sectors. The next section briefly summarizes the broad types of government programs in agriculture and how those programs complement or contradict one another. The following section discusses some of the definitional issues and analysis problems that are inherent in analyzing free markets for agriculture. The next sections summarize the analysis approach, the results, and conclusions.

Government Programs and Agriculture

For numerous reasons — some economic and some political — a series of government programs have been put into place which are specific to agriculture. Their impacts on major crop markets can be seen as contradictory. For example, technology advancement from research and extension

and price stabilization from commodity programs boost production and lower farm and food prices. On the other hand, acreage reduction programs reduce production and, with price and income supports, increase farm prices and incomes. The societal objective of an abundant and safe food supply is the basis for the former, while orderly resource adjustment in the agricultural sector and income compensation can be served by the latter. In the case of research, extension and reduced capital costs, consumers benefit with lower food prices, and farmers as a group generally lose income. With commodity programs the benefits and losses are reversed.

Clearly, the two program types are at cross purposes in the short run. In the long haul, when plans are based on expectations about long-term prices and resource returns, it is unclear whether expenditures on technology advancement and on commodity programs are contradictory or complementary. For example, the combination of public expenditures for these very different program types has occurred concurrently with massive movement of redundant resources out of agriculture, readjustment of resource combinations, and capital investments to continually modernize durable equipment in agricultural production. Would the adoption of new technologies generated from public expenditures on research and the attendant resource recombinations have occurred as fast, faster or at a slower pace in the absence of the price and income stabilization of commodity programs? What would be the short-and long-run impacts of eliminating U.S. farm programs from this point on?

Free Markets: Analysis and Definitional Issues

Researching answers to these questions is difficult because agricultural simulation models are based on relationships estimated with data for years when commodity programs were in effect. Data reflecting the elimination of support prices and payments, acreage diversions and other program elements can be fed to the simulators, but model relationships, such as the responsiveness of quantities supplied and demanded to price changes, may also need to be adjusted. Hence, free market studies provide first-cut estimates of the economic dislocation, but the rate of actual adjustment — and the long-run levels adjusted to — may be under- or over-estimated.

There is also the definitional question of what is meant by free markets. Strictly defined, free markets would mean zeroing out government expenditures for agricultural research stations, the extension service, and the underwriting of the farm credit system or other farm-related agencies and activities, as well as the elimination of commodity programs. If the idea is to eliminate all government-sponsored programs that affect agricultural markets, excluding research and extension from elimination would suggest such programs have no effect on the supply (and therefore the price) of agricultural products. However, the convention is to define free U.S. markets to mean only the elimination of commodity programs. Hence, federal expenditures on research and extension — and their well-docu-

mented consumer benefits — are assumed to continue under "free markets". Occasionally, elimination of U.S. commodity programs is referred to as unilateral free trade.

International trade of agricultural products is also affected by farm programs and policies. Foreign as well as domestic consumers benefit from the adoption of technologies that reduce farm production costs and food prices. But domestic commodity programs can be detrimental to the free movement of agricultural commodities among countries. Farm prices supported above market levels, tariffs or variable levies to keep imports low, export subsidies to channel excess production to international markets, and the subsequent reduction in world prices interfere with the economically efficient production and distribution of agricultural products world-wide.

This loss of global economic efficiency compared to multilateral worldwide free trade follows from economic theory and common sense. But it must be recognized that economic optimization is often only one of several agricultural policy objectives of a country's policymakers. For example, a country's objectives for agricultural policy may include self-sufficiency, sector development, income and population distribution, environmental preservation, or maintaining a certain organizational structure of agriculture. Unlike economists, policymakers usually do not have the luxury of gauging outcomes based on a single criterion.

Like other empirical free market analyses, this study suffers from these various limitations. For example, the study focuses strictly on short- to immediate-run economic outcomes, assumes the market response parameters remain robust in the before and after situation and assumes continuation of research, extension, and other agricultural non-commodity programs at their trend levels.

Analytical Models

A recently developed econometric simulation model of Oklahoma agriculture is the primary analysis tool for the study (De Valle, and De Valle and Ray). Like most regional econometric models, some of the dependent variables (e.g. wheat price) are largely determined by corresponding national-level variables (U.S. wheat price). Hence, in addition to the state model, free market estimates of U.S. commodity prices and other variables are also needed from national models. POLYSIM and FAPRI provide the needed estimates [Food and Agricultural Policy Research Institute, forthcoming (b); Ray, forthcoming (b)].

The Oklahoma model contains the following relationships for wheat: price, planted acreage, harvested acreage, yield per acre, production, and value of production as identities and cash receipts. Relationships for the Oklahoma cattle sector include price of calves, price of all cattle, production, value of production, and cash receipts. Aggregate Oklahoma relationships include total production costs, total receipts, and net farm income. The

recursive model is estimated with ordinary least squares corrected for autocorrelated disturbances when appropriate. Figure 1 provides a schematic of functional relationships. As depicted by the diagram, Oklahoma farm variable values are affected by government policy variables, national prices, interest rates and inflation, and economic variables and conditions specific to Oklahoma. The estimated relationships and model validation are discussed in detail in De Valle and Ray.

The FAPRI [Food and Agricultural Policy Research Institute, forthcoming(a)] model is an econometric simulation model consisting of a series of integrated submodels. Four U.S. livestock submodels are included (beef, pork, broilers, and dairy) and eight U.S. crop submodels (corn, wheat, soybeans and oil and meal, sorghum, barley, oats, cotton and rice). World trade submodels for feed grains, wheat, and the soybean complex are also available to be linked into the system. The world trade submodels solve for net quantities traded by country or region. Government cost and net income submodels are also included. The livestock and crop submodels estimate U.S. supply, demand, and prices. The world trade submodels determine net export demands facing U.S. crop markets. The government cost submodel estimates Commodity Credit Corporation expenditures to carry out U.S. farm programs. The net farm income submodel generates estimates of cash receipts, production costs, and net farm income.

POLYSIM [Ray, forthcoming (a)] is a national policy simulation model of aggregate U.S. agriculture with submodels for the seven major crops and the seven major livestock categories. The model analyzes the commodity and aggregate economic consequences of alternative farm program proposals and economic conditions facing agriculture. Model output includes information commonly requested by policymakers, including supply, use, prices and incomes by commodity, net farm income, government payments, and consumer food expenditures impacts. POLYSIM anchors its analyses to a published baseline of 5 to 10 year projections on all variables of interest, providing decision-makers with a familiar context for evaluating simulation results. POLYSIM uses elasticities to estimate changes in model variables from baseline values in response to deviations from baseline values of farm program or other exogenous variables. This simplifies the simulation process, allowing faster solution convergence and analysis turnaround without sacrificing commodity coverage or detail.

Baseline Situation and Policy Assumptions

Analyzing the free market scenarios requires a benchmark or baseline for comparison. The Food and Agricultural Policy Research Institute's *International Agricultural Outlook Report* of March 1988 is used (Food and Agricultural Policy Research Institute, 1988). The baseline projections through 1996 are conditioned on a number of assumptions. The U.S. and world economies are expected to grow moderately over the period with no

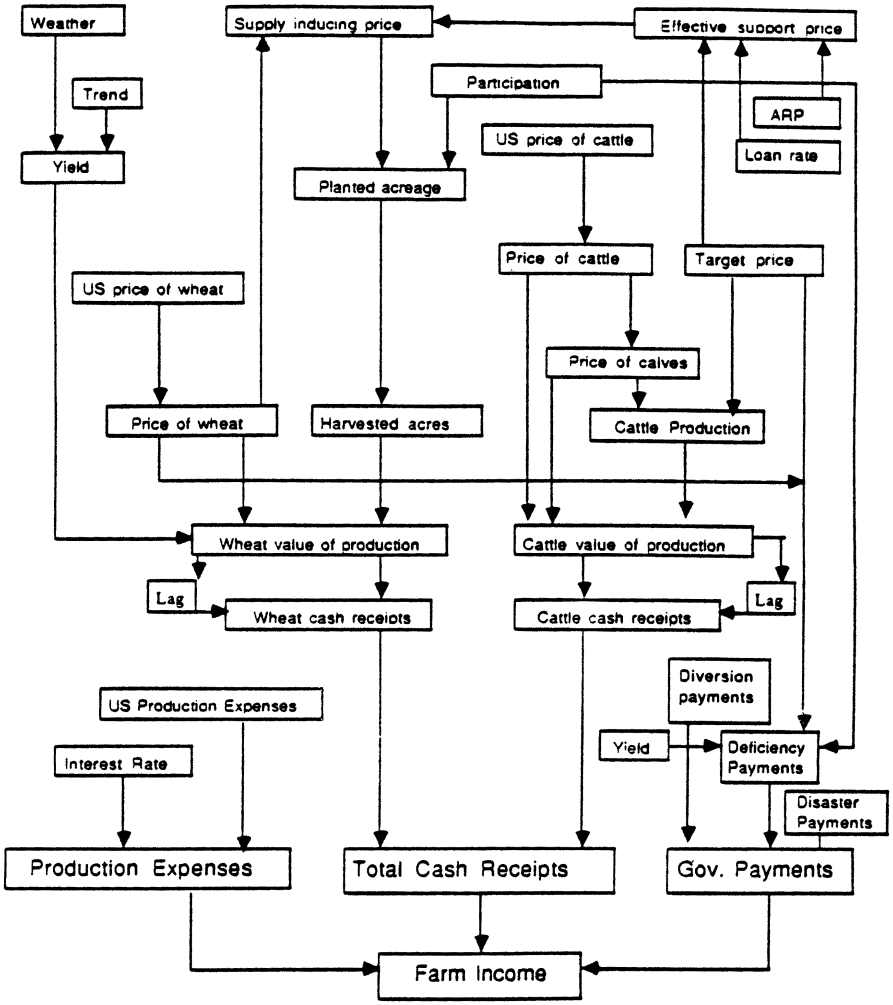

Figure 1. Diagram of The Econometric Simulation Model of Oklahoma Agriculture.

serious recession. It is assumed that there will be no fundamental change in U.S. and foreign agricultural policies. Target prices are assumed to decrease by 2 percent annually after 1990, and the conservation reserve program (CRP) is assumed to be capped at 45 million acres. The annual acreage reduction program is gradually reduced over time, and the paid diversion is eliminated as the CRP expands and market prices begin to increase.

The first and third data columns of Table 1 present average baseline values of selected U.S. agricultural variables for 1988-1992 and 1992-1996. Note that the increase in crop and livestock cash receipts over the two periods is offset by increased production expenses. Baseline government payments average $4 billion less in 1992-1996 than 1988-1992, with net farm income down by nearly the same amount. This national baseline set serves as the comparison benchmark for evaluating the Oklahoma effects of first unilateral and then multilateral free markets.

The first and third columns of Table 2 contain baseline variable averages from the Oklahoma model. The 1988-1992 and 1992-1996 averages reflect impacts of national prices and other variables plus Oklahoma-specific conditions, including normal weather over the period. Over the two periods, average wheat prices increase by $0.24 per bushel while cattle prices decline $3 per cwt. Total cash receipts remain relatively stable, but higher production expenses and wheat target prices declining to $3.52 by 1996 cause net farm income to decline by one-third over the two periods.

Unilateral Free Markets

Unilateral free markets are defined here to mean the elimination of annual acreage reduction and diversion programs, target prices, loan rates, CCC and Farmer-Owned-Reserve stocks, CCC milk removals, and the ethanol program. The Conservation Reserve Program is retained. All other agriculturally related programs, including research, extension, and backing of agricultural credit institutions, are also assumed to continue. The simulation process began in 1988 and continues through 1996. Results are reported as five-year averages for the periods 1988-1992 and 1992-1996.

U.S.

Releasing of non-CRP diverted acres causes significant increases in crop acreage and production in the early part of the simulation period (Table 1). With additional pressure from the release of CCC and F-O-R stocks, crop prices are pushed down substantially. Feed grain and wheat prices decline by over 30 percent during the first three years, while soybean prices are down about 20 percent. As supplies and demands adjust, crop prices increase appreciably but remain below baseline values.

Corn exports average 13 percent above baseline during 1988-1992 and 9 percent higher when averaged over the last five years of the period. But the value of crop exports is down by 15 percent during the first five years

Table 1. Baseline and POLYSIM Unilateral Free Market Scenario, 1988 - 1992 and 1992 - 1996 Averages for Selected Variables, U.S.

Item[1]	1988 - 1992		1992 - 1996	
	Baseline	Unilateral Free	Baseline	Unilateral Free
Harvested Acreage (mil. ac.)				
Corn	63.2	68.4	67.3	69.0
Wheat	61.4	65.6	64.5	66.9
Soybeans	61.3	63.0	63.0	63.2
Production (bil. bu.)				
Corn	7.49	7.85	8.32	8.47
Wheat	2.40	2.51	2.61	2.69
Soybeans	2.08	2.09	2.21	2.17
Cattle & Calves (bil. lbs.)	22.91	23.57	22.95	24.06
Hogs (bil. lbs.)	15.72	16.16	14.68	15.70
Prices				
Corn ($/bu.)	2.02	1.41	2.25	1.85
Wheat ($/bu.)	3.00	2.18	3.23	2.93
Soybeans($/bu.)	5.54	4.67	5.64	4.92
Cattle & Calves ($/cwt)	63.18	58.31	61.75	55.53
Hogs ($/cwt.)	39.66	36.09	45.89	40.06
Export Demand (bil. bu.)				
Corn	1.77	2.00	2.10	2.28
Wheat	1.47	1.71	1.59	1.67
Soybeans	.76	.85	.81	.90
Value of Exports (bil. $)[2]	12.94	10.95	15.44	14.42
Corn	3.56	2.82	4.73	4.21
Wheat	4.41	3.73	5.14	4.89
Soybeans	4.21	3.97	4.57	4.43
Crop Receipts (bil. $)	67.08	60.07	78.33	72.15
Corn	12.87	9.80	15.47	12.70
Wheat	8.33	6.63	8.80	7.93
Soybeans	10.28	8.89	11.18	9.48
Livestock Receipts (bil $)	68.74	64.34	70.85	66.92
Cattle & Calves	28.46	26.89	27.17	25.56
Hogs	8.48	7.95	9.04	8.45
Government Payments (bil.$)	10.57	2.22	5.83	2.25
Corn	4.67	0.0	2.00	0.0
Wheat	1.86	0.0	.86	0.0
Aggregate (bil.$)				
Total Receipts	160.18	139.73	169.29	154.85
Production Expenses	125.96	121.83	138.74	134.49
Realized Net Farm Income	34.22	17.89	30.55	20.36

[1]All numbers reported as annual averages.
[2]Seven model crops only (four feed grains, wheat, soybeans and cotton).

Table 2. Baseline and Model Estimates Under Unilateral Free Market, 1988-1992 and 1992-1996 Averages for Selected Variables, Oklahoma.

Item[1]	1988 - 1992		1992 - 1996	
	Baseline	Unilateral Free	Baseline	Unilateral Free
Wheat				
Price ($/bu)	3.02	2.17	3.26	2.95
Planted Acres	7353	7242	7635	7587
Harvested Acres (Th. Ac.)	5961	5881	6213	6134
Production (Mil. bu.)	196	193	212	209
Value of Prod. (mil. $)	593	423	695	622
Cash Receipts (mil. $)	564	402	667	595
Cattle				
Price of Cattle ($/cwt)	56.90	51.20	53.88	46.58
Price of Calves ($/cwt)	70.59	61.91	65.98	54.90
Production (Mil. bu.)	2215	2299	2168	2140
Value of Prod. (mil. $)	1277	1210	1193	1036
Cash Receipts (mil. $)	1594	1521	1502	1328
Aggregate				
Total Cash Receipts (mil. $)	3401	3134	3468	3201
Net Farm Income (mil. $)	887	509	593	323

[1]All numbers reported as annual averages.

and down 6 percent from 1992-1996.

Except for dairy, lower feed costs expand livestock production. Most of the increase comes in the middle to latter portion of the 9 year period. Average price decreases during the 1992-96 period range from 5 to 10 percent for the various livestock categories.

Cash receipts for crops average 8 percent below baseline during the last five years, while livestock receipts average 5.6 percent lower the last five years. With only CRP payments retained, government payments plummet. Production expenses decline but by a modest 3 percent. Net farm income decreases by nearly 50 percent from 1988-1992 and averages 33 percent lower during the last five years of the simulation.

Oklahoma

Oklahoma wheat production remains relatively stable as farmers' responses to a nearly one-third drop in the average wheat price in the 1988-1992 period offsets the effects of eliminating annual acreage diversion programs (Table 2). The wheat value of production and cash receipts decline by 28 and 29 percent respectively for the 1988-1992 period and average 10 and 11 percent lower during the 1992-1996 period.

Oklahoma cattle prices average 10 percent below the baseline during the first period and 15 percent lower the latter period. Cattle production increases slightly during the first period in response to lower feed prices.

But, as livestock prices decline, production during the latter years drops by about 1 percent. Lower prices cause cattle receipts to be well below baseline levels in both periods, 5 percent less in 1988-1992 and 11 percent in 1992-1996.

Total cash receipts average about 8 percent below baseline during both periods. With reduced government payments and increased production expenses, net farm income drops by 42 percent in 1988-1992 and by 45 percent in 1992-1996 compared to baseline averages. Unilateral free markets accentuate the baseline trend of lower farm incomes over time. The 1992-1996 net farm income estimate for unilateral free trade is about one-third of the baseline net farm income for the first period.

In summary, the Oklahoma results suggest that, with unilateral suspension of wheat and other commodity programs, Oklahoma wheat prices decline, wheat production remains stable, cattle prices decline, wheat, cattle and total cash receipts go down and net farm income drops to nearly one-half of baseline net farm income, which itself declines over the period.

Multilateral Free Markets

The multilateral free market analysis includes the same assumptions on eliminating U.S. farm programs as already summarized. In addition, protectionist policies in the European Common Market, Japan, Mexico, Argentina, Brazil, India, Egypt, Algeria and Morocco are eliminated over the same period. Prices in these countries are linked to border prices, and the level and fluctuations of world prices are directly transmitted to these markets [Food and Agricultural Policy Research Institute, forthcoming (b)].

U.S.

As in the case of unilateral free markets, acreage and production of major crops increase with the elimination of acreage diversions (Table 3). With multilateral free trade, higher commodity prices reflecting increased U.S. export demand also encourage farmers to plant land to crops. Even with increased acreages, the higher prices also keep yields near baseline levels.

Corn and wheat prices average well over 10 percent above baseline levels during the last five years. Soybeans, however, decline somewhat due to reduced demand from the European Common Market in the face of lower feed grain prices. Export volume increases and, since the price increases are export-driven, the value of exports also increases dramatically.

Higher corn prices drive cattle and hog production down slightly over virtually the entire span of years. Livestock prices increase by about 3 percent relative to the baseline over the 1992-1996 period. Net farm income declines by much less than with unilateral free markets. Crop and livestock cash receipts are up as a result of higher market prices, but production expenses also are higher, leaving net farm income down by an average of about 10 percent during the last period.

Table 3. Baseline and FAPRI Multilateral Free Market Scenario, 1988-1992 and 1992-1996 Averages for Selected Variables, U.S.

Item1	1988 - 1992		1992 - 1996	
	Baseline	Multilateral Free	Baseline	Multilateral Free
Harvested Acreage (mil. ac.)				
Corn	63.2	66.4	67.3	70.0
Wheat	61.4	64.1	64.5	67.2
Soybeans	61.3	61.5	63.0	61.4
Production (bil. bu.)				
Corn	7.49	7.65	8.32	8.5
Wheat	2.40	2.47	2.61	2.7
Soybeans	2.08	2.08	2.21	2.15
Cattle & Calves (bil. lbs.)	22.91	22.95	22.95	22.86
Hogs (bil. lbs.)	15.72	15.74	14.68	14.50
Prices				
Corn ($/bu.)	2.02	2.15	2.25	2.53
Wheat ($/bu.)	3.00	3.19	3.23	3.66
Soybeans($/bu.)	5.54	5.14	5.64	5.26
Cattle & Calves ($/cwt)	63.18	64.28	61.75	66.22
Hogs ($/cwt.)	39.66	39.75	45.89	48.54
Export Demand (bil. bu.)				
Corn	1.77	2.25	2.10	2.76
Wheat	1.47	1.89	1.59	1.90
Soybeans	.76	.76	.81	.78
Value of Exports (bil. $)2				
Corn	3.56	5.97	4.73	8.53
Wheat	4.41	6.00	5.14	7.29
Soybeans	4.21	4.30	4.57	4.54
Crop Receipts (bil. $)	67.38	67.76	78.33	80.46
Livestock Receipts (bil $)	68.74	67.38	70.85	71.12
Aggregate (bil.$)				
Total Receipts	160.18	156.35	169.29	167.86
Production Expenses	125.96	127.56	138.74	140.06
Realized Net Farm Income	34.22	29.23	30.55	27.64

1All numbers reported as annual averages.

Oklahoma

Higher wheat prices draw significantly more Oklahoma cropland into wheat production. Harvested wheat acreage averages 7 percent above baseline during 1988-1992 and 9 percent above baseline the last five years of the simulation period. With wheat production increasing by nearly the same percentage as harvested acreage plus higher prices, value of wheat production and wheat cash receipts increase significantly (13 and 23 percent

for the respective five-year averages).

The Oklahoma cattle industry benefits from the higher national cattle prices and, since much of the cattle production in Oklahoma takes place as a complementary enterprise to wheat production, cattle production also increases, in spite of less total U.S. cattle production. Cash receipts increase by 4 percent in the 1988-1992 period and by 9 percent the last five-year period.

Total market receipts are between 5 and 9 percent higher than under the baseline. Net farm income averages 7 percent below the baseline scenario during the first five years but increases significantly above the baseline during the last five years.

In summary, Oklahoma wheat and cattle prices and production increase, cash receipts increase and, by the end of the simulation period, the higher receipts more than offset reductions in government payments and increased production expenses, thereby raising net farm income.

Summary and Conclusions

Numerous methodological problems are inherent in a free market analysis of agriculture. One is the definition of free markets. Conceptually, to achieve free markets, all programs which influence the production, resource allocation, prices, or incomes in agriculture would be eliminated. However, most discussions and analyses, including this one, assume continuation of expenditures on research and extension. In one sense, this is appropriate because it probably represents what would occur if commodity programs were eliminated. However, equating non-intervention of the government in agricultural markets with the elimination of commodity programs implies that public investments in agricultural extension do not influence the level or prices of agricultural production, a supposition that lacks empirical defense.

Hence, benefits to consumers of public expenditures on research and extension are assumed to continue after commodity programs are eliminated. This does not necessarily mean that new technologies would be adopted at the same rate as with commodity programs. Some studies suggest that freer markets would force farmers to adopt technology more rapidly (Teigen), while others suggest that market uncertainty would slow farmers' investment in new technologies (Tyner and Tweeten, Ray and Heady, Nelson and Cochrane). Both possibilities suggest changed response parameters of the empirical relationships that describe market behavior in agricultural simulation models. Also, given the multiple objectives of farmers and public policies, strict economic optimization as a behavioral descriptor may be inappropriate.

Keeping the foregoing caveats in mind, this study evaluated the economic impacts on Oklahoma agriculture of eliminating U.S. commodity programs and of eliminating commodity programs world-wide. With only free markets in the U.S. (unilateral), Oklahoma wheat production remains

Table 4.Baseline and Model Estimates Under Unilateral Free Market, 1988-1992 and 1992-1996 Averages for Selected Variables, Oklahoma.

Item1	1988 - 1992		1992 - 1996	
	Baseline	Multilateral Free	Baseline	Multilateral Free
Wheat				
Price ($/bu)	3.02	3.22	3.26	3.70
Planted Acres	7353	7968	7635	8533
Harvested Acres (th. ac.)	5961	6353	6213	6791
Production (mil. bu.)	196	208	212	232
Value of Prod. (mil. $)	593	675	695	861
Cash Receipts (mil. $)	564	637	667	826
Cattle				
Price of Cattle ($/cwt)	56.90	58.20	53.88	59.11
Price of Calves ($/cwt)	70.59	72.56	65.98	73.94
Production (Mil. bu.)	2215	2277	2168	2208
Value of Prod. (mil. $)	1277	1336	1193	1316
Cash Receipts (mil. $)	1594	1658	1502	1637
Aggregate				
Total Cash Receipts (mil. $)	3401	3555	3468	3797
Net Farm Income (mil. $)	887	827	593	805

1All numbers reported as annual averages.

relatively steady as the effect of lower wheat prices on planted acreage is offset by bringing acreage diversions back into production. Wheat cash receipts are down by nearly one-third over the first five years compared to the with-farm-programs baseline and by 10 percent the second five year period. With no government payments, total receipts to wheat farmers are down dramatically. Cattle receipts also decline as production increases, but price drops by a larger percentage. Net income drops by 45 percent during the first five years and averages over one third below baseline for the last five years of the 1988 to 1996 study period.

As expected, the results are much rosier for Oklahoma agriculture when it is assumed that all countries completely eliminate their protectionist farm policies. Prices and production increase for both of Oklahoma's major agricultural commodities, cattle and wheat. Due to the complementary relationship between cattle and wheat grazing, cattle production increases in Oklahoma even though national beef production declines slightly in the latter portion of the simulation period. Oklahoma cash receipts rise above baseline levels, and by the end of the simulation period, the increased receipts more than offset the effects of no government payments, causing net farm income to exceed baseline levels.

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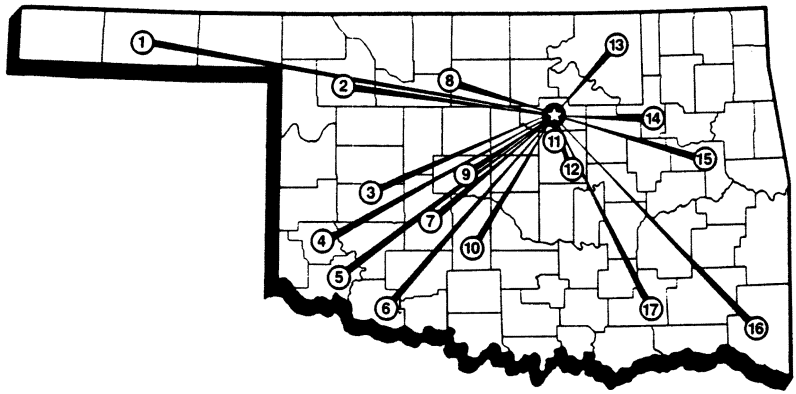

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