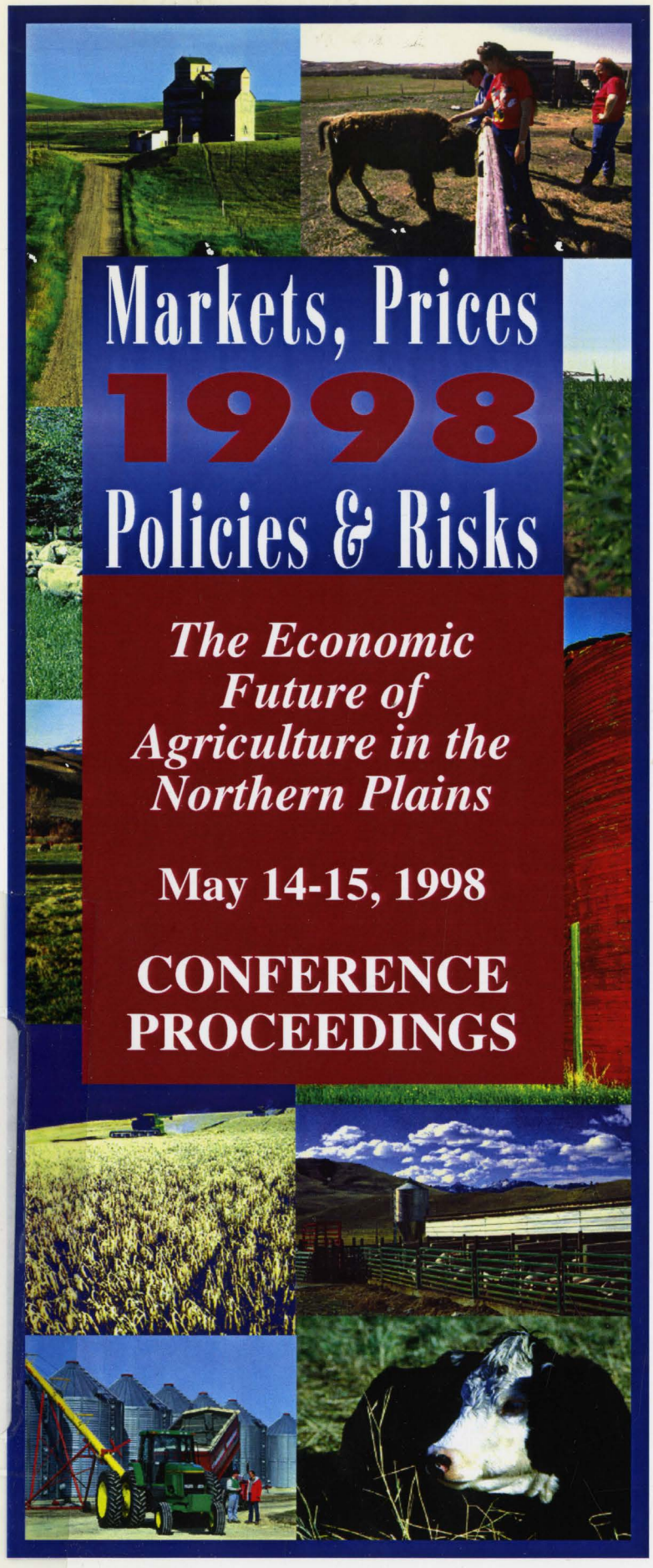
TRADE RESEARCH CENTER

Montana State University Bozeman



Markets, Prices 1998 Policies & Risks

The Economic Future of Agriculture in the Northern Plains

May 14-15, 1998

CONFERENCE PROCEEDINGS

Objective Analysis for Informed Decision Making

Impacts of Agricultural and Trade Policies on Northern Plains Agriculture: A Representative Farm Approach

Won W. Koo

Introduction

Farm programs and trade policies in the United States and other countries change in response to market developments and political initiatives. Impacts of these policy changes can differ substantially across regions in the United States because each region has its own unique soils, climate, crop mix, marketing conditions, and economic base. Even within regions, such as the Northern Plains, there is substantial variability in these features that leads to different farm-level impacts. Evaluating the regional effects of national and international policies is of vital concern to decision makers at the national, state, and local levels.

The overall objective of this paper is to estimate farm-level impacts of national and international policy changes.

The overall objective of this paper is to estimate farm-level impacts of national and international policy changes. Special attention is given to changes in net farm incomes, land prices, cash rents, and debt-to-asset ratios for representative farms in North Dakota under the 1996 FAIR Act, the Uruguay Round (UR) Agreement, and the North American Free Trade Agreement (NAFTA).

The Northern Plains states represent a major agricultural area with distinctive climate and crop mix. The region is also uniquely situated in terms of marketing and logistics within the United States in terms of sharing a border with its largest trading partner, Canada. Changes in government policies through the 1996 FAIR Act and the UR Agreement have affected the region's economy more than any other region in the United States. The U.S.-Canada Free Trade Agreement (CUSTA) also has affected the Northern Plains more than any other U.S. region.

Several analytical tools were developed and employed to evaluate impacts of national and international policy changes on national and regional agricultural economies of the United States. These are the large-scale policy simulation models and farm sector models.

Large-scale policy simulation models are typically nonspatial partial dynamic simulation models. Most of these models are behavioral models based on econometric techniques. Some models deal with major agricultural commodities and livestock produced, consumed, and traded in major exporting and importing countries (FAPRI model). Others deal with a single commodity (North Dakota Wheat Model, North Dakota Sugar Model, and Arkansas Rice Model). Some single commodity models, such as the North Dakota Wheat Model, divide the commodity into different classes to evaluate impacts of policy changes on the different commodity classes and to avoid aggregation bias (Yang and Koo 1996).

Farm sector models focus on impacts of policy changes on farms in a region. Since these models focus on small subregions, the models are not capable of determining equilibrium conditions. Therefore, development of the models is based on the equilibrium conditions developed by national models. Texas A&M University and North Dakota State University developed representative farm models to analyze the regional impacts of national and international policy changes.

The North Dakota Representative Farm Model is a deterministic simulation model that analyzes the impacts of policy changes on farm income.

North Dakota Representative Farm Model

The North Dakota Representative Farm Model is a deterministic simulation model that analyzes the impacts of policy changes on farm income. The model projects average net farm incomes, debt-to-asset ratios, cash rents, and cropland prices for representative farms producing five major crops: wheat, barley, corn, soybeans, and sunflowers. The model is linked to the FAPRI and North Dakota wheat simulation models and uses the prices of the crops generated from the models. In addition, macro policies and assumptions, trade policies, and agricultural policies are incorporated into the model directly or indirectly.

The model has twelve representative farms: three farms in each of four regions of North Dakota. These regions are the Red River Valley (RRV), North Central (NC), South Central (SC), and Western (West). Farms in each region are representative of small-, medium-, and large-size farms enrolled in the North Dakota Farm and Ranch Business Management Association.

The large farm is the average of the largest 25 percent of farms in cropland acres for each producing region. The small representative farm is an average of the smallest 25 percent of the farms for each producing region. The medium-size farm is the average of the remaining 50 percent of the farms. The large-size farm averages 2,358 cropland acres, the medium-size farm averages 1,182 cropland acres, and the small-size farm averages 475 cropland acres.

The North Dakota agricultural outlook for the 1998–2007 period is based on the baseline results produced by the FAPRI global model under optimistic and pessimistic scenarios.

North Dakota Agricultural Outlook

The North Dakota agricultural outlook for the 1998–2007 period is based on the baseline results produced by the FAPRI global model under optimistic and pessimistic scenarios. The optimistic scenario provides the most economically desirable situation for the U.S. wheat economy with increases in import demand from major importing countries, such as India, China, and Former Soviet Union (FSU), and at the same time decreases in exportable surplus of wheat in major exporting countries, such as Canada, Australia, the countries of the European Union, and Eastern Europe. The pessimistic scenario is the reverse case of the optimistic scenario.

Net Income for North Dakota Representative Farms

Net farm income is calculated by subtracting total crop and livestock expenses from total farm income. Crop and livestock expenses consist of direct costs, including seed, fertilizer, fuel, repairs, feed, supplies, feeder livestock purchases, and hired labor, and indirect costs that include machinery depreciation; overhead, such as insurance and licenses; land

taxes; and land rent or interest on real estate debt. Total farm income is the sum of cash receipts from crop and livestock enterprises, government payments, CRP payments, custom work, patronage dividends, insurance income, and miscellaneous income.

The net farm income for the large-size farm under the optimistic scenario is predicted by the model to decrease from $136,000 in 1997 to $125,000 in 1998 and then increase gradually over the 2000–2007 period (see Table 21). Net income for the large-size farm in 2007 is $186,000, 37 percent higher than that in 1997.

Table 21. Net Farm Income for Large-, Medium-, and Small-Size Farms under the Optimistic and Pessimistic Scenarios

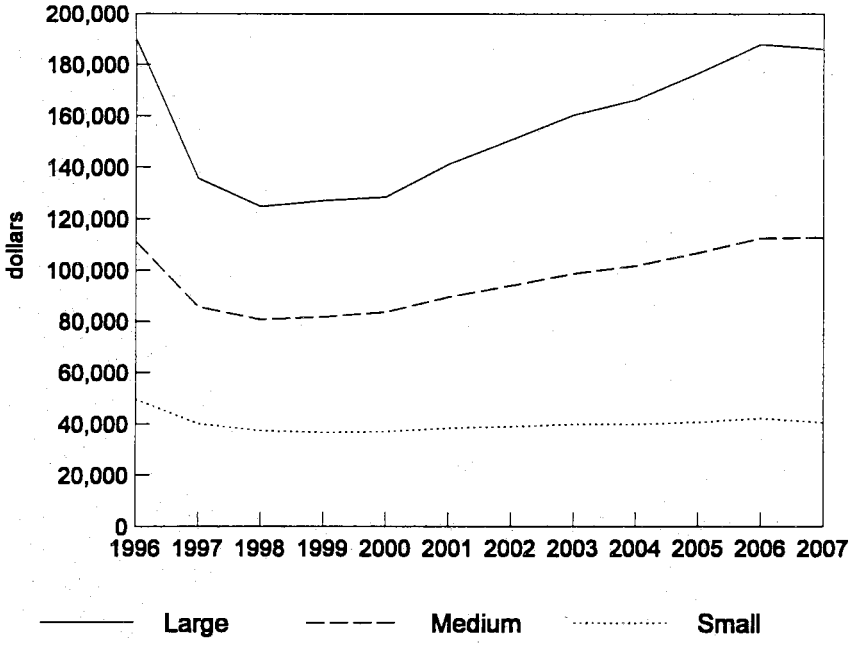
	Optimistic Scenario			Pessimistic Scenario		
Year	Large	Medium	Small	Large	Medium	Small
	1000 nominal dollars					
1997	136	86	40	136	86	40
1998	125	81	37	103	71	34
1999	127	82	37	90	65	31
2000	128	84	37	91	66	30
2001	141	90	38	89	65	30
2002	150	94	40	95	68	30
2003	160	99	40	97	69	29
2004	166	102	40	104	72	30
2005	176	107	41	108	74	29
2006	188	113	42	113	77	30
2007	186	113	41	112	77	29
Average (1998–2007)	155	96	39	100	70	30

The net farm income for the medium-size farm was $86,000 in 1997 and is projected to decrease to $81,000 in 1998 and then increase gradually over the remaining forecast period. Net income in 2007 is $113,000, 31 percent higher than that in 1997.

Changes in the net farm income for the small-size farm over the forecast period is similar to those for the large- and medium-size farms, but the recovery rate for the 2000–2007 period is much slower than for the large- and medium-size farms. As a result, the projected net farm income in 2007 ($41,000) is similar to that in 1997 ($40,000) for the small-size farm.

Average farm income for the 1998–2007 period under the optimistic scenario is $155,000 for the large-size farm, $96,000 for the medium-size farm, and $39,000 for the small-size farm. Projected changes in net farm income for the farms for the 1997–2007 period under the optimistic scenario are shown (see Figure 12).

Figure 12. Net Income for North Dakota Representative Farms under the Optimistic FAPRI Scenario



Under the pessimistic scenario, the net farm income for the large-size farm is predicted to decrease from $136,000 in 1997 to $90,000 in 1999 and then increase gradually for the remaining period. The income growth rate for the period under this scenario is slower than that of the optimistic scenario. Net farm income in 2007 is projected to be 6.8 percent smaller than that of 1997.

Changes in the net farm income for the medium-size farm are similar to those for the large-size farms, but the recovery rate is even slower. Net farm income in 2007 is projected at $77,000 as compared to $86,000 in 1997.

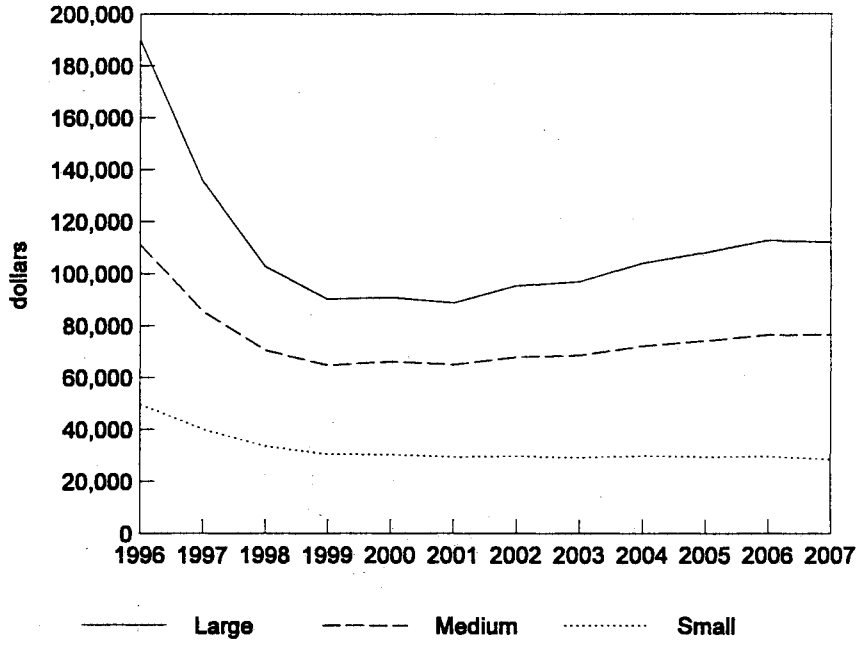
The net farm income for the small-size farm was $40,000 in 1997 and is projected to decrease to $29,000 in 2007.

Average farm income under this scenario is $100,000 for the large-size farm, $70,000 for the medium-size farm, and $30,000 for the small-size farm. Changes in net farm income for the farms for the 1997–2007 period under the pessimistic scenario are shown (see Figure 13).

Under both optimistic and pessimistic scenarios, the net farm income for the small-size farm is much smaller than those for other farms. It is doubtful that farms of this size will be able to provide for family living expenses and to service farm-related debt without nonfarm sources of income.

It is doubtful that small-size farms will be able to provide for family living expenses and to service farm-related debt without nonfarm sources of income.

Figure 13. Net Income for North Dakota Representative Farms under the Pessimistic FAPRI Scenario



Debt-to-Asset Ratios for North Dakota Representative Farms

Debt-to-asset ratio is calculated by dividing total debt by total assets. Debt-to-asset ratios for all farms under the optimistic scenario are highest in the 1999–2000 period due to the lower net farm incomes in 1998 and 1999.

Debt-to-asset ratio is calculated by dividing total debt by total assets. Total debt includes liabilities associated with farm business operation, equipment, and farm real estate. These debt-to-asset ratios are pertinent to farms enrolled in the North Dakota Farm and Ranch Business Management Association but not representative of all North Dakota farms.

Debt-to-asset ratios for all farms under the optimistic scenario are highest in the 1999–2000 period due to the lower net farm incomes in 1998 and 1999 (see Table 22). Debt-to-asset ratios for the farms under this scenario are predicted to decrease slowly for the remaining period. The debt-to-asset ratios for the small-size farm are much higher than those for other farms but do not reach the critical level in farm operation.

Debt-to-asset ratios for the farms under the pessimistic scenario increase until 2004 and then decline slowly for the forecasting period. The debt-to-asset ratios for the small-size farm are larger than those for other farms and also increase faster. Higher debt-to-asset ratios for the small-size farm, when coupled with meager net farm income, suggest serious problems in sustaining the farm business unless substantial off-farm income is earned by the farm families. In addition, highest debt-to-asset ratios for the small-size farm clearly indicate farm size is an important factor affecting financial well-being.

Land Prices and Cash Rents

Land prices are estimated on the basis of the implicit discount rate the farms have previously used and the expected return on land. Therefore, the

Table 22. Debt-to-Asset Ratios for Large-, Medium-, and Small-Size Farms under the Optimistic and Pessimistic Scenarios

	Optimistic Scenario			Pessimistic Scenario		
Year	Large	Medium	Small	Large	Medium	Small
1997	0.29	0.31	0.39	0.29	0.31	0.39
1998	0.30	0.32	0.40	0.32	0.33	0.41
1999	0.30	0.32	0.41	0.34	0.36	0.44
2000	0.30	0.32	0.41	0.36	0.37	0.45
2001	0.30	0.31	0.40	0.37	0.39	0.47
2002	0.29	0.31	0.40	0.38	0.39	0.48
2003	0.29	0.30	0.39	0.39	0.40	0.49
2004	0.30	0.30	0.39	0.39	0.40	0.49
2005	0.29	0.30	0.39	0.39	0.39	0.48
2006	0.28	0.29	0.38	0.39	0.39	0.48
2007	0.27	0.28	0.36	0.37	0.38	0.47
Average (1997–2007)	0.29	0.30	0.40	0.36	0.38	0.47

land prices are defined as the amount that farms can afford to pay for farm land and are not prevailing market prices. Likewise, cash rents are defined as the amount that farmers are willing to pay for the rented cropland to produce crops.

Land prices are defined as the amount that farms can afford to pay for farm land and are not prevailing market prices. Land prices are predicted to decrease for the 1997–2000 period and then increase for the remaining period under the optimistic scenario.

Land prices are predicted to decrease for the 1997–2001 period and then increase for the remaining period under the optimistic scenario (see Table 23). Land prices for the farms under the pessimistic scenario decrease from 1997 to 2004 and then increase. Average land prices for the period are $733 per acre under the optimistic scenario and $523 per acre under the pessimistic scenario.

Cash rents under the optimistic scenario reach $59 per acre in 2000, due to the higher land prices in 1997, decrease for two to three years, and then increase over the remaining period, following land prices (see Table 23). Cash rents in 2007 under this scenario are higher than those in 1997. However, cash rents under the pessimistic scenario reach the highest level in 2000 and then decrease for the remaining period.

Concluding Remarks

The agricultural outlook for this region is affected by the 1996 FAIR Act and recent trade agreements, including the UR Agreement, CUSTA, and NAFTA. Under the trade agreements and the FAIR Act, farm operation is riskier in terms of debt-to-asset ratios and requires more efficiency, suggesting that larger-size farms are better equipped to handle the problems than smaller-size farms.

Large- and medium-size farms can survive under both optimistic and pessimistic scenarios. Net farm incomes for the farms are predicted to grow for the 1997–2007 period. Income growth rates under the optimistic scenario are much faster than those under the pessimistic scenarios. Net farm income for

the small-size farm is relatively stable under the optimistic scenario and decreases under the pessimistic scenario. With the limited net farm income for the small-size farm it will be difficult for them to survive without other sources of income.

Table 23. State Average Land Price and Cash Rents for Large-, Medium-, and Small-Size Farms Under Optimistic and Pessimistic Scenarios

Year	Optimistic	Pessimistic
	---------- *nominal dollars/acre* ----------	
Land Price		
1997	724	724
1998	723	723
1999	697	655
2000	675	574
2001	674	526
2002	684	479
2003	709	452
2004	737	425
2005	765	439
2006	811	464
2007	854	493
Average (1997–2007)	733	523
Cash Rent		
1997	43	43
1998	50	50
1999	57	57
2000	59	58
2001	58	53
2002	57	48
2003	57	43
2004	58	40
2005	60	37
2006	62	36
2007	63	35
Average (1997–2007)	58	46

Land prices and cash rents under the optimistic scenario are predicted to be higher than those under the pessimistic scenario. Land prices and cash rents tend to increase under the optimistic scenario but decline under the pessimistic scenario.

The debt-to-asset ratios under the optimistic scenario are predicted to increase slowly until 1999 and then decrease. However, the debt-to-asset ratios under the pessimistic scenario increase during the forecast period. Higher debt-to-asset ratios for the small-size farm under the pessimistic scenario, when coupled with meager net farm income, suggest serious problems in sustaining the farm business unless substantial off-farm income is earned by the farm families.

Considering the financial crisis in South and Southeast Asia and sharp increases in agricultural production in Brazil and Argentina, the agricultural outlook under the pessimistic scenario may prevail and small-size farms may suffer substantially.

References

Benirschka, M., and W. W. Koo. *World Wheat Policy Simulation Model: Description and Computer Program Documentation*, Agricultural Economics Report No. 340, Department of Agricultural Economics, North Dakota State University, 1995.

Benirschka, M., W. W. Koo, and J. Lou. *World Sugar Policy Simulation Model: Description and Computer Program Documentation*, Agricultural Economics Report No. 356, Department of Agricultural Economics, North Dakota State University, 1996.

FAPRI Baseline Projections. Food and Agricultural Policy Research Institute, Columbia, MO, April 1996.

Koo, W. W., M. R. Duncan, R. D. Taylor, and D. G. Aakre. *Impacts of Alternative Farm Programs on the North Dakota Agricultural Economy*, Agricultural Economics Report No. 343, Department of Agricultural Economics, North Dakota State University, 1996.

Leistritz, F. L., W. W. Koo, M. R. Duncan, R. D. Taylor, and D. G. Aakre. *Economic Impact of Alternative Farm Program Scenarios on the North Dakota Economy*, Agricultural Economics Staff Paper No. AE95008, Department of Agricultural Economics, North Dakota State University, 1995.

North Dakota Agricultural Statistics. Various issues. North Dakota Agricultural Statistics Service, Fargo.

North Dakota Farm and Ranch Business Management Annual Reports, 1993 and 1994. North Dakota State Board for Vocational Education, Bismarck.

U.S. Department of Commerce. Census of Agriculture. Washington, D.C., 1992.

United States House of Representatives and United States Senate. Conference Report. Federal Agriculture Improvement and Reform Act of 1996. Washington, D.C., March 25, 1996.

Wailes, E., and G. Cramer. *World Rice Policy Simulation Model: Documentation*, Department of Agricultural Economics and Rural Sociology, University of Arkansas, Fayetteville, 1993.

Yang, S., and W. W. Koo. "Hicksian Aggregation and Price Dynamics: Test for a Single Price Index in the U.S. Wheat Markets," *Journal of Rural Development*, Vol. 18 (227–242), 1996.

About the Author

Won W. Koo is a Professor of Agricultural Economics at North Dakota State University. His research focus is international trade and agricultural policy.