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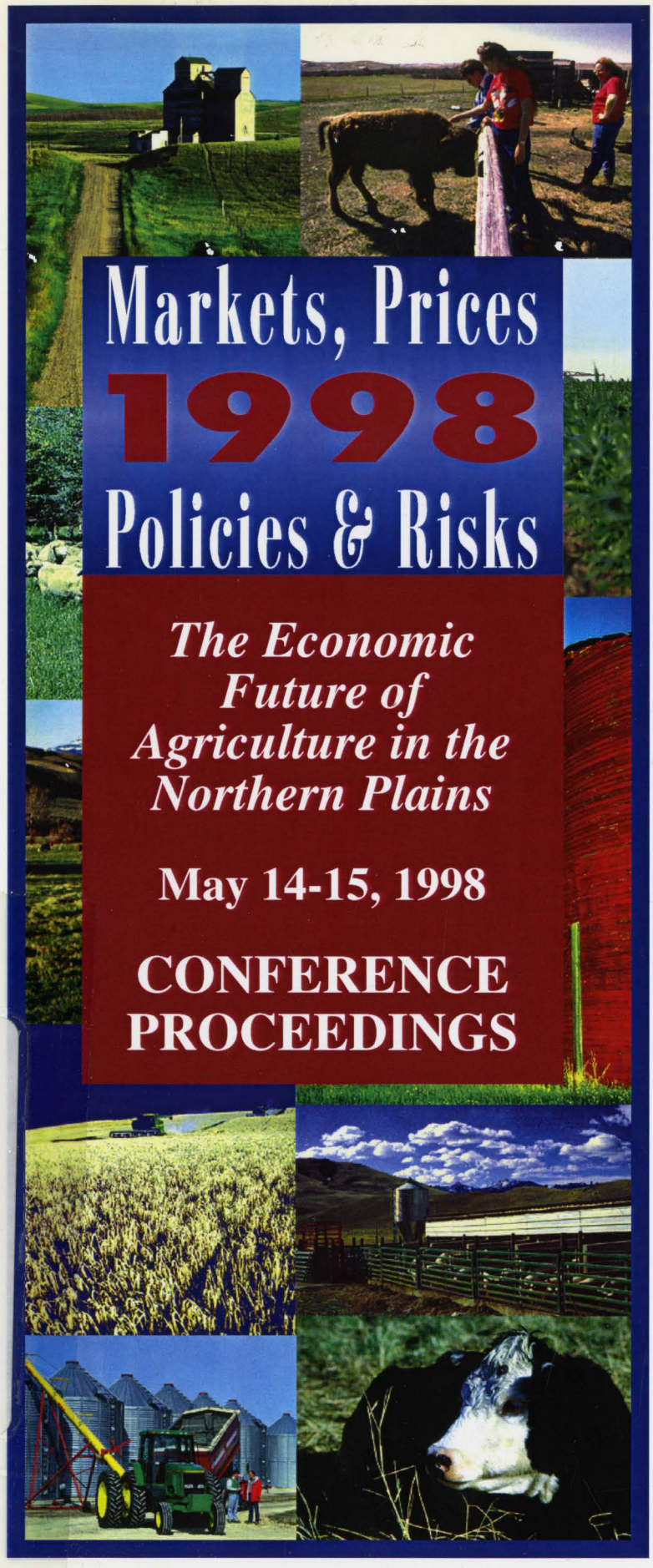

Markets, Prices 1998 Policies & Risks

The Economic Future of Agriculture in the Northern Plains

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CONFERENCE PROCEEDINGS

Objective Analysis for Informed Decision Making

Net Returns and Production Costs for Montana Grain Producers

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Grain production in Montana is a major component of the state's agricultural sector. Wheat and barley account for approximately 50 percent of Montana's annual agricultural cash receipts. Volatility in grain prices and a dependence on climatic conditions provide for variability in cash receipts from sales and in net returns to Montana grain producers. This paper provides estimates of the net returns for dryland grain producers in Montana and the sensitivity of these measures of net returns to geographic location and variations in yields and output prices. Estimates of the production costs per bushel for spring wheat are also reported and compared to long-term planning prices.

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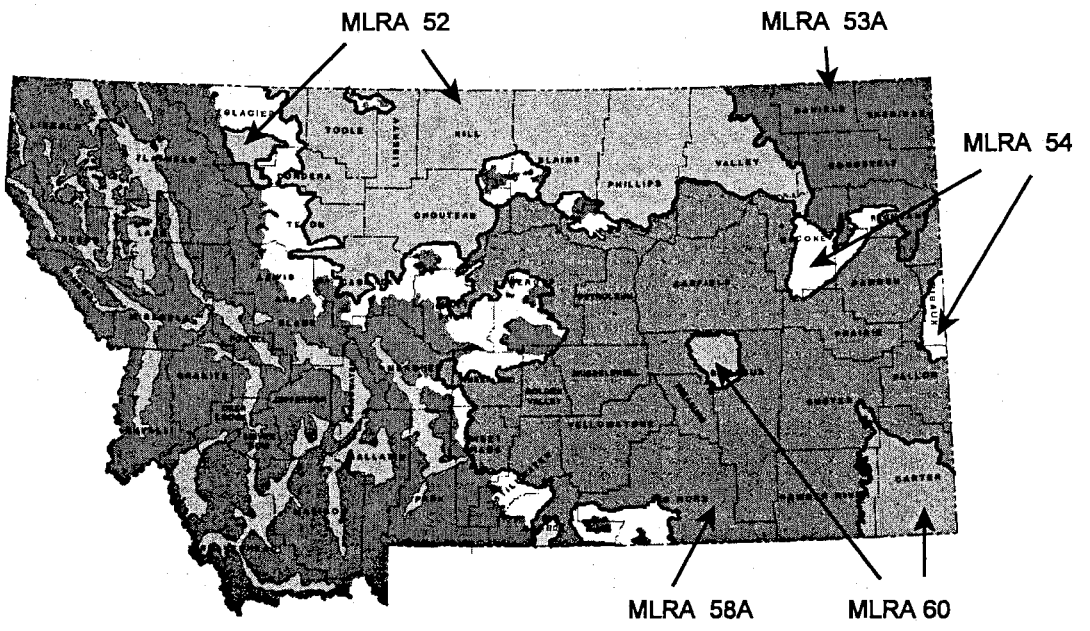
The net returns and cost calculations are based on the results of a cropping practices survey of randomly selected dryland grain producers in central and eastern Montana. This survey, funded by the USDA and the Trade Research Center at Montana State University–Bozeman, was conducted in collaboration with the Montana Agricultural Statistical Service (MASS). The purpose of this survey was to obtain detailed information on production practices, input use, yields, and costs for annually planted dryland crops during 1995. The sample was designed to be statistically representative of the four major land resource areas (MLRAs) that constitute the majority of dryland production acreage in the eastern two- thirds of the state (see Figure 14). Of the 700 producers initially selected for inclusion in the survey, there were 425 usable responses distributed throughout the population as follows: Northern Montana MLRA 52, 128; Northeastern Montana MLRA 53A, 136; East Central Montana MLRA 54, 52; and Southeastern Montana MLRA 58A, 109. No producers were selected for interview from MLRA 60, primarily a range livestock area.

Grain farms included in the sample range from 1,000 acres to more than 11,000 acres of cropland. The average acres of cropland per farm in the survey is about 2,000 acres in the Northern Montana MLRA 52, slightly less than 1,800 acres per farm in the Northeastern Montana MLRA 53A, about 1,600 acres per farm in the East Central Montana MLRA 54, and about 1,400 acres per farm in the Southeastern Montana MLRA 58A. Average total land per farm in the survey, including cropland plus pasture and range, is about 3,600 acres in MLRA 52; 3,700 acres in MLRA 53A; 4,100 acres in MLRA 54; and 5,200 acres in MLRA 58A. Range and pasture land are more prevalent in the east-central and southeastern areas of Montana.

Figure 14. Major Land Resource Areas in Central and Eastern Montana



Net Returns for Dryland Grain Production in Montana

Economic net returns approximate economic profit and are computed on a per-acre basis for wheat and barley crops. The net returns for each crop are also differentiated according to land use during the previous growing season (fallow or in crop production), i.e., spring wheat after fallow, or spring wheat recrop. Although information was obtained for other annually-planted crops, sample sizes were sufficient to estimate net returns for wheat and barley crops within each MLRA, but not of sufficient size for reliable net returns estimates for other crops.

These economic net returns per acre that approximate economic profit are computed as revenues from sales per acre minus costs per acre. For each observation, net returns are calculated as the output price per bushel for the crop multiplied by the per acre yield less the sum of the operating plus ownership costs per acre. In this analysis we have eight crop enterprises: winter wheat after fallow, winter wheat recrop, spring wheat after fallow, spring wheat recrop, durum wheat after fallow, durum wheat recrop, barley after fallow, and barley recrop.

Net returns are calculated as the output price per bushel for the crop multiplied by the per acre yield less the sum of the operating plus ownership costs per acre.

The net returns for each crop in a major land resource area is determined by averaging net returns over all observations of that crop. The net returns reported in this paper do not incorporate the deficiency payments for the 1995 crop year (as there were none). Projections of net returns under alternative price scenarios do not incorporate the market transition payments that most grain producers are realizing since implementation of the 1996 FAIR Act. Farm-to-elevator transportation costs are not included, as transportation costs are highly variable due to the differences in distances from the farm storage to the elevators.

Net returns are calculated using two scenarios for output prices. In the first scenario, the average of the 1995–1996 USDA-AMS prices per bushel for spring wheat, winter wheat, durum wheat, and barley are used in the revenue calculations along with the actual survey per-acre yields. For the second scenario, we use a long-term planning price per bushel based on the midpoint of the FAPRI price estimates, adjusted for historical price spreads for spring wheat, durum wheat, and barley in Montana. The long-term planning prices do not vary by county. The long-term planning prices are close approximations of the prices that prevailed at the beginning of the planting period for the 1995 crop year.

A comparison of the two sets of output prices is provided (see Table 24). The 1995–1996 USDA-AMS prices are the simple averages of the weekly, county-level prices. The 1995–1996 USDA-AMS prices for winter wheat and spring wheat are 25 to 30 percent above the long-term planning prices.

Net returns are calculated using two scenarios for output prices.

Table 24. Comparison of Grain Prices

	1995–1996 USDA-AMS Price[a]	Long-Term Planning Price[b]
	$/bushel	
Winter Wheat	4.26	3.30
Spring Wheat	4.60	3.65
Durum Wheat	5.64	3.95
Barley (feed)	2.49	2.00

[a]Unweighted average of 1995–1996 USDA weekly marketing prices in Montana.

[b]Based on FAPRI baseline price estimates for winter wheat adjusted for historical price spread for spring wheat, durum wheat, and barley in Montana.

Utilized in this paper are the actual yields per acre for 1995 reported in the cropping practices survey so that mean net returns and variability of net returns can be assessed. County-level mean yields per acre reported by MASS do not allow for estimating the variability of the yields within an area smaller than a county. A comparison is presented of the average 1995 yields per acre for each MLRA from the cropping practices survey and the mean yields per acre reported by MASS averaged over the 1991–1995 period (see Table 25). The 1995 average yields per acre exceed the five-year average reported by MASS for all crops in MLRA 52 and for winter wheat and barley in MLRA 58A. The 1995 survey yields for all other crops in the other MLRAs were generally less than the 1991–1995 MASS yields.

Costs include the following categories: (1) seed, cleaning, and treatment costs; (2) pesticide and fertilizer costs; (3) crop insurance costs; (4) machinery operating costs; (5) fallow operating costs, for those crops planted after fallow; (6) interest on operating costs; and (7) ownership costs

Table 25. Comparison of Yields per Acre, by Major Land Resource Area

MLRA	Sample Average Yield	MASS 1991–1995 Average Yield
	bushels per acre	
MLRA 52		
Winter Wheat Fallow	46.6	39.5
Winter Wheat Recrop	37.3	34.8
Spring Wheat Fallow	38.9	34.0
Spring Wheat Recrop	35.7	27.8
Durum Wheat Fallow	42.4	34.1
Durum Wheat Recrop	*	30.9
Barley Fallow	61.0	47.7
Barley Recrop	59.2	43.2
MLRA 53A		
Winter Wheat Fallow	*	33.4
Winter Wheat Recrop	*	26.9
Spring Wheat Fallow	28.4	32.0
Spring Wheat Recrop	19.9	25.5
Durum Wheat Fallow	31.3	31.2
Durum Wheat Recrop	26.1	27.7
Barley Fallow	34.9	40.8
Barley Recrop	29.9	34.4
MLRA 54		
Winter Wheat Fallow	21.5	31.5
Winter Wheat Recrop	*	25.4
Spring Wheat Fallow	19.0	30.3
Spring Wheat Recrop	13.9	24.7
Durum Wheat Fallow	*	29.6
Durum Wheat Recrop	*	22.0
Barley Fallow	26.1	41.0
Barley Recrop	23.6	36.2
MLRA 58A		
Winter Wheat Fallow	35.6	33.8
Winter Wheat Recrop	31.9	29.6
Spring Wheat Fallow	27.2	30.7
Spring Wheat Recrop	22.7	24.4
Durum Wheat Fallow	*	27.8
Durum Wheat Recrop	*	15.0
Barley Fallow	42.9	40.4
Barley Recrop	39.3	36.7

*Sample size too small to provide a reliable estimate.

(including depreciation, property taxes, insurance, and opportunity costs on investment, family labor, and management). With the exception of the interest and ownership costs, the survey data enable us to compute remaining costs on a field-specific basis. The ownership costs are approximated by average county-level CRP payment rates per acre that prevailed for CRP signups 1 through 12. Interest costs are computed using a 9 percent operating capital interest rate charge for the applicable time periods.

Median net returns for each crop in each resource area are calculated using USDA-AMS prices and 1995 survey yields. The median net returns, representing a return when half the net returns would be lower and half would be higher, are reported (see Table 26). These net returns reflect the returns to producers for the 1995 crop year, excluding government payments and farm-to-elevator and dockage costs. Comparisons can be made across MLRAs and across production differentiated according to land use in the previous season. Median net returns per acre are higher in Northern Montana MLRA 52 for all crops than in any other resource area. Median net returns per acre are lower for crops grown after fallow relative to crops grown on recrop in spite of the higher per acre yields. Increased revenues associated with the higher yields for crops produced after fallow are more than offset by the increases in the operating and ownership costs associated with the fallow year.

Median net returns per acre are higher in Northern Montana MLRA 52 for all crops than in any other resource area. Median net returns per acre are lower for crops grown after fallow relative to crops grown on recrop in spite of the higher per acre yields.

Table 26. Median Economic Net Returns per Acre, by Crop within MLRA, Using 1995–1996 USDA-AMS Prices and 1995 Yields per Acre

	MLRA 52	MLRA 53A	MLRA 54	MLRA 58A
		$/acre		
Winter Wheat Fallow	58.23	*	2.18	24.63
Winter Wheat Recrop	69.34	*	*	31.16
Spring Wheat Fallow	59.94	30.88	-19.97	8.87
Spring Wheat Recrop	75.47	20.32	0.67	11.99
Durum Wheat Fallow	*	56.04	*	*
Durum Wheat Recrop	*	50.55	*	*
Barley Fallow	23.68	-5.68	-25.64	-14.23
Barley Recrop	66.06	11.31	7.12	19.99

*Sample size too small to provide a reliable estimate.

Estimates of the median net returns based on the long-term planning prices and the 1995 survey yields per acre are provided (see Table 27). When long-term planning prices are used, median net returns are lower for all crops across all MLRAs compared to the median net returns using the 1995–1996 USDA prices. However, within this price scenario, median net returns are highest in Northern Montana MLRA 52. Within each MLRA, median net returns tend to be greater for crops that are planted recrop as compared to planting after fallow. For example, median net returns for spring wheat recrop in MLRA 52 are $33.55 per acre versus $20.41 per acre for spring wheat fallow.

Table 27. Median Economic Net Returns per Acre, by Crop within MLRA, Using Long-Term Planning Prices and 1995 Yields per Acre

	MLRA 52	MLRA 53A	MLRA 54	MLRA 58A
			$/acre	
Winter Wheat Fallow	10.16	*	-21.14	-15.32
Winter Wheat Recrop	20.71	*	*	8.82
Spring Wheat Fallow	20.41	2.20	-36.14	-19.29
Spring Wheat Recrop	33.55	2.09	-13.97	-4.45
Durum Wheat Fallow	19.98	7.05	*	*
Durum Wheat Recrop	*	9.72	*	*
Barley Fallow	-12.97	-19.81	-37.59	-30.35
Barley Recrop	25.65	-2.60	-4.69	4.85

*Sample size too small to provide a reliable estimate.

For both price scenarios, the median net returns for recrop generally exceed the median net returns for fallow on a crop-by-crop basis. However, without some comparable estimates of the variability of yields and net returns per acre across production practices, it is premature to conclude that producers would benefit from a greater allocation of land to recropping or especially to continuous cropping practices. It is likely that crop yield variability would increase from what is observed in the sample as land use intensity increases.

As output prices vary, producers adjust their land allocation and input use decisions to maximize expected net returns.

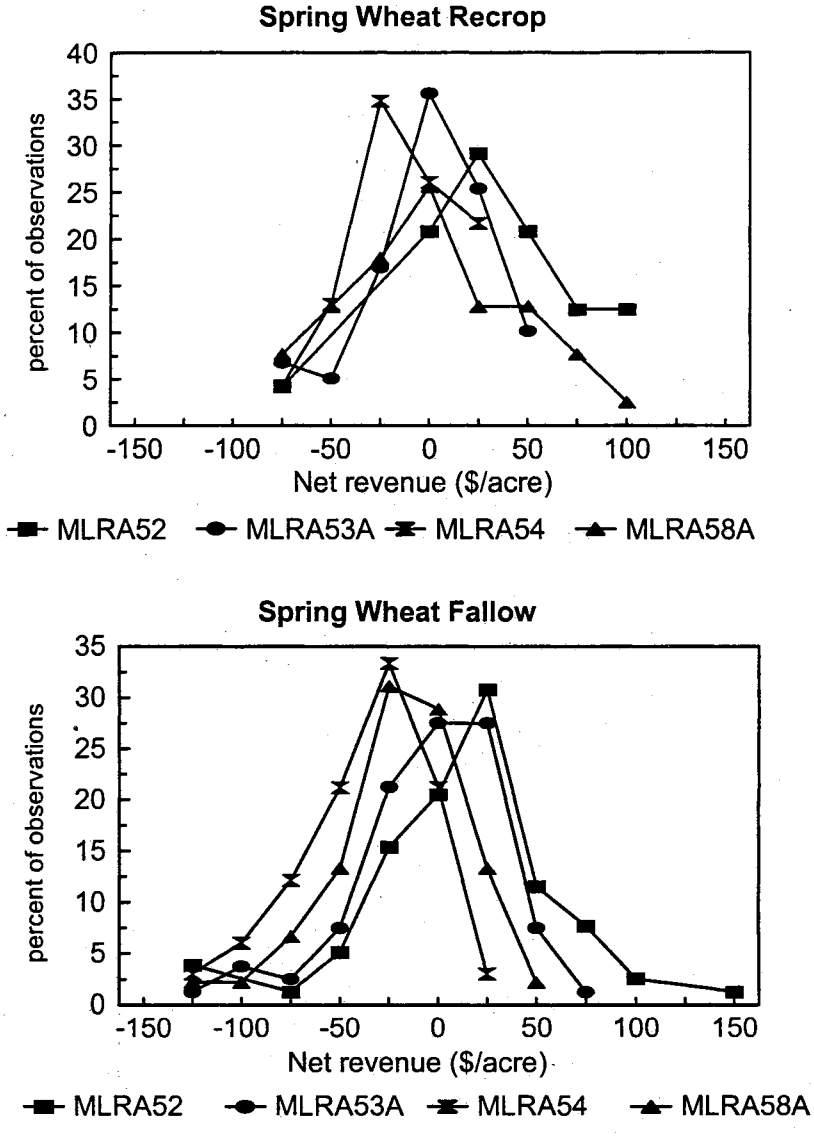
As output prices vary, producers adjust their land allocation and input use decisions to maximize expected net returns. Survey data are available to enable us to estimate these responses. These analyses are underway but have not been completed. But the long-term planning prices are a close approximation to the prices that existed when 1995 planting decisions were made. Therefore, using the data from the cropping practices survey in conjunction with the long-term planning prices provides a good approximation of long-term expected net returns.

Variability of Net Returns for Spring Wheat

The implications of future price scenarios for Montana grain producers are examined by varying the expected output prices and observing what happens to the mean net returns and the variability or spread of the distribution of net returns.

Using the 1995 yields per acre, the distribution of net returns per acre based on the long-term planning prices for spring wheat recrop and spring wheat fallow, by MLRA, are shown (see Figure 15). Producers in Northern Montana MLRA 52 were more profitable than producers in other regions for both spring wheat recrop and spring wheat on fallow production. With the exception of spring wheat recrop in MLRA 58A, the distributions show increasing dispersion as mean net returns increase.

Figure 15. Economic Net Returns Distributions for Spring Wheat



The percentage of observations in each MLRA with negative net returns for spring wheat for three price scenarios (1) the long-term planning price, (2) 85 percent of the long-term planning price, and (3) 115 percent of the long-term planning price are shown (see Table 28). These latter two prices reflect the pessimistic and optimistic FAPRI scenarios for grain prices. At the long-term planning price, a higher percentage of producers in Northern Montana MLRA 52 generally earn positive economic profits per acre, excluding any revenue from government payments and the farm-to-elevator transportation and dockage costs. A considerably lower percentage of the spring wheat producers in Southeastern Montana MLRA 58A have positive economic profits. At 115 percent of the long-term planning prices, prices that approximate those available in the 1995–1996 period, the proportion of spring wheat producers with negative

economic profits is reduced to 22 percent in Northern Montana MLRA 52 and 56 percent in Southeastern Montana MLRA 58A for spring wheat after fallow, and to 4 percent in MLRA 52 and 38 percent in MLRA 58A for spring wheat recrop.

Table 28. Percentage of Observations with Negative Net Returns for Spring Wheat

	85% of Planning Price	Long-Term Planning Price	115% of Planning Price
	percent		
(a) Spring Wheat Fallow			
MLRA 52	54	36	22
MLRA 53A	74	46	31
MLRA 54	97	91	76
MLRA 58A	89	64	56
(b) Spring Wheat Recrop			
MLRA 52	33	8	4
MLRA 53A	63	44	32
MLRA 54	78	65	57
MLRA 58A	67	59	38

There is substantial variability in net returns for dryland grain producers across these four resource areas in central and eastern Montana. With the exception of Northern Montana MLRA 52, a substantial share of the acreage in wheat and barley production returns negative economic profits, when prices drop below the levels observed in 1995–1996. In the past, these negative net returns were somewhat offset by deficiency payments. These negative economic profits are currently being offset to some degree by market transition payments associated with wheat and barley contract acres (and in some cases, crop insurance indemnifications).

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Production Costs for Spring Wheat

Production costs per acre for spring wheat after fallow and spring wheat recrop, by MLRA, are reported (see Table 29). These costs reflect the average of all observations within an MLRA. Operating costs for spring wheat after fallow are less than operating costs for spring wheat recrop except in East Central MLRA 54. However, when the fallow and ownership costs are included, average total costs per acre are greater for spring wheat after fallow than spring wheat recrop.

Total costs per bushel incurred in the production of spring wheat after fallow are arrayed according to the distribution of producers (see Figure 16). Each graph displays the percent of the distribution of producers in a given MLRA that were producing spring wheat at or below a specified level total cost per bushel. For example, in MLRA 52, 60 percent of the producers have a total per bushel cost of production that is $3.52 or below, whereas only 30 percent of the producers have a cost that is $3.00 or below.

Table 29. Costs of Production per Acre for Spring Wheat, by MLRA

MLRA and Cost Category	Spring Wheat after Fallow	Spring Wheat Recrop
	$/acre	
MLRA 52		
Operating costs	43.67	50.87
Operating and fallow costs	53.38	50.87
Operating, fallow, and ownership costs	135.49	96.45
MLRA 53A		
Operating costs	36.15	39.98
Operating and fallow costs	43.18	39.98
Operating, fallow, and ownership costs	109.42	73.86
MLRA 54		
Operating costs	37.26	34.57
Operating and fallow costs	43.73	34.57
Operating, fallow, and ownership costs	105.68	68.39
MLRA 58A		
Operating costs	42.54	48.18
Operating and fallow costs	52.24	48.18
Operating, fallow, and ownership costs	120.34	83.94

The long-term planning price of $3.65 and the 1995–1996 USDA-AMS price of $4.60 are indicated with horizontal lines (see each panel, Figure 16). In MLRA 52, the costs per bushel for 64 percent of the spring wheat on fallow producers is below the long-term planning price. In the other MLRAs, the proportion of producers not covering total per bushel costs ranges from 46 percent to 91 percent at the long-term planning price.

Conclusions

Net returns and costs of production vary substantially by geographic location and by production practice for dryland grain production in Montana. A substantial portion of the dryland cropland in production in Montana would become less profitable at current asset values if government income transfer payments were phased out. At crop price levels above the long-term planning price, such as the wheat and barley prices observed in 1995 and 1996, the outlook for Montana grain producers improves. If prices fall to the levels predicted by the pessimistic FAPRI forecast, the outlook for Montana grain producers, especially the resource areas other than Northern Montana MLRA 52, is less encouraging. If prices were to persist at these levels, cropland values would be expected to decline.

Our analysis has focused on comparisons of the median net returns and the variability of net returns by crop and by resource area, holding constant the land allocation and input use decisions at 1995 levels. Future research will focus on using the crop production practices survey data to model the behavioral responses of producers to changes in output and input prices. This information will provide the basis for a definitive analysis of how land allocation and input use decisions change in response to changes in prices and government policies.

About the Authors

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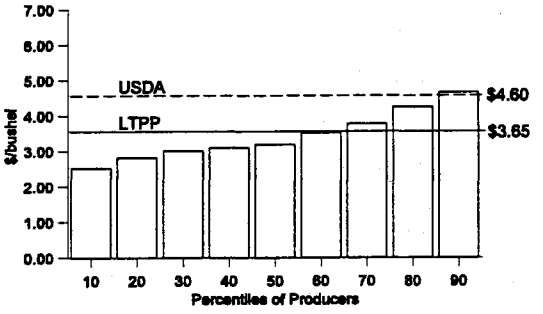
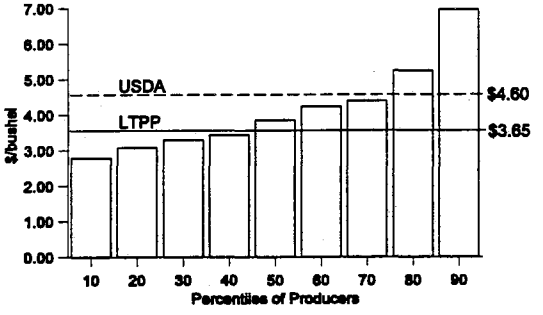
Figure 16. Distribution of the Total Costs per Bushel, Spring Wheat after Fallow, by MLRA

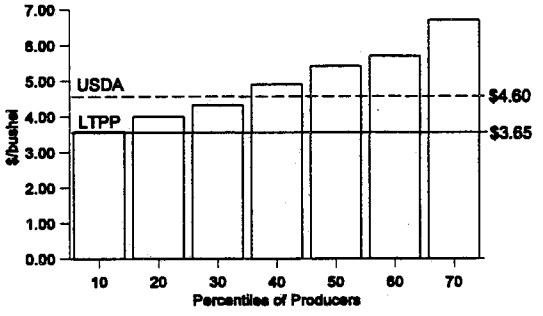
MLRA 52



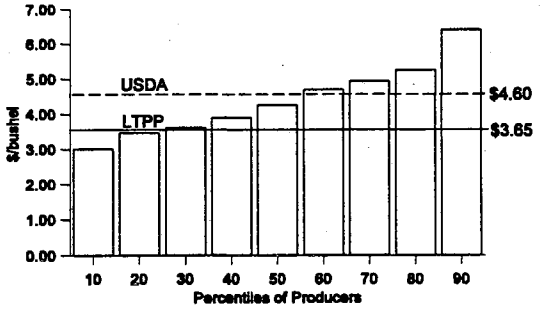
MLRA 53A



MLRA 54



MLRA 58A



USDA – – USDA--AMS Price

LTPP —— Long-Term Planning Price