Special Report 963
June 1996

A Comparison of the Revenue and Costs of Wheat Production with Conservation Reserve Program Payments in North Central Oregon

Agricultural Experiment Station
Oregon State University

For additional copies of this publication, write:

Stanley F. Miller
Department of Agricultural and Resource Economics
Oregon State University
213 Ballard Extension Hall
Corvallis, OR 97331-3601

A Comparison of the Revenue and Costs of Wheat Production with Conservation Reserve Program Payments in North Central Oregon

Donald M. McLeod**, Stanley F. Miller* and Gregory M. Perry*

*Department of Agricultural and Resource Economics
Oregon State University
**Department of Agricultural Economics
University of Wyoming

Research Funded by STEEP II Grant: "Farmer Response to Modifications in the Conservation Reserve Program."

I. Introduction

The Conservation Reserve Program (CRP) is currently authorized through 1996. A majority of the ten-year contracts are scheduled to run out in 1997 and 1998. If the CRP is not re-authorized, some of the land will return to production. Nationally, surveys have been conducted to determine what CRP contract holders intend to do with their land (Osborn, Schnepf and Keim, 1994). Regionally, contract holders have been surveyed to determine their post-CRP land use management plans (McLeod, Miller and Perry, 1995).

This paper seeks to determine the cost and revenue basis for post-CRP land use. The central question to be addressed is the mix of institutional and/or market conditions that will lead to resumption of wheat production on CRP land. Analysis conducted by crop type for all land nationally (CRP and non-CRP) has focused on market price changes caused by changes in levels of production (Ray and Ugarte, 1995). This analysis establishes three scenarios based on changes in the provisions of the CRP: 1) targeting the environmentally sensitive lands to be put into a modified CRP, 2) continuing CRP as it currently exists, or 3) terminating the program.

Impacts of national CRP changes have not been investigated for the state of Oregon. Most of the CRP acreage in Oregon resides in the north central portion of the state; Wasco, Sherman, Gilliam, Morrow, and Umatilla Cunties. CRP land in this area was formerly in dryland grain production. Soft white wheat is the primary cash crop in this area (USDA and ODA, 1994). Area survey results indicate that about 65 percent of current contract holders intend to resume wheat on at least some of their CRP land if the program is terminated. If the

CRP changes or is terminated, then policy analysis is needed that will provide insight into future land use.

There are several reasons why the future land use of current CRP acreage is important. County tax revenues are based on property assessments. Assessments are a reflection of the particular county's market rental rate for agricultural land which, in turn, reflects the productive value of that land. The assessed value for agricultural land is based on the type of use. Land that is used for livestock production is assessed at a lower value than land cropped for wheat (Seavert, 1995). The reduction in the wheat producing land base incurred by CRP enrollment has reduced the demand for agribusiness products (input supply) in the north central and northeastern regions of Oregon (Martin et al., 1991). Post CRP land management may lead to increased demand for agricultural inputs. The 10 year retirement of CRP lands from production has lead to a decrease in the supply of cropland available for leasing. The amount of land that is not grazed or not re-enrolled would then be available for cropland leasing. Finally, policy makers assessing the cost of the CRP in Oregon would benefit from knowing how CRP payments compare with net returns from crop production. Any adjustment of the CRP annual per acre payment (particularly program termination) would require an examination of producer costs and revenues to obtain a sense of producer decision possibilities and land use options.

Probable post CRP land management can be ascertained by examining producer response to different wheat price levels. Revenue can be determined from given price and proven program yields. Cost curves based on proven program yields and given levels of inputs provide a hypothetical supply of wheat from land currently in the CRP. Thus cost of

production schedules are constructed by county and for the five-county aggregate. Net revenue schedules are then provided for given price levels in order to compare production profits with program payments.

II. Methodology

The methodology consists of a simulation of revenues and costs associated with wheat production in the five county region of north central Oregon. Two-tiered linear cost functions, based on proven USDA program yields, are constructed for each of the counties. The tiers are based on high or low yield production practices. The cut-off point defining the levels of input used is 35 bushels per acre. Wheat production practices have been modified for each county based on written comments from county Extension agents, county natural resource conservation personnel, and county Consolidated Farm Services personnel. Table 1 contains a summary of wheat production practices by county. The table indicates that for higher yielding land higher levels of inputs are used. Table 2 shows a modified version of the variable cost portion of the mid-Columbia area winter wheat enterprise budget (Seavert et al., 1994). Note that only variable cost is used to construct cost per bushel or per acre schedules. The original enterprise budget was one in a series of wheat budgets that have kept the tillage practices the same over time for comparison purposes. The budget shown in Table 2 includes conservation tillage practices (trashy fallow) and omits the use of the moldboard plow. The budget indicates combine costs that differentiate between low and high yielding harvests. Table 3 shows the cost schedule formula based on per acre input levels depending on high or low yielding production practices. An example is provided below Table 3.

The use of variable cost of wheat production indicates analysis that is short run and static for crop land currently in CRP. Input prices are held constant and no producer expectations or price forecasts are given. Proven program yields incorporate five years of yield fluctuation reflecting soil moisture and/or frost damage fluctuation as well as the productivity of a given operation. The CRP parcel is probably the least productive or most costly part of the operation. Thus proven yields tend to overestimate the wheat output from production that will occur on CRP lands. This analysis gives producers a net revenue basis on which to compare the benefits of wheat production with CRP contracts. The production decision here is simplified. Potential producers utilize the neoclassical, perfectly competitive market solution of average revenue, or market price, being at least equal to average cost (AR $\geq$ AC) in order to produce in the short run (see Varian 1984 for neoclassical assumptions pertaining to a perfectly competitive market equilibrium). Each operation is assumed to have a uniform land resource based on its program yield. If AR $\geq$ AC of production occurs, then the entire CRP parcel is put into wheat production. This depiction of producer choice assumes away the variable productivity of the CRP land. Producers are viewed as both protecting their program wheat base and capitalizing on favorable market conditions by putting all of their CRP acreage into wheat production. Recent survey results indicate that most CRP contract holders will put their land into a variety of uses including barley and livestock production (McLeod et al., 1995). As risks associated with production are not explored in this analysis, net revenue resulting from wheat production tends to be overestimated. For these reasons, this analysis tends to overestimate the net revenue arising from the production of wheat.

It may be that the CRP land brought back into production will provide higher yields in the initial production periods. These yields will decline as future crops are harvested (Seavert, 1994). The possibility of initial high yields on former CRP lands is not considered in this study.

III. Data

The data come from the USDA-ERS Internet service, the Oregon State University Extension Service (Seavert et al., 1994), and the USDA-ERS publication "Wheat Situation and Outlook" (1994). Price scenarios, used to calculate net revenue schedules, are constructed from the Portland market price per bushel for soft white wheat. The Portland price has ranged from $2.87 to $4.97 since 1988. Proven program yields and CRP acreage for each contract for the five counties were obtained from the USDA Internet service. Wheat revenue per acre is then calculated by multiplying proven program yield by market price for each operation.

Costs are calculated on a per acre basis and a per bushel basis. Average costs are found using the modified enterprise budget for wheat as described in section II. As the enterprise budget has been modified to include different local wheat practices, costs vary for identical yields across the five counties.

IV. Results

The results are divided into a series of figures and tables. Table 4 indicates that most of the CRP parcels have some wheat base. Hence the wheat market is one of the more important factors for determining how much CRP land will come back into wheat production,

or be re-enrolled in a given form of the CRP. Wasco and Umatilla Counties have smaller average parcels in the CRP with higher average proven program yields. Wasco and Sherman Counties have the highest average cost per bushel. Wasco and Umatilla Counties have the highest average cost per acre. These last two results occur due to the yield-based cost functions unique to each of the counties. The per operation cost for CRP acreage is indicative of the relative size of the CRP parcels.

Figures 1 through 5 indicate the average variable cost per bushel and the associated output of winter wheat for Gilliam, Morrow, Sherman, Umatilla, and Wasco County CRP land, respectively. Each reveals an upward sloping supply schedule with the highest per bushel cost and least productive land entering production at the highest market prices. The aggregate cost graph (Figure 6) indicates that approximately 10 million bushels of wheat would be produced at a $3 per bushel market price.

Figures 7 through 11 indicate the per acre net revenue at $3 per bushel arising from wheat production on CRP land for each of the five counties. The net revenue calculated on a per acre basis can then be compared with the current $50 per acre CRP payment level, or any other payment level. The per acre net revenue for $3 wheat is less than the $50 CRP payment for all of Gilliam, Morrow, Sherman, practically all of Wasco, and a majority of Umatilla Counties' CRP acreage (see also Table 6). Note that approximately 15 percent of Umatilla County's CRP acreage with wheat base would obtain more net revenue from production than from program payments. Based solely on this short run analysis, less than 10 percent of the existing CRP acreage with wheat base would fare better out of the program than re-enrolling

in a CRP with the existing payment level at a $3 per bushel market price (Figure 12). An example of the net revenue calculations is provided below Table 3.

Figures 13 through 17 indicate the per acre net revenue at a market price of $4 per bushel arising from wheat production on CRP land for each of the five counties. The net revenue for $4 wheat is less than the $50 CRP payment level for 70 percent of Gilliam, Morrow, and Sherman, 60 percent of Wasco, and half of Umatilla Counties' CRP acreage (see Table 6). Based solely on this short run analysis, less than half of existing CRP acreage with wheat base would fare better out of the program than re-enrolling in a CRP with the existing payment level at a $4 per bushel market price (Figure 18 and Table 6).

Figures 19 through 23 indicate the per acre net revenue at $5 per bushel market price arising from wheat production on CRP land for each of the five counties. The net revenue for $5 wheat is more than the $50 CRP payment level for 80 percent of Gilliam, Morrow, and Sherman, 90 percent of Umatilla, and only 70 percent of Wasco counties' CRP acreage. Thus, over 80 percent of existing CRP acreage with wheat base would fare better out of the program than re-enrolling in a CRP with the existing payment level at a $5 per bushel market price (Figure 24).

Table 5 presents the percent of contracts that would obtain higher net revenues from wheat production at the hypothetical market price than from a $50 CRP payment. Table 5 indicates similar results to those given by the above figures except in terms of percent of contracts. Table 5 is also indicative of potential re-enrollment, given the simplifying assumptions of this analysis. Re-enrollment for a CRP at the $50 payment level would be no greater than the difference resulting from taking 100 percent minus the given percent at each

price for the county of interest. A majority of the contract holders would obtain higher net revenues from production at prices in excess of $4.

Table 6 indicates the percentage of CRP acreage that would provide higher net revenue if put into wheat fallow production, given the listed prices. The information contained in this table complements Figures 7 through 11, 13 through 17, and 19 through 23.

V. Conclusion

This paper provides simple short run static economic analysis using neoclassical economic production decision criteria. The production levels are given with the revenue and cost functions constructed as linear relations of the arguments. The analysis indicates the maximum net revenue per acre from wheat production for reasons previously given. It consequently gives the maximum amount of acreage expected to go into production for the current CRP. The net revenue per acre also indicates the acreage returning to production without CRP payments.

The net revenue calculated in section III. and IV., and shown in Figures 7 through 24, are for the harvest year of a two year production cycle. Summer fallow occurs every other year to build soil moisture to sprout the wheat when planted. Hence over a 10 year period the CRP land could earn $50 every year while production would earn a net revenue in year two, four, six, eight and 10. In other words the calculations indicate the net revenue, for various wheat prices, for an acre in production. Typically the summer fallow operation will hold part of the land base out of production in any given year in order to have a continuous flow of revenue. Thus the amount of acreage in CRP that may be converted to dryland wheat

production must earn at least $50 per year or $100 every two years in a summer fallow system to compete with the CRP program in its current form.

Another financial benefit of the CRP program is that the land enrolled in the CRP erodes less due to the grass cover, in that it is not disturbed by grazing or tilling. This land is free from the possible penalties incurred from not being in compliance (conservation compliance program). This is another cost and risk that CRP enrollees do not face.

CRP has offered risk free and low cost payment to dryland wheat producers in north central Oregon. The payment level compares very favorably with the projected economic returns to dryland wheat production on land currently enrolled in the CRP.

Readers are reminded that the practices used here are the best available representation for each county. They may vary from operation to operation. As fixed costs of production and costs of CRP grass seed and weed control are not included, the provided measures are approximate. This analysis does not provide any measures of CRP benefits such as reduced soil erosion, improved water quality, and increased wildlife habitat. The analysis provided here simply compares alternative revenue opportunities for wheat production and for CRP participation.

References

Martin, M., H. Radtke, B. Eleveld and D. Nofziger. 1988. "The Impacts of the Conservation Reserve Program on Rural Communities: The Case of Three Oregon Counties." *Western Journal of Agricultural Economics*. 13(2):225-32.

McLeod, D., S. Miller and G. Perry. 1996. "North Central Oregon Conservation Reserve Program Survey: Summary of Results." Agricultural Experiment Station Special Report 959. Oregon State University, Corvallis, OR.

Osborn, T., M. Schnepf and R. Keim. 1994. "The Future Use of Conservation Reserve Program Acres: A National Survey of Farm Owners and Operators." Soil and Water Conservation Society. Ankeny, IA.

Ray, D. and D. De La Torre Ugarte. 1995. "Conservation Reserve Program Simulations Output: An Analysis for NC-214." unpublished manuscript. Agricultural Policy Analysis Center, University of Tennessee, Institute of Agricultural, Knoxville, TN.

Seavert, C. and S. MacNab. 1994. "Enterprise Budget: Wheat, Winter, Mid-Columbia Area." EM8508. Extension Service, Oregon State University, Corvallis, OR.

Seavert, C. Extension Agent Hood River County. Personal Communication. October, 1994.

United States Department of Agriculture-National Agricultural Statistics Service and Oregon Department of Agriculture-Oregon Agricultural Statistics Service. 1994. "1993-1994 Oregon Agriculture and Fisheries Statistics." Portland, OR.

Varian, H. 1984. *Microeconomic Analysis*. 2nd edition. WW Norton, New York.

Table 1. County by County Practices on Per Acre Basis

	High Yield (>35 bu)	Low Yield (<35 bu)
Wasco County		
Chisel	2x	1x
Cultivate	1.5x	1x
Rod Weed	3x	2x
Fertilizer	70 lb. Nitrogen 5 lb. Sulfur	50 lb. Nitrogen
Herbicide	16 oz. Glyophosphate	16 oz. Glyophosphate
Wheat Seed	90 lb.	70 lb.
Gilliam County		
Chisel	2x	1x
Cultivate	1x	1x
Rod Weed	3x	2x
Fertilizer	45 lb. Nitrogen 3 lb. Sulfur	30 lb. Nitrogen
Herbicide	16 oz. Glyophosphate + 2,4D @ $5	16 oz. Glyophosphate
Wheat Seed	60 lb.	50 lb.
Morrow County		
Chisel	2x	1x
Cultivate	1x	1x
Rod Weed	2x	2x
Fertilizer	50 lb. Nitrogen	45 lb. Nitrogen
Herbicide	16 oz. Glyophosphate	12 oz. Glyophosphate
Wheat Seed	75 lb.	60 lb.
Sherman County		
Chisel	2x	1x
Cultivate	1.5x	1x
Rod Weed	2.5x	2x
Fertilizer	1 lb. Nitrogen per bushel Yield	same
Herbicide	20 oz. Glyophosphate	16 oz. Glyophosphate
Wheat Seed	75 lb.	65 lb.
Umatilla County		
Chisel	2x	1x
Cultivate	1x	1x
Rod Weed	3x	2.5x
Fertilizer	50 lb. Nitrogen 10 lb. Sulfur	45 lb. Nitrogen 5 lb. Sulfur
Herbicide	16 oz. Glyophosphate + 2,4D @ $6	12 oz. Glyophosphate + 2,4D @ $5
Wheat Seed	75 lb.	75 lb.

Table 2. Variable Costs of Winter Wheat Production, 1995, North Central Oregon ($/acre)

	Labor	Machinery	Materials	Total
Summer Fallow Establishment and Maintenance				
Chisel Plow (1x)	0.82	2.61	0	3.43
Cultivate (1x)	0.60	1.79	0	2.39
Rod Weed (1x)	0.50	1.61	0	2.11
Crop Production				
Fertilize	0.36	0.91	N + S	
Nitrogen (N) @ $0.185/lb				
Sulfur (S) @ $0.43/lb				
Drill Seed (1.1x)	1.00	5.70	Seed	
Wheat Seed @ $0.102/lb				
Herbicides	0	0	Chemical + Application	
Chemicals (16 oz. Round-up) @ $8.47/acre				
Custom Application @ $3.90/acre				
Harvest Operations				
Combine 3.5 mph (≥35bu)	1.52	7.23	0	8.75
Combine 4.0 mph (<35bu)	1.33	6.34	0	7.67
Hauling Grain	1.60	1.34	0	2.94
Marketing @ $0.525/bu				
Handling @ $0.105/bu				
Storage @ $0.15/bu				
Transportation @ $0.24/bu				
Wheat Commission @ $0.03/bu				
Other Charges				
Pick-up/Truck Repairs				
Fuel & Lube	0	2.21	0	2.21
Other Machinery	0	1.03	0	1.03
Miscellaneous	4.47	1.00	5.00	10.47
Interest				
Operating Capital	0	0	1.45	1.45

Table 3. Variable Cost per Acre Formulation

Practices at activity per acre and costs on per acre basis.

Summer Fallow: C*($3.43) + P*($2.39) + R*($2.11),

Crop Production: $1.27 + N*($0.185) + S*($0.43) + $6.70 + W*($0.102) + G*($0.53) + $3.90 + D + H + $2.94 + Y*($0.525) + $15.16,

where C = Chisel plowing,
P = Cultivating,
R = Rod Weeding,
W = Wheat seed in pounds,
G = Glyophosphate in ounces,
Y = Wheat yield in bushels,
D = Cost of 2,4 D,
N = Nitrogen fertilizer applied in pounds,
S = Sulfur fertilizer applied in pounds,
and H = Combining Costs.

Note that the above formulation includes variable costs only.

For example, suppose one is interested in knowing the net revenue for a low yield operation, in Wasco county. Using the information provided in Table 1, Table 2 and the yield acreage data provided by the USDA the following calculation would result:

Proven Yield = 25 bu/acre
200 acre operation
Wheat Combined at fast speed
Market Price = $4.00

Summer Fallow: (1)*($3.43) + (1)*($2.39) + (2)*($2.11) = $10.04,

Crop Production: $1.27 + (50)*($0.185) + (0)*($0.43) + $6.70 + (70)*($0.102) + (16)*($0.53) + $3.90 + 0 + $10.61 + $2.94 + (25)*($0.525) + $15.16 = $78.58

Total Variable Cost per acre = $88.62
Total Revenue per acre = $100.00
Net Revenue per acre = $11.38.
Total Net Revenue = $2,276.
Revenue (ignoring grass seed costs and weed control)
from $50 per acre CRP payment = $10,000.
Even if the price of wheat is at $5.00 per bushel, the CRP remains more profitable and less risky.

Table 4. Yield, Acreage and Potential Variable Cost of Wheat Production on CRP Land with Wheat Base by County, 1995

	Gilliam	Morrow	Sherman	Umatilla	Wasco
Percent of CRP Acres with Wheat Base	94	87	83	87	91
Average Operation Size (acres) in CRP with Wheat Base	511	398	495	300	298
Average Yield (bushels) per acre	31	32	31	40	34
Average Variable Cost ($/bu)	2.71	2.75	2.85	2.50	2.91
Average Variable Cost ($/acre)	81.61	85.02	83.32	95.18	91.60
Average Variable Cost per Operation ($)	42,209	33,745	40,649	28,452	27,275

Table 5. Short-run Net Revenue Compared with $50 CRP Payment Levels by County for Contract Holders

The percent of CRP contract holders with wheat base that would gain more from wheat production at various price levels than from the CRP payment at $50.

	Price Levels ($/bu)				
County	3.00	3.50	4.00	4.50	5.00
Gilliam	0	3	35	67	83
Morrow	0	14	47	66	79
Sherman	1	14	23	48	74
Umatilla	21	35	50	79	92
Wasco	5	11	30	68	73

Table 6. Short-run Net Revenue Compared with $50 CRP Payment Levels by County for CRP Acreage

The percent of CRP acreage with wheat base that would gain more from wheat production (come into production) at various price levels than from the CRP payment at $50.

	Price Levels ($/bu)				
County	3.00	3.50	4.00	4.50	5.00
Gilliam	0	3	39	71	89
Morrow	0	11	41	68	81
Sherman	0	7	28	50	71
Umatilla	16	30	53	79	91
Wasco	1	11	34	60	67

FIG. 1. GILLIAM COUNTY WHEAT
COST PER BUSHEL FOR LAND IN CRP

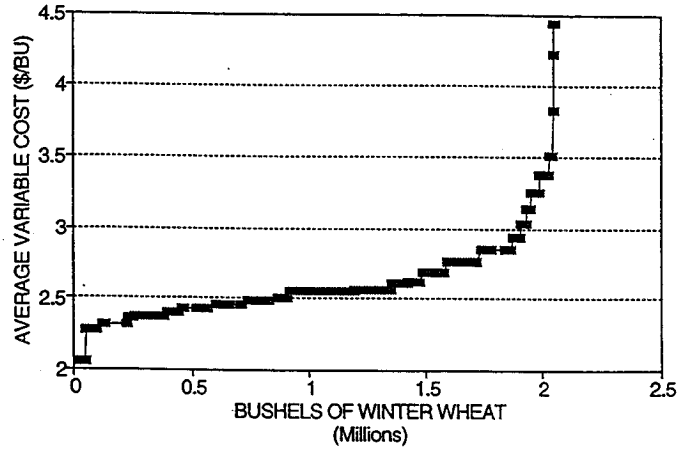

Fig. 2. MORROW COUNTY WHEAT
COST PER BUSHEL FOR LAND IN CRP

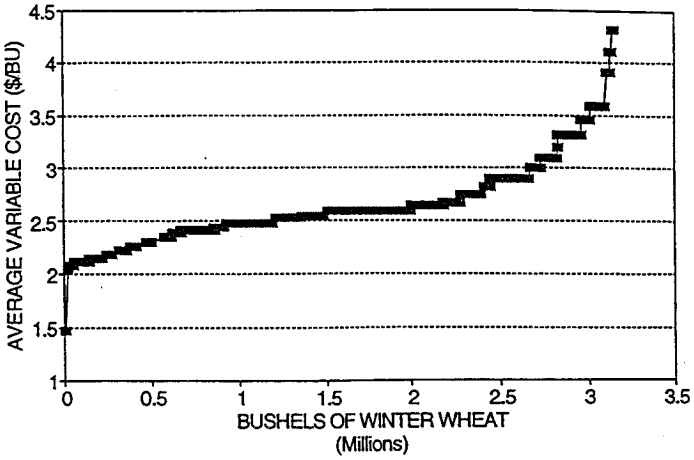

FIG. 3. SHERMAN COUNTY WHEAT
COST PER BUSHEL FOR LAND IN CRP

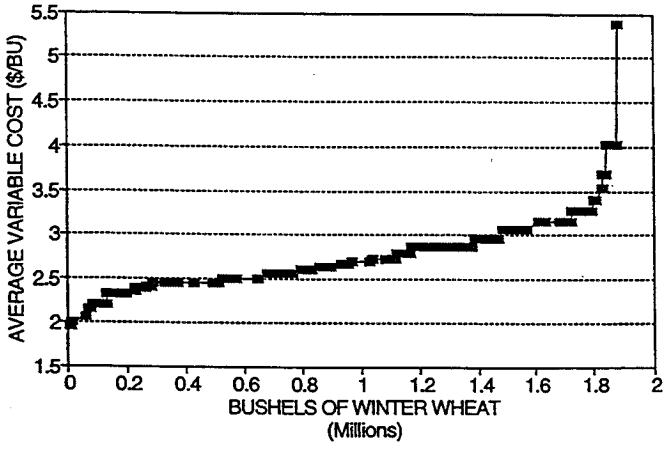

FIG. 4. UMATILLA COUNTY WHEAT
COST PER BUSHEL FOR LAND IN CRP

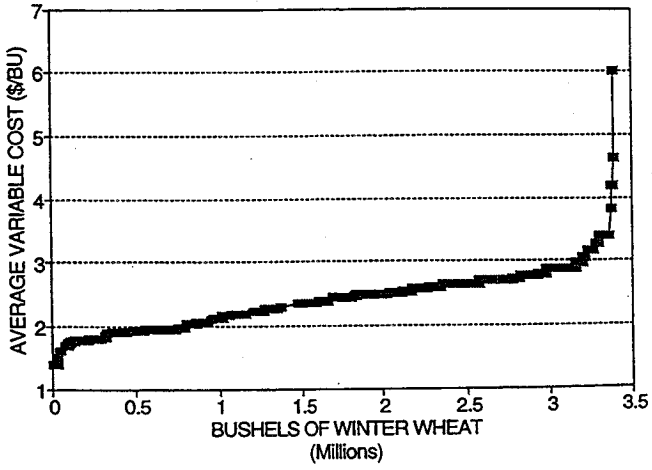

FIG. 5. WASCO COUNTY WHEAT
COST PER BUSHEL FOR LAND IN CRP

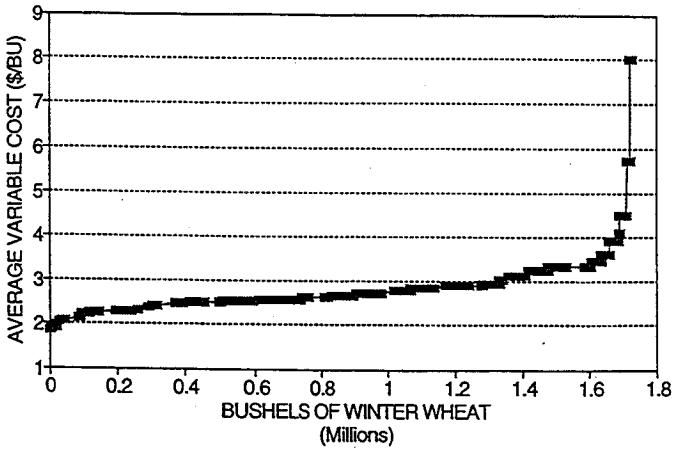

FIG. 6. COMBINED COUNTY WHEAT
COST PER BUSHEL FOR LAND IN CRP

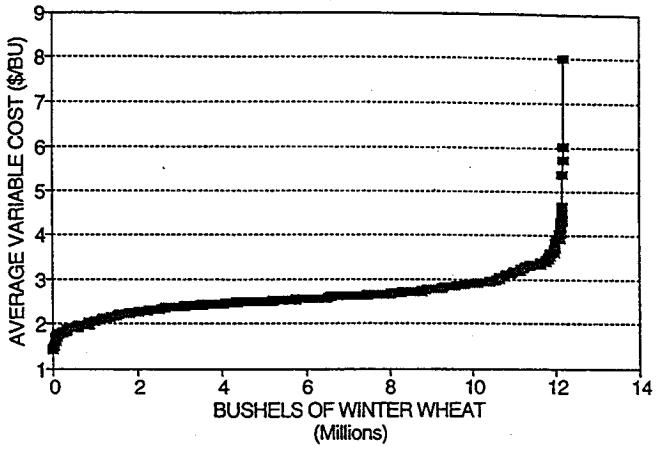

FIG. 7. GILLIAM COUNTY WHEAT
NET REVENUE PER ACRE FOR LAND IN CRP

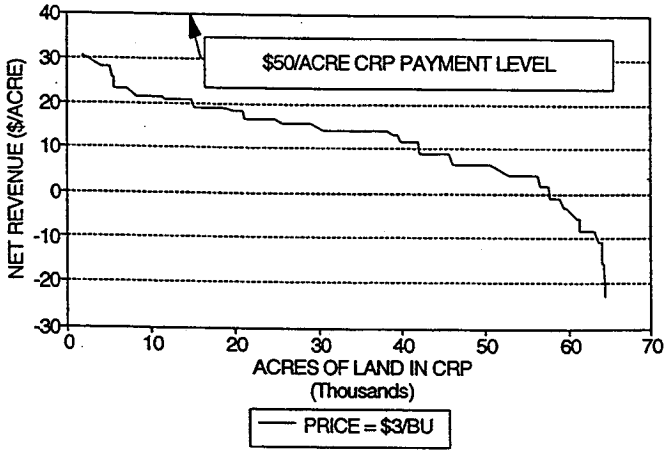

FIG.8. MORROW COUNTY WHEAT
NET REVENUE PER ACRE FOR LAND IN CRP

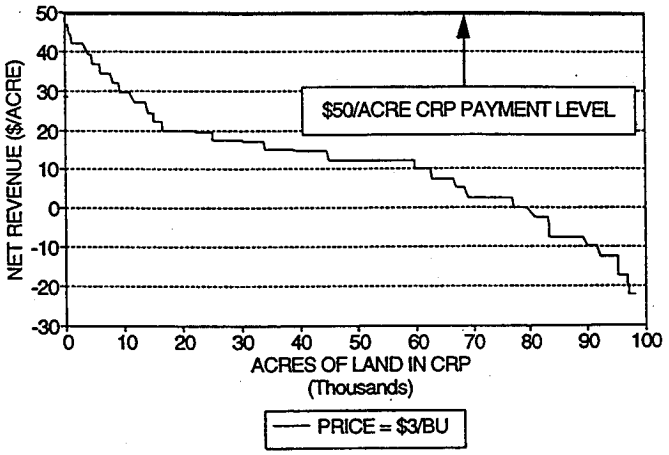

FIG. 9. SHERMAN COUNTY WHEAT
NET REVENUE PER ACRE FOR LAND IN CRP

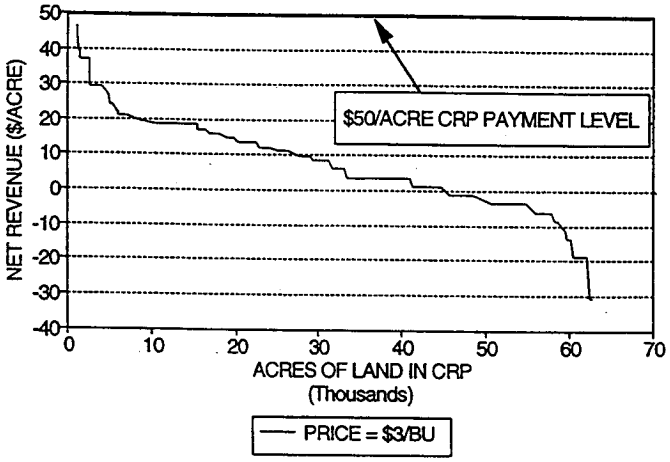

FIG. 10. UMATILLA COUNTY WHEAT
NET REVENUE PER ACRE FOR LAND IN CRP

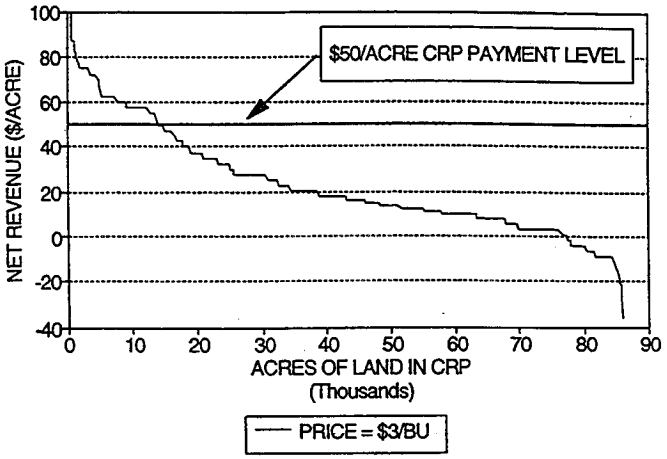

FIG. 11. WASCO COUNTY WHEAT
NET REVENUE PER ACRE FOR LAND IN CRP

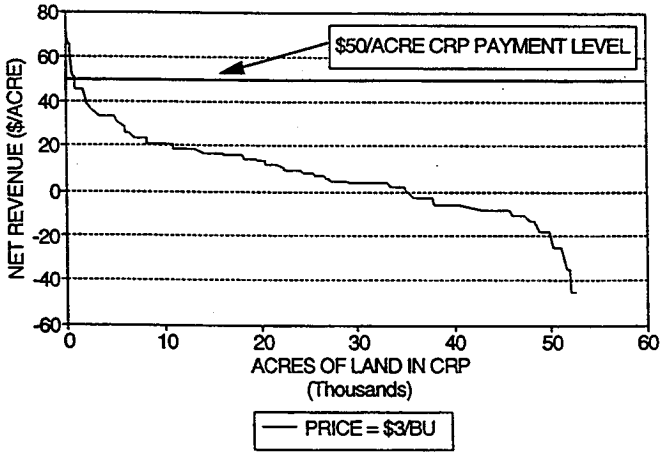

FIG. 12. COMBINED COUNTY WHEAT
NET REVENUE PER ACRE FOR LAND IN CRP

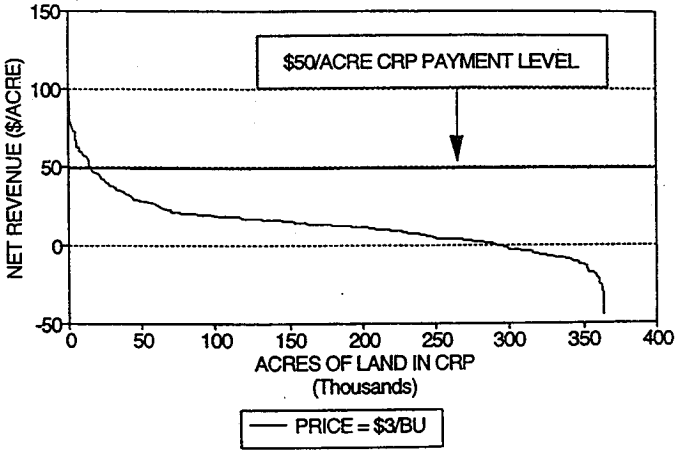

FIG. 13. GILLIAM COUNTY WHEAT
NET REVENUE PER ACRE FOR LAND IN CRP

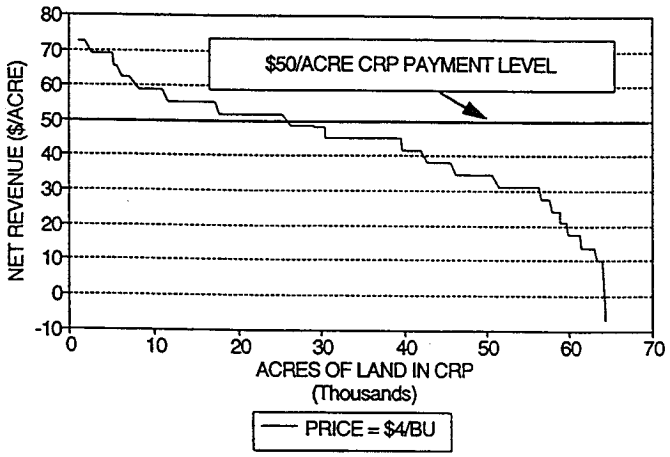

FIG.14. MORROW COUNTY WHEAT
NET REVENUE PER ACRE FOR LAND IN CRP

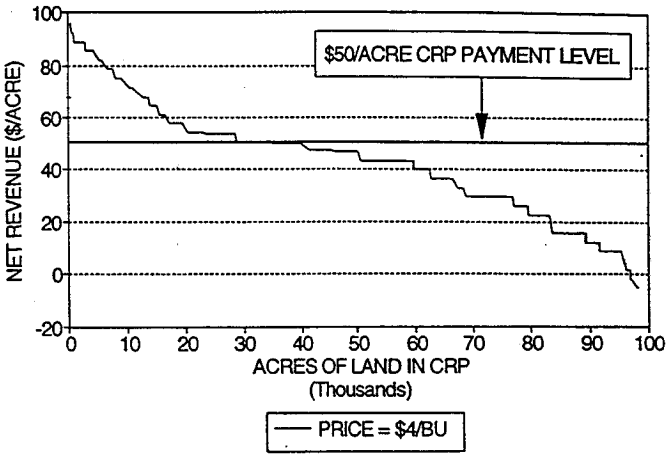

FIG. 15. SHERMAN COUNTY WHEAT
NET REVENUE PER ACRE FOR LAND IN CRP

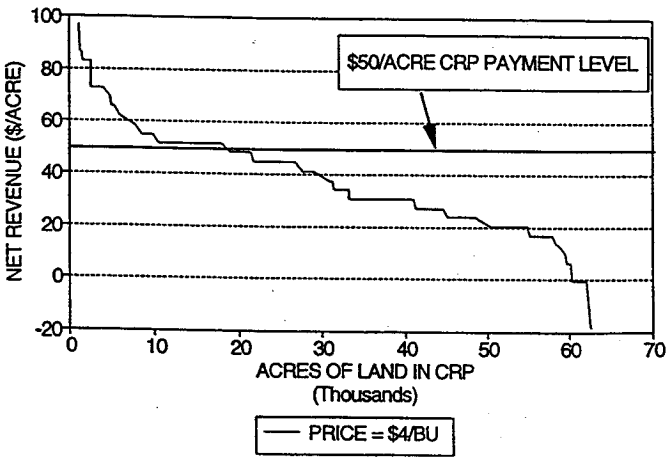

FIG. 16. UMATILLA COUNTY WHEAT
NET REVENUE PER ACRE FOR LAND IN CRP

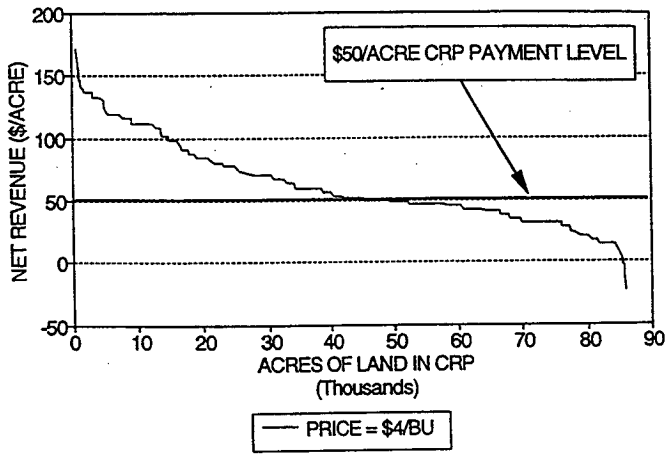

FIG. 17. WASCO COUNTY WHEAT
NET REVENUE PER ACRE FOR LAND IN CRP

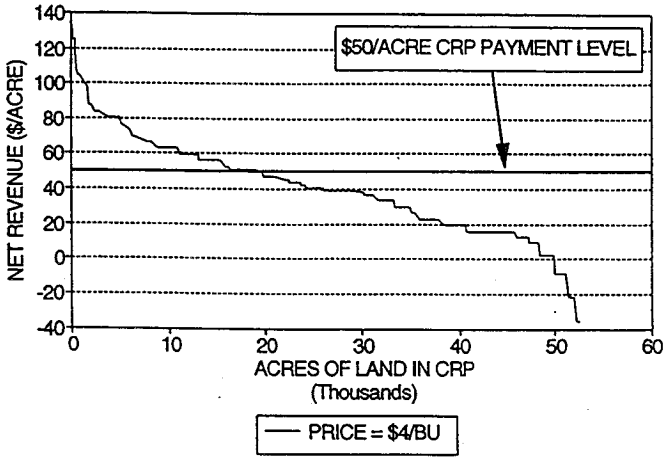

FIG. 18. COMBINED COUNTY WHEAT
NET REVENUE PER ACRE FOR LAND IN CRP

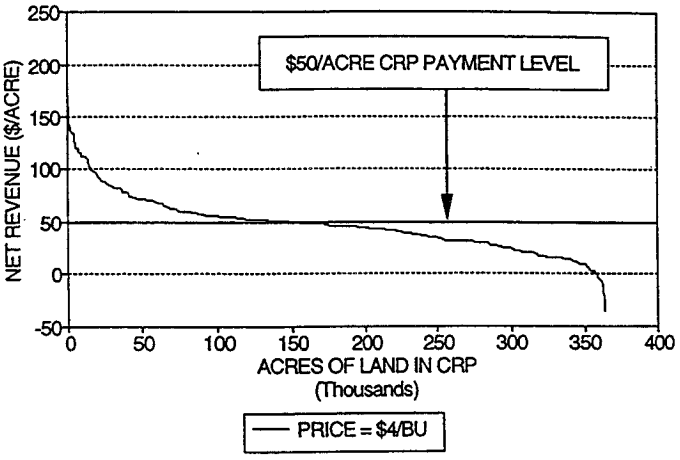

FIG. 19. GILLIAM COUNTY WHEAT
NET REVENUE PER ACRE FOR LAND IN CRP

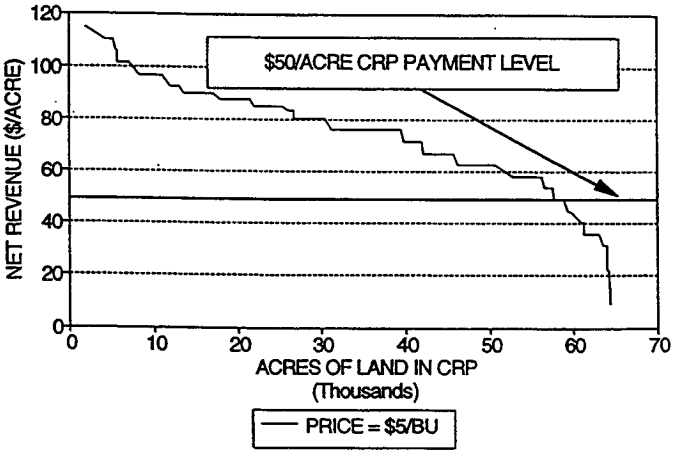

FIG.20. MORROW COUNTY WHEAT
NET REVENUE PER ACRE FOR LAND IN CRP

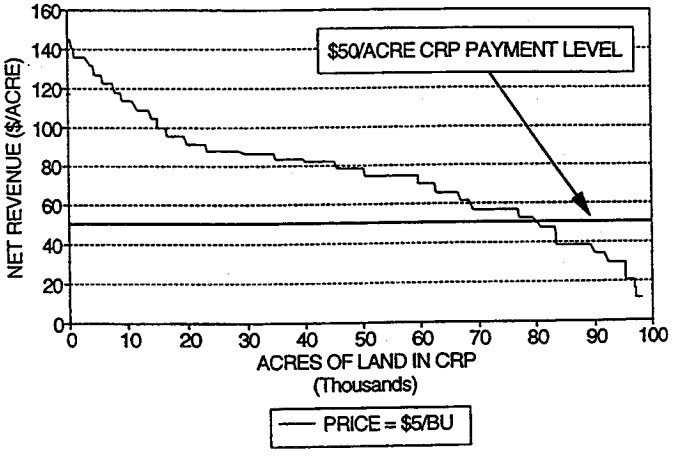

FIG. 21. SHERMAN COUNTY WHEAT
NET REVENUE PER ACRE FOR LAND IN CRP

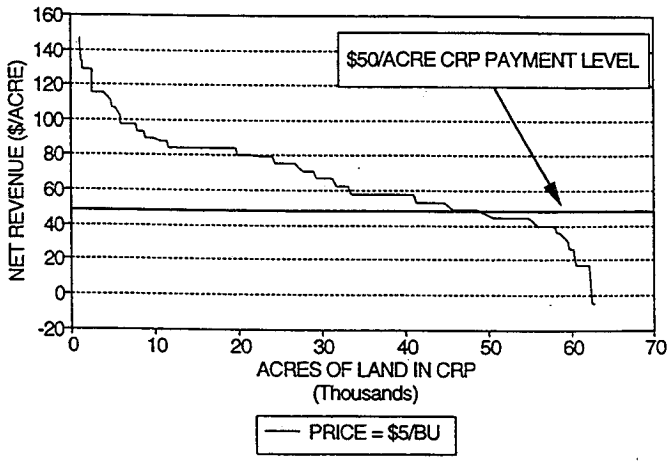

FIG. 22. UMATILLA COUNTY WHEAT
NET REVENUE PER ACRE FOR LAND IN CRP

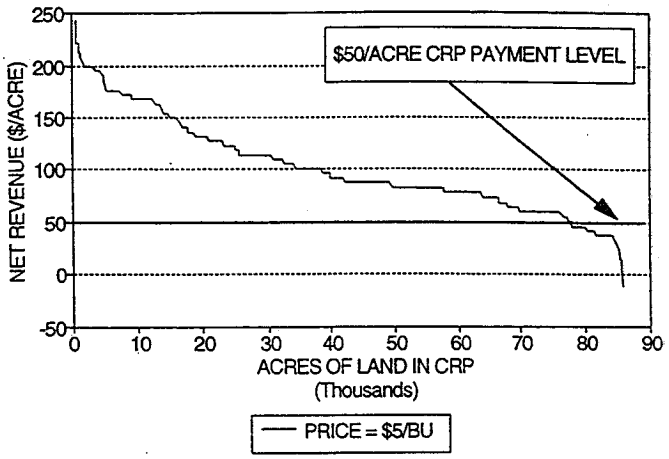

FIG. 23. WASCO COUNTY WHEAT
NET REVENUE PER ACRE FOR LAND IN CRP

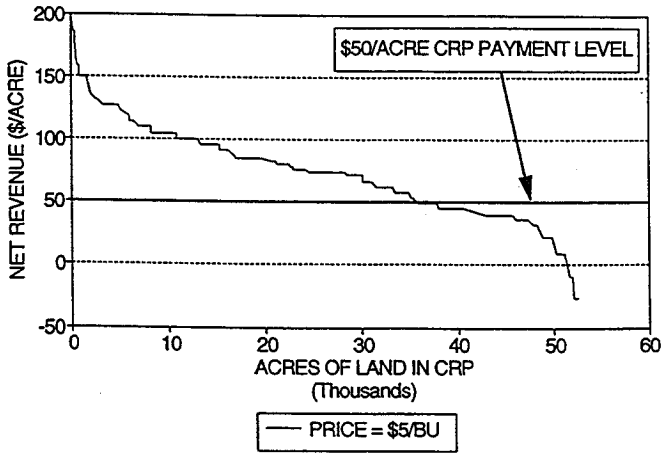

FIG. 24. COMBINED COUNTY WHEAT
NET REVENUE PER ACRE FOR LAND IN CRP