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# Report

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## 1990 Indiana Farm Finance Survey\*

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The Indiana Farm Finance Survey for 1990 indicates the financial condition of many Hoosier farmers improved from 1989 to 1990, causing many farm financial indicators to return to levels recorded just prior to the 1988 drought. In particular, the delinquency rate for real estate loans, debt-asset ratios, percentages of respondents with debt-asset ratios exceeding 40 and 70 percent, percentage of respondents unable to get loan funds, and the percentage of debt held by respondents who were technically insolvent all fell to levels equal to or slightly lower than those recorded for 1988. The delinquency rate for nonreal estate loans and the percentage of respondents turned down when applying for a loan were higher in 1990 than in 1988, but much lower than in 1986. Farmers have continued to reduce total debt and adopt management practices which increase their efficiency. Also, farmers' purchases of machinery have recovered substantially from the depressed levels of the mid-1980s.

Indiana Farm Finance Surveys were conducted in March-May 1985, March-June 1986, March-June 1988, and April-June 1990, by the Departments of Agricultural Economics and Agricultural Statistics at Purdue University. An abbreviated survey of a smaller sample was conducted in February-March 1989. This article reports on the 1990 survey, compares the 1990 results to the findings for 1988 and to selected findings for 1986 and 1989, describes the financial strength of Indiana farmers following the 1988 drought period, and draws inferences regarding the capacity of farmers to adjust successfully to financial problems that may occur in the future.

\$     \$     \$     \$     \$

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### Procedure

In April 1990, a farm finance questionnaire was sent to about 5,000 Indiana farmers by the Department of Agricultural Statistics at Purdue University. Approximately 1,000 farmers who had responded to the 1988 farm finance questionnaire were included in the sample, together with a random sample of an additional 4,000 farmers. Approximately four weeks after the initial mailing, a reminder questionnaire was mailed to farmers who had not yet responded to the mail questionnaire. (See Authors' note) The number of questionnaires containing completely usable or partially usable responses was 2,169 for a response rate of 43 percent. However, as noted in the summary tables, the number of usable responses varied substantially from question to question.

Results are reported as statewide averages for Indiana, and regionally for the northern, central, and southern regions of the state. The regions represent the Indiana statistical reporting districts, and are noted on the map in Figure 1.

### Characteristics of Respondents

Respondents averaged 52 years of age and had 26 years of experience as a farm operator. The number of acres operated by respondents in 1990 was greater than in 1988. The number of acres operated by respondents in the central region was about 122 acres greater than the number operated by those in the southern region (Table 1).

Livestock enterprises provided a smaller percentage of farm income to respondents than crops. Seventy-one percent obtained half or less of their gross farm income from livestock or livestock products, and twenty-nine percent of the farmers obtained more than half of their gross farm income from livestock enterprises. Thirty-eight percent of the respondents reported no livestock income.

### Financial Condition of Indiana Farmers

**Gross and Net Farm Income.** Gross farm income is the income generated by a farm before expenses are subtracted. In the 1990 survey, income figures are for calendar year 1989. An arbitrary cutoff point sometimes used for differentiating between part-time and full-time farms is \$100,000 of

gross farm income. If the \$100,000 cutoff point is used, about 28 percent of the respondents would have represented full-time farms and 72 percent part-time farms in 1989 (Table 2). The comparable figures for 1987 regarding full-time and part-time farmers were 30 percent and 70 percent, respectively. In southern Indiana only 19 percent of the respondents had 1989 gross farm incomes greater than \$100,000, while 32 percent and 31 percent fell into that category in central and northern Indiana, respectively.

These figures indicate that there are many operators of smaller, part-time farms in Indiana of whom many obtain large percentages of their income from nonfarm sources. Because the financial problems on part-time farms may differ from those on full-time farms, certain statistics will be presented separately in the article for farmers with gross incomes of less than \$100,000 per year and for farmers with gross incomes exceeding this total.

Net cash farm income was defined as total cash receipts minus total cash operating expenses. Net farm income was defined as net cash farm income minus depreciation.

Net farm income is commonly defined as the return to unpaid operator and family labor, management, and equity capital. Viewed another way, net farm income plus depreciation allowances represent the amount of money available to repay the principal on intermediate and long-term debt, purchase capital assets, pay family living expenses, pay income taxes, and retain as a financial reserve in the farming operation.

About 17 percent of the respondents reported net cash farm incomes for 1989 in the loss category; about 25 percent of the respondents reported net farm incomes falling in the loss category (Table 2). The 25 percent figure is about the same as reported for 1987, a very profitable year for many Hoosier farmers. The percentage of respondents reporting net losses in 1989 was largest in southern Indiana.

Figure 1: Geographic areas used in the Indiana Farm Finance Survey, 1990.

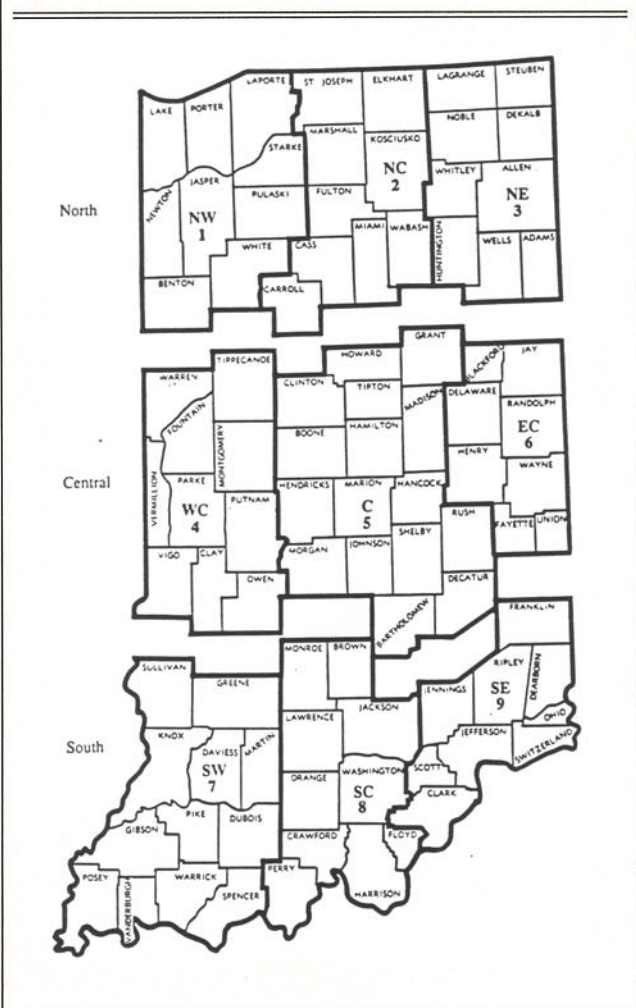


Table 1: Respondents' age, experience as farm operator, acres farmed, and percentage of income obtained from sale of livestock and livestock products, 1988 and 1990.

Characteristics of respondents	North 1990	Central 1990	South 1990	State		Number of usable responses in 1990 <sup>a</sup>
				1988	1990	
Age (years)	50.3	52.8	52.7	51.4	51.9	2,169
Years as farm operator	25.4	26.9	25.9	25.7	26.1	2,111
<b>Acres in farming operation:</b>						
a. Owned	163.8	183.5	175.0	187.0	174.1	
b. Rented from others	209.3	258.9	139.5	182.7	206.6	
c. Rented to others	<u>5.2</u>	<u>12.1</u>	<u>6.4</u>	<u>9.1</u>	<u>8.0</u>	
Total acres operated (a + b - c)	367.9	430.3	308.1	360.6	372.7	1,946
<b>Percentage of gross farm income obtained from livestock or livestock products:<sup>b</sup></b>						
Zero	45.4%	37.9%	28.6%	35.9%	37.9%	
1% to 25%	16.0	26.6	20.4	19.1	21.1	
26% to 50%	9.7	14.2	11.0	11.8	11.7	
51% to 75%	11.3	10.6	10.4	12.7	10.8	
Over 75%	<u>17.5</u>	<u>10.6</u>	<u>29.6</u>	<u>20.5</u>	<u>18.6</u>	
	99.9%	99.9%	100.0%	100.0%	100.1%	2,102

a Some responses for items were not usable because of missing numbers, inconsistencies and other reasons.

b Represents the percentage of respondents falling in each category relating to percentage of income obtained from livestock or livestock products.

About 79 percent of the respondents had net farm incomes of less than \$20,000 in 1989, equal to the comparable number for 1987. The percentage of respondents reporting net farm incomes of less than \$20,000 has declined from 85 percent in 1985 to 79 percent in 1989.

Many Indiana farmers supplement farm income with income from nonfarm sources, which can reduce the problems created by low net farm incomes. Nonfarm income was defined to include the earnings of the farmer and spouse from off-farm jobs, earnings from sales of goods and services (e.g., seed corn, welding services, baked goods, sewing, etc.) and earnings from nonfarm investments.

The average nonfarm income was about \$26,000, but varied by reporting district. The lowest average nonfarm income figure (\$17,820) among the Indiana statistical reporting districts was in the northwestern district (Table 3). The central and southern parts of this district consist of predominantly rural counties. Moreover, farmers tend not to commute long distances to off-farm work; respondents to a 1987 nonfarm income survey for Indiana commuted an average of only 14.5 miles (one-way) to off-farm jobs [1]. The northwestern district also includes many operators of large commercial farms who tend to obtain smaller incomes from off-farm sources.

Larger nonfarm incomes obtained by respondents in the central, south central and southeastern agricultural statistics districts probably reflect the close proximity of those districts to the job markets of Indianapolis; Louisville, Kentucky; and Cincinnati, Ohio, respectively.

Nonfarm income of the farmers with less than \$100,000 of gross sales exceeded that for the larger farmers (Table 3). This pattern probably reflects the heavy demands placed on the operators of larger farmers for on-farm work, the smaller

number of cases on larger farms where both the farmer and spouse work off the farm, incomes generated on the larger farms which lessen the need for off-farm work, and other factors.

**Balance Sheet Information.** A balance sheet shows assets (what is owned), liabilities (what is owed), and owner equity. Respondents provided an estimate of their nonreal estate and real estate assets and liabilities. A word of caution is that the real estate and farm machinery values which made up a large portion of each respondent's balance sheet are subject to the possible biases of the individual respondents. No mechanism was employed to reduce these potential biases.

The average value of farm real estate assets reported by respondents as of January 1, 1990 was \$256,597, ranging from \$210,719 in southern Indiana to \$279,165 in central Indiana (Table 4). Farm nonreal estate assets averaged \$131,248 in value for the state, exhibiting their lowest value (\$101,215) in southern Indiana and their highest value (\$144,073) in northern Indiana.

For all respondents, the average amount of real estate debt was \$60,470, ranging from \$42,608 in southern Indiana to \$73,128 in central Indiana. Their nonreal estate debt (state average) was \$29,775, varying from \$18,301 in southern Indiana to \$37,813 in central Indiana. For Indiana, from 1988 to 1990 the average amount of real estate debt owed by the respondents declined by 8.6 percent; while the amount of nonreal estate debt increased by the same percentage.

Nonreal estate debt probably increased from 1988 to 1990 because of reduced advanced deficiency payments and Commodity Credit Corporation loans which increased farmers' needs for short-term production credit during this

Table 2: Gross and net farm income of respondents, 1987 and 1989.

Farm income category <sup>a</sup>	North	Central	South	State		Usable responses for 1989
	1989	1989	1989	1987	1989	
	----- Percent -----					
<i>Gross income categories</i>						
Less than \$10,000	16.5	20.7	36.2	22.8	23.8	
\$10,000 to \$39,999	29.1	23.0	28.7	27.7	26.8	
\$40,000 to \$99,999	23.1	24.0	16.6	19.3	21.5	
\$100,000 to \$249,999	21.4	20.7	11.9	20.0	18.4	
\$250,000 to \$499,999	6.6	8.6	5.4	7.0	6.9	
\$500,000 and over	<u>3.3</u>	<u>3.0</u>	<u>1.3</u>	<u>3.2</u>	<u>2.6</u>	
Totals	100.0	100.0	100.1	100.0	100.0	2,089
<i>Net cash farm income categories</i>						
Net Loss	13.1	16.0	22.6	15.3	16.9	
\$0 to \$4,999	21.1	21.1	29.7	24.6	23.6	
\$5,000 to \$9,999	14.2	15.4	15.9	13.0	15.1	
\$10,000 to \$19,999	17.8	15.9	14.3	16.6	16.1	
\$20,000 to \$49,999	22.5	20.4	11.6	20.1	18.6	
\$50,000 and over	<u>11.3</u>	<u>11.2</u>	<u>5.8</u>	<u>10.4</u>	<u>9.7</u>	
Totals	100.0	100.0	99.9	100.0	100.0	1,914
<i>Net farm income categories</i>						
Net Loss	20.8	23.8	31.0	23.6	24.8	
\$0 to \$4,999	21.7	24.6	30.3	26.4	25.2	
\$5,000 to \$9,999	15.0	12.9	15.0	13.1	14.2	
\$10,000 to \$19,999	19.4	14.7	10.8	15.6	15.3	
\$20,000 to \$49,999	16.4	16.3	9.7	15.3	14.5	
\$50,000 and over	<u>6.8</u>	<u>7.7</u>	<u>3.2</u>	<u>6.0</u>	<u>6.0</u>	
Totals	100.1	100.0	100.0	100.0	100.0	1,867

<sup>a</sup> Income categories were defined to include income obtained from government payments. Net cash farm income equals total cash receipts minus total cash expenses. Net farm income equals net cash farm income minus depreciation.

period. Also, it probably reflects the financing of machinery purchases, which increased during the period.

Owner equity (total assets minus total liabilities) averaged \$297,600 for the state. It was highest in northern Indiana (\$321,489) and lowest in southern Indiana (\$251,025) (Table 4). The average owner equity of respondents was 5.5 percent higher in 1990 than in 1988.

The statewide average debt-asset ratio of 24.3 percent as of January 1, 1990 (Table 4) improved modestly compared to 1988. The ratio was highest in central Indiana (26.8%) and lowest in southern Indiana (20.2%).\*

The percentage of all respondents carrying real estate and nonreal estate debt in 1990 and the average interest rates paid by the respondents on the debt are listed in Table 4. Note that about 39 percent of all respondents reported zero debt in 1990. About 48 percent of the respondents in southern Indiana reported they had no debt on January 1, 1990.\*\*

Nearly 42 percent of the respondents made principal payments on real estate loans that were in addition to scheduled payments during the past year. The comparable figure was 55 percent for nonreal estate loans.

For Indiana, respondents reported they paid interest rates on real estate and nonreal estate debt in 1990 which averaged 10.2 percent and 11.7 percent, respectively.

Harrington [2] and other authors of USDA publications have employed debt-asset ratios to describe the amount of financial stress facing farmers, as follows:

Debt-asset ratio	Status of farmer
Under 40%	No apparent financial problems
40% - 70%	Serious financial problems
70% - 100%	Extreme financial problems
Over 100%	Technically insolvent

About 25 percent of those responding to the Indiana survey had debt-asset ratios exceeding 40 percent in 1990,

down from the 26 percent found in 1988. Eight percent had debt-asset ratios exceeding 70 percent in 1990, the same as in 1988. The guidelines in the USDA classification suggest that about one-quarter of all Indiana respondents face serious financial problems, extreme financial problems, or technical insolvency; however, this tends to overstate the problem. For example, some skilled managers who carry a relatively small proportion of their debt in the form of land debt may be in satisfactory financial condition despite having a debt-asset ratio exceeding 40 percent. In addition, farmers' net incomes have increased substantially since 1985 and may increase again in 1990. This means more farmers now have sufficient income to service 40 percent or more debt. Additional analyses involving subsets of respondents and cross-tabulations are presented later in the article to assess more fully the meaning of the debt-asset ratio figures.

Thirty-three percent of respondents reporting gross farm incomes of \$100,000 or more had debt-asset ratios exceeding 40 percent in 1990, which is essentially equal to the 34 percent in 1988. About 9.8 percent had debt-asset ratios exceeding 70 percent in 1990, down from the 12.6 percent in 1989 and about the same as in 1988.

**Delinquency Rates.** A second measure of financial condition is the rate of delinquency of loan payments. Those respondents having real estate loans (49.4% of all respondents) were asked if their principal and interest payments were current. For those respondents, 4.9 percent said "no" (Table 4). This is more than one percentage point lower than the 6.1 percent reported in 1988. This figure, which is nearly four percentage points lower than the percentage reported for 1985 and 1986, underscores the improvement that has occurred in farm real estate lending. Also, about 41 percent of those who were delinquent on their real estate loans were current on the interest payments and delinquent only on principal payments. The same question was asked about nonreal estate loans. About 7.9 percent of the respondents having nonreal estate loans indicated that their principal and interest payments were not current (Table 4), which is 2.2 percentage points higher than the figure reported in 1988. Comparable figures for 1985 and 1986 were 22 and 14 percent, respectively.

**Loan Requests Rejected.** A third indicator of the financial condition of farmers is the percentage of loan applications turned down. Respondents were asked if they were turned down for a 1990 farm loan and, if so, why the loan

\* A word of caution should be extended about the reliability of this ratio as an indicator of the financial condition of Indiana farmers. First, the total debt component of the ratio does not take into account how the debt is structured, which can influence the ability of a farmer to service and repay debt. Secondly, the problems discussed earlier about how difficult it is to establish a value for farm assets should be remembered. Finally, the change in the amount of owner equity can be the result of a profit or loss in a previous year and/or the result of an increase or decrease in the asset values. Without an income statement and the knowledge of asset values on the previous balance sheet, it is difficult to identify the reasons for the change in owner equity for an individual operation.

\*\* The percentage with \$100,000 of gross farm income carrying zero debt in 1990 is considerably lower than the percentage of all respondents. Only about 17 percent of the full-time farmers reported zero debt in 1990.

Table 3: Average gross nonfarm income of respondents and spouses by agricultural statistics district and gross farm income category, 1989.

Location and income category	Gross nonfarm income <sup>a</sup>	Usable responses for 1989
<i>Agricultural statistics district</i>		
Northwest	\$17,820	
North central	25,567	
Northeast	23,396	
West central	25,826	
Central	28,879	
East central	26,408	
Southwest	24,716	
South central	31,329	
Southeast	29,068	
Average for state	\$26,039	1,769
<i>Gross farm income category</i>		
\$0 to \$9,999	33,166	
\$10,000 to \$39,999	29,372	
\$40,000 to \$99,999	24,574	
\$100,000 to \$249,999	16,433	
\$250,000 to \$499,999	17,100	
\$500,000 and over	23,593	
Average for state	25,809	1,714

a Includes wages from off-farm jobs, earnings from sales and services, e.g., seed corn, welding services, baked goods, sewing, etc., and earnings from nonfarm investments.

request was rejected. Only results for respondents who actually applied for a loan were considered. Of the 457 respondents indicating they applied for a loan about 11.6 percent indicated they were turned down, which is up from 7.9 percent in 1988 (Table 4), but down considerably from the more than 16 percent reported in 1986.

The reasons their loan applications were rejected are ranked in order of frequency of mention, and appear in the following schedule:

Reason loan request was rejected	Percentage of total reasons
Low farm income	29%
Insufficient equity	21
Lender not interested in making agricultural loans	16
Previous loan repayment problems	14
Other	<u>20</u>
TOTAL	100%

The percentage of respondents who indicated they were turned down because the lender is not interested in making agricultural loans, 16 percent, is two percentage points lower than the percentage found in 1988, 18 percent.

Respondents whose loan requests were rejected were asked if they eventually obtained loan funds for the 1990 crop year. Seventy-one percent of these respondents said "yes". Thus, about three percent of those who applied for loans for the 1990 crop year (15 of 457) were unable to get loan funds, which equals the comparable figure in 1988. The sources of loan funds for the seventy-one percent who eventually received loans, ranked in order of frequency of mention, were as follows:

Source of loan funds	Percentage of total sources
Lenders other than FmHA	24%
Farm suppliers	22
Relatives	18
FmHA	16
Machinery dealers	2
All other sources	<u>18</u>
TOTAL	100%

The 16 percent of the respondents who received loans from FmHA is down 4 percentage points from the 20 percent reported in 1988. This decline probably reflects the move by FmHA away from insured loans to guaranteed loans.

Respondents were asked to indicate how credit services (e.g., record programs, financial counseling, market information, etc.) provided by lenders have changed during the past year. One-half of the respondents indicated there had been no change in services and 41 percent indicated the question did not apply to them. Seven percent of the respondents indicated credit services have increased; whereas, only two percent indicated services decreased.

Change in credit service	Percentage of respondents
No change	50%
Not Applicable	41
Increased	7
Decreased	<u>2</u>
TOTAL	100%

During the past 12 months, Indiana farmers have expressed concerns to the authors about the availability of loan funds and credit services. The concerns are that some

Table 4: Balance sheet, debt, loan repayment, interest rate, delinquency rate, and loan rejection rate information for respondents, 1988 and 1990.

Item	North 1990	Central 1990	South 1990	State		Usable responses for 1990
				1988	1990	
<b>Balance sheet information:</b>						
Real estate assets (\$)	\$268,894	\$279,165	\$210,719	\$244,581	\$256,597	
Nonreal estate assets (\$)	144,073	141,394	101,215	131,040	131,248	
Real estate liabilities (\$)	61,159	73,128	42,608	66,188	60,470	
Nonreal estate liabilities (\$)	30,319	37,813	18,301	27,409	29,775	
Owner Equity (\$)	321,489	309,618	251,025	282,024	297,600	
Debt (liability)/asset ratio (%)	24.9	26.8	20.2	24.9	24.3	1,485
<b>Percentage of respondents with:</b>						
Real estate debt	50.6	52.4	44.3	48.9	49.4	2,128
Nonreal estate debt	45.1	48.2	34.1	41.4	43.0	2,104
No real estate or nonreal estate debt	36.2	34.4	48.3	39.9	39.1	2,099
<b>Percentage of respondents who made principal payments in addition to scheduled payments in the past year on:</b>						
Real estate loans	45.3	39.5	40.5	44.8	41.9	972
Nonreal estate loans	57.3	55.8	50.3	56.4	55.2	783
<b>Interest rate paid on:</b>						
Real estate debt (%)	10.0	10.1	10.4	9.6	10.2	1,022
Nonreal estate debt (%)	11.6	11.6	11.9	10.6	11.7	867
<b>Percentage of respondents delinquent on principal and/or interest payments for:</b>						
Real estate loans	3.2	4.0	8.4	6.1	4.9	1,041
Nonreal estate loans	7.9	6.4	10.7	5.7	7.9	882
<b>Percentage of respondents turned down when applying for a loan</b>						
	9.6	11.0	16.0	7.9	11.6	457

lenders in Indiana have stopped making loans to farmers and this has resulted in a shortage of loan funds for farmers. No evidence was found in this study to support the claim there is a shortage of loan funds or a decrease in credit services to farmers.

### Additional Information on the Incidence of Farm Financial Stress

**Debt-Asset Ratios by Farm Size.** Table 5 shows the percentage of all farmers and the percentage of farmers with gross incomes exceeding \$100,000 per year that fell in the different debt-asset ratio categories in 1990. About one-fourth of all respondents had debt-asset ratios of 40 percent or more compared to one-third of those with gross incomes over \$100,000. The percentage of respondents in this higher debt category declined about one percentage point for all farmers as well as for those with higher gross incomes (Table 5).

**Amount of Debt Owed by Respondents in Different Debt-Asset and Gross Farm Income Categories.** Debt is concentrated in the hands of respondents in the higher debt-asset ratio categories. As noted below, about 25 percent of the debt was owed by respondents with debt-asset ratios of 70 percent or higher with about six percent of the debt owed by respondents who were technically insolvent. However, the six percent is down from eight percent in 1989 and from 9.9 percent reported in 1988. The reduction is probably due to loan write-downs by lenders. The two percent of the respondents who are technically insolvent and some respondents in the 70.0 percent to 99.9 percent debt-asset ratio category presumably are vulnerable to any future financial adversities encountered.

Debt-asset ratio category	Percent of respondents	Percent of debt
Under 40.0%	75.1%	38.0%
40.0% - 69.9%	16.6	37.0
70.0% - 99.9%	6.2	18.8
100.0% and over	<u>2.1</u>	<u>6.1</u>
TOTAL	100.0%	99.9%

**Table 5: Distribution of farms according to debt-asset ratio for all farmers in surveys and farmers in surveys with gross farm incomes exceeding \$100,000 per year.**

Year and debt-asset ratio category	Percent of respondents in category based on figures for	
	All farms	Farms with gross incomes exceeding \$100,000
<b>1988 debt-asset ratio:</b>		
Under 40.0%	74.3%	65.9%
40.0% - 69.9%	17.5	24.0
70.0% - 99.9%	5.0	6.8
100.0% and over	<u>3.2</u>	<u>3.3</u>
Totals	100.0%	100.0%
<b>1990 debt-asset ratio:</b>		
Under 40.0%	75.1%	67.0%
40.0% - 69.9%	16.6	23.2
70.0% - 99.9%	6.2	7.8
100.0% and over	<u>2.1</u>	<u>2.0</u>
Totals	100.0%	100.0%

Debt is also concentrated in the hands of larger farmers. In 1990, respondents with gross farm income exceeding \$100,000 per year owed 69 percent of the debt even though they made up only 39 percent of total respondents who answered the question.

### Farmer Responses to the Financial Situation

Farmers were asked to identify the adjustments that they had made during the past 12 months and those they expected to make during the next 12 months to deal with the farm financial situation. The adjustments checked by respondents, ranked according to frequency of mention using the state figures, appear in Table 6. Each adjustment made or expected to be made, which accounted for less than five percent of the total, was lumped together in the "other adjustments" item in Table 6.

**Past 12 Months.** The adjustments made during the previous 12 months that were most frequently mentioned by respondents were "reduced debt", "purchased additional machinery", "increased off-farm work", "bought crop insurance", and "kept more complete records" (Table 6). Adjustments made during the past 12 months can be categorized as changes which helped them to reduce costs (e.g., those relating to reducing debt, and hiring others to do

**Table 6: Adjustments made by respondents in farming operations to deal with the farm financial situation.**

Adjustment item and period	Percentage of total adjustments accounted for by item			
	North	Central	South	State
<b>Past 12 months</b>				
Reduced debt	13.7	12.5	12.6	12.9
Purchased additional machinery	12.6	11.6	11.0	11.8
Increased off-farm work	8.5	7.7	9.4	8.4
Bought crop insurance	6.5	7.6	4.9	6.6
Kept more complete records	6.2	7.2	6.0	6.5
Hired others to do custom work with their machinery	5.8	6.1	5.9	5.9
Increased or added a livestock enterprise	5.3	5.4	6.9	5.7
Used my machinery to do custom work for others	4.8	5.9	5.3	5.3
Other adjustments <sup>a</sup>	<u>36.6</u>	<u>36.0</u>	<u>38.1</u>	<u>36.8</u>
Totals <sup>b</sup>	100.0	100.0	100.1	99.9
<b>Next 12 months</b>				
Reduce debt	15.8	14.5	13.1	14.6
Purchase additional machinery	11.1	9.6	8.0	9.7
Increase or add a livestock enterprise	7.8	7.8	11.1	8.7
Keep more complete records	7.8	8.5	7.4	8.0
Increase off-farm work	8.8	7.2	7.2	7.8
Farm more land	6.5	6.8	6.1	6.5
Hire others to do custom work with their machinery	5.0	5.8	6.1	5.6
Use my machinery to do custom work for others	5.2	5.7	4.6	5.2
Reduce living expenses	4.1	5.5	6.1	5.2
Other adjustments <sup>a</sup>	<u>27.9</u>	<u>28.6</u>	<u>30.3</u>	<u>28.7</u>
Totals <sup>c</sup>	100.0	100.0	100.0	100.0

<sup>a</sup> Adjustments, each of which accounted for less than 5% of the state total.

<sup>b</sup> In 1990 usable responses were 1,257.

<sup>c</sup> In 1990 usable responses were 1,119.

custom work), to diversify and reduce risks (e.g., used my machinery to do custom work for others, adding or expanding livestock enterprises, increasing off-farm work and buying crop insurance), and to measure more accurately farm costs and returns (e.g., keeping more complete records).

**Next 12 Months.** Many of the adjustments planned for the next 12 months by the respondents are similar to those made during the previous 12 months and to those reported on previous surveys.

"Reducing debt" topped the list followed by "purchasing additional machinery", "increasing or adding a livestock enterprise", "keeping more complete records", "increasing off-farm work", "farming more land", and "hiring others to do custom work with their machinery". Several of the adjustments planned for the next 12 months can be categorized in a similar manner as before, with the addition of a category for expansion (e.g., purchasing additional machinery and farming more land).

### Summary and Implications

Key findings and implications of the 1990 farm finance survey are that:

- The distribution of 1989 net farm incomes for respondents is similar to the distribution found in 1987. About 20 percent of the respondents in 1989 had net farm incomes greater than \$20,000, down slightly from the figure reported for 1987. The percentage of respondents in 1989 with a net loss, 24.8, is slightly higher than the percentage with a net loss in 1987.
- The average total gross nonfarm income for respondents in 1989 was about \$26,000.
- The average debt-asset ratio for respondents in 1990, 24.3 percent, is essentially unchanged from 1988.
- The delinquency rate on farm real estate debt in 1990, 4.9 percent, is down from the 6.1 percent reported in 1988. The 7.9 percent delinquency rate on farm nonreal estate debt in 1990 is up from 5.7 percent reported in 1988, but down from the 13.9 percent in 1986 and the 13.7 percent in 1989.
- The percentage of Hoosier farmers who applied for a new loan or additions to existing farm loans for the 1990 crop year and were turned down, 11.6 percent, is up from 7.9 percent reported in 1988, but down from 16.3 percent in 1986.
- The percentage of all respondents in 1990 with debt-asset ratios less than 40 percent, 75.1, is slightly higher than for 1988. The percentage of farmers in 1990 with gross farm incomes exceeding \$100,000 and debt-asset ratios less than 40 percent, 67 percent, also was slightly higher than for 1988.
- The percentage of all respondents in 1990 with debt-asset ratios greater than 70 percent, 8.3 percent, is about the same as the 8.2 percent reported in 1988, but down from nine percent in 1989. The percentage of farmers in 1990 with gross farm incomes exceeding \$100,000 and with debt-asset ratios greater than 70 percent, 9.8 percent, is down from 12.6 percent in 1989 and about equal to the 10.1 percent in 1988.

- The percent of debt held by all respondents in 1990 with 100 percent or higher debt-asset ratios, 6.1 percent, is down from 8 percent reported in 1989 and from 9.9 percent in 1988.
- During the past year, "reducing debt" and "purchasing additional machinery" were the two most frequently mentioned adjustments for respondents.
- There are no data to support the claim that a significant number of lenders in Indiana have stopped making loans to farmers, or that there is a shortage of loan funds available to farmers. The percentage of applicants in 1990 who applied for a loan but were turned down because the lender is not interested in making agricultural loans, 16 percent, is down from 18 percent in 1988. The percentage of respondents unable to get a loan for the 1990 crop, three percent of those who applied, is equal to the percentage in 1988.
- Additional restructuring and/or write off of debt by farm lenders may be necessary since about six percent of the debt was owed by farmers who were technically insolvent on January 1, 1990.
- In summary, several findings noted above are interpreted as signaling general improvement in the financial condition of Hoosier farmers. However, two qualifications should be mentioned. First, farmers in the higher debt-asset ratio categories could experience major financial problems in the future if they encounter any substantial adversity. Second, a group of Hoosier farmers continue to experience financial problems and will likely require additional debt restructuring and/or write off. Thus, Hoosier farmers should continue efforts to reduce cost, improve efficiency and reduce risks. Such adjustments will enable them to withstand unforeseen financial problems and to operate successfully in the highly competitive economic environment of the 1990's.

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### Authors' Note

*In June 1990 a telephone survey of about 400 nonrespondents was conducted mainly to determine if the characteristics of the farmers who did not respond to the mail questionnaire differed from those who responded. Such an investigation helped to determine if the mail questionnaires produced a representative sample, particularly whether nonrespondents were in worse financial condition than respondents. The respondents to the telephone survey farmed fewer acres (324) than respondents to the mail survey (384). The financial measures were, for the most part, better for telephone respondents than for mail respondents; delinquency rates for real estate and non-real estate loans, farmers with a net farm loss in 1989, debt-asset ratio and percentages with debt-asset ratios exceeding 40 and 70 percent. The percent turned down when applying for a loan was higher for telephone respondents (12.8 percent; 39 respondents) than for mail respondents (11.6 percent; 418 respondents). No other differences in characteristics could be detected in the responses obtained by telephone. Hence, the results obtained by telephone were included with those obtained by mail questionnaires to produce the summaries appearing in this article.*



# The 1990 Farm Bill: Basic Provisions and Implications

*Bob F. Jones, Professor and Marshall A. Martin, Professor*

The Food, Agriculture, Conservation, and Trade Act of 1990 that was recently signed by President Bush covers the 1991-1995 crops. The Act keeps the direction of farm programs on the same general track that was laid down in the 1985 Act. However, provisions of the Act clearly provide for a reduction in government payments over the next five years. Cost estimates for the original House and Senate versions of farm legislation for the 1991-1995 period were projected to be about \$54 billion. The Bill that survived the budget reconciliation process is estimated to cost \$40 billion over the next five years, mainly for commodity programs. In contrast, budget outlays for the 1985 Bill when it was passed were estimated to be \$80 billion for the 1986-1990 period. Actual market prices and export performance will be major determinants of the final program costs over the 1991-1995 period.

Although the new Act provides the general direction for future commodity programs and the level of price and income support, some of the program details await administrative decisions. Also, the Act may have to be modified in 1991, depending upon specific international trade agreements being negotiated under the General Agreement on Tariffs and Trade (Uruguay Round of GATT talks).

## Basic Provisions

This article discusses the main provisions of the Act with emphasis on changes from the 1985 Act and some of the program implications for 1991. The House and Senate bills froze target prices for grains at the 1990 level. When the Conference Committee was instructed under the budget deficit reduction legislation to cut \$13.6 billion from the separate five-year bills originally passed by the House and Senate, it chose to leave target prices at current levels but reduce the proportion of base acres eligible for payments and to provide some flexibility for farmers' planting decisions.

**Triple base.** The so-called "triple base" concept is the principal source of government cost savings. It reduces the acreage eligible for price and income supports by 15 percent in each of the next five years. In effect, it is a 15 percent reduction in direct payments to farmers. The 15 percent is calculated from base crop acres before the acreage reduction program is determined.

In order to spread the cost of the cuts across crops that receive benefits but not deficiency payments, a special assessment was made on those producers. For example, soybean producers who use the loan program will have to pay a loan origination fee of two percent, effectively reducing the loan rate by about 10 cents per bushel. Flexibility is introduced by allowing farmers to plant 15 percent of their base acres to any program crop; to oilseeds such as soybeans, canola, or sunflowers; and to any other non-program crop except fruits and vegetables. The USDA was given authority to specify other prohibited crops. Crops produced on the 15 percent of base acres are not eligible for deficiency payments, but are eligible for price support loans.

Another 10 percent base crop acre reduction is optional for producers. Guidelines are the same as for the triple base, but there are limits placed on soybean plantings on this 10 percent. Soybeans may not be planted on this 10 percent if the Secretary of Agriculture determines the season average price would be less than 105 percent of the loan rate.

These provisions that allow up to 25 percent of base acres to be planted to soybeans is similar to the programs in effect for 1989 and 1990 which were authorized by the Disaster Assistance Act of 1988. With that Act, corn or wheat base acres planted to soybeans were not eligible for corn or wheat deficiency payments. Consequently, the switch from the program crop to soybeans was very small. However, under the new rules, the switch will likely be larger as payments will not be made for the program crop on 15 percent of the acres. So, in effect, the program crops without the deficiency payment will be competing with soybeans for those acres. Thus, the planting decision on 15 percent of the base acres will be based on market prices and not government support prices.

The flexibility and triple base features are a concern to wheat farmers in the Great Plains and cotton and soybean producers in the South. Increased production of "their" principal crops will put downward pressure on prices. For example, additional soybeans on "flex" acres in the Corn Belt would depress the price of soybeans for all producers with the effect more noticeable in the South where producers have fewer alternative crops.

Because of the lateness of passage of the bill there is a special provision for wheat producers in 1991. Winter wheat producers had already planted their wheat before program provisions were known. Consequently, wheat producers were given two options. They must choose one to be in compliance with the program for 1991. In either case, they must comply with the 15 percent Acreage Reduction Program (ARP) requirement. In addition, they can choose to either receive deficiency payments on all their planted acres by using a 12-month average price for wheat, or at the 5-month average price on their base acreage which is reduced by the triple base factor of 15 percent.

**Acreage Reduction Programs.** For 1991 the ARP for wheat is 15 percent; for corn it is 7.5 percent. In 1992-1995, the maximum ARP for wheat and feed grains is 20 percent with the actual rate to be determined each year by the Secretary.

To illustrate how the triple base and ARP reductions work, consider the following example. Assume a producer has 100 corn base acres. Fifteen percent or 15 acres are considered the triple base. Those acres are not eligible for deficiency payments but production on those acres is eligible for price support loans. Next, subtract 7.5 acres for ARP in 1991. As in the past, no crops for harvest can be grown on the ARP acres. Corn can be grown on the remaining 77.5 acres and be eligible for deficiency payments and price support loans. The producer has an additional option of reducing corn planting to 67.5 acres with planting on the



other 10 acres subject to the same rules as apply to the 15 percent triple base. The 10 acres would not be eligible for deficiency payments.

**Target Prices.** Target prices were frozen at \$4.00 per bushel for wheat and \$2.75 a bushel for corn for the five years of the bill. Deficiency payments will be calculated by using market prices for the first five months of the marketing year for 1991-1993. A 12-month average will be used on all program crops in 1994 and 1995. This latter provision will likely lower deficiency payments in 1994 and 1995 as crop prices usually rise in a seasonal pattern with the 12-month average being higher than the five-month average. In the last 10 years, the 12-month average price for corn has been nine cents higher than the five-month average. For the most recent five years, the 12-month average was seven cents higher than the five-month average. In the last 10 years, the 12-month wheat price has averaged seven cents higher than the 5-month average. In the last five years, the 12-month wheat price has averaged 11 cents higher.

**Loan Rates.** Wheat and feed grain loans will be calculated at 85 percent of the previous five-year average of farm prices, with high and low years excluded. This is an increase in loan rates from the 1985 Act which based loans on 75 percent of the five-year moving average of prices. However, the Secretary of Agriculture was given authority to reduce loan rates depending on expected carryover stocks. Large stocks could result in as much as a 20 percent reduction in loan rates.

These provisions suggest the following loan rates for corn and wheat for the 1991 crops. Based on the October estimate of prices for the 1990 marketing year, plus the previous four years, and assuming the USDA uses all the discretionary reductions possible in the new Bill, the 1991 loan rate for corn would be \$1.63 and \$2.07 for wheat. For comparison, 1990 loan rates are \$1.57 for corn and \$1.95 for wheat.

The loan rate for soybeans was set in the Bill at \$5.02, compared to \$4.50 for the 1990 crop. The previous bill allowed the Secretary to set the loan rate within limits. A two percent loan origination fee will be charged for oilseed loan program participants under the new Act. In effect, this reduces the net soybean loan rate to \$4.92 per bushel. A marketing loan will be available to producers of soybeans for 1991 through 1995. This was an option in the 1985 Act that the Secretary never chose to implement. Under the marketing loan procedure, a producer may take out a loan (net \$4.92) and repay it at the prevailing world market price if the world price is below the loan rate. Producers will continue to have the option of forfeiting the crop to the Commodity Credit Corporation (CCC).

**Grain Reserves.** The grain reserve program was continued with some changes in entry and release rules. Entry of grain into the reserve must be allowed whenever the 90-day average price falls below 120 percent of the loan rate and when stocks/use ratios equal or exceed 37.5 percent for wheat and 22.5 percent for corn. If only one of these conditions is met, reserve entry is at the Secretary's discretion.

Restrictions on taking grain out of the Reserve by producers were eliminated. Storage payments will stop whenever the five-day average price exceeds 95 percent of

the target price (\$2.61 for corn, \$3.80 for wheat). Interest accrues only if the five-day average price exceeds 105 percent of the target price.

The CCC may sell its stocks for cash whenever the five-day average price exceeds 150 percent of the loan rate. Release for certificate exchanges may continue at any price level.

The Bill sets a 300 million bushel minimum on the wheat reserves and imposes a 450 maximum. For feed grains, the limits are 600 million bushels minimum and 900 million bushels maximum.

**Dairy.** A milk price support floor of \$10.10 per cwt. is continued through fiscal 1991, but dairy farmers will be assessed five cents per cwt. taken out of milk checks in 1991 and 11 cents for 1992 through August 31, 1995. The assessment can be refunded to a producer who proves his or her milk production has not increased from the previous year's level.

The law includes an additional incentive not to increase milk production. Price support adjustments will depend on USDA surplus product purchases. If purchases are expected to exceed seven billion pounds, total solids basis, in any calendar year beginning in 1992, USDA may assess producers to cover all costs for purchasing products in excess of the seven billion pound trigger level.

**Payment Limits.** The \$50,000 limit on direct and deficiency payments is maintained. A new \$75,000 limit is placed on marketing loan gains and so-called Findley payments for a combined total of \$125,000. Findley payments make up for the difference between administratively reduced loan rates and the statutory rates.

The maximum payment including commodity loans an individual can receive will be reduced from \$500,000 to \$250,000. The total does not include payments made under the Conservation Reserve Program, which has separate payment limits. An individual farmer could receive another \$125,000 maximum from interest in two other farming entities.

**Conservation Programs.** Conservation compliance provisions contained in the 1985 Act are continued with minor adjustments. The sodbuster feature -- denying program benefits for cropping land that has not been cropped for an extended period of time -- is amended by expanding the list of program benefits lost for violations. Graduated sanctions from \$500 to \$5,000 can be levied against farmers for inadvertent violations. The swampbuster program -- denial of benefits for converting wetlands -- also will have an expanded list of lost benefits and graduated fines from \$750 to \$10,000 for inadvertent violations.

**Conservation Reserve Program.** This program falls under a new program title, the Agricultural Resource Conservation Program (ARCP). The expanded program includes the Conservation Reserve Program (CRP), Wetlands Reserve Program (WRP) and Water Quality Incentive Program (WQIP) to idle up to 50 million acres of the most environmentally sensitive agricultural land. CRP enrollment cannot be less than 40 million acres or more than 45 million acres by 1995. The 1985 Act authorized the CRP to contain a minimum of 40 million acres with authority to increase it to 45 million acres. To date, 34 million acres have

been contracted for inclusion in the reserve. Budgetary considerations limited expansion beyond that size.

The WRP establishes a voluntary program for one million wetland acres to be placed under paid 30-year or longer easements. The WQIP establishes a new 10 million acre, five-year program for farmers to protect water quality. Farmers with approved plans may receive up to \$3,500 per year in cost share assistance.

**Pesticide Record Keeping.** Certified pesticide applicators, including farmers, will be required to maintain records of their use of restricted pesticides. Records must be maintained for two years and may be requested by federal and state agencies, as well as by health officials. Individual farm confidentiality, except for the prescribed releases, is to be maintained. Some farmers may consider this an unnecessary burden and an intrusion on privacy. However, many good managers have been keeping these types of records for their own use for several years.

**Food Aid and Export Promotion.** Foreign Food Aid programs have been in operation in some form since 1954. Some program changes are made in each farm bill. The 1990 Act gives primary authority over Title I, concessional sales, to the USDA. Concessional sales generally involve interest rate subsidies to the buyers. The Agency for International Development (AID) is given authority for Titles II and III grant aid programs. Grant aid programs are generally outright donations of commodities through relief agencies. This represents some of the most sweeping changes in lines of government agency authority since the food aid programs were started in 1954.

**Export Enhancement Programs (EEP).** Current GATT trade negotiations are focused on restrictions on the use of export subsidy programs. The U.S. has proposed a multi-lateral phasing out of such programs. Recently, the U.S. stance has been to favor a 90 percent reduction in 10 years. Given the uncertainty over the outcome of the negotiations, authority for the EEP has been retained in the 1990 Act. EEP would be funded at not less than \$500 million annually, with a goal of 25 percent of EEP funds to be used for the export of high-value products.

The export credit guarantee programs, GSM-102 and GSM-103, are reauthorized. The GSM-102 program is a program which guarantees short-term credit extended by private lenders to foreign buyers. The GSM-103 program guarantees longer-term credit. USDA is directed to guarantee loans to finance only U.S. farm commodities under the GSM-102 with six to 36 month credit and GSM-103 with three to 10 year credit. At least \$5 billion is authorized for GSM-102, and \$500 million annually for GSM-103.

**FmHA Direct Loans.** As part of the budget reduction program, Farmers Home Administration direct loans would be progressively scaled down. Direct loans would be reduced from \$700 million this fiscal year to \$600 million in fiscal 1992, \$500 million in 1993, and \$450 million in fiscal 1994 and 1995. FmHA may buy-down the interest rate by as much as four percent on some guaranteed loans.

**Crop Insurance.** Crop insurance became a controversial issue as the farm bill was developed. At one point, it appeared that it would be phased out. The administration wanted to phase it out and replace it with a permanent dis-

aster program. This was a reversal of the position taken by the USDA in the early 1980s. The 1990 Act provides for continuation of the current program for the 1991 crop year in which insurance is provided by private firms with the federal government subsidizing up to 30 percent of the cost of the insurance. It is assumed that Congress will resume efforts next year to reform the program to make it more self-supporting.

**Domestic Nutrition Program.** The Act reauthorizes the Food Stamp Program for five years, simplifies some program rules and institutes additional penalties for fraud and misuse of coupons.

The Temporary Emergency Food Assistance Program (TEFAP) survived after having been proposed for elimination. In fact, funding was increased from \$120 million to \$220 million per year. About 15 million people a month receive TEFAP commodities such as wheat, corn, butter, peanut butter and canned meats while they await approval for food stamps. These commodities also go to many elderly and rural residents who never apply for food stamps.

Results of a recently released study of the special nutrition program for low income women, infants and children (WIC) have been cited as contributing to increased funding for nutrition programs in fiscal 1991. Looking at program cost effectiveness, the study found that "For every dollar spent on the prenatal WIC program, the associated savings in Medicaid costs during the first 60 days after birth ranged from \$1.77 to \$3.13."

**Rural Development.** A new Rural Development Administration (RDA) within USDA is authorized which would dispense money as well as encouragement and technical assistance to rural communities. The RDA would take over some of the responsibilities formerly held by the Farmers Home Administration. These include handling water, sewer, other community facilities and business and industrial loans and grant programs. FmHA would continue farm lending programs.

A Rural Development Pilot Program is established. Under this program, state panels would set priorities for applications for federal financing of rural development projects. A revolving rural development loan program is authorized and will be partly funded by federal contributions. The loan fund would be set up by states with private lender participation.

The Bill provides for linking rural schools, hospitals, and clinics to urban institutions so that students or rural medical technicians may receive instruction by TV.

**Commodity Promotion Program.** Producers of certain crops will be assessed to support research and promotion programs. Assessments are authorized for soybeans, pecans, mushrooms and limes. The program for soybeans will affect Indiana soybean producers. The nationwide soybean check-off would operate for 18 to 36 months before any referendum would be held. The national check-off of one-half percent of value or about three cents per bushel is expected to raise \$60 million a year. During the initial mandatory check-off period, producers may request a refund of their contributions. After the trial period, growers will be polled to determine whether they want a referendum to determine whether refunds should be permitted in the future.

**Research and Extension.** Funding for agricultural research and extension under a competitive grant system is authorized to expand from \$70 million to \$500 million a year. The increase is subject to annual appropriations and is in response to recommendations made by a National Academy of Science panel.

Research and extension activities would be expanded to encourage environmentally sound farm production practices, focusing on sustainable agriculture. The authorization includes \$40 million for low-input research, \$20 million for integrated resource management and \$20 million to train and educate producers.

### Conclusions

Details on the 1990 commodity programs are yet to be released. When details are available, producers will need to evaluate participation in the programs for 1991. One thing is clear: program payments will decline over the next five years. Deficiency payments will not be made on the 15 percent of base acres which may be planted to alternative crops and by 1994 deficiency payment calculations will be based

on the average price over the marketing year rather than the first five months of that year.

Given current wheat prices and prospects for prices in 1991, those who plant wheat will have stronger economic incentives to participate in the wheat program than those who plant corn and need to decide on participation in the corn program. Some farmers are likely to plant soybeans on their triple base acres.

The outcome of current trade negotiations remains uncertain. Observers note the stiffening resistance in the European Community towards the reduction or removal of export subsidies, especially by the Germans. If no reduction is obtained, the United States may counter with increased use of the Export Enhancement Program. If an agreement is reached to reduce large export subsidies and internal price supports, changes in U.S. price support legislation in 1991 would probably be required. Because of the importance of exports to U.S. agriculture, farmers and other participants in the agricultural sector need to continually monitor the changing trade environment.

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# Alternative Agricultural Systems and Environmental Quality

*Stephen B. Lovejoy, Associate Professor and Coordinator of the Center for Alternative Agricultural Systems*

Society is telling all sectors of the economy, including the agricultural sector, that they want a different mix of outputs. In the 1970's, society was giving the agricultural sector the message to PRODUCE, PRODUCE, PRODUCE. Agriculturalists were asked to produce as much as possible to sell on the world market. Rarely did individuals or their representatives ask about the off-farm effects like water quality or wildlife habitat. However, in the 1990's, that is no longer the case. Society is giving the agricultural sector the message that they NO LONGER want food produced as cheaply as possible! They want relatively inexpensive food but they also want a better environment.

## What Society Wants

Society is concerned about the quality of the environment. All the polls suggest that Americans want a cleaner environment even if they have to sacrifice economic growth or deal with increased regulations. In 1987, 54% of Americans thought we were spending too little money on improving and protecting the environment and only 7% said that we were spending too much on environmental quality (Lovejoy and Fletcher, 1990). Americans seem to care about their natural environment. In the same poll, 58% of Americans said that we should sacrifice economic growth in order to preserve and protect the environment. Since the early 1970's, the number of Americans suggesting that we spend too little on environmental protection and improvement has remained between 48 and 61 percent. Sixty-six percent of Americans suggest that protecting the environment is so important that requirements and standards cannot be too high, and continuing environmental improvements must be made regardless of cost. In 1982, 35% of Americans suggested that there was too little governmental regulation and involvement in the area of environmental protection. By 1986 this had risen to 59% of Americans feeling that there was too little governmental regulation and involvement in the area of environmental protection (see Lovejoy and Fletcher, 1990 for details on above statistics).

In general, the high level of concern about the environment, first evidenced in the 1970's, is still very viable and in some cases growing. A majority of Americans feel that more environmental protection is desirable and are willing to make some sacrifices for such protection.

## Farmer Concerns

Many in agriculture realize that people are concerned about the environment and are anticipating that this concern may require changes in agricultural practices and operations. As one farmer stated, "Farming is a service industry... If the other 97% of the population worries about water quality and food safety, farmers had better figure out how to make a living by farming in a way that meets those needs" (Klor, 1989).

A recent survey of Indiana farmers suggests that agricultural producers have altered their attitudes about environmental issues. In 1989, Professor Martin, in this publication,

reported that over half of Hoosier farmers support the idea that commodity program benefits should be linked to compliance with soil and water conservation practices. While the farmers sampled by Professor Martin did not, contrary to the general public, favor increased regulation, they did favor increased cost share programs to assist producers in the transition to alternative practices or systems of production.

## New Agricultural Systems

In light of these concerns, there are many types of agriculture that are being advocated to meet these changing societal goals. Some of these different types of agriculture may influence the future of Indiana agriculture while others may be discarded as inappropriate or impossible. These concepts include: low input, sustainable, regenerative, holistic, alternative, organic, agro-ecologic, permacultural and reduced tillage.

Each of these perspectives has a point; what are needed are changes in human behavior, alterations in the way we produce food and fiber in order to provide the desired outputs (food and a high quality environment). Protection of our environmental resources will require us to alter our soil and water conservation programs as well as our agricultural programs and production practices. However, we must do this in an intelligent manner keeping in mind the DUAL goals of food production and environmental quality. Policies to achieve these societal goals will require the following orientations:

1. Targeting of efforts and resources to those regions, those counties and those acres where agricultural production imposes unacceptable damage to environmental resources. Universal, across-the-board policy instruments will be extremely inefficient.
2. Development of programs and mechanisms which permanently alter production patterns that impose unacceptable damages upon environmental resources rather than utilizing one-year set asides or 10-year CRP.
3. Careful examination of proposed production changes for their impact upon food supplies, prices, local communities and farm families as well as their impact upon environmental amenities, health risks or ecology.

Most farmers want to be good stewards of the land. We, as researchers and educators, are trying to help them in their search for production systems that will produce the food and fiber desired by consumers and to provide the high quality environmental resources demanded by our citizens.

## Purdue's Emphasis

Purdue and the School of Agriculture feel that we have an obligation to assist farmers by providing them with the information necessary to evaluate and utilize production practices, crop rotations, chemical applications and animal production practices that maximize production of food and

fiber, BUT minimize the impacts upon environmental resources.

As a method of encouraging the necessary types of research and educational activities, the Center for Alternative Agricultural Systems was established in the Fall of 1989. The purpose of the Center is to foster and promote interdisciplinary research, extension and teaching in the area of alternative agriculture, including relevant thrusts in low input and sustainable good management practices within the context of profitability, environmental soundness and social acceptability.

The goals of the Center include the development of the following:

1. Sustainable agricultural systems, including the long-term maintenance of productivity, the continued vitality of rural communities, and the preservation and enhancement of the environment.
2. Alternative plant and animal production systems that enhance profitability, including the optimum use of purchased inputs such as fertilizer, pesticides and antibiotics.
3. Alternative crops and products.
4. Alternative uses of resources such as land, labor, and capital, as a means of generating income in rural areas.
5. Alternative uses and markets for traditional agricultural products to enhance demand.

### Center Progress

Over the past several months the Center has assisted in encouraging several research projects. At Throckmorton Agricultural Center, researchers are experimenting with

close seeding of soybeans as a weed control strategy. Other researchers are investigating the interactions among a variety of cropping rotations, tillage operations and levels of pesticide and fertilizer use. One group of researchers is investigating the use of different forages and trees in vegetative filter strips in an attempt to provide for protection of water quality with crops that have economic value. The Center is participating in several demonstration and on-farm research projects investigating a variety of systems including intensive grazing, banding of fertilizer and herbicides and timing of fertilization. Many of these projects, as well as others, were highlighted at the Alternative Agricultural Systems Field Day on September 12 at the Throckmorton Agricultural Center, 10 miles south of Lafayette on US 231.

In short, the Center is interested in assisting producers in Indiana with alternative production systems that meet society's environmental goals and the producers' economic goals. IN ADDITION, we want to help society refine their environmental goals in such a way that we get a clean environment and maintain a healthy and productive agricultural sector. All of us, as agriculturalists and environmentalists, need to assist in determining the level of agricultural production and environmental quality that our society wants and can afford.

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# Sources of Cycles in the United States Beef Industry

*Kenneth A. Foster, Assistant Professor*

Cycles in cattle numbers and price have been a fairly regular event throughout the current century. Most farmers are aware that, approximately every 10 to 12 years, prices reach a peak and begin to decline. One of the causes for the cyclical patterns is farmers' tendency to base future production on current and recent past prices. For example, when prices are rising and profitable, expansion takes place. Expansion increases supply, which leads to lower prices in a subsequent period. Low prices and losses then create contraction in the industry and thus higher prices the next period. This dynamic process gives rise to the cattle production and price cycle. This paper deals with the source of persistence in cattle cycles and helps evaluate what determines both the length and the magnitude of the swings in production and prices.

The cattle cycle has a major influence on the financial status of the farm. Unfortunately, for the producers of feeder calves and finished cattle, the cycles in production and price run counter to each other. Thus, when prices are high, farmers in aggregate have fewer animals to sell. Conversely, when prices are low, farmers have larger numbers to sell. For a given supply schedule, the relative magnitude of the price and production swings are determined by the price elasticity of demand for the product. Historically, farm level demand for cattle has been fairly inelastic, leading to cycles characterized by a greater percentage change in prices relative to quantities. Large changes in price across the cycle result in increased financial uncertainty and greater risk for the farmer. Thus, the effect of cycles on the cattle industry relates to a broad set of concerns for farmers including marketing, finance, and management. Uncertainty about future prices helps to create the cyclical marketing and production dilemma, because many producers respond by using current prices as a forecast. As a result, financial burdens are often greatest when market conditions are at their worst.

## Length of Cycle and Why Cycles Continue

A biological lag in production responses is the primary factor causing the cattle cycle to be longer than one or two years. When cow-calf operators make a decision to expand production, it requires the retention of heifers into the breeding herd. From the time this decision is made until an increase in cattle slaughter is noticed may be as long as three years. Add to this the psychological lag in making a decision to expand and the diversity of decision makers in the industry, and the expansion process may actually take five or six years to occur. Historical cycles have actually required about seven years on average for the expansion phase. The additional year may reflect a reluctance of producers to commit themselves to expansion until it is very clear that prices are truly rising.

An additional factor contributing to the persistence of the cattle cycle may be the fact that large numbers of heifers are brought into the herd during the expansion phase of the cycle. As this large pool of heifers age through the cycle, it causes a skewed age distribution. Then at some point late in

the production cycle, it will be necessary to cull a greater number of cows to remove those heifers retained in the expansion. Replacing these aged cows creates a drain on the number of heifers available for slaughter and may contribute to the start of the next cycle. The research reported in this article examines both the biological lag and the skewed age distribution as explanations for the length and persistence of the cycles.

## Two Models of Cattle Inventories

Two different approaches were developed to examine aggregate producer response to prices in the U.S. beef cattle industry. The first approach addresses the biological lag in production without any impact arising from the skewed age distribution. The second method allows for an inherent cyclical component in the replacement heifer retention due to the skewed age distribution over time. The two different relationships were then simulated along with a demand system for retail beef, fed cattle, and feeder calves. By comparing the results of these two models, we can isolate the impacts of the biological lag from the age distribution cyclical impacts and determine the potential for a cycle even when there is no built-in cyclical component in the supply response of producers.

Both models are based on annual data for the United States collected from *Agricultural Statistics* from 1965 to 1988. For further reference to the development of both approaches, any interested reader should refer to Foster.

**Without a Cyclical Supply Component.** This model of the beef breeding herd combined the replacement heifer and mature cow inventories. Doing so precluded evaluation of the effects of the age distribution, because it averages the culling rate across all ages of breeding animals. It was found that taking this approach resulted in a model with no cyclical supply component. Past prices were used in the analysis to both capture some of the psychological lag and because they represent the information farmers have available for decision making. The model also employed lagged values of the breeding herd to capture the biological lag in production response.

The short-run elasticity of the breeding herd with respect to a change in the feeder calf price was .019. That means that a one percent increase in the price of feeder calves will lead to a .019 percent increase in the size of the breeding herd the following year.

In a dynamic setting such as the one in which cattle cycles occur, a single period producer response to a feeder calf price change does not tell the entire story. The model also provides breeding herd responses for future years. These are presented in Table 1 under the biological lag only model.

Notice that the elasticity for feeder price rises until the tenth year, then begins to fall. This means that producers

*\* Notice, that the liquidation phase of the cycle should be expected to proceed more rapidly than the accumulation phase described. This is because there is no biological lag between the time the decision to scale down is made and the enactment of the policy.*

continue to expand the breeding herd for the 10-year period, and represents the completion of a cycle. However, these cycles are not long lasting. The elasticity levels off at a point where the herd size becomes stable. This means that, without any further intrusion on the industry, the initial shock from feeder prices will only last about two cycles and the impact during the second cycle will be almost imperceptible. The near equilibrium reached after one cycle is analogous to the point where the supply and demand schedules cross. Thus this model suggests there would be no longer term affect causing a repeated cycle.

Also shown in the table are the elasticities for corn and fed steer prices. The affects of the corn price also appear to wear out after one cycle. The steer price, however, has a longer term affect which arises from a trend implied by the price shock in the model of beef demand.

**With a Cyclical Supply Component.** The lack of a recurring cycle in the above model tells us that the separation of the age distribution may be an important component of the dynamic relationships in the cattle industry. Unfortunately, the USDA does not collect data specific to the age of cows. However, they do maintain data on the number of heifers kept for replacement and the number of mature cows. In this case, separate models were developed for mature cows and retained heifers. Proper specification of these allows the age distribution of the cows to be approximated from the retention of heifers in the past and an estimated annual culling rate of about 20 percent. The model for replacement heifers has a built-in cyclical component suggesting that there is in fact a response to the changing age distribution.

Separating mature cows and heifers has the added advantage of reducing some of the uncertainty with respect to the heifers. Some of the heifers counted as replacements will never enter the breeding herd. However, there is no accurate measure of this group. The assumption is that the percentage actually retained out of those counted as replacements will be rather constant from year to year. It would be dangerous to ignore the heifers completely because a sizeable portion will bear a calf, creating a potentially significant impact on the cattle market.

The elasticity measures derived from this approach are also in Table 1. They are listed under Biological Lag and

Age Distribution Combined. This represents the percentage impact of a one percent change in the price variable on the sum of mature cows and replacement heifers. Notice that the cycles, resulting from feeder calf prices, are more long lasting than the previous set. The long run elasticities peak markedly every 10 years after the shock. This suggests a source of persistence in cattle cycles.

The elasticities implied by the two models are very similar. The primary differences are the recurrence of the cycle and slightly larger responses in the second approach.

### Conclusion

The discussion above demonstrates how the combination of an inelastic demand curve for beef and the biological and psychological lags plus a skewed age distribution may result in a persistent cycle in the production and prices of cattle in the United States.

Cattle cycles are a well-documented phenomenon, but they are by no means exact or predictable. The models used in this study performed reasonably well in determining turning points in the size of the beef cattle breeding herd, but encompassed only two full cycles, both of which were atypical.

Producer responses to cattle cycles take three main forms. The first is the producer who responds to the prices in the marketplace and produces with the cycle. The second method attempts to hold production fairly constant over time to average the low and high prices. The third approach is to attempt to read the cycle and behave counter to it. Any of these approaches may be acceptable depending on the individual situation. Producers who are highly leveraged will find it difficult to sustain the losses, during low price periods, associated with the second and third strategies. However, good forecasters of future trends in cattle prices may be wise to gamble on the third strategy, which attempts to reduce their commitment during low price periods and boosts production when prices are high. However, the difficulty here is accurately determining the turning points. Inaccurate predictions may lead to production in conjunction with the cycle. One suggestion directly related to the results presented in this paper is for farmers to attempt to smooth out the age distribution of their breeding herd through their

**Table 1: Intermediate-Run Elasticities for the U.S. Beef Breeding Herd.**

Time horizon (years)	1	2	3	4	5	6	7	8	9	10	12	15	20	25
<i>Elasticity with Biological Lag Only:</i>														
<i>Price for:</i>														
Corn	-.004	-.034	-.060	-.085	-.107	-.124	-.136	-.143	-.147	-.148	-.149	-.148	-.148	.148
Feeder Calves	.019	.159	.352	.550	.715	.834	.909	.949	.966	.970	.964	.956	.956	.956
Fed Steers	.000	.001	.013	.039	.083	.143	.214	.290	.367	.441	.574	.730	.909	1.02
<i>Elasticity with Biological Lag and Age Distribution Combined:</i>														
<i>Price for:</i>														
Corn	-.005	-.040	-.061	-.090	-.111	-.129	-.140	-.147	-.151	-.152	-.153	-.155	-.156	-.156
Feeder Calves	.022	.190	.381	.588	.754	.876	.951	.990	1.00	1.01	1.00	.990	1.02	1.01
Fed Steers	.000	.001	.015	.043	.090	.153	.227	.306	.385	.461	.596	.758	.950	1.07

*Notes: These elasticities were calculated at the means of the simulated data. The following notation was used for the price variables: Price corn = annual average price of corn (\$/bu), Prices Feeders = annual average price of Omaha Choice steers (\$/cwt), and Price Fed Steers = annual average real price of feeder calves (\$/cwt).*

culling and retention practices. This will prevent them somewhat from being constrained to the cycle.

It was suggested earlier that the level of demand elasticity plays a significant role in determining the characteristics of the cattle cycle. Demand for beef has become more elastic since the mid-1970's. In today's economy, people are more willing to substitute other foods for beef when beef prices are relatively high. Thus, if there are no corresponding changes in the supply schedule, one would expect that in the future cattle price swings may be smaller relative to their accompanying quantity cycles. This will likely lead to more rapid expansion and contraction and slightly shorter cycles in the future. However, slow expansion to recent price increases suggests that the psychological lag may have lengthened, that is, the threshold price which producers view as sufficient to support expansion is higher now than in the past.

The importance of reflecting on cycles in the beef breeding herd is emphasized by their impact on the rest of the beef production chain. The number of cows and heifers available for breeding directly impacts the number of calves available to feedlots, and ultimately the amount of beef in the market. Both producers and packers need to be aware of the occurrence of these cycles and keep an eye on changes in the economic and political environment which might lengthen or shorten a cycle. By doing so, they may be more timely in adjusting their particular operation to ups and downs of the market.

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