

# PURDUE AGRICULTURAL ECONOMICS REPORT

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## Can I Repay? Managing Farm Debt Repayment Capacity

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**L**ow prices have some farmers wondering whether they will be able to meet their needs for cash for family living and taxes, debt repayment, and

reinvestment. Repayment problems can happen to the best of farmers, because they aren't always the result of a lack of profitability. Lenders are increasingly asking their farm

customers for documentation of repayment or debt servicing capacity. The need to be able to measure and manage repayment capacity seems clear.

However, an alternative available to farmers is to rely on their lenders' expertise to make them aware of repayment capacity problems and to help them solve such problems. Obviously, most lenders are very knowledgeable about measuring repayment capacity, know what kinds of documentation they prefer, and have their own strategies for working out repayment capacity problems (see accompanying text box). We do not recommend this approach. Depending solely on your lender to monitor your repayment

### Working with Farm Lenders to Document Repayment Capacity

The key issue in repayment capacity analysis for the farm lender is to obtain the best evidence that sufficient cash will be available to make scheduled principal and interest payments. The lender may use one or more of several different measures/tools for documenting repayment capacity. These may include particular measures of financial position and performance or actual and projected financial statements. Increasingly, lenders will include cash flow budgets or projections in their requests for loan documentation. Lenders are interested in both actual repayment capacity, that is, the ability to repay during the current or just completed year, and future repayment capacity. Lenders recognize the predictive value of past performance, but they know that past performance doesn't necessarily guarantee future repayment capacity. Things change. As a result, estimates of future income, expenses, and other cash flows are



often a key element of repayment capacity documentation.

Farmers and lenders alike must be very conscious of uncertainty about the future when assessing estimated future repayment capacity. Because of this uncertainty, a range of possible outcomes may be more useful than a single (point) estimate of future repayment capacity. Uncertainty about the future and estimated future performance increases the value of communication between lender and farmer. Assumptions about key determinants of receipts, expenditures, and other cash flows should be discussed in detail with your lender. The potential impact of these assumptions on the likely variability of results should be explicitly considered in this communication process. Because of uncertainty, lenders will want to see a margin where the repayment capacity projected for next year exceeds the amount actually needed to repay scheduled debts. This excess repayment capacity provides an important buffer against the risks associated with farming.

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capacity may result in less timeliness in anticipating repayment problems, less flexibility in making adjustments, and less predictable results.

It isn't that the documentation required by the lender won't benefit the farmer, because it can. But the farmer has a variety of tools and techniques available for managing repayment capacity that go beyond the budgeting and financial performance measures that are typically at the heart of the loan documentation process. These alternatives, which we will call "operational strategies," can give the farmer greater control, be more reliable, facilitate more timely management intervention,

and be easier to use. Also, budgeting and financial measures are far more powerful management tools when they are used as part of the day-to-day decision making on the farm than when they are used solely for loan documentation.

### Operational Strategies for Managing Repayment Capacity

The basic premise of operational strategies for managing repayment capacity is to set limits on either the amount of funds borrowed or on the operating decisions of the business. In essence, these limits are intended to guarantee that adequate cash is available to repay the debt obligations. These strategies can take many forms. The following are a few examples.

1. Buy crop insurance and forward contract or hedge product prices, so as to reduce the chances of a cash flow shortage from low yields or poor prices.
2. Maintain cash reserves equal to a specified percentage of existing debt obligations. This is a strategy of maintaining a reserve that can be dipped into to make payments if current operations come up short.
3. Maintain a debt repayment margin by only borrowing a specified percentage of the purchase price of capital items. With this strategy, a larger proportion of capital expenditures is financed with past earnings, thereby reducing the demands placed on future earning.
4. Borrow the purchase price of feeder livestock only if adequate feed inventories are available, rather than borrowing for both livestock and feed purchases.
5. Assign the milk check, a procedure whereby a percentage of all proceeds are allocated by the processor or coop to make payments on a debt. This is a strategy that controls spending by ensuring that milk proceeds are used to

make payments on existing obligations before you have any opportunity to use the proceeds for discretionary spending.

6. Forecast revenues for the upcoming year, and then establish a spending limit for each of the major types of operating expenses that is well below expected revenues.

Again, the objective of these operational strategies is to create operating procedures that increase the likelihood that cash will be available to make the loan payments.

### Repayment Capacity Ratios and Measures

Worksheet 1 provides guidance for computing five of the financial measures and ratios commonly used to assess and document repayment capacity. These are the current ratio, working capital, the term debt coverage ratio, term debt repayment capacity, and term debt repayment margin. Technically, the current ratio and working capital are not measures of repayment capacity, but instead are measures of liquidity (the ability to meet financial obligations as they come due). These liquidity measures are included here because of their widespread usage as indicators of short-term repayment capacity. All of these measures can be figured after the fact using actual performance data from farm financial statements. They can also be computed using forecasted financial statements for upcoming operating periods. These measures should always be based on accrual-adjusted financial information.

The *current ratio* indicates the dollars of current assets that are available on the balance sheet date for every dollar of current liabilities on that date. The current ratio is indicative of the farm's ability to pay current obligations, and thus it is generally classified as a measure of current liquidity. *Working capital* is determined as the absolute dollar amount by which current assets exceed current liabilities. It reflects the margin or cushion in short-term

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capacity to meet current obligations as they come due.

The current ratio and working capital measures are stock concepts. That is, they take stock of the current assets and liabilities on the balance sheet date. As a result, their usefulness as indicators of repayment capacity is limited to the very near term. The money that must flow out of the business during a year in order to meet obligations may far exceed the working capital on the beginning balance sheet date.

More direct and explicit measures of repayment capacity (see accompanying text box for definition) include the term debt coverage ratio, term debt repayment capacity, and term debt repayment margin. The *term debt coverage ratio* indicates the accrual-adjusted net income (not cash flow) from the farm business that is available annually for scheduled principal and interest payments on term debt. *Term debt repayment capacity* is an absolute measure of the dollar amount of income available for servicing term debt. The *term debt repayment margin* measures how much of the term debt repayment capacity remains after the scheduled principal and interest payments have been made.

Unlike liquidity measures, repayment capacity measures take into account both the stock of working capital and the expected flows of money that will go in and out of the business during the year subsequent to the balance sheet date. The revenue and expense flows used when computing repayment capacity measures should be measured on an accrual-adjusted basis. That is, they should reflect changes in current assets, such as inventories, and current liabilities, such as accrued rent or interest. Their usefulness is thus increased by connecting the flow of funds during the year to the stock of working capital on hand on the balance sheet dates. For that reason, repayment capacity measures provide invaluable information about whether or not a farm

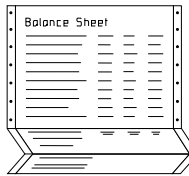
is, or is expected to be, profitable enough to meet its financial obligations over the course of an accounting period.

A term debt coverage ratio greater than one indicates that there is more net income being generated than is required for term debt repayment. The larger the ratio, the greater the ability of the farm to weather an income decline. A ratio less than one indicates a lack of repayment capacity. Similar information is provided by the term debt repayment margin. Using this

measure, positive values indicate sufficient income for repayment, and negative values indicate repayment difficulties.

**Computing Repayment Capacity – An Example**

It may be helpful to illustrate repayment capacity computations with an example involving the term debt coverage ratio. The starting point in this computation is accrual-adjusted net farm income. If your accounting system can not generate an accurate accrual-adjusted measure of net



ment capacity measures take into account both the stock of working capital and the expected flows of money that will go

**Worksheet 1. Repayment Capacity Ratios and Measures**

<b>1. Current Ratio:</b>		
Current assets (from ending farm balance sheet)		_____
Current liabilities (from ending farm balance sheet)	(÷)	_____
<b>Current ratio</b>	(=)	_____
<b>2. Working capital:</b>		
Current assets (from ending farm balance sheet)		_____
Current liabilities (from ending farm balance sheet)	(-)	_____
<b>Working capital</b>	(=)	_____
<b>3. Term Debt Coverage Ratio:</b>		
Net farm income <sup>1</sup> (from farm income statement)		_____
Net non-farm income <sup>2</sup>	(+)	_____
Interest on term debts (from farm records)	(+)	_____
Depreciation expense (from farm income statement)	(+)	_____
Family living expenses & income taxes (from records)	(-)	_____
Income for debt servicing and capital replacement	(=)	_____
Cash used for capital replacement (from farm records)	(-)	_____
<b>Term debt repayment capacity</b>	(=)	_____
Annual scheduled principal and interest payments on term debts (from farm records) <sup>3</sup>	(÷)	_____
<b>Term debt coverage ratio</b>	(=)	_____
<b>4. Term Debt Repayment Capacity and Margin:</b>		
Net farm income <sup>1</sup> (from farm income statement)		_____
Net non-farm income <sup>2</sup>	(+)	_____
Interest on term debts (from farm records)	(+)	_____
Depreciation (from farm income statement)	(+)	_____
Family living expenses & income taxes (from records)	(-)	_____
Income for debt servicing and capital replacement	(=)	_____
Cash used for capital replacement (from farm records)	(-)	_____
<b>Term debt repayment capacity</b>	(=)	_____
Annual scheduled principal and interest payments on term debts (from farm records) <sup>3</sup>	(-)	_____
<b>Term debt repayment margin</b>	(=)	_____

1 Use net farm income from "normal operations" which excludes capital gains or losses that are both unusual in nature and infrequent in occurrence.  
 2 Non-farm income is one potential source of income for farm debt repayment. However, it may be consumed in the form of personal expenditures before it can be used to pay farm debt. Include only the non-farm income (net of personal expenditures) used to repay farm financial obligations. In family living expenses, include only amounts withdrawn from or paid directly by the farm.  
 3 Include annual scheduled principal and interest payments on capital leases.

### What Are Repayment Capacity Measures And What Do They Measure?

Repayment capacity is a financial criterion that is extremely useful for measuring and analyzing the financial position and financial performance of farm businesses. The Farm Financial Standards Council has defined repayment capacity as the ability of a borrower to repay term farm debt from farm and non-farm income. Generally, repayment capacity measures assume that operating loans will be self-liquidating, i.e., revenue from current operations will be sufficient to fully repay operating loans and interest on loans by the end of the current operating period. Operating loans that are not self-liquidating



must be carried over to subsequent operating periods and are treated as term debts. Thus, repayment capacity assesses the ability to repay operating loans in a timely fashion and the ability to make scheduled principal and interest payments on the term (intermediate and long-term) commitments of the farm business. Repayment capacity exists only when adequate cash is available to meet these obligations, as well as needs for family living expenditures, including income and self-employment taxes. Repayment capacity must also take into account expenditures for farm capital replacement, because income expended for capital replacement isn't available for debt service or family living needs.

farm income, obtain a copy of Purdue University Cooperative Extension Service publication EC-712, "Measuring & Analyzing Farm Financial Performance." It contains worksheets that facilitate computing accrual-adjusted net farm income from cash record information.

In our example, B&B Farms has determined that actual accrual-adjusted net farm income in 1999 was \$29,000. Bob and Ben estimate that their net farm income will increase to \$43,000 in 2000. They have separate personal accounts, and they don't rely on

non-farm income sources to pay farm financial obligations directly, even though they have non-farm income. Each of the two partners in the farm operation withdraws \$35,000 per year from the farm. Their total family living expenditures including taxes were \$39,000 and \$36,000, respectively, in 1999, but these amounts can be ignored because only \$35,000 per partner represents a financial obligation of the farm operation. Farm interest expense in 1999 was \$40,000 and is estimated at approximately \$42,000 for 2000. Depreciation expense was \$30,000 in

1999 and will increase to \$42,000 in 2000 based on planned capital purchases. B&B Farms has a small balance of \$15,000 on their 1999 operating loan that the farm was unable to repay and that they plan to roll over into their 2000 operating loan. Scheduled principal payments on term debts in 1999 were \$37,000 and will be \$37,000 again in 2000 given their current plans. The farm made no capital purchases in 1999. B&B plans to purchase a sprayer in March of 2000. The estimated cost of the sprayer is \$12,000. Of this amount, \$9,000 will be financed with three equal annual payments starting in March 2001. The following exhibit summarizes this information in the form outlined in Worksheet 1 for both the just completed year and next year.

Exhibit 1 shows that the actual term debt coverage ratio for B&B farms was 83% in 1999; it is projected to improve to 95% for the year 2000. Generally, a term debt coverage ratio of less than 125% is cause for concern. The bare minimum that will be acceptable, even to lenders of last resort, is normally 110%. The unpaid operating loan balance from 1999 has been added to scheduled term debt payments in 2000, because unpaid carryover debt is by definition term debt in 2000. The estimated interest expense on the \$15,000 carryover debt was added to the term debt interest expense in 2000. In addition, the estimated interest expense that will accrue on the sprayer note in 2000 has been added to the estimated interest expense on term debt for 2000. We would recommend that B&B Farms consider refinancing the 1999 operating debt carried over to 2000 with a separate term note, rather than rolling it into the operating loan for 2000. It is obvious that the refinanced amount won't be paid in full, if the 2000 year outcome is consistent with expectations.

### Classification of Farm Debts

Correctly classifying farm loans into their current (due this year) or noncurrent components (due in later years) is a key step in producing

**Exhibit 1. Computation of Actual and Projected Term Debt Coverage Ratios, B&B Farms**

Information Used in the Computation	Actual for 1999	Projected for 2000
Net farm Income	\$ 29,000	\$ 43,000
Plus net non-farm income	\$ 0	\$ 0
Plus interest expense on term debts	\$ 40,000	\$ 42,000
Plus depreciation expense	\$ 30,000	\$ 42,000
Minus owner withdrawals for family living and taxes	\$ 35,000	\$ 35,000
Equals: income for debt service and capital replacement	\$ 64,000	\$ 92,000
Minus cash used for capital replacement	\$ 0	\$ 3,000
Equals: term debt repayment capacity	\$ 64,000	\$ 89,000
Divide by scheduled principal and interest payments	\$ 77,000	\$ 94,000
Equals: term debt coverage ratio	83%	95%

accurate liquidity and repayment capacity measures. If a term debt is incorrectly classified as a current liability, it may be overlooked altogether in the computation of repayment capacity measures. The oversight will result in overstated measures of repayment capacity and understated measures of liquidity. Only the amount the borrower is expected to pay during the current year on each loan should be classified as a current liability. Any remaining principal balance should be classified as a noncurrent liability, and the estimated future annual payments on that balance should be taken into account in the computation of repayment capacity measures.

### Cash Flow Budgeting\*

The repayment capacity measures described in the previous section still may not tell us everything we need to know to manage repayment capacity and avoid getting caught short of cash. The problem is that repayment capacity measures tell us about the total amount of repayment capacity for an accounting period, but they don't tell us anything about the timing of cash inflows and outflows during that accounting period. Periodic cash flow budgets can be used to determine both the timing and the amount of financial obligations that can be met by a farm business, and therefore cash flow budgeting provides another extremely useful tool for managing repayment capacity.

A cash flow budget is an estimate of all planned or expected cash receipts and cash expenditures during a certain time period. Estimates may include non-farm income and expenditures. Estimates are made monthly, bi-monthly, quarterly, or annually depending on the desired amount of detail, the seasonality of

cash flows, and how the information will be used. For loan documentation, an annual summary may be sufficient. But, for planning and control purposes, the year should be divided into shorter time periods, because longer periods may obscure exactly when during the year that cash will run short and why that shortage occurred. Tables 1 and 1a illustrate an annual cash flow budget that has been divided into six bi-monthly periods for budgeting and reporting purposes.

Cash flow budgets are quite different in another way from the financial measures discussed earlier. Cash flow budgeting looks only at money movement, not at profitability. The only stock amount that is almost always reported in a cash flow projection is the stock of cash. Sometimes the stock of liabilities is summarized in the cash flow projection, but not always. So cash flow projections show very little, or at most a very incomplete picture, about the financial position of a business and how that financial position changes as the money flows in and out. It is possible to increase cash inflows at the expense of assets, for example through the liquidation of inventory, in a way that is not readily apparent from a cash flow projection. Net cash income from farming can usually be determined from a cash flow projection; but it is frequently quite different than accrual-adjusted net farm income and should never be considered a reliable measure of periodic net farm income. An annual cash flow projection is therefore useless as a tool for assessing farm profitability or farm financial efficiency. Furthermore, it is quite possible to cash flow for one or more accounting periods even though a farm currently shows no actual repayment capacity whatsoever. A multi-year cash flow may help to identify farms that have strong current cash flows, but weak profitability. But neither periodic nor multi-year cash flow budgeting are substitutes for accrual-adjusted measures of profitability and financial position. Instead, financial analysis and cash flow budgeting should be

recognized as being complementary management activities.

The interpretation of a cash flow budget hinges on how cash inflows and outflows affects the cash balance at the end of each period, which is reported on the last line in Table 1a. If cash is short, then additional operating borrowing may be necessary in order to cover the shortfall. Alternatively, other adjustments can be made that affect the timing and amounts of cash inflows and outflows. If a cash flow budget projects a cash deficit for the upcoming year, that is a very good sign that significant adjustments may be needed in planned operating, investing, and financing activities. Plans should be changed before the year starts in order to prevent the cash shortfall. Some farmers operate with a line of credit from their lender with a maximum borrowing limit. The cash flow budget can be used to test if the need for operating capital will exceed this limit and, if so, when the line of credit will be exceeded.

Illustrative types of seasonal adjustments that can be made when projected net cash flow is positive for the whole year but negative for some periods include the following.

- Shift the timing of certain planned sales.
- Shift the timing of certain planned expenditures.
- Increase short-term borrowing in periods with negative cash flow with repayment projected in periods with positive cash flow. Don't forget to add the estimated interest charges on the additional borrowing to projected interest payments.
- Delay the due date of fixed debt payments to periods with positive net cash flow.

If total projected net cash flow for the year is negative, the following annual adjustments can be made.

- Sell more current assets (crops and livestock). Be careful here,

\* Adapted from Edwards, William, "Developing a Cash Flow Budget," *Ag Decision Maker*, C13-15, July 1995, and Edwards, William, "Analyzing a Cash Flow Statement," *Ag Decision Maker*, C3-16, May 1995.

- though, reducing inventories may solve the cash flow squeeze this year, but result in even more severe problems next year.
- Finance capital expenditures with credit, or postpone them until another year.
- Try to reduce the size of intermediate and long-term debt payments by lengthening the repayment period or adding a balloon payment at the end.
- Convert carry-over short-term debt to intermediate or long-term debt by refinancing.
- Reduce non-farm expenditures or increase non-farm income.

**Table 1. Annual Cash Flow Budget**

Cash flow budget for 200 _____		Name _____					Date Prepared _____	
	Last Year <sup>4</sup>	Jan.-Feb.	March- April	May-June	July-August	Sept.-Oct.	Nov.-Dec.	Total Projected
<b>INCOME (all sources)</b>								
Livestock sales	\$	\$	\$	\$	\$	\$	\$	\$
Livestock product sales								
Crop sales								
Government payments								
Custom work income								
Other income								
Capital sales								
New term debt								
Net non-farm income								
<b>TOTAL INFLOWS</b>	\$	\$	\$	\$	\$	\$	\$	\$
<b>EXPENDITURES</b>								
Feed - commercial	\$	\$	\$	\$	\$	\$	\$	\$
Feed - grain								
Livestock purchases								
Labor								
Mach. & Equip. repair								
Gas, fuel, oil								
Machine hire								
Auto, operating								
Utilities								
Fertilizer and lime								
Other crop expense								
Livestock expense								
Building repairs								
Taxes — R.E. & P.P.								
Insurance								
Rent								
Other farm expense								
Life insurance								
Owner withdrawals								
Capital purchases								
Term debt payment due								
Term debt interest due								
Income Tax State								
Federal and S.E.Tax								
<b>TOTAL OUTFLOWS</b>	\$	\$	\$	\$	\$	\$	\$	\$
<b>NET CASH FLOW (+ or -)</b>	\$	\$	\$	\$	\$	\$	\$	\$

<sup>4</sup> Use the first column to enter last year's totals from your records as a guideline.

- Sell intermediate or long-term assets.

Review your cash flow budget from time to time during the year. Prices and costs may have been different from your estimates, or production plans may have changed. Better yet, prepare a cash flow summary of your actual cash flows as you proceed through the year. Compare these directly to your budgeted cash flows. This type of systematic comparison of planned results to actual results is called a “control activity.” This will help you anticipate changes in your needs for cash and credit during the year that weren’t adequately reflected in the budget and it will result in greater management control over business finances.

A cash flow budget can also be very helpful in evaluating major capital investments or changes in the farm business. Examples are purchasing land, building new hog facilities, or expanding a beef cow herd. Often it will be necessary to develop multi-year budgets: one for a typical business year after the investment or change in the business is complete and one for each of the intermediate or transition year(s). Oftentimes, there is a lag of several months to several years between when the initial expenditures associated with a capital investment are made and when the full income potential of the new asset is realized.

Developing a cash flow budget for the first time is never easy. The account totals from last year’s

records provide a good beginning point. Notice that Table 1 provides a column just for those totals. Those numbers provide the best evidence you may have of a reasonable estimate for next year for some of the revenue and expense categories. On the other hand, many of the values for revenues and expenses should be estimated based on your plans for the new year. Additional information about the development of a cash flow budget is available in Purdue Extension publication EC-616, “The Projected Cash Flow Statement.”

Because of the large amount of detailed information contained in a monthly or multi-year cash flow, a computerized cash flow generator should be considered as an alternative to making all the calculations by hand. A computer program can provide a framework for making the necessary computations. A computer can also ease the number-crunching chores. In particular, it is much easier to make needed adjustments to the cash flow in a computerized environment. Computerized cash flow generators generally have routines for estimating loan payments and scheduling loans. The best programs include tools for budgeting expenses that typically change from year to year, estimate changes in balance sheet accounts likely to be affected by cash inflows and outflows, such as inventories, and provide monitoring worksheets to facilitate the comparison of the projected cash flows with actual cash flows. The FINFLO program in FINPACK is a prime example of a computer software program designed for developing monthly

budgets for a single-year or multi-year cash flow budgets.

### How Much Total Farm Debt Can I Repay?

One question often asked by farmers is, “How far in debt can I safely go?” The answer to this question will be different for each farmer and will depend on the extent of their preference for risk, their management ability, and a whole host of other considerations. Maintaining a proportionately large amount of equity has been a time-honored technique for managing the ups and downs of farming over the long haul. Debt levels in agriculture have on the whole been lower than they might otherwise have been if debt had been viewed in a different manner and other tools for managing risk had predominated. But it is possible to approximate an answer to the question of a safe debt load for an individual farm using actual measured (or estimated future) repayment capacity.

Answering the question first requires rephrasing the question “How far in debt can I safely go?” to read “How much debt can I repay?” The maximum amount of debt that can be repaid with a farm’s measured repayment capacity is the maximum safe debt load for the farm.

If we assume an even total (principal plus interest) debt payment schedule, the amount of term debt that can be supported with a given amount of repayment capacity can be estimated using a table of amortization factors such as Table 2. In essence, an amortization factor

**Table 1a. Annual Cash Flow Budget - Cash Summary**

	Jan.-Feb.	March-April	May-June	July-August	Sept.-Oct.	Nov.-Dec.	Total Projected
<b>CASH TRANSACTIONS</b>							
a) Beginning cash balance							
b) Net cash flow (+ or -) from Table 1							
c) New operating borrowing							
d) Operating loan repayment							
— principal							
e)    — interest							
Cash balance, end of period (a + b + c - d - e)	\$	\$	\$	\$	\$	\$	\$



indicates the annual cash requirement associated with repaying a dollar of farm debt. If we borrow money today and plan to repay a specified constant amount of principal and interest each year, we can set up an amortized (equal payment) loan with the lender. The amortization factor indicates the repayment requirements for both principal and interest for each dollar of debt. For example, at 8-percent interest, a loan of \$1,000 repaid over 10 years would require an annual payment of \$148.53 ( $\$1,000 \times .14853$ ). Thus, \$1,000 of annual repayment capacity will pay the principal plus interest on a 10-year loan of \$6,710 ( $1,000 \div 0.1490$ , from Table 2). If the \$1,000 of annual repayment capacity is expected to recur every year for the next 20 years, it could service a maximum of \$9,818.36 ( $\$1,000 \div .10185$ ). Thus, extending the length or term of the loan increases the amount of debt that can be supported with a specified amount of annual repayment capacity. Amortization factors for shorter repayment periods and higher interest rates result in reduced amounts of debt that can be repaid.

The maximum safe debt load computation requires that term debt repayment capacity be divided by the appropriate amortization factor from

Table 2 for the specified interest rate and term of the note. Let's assume that line item 4 in Worksheet 1 was used to compute term debt repayment capacity for White River Farms and the actual computed repayment capacity for 1999 was \$85,000 per year. If the average actual repayment term for the farm's liabilities was 9 years and the actual weighted average interest cost of farm debt was 9%, the implied maximum safe debt load for White River Farms is \$509,592 ( $\$85,000 \div .16680$ ).

The absolute dollar amount of a farm's repayment capacity will vary from year to year. One wouldn't be wise to estimate the maximum safe debt load based on a farm's highest net income in the last 10 years. Net farm income may also include income from sources that are only temporary and aren't likely to recur. These should be excluded when estimating the maximum safe debt load. Interest cost will also vary over time. It may be more conservative to use an estimate of the average expected future interest cost of farm loans. The average maturity of farm loans may also vary over time. It may be more conservative to use expected future repayment periods rather than the current average maturity when estimating the maximum safe debt load for a farm business.

### How Much Additional Debt Can the Farm Afford?

A farmer may also be interested in how much he or she can afford to borrow in addition to the farm's existing liabilities. A related question is how any additional debt financing should be structured. That is, how much cash down payment can I afford and how long should the loan repayment period be? In this situation, the computation should be based on the farm's term debt repayment capacity margin rather than term debt repayment capacity. Only the term debt repayment margin is available to service additional/new debts.

For example, Jon Corngrower's farm had an actual term debt repayment margin of \$21,000 in 1999. This appears to indicate that he has some capacity to take on additional debt. He wants to trade tractors before spring fieldwork starts in earnest. The cash difference on the trade he is considering will be \$59,000. He knows he has already earned the \$21,000, so he can safely spend it. The maximum amount of cash available for a down payment is \$21,000, because any cash paid in excess of that amount will have to be financed in one way or another. Jon decides to set aside \$11,000 to pay income and self-employment taxes for 1999 and will make a cash down-payment of \$10,000.

Let's assume that Jon's 1999 term debt repayment margin of \$21,000 is indicative of what he can expect over the next few years while he will be paying for the tractor. Thus, the annual payments on the tractor loan should be well below \$21,000. He needs to leave at least some of the \$21,000 expected annual term debt repayment margin as a buffer against income variability. If he could find a seven-year loan at a 9-percent interest rate, the annual loan payment on the \$49,000 loan would be \$9,735.81 ( $\$49,000 \times .19869$ ), which is within the margin of \$21,000. But even this relatively long repayment period for the tractor is going to leave the farm with annual payments for the next seven years that will take a big bite out of

Table 2. Amortization Factors For Equal Annual Total Payments

Years	Interest Rate						
	7%	8%	9%	10%	11%	12%	13%
2	0.54544	0.56077	0.56847	0.57619	0.58393	0.59170	0.59948
3	0.37411	0.38803	0.39505	0.40211	0.40921	0.41635	0.42352
4	0.28859	0.30192	0.30867	0.31547	0.32233	0.32923	0.33619
5	0.23740	0.25046	0.25709	0.26380	0.27057	0.27741	0.28431
6	0.20336	0.21632	0.22292	0.22961	0.23638	0.24323	0.25015
7	0.17914	0.19207	0.19869	0.20541	0.21222	0.21912	0.22611
8	0.16104	0.17401	0.18067	0.18744	0.19432	0.20130	0.20839
9	0.14702	0.16008	0.16680	0.17364	0.18060	0.18768	0.19487
10	0.13587	0.14903	0.15582	0.16275	0.16980	0.17698	0.18429
12	0.11928	0.13270	0.13965	0.14676	0.15403	0.16144	0.16899
15	0.10296	0.11683	0.12406	0.13147	0.13907	0.14682	0.15474
20	0.08718	0.10185	0.10955	0.11746	0.12558	0.13388	0.14235
25	0.07823	0.09368	0.10181	0.11017	0.11874	0.12750	0.13643
30	0.07265	0.08883	0.09734	0.10608	0.11502	0.12414	0.13341
35	0.06897	0.08580	0.09464	0.10369	0.11293	0.12232	0.13183
40	0.06646	0.08386	0.09296	0.10226	0.11172	0.12130	0.13099



the farm's expected repayment margin.

### Estimating How Much of the Cash on Hand Is Available for Investment or Additional Repayment?

A question that is very much related to the previous discussion is how much of the cash that is actually on hand at any given time is really available for owner withdrawals or capital purchases. Farm businesses typically have significant amounts of cash on hand at one time or another that sometimes appears to be available for capital investments or owner withdrawals, but that in fact are already committed to other uses later in the year. At such times the farmer may be very tempted to repay existing debts early or make additional capital investments. A detailed cash flow budget that has been adjusted to reflect actual inflows and outflows year-to-date is one tool that can be used to determine whether what appears to be some extra cash on hand is really surplus. Another way that is easier is to estimate the term debt repayment margin.

For example, let's assume that Jon Corngrower decides to add wheat to his crop mix in 2000. Assume that on August 1 he sells his wheat crop, which turns out to be larger and higher priced than he expected, for \$40,000. He had submitted a forecasted income statement for 2000 as part of his documentation for his 2000 crop loan showing the estimated value of the wheat at \$33,000. He had just about convinced himself to use \$32,000 of the \$40,000 from the wheat sale to pay cash for a new pickup truck. He hadn't included the truck purchase in his planned capital purchases in his loan documentation, so he decided to revisit his forecasted income statement for 2000. After adjusting estimated revenues for the \$7,000-increase in wheat revenues, he estimated the farm's term debt repayment margin for 2000 using Worksheet 1. The updated estimate of term debt repayment margin without figuring in the new truck is \$27,000. At most, only \$27,000 of the

\$40,000 of money on hand from the wheat sale is really uncommitted and actually available for additional investments, debt retirement, or owner withdrawals. A prudent manager in this situation would not pay \$32,000 cash for the truck.

### Final Comments

Repayment capacity deserves careful attention and is eminently manageable. Repayment capacity is an important determinant of the ability

adequately for family living expenses, taxes, and reinvestment in the farm operation. The starting point for measuring repayment capacity is determining accrual-adjusted net farm income. Repayment capacity measures do not show whether the timing of cash inflows and outflows will cause repayment shortfalls during the year. A periodic cash flow budget is a particularly useful tool for managing both the amount and timing of

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***“Repayment capacity is an important determinant of the ability to obtain farm financing.”***

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to obtain farm financing. As such, one important aspect of managing repayment capacity involves working effectively with lenders by providing the evidence they need to document repayment ability. But managing repayment capacity should start on the farm and not in the lender's office. There are different ways to manage repayment capacity. Some of the alternatives that we called “operational strategies” may be easier to use and more effective for some farmers than those normally associated with loan documentation.

Repayment management requires measuring and monitoring repayment capacity. The measures may be based on actual historical financial information or on estimated future financial information. Liquidity measures, such as the current ratio and working capital, are sometimes used as indicators of repayment capacity. Because of their exclusive focus on the stock of current financial assets and liabilities, they are only short-term indicators of repayment capacity at best. They should be used in combination with true repayment capacity measures, like the term debt repayment margin or the term debt coverage ratio, or with cash flow projections in order to avoid a very short-sighted perspective.

Repayment capacity measures tell us whether farm income was or will be adequate to service scheduled debt payments, as well as to provide

repayments during a particular year. However, a cash flow budget can not be used to measure farm profitability. Ultimately, scheduled farm debts, farm family living expenses, income and self-employment taxes, and farm reinvestment must be paid from net farm income (possibly with some help from non-farm income) rather than from cash flows. For that reason, a thorough manager should compute repayment capacity measures, like the term debt coverage ratio or the term debt repayment margin, in addition to using a cash flow budget. A multi-year cash flow budget, like repayment capacity measures, is recommended for planning capital investments in a farm operation.

A knowledge of repayment capacity and how it can be estimated can be used to answer questions that tend to crop up frequently in farm decision making. Questions about how much additional debt a farm can afford to incur and how to structure the financing for capital purchases are perfect examples.

*You can order EC-712, “Measuring & Analyzing Farm Financial Performance,” and EC-616, “The Projected Cash Flow Statement,” through your county office of Purdue Extension or by calling 1-888-EXT-INFO.*

# What's the Right Rent Now? How Can it Be Kept Right Easily?

*D. Howard Doster, Purdue Extension Economist*

**T**he short answer to the title question is that average rents are too high to be sustained by most tenants. While no one knows the actual yields and prices yet for 2000, we do know that government payments for 2001 are scheduled to be much lower than for 2000. Many leases for 2001 will be negotiated this summer and fall, long before Congress considers any possible extra payments for 2001.

## What's the Theory?

As economists, we study how persons trade with each other, and then predict how they will trade with each other. We have learned that the residual returns go to the scarce resources. In crop farming, the scarce resources are productive land and top management. When times are good, land rents increase; in bad times, rents eventually drop. During transition times, one party receives excess returns, and the other suffers.

## What's the Practice?

Once they've negotiated a lease, many landowners continue the same lease with the same tenant for several years. When tenants receive unexpected revenue from high yields or prices, or government payments, some tenants report they sometimes share their excess revenue with their landowner. When revenues are unexpectedly low, some Indiana landowners report they sometimes refund part of their rent.

Some landowners have cash leases with adjustors for yield and/or prices that are based on the tenant's reported performances, but these performances may not be timely.

Few landowners have adjustors for government payments, even though the payments have varied greatly in recent years. FSA pays the person who is at risk, the tenant in a cash lease. (However, the tenant and landowner can have a lease that provides for the tenant to pay the

landowner all the government payment. Such a lease shifts the risk of uncertain payment amounts to the landowner.)

Very few leases provide for between-year adjustments in base rent. Therefore, leases must be renegotiated to reflect current economic conditions when expected prices or government payments change greatly.

## What's a Better Way?

I think landowners and tenants can create leases that provide for adjustments that are appropriate for current economic conditions. Later, in this paper I will illustrate one such lease. The adjustments can account for 100% or for 50% of the changes that occur after the lease is negotiated. Tenants are expected to pay more rent for leases with these adjustment terms. The adjusted rent will be less than the base rent in low income years and more than the base rent in high income years. With this lease, the tenant does not need to report actual performance to the landowner.

## How Much Have Returns and Rents Varied Recently?

Per acre crop returns have varied considerably over the past five years, and many persons expect returns to vary considerably over the next several years. Yields often vary widely from year to year. Crop prices increase when forecasted inventory carry-out is small; other years, prices decrease until someone is willing to own bushels that may not be used the next year.

In the past five years, government payments have varied from zero in 1995 to an estimated \$68 per acre in 1999, as shown in Table 1, "Returns to Indiana Cropland." In addition to increasing each of the years from 1995, government payment increases have been announced after leases were negotiated in four of the five

years. (If the just-passed Senate bill becomes law, government payment increases will have been announced after leases were negotiated in five of the last six years.)

In 1996, the Farm Bill was passed in May, after some crops were planted. The actual 1997 payment was included in the 1996 Farm Bill. However, in the fall of 1998, the 1998 payment was increased 49% above the provisions included in the 1996 bill. In the fall of 1999, the payment was increased 100% above the amount provided for in the 1996 bill. In 2000, the May 2000 Senate bill also increased the payment 100% above the amount provided for in the 1996 legislation. Thus, tenants have been forced to base their rent offer on possible additional payments. Payments from the 1996 bill are scheduled to continue at a declining amount through 2002.

As shown in Table 1, average returns during the five years varied more than reported average rents. Note the numbers on the line identified as "Contribution Margin." Contribution margin is revenue, including crop sales and government payments, minus variable costs. It is the return to the resources: labor/management, machinery replacement, and land. The per acre contribution margin was \$192 in 1995, increasing to \$214 in 1997, then decreasing to \$154 in 1999. Thus, over this period, the Indiana average contribution margin varied by \$60 per acre.

As shown in Table 1, reported average rent increased from \$104 in 1995 to \$121 in 1998, before dropping to \$117 in 1999. Thus, over this period, the Indiana average rent varied by \$17 per acre.

For 2000, suppose yields are at trend amounts (135.8 bu corn and 43.5 bu beans), prices are at loan rates, variable costs are increased an average of \$6 per acre, and government payments are at the scheduled

\$31 per acre. Then, as compared to the 1999 amounts in Table 1, the contribution margin is \$146, down \$8 from 1999. If the government payment is doubled as in the Senate bill, the contribution margin is increased to \$161. Then, by subtracting \$93 from these numbers, the return to land is either \$53 or \$68, well below the likely reported average rent for 2000.

### What Is Right Rent?

What is the right rent? You may ask that question as you study Table 1. Was rent too low in 1995 and right in 1999? Or was it about right in 1995, 1996, and 1997, as suggested by the relationship between the bottom two lines, "Return to Land" and "Reported Average Rent"? In those years, the difference was only \$3-8. However, in 1998 and 1999, the difference was \$42-56, even after including the extra government payments of 49% and 100%.

Without providing the details here, the variable costs and the labor and machinery replacement are amounts I report annually in the "Purdue Crop Guide" (ID-166). I

think they are representative values for Indiana tenants. Therefore, I think the evidence suggests average rents were about right in 1995-97 and much too high in 1998 and 1999.

How can tenants pay rents that are too high? Some can't, and they exit the industry. Others can pay more rent because they are more productive, have lower costs, have non-crop income, have some lower rents (including zero rents on debt-free owned land), and/or can postpone machinery replacements. Based on reported combine and tractor sales, most farmers have postponed machinery replacement. However, some farmers are buying the new, larger sized combines and are renting additional land. These farmers can have lower per acre labor/management costs. Nevertheless, I think rents are too high to be sustained at the 1999 average amount, given the current contribution margins.

I expect continued consideration of government policy alternatives to somehow increase contribution margins. Somehow, I think the two bottom line amounts in Table 1 for the

next five years will become closer together than the amounts reported for 1998 and 1999.

To me, the question, "What is the right rent?," creates a problem. As an economist, I read a market rent survey to learn what buyers are paying and sellers are accepting. I have reported these amounts. As an economist, I also calculate returns and costs to estimate what tenants can afford to pay. Based on the above two economic analyses, I conclude average rents are currently not at a sustainable or equilibrium amount. Thus, I say that rents are not "right" now. Many landowners are getting excess returns, and tenants are suffering.

### Is it Time for a Lease Change?

In theory, except for changes in the number of prospective tenants, when expected costs, yields, prices, or government payments change, tenants are expected to adjust their rent bids so that the returns to their resources remain about the same. This theory is the basis for presenting the various adjusters in this paper.

**Table 1. Returns to Average Indiana Cropland Corn/Soybean Rotation, 1995-99**

	1995		1996		1997		1998		1999	
State Average Yield <sup>1</sup>	113	39.5	123	38	122	43.5	137	42	132	39
State Price, November <sup>1</sup>	<u>\$3.11</u>	<u>\$6.61</u>	<u>\$2.69</u>	<u>\$6.90</u>	<u>\$2.60</u>	<u>\$6.88</u>	<u>\$2.06</u>	\$5.49	<u>\$1.90</u>	<u>\$5.41</u>
Sales	\$351	\$261	\$331	\$262	\$317	\$299	\$282	\$231	\$251	\$211
Less Variable Costs <sup>2</sup>	<u>\$138</u>	<u>\$90</u>	<u>\$134</u>	<u>\$94</u>	<u>\$137</u>	<u>\$96</u>	<u>\$138</u>	<u>\$85</u>	<u>\$135</u>	<u>\$86</u>
Operations Contribution Margin	\$213	\$171	\$197	\$168	\$180	\$203	\$144	\$146	\$116	\$125
+ Government per base acre <sup>3</sup>	<u>0</u>		<u>23</u>		<u>45</u>		<u>53</u>		<u>68</u>	
Equals Contribution Margin <sup>4</sup>	\$192		\$194		\$214		\$172		\$154	
Less Labor, Machinery Replacement <sup>2</sup>	<u>91</u>		<u>91</u>		<u>93</u>		<u>93</u>		<u>93</u>	
Equals Returns to Land <sup>5</sup>	\$101		\$103		\$121		\$79		\$61	
Reported Average Rent <sup>6</sup>	\$104		\$111		\$118		\$121		\$117	

1 Yield estimates are based on state average yields. Prices are based on state average November sales prices, compiled by Indiana Agricultural Statistics Service. Prices for 1999 are estimated loan prices.

2 Costs are from the "Purdue Crop Guide," ID-166, revised for year-to-year consistency.

3 Government payments were estimated for a 50% corn base farm with a 110 bushel FSA yield. For example, the 1999 calculation was: (\$.363 per bushel x .85 x 110) + 100% AMTA payment = \$68 per base acre, or \$34 per cropped acre. Any loan deficiency payment (LDP) is accounted for in the \$1.90 and \$5.41 price. An oilseed payment, not yet made, of perhaps \$.14 per bushel of beans or about \$3 per cropped acre, is not included.

4 Contribution margin (cm) is revenue (crop sales plus government payments) minus variable costs. It is the returns to labor/management, machinery replacement, and land. The calculation is (corn cm + bean cm + government per base acre) ÷ 2.

5 Estimated returns to land averaged \$93 per acre on average Indiana cropland in the past five years, ranging from a high of \$121 in 1997 to a projected low of \$61 in 1999.

6 Based on cash rents for average Indiana land reported annually in the August/September issue, Purdue Agricultural Economics Report. Reported values are adjusted for soil with expected state average yield.

If landowners permit bidding, rents are set by prospective tenants. It's relatively easy for tenants to bid up rents when crop prices or government payments cause an increase in the expected contribution margin. Prospective tenants tend to bid most of the expected returns above their other costs into rent.

After expected prices and/or government payments fall significantly, neither present tenants nor prospective tenants should be expected to bid the same terms for the next year that seemed appropriate for the previous year. But that's what they do if they don't renegotiate their leases or have adjustor terms in share leases as well as in cash leases. Few leases, either share or cash, include adjustor terms. Perhaps more leases should contain adjustor terms. With appropriate adjustor terms, tenants can start each new year expecting to get the same contribution margin as when the base was first negotiated, thus reducing stress on both parties.

Landowners could offer tenants the opportunity to start each new

year expecting to get the same contribution margin as when the base rent was negotiated, thus reducing the need to renegotiate the lease. (See Table 2. 2001 Benchmark Budget.) Without this opportunity, when economic conditions change, one party benefits and the other party suffers. Many tenants are likely paying more rent in 2000 than if their leases had been renegotiated for 2000. Unless leases are renegotiated for 2001, many tenants will pay higher rents in 2001 than now appears to me to be justified.

Some leases continue unchanged for several years. Some people argue that good years get offset by bad years. However, with mostly one year leases, there is no guarantee that one party will "get even" with the other. Also, currently, there is no guarantee what the next government program will be.

Landowners create lease terms. If landowners permit tenants to compete for their land, prospective tenants determine the amount of the rent by their bids. It may be time for

landowners to create lease terms that provide for the landowner to expect to realize the residual returns to land each year, thus reducing the stress in either party to renegotiate the lease. With this feature, landowners can expect to have more variable returns than landowners with cash rent leases and no adjustors. Their income variability will be similar to the variability experienced by owner-operators and cash rent tenants. With this feature, perhaps tenants will bid higher rents than if they don't have this provision. Tenants surveyed at the 1998 Purdue Top Farmer Crop Workshop said, on average, they would bid \$13 per acre more for a lease with this feature. That's comparable to some crop insurance payments, but the money goes to the landowners.

Once a lease is negotiated, changes can occur in costs, yields, prices, and government programs. Cost changes are generally small compared to year-to-year yield and price changes. However, an adjustor lease can include recognition of cost changes.

### Cash Lease Adjustors

In a cash lease, the landowner allows tenants to set the cash rent by the amount of their bids. In calculating their bids, tenants consider or can consider the following:

- Their skills
- Their risk-taking ability
- Their other opportunities for using their resources
- Their competitors
- Their expectations about costs, yields, prices, and government payments on the landowner's farm

If landowners were to create a benchmark budget with their expectations for their own farm such as shown in Table 2, they could ask their tenants to base their rent bids on the costs, yields, prices, and government payments used to calculate the benchmark budget. The

Table 2. 2001 Benchmark Budget Sample Farm, Corn/Bean Rotation

	Expected		Adjusted	
	Corn	Soybeans	Corn	Soybeans
Yield <sup>7</sup>	137.3	46.0		
Price <sup>8</sup>	\$1.90	\$5.41	\$	\$
Sales	\$261	\$249	\$	\$
Less Variable Costs <sup>9</sup>	143	90	—	—
Operations Contribution Margin	\$118	\$159	\$	\$
+ Government per base acre <sup>10</sup>		\$24		\$
Contribution Margin <sup>11</sup>		\$150		\$
- Base Rent Bid <sup>12</sup>		65		65
= Returns to Tenant's Resources <sup>13</sup>		\$85		xx
- Returns to Tenant's Resources <sup>13</sup>		xx		\$85
= Adjustments		xx		\$

7 Expected yield is increased 1.1% above expected 2000 yield.

8 See "Price" in the Possible Outside Adjustor section. Without a major drought somewhere in 2000 or 2001, prices are expected to be at loan (LDP) prices.

9 Cost budgets are from the 2000 "Purdue Crop Guide" (ID166), increased \$8 an acre for corn and \$4 for beans to account for higher fuel related prices.

10 For 2001, the scheduled government payment per corn base acre is \$.26 x .85 x FSA yield (assumed here to be 110 bushels) = \$24. With a 50% corn base, the payment is \$12 per cropped acre.

11 Contribution margin is return to resources. The resources include the tenant's labor/management and machinery replacement, plus the landowner's land.

12 Base rent is the rent before adjustments.

13 The returns are for the tenant's labor/management and machinery replacement.

landowner could then subtract the selected tenant's cash rent bid from the rotation contribution margin to find the returns to the tenant's resources.

One year later, instead of re-opening rent negotiations, the landowner could re-calculate his/her benchmark budget for the upcoming year. To find the tenant's rent for the next year, the landowner would merely subtract returns to the tenant's resources calculated the previous year from the landowner's owner-operator rotation contribution margin. By paying this rent for the next year, the tenant expects to have the same earnings, (returns to his/her resources) as in the year the lease was first negotiated.

To illustrate, the winning tenant for 2001 pays \$65/acre in base rent for the Table 2 average soil farm. Then, based on the landowner's benchmark budget, the tenant's return is \$85 (\$150 minus \$65). Because of his superior performances, the winning tenant likely expects to realize higher returns to his resources than the \$85 shown in Table 2.

Suppose that, after harvest, the Table 2 adjusted contribution margin is calculated to be \$160. Then, \$160 minus \$65, the rent bid, minus \$85, the tenant's expected returns, equals \$10, the adjustment amount that the tenant pays the landowner.

Suppose that the landowner's benchmark budget for 2002 shows a rotation contribution margin of \$165, an increase of \$15 per acre. Then, \$165 minus \$85, tenant's expected returns, equals \$80 in base rent for 2002, an increase of \$15 per acre.

### Share Lease Adjustors

The 50-50 crop share lease accounts for changes in prices, yields, costs, and government program payments. Each party realizes 50% of the changes.

Tenants with 50/50 leases negotiated for, say, 1997, should recognize that their 50/50 lease sharing accounts for only half of the \$64 change between the 1997 contribution margin of \$214 and the 1999 contribution margin of \$150 in

Table 1. Thus, if prices stay at lower levels, such 50/50 tenants will also realize low returns to their labor/management and machinery resources. Likely, these tenants could renegotiate a more favorable 50/50 lease for 2001.

Historically, landowners of low quality land include incentives to tenants to get them to accept 50-50 leases. On high quality land, tenants have been able and willing to make privilege payments in order to get 50-50 leases. I think landowners should increase their incentives payment for 2001, and, assuming prices are at loan levels, payment should be made on all but high quality land.

I propose that landowners adjust their leases at the beginning of each lease year. If expected returns are lower, rents will eventually be lower by about the same amount. The questions are "when" and "how." Make the adjustment at the beginning of each year, and reduce stress. Until rents change, one party gets the lease benefits, while the other party suffers.



### Outside-The-Farmgate Adjustor Leases

By using outside-the-farmgate adjustors, tenants can solve four problems related to their landlords.

1. With outside adjustors, tenants can buy all the inputs and sell all the outputs and not have to segregate either by landowner.
2. With outside adjustors, landowners need not worry about when their crops are actually planted or harvested.
3. With an adjustor lease, the risk of no increase in government payments is transferred to the landowner.
4. With outside adjustors, tenants realize 100% of their actual performance.

Here are the features of outside adjustor leases. A landowner prepares a so-called benchmark budget for his soil such as is shown in Table 2. Landowners may use one of the budgets for low, average, or high yielding soil published annually in

the "Purdue Crop Guide," ID-166. The landowner can indicate how adjustments are to be made. The landowner can take bids from prospective tenants of his choosing and accept the bid he/she wishes, which may not always be the highest bid.

Suppose the landowner offers to take 50% of outside-the-farmgate changes in prices, yields, costs, and government program payments. This is a 50-50 share lease, but with the adjustor benefits listed earlier.

As with more conventional 50-50 leases, this lease also needs to be adjusted at the beginning of each year. The adjustment can be to change the base rent so the tenant has the same expected contribution margin as in the first year of the lease.

Tenants should recognize the features of the adjustor leases limit their upside gains as well as their downside pains. In a 100% outside adjustor lease, the tenant locks in his expected contribution margin for the duration of the lease, except for the generally small gains or losses he/she experiences because of his/her actual performances. Therefore, in a 100% adjustor lease, the calculation of the current year rent includes all the current year change in the outside adjustors that were used.

At the beginning of each year in a 50-50 outside adjustor lease, the base rent should be adjusted so that the tenant's expected contribution margin is the same as in the landowner's benchmark budget when the lease was negotiated. This means that the landowner's benchmark budget for the next year includes 100% of the current year changes in the outside adjustors that were used. During each year, the tenant and landowner then share equally in the changes in the outside-the-farmgate changes in prices, yields, costs, and/or government programs.

With both 100% and 50-50 adjustor leases, the tenant takes 100% of the risk for actually producing and marketing the crops. Therefore, the tenant can expect to earn more rewards than when doing custom farming.

Since the tenant is responsible for the actual crop production, some landowners may be concerned that the tenant won't use sufficient fertilizer or lime to maintain the soil tests at optimum economic levels. To solve this problem, in their lease contract, landowners can commit to applying a specified quantity of lime, phosphate, and potash, at the landowner's expense, each year. Knowing this commitment, tenants will bid higher rents.

Some landowners may not want to create adjustor leases with benchmark budgets on their own. Professional farm managers can perform this service and select a tenant in less time the first year than they spend in managing a farm with a crop share lease. In succeeding years, managers will likely spend no more, and perhaps less, time than they devote to either a cash or share lease.

### Possible Outside Adjustors

A landowner may use any or all of the following adjustors.

1. Prices. Grain prices are adjusted by the difference between the expected harvest price and an actual harvest price. The expected price might be a local elevator harvest bid price on the date the lease is negotiated, or it might be the Chicago Board of Trade (CBOT) closing prices for November beans and December corn on the date the lease is negotiated.

If the futures prices are used, both the landowner and prospective tenants will want to recognize that the tenant's expected contribution margin includes an amount to account for the expected local basis, the difference between the CBOT futures and the local elevator price. Further, the tenant will be at risk to decide when to lock in the basis with a local buyer.

If the futures price is used, the "actual" price can be, say, the average closing prices of the two futures on the last two Wednesdays in October and the first two Wednesdays in November.

2. Yields. Landlords can adjust their farm-budgeted yields by the percentage change between expected

yields and reported average county yields. The percentage change in county yields will not always be the same as the percentage change in yields on a specific farm. Thus, the tenant is also taking yield risk because of county variation in weather. On both a 50-50 and 100% outside adjustor lease, the tenant is taking 100% of the actual yield variation on the rented farm.

If the landowner wants to have a share of the actual crop or if the local FSA office requires it on a share lease, the tenant could calculate expected yields on each of his/her farms. Then, once the total production is determined, the bushels can be pro-rated to each farm. Using this process, the tenant doesn't need to report input and output to each of his/her landowners.

3. Costs. Variable costs can be adjusted by the percentage change from April 2000 to April 2001 for production items, interest, taxes, and wage rates paid by farmers, as reported in the USDA's publication, "Agricultural Outlook".

4. Government payments. These payments are adjusted by the change between expected and actual government payments. If loan rates are used when prices are below loan, no separate loan deficiency payments are included.

### My Lease

As the tenant, I have a 100% adjustor lease for land in a nearby state. As compared to Table 1 yields, the county yields there were much higher in 1998 and much lower in 1999. I received an adjustment of \$20 in 1998 and \$50 in 1999. Recently, the landowner requested, and I agreed, to continue the lease for at least three more years. Perhaps the landowner is expecting much higher contribution margins in the future. If that occurs, I will pay the landowner 100% of the increase above the tenant's benchmark contribution margin. See Table 2 as an example for making the calculations.



### Unsolved Problems

I identify three problems that may not be solved by adjusting rents as proposed. While use of adjustors causes a decrease in income variability for the tenant, there is the landowner's perspective to remember, as well.

1. The use of adjustors causes an increase in income variability similar to that of an owner-operator for the landowner, something that some landowners consider quite undesirable. Of course, as noted earlier, landowners can expect tenants to pay more rent every year than they would pay without adjustors in the lease.

2. The use of adjustors causes a decrease in the tenant's income variability only on those rentals where the tenant has an adjustor lease. On his/her other rentals, the tenant is still likely paying excessive rent for 2000. Thus, the conscientious landowner may feel that he/she is subsidizing the tenant and that the other landowners are enjoying the "free ride" associated with higher rental income. Of course, some landowners already subsidize their tenants by charging under the market rents.

3. Landowners who need a steady return will have a cash flow problem if their needs are more than the adjusted rent in low income years such as indicated for 1999 in Table 1. To solve this problem, tenants might offer to loan the landowner needed cash in exchange for a lien on the land.

### Conclusion

At 1999 crop loan prices, not much Indiana cropland will be idled in 2001. Almost everybody thinks they can more than cover their variable costs other than rent. Tenants now rent from multiple landowners. Expected yield may differ on each farm, and lease terms may also differ. At the 1997 Purdue Top Farmer Crop Workshop, on average, the participants indicated expected returns from their various rentals varied by \$50 per acre. Tenants have quite different production skills. At the 1997 workshop, participants estimated 25 bushels per acre difference in the

production skill of their tenant neighbors on the same soil type. This 1997 survey documents the great profit differences between leases and the great productivity differences between operators.

If you're not a low-cost producer and likely can't become one quickly, exit the industry now. Sell out ahead of the crowd, and do something where you have a comparative advantage.

If you are a low-cost producer, stay in business. At a lower rent, pick up land that others drop. Then, perhaps drop your leases with low returns potential or re-negotiate them to give you more favorable

returns. Consider outside adjustor leases.

*Editors note: This article is believed to be helpful in furthering the discussion between tenants, landowners and farm managers for finding better ways to share the risk of fluctuations in the "returns to land."*

*The editor, and his reviewers among the faculty feel the presentation is more opinionated than we would normally publish. However, it raises several important issues that merit discussion. This article suggests one approach, but there are others. Exploring other alternatives is an important part of the negotiation process associated with developing a lease that is equitable to the tenant and landowner.*

*Those who wish more information on the legal aspects of Indiana farmland leases and on ways to protect the landowner against the nonpayment of rent, can find "Lease Law" at the editor's Ag Law course Internet site: <<http://www.agecon.purdue.edu/academic/agec455/>>. "Extension Publications" including lease forms are also available with the list of references at that site. A farmland lease is both a legal and economic document, therefore the assistance of a lawyer and farm manager is advised. You may contact the editor at 765-494-4216 or toll free 1-888-398-4636 or by E-mail: <[harrison@agecon.purdue.edu](mailto:harrison@agecon.purdue.edu)>.*

## 33<sup>rd</sup> Annual Top Farmer Crop Workshop Purdue campus, July 16-19

*D. H. Doster, Extension Economist*

**A**s farmers buy more services, and produce more crops by recipe, are they in danger of becoming serfs? Howard Doster, coordinator of the 33<sup>rd</sup> annual Purdue Top Farmer Crop Workshop, asked each of the fifty speakers including farmers, professors, and major corporation presidents, to answer that question and similar questions as they present their products, services, and ideas on the West Lafayette campus, July 16-19. Doster wants each speaker to share how farmers can create opportunities by adding significant value as they produce and market their crops. Speakers will also answer:

1. What value does a farmer add who contracts to grow and sell a specific recipe to an integrator?
2. How are not-so-big chemical companies competing?
3. How are smaller seed firms getting cutting edge genetics?
4. Which internet buying and selling methods help a farmer?
5. What are the benefits and limitations of the next farm bill alternatives?
6. What will the weather and marketing experts say on July 18?
7. Which precision farming practices add value?
8. Which personnel management practices add value?
9. Why update our vision and mission statements as we do our strategic planning?
10. How many acres can one crew farm using the biggest combine?
11. How are smaller farmers jointly using large machinery?
12. How can a group of smaller farmers use one big combine and charge themselves a rate by date?
13. What non-farm jobs fit with crop farming?
14. What services do I want from a marketing consultant?
15. What types of information do I want on Purdue's Farm Management Web page?
16. What's the next "tillage?"
17. Should I have a Veris machine classify my soils?
18. Will inter-planting coated beans into wheat allow double cropping in northern Indiana?
19. Will my next planter be used for corn, beans, and wheat?
20. Which crop insurance helps a farmer?
21. How can I transfer more risk to the landowner?



In addition, participants will use Purdue's computer to test before they invest in changes in their crop rotations, tillage system, machinery size, and/or farm size. Since the first Top Farmer Crop Workshop in 1968, over 7,000 mostly cornbelt farmers have tested 25,000 alternatives for their own farm. In this workshop, farmers ask "How much can I do?", not, "How much do I need to do?"

The registration fee is \$199 for the first person and \$75 for each additional person from the same farm. Enroll early and have plenty of time to do the homework.

For more information, read the web page at <http://www.agcom.Purdue.edu/AgCom/news/backgrd/TopFarmer/topfarm.html> or call Howard Doster at (765)494-4250.



# Early 21<sup>st</sup> Century Farm Management on Display

## State Farm Management Tour, North Lafayette Area, July 5-6, 2000

*D. H. Doster, Purdue Extension Economist*

**T**hat's the theme for the 68<sup>th</sup> Annual State Farm Management Tour July 5-6, 2000 just north of Lafayette. Formed in 1932 to encourage and develop management skills in farming, the State Farm Management Association, Purdue Cooperative Extension Service and Agricultural Economics Department have selected five host families for this year's tour. Visitors can see corn and beans and cows and pigs, but the focus is on evaluating the management skills of the host families. Visitors should evaluate how compatible each host's goals are with their material resources and mind/muscle skills.

Greenhouse in PA who furnishes Walmart in several states.

3:00pm, Wednesday, July 5 - Just west of Brookston, Walter Kelley and his wife own 1800 acres of the best farmland anywhere. One 400 acre field yielded just under 200 bushels per acre in 1999. Their engineering graduate son, Kevin, is entering the business this year. Kelley is widely recognized for his skills in manufacturing farm sprayers. Walt and Kevin are now also partnering with a neighbor in planting corn. They will complete a new bin and dryer installation before harvest.

at 5600 grain acres, they're also sub-leasing another 1300 acres to others until they're ready to farm it themselves. Learn how they're teaching their values to their kids as they help them with their hay, vegetables and custom baling business.

10:00am, Thursday, July 6 - Harold and son, Jon Kingma, farm 1500 grain acres and 200 acres of Christmas trees in Jasper county. Harold is past president of the State Christmas Tree Assn. Consider how their tree work increases the number of days they can do field work, in April, June, and November. The tour lunch will be held in their new heated floor farm shop. After lunch, Purdue's Chris Hurt will present his crop/hog commodity price outlook.

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***“Formed in 1932 to encourage and develop management skills in farming, the State Farm Management Association, Purdue Cooperative Extension Service and Agricultural Economics Department have selected five host families for this year's tour.”***

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Then, look for evidence of their production, marketing, finance, and personnel management skills. On Wednesday evening, Senator Richard Lugar will share his risk management insights, based on materials he's presented to the Senate Ag. Committee.

1:00pm, Wednesday, July 5 - Levi and Norma Huffman of near Buck Creek have recently brought their son and daughter's families into their business. The six adults now meet monthly and conduct business in their own farm advisory board. They are now implementing the mission statement they created in their first three monthly sessions. In addition to a large hog and grain operation, they produce processing tomatoes for Red Gold Cannery and Indian corn for Dan Schantz'

7:00pm, Wednesday, July 5 - Harrison High School Auditorium, just north of West Lafayette, Honorable Richard G. Lugar, U.S. Senator, will speak on "Risk Management and other Ag. Policy Issues". As Chairman of The Senate Agricultural Committee, Senator Lugar has been and is expected to continue to be among the most influential politicians on issues related to agriculture.



8:00am, Thursday, July 6 - Brothers Dave and Mike Harper of Eastern Jasper County got into farming when their Dad died while they were still in high school. They substituted mind and muscle for money and once finished 5000 hogs in pasture and mud lots while also producing grain. Now

1:30pm, Thursday, July 6 - Veterinarian Mike McClosky is managing partner of the new 10,000-cow Fair Oaks Dairy in eastern Newton County. He's also manager of his dairy marketing coop which is marketing milk into southeastern US cities. In addition to learning about his people management, feed sources, manure disposal, and milk marketing plans, tour visitors will see 72 cows being milked at a time on a large turn-Table by four people. Tour visitors are asked to obtain a free "Dairy" admission ticket at one of the Wednesday tour sites.

Farmers are encouraged to look for useful management processes which they might adopt or adapt. Landlords and potential landlords are invited to learn how the hosts can pay a competitive rent and also create and carry out a successful business and family lifestyle. Input suppliers and output buyers may learn how to better serve their customers. City folks may bring their kids and grandkids and marvel at the changes since the good old days.

Web Site: [www.agcom.purdue.edu/AgCom/news/farmmgmt/index.html](http://www.agcom.purdue.edu/AgCom/news/farmmgmt/index.html)

# Environmental Awareness and Attitudes: Large-Scale Farmers and the General Public\*

George F. Patrick, Professor

**D**o farmers and the general public have the same knowledge and views on environmental issues? This article compares a national survey of the general public with a group of large-scale farmers from the eastern Cornbelt. There are substantial differences between producers and the general public in environmental knowledge and views on environmental issues. The large-scale farmers were much more knowledgeable about the environment than the general public. However, while farmers feel environmental policy has “gone too far,” the general public feels policy has “not gone far enough.” These results suggest that agriculture will continue to face formidable challenges in the environmental policy area.

In 1997, the National Environmental Education and Training Foundation (NEETF), together with Roper Starch Worldwide, conducted a national telephone survey of 1501 randomly selected individuals 18 years of age or older. A number of questions were asked about attitudes toward environmental rules and regulations, compensation for loss of value from land use restrictions, and views of the environmental future. A 12-item multiple-choice test of environmental knowledge was also given. A subset of the same questions was given in a written questionnaire to participants in the 1997 Top Farmer Crop Workshop (TFCW) held at Purdue University (Appendix A). Although the TFCW participants are not a representative sample of all farmers, they have characteristics of the farmers who produce the bulk of

the nation’s food and fiber. The 41 male respondents are large-scale farmers, growing nearly 1950 acres of crops in 1997 (primarily corn and soybeans) on owned, cash-rented, share-leased and custom-farmed land. All had gross farm incomes of more than \$100,000. These producers averaged 40.6 years of age and had completed more than 3 years of education beyond high school. Less than 10 percent of respondents received more than 25 percent of their gross income from livestock.

The TFCW participants correctly answered an average of 10.6 questions on the 12-item test of environmental knowledge, with over 56 percent responding correctly to 11 or more of the questions. In contrast, only 11 percent of the NEETF sample responded correctly to 11 or more questions. The general public averaged 7.0 correct responses, and the average increases to 7.8 if only men



are considered. If only college graduates and those with post graduate education are considered, respondents with educational levels similar to those of the TFCW participants, the number of correct responses increased to 7.9 and 9.1, respectively. Although the TFCW participants demonstrated a much higher level of environmental knowledge, less than 5 percent thought that they knew a lot about environmental issues and problems, as compared to 16 percent of the men in the NEETF study.

Table 1 compares the percentage of the NEETF sample and the TFCW participants who answered each of the 12 environmental knowledge questions correctly. TFCW participants had much higher percentages of correct responses on questions related to sources of water pollution, how electricity is generated, the definition of bio-diversity, and primary benefits of wetlands. The percentages of correct responses for the two groups were similar for the

**Table 1. Percentage of Individuals Answering Each Environmental Knowledge Question Correctly**

Content of Environmental Knowledge Question	Percentage Answering Correctly	
	NEETF N = 1501	TFCW N=41
The most common source of water pollution	23	88
How most electricity in the U.S. is generated	33	81
Definition of bio-diversity	40	93
The primary benefit of wetlands	53	95
Protection provided by ozone in upper atmosphere	57	63
Disposal of nuclear waste in U.S.	58	95
Recognition of a renewable resource	66	100
Knowledge about materials considered hazardous waste	67	95
The largest source of carbon monoxide (air pollution) in U.S.	69	81
The most common reason for the extinction of animal and plant species	73	76
Environmental Protection Agency is the primary federal agency that works to protect the environment	74	98
Where most household garbage ends up	83	98
<b>Average number of correct responses</b>	<b>7.0</b>	<b>10.6</b>

\* Appreciation is expressed to Lynn M. Musser, a former Purdue faculty member, who worked with the National Environmental Education and Training Foundation (NEETF) in conducting the national survey. She provided the questions used in the survey and analysis of the NEETF results.

## Appendix A

### Environmental Knowledge Quiz

The following questions deal with general knowledge about the environment and environmental issues. These questions were originally developed by the National Environmental Education and Training Foundation (NEETF) for a survey of the general public. Each question also included response e, "Don't know."

(Correct answers are in bold.)

1. There are many different kinds of animals and plants, and they live in many different types of environments. What is the word used to describe this idea?
  - a. Multiplicity
  - b. **Bio-diversity**
  - c. Socio-economics
  - d. Evolution
2. Carbon monoxide is a major contributor to air pollution in the U.S. Which of the following is the biggest source of carbon monoxide?
  - a. Factories and businesses
  - b. People breathing
  - c. **Motor vehicles**
  - d. Trees
3. How is most of the electricity in the U.S. generated?
  - a. **By burning oil, coal, and wood**
  - b. With nuclear power
  - c. Through solar energy
  - d. At hydro electric power plants
4. What is the most common cause of pollution of streams, rivers, and oceans?
  - a. Dumping of garbage by cities
  - b. **Surface water running off yards, city streets, paved lots, and farm fields**
  - c. Trash washed into the ocean from beaches
  - d. Waste dumped by factories
5. Which of the following is a renewable resource?
  - a. Oil
  - b. Iron ore
  - c. **Trees**
  - d. Coal
6. Ozone forms a protective layer in the earth's upper atmosphere. What does ozone protect us from?
  - a. Acid rain
  - b. Global warming
  - c. Sudden changes in temperature
  - d. **Harmful, cancer-causing sunlight**
7. Where does most of the garbage in the U.S. end up?
  - a. Oceans
  - b. Incinerators
  - c. Recycling centers
  - d. **Landfills**
8. What is the name of the primary federal agency that works to protect the environment?
  - a. **Environmental Protection Agency (EPA)**
  - b. Department of Health, Environment, and Safety (DHES)
  - c. National Environmental Agency (NEA)
  - d. Federal Pollution Control Agency (FPCA)
9. Which of the following household wastes is considered hazardous waste? Is it...
  - a. Plastic packaging
  - b. Glass
  - c. **Batteries**
  - d. Spoiled food
10. What is the *most common reason that an animal species becomes extinct*?
  - a. Pesticides are killing them
  - b. **Their habitats are being destroyed by humans**
  - c. There is too much hunting
  - d. There are climate changes that affect them
11. Scientists have not determined the best solution for disposing of nuclear waste. In the U.S., what do we do with it now?
  - a. Use it as nuclear fuel
  - b. Sell it to other countries
  - c. Dump it in landfills
  - d. **Store and monitor the waste**
12. What is the primary benefit of wetlands?
  - a. Promote flooding
  - b. **Help clean the water before it enters lakes, streams, rivers, or oceans**
  - c. Help keep the number of undesirable plants and animals low
  - d. Provide good sites for landfills

**Table 2. NEETF and TFCW Survey Participants Beliefs About Laws and Regulations for Specific Types of Environmental Problems (percent)**

Belief about Laws and Regulations		Type of Environmental Problem				
		Water Pollution	Air Pollution	Protecting Wild or Natural Areas	Protecting Wetlands	Protecting Endangered Species
“Have not gone far enough”	NEETF <sup>1</sup>	72	62	48	44	41
	TFCW	17	24	15	12	17
“Have struck about the right balance”	NEETF	19	24	32	27	33
	TFCW	12	58	42	17	32
“Have gone too far”	NEETF	4	8	13	15	21
	TFCW	68	19	38	57	48
“Don’t know”	NEETF	6	6	7	14	5
	TFCW	2	7	5	2	2

<sup>1</sup> The percentages of men in the NEETF sample that believed that environmental laws and regulations have not gone far enough with respect to specific issues were 69,57,45,47, and 38 percent, respectively.

protection offered by ozone in the upper atmosphere and the primary reason for the extinction of animal and plant species.

When attitudinal responses about environmental beliefs are compared, there are also differences. About 47 percent of the NEETF respondents believed that environmental laws and regulations in general had not gone far enough, while 16 percent believed they had gone too far, and 26 percent believed that about the right balance had been struck. For the TFCW participants, less than 5 percent believed environmental laws and regulations had not gone far enough, 46 percent believed they have gone too far, and 39 percent believed it was about the right balance. Some 10 percent of each group “did not know.”

Table 2 compares the beliefs of the two groups with respect to laws and regulations in five specific environmental problem areas. There are very sharp contrasts in the beliefs of the groups. For example, 72 percent of the NEETF respondents believed that laws and regulations had not gone far enough in the water pollution area, while 68 percent of the TFCW participants believed that these laws and regulations had gone too far. About 57 percent of the TFCW participants believed that laws and regulations had gone too far in protecting wetlands, and 48 percent had similar beliefs with respect to endangered species. More than 40 percent of the NEETF

respondents believed that laws and regulations had not gone far enough in any of the five environmental problem areas. Beliefs of the two groups were the closest on air pollution.

On the issue of whether compensation should be paid for the lost value of land because of use restrictions related to protecting endangered species or wetlands, less than 5 percent of the TFCW participants as compared with 30 percent of the NEETF study participants thought that compensation should not be required. Some 61 percent of the NEETF participants thought compensation should be paid. Almost 71 percent of the TFCW participants thought compensation should be



paid, and nearly a quarter thought it should depend on how much value was lost due to restrictions. With a choice between environmental protection and economic development, some 74 percent of the college graduates in the NEETF study felt that environmental protection and economic development “could go hand in hand,” while 26 percent felt “a choice must be made.” Only 8 percent of the TFCW participants felt “a choice must be made.” Although 60 percent of the TFCW participants felt environmental protection and economic development “could go hand in hand,” nearly 30 percent selected the response that the choice “would depend.” In the NEETF study, the “would depend” response was not

**Table 3. Percentages of NEETF and TFCW Survey Participants Indicating Agreement or Disagreement with Selected Environmental Solutions.**

Position		Technological solution <sup>2</sup>	Environmental Solution		
			Last chance <sup>3</sup>	Shift resources <sup>4</sup>	Good balance <sup>5</sup>
Agree	NEETF	63	58	58	NA
	TFCW	80	4	12	93
Disagree	NEETF	33	37	33	NA
	TFCW	10	89	70	7
Don't know	NEETF	4	7	9	NA
	TFCW	10	5	17	–

<sup>2</sup> “Technology will find a way of solving environmental problems.”

<sup>3</sup> “The next 10 years are the last decade when humans will have a chance to save the Earth from environmental catastrophe.”

<sup>4</sup> “Federal government spending should be shifted to environmental programs from other areas.”

<sup>5</sup> “I think we can find a good balance that will allow us to enjoy economic progress and protect the environment.”

included, and only 4 percent of all respondents volunteered it.

Differences of opinion between the NEETF and TFCW samples with respect to future solutions of environmental problems were less pronounced. As indicated in Table 3, 63 percent of the NEETF sample and 80 percent of the TFCW sample agreed or strongly agree with the belief that "technology will find a way of solving environmental problems." On the issue of whether "federal government spending should be shifted to environmental programs from other areas," 33 and 70 percent of the NEETF and TFCW respondents, respectively, disagreed with the statement. On the other hand, only 4 percent of TFCW respondents as compared with 58 percent of NEETF respondents believed that "the next 10 years are the last decade when humans will have the chance to save the Earth from environmental catastrophe."

### Summary

The NEETF study considered the relationships between level of environmental knowledge and environmental beliefs in some detail. Individuals with higher levels of education were generally more knowledgeable about environmental issues. Individuals with a high level of knowledge about environmental issues had beliefs about environmental laws and regulations that were

somewhat closer to the beliefs of the TFCW respondents than individuals with a low level of environmental knowledge. Similar relationships also existed with respect to beliefs about environmental solutions.

Although agricultural producers may often feel they bear the brunt of environmental protection, they should be supportive of environmental education programs for the general public. Such educational

programs can result in a more informed public. Greater environmental knowledge is associated with beliefs that economic development need not be sacrificed in order for the environment to be protected. However, agricultural producers must be aware that if a difficult choice between the environmental protection and economic development must be made, most Americans favor environmental protection.

## New Ag Econ Faculty

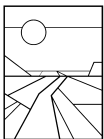


**Douglas Miller**

**D**ouglas Miller joined the Department of Agricultural Economics as an Assistant Professor in August, 1999. He is a native of northwestern Illinois and a graduate of Iowa State University. Before entering graduate school, Doug worked as a statistician for the Bureau of the Census in Washington, D.C. He completed his graduate studies in agricultural and resource economics and statistics at Cornell University and the University of California.

At Purdue University, Doug teaches undergraduate courses on agricultural markets and graduate courses on econometric methods. He specializes in applying econometric methods to agricultural research problems, and his published research includes studies of agricultural land use, land values, and commodity markets. Doug is also co-author of two textbooks, *Maximum Entropy Econometrics* and *Econometric Foundations*.

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