AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Winter/Spring 1991

Purdue Agricultural Economics Report

A QUARTERLY PUBLICATION OF THE AGRICULTURAL ECONOMICS FACULTY

EDITOR: CHRIS HURT

EDITORIAL BOARD: STEPHEN B. LOVEJOY AND KATHY HEAPHY

AGRICULTURAL ECONOMICS DEPARTMENT • PURDUE UNIVERSITY

Evaluating Participation in the 1991 Government Farm Program

Purdue Farm Management Staff

The 1991 farm program is the first year under the new Agriculture Act. New alternatives are provided for farmers which include planting flexibility and opportunities to plant minor oilseeds under the 0-92 program. This article provides a brief overview of the program, suggests a step-by-step approach for farmers to evaluate the economics of their alternatives, and provides our own economic analysis using Purdue budgets.

Farmers are given flexibility to plant alternative crops on portions of their crop bases this year. Both corn and wheat farmers have 25 percent of their bases which are flexible to be planted to alternative crops. This 25 percent is composed of 15 percent of the base which is called the Normal Flex Acres (NFA), and 10 percent called Optional Flex Acres (OFA). The NFA acres are not eligible for deficiency payments, while the OFA acres are eligible for deficiency payments, but only if they are planted to the program crop.

Steps For Farmer Evaluation

The following steps are suggested for farmers to evaluate their economic alternatives:

1. Decide whether to participate or stay out this year.
2. If you participate, what is the highest return crop on NFA?
3. What is the best return crop on OFA?
4. Consider returns in 0-92.
5. Consider returns for Pay-92.
6. Select the highest return set of crops.
7. How sensitive are returns on these "best crops" to: Price change, yield change, rotations, planting dates, ASCS yield base, and other factors?

Corn Program

The following economic evaluations are based upon Purdue budgets for various classes of land. The low-quality land has yields for corn at 93 bushels per acre, beans at 30 bushels, and wheat at 51 bushels. These same yields for the average-quality land are: 119, 38, and 60. For the high-quality land, yields are: 150, 48, and 68 bushels per acre. Prices per bushel used in these examples were: corn $2.30; soybeans $5.80; and wheat $2.50. Numbers shown in the tables are the returns per base acre above the direct costs of production.

The first items most farmers will want to evaluate are the returns for participation versus staying out of the program. Returns are about $20 to $30 per acre higher to participate in the basic corn program, which allows farmers to plant 92.5 percent of their corn base to corn. Since participation generally looks favorable, the next evaluation is to examine the highest return crop on the NFA acres. Most will want to consider soybeans on corn NFA. You can see in the table that returns go down modestly in our base case when beans are planted on NFA.

Basic Corn Evaluation

	Low	*Ave*	*High*
Corn out	99	143	197
Corn in 92.5%	120	169	230
Beans on NFA	119	167	226
Beans on NFA + OFA	115	160	218
Breakeven Prices Rotation Corn:			
Stay out if corn above	$2.53	$2.52	$2.51
Beans on NFA if above	6.06	6.20	6.25
Beans on OFA if above	7.35	7.51	7.55
Breakeven Prices Continuous Corn:			
Beans on NFA if above	5.10	5.34	5.52
Beans on OFA if above	6.48	6.64	6.82

Planting beans on OFA, however, sharply reduces returns. This is because the OFA acres are eligible for corn deficiency payments, thus, if beans are planted on corn OFA, a sharp reduction in government payments occurs. This, of course, is not the case on NFA acres since they are not eligible for corn deficiency payments.

Breakeven prices are also shown in the table. The corn breakeven shows the corn price per bushel needed to stay out of the program and receive as high a return as program

Farm management staff working on this evaluation include: Chris Hurt, Don Pershing, Lee Schrader, Bob Jones, Craig Dobbins, Bill Uhrig, Howard Doster, Marshall Martin, and Wally Tyner.

participation (given assumptions in the base case). These levels are generally in the low $2.50 range. Soybean breakevens show that $6.06 to $6.25 beans are needed on rotation corn to break even with $2.30 corn on the corn NFA. Prices well over $7 are needed to break even with corn on OFA.

The economics of flexing beans on corn base may be somewhat different if a farm has had continuous corn. Research by Purdue agronomists shows a seven percent lower corn yield for continuous versus rotation corn. In addition, production costs on continuous corn are higher, especially for added pesticide costs. We have assumed a seven percent lower corn yield and $10 to $12 an acre higher production costs. Breakeven prices to flex soybeans on corn NFA are lowered to $5.10 to $5.52 per bushel. Flexing onto corn OFA would require soybean prices of $6.48 to $6.82. Thus, it appears that most producers who have a portion of their corn base in continuous corn will want to strongly consider flexing this to soybeans, at least on the OFA acres.

Most farmers will want to examine the potential returns from 0-92 and Pay-92 alternatives for their corn base. The 0-92 provisions are similar to last year in that the corn base (or a portion of it) could be diverted to conservation use, and still receive 92 percent of the deficiency payments. With the $15 per acre set-aside cost used in the base budgets, returns above direct costs per acre would be only $21 to $42 per acre depending on land quality (CU 100% line) (CU stands for conservation use acres). However, since the 15 percent NFA acres do not receive any deficiency payment, one could elect 0-92, plant 15 percent to soybeans, and still receive the full deficiency payment. This would increase returns to $36 to $71 per corn base acre. New provisions called Pay-92 allow farmers to plant a minor oilseed crop on 92.5 percent of the corn base, harvest all of the crop, and still receive the 0-92 deficiency payment.

Corn 0-92 & Pay-92

	Low	*Ave*	*High*
CU 100%	21	30	42
Beans 15%, CU 85%	36	52	71
Canola 92.5%	-	163	-
Beans 15%, Canola 77.5%	-	163	-

The two oilseeds which are possibilities in Indiana are canola and sunflowers. Budgets for sunflowers do not appear financially attractive, so we have used canola for these illustrations. As shown in the table, returns for Pay-92 with canola appear to be only about $6 per acre below corn in the basic program. Thus, Pay-92 with canola on corn base may be a consideration for coming years, but we will all have to learn more about the crop and watch prices. The following are general conclusions about the corn program:

1. Returns are $20 to $30 per acre higher to participate.
2. Most participants should consider:
   - Flexing beans on corn NFA, especially for average to low quality land.
   - Breakevens are slightly over $6 per bushel on rotation corn.
   - Breakevens are $5 to $5.50 per bushel on continuous corn land.
3. Few will flex beans on corn OFA because breakevens are over $7.
4. Few will elect 0-92: only special situations.
5. Pay-92 with canola is worth watching:
   - Learn more about production.
   - Watch prices.
   - Consider for 1992 crop.
   - Be cautious.
6. Pay-92 with sunflowers generally is not competitive.

Wheat Evaluation

The wheat program can be evaluated in a similar manner as corn. In evaluating the participation question, it is clear that incentives to participate are very high. This, of course, is because the target of $4 per bushel is sharply higher than the roughly $2.50 new crop wheat price.

Wheat farmers, who planted wheat last fall, can choose two ways of calculating deficiency payments. They can elect to be paid on 70 percent of their base, with the calculation based upon the market price in the first five months of the year. Alternatively, they can be paid on 85 percent of their base, but with the market price based upon all 12 months of the marketing year. The 12-month payment base is limited by law to be no more than 10 cents below the five-month base. Returns in the table for the 85 percent program are based upon the 85 percent deficiency payment base, which generally will provide higher returns. However, if farmers elect the 85 percent deficiency payment base, they cannot flex their wheat NFA or OFA to other crops.

The following wheat evaluation is in two parts. The first assumes all costs of production are still to be incurred, as for the 1992 crop. However, for the already seeded 1991 crop, some of the production costs have already occurred. This analysis is covered in the latter part of this section.

First, we will evaluate returns without regard for any expense which is already sunk in a growing wheat crop. The data in the next table show that participation returns are sharply higher than staying out of the program. Those deciding to participate should consider beans on NFA. Returns are higher than the basic 85 percent wheat program (with the 85 percent deficiency payment base) only for high-quality land. Beans on wheat OFA provide lower returns yet, and would not generally be considered. However, corn on wheat NFA appears to provide competitive returns with the basic wheat program. Also note the returns to wheat and double-crop beans, at $122 to $209 per acre, are higher than any other wheat program alternative.

Basic Wheat Evaluation

	Low	*Ave*	*High*
Wheat out	66	79	96
Wheat in 85% (85%d.p.)	109	130	153
Beans on NFA	107	130	156
Beans on NFA + OFA	102	127	155
Corn on NFA	108	132	160
Corn on NFA + OFA	104	130	160
Wheat 85% + DC** Beans	122	162	209
Breakeven Prices			
Stay out if wheat above	$3.35	$3.35	3.34

***Double crop*

Breakeven levels are shown in the lower portion of the table. Wheat prices of about $3.35 per bushel would be needed to break even outside the program. This means that market prices need to be at or above these levels to have the same or higher returns out of the program compared with program participation, using the 85 percent deficiency payment base.

Those who have already planted wheat on 85 percent of their wheat base have a portion of the direct costs invested in the growing crop. For these individuals, the appropriate direct costs are only those which are still to be incurred. Thus, we have adjusted our budgets to reflect this. The basic question is, should the wheat NFA acres be planted to corn or soybeans. This would likely involve no-tilling the corn or beans into the "burned-back" wheat. The following table shows the prices at which corn or beans would break even with leaving the wheat in place and harvesting.

Breakeven prices are shown for both the 70 percent deficiency payment rate and the 85 percent deficiency payment rate. Since most people will elect the 85 percent deficiency payment, those are the relevant numbers to observe. Breakevens show that single crop wheat base flexed to beans on high-quality land would require bean prices of $5.78, and corn prices of $2.15 to give the same returns as the wheat program. Thus, on some above-average-quality land, producers may want to plant corn or beans on wheat NFA even though it was already seeded to wheat. Most of the average or lower-quality land that is seeded already will likely stay planted to wheat.

If Wheat is Already Seeded on 85%

Breakeven Prices	*70% Deficiency*		
	Low	*Ave*	*High*
Single crop: Flex NFA to beans	5.58	5.16	4.67
Single crop: Flex NFA to corn	2.15	1.97	1.79
Double crop: Flex NFA to beans	6.33	6.38	6.25
Double crop: Flex NFA to corn	2.39	2.36	2.30

Breakeven Prices	*85% Deficiency*		
	Low	*Ave*	*High*
Single crop: Flex NFA to beans	6.95	6.41	5.78
Single crop: Flex NFA to corn	2.59	2.37	2.15
Double crop: Flex NFA to beans	7.58	7.45	7.13
Double crop: Flex NFA to corn	2.79	2.70	2.58

Returns for wheat 0-92 and Pay-92 are shown in the next table. Returns are lower than cash rent for the 0-92 alternatives. However, canola returns on Pay-92 appear to exceed returns for any other alternative in the wheat program except wheat plus double crop beans. This is because our canola returns are close to the same returns as soybeans, but in Pay-92, you also receive about $40 per base acre in deficiency payments.

Wheat 0-92 & PAY-92

	Low	*Ave*	*High*
CU 100%	29	37	44
Beans 15%, CU 85%	45	58	72
Corn 15%, CU 85%	47	61	75
Canola 85%	-	159	-
Corn 15%, Canola 70%	-	161	-
Beans 15%, Canola 70%	-	59	-

Canola, of course, is a late summer-seeded crop, so the Pay-92 alternative will not be a possibility for most farmers until the 1992 crop program. Canola is a new crop, so be cautious until you can learn the necessary production practices. Watch markets closely.

Our budgets indicate that Pay-92 canola has returns somewhat under returns for wheat plus double-crop beans. This means that those with wheat and double-crop beans will have little incentive to shift to Pay-92 canola. However, the incentive for those with single-crop wheat to consider Pay-92 with canola is fairly strong.

The following are general conclusions for the wheat program:

1. Returns are $43 to $57 per acre higher to participate.
2. If wheat base was not planted last fall:
   - Most will plant beans on base, but you could participate in the wheat program, but need 15% set-aside, and thus returns are low.
   - Could elect 0-92.
   - Could elect Pay-92, but not until 1992 to plant canola.
   - Could elect Pay-92 with spring-seeded sunflowers, but these returns do not look competitive.
3. If 85 percent of the base was seeded already, most will elect the 85 percent deficiency payment method, and not flex to another crop. However, those with high-quality land may elect the 70 percent deficiency payment method and flex wheat NFA to corn or beans.
4. If you have seeded more than 85 percent of the wheat base, you:
   - Could flex extra to corn NFA, but returns are low.
   - Could consider extra as set-aside.
   - Could tear-up extra acres and plant to beans.
5. Those who have wheat plus double-crop beans generally won't flex wheat NFA or OFA to an alternative crop.
6. Pay-92 canola should be watched, as it has possibilities on single crop wheat base.
7. Late next summer, evaluate your fall 1991 wheat planting. Indiana farmers are not likely to seed wheat NFA to wheat.

What Next

After selecting your best crop mix, you will want to evaluate how sensitive these crops are to changing prices, changing yields, and other factors. The Cooperative Extension Service office in your county has worksheets to help you budget many of these alternatives using your own farm numbers. In addition, most of the county offices will be able to provide you with computer evaluations which will help evaluate all of the program alternatives shown here, as well as evaluate any crop you want to consider in your flex decisions. As always, these Purdue budgets provide general guidelines, but using your own budgets will allow you to make the best program decisions.

Economic Impacts of Reduced Fertilizer and Pesticide Use: A Complex Question

John G. Lee, Assistant Professor and Stephen B. Lovejoy, Associate Professor

In 1989, the Board on Agriculture, a part of the National Academy of Sciences, published a report entitled *Alternative Agriculture*. This report suggested that nearly all segments of society would be better off without the use of fertilizers and pesticides. This study has been widely criticized as being incomplete and biased, but was warmly received by many farmers and nonfarmers.

Many interpreted these findings as suggesting that if American agriculture reduced the quantity of chemicals used, everyone would be better off. Producers would have a safer working environment and higher incomes, consumers would continue to have cheap food but it would be safer, and the environment would be protected.

Many in agriculture found it hard to believe these conclusions. In the ensuing months a group of agricultural interest groups funded a study to examine a "worst case scenario," namely, what would be the impact upon farm income and consumer prices if the use of all pesticides were eliminated, and what would be the impact of removing both pesticides and nitrogen fertilizer.

The study involved dozens of scientists at several universities to estimate the productivity impacts of eliminating all pesticides and inorganic nitrogen fertilizer (Knutson, et al.). While no one is talking about eliminating **all** pesticides and fertilizer, these estimates at least provide a "worst case" scenario.

These researchers estimated that with the elimination of pesticides, per acre production would fall, more acres would be required, and grain farmers' income would be about the same, due to higher prices. However, livestock farmers' incomes would be reduced significantly and consumer prices would increase. Prices paid by consumers are a reasonable focal point, because it is the consumer that will ultimately decide whether the cost would be offset by improvements in the quality of the food and the environment. The prediction was that the average American household would spend an additional $228 annually for food and fiber if no pesticides were used in the production. Likewise it was estimated that expenditures for food and fiber would increase by $428 per household under the no pesticide and no inorganic nitrogen case.

For some consumers, these cost estimates may seem extremely high. The $20-$40 per month increase in food and fiber costs would adversely affect low-income households and individuals with fixed incomes. On the other hand, for consumers concerned about environmental quality and food safety, this may appear to be a bargain, especially when viewed as less than $5 per week.

Omitted Factors

While these particular numbers ($228 and $428) represent an extreme case of banning pesticide use and inorganic nitrogen in the U.S., there are a number of factors not addressed in the study which could alter their consumer costs.

One factor which may make their current cost estimates too high is the inability to accurately assess future input substitution possibilities. Although a ban on inorganic nitrogen might cause short-term problems for producers, a farmer could adopt alfalfa or other nitrogen-fixing crops in rotations to supply nitrogen to subsequent crops. This type of adjustment in crop production practices can decrease the cost estimate of reducing agricultural chemical use.

A second factor which may make the cost estimates of reduced agricultural chemical use too high regards the assumption on the imports of agricultural commodities. In this study, the price of corn was projected to rise from $2.30/bu in 1990 to more than $7.98/bu in 1994 under the no-chemical case. Likewise, the price of soybeans was projected to increase from $5.39/bu in 1990 to more than $21.18/bu in 1993. This represents a 300% increase in the price of soybeans.

It is unrealistic to believe that, given these price levels, crop producers in other regions of the world would not seek to increase their crop output. This type of supply response will reduce the increase in crop prices, thereby decreasing the estimated consumer cost of reducing chemical use in agriculture.

A third factor which may make the cost estimate of $228 per household too high relates to the treatment of government budget savings relative to deficiency payments. Given the rapid increase in projected commodity prices, a per-household budget saving from no deficiency payment would be about $110 per household per year. This would imply a lower social cost of no pesticides of $118 per household per year as opposed to $228, assuming that deficiency cost savings were transferred back to consumers.

There are at least two factors neglected in the study which would raise the costs to consumers. On the production side, elimination of nutrient material will lead to an increase in production risk, namely yield variability. Yield variability from year to year can place pressure on the farmer to consistently meet financial obligation. Agricultural production without these materials will likely require a substitution of more labor and management skills for these materials. This substitution may be difficult given the general trend in agriculture to substitute capital for labor.

Finally, on the consumer side, *one of the major omissions of this study was the impact of no pesticides on fruits and vegetables.* These impacts may more than dominate the values that they estimated for the following reasons:

1. Horticultural specialists estimate that the fruit and vegetable industry is so dependent upon pesticides that certain products would not be available at any price without pesticides, and that others might increase in price as much as 200%.

2. Organic food stores typically charge a price premium of 25 to 50% above the price of nonorganic foods, and this is for relatively seasonal and local production.
3. Fruits and vegetables are a major part of consumers' food dollars, and several estimates place the percentage of the consumer grocery dollars spent on fruits and vegetables at 17 to 18%. In addition, this has been increasing substantially. Since the early 1970's, per capita consumption of fresh vegetables has increased more than 40%.
4. Using a conservative estimate of a 100% increase in costs of fruits and vegetables to the consumer, this would amount to an additional annual $600 per household increase in the grocery bill, overshadowing the $228 increase resulting from no pesticides in the cash grain and livestock sector. Of course, consumers would certainly change their consumption of fruits and vegetables in response to higher prices.
5. An additional impact of no pesticides upon the fruit and vegetable market would be the obvious change in diets of the American public as consumers sought to utilize their food dollars most efficiently. The American Cancer Society and the American Heart Association both suggest increased consumption of fruits and vegetables for a healthy diet, but higher prices would lead to lower consumption. There are many unanswered questions about the impact of lower consumption of fruits and vegetables upon the incidence of cancer and heart disease in American society, but the factors should be considered in the calculation of social costs.
6. All this suggests that total social cost of removal of pesticides may be considerably higher than this study suggests, because of the additional cost to consumers of fruits and vegetables and the additional health costs resulting from lower consumption of fruits and vegetables.

Summary

The issue of reducing pesticide and fertilizer use is a complicated research problem. While the study reviewed in this article attempts to provide a "worst case" estimate, we believe that their data and underlying assumptions are extremely limited. These two factors raise a question regarding the validity of their cost estimates. Particularly, if the cost estimates are used as input information in the policy debate on the subject.

Obviously, as one might expect researchers to find, the questions raised here suggest the need for additional research into the impacts of pesticide removal. This article points out that looking at the total impact to society is indeed complex. If society and consumers are to make informed tradeoffs between the costs of pesticide use and the costs of pesticide removal, more information is necessary.

References

Knutson, Ronald D., C. Robert Taylor, John B. Penson, and Edward G. Smith, 1990. *Economic Impacts of Reduced Chemical Use*. Knutson & Associates, College Station, Texas.

Lovejoy, Stephen B. and Jerald J. Fletcher, 1990. "Water Quality, Agriculture and Rural America," in *Rural Policy for the 1990's*, edited by Cornelius Flora and James Christenson, Boulder, Colorado: Westview Press.

National Research Council, 1989. *Alternative Agriculture*, Committee on the Role of Alternative Farming Methods in Modern Agriculture, Washington, D.C., National Academy Press.

Upcoming Events

April 9

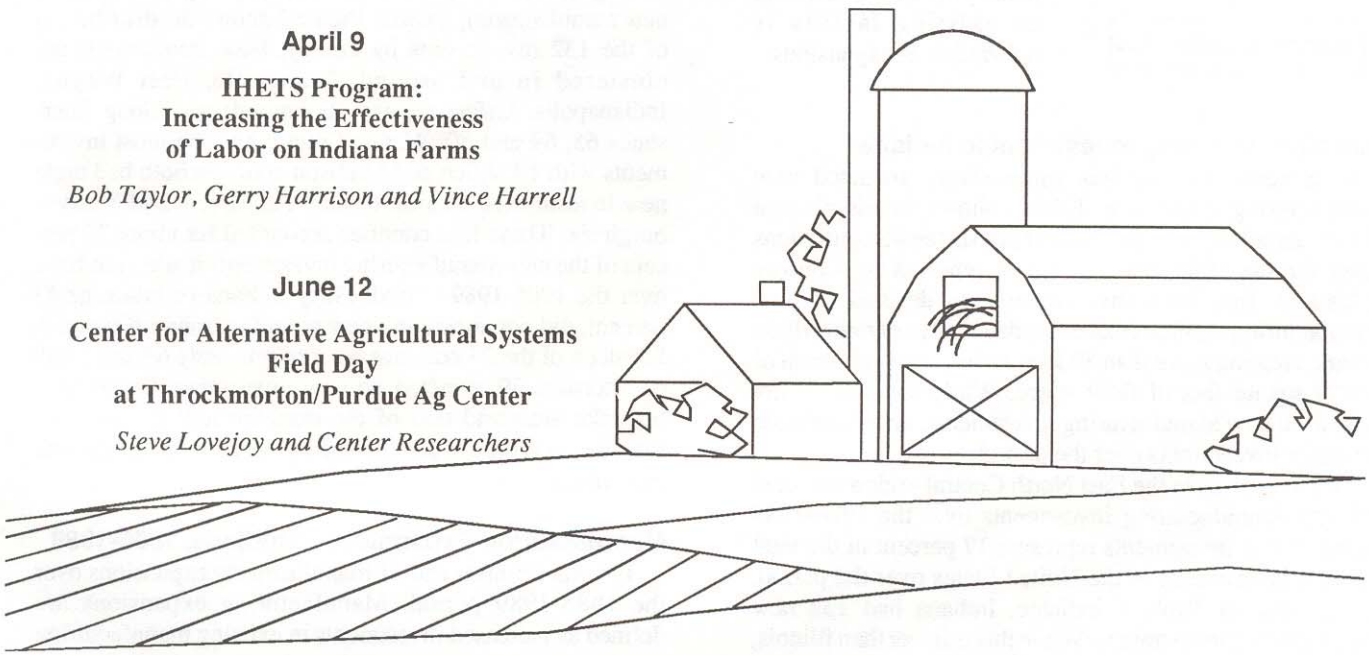
IHETS Program:
Increasing the Effectiveness of Labor on Indiana Farms

Bob Taylor, Gerry Harrison and Vince Harrell

June 12

Center for Alternative Agricultural Systems Field Day at Throckmorton/Purdue Ag Center

Steve Lovejoy and Center Researchers



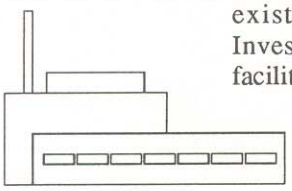
Manufacturing Investment: How is Indiana Doing?

Kevin T. McNamara, Assistant Professor and Rural Development Economist

Attracting new manufacturing investment has been a key component of local and state economic development efforts in Indiana. Metropolitan and rural communities alike have seen manufacturing recruitment as a means to increase manufacturing employment to replace lost jobs and/or to provide increased income and employment opportunity for area residents. New manufacturing investment also expands the tax base, providing additional funds for local government services.

However, changes in the U. S. economy raise questions about how successful this strategy will be in the future for communities wanting to expand income and employment opportunities. An increased dependence of domestic manufacturing on technology, combined with the migration of low-wage, low-skill jobs to foreign locations, suggests managers now look at site selection for manufacturing facilities differently. Now, access to skilled labor and technical services will become more important to firms seeking sites for new manufacturing facilities. Rural communities, especially those farthest from urban areas and not located near a major highway, may lack the resources to attract new manufacturing investment in the 1990s. State and local government officials and economic development leaders need to be aware of the changing needs of manufacturing facilities to ensure that Indiana communities continue to attract manufacturing investment. Also, this awareness will enable them to advise specific communities on the appropriateness of manufacturing recruitment as a local development strategy.

Manufacturing investment can be either investment in a new manufacturing facility or increased investment in an existing manufacturing facility. Investment in new manufacturing facilities is referred to as new investment, while investment in an existing facility is referred to as expansions.



New Manufacturing Investment in Indiana

In general, Indiana has successfully attracted new manufacturing investment. Table 1 shows the distribution of new manufacturing investment across the 48 contiguous states for the 1986-1989 period as reported by Conway Industries, Inc. New investments are defined as new manufacturing facilities that exceeded a value of one million dollars, creating more than 50 jobs, or having a minimum of 20,000 square feet of floor space. While the data do not include all new manufacturing investments, they do include the major investments over the period.

The five states in the East North Central region attracted 992 new manufacturing investments over the 1986-1989 period. These investments represent 17 percent of the total reported investments in the United States over the period. As the data in Table 1 indicate, Indiana had 132 new manufacturing investments. While this is fewer than Illinois, Michigan, and Ohio, Indiana's share compares favorably to the state's regional population share. Indiana's population is 13 percent of the region's population. Indiana's 132 new manufacturing investments represent 13 percent of the region's investments.

Table 1. Number of New Manufacturing Investments in the United States, 1986-1989[1]

	YEAR				
REGION[2]	1986	1987	1988	1989	TOTALS
East North Central	369	208	173	242	992
Illinois	145	56	35	44	280
Indiana	45	28	28	31	132
Michigan	140	51	36	42	269
Ohio	14	58	57	83	212
Wisconsin	25	15	17	42	99
New England	41	33	38	43	155
Middle Atlantic	92	84	60	120	356
West North Central	102	80	88	131	401
South Atlantic	332	432	411	469	1644
East South Central	166	185	209	258	818
West South Central	108	197	162	250	717
Mountain	57	59	61	62	239
Pacific	117	123	109	153	502
TOTALS	1384	1401	1311	1728	**5824**

1. *Source: Conway Data, Inc., 1987, 1988, 1989, 1990.*

2. *East North Central includes: Illinois, Indiana, Michigan, Ohio, and Wisconsin; South Atlantic includes Delaware, D.C., Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, and West Virginia; East South Central includes Alabama, Kentucky, Mississippi and Tennessee; West South Central includes Arkansas, Louisiana, Oklahoma, and Texas.*

Indiana Distribution of New Investment

Regions of Indiana did not share equally in the state's new manufacturing growth. Figure 1 shows the distribution of the 132 investments by county. New investments are clustered in and around Evansville, Fort Wayne, Indianapolis, Lafayette, and Richmond; and along interstates 65, 69 and 80. Wayne County had the most investments with 10. Allen and Madison counties both had eight new investments. Marion County had seven, and Vanderburgh six. These five counties accounted for about 30 percent of the new manufacturing investments made in Indiana over the 1986-1989 period. Forty Indiana counties, or 43 percent, did not attract any new manufacturing investment. Eighteen of the 24 counties west of Interstate 65 and south of Interstate 70 attracted no new investment. Counties to both the west and east of the northern half of Indiana's Interstate 65 corridor also did not attract new manufacturing investment.

Manufacturing Expansions in Indiana, 1986-1989

Indiana counties had 51 manufacturing expansions over the 1986-1989 period. Manufacturing expansions are defined as increased investments in existing manufacturing

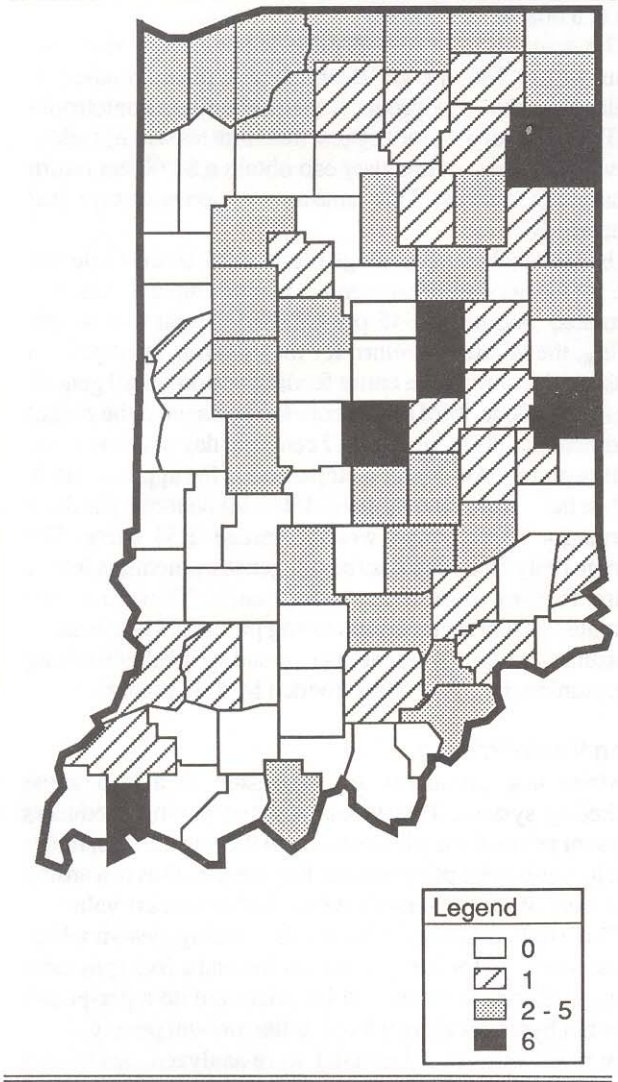
facilities that exceeded a value of one million dollars, created in excess of 50 jobs, or had a minimum of 20,000 square feet of floor space. Figure 2 shows the geographic distribution of these investments across Indiana counties. While much of the expansion occurred in metropolitan areas, investments in the expansion of existing manufacturing facilities also occurred in several of the counties located in the southwestern quarter of Indiana. Eleven of the 24 counties west of Interstate 65 and south of Interstate 70 grew through increased investment in existing manufacturing facilities. Counties to both the west and east of the northern half of Indiana's Interstate 65 corridor, which did not attract new manufacturing investment, also failed to attract investment to expand existing manufacturing facilities.

Summary

Indiana, like neighboring states, was successful in attracting both new and expanded manufacturing investment in the 1986-1989 period. Both types of investment are heaviest in the metropolitan areas. New manufacturing investments occurred in communities along interstate highway corridors. The expansions that occurred in non-metropolitan counties, on the other hand, were in counties that were not along corridors. This location pattern suggests that different types of Indiana communities might wish to consider different development strategies.

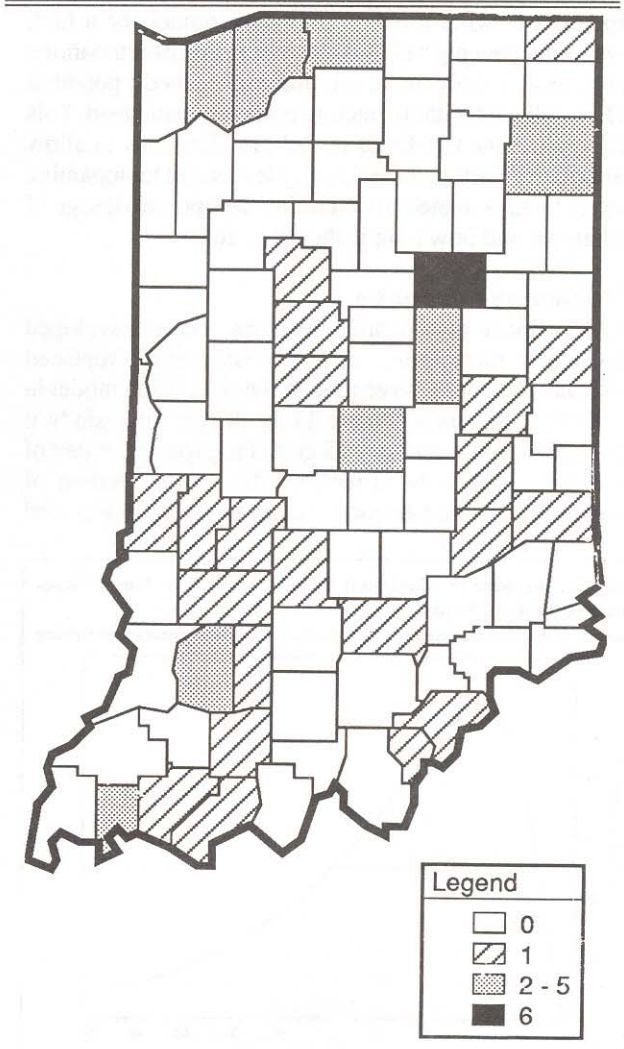
Examination of the location data suggest two questions: How does access to interstate highways impact firms' location decision? and, How can community leaders identify local firms that have the potential to and are considering expansion of their manufacturing capacity? Research and Extension efforts to address both of these questions are currently underway in the Department of Agricultural Economics at Purdue to provide local leaders with information about the most effective strategies for expanding a local economy.

Figure 1. Number of New Manufacturing Locations 1986 - 1989



Source: Conway Data, Inc. Compiled by Author

Figure 2. Number of Facility Expansions 1986 - 1989



Source: Conway Data, Inc. Compiled by Author

Economic Implications of Alternative Ractopamine Dosages on Hogs

Kristina Kitts, Extension 4-H/Youth Agent; Marshall A. Martin, Professor; Paul V. Preckel, Associate Professor, Department of Agricultural Economics; and Allan P. Schinckel, Associate Professor of Animal Science

Ractopamine, a feed additive currently under review by the U.S. Food and Drug Administration, results in faster growth, better feed efficiency and greater lean pork production. Ractopamine affects swine growth by redirecting nutrients away from the production of fat tissue to the production of lean muscle. In ractopamine test trials the feeding of ractopamine increased average daily gain (pounds per day) by 8 to 13%, increased loin eye (square inches) by 15%, improved feed efficiency (pounds of feed per pound of weight gain) by 10 to 20%, and decreased backfat at the 10th rib (inches) by 12 to 20% (Millar, et al.).

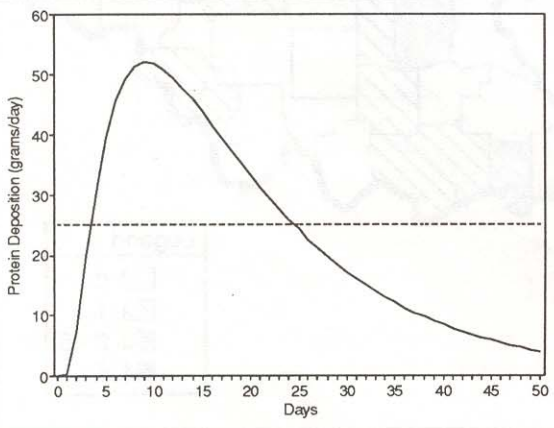
Increases in pork production efficiency may improve the economic performance and profitability of pork production. Thus, hog producers will be interested in how much ractopamine to feed and for how long in order to maximize profits.

The Summer 1990 issue of *Purdue Agricultural Economics Report* contained an article with results from a computerized swine growth simulation model for a high investment feeder pig finishing operation using ractopamine (Millar, et al.). Low, medium, and high genetic potential pigs fed with, and without, ractopamine were analyzed. This article reports the results of model modifications to allow for alternative ractopamine feeding levels and ractopamine response to days treated to determine the optimal dosage of ractopamine and how long it should be fed.

Ractopamine Response

A non-linear ractopamine response curve developed from a recent ractopamine trial (Williams, et al.) replaced the constant response curve used in the simulation model in the Millar, et al. study (Figure 1). In the previous study it was assumed that a constant 25 grams of protein per day of lean muscle growth were realized due to the feeding of ractopamine. The non-linear response to ractopamine used in this study reflects a pharmacological response or acclimation process, i.e., after an initial increase in lean muscle growth from feeding ractopamine, the lean growth reaches a peak and then declines over time. The lean growth response curve (height of the curve and rate of decline) is affected by the ractopamine dosage level. As a result, the optimal feeding period, production costs, and average daily profits also are affected by the dosage level and period of ractopamine feeding.

Figure 1. Increase in Maximum Protein Deposition Due to Ractopamine Fed at 20 ppm[1]



1. Protein deposition is a measure of lean muscle growth.

The objective of the study was to maximize average daily profits and determine the amount of ractopamine to feed and the length or duration of its use. Computer model simulations were based on medium genetic potential hogs. Ten different weights for starting ractopamine use and four dosages of ractopamine (0, 5, 10, and 20 ppm) were analyzed. The Elanco Division of the Eli Lilly Corporation, the developer of ractopamine, has conducted trials where ractopamine was fed for the last 90 pounds of live weight gain at a dosage of 20 ppm.

The actual cost of ractopamine is not known since the manufacturer has not yet established a price. Studies of similar biotechnology products such as bovine somatotropin (BST) in the dairy sector suggest that farmers will not adopt a new technology unless they can obtain a $2.00 net return for each $1.00 in cost. This same assumption was employed in this study.

Using the $2.00 net average return to $1.00 cost rule, the cost to farmers of ractopamine per pound of feed was calculated. Assuming $45 per hundred weight live weight pricing, the additional return for ractopamine averaged 3.5 cents per day during the entire feeding period for all genetic potentials. If one-third of this benefit represented the cost of ractopamine, this would be 1.17 cents per day over the entire feeding period. Assuming ractopamine is fed approximately the last half of the feeding period (last 90 pounds), the daily charge for ractopamine would average 2.34 cents. The average daily feed intake across all genetic potentials for the entire feeding period is 4.87 pounds. Therefore, the estimated cost of ractopamine to hog producers in this study is assumed to be 0.48 cents per pound of feed containing ractopamine, i.e., 2.34 cents divided by 4.87 pounds.

Lean Value Pricing

Many hog producers are interested in a lean value marketing system. This would involve paying producers different prices for the lean and fat in the hog carcass, rather than a single price per pound of live weight, thus rewarding producers of leaner animals with a higher carcass value.

This study examined a lean value pricing system which included a price for lean, a price for fat, and a fixed payment for byproducts. The lean and fat prices are on a per-pound basis but byproducts are a fixed dollar amount per pig. Lean to fat price ratios of 3:1 and 4:1 were analyzed, based on a live weight price of $0.45 per pound. The carcass merit pricing ratios were designed so that producers of non-rac-

topamine fed, medium genetic potential animals would remain indifferent between live weight and lean value pricing for animals sold at the weight which yields a maximum average daily profit. The average 1989 yellow sheet price for byproducts of $8.72 per pig was used (Whipker and Akridge).

Study Results

The results show that optimal slaughter weights are insensitive to the different pricing systems and ractopamine levels. The economically optimal slaughter weight of slightly less than 235 pounds corresponds to the weight at which packers do not discount for light animals (Table 1). The number of days on feed decreased as the ractopamine dosage increased due to increased average daily gain with increased dosage. Maximum average daily profits changed significantly depending on the lean value price ratio selected and the ractopamine dosage.

When determining the level of ractopamine to feed and at what weight the ractopamine should be started for the three pricing systems, maximum average daily profits must be considered. With 20 ppm of ractopamine and a live weight pricing system, ractopamine use should start at 180 pounds (Table 1). The average daily profit would be 26.30 cents compared to 21.39, 24.86, and 25.48 cents per day with 0, 5, and 10 ppm of ractopamine, respectively.

With the lean value pricing system, average daily profits are the highest when ractopamine is fed at a rate of 20 ppm. For the 3:1 pricing system and 20 ppm of ractopamine, feeding of ractopamine should start at 150 pounds (Table 1). Average daily profits would be 30.87 cents per day compared to 22.73, 27.19, and 28.85 cents per day for 0, 5, and 10 ppm ractopamine, respectively. For the 4:1 pricing system and 20 ppm, ractopamine should be fed starting at 150 pounds. The average daily profits would be 31.79 cents per day compared to 22.98, 27.71, and 29.52 cents per day for 0, 5, and 10 ppm ractopamine levels.

The results from this study indicate that ractopamine use can be profitable when fed for less than the last 90 pounds of live weight gain. The optimal starting weight is 180 pounds for live weight marketing. For both the 3:1 and 4:1 lean value pricing ratios the optimal starting weights are 150 pounds. Of course, these starting weights may be different for different ractopamine cost levels.

Table 1. Optimal Slaughter Weight, Maximum Average Daily Profits and Days on Feed Under Various Lean to Fat Price Ratios and Ractopamine Dosages

	Parts per million (ppm) of Ractopamine			
	0	5	10	20
Lean/Fat Price Ratio (1:1)				
Ractopamine Feed Starting Weight (pounds)		180	180	180
Average Daily Profits (cents/day)	21.39	24.86	25.48	26.30
Days on Feed	106	102	102	101
Slaughter Weight (pounds)[2]	234.6	233.7	234.8	234.8
Lean/Fat Price Ratio (3:1)				
Ractopamine Feed Starting Weight (pounds)		140	150	150
Average Daily Profits (cents/day)	22.73	27.19	28.85	30.87
Days on Feed	106	103	102	101
Slaughter Weight (pounds)[2]	234.6	234.6	234.1	233.9
Lean/Fat Price Ratio (4:1)				
Ractopamine Feed Starting Weight (pounds)		120	150	150
Average Daily Profits (cents/day)	22.98	27.71	29.52	31.79
Days on Feed	106	103	102	101
Slaughter Weight (pounds)[2]	234.6	233.9	234.1	233.9

2. *None of the optimal slaughter weights are significantly different from the lower limit on the "no discount range" for packer live weight prices. The small differences reflect the daily nature of the simulation model.*

Summary

Feeding ractopamine increases the proportion of lean muscle in the carcass, decreases days on feed, increases feed efficiency, and increases maximum average daily profits. Profits are sensitive to the amount of ractopamine used and the pricing system for hogs, i.e., live weight versus lean value pricing. Also, profits will be affected by the cost of ractopamine.

A lean value pricing system, using two lean to fat price ratios (3:1 and 4:1), was analyzed. Optimal slaughter weights of about 235 pounds were found to be insensitive to the different price ratios and levels of ractopamine use (0, 5, 10, and 20 ppm). Slaughter weights are very sensitive to packers' price discount schedules for lightweight animals, however.

Maximum average daily profits varied significantly, depending on the price ratio selected and the level of ractopamine use. The number of days on feed decreased as much as 5 days as the amounts of ractopamine used increased from 0 to 20 ppm. This would allow producers to feed more hogs per year with the same finishing facilities. Profits to producers of medium genetic potential hogs were highest with 20 ppm of ractopamine fed for approximately the last 84 pounds of live weight gain at the 3:1 and 4:1 lean value price ratios. Compared to non-ractopamine fed animals, an increase in average daily profits of 8.14 and 8.81 cents per day can be realized for the 3:1 and 4:1 lean value price ratios.

If the hogs are sold on a live weight basis (1:1), average daily profits would be highest with ractopamine fed at 20 ppm for the last 54 pounds of live weight gain. However, the hogs would still be fed 101 days and sold at about 235 pounds.

The additional daily profits from feeding ractopamine at 20 ppm when hogs are sold on a live weight basis are 4.91 cents. However, if ractopamine is fed at 20 ppm **and** the hogs are sold at a 4:1 lean value price ratio, average daily profits increase by an additional 5.49 cents. Thus, feeding ractopamine and shifting to a lean value pricing system both can contribute to increased profits from pork production. In fact, hog producers could pay slightly more for ractopamine than assumed in this study and still be profitable. Finally, it appears that, based on the prices used in this study, the optimal feeding period for ractopamine is quite sensitive to the responsiveness of the animal to the feed additive and to the dosage level. Also, the profitability will be sensitive to hog prices and the price of ractopamine. These factors will be of great importance in determining how ractopamine is ultimately used by hog producers.

References

Millar, Todd W., Marshall A. Martin, Paul V. Preckel, and Allan P. Schinckel. Impact of Ractopamine Use on Hog Slaughter Weights, Feeding Period, and Returns with a Lean-Value Pricing System. *Purdue Agricultural Economics Report*, Summer 1990, pp. 5-8.

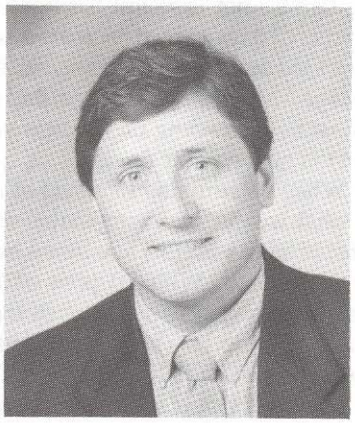
Whipker, Linda D., and Jay T. Akridge. *Pricing Lean: A Lotus Template for Determining the Price of Lean Pork*. Ver. 2.0. February 25, 1990.

Williams, N., T. Cline, D. J. Jones, and A. P. Schinckel. Effects of Ractopamine as a Function of Time and Weight Gain on Test. *Journal of Animal Science*. 75(Abstract). 1991. (In Press).

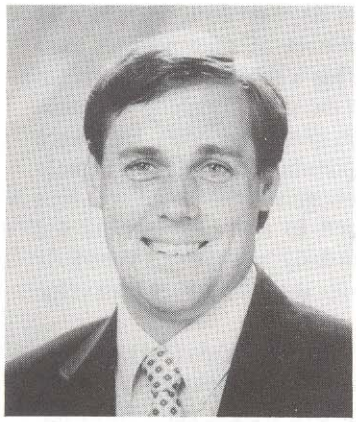
New Agricultural Economics Faculty

Kenneth A. Foster joined the Agricultural Economics faculty as assistant professor in the area of livestock production economics. Foster grew up on a livestock and grain farm near Wheatfield, Indiana, and completed his B.S. in agricultural education at Purdue in 1981. He then joined the Peace Corps, where he served for three years as an agricultural instructor for the Belize School of Agriculture.

Foster completed his M.S. in agricultural economics at the University of Georgia in 1986, and his Ph.D. at the University of California at Davis in 1989. At Davis, he conducted research in production economics, time series modeling, and consumer demand analysis. He also assisted teaching economic theory and econometrics. Foster's dissertation research focused on the dynamics of the supply of beef cattle in the United States. He has initiated research on contracting and coordination arrangements in the hog/pork industry.



Ken Foster



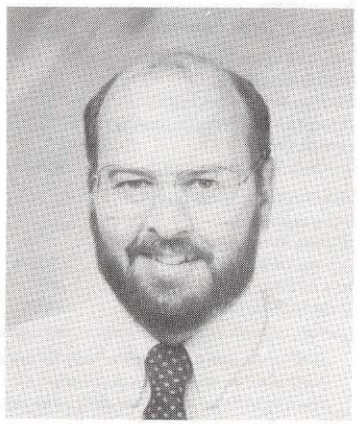
John Lee

John G. Lee became a member of the Agricultural Economics faculty as an assistant professor to conduct research in the areas of natural resources and production economics. He has also initiated a research/teaching/extension program in water quality issues. Lee was most recently an assistant professor at Louisiana State University, and received his Ph.D. from Texas A&M University in 1988.

A native of New Mexico, where he did his undergraduate work, Lee is no stranger to Indiana. He received his master's degree in agricultural economics from Purdue in 1983. Lee has considerable experience in interdisciplinary work, particularly in integrating physical and economic models to provide policy-relevant information. He is well-versed in the area of water quality and has written on and analyzed several of the conservation programs from the 1985 Food Security Act. See his article on page 4 in this issue of PAER.

Kevin T. McNamara joined the Agricultural Economics faculty as an assistant professor. His areas of expertise include the study of manufacturing growth/facility location; the impact of education on regional economic growth; and linkages between the local economy and off-farm earnings of farm families.

McNamara received his bachelor's degree in business administration from Ohio University in 1971, his master's in community development from the University of Missouri in 1976, and his Ph.D. in agricultural economics from Virginia Polytechnic Institute in 1986. He served for two years in the Peace Corps in Afghanistan. McNamara was also an extension specialist in rural development at Virginia State University, and most recently worked in rural development in the Department of Agricultural Economics at the University of Georgia. See his article on page 6 in this issue of PAER.



Kevin McNamara

The Desirability of Farming as a Vocation

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

We all know that the number of farms in the United States has been declining from a peak of nearly 7 million in 1935 to only 2 million in the 1980s. The number of farmers has declined at a similar rate, and the number of farmers and their families as a proportion of the US population has gone from 70-80% to less than 3%. These trends are, of course, the result of increased productivity of the remaining farm families who have continued to provide us with abundant and relatively inexpensive supplies of food and fiber products.

Over the course of the last several decades, attempts have been initiated to slow this out-migration from the farms, often with little success. More recently, concern has been voiced about the future of American agriculture and whether present trends are desirable for our society. While I will not debate the desirability of present trends, more understanding of the motivations of those entering agriculture may be helpful in deliberations concerning public policies effecting agriculture.

As financial and other problems persist in agriculture, more and more observers question the desirability of farming as an occupation and as a lifestyle. Even the Future Farmers of America have changed their name to simply FFA in order to broaden their appeal to a greater number of young people. Some see these trends as indicative of a new age where farming is not a preferred occupation, and suggest that many of those best qualified to farm will pursue other types of careers. In order to assess the validity of such observations, it would be helpful to understand the pros and cons of farming as an occupation from the viewpoint of those engaged in farming.

Several years ago, while on leave with the U.S. Environmental Protection Agency (EPA), I had the opportunity to meet with two groups of young agricultural leaders. These groups were in Washington, D.C. to meet with a variety of agencies and congressional delegations. Will Erwin, a Hoosier farmer who was then the agricultural consultant to the Administrator of EPA, and I met with groups from Michigan and Indiana to give them an orientation to the activities of EPA and the potential impacts of these activities upon the agricultural sector and upon them as agricultural leaders. As part of these meetings, we asked these young agriculturalists to imagine that they were asked to advise a new college graduate about the desirability of pursuing farming as a vocation.

In their responses and subsequent discussions, we found their comments about the desirability of agriculture as an occupation extremely instructive in understanding the frustrations and rewards experienced by farm families. They all agreed that farming offers a great deal of independence and challenge. As one suggested, "The biggest advantage of going into farming is the opportunity to own and manage your own business, and to make your own decisions. Many people spend a lifetime dreaming about such a prospect."

These young farmers also suggest that farming is as much a way of life as an occupation. One said, "Farming is important to me because of the lifestyle it offers." Another said, "The non-financial benefits are tremendous: small community pride and friendship, less hurly-burly, and a connection with traditional values." Many believe that a farm is a good environment in which to raise a family and to teach children responsibility, independence, fortitude, and hard work.

Many suggest that farming gives them an opportunity to observe the poetry of the life cycle and make a living outdoors: "It's the experience of growing crops and raising livestock. I am out in the fresh air and working in a very natural environment."

On the other hand, these young agriculturalists suggested that there are also a number of negative aspects to farming. Many mentioned lack of financial return and security. Several stated that long hours and the necessity of off-farm income to support their families were distinct disadvantages, especially as they cut into the amount of time spent with their families.

Others worry that, while farming is viewed as a healthy occupation, they have to deal constantly with hazardous chemicals posing significant health risks. Many young farmers insist that excessive government regulation has created new uncertainties, especially new types of constraints and possible liabilities linked to chemicals and fertilizers. "It's too risky; society can change the rules overnight," one complained. Another declared it is now too difficult to deal with financing and production regulations.

The same sentiment is at work in comments about the burden of escalating paperwork, greater risk, and rising stress. Many say that the occupation has become much too complex and requires a very high level of managerial skills in order to survive. Several have suggested that farming has changed from a way of life to a business, one with low margins, low returns on equity, and large capital requirements.

Farmers seem to feel that non-agricultural sectors are intruding more and more into agricultural decisions. Some say, "Many decisions made by the other 98% of the population are limiting the non-financial benefits so important to the choice of farming for a living."

These responses from young agricultural leaders from Michigan and Indiana suggest that there are still many aspects to farming that make it a very desirable vocation. However, they also illustrate the frustrations encountered by the increasing complexity of farming and the increasing burden of regulations and paperwork, as well as concerns about health, safety, and financial security. Greater attention to the attitudes and concerns of agriculturalists will provide better information and hopefully better policies and programs which effect farmers and the entire agricultural community.

If society desires to maintain an agricultural sector composed of family farmers, we need to consider the impacts of policies upon the desirability of farming as a vocation and as a lifestyle.

Interested in a career in agriculture or agribusiness?

Do you have a son, daughter, friend, or neighbor who might be?

Do you like to solve problems? Manage businesses? Use computers? Buy and sell products and services? Find more efficient ways to do a job? Make investments?

If so, then you should consider continuing your education in the field of agricultural economics. Purdue's Department of Agricultural Economics can provide you with outstanding educational experiences and opportunities leading to professional careers in agriculture and agribusiness.

The department offers several study plans leading to careers in all phases of the food industry: agribusiness management, agricultural economics, agricultural finance, agri-sales and marketing, farm management, food business management, and quantitative agricultural economics.

Each of these programs contains a solid core of business and economics courses, supplemented with food and agricultural technical courses and social science classes. Students may move freely between these programs as their career plans develop and change.

For more information about the department's programs, clip out the coupon below and mail it to:

Professor Bohl
Dept. of Agricultural Economics
1145 Krannert Bldg., Room 660
Purdue University
West Lafayette, IN 47907-1145

Please send me information about the following Purdue Department of Agricultural Economics undergraduate programs:

- ☐ Agribusiness Management
- ☐ Ag. Economics
- ☐ Ag. Finance
- ☐ Agri-Sales & Marketing
- ☐ Farm Management
- ☐ Food Business Mgmt.
- ☐ Quantitative Ag. Econ.
- ☐ All of the above

Name _____ Age _____

Address _____

City/State _____ Zip _____

IN THIS ISSUE

Purdue University is an affirmative action/equal opportunity institution.

Dept. of Ag. Economics
Chris Hurt
1145 Krannert Bldg., Room 575
W. Lafayette, IN 47907-1145

Non-profit Organization
U.S. Postage
PAID
Lafayette, Indiana
Permit No. 221