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EDITOR: Chris Hurt

LAYOUT AND DESIGN: Cathy Malady

EDITORIAL BOARD: Stephen B. Lovejoy and Kathy Heaphy

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Bringing On-Farm Fluid Fertilizer Storage into Compliance: What Will It Cost?*

Duane Rogers, Graduate Research Assistant; and Jay T. Akridge, Associate Professor, and Associate Director of Center for Agricultural Business

There has been increasing concern regarding the effect of agricultural pesticides and fertilizers on our water supply. Much attention has focused on residues which have been detected in a small number of rural water wells (EPA). In response to this increased public concern, federal and state governments have passed legislation affecting the handling and use of many fertilizers and pesticides.

The Indiana State Chemist recently adopted guidelines for the construction of fertilizer and pesticide storage containment facilities (Indiana State Chemist and Seed Commissioner, 1991b; 1991c). These facilities are to contain any spills which might occur during the storage or handling of fertilizers and pesticides. The rules will affect many Indiana agribusiness firms, as well as farmers who store these products on their farms. Thus, many Indiana farmers will need to decide whether to upgrade their storage

facilities to comply with the new regulations or to abandon their on-farm storage program.

This article discusses the costs involved in bringing on-farm storage facilities for fluid fertilizers into compliance. Compliance costs for two typical on-farm storage tank sizes are presented. In addition, the steps for evaluating the decision of whether to upgrade or abandon storage facilities are outlined.

The Rules

The Indiana State Chemist adopted two sets of rules on containment of fertilizers and pesticides. The rules governing bulk pesticide storage went into effect May 7, 1991 (Indiana State Chemist and Seed Commissioner, 1991b). The rules which govern bulk fertilizer storage went into effect July 6, 1991 (Indiana State Chemist and Seed Commissioner, 1991c).** These rules apply to anyone who stores bulk pesticides and fertilizers in excess of



specified minimum amounts. The law makes no distinction between farmers and agribusiness firms — Indiana farmers must comply with the rules if they store pesticides and fertilizers in quantities which exceed the specified minimums.

What are the minimums? For fertilizer products, any location which stores more than 2,500 gallons of fluid fertilizer in undivided quantities or more than 12 tons of dry bulk fertilizer in undivided quantities must comply with the rules (Indiana State Chemist and Seed Commissioner, 1991c). The term “undivided quantities” simply means ‘stored in a single container.’ This says that while a farmer with one 3,000-gallon fertilizer storage tank would need to comply with the new rules, a farmer with six 500-gallon tanks would not.

For dry pesticide products, any location where more than 100 pounds of dry pesticides are stored in undivided quan-

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** These rules are outlined in two publications entitled “Rules and Regulations Under the Indiana Pesticide Registration Law” and “Rules and Regulations Under the Indiana Commercial Fertilizer Law.” Copies of these publications can be obtained by contacting the Indiana State Chemist Office, Purdue University, West Lafayette, IN 47907.

tities will need to comply. For fluid pesticides, the minimum is 55 gallons (Indiana State Chemist and Seed Commissioner, 1991b). The one exception to this rule is if the products are stored in 'mobile containers' for less than 15 days. A 'mobile container' is basically any container that is on wheels and can be readily moved. Minibulk containers normally filled by dealers, loaded onto vehicles, and transported to the farm or field are considered mobile (Indiana State Chemist and Seed Commissioner, 1991c).

While Indiana farmers must be familiar with all rules, the rules pertaining to fluid fertilizer storage will likely have the biggest impact on Hoosier farmers. Given the widespread practice of storing fluid fertilizers on the farm, the remainder of this article focuses on the fluid fertilizer rules.

To bring fluid storage facilities into compliance, two types of containment facilities must be erected. The rules state that there must be a facility (dike) capable of containing any spill due to failure of the storage tank. In addition, an operational area containment pad is required to contain any spill that occurs during the loading or unloading of the storage tank.

The regulations state that the diked area around the storage tank(s) must be large enough to contain the volume of the largest tank plus the volume displaced by all tanks and equipment inside the containment area. An extra six inches (free board space) must be added to the height of the wall to accommodate rainfall.

The operational area containment pad must be constructed and reinforced to handle the maximum gross load (including product) of any vehicle using the operational area. The operational area must at least 10 feet wide and 20 feet long. The curbed surface and catch basin of the area must be large enough to hold at least 750 gallons of discharged fluid (Indiana State Chemist and Seed Commissioner, 1991c).

The Example

For this analysis, two storage tank sizes commonly used on Indiana farms were chosen — 6,000 and 10,000 gallons. The cost estimates presented in this article were developed with the assistance of a construction company. The actual cost of bringing your own storage facility into compliance may be quite different from the figures presented here. However, the method used to calculate the costs is general and should provide an example to follow when calculating your costs. There are five steps which are important to follow when making the upgrade or abandon decision. These steps are outlined below.

Step I - Choose Diking Material

The first step in the analysis is to decide on the appropriate material to be used for construction of the containment facility. Concrete is used in the example presented here, but other materials such as synthetic or clay/earthen liners could also be used (Indiana State Chemist and Seed Commissioner, 1991c; *Solutions*). Note that this is a fundamental decision and it is important to check with the

State Chemist if there are any questions as to the nature of the materials used or the construction plan itself.

Step II - Calculate Initial Investment Costs

The second step consists of estimating the cost of building the containment structures. Since some farmers may use their own labor, the cost of construction has been broken into two categories, labor and materials. For the two example tanks, the cost estimates are shown in Table 1. (Appendix A presents detail on the specifications of the structures.) For the 6,000-gallon storage tank, the cost of the 17'x17'x3'-6" dike required to comply with the regulations would be \$6,324. For the load/unloading pad, the minimum allowable size was used. Thus, the load/unloading pad measures 10' x 20' and cost \$1,473 to build. The total initial investment required to bring this 6,000-gallon tank into compliance is \$7,797. For the 10,000-gallon tank, a 22'x22'x3'-6" dike is required. The total investment for the dike and load/unloading pad with the larger tank is \$9,712. Cost estimates obtained from other construction firms for the 6,000-gallon tank ranged from \$6,000 and \$6,500 for the combined dike and load/unloading pad. For the 10,000-gallon tank, cost estimates ranging from \$7,900 to \$9,015 were obtained. Obviously, there can be wide differences in costs and it is recommended that you consult with more than one construction company when seeking estimates. Note also that there are considerable scale economies involved — a 66% increase in tank capacity

Table 1. Total Initial Investment — 6,000- and 10,000-Gallon Tanks

Component	6,000-Gallon			10,000-Gallon		
	Dike	Load/ Unload Pad	Total	Dike	Load/ Unload Pad	Total
Materials	\$2,790	\$ 932	\$3,722	\$4,446	\$ 932	\$5,378
Labor	3,534	541	4,075	3,793	541	4,334
Total	\$6,324	\$1,473	\$7,797	\$8,239	\$1,473	\$9,712

Table 2. Annual Fixed Investment Costs of Compliance for 6,000-Gallon (32.1-Ton) Tank

Item	Unit	Initial Investment	Useful Life	Taxes & Insurance	Maintenance & Repairs	CRC ¹	Annual Cost
Dike	17'x17'x3'6"	\$6,324	10	\$228	\$126	\$ 828	\$1,182
Load/Unload Pad	10'x20'	\$1,473	10	53	29	193	275
Totals	-	\$7,797	-	\$281	\$155	\$1,021	\$1,457

¹ Capital Recovery Charge — annual charge for depreciation and interest.

requires only a 25% increase in the initial investment. Note also that the total initial investment cost is split roughly 50/50 in terms of labor and materials.

There are two costs which were not included in the cost estimates. First, the cost of physically moving the tank onto the load/unloading pad was excluded. In addition, the cost of a pump to transfer any spill liquid from the containment area into a holding tank was not included. These costs would vary with each individual situation.

Step III - Calculate Annual Ownership Costs

The third step in the analysis is to convert the initial investment cost into an annual ownership cost. For our analysis, a long-term interest rate of 10.5% and an annual inflation rate of 5% is used. The containment structure is assumed to have a 10-year useful life with no salvage value at the end of its useful life. The calculations used to determine annual ownership costs are shown in Table 2 and Table 3.

The column labeled 'Taxes & Insurance' in each table refers to the

increase in property taxes and insurance resulting from construction of the containment facilities. For the example, annual taxes and insurance are assumed to increase annually by 3.6% of the initial investment cost (Simpson). The column titled 'Maintenance & Repairs' refers to the cost of repairing and maintaining the containment facilities. Annual maintenance and repairs are assumed to be 2% of the initial investment (Simpson).

The last column of Table 2 is titled 'CRC,' an abbreviation for 'Capital Recovery Charge.' The CRC is simply the annual cost associated with depreciation and interest. This formula annualizes the cost of depreciation and interest using the real rate of interest (rate of interest with inflation removed) over the life of the asset. (Additional information on the CRC calculation is presented in Appendix B.)

Summing the three columns in Table 2 shows the annual cost for the 6,000-gallon tank dike is \$1,182. In addition, the annual ownership cost for the load/unloading pad is \$275. The total annual cost of compliance for the 6,000-

gallon tank is \$1,457. Using the same method of calculation for the 10,000-gallon tank, the annual cost is \$1,816 (Table 3).

Step IV - Calculating Annual Per-Ton Costs

One way to look at the cost issue is to express cost on a per-ton basis; that is, what is the annual compliance cost per ton of product stored? This per-ton cost can then be compared to the benefits which might accrue to on-farm storage, such as lower product prices.

The first step in calculating an annual per-ton cost is to convert the tank capacity from gallons to tons. The 6,000-gallon tank has a capacity of approximately 32.1 tons of fluid fertilizer. To obtain this figure, the tank's capacity (6,000 gallons) is multiplied by the weight per gallon of 28% nitrogen solution (10.7 lbs/gallon), and the resulting amount is divided by 2,000 (lbs/ton). Following the same procedures for the 10,000-gallon tank, the capacity in tons is approximately 53.5.

The next step is to divide the annual ownership cost by the number of tons of

Table 3. Annual Fixed Investment Costs of Compliance for 10,000-Gallon (53.5-Ton) Tank

Item	Unit	Initial Investment	Useful Life	Taxes & Insurance	Maintenance & Repairs	CRC ²	Annual Cost
Dike	22'x22'x3'6"	\$8,238	10	\$297	\$165	\$1,079	\$1,541
Load/Unload Pad	10'x20'	\$1,473	10	53	29	193	\$ 275
Totals	-	\$9,711	-	\$350	\$194	\$1,272	\$1,816

² Capital Recovery Charge — Annual charge for depreciation and interest.

material moving through the tank during the year. In this example, three levels of throughput were considered:

- filling and unloading each tank once a year
- twice a year
- three times a year

For the 6,000-gallon tank, the annual throughput associated with filling and unloading the tank once a year is 32.1 tons. The annual throughput for two and three times per year is 64.2 and 96.3 tons, respectively. Obviously, the higher the throughput figure, the lower the annual per-ton cost.

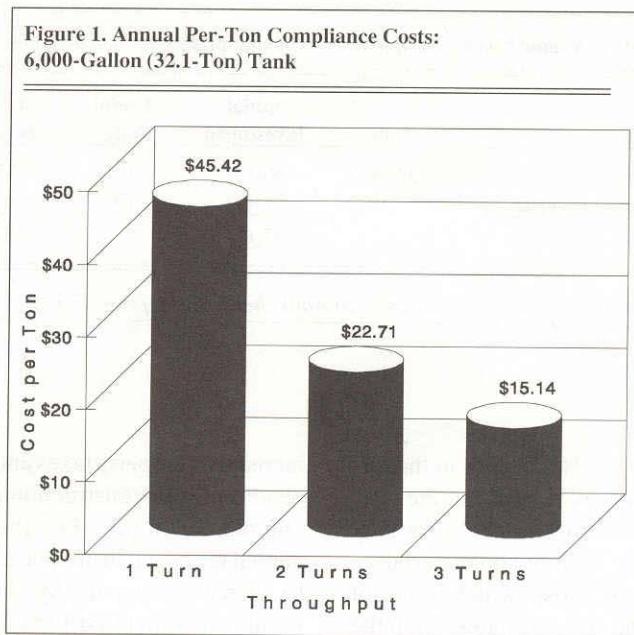
The impact of throughput on annual cost for the 6,000-gallon tank is shown in Figure 1. For one turn, the annual cost is \$45.42 per ton. It is \$22.71 per ton for two turns, and \$15.14 per ton for three turns. Repeating the same procedure for the 10,000-gallon (53.5-ton) tank gives per-ton costs of \$33.94, \$16.97, and \$11.31, for one, two, and three fillings per year, respectively (Figure 2).

The costs associated with upgrading facilities to comply with the new rules concerning secondary and operational area containment are significant. There are substantial economies of scale involved — costs drop dramatically as throughput is increased. To make upgrading your facilities economically feasible, you would need to be able to obtain fluid fertilizer at a much lower price or obtain other substantial benefits from on-farm storage.

Step V - Compare Costs and Benefits

To complete the analysis, the annual per-ton ownership cost should be compared to the benefits of on-farm storage. The most likely benefits are:

- savings in the form of a lower price as a result of being able to store material on your farm
- convenience of having fluid fertilizer available when you need it,



instead of relying on your local fertilizer supplier to deliver fertilizer to you in the busy spring season

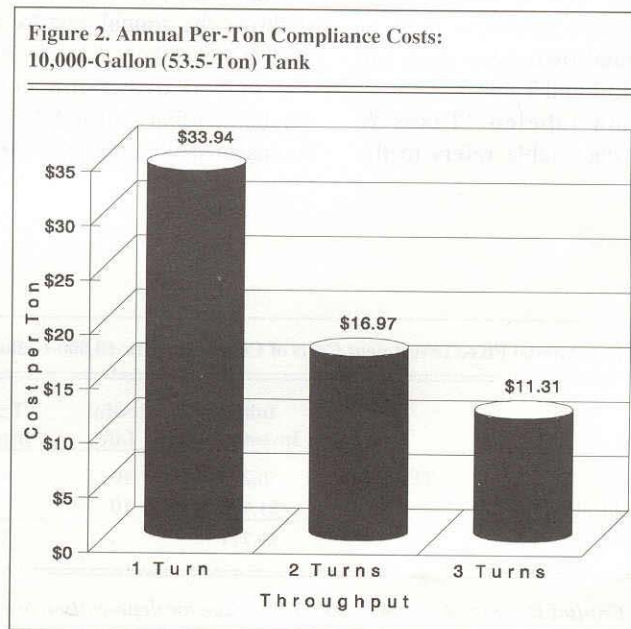
- the purchasing flexibility associated with having your own storage facilities

By having your own storage facility, you can buy and pay for fertilizer whenever it is most advantageous to do so. By buying fertilizer in the off-season,

you may be able to realize a substantial cost savings. Benefits such as a lower product price, convenience, and purchasing flexibility must be compared against the per-ton cost to arrive at the decision that is best for you.

Summary

In summary, the procedure for deciding on the appropriate plan of action is fivefold. First, identify the construction material which is best suited for your



particular situation. We have only evaluated one such alternative, concrete. Some synthetic and clay/earthen materials may also be used for diking purposes and these options may be more cost effective than concrete. After selecting the diking material, the second step is to calculate the initial investment cost associated with that material. The third step involves converting the initial investment cost, along with all other relevant costs, into an annual ownership cost. In the fourth step, the annual ownership cost is converted to an annual per-ton cost. The final step is to

compare the costs to the benefits of on-farm storage. Following these steps should put you in a better position to make the correct upgrade or abandon decision on your farm.

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APPENDIX A - Specifications

Specification	6,000-Gallon Tank	10,000-Gallon Tank
	Dike	Dike
Dike Size	17'x 17'x 3'-6"	22'x 22' x 3'-6"
Site Strip	25'x 25' x 2' (46.3 cu. yds.)	32'x 32' x 2' (75.9 cu. yds.)
Excavating	(4'x 19') x 4' (56.3 cu. yds.)	(4 x 28) = 112 x 4 x 5 (83 cu. yds.)
Granular Fill	19'x 19' x 12" (13.4 cu. yds.)	30' x 30' x 12" (33.3 cu. yds.)
Earth Backfill	76'x 3'x 5' (42.2 cu. yds.)	112'x 3' x 5' (62.2 cu. yds.)
Concrete Footings	68' x 16" x 8" (2.2 cu. yds.)	96' x 16" x 8" (3.2 cu. yds.)
Water Stop	72 L.F. - 6" Bulb Stop	96' L.F. - 6" Bulb Stop
Footing Rebar	68' x 3 = 204 L.F. x 110% = 12 - 20' bars	96' x 3' = 288 L.F. x 110% = 16 - 20' bars
Concrete Wall	68'x8'x8" (13.4 cu. yds.)	88'x 8' x 8" (17.5 cu. yds.)
Wall Rebar	(68'x4') + [(68/4) x 10] = 442 x 110% = 25-20'bars	88'x 4' + [(88/4) x 10'] = 572 x 110% = 32 - 20' bars
Concrete Slab	17'x 17' x 12" (10.7 cu. yds.)	22'x 22' x 12" (17.9 cu. yds.)
Slab Rebar	34 x 17 = 578 x 110% = 32 - 20' bars	(22 x 22) x 2 x 110% = 53 - 20' bars
Totals:		
Excavation:	103 cu. yds.	160 cu. yds.
Compacted Fill:	14 cu. yds.	35 cu. yds.
Earth Fill:	43 cu. yds.	65 cu. yds.
Water Stop:	72 Linear Feet	100 Linear Feet
Concrete:	27 cu. yds.	40 cu. yds.
#4 Rebar:	69 - 20' bars	101 - 20' bars
	Loading/Unloading Pad	
Pad Size	10'x 20' x 8"	
Excavating	20'x 30' x 1'-8" (37.0 cu. yds)	
Granular Fill	20'x 30' x 12" (22.2 cu. yds)	
Concrete	20'x 30' x 8" (4.9 cu. yds)	
Rebar	#4 rebar - 12" o.c. each way 400 L.F. x 110% = 22 - 20' bars	

APPENDIX B - The Capital Recovery Charge

The Capital Recovery Charge (CRC) is one way to calculate an annual charge for depreciation and interest. The formula, which is outlined below, annualizes the cost of depreciation and interest using the real rate of interest over the life of the asset. The real rate of interest (or rate of interest after inflation has been removed) is calculated as follows:

$$(1) \quad 1+r^* = \left[\frac{1+r}{1+I} \right]$$

where r^* is the real (inflation removed) rate of interest; r is the nominal long-term interest rate (interest rate charged by a bank); and I is the inflation rate. For Tables 1 and 2, we assumed a nominal interest rate of 10.5% and a 5% annual inflation rate. Plugging these numbers into the above formula, we obtain a real rate of interest of 5.24%:

$$(2) \quad r^* = \left[\frac{1.105}{1.05} \right] - 1 = 5.24\%$$

The CRC uses the above real rate of interest to arrive at an annual cost of depreciation and interest

which can be used in budgeting. The CRC is calculated as follows:

$$(3) \quad CRC = \left[\frac{r^*}{1 - (1+r^*)^{-n}} \right] \times [Initial Investment]$$

where n is the useful life of the containment structure. Application of the formula will be illustrated for the 6,000-gallon tank. The interest rate and inflation rate assumptions were given above. The initial investment for the 6,000-gallon tank was \$7,797. Plugging these numbers into the CRC formula:

$$(4) \quad CRC = \left[\frac{.0524}{1 - (1+.0524)^{-10}} \right] \times (\$7,797) = \$1,021$$

This \$1,021 is the annual cost of depreciation and interest for the 6,000-gallon tank. Using the CRC formula, you can change the assumptions that we have made concerning the inflation rate, the rate at which you can borrow money (nominal interest rate), or the useful life of your particular containment structure to more closely model your particular situation.

Visit the 1992 Indiana and Ohio Farm Management Tour

June 30: Preble and Darke Counties in Ohio
July 1: Randolph and Wayne Counties in Indiana

Tuesday, June 30

Times today are EDT or Ohio time

1) Robert Yeazel Farm — Tour begins at 9:30 a.m., interview at 10:20 a.m. Two generations are involved in the operation and management of this farm. Mark Yeazel is working to improve the Red and White Holstein breed in part through sale of embryo transplants. The purebred Durocs are primarily managed by Jim Yeazel. New manure regulations impact all live-stock producers. Aspects of concern include adequate storage relative to land for application, controlling runoff to protect surface water sources, and balancing manure nutrients with crop production needs. Hear a discussion of preliminary plans for utilizing manure resources and

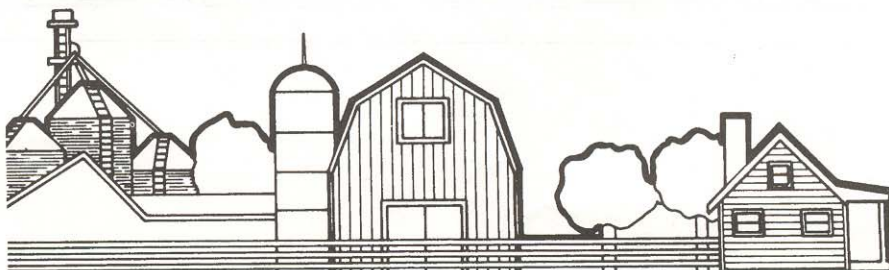
reducing pollution potential on this farm.

2) Running Springs Farm — Tour and interview begin at 11:30 a.m. What's continuous corn doing on slopes like this? Norman Mull has seen the home farm change from primarily grassland for dairy and beef cattle to cash grain over the last 30 years. His experience with SCS has backed his concern for conservation farming, while detailed farm records have proven the benefits.

Lunch at 12:00 p.m.

Enjoy lunch in the shade at the private park/campgrounds operated by the Mulls. Luncheon tickets may be purchased for \$5.00 at any tour stop until all tickets are sold.

Dale McNelly Farm — After lunch, hear about ridge tillage from one of the pioneers in the use of this tillage system. Average yields for 1987-1991 were 147 bushels on corn and 48 bushels on soybeans. Dale does a



lot of experimenting with ridge tillage and has some promising ideas to share with you.

- 3) **Vanzant Farms** — Tour begins at 1:45 p.m., interview at 2:30 p.m. Steve Vanzant began farming on 260 acres with Norman Mull in 1980. Today, Vanzant Farms has 1,575 acres in row crops and a 100 sow farrow-to-finish hog operation, currently being expanded to 200 sows. Steve's two full-time employees are a vital part of the operation. Financial records aid in keeping overhead costs down and are vital in planning.
- 4) **Downing Fruit Farm** — Interview begins at 3:50 p.m., tour at 4:35 p.m. The Downing family has been involved in horticulture for 155 years in western Ohio. Currently the fifth through seventh generations are in a family partnership producing and marketing apples and pears plus other fruits and vegetables. See their unique apple production and replacement methods, and hear how they store and market products at their farm market and elsewhere.

Wednesday, July 1

Times today are EST or Indiana time

- 5) **Wilbur and Rex Clements Farm** — Tour begins at 8:00 a.m., interview at 9:00 a.m. The Clements' Farm is operated by Wilbur and his son Rex. They combine the talents and resources of their families to farm 900 acres and produce 2200 head of hogs farrow-to-finish, while using no hired labor. Learn how this operation has evolved into a highly efficient family business where each individual's expertise is utilized to its fullest potential. Take a tour of their swine facilities, and see a demonstration of computerized feed mixing.

- 6) **Myron Moyer Family Farm** — Tour begins at 10:15 a.m., interview at 11:05 a.m. A computer helps feed the 65+ registered Holsteins on this 940-acre Wayne County dairy-grain farm. Myron Moyer considers it a challenge to breed cows that are high producers and also have excellent type. The rolling herd average of about 18,500 pounds of milk, 700 pounds of butterfat, and 630 pounds of protein per cow per year with a 105.4% B.A.A. (Breed Age Average) for type indicate he is succeeding. The computer which controls amounts of concentrates for individual cows is also used for production and breeding records. Sara Jane Moyer uses a second computer for their business records. Their home and office will be open for the tour.

- 7) **Lunch at Kirlin Farms** at 12:00 p.m. Luncheon tickets may be purchased for \$5.00 at any tour stop until all tickets are sold.

Triple "B" Farms — After lunch, hear Ed and Debbie Bell tell about their vegetable farm in Wayne County. A great deal has been written about diversifying farms by identifying the unique production opportunities or market niches. As a management team, Ed and Debbie Bell have identified and positioned their farm to take advantage of such opportunities. Production includes corn, soybeans, several varieties of sweet corn, green beans, and strawberries. They are continually seeking new markets, ways to add value to their products, and methods of differentiating their products from those of their competitors. Our visit with Ed and Debbie will provide the opportunity to learn more about

identifying niches and how to take advantage of them.

Kirlin Farms — Tour begins at 1:45 p.m., interview at 2:30 p.m. The Charles and Nancy Kirlin farm is a diversified grain and livestock farm comprised of 1100 acres of crops and forages, as well as three livestock enterprises. The cropping program features a center-pivot irrigation system just installed for the 1992 growing season on a field which yielded only 13 bushels of corn per acre in 1988. The farm's three livestock enterprises include 175 registered Hampshire ewes, a 1500 head farrow-to-finish hog operation, and a 100 head cattle finishing operation. You will hear how the Kirlins make the sheep operation one of the most rewarding on the farm.

- ▶ Following the interview, Agricultural Economist **J. William Uhrig** will present an **outlook update**.
- ▶ Luncheon tickets for each day may also be purchased prior to June 26 by mailing a check payable to IFMA to Don Pershing, Ag Economics Dept., Purdue University, 1145 Krannert, W. Lafayette, IN 47907-1145. Specify the number of tickets and the day for the luncheon. Cost of each luncheon is \$5.

Note: You may want to bring a lawn chair.

The Indiana Farm Management Association sponsors this tour to encourage and develop high levels of management competence in Hoosier farmers.

Can Moderate-Sized Swine Enterprises on Diversified Farms Compete with Large, Specialized Units?*

John E. Kadlec, Professor

Moderate-sized swine enterprises on diversified farms can compete with large, specialized units, but most must make management changes to survive.

A comparison of the production costs of moderate-sized diversified Iowa farms with larger, more specialized units indicates that only the best 20-30% of Iowa farm record keepers had costs of production as low as the larger, more specialized units (Table 1). Many managers of diversified farms selling 1,000 to 5,000 hogs are questioning whether they can compete with larger, more specialized units that produce over 5,000 hogs per year. Following is a discussion of five areas in which moderate-sized swine enterprises must be better than average in order to survive.

Control Feed Cost Per Pound of Gain

The most important cost for swine producers to monitor is feed cost per hundredweight of gain. Feed accounts for approximately 60% of the cost of pork production and can affect profit by as much as \$4 per hundredweight (Table 2). The \$4.00 per hundredweight difference in feed cost translates into a \$30,000 yearly profit difference for a 3,000-hog enterprise. Feed cost per hundredweight of gain depends on feed conversion, feed ingredient mix, and prices paid for ingredients.

➤ Feed efficiency has improved dramatically during the past 10 years (Table 3). Swine producers must know the amount of feed required to produce a hundredweight of pork on their farms and must compare their feed conversion to the feed conversion of above-average swine producers. At the present time, a feed conversion of

3.5 or less provides a competitive advantage, while over 4.0 is not. Improvements in feed efficiency appear to be due to a variety of factors, including breeding stock selection, terminal crossbreeding systems, feeder technology and adjustment, and control of health problems through good management.

- Both price of ingredients and effect of ingredients on hog performance should be considered. It is not uncommon for swine producers to feed rations that result in high cost of production and/or poor hog performance because of improperly calibrated feed mixing equipment.
- Swine producers must be competitive in the prices paid for corn, soybean meal, and other purchased feed. Enterprise size, storage facilities, and geographic location affect prices paid per unit of feed.

Farms that produce and store their own corn have a 20 cents per bushel or \$2.50 per hog advantage over units that

purchase corn. Also, corn prices in geographic areas where much of the specialized-unit expansion is taking place, such as North Carolina, are an additional 20 cents per bushel higher. Therefore, midwest farms that produce their own corn have a \$2.50 per hog advantage over specialized units in the same area, and as much as a \$5.00 per hog advantage over specialized units in corn deficit areas.

Control Building and Equipment Costs

Building and equipment costs (depreciation, interest, taxes, insurance, and repairs) account for 15-20% of total costs of production. Four ways to attain low building costs per hundredweight of gain are:

- Keep construction costs as low as possible without sacrificing building quality. The investment in buildings and equipment reported by some large specialized units is less than \$100 per farrow-to-finish hog produced. These large operations often receive discounts because of size and duplication of the construc-

Table 1. Comparison of Iowa top 20% with competition, 1986 (farrow to finish)

	Iowa Producers Top 20%	Average	Intensively Managed Operations
Feed cost per hundredweight	\$19.41	\$22.56	\$20.11
Fixed cost per hundredweight	4.23	6.53	N/A
Diet cost per hundredweight	5.38	5.80	6.01
Total cost per hundredweight	30.78	38.02	32.50
Feed efficiency	3.63	4.05	3.40
Average head marketed per year	1260	1249	5000
Litters per sow per year	1.78	1.77	2.10
Pigs per sow per year	14.42	14.12	18.50
Pigs weaned per litter	8.10	7.98	8.80
Death, loss %	14.95	16.10	10.00

Source: "The Iowa Pork Industry: Competitive Situation and Prospects," Iowa State University, STF1: December 1988. The specialized units designated as "intensively managed operations" in Table 1 consist primarily of operations located in the Atlantic coastal region and the midsouth, but this group also includes some units in the midwest.

*The author appreciates the helpful suggestions of Howard Doster, Kenneth Foster, Chris Hurt, and Bob Jones.

tion of particular types of buildings, and some even have their own building construction crew. Also, building requirements in warm climates may be less costly than in cold climates.

Building investments of moderate-sized diversified farms often are \$120 or more per hog produced. Each \$10 increment in building investment per hog produced results of about \$1.50 higher production cost per hog during the entire life of the building, assuming hog performance and labor requirements are unaffected by the building investment. Large specialized units have a per-hog cost advantage of about \$5.00 over moderate-sized diversified farms. The diversified farm may be able to reduce building investments by doing part or all of the construction work and/or by serving as the general contractor.

- Keep buildings fully utilized. If building ownership costs for a fully-utilized building average \$7 per hundredweight of pork produced, each 10% below full utilization results in increased costs of approximately 70 cents per hundredweight of pork produced. This is because total building costs remain almost the same regardless of the number of hogs produced.
- Increase the life of buildings and equipment. Some managers extend the life of buildings and equipment through good maintenance. Assuming a \$100 investment per hog in buildings and equipment and a normal life of 10 years, one "extra year"

Table 3. Illinois Farm Business Farm Management Record Keepers, Farrow to Finish

Years	Feed/Cwt Gain	Pigs/Litter	Ave/Wt	Litters/Farm
1960-69	413	7.4	236	69
1970-74	427	7.2	235	97
1975-79	421	7.2	238	117
1980-84	404	7.3	237	154
1985-89	388	7.7	243	184

Table 2. Comparison of Iowa swine enterprise record high- and low-return producers, 1986-1990 averages

Categories of Comparison	Top One-Third	Low One-Third	Difference
Average sow herd size	109	103	6
Total number of market hogs sold	1,445	1,233	212
Net profit and return to management	\$55,288	\$11,993	\$43,295
Feed cost per hundredweight	22.21	26.38	4.17
Other operating costs per hundredweight	3.98	5.81	1.83
Fixed cost per hundredweight ¹	4.81	7.50	2.69
Labor cost per hundredweight	3.87	5.27	1.40
Total cost per hundredweight	34.87	44.96	10.09
Feed efficiency	3.64	3.98	.34
Cost of ration per hundredweight of feed	6.12	6.65	.53
Pig death loss, weaning to market	5.22%	6.17%	.95%
Pigs weaned per sow per year	15.49	14.16	1.33

¹ Depreciation, taxes, insurance, and capital charges.

Source: The Iowa State University Swine Enterprise Records Summary.

decreases cost per hog by \$1.00 for the entire life of the building. Arrangements for continuity of the business also affect the length of time that buildings and equipment are used.

- Shop for interest rates. Each 1% difference in interest rates affects building and equipment costs about 60 cents per hog produced. Operators can attain significant savings by borrowing at favorable rates or by financing with a larger percentage of equity capital.

Improve People Management

Labor costs represent 10-15% of the cost of production. The most important challenge is to follow sound procedures in recruiting, hiring, training, evaluating, motivating, and compensating employees. In order to hire and keep good employees, managers must

become "masters of labor management."

Merchandise Your Hogs

Some producers receive \$1 or more per hundredweight of hogs sold than do other producers. This price advantage can most likely be attributed to location; the type, weight, and volume of hogs sold; and the arrangement between the buyer and the producer. Hogs from larger units are likely to be more attractive to buyers than smaller units. It is extremely important for all producers, but especially smaller producers, to monitor price received relative to other farms and to take necessary steps to ensure competitive prices. These steps may include:

- developing specific arrangements with buyers regarding the type, size, and number of hogs to be delivered at particular times
- coordinating with other producers in the same area to provide the type and number of hogs needed at specific times and bargaining with buyers for compensation for volume and quality

Identifying and maintaining good markets will be one of the greatest challenges for swine producers in the decade ahead.

Grow to a Suitable Size

Be large enough to gain economies of size and to generate your desired income. Profit margins per hog will likely narrow in the decade ahead due to greater competition from large specialized units. In order to have the same income provided from the swine enterprise as in the past, it will be necessary to produce more hogs. Also, it will be necessary to gain economies of size for labor use, in feed equipment use, in purchase prices, on building prices, and market prices. For most operators, a 3,000-head-per-year farrow-to-finish hog unit will be needed. Smaller enterprises may gain economies by making group purchases and sales with other producers.

How to Excel

Diversified, moderate-sized swine farms in the midwest have some cost advantages over larger, more specialized units due to lower costs for corn,

waste disposal, and overhead. Yet in a study of Iowa farms, only about 20-30% of the Iowa State University record keepers had lower costs of production than large, specialized swine production units. The average Iowa record keeper had \$5.50 higher costs per hundredweight than the specialized units. To be competitive, the moderate-sized, diversified farms in the midwest must:

- ▶ keep good swine enterprise records and know such key management factors as feed cost, building cost, and price received per hundredweight of pork produced
- ▶ compare key management factors to similar farms and to large specialized units
- ▶ be at the cutting edge of practices that lead to improved feed efficiency, especially in the selection of

breeding stock and use of terminal crosses

- ▶ purchase feed at below-average prices
- ▶ keep building costs at a minimum with low-cost construction, full utilization, good maintenance, and low interest rates
- ▶ understand labor management practices that will ensure hiring, motivating, and keeping good employees
- ▶ produce the type of hog that best fits consumer demand and take steps to assure good markets
- ▶ be large enough to be competitive in purchasing inputs and securing good markets. For small producers, group purchasing and selling may be required.

Indiana Agriculture 2000: A Strategic Perspective

Lee F. Schrader, Professor

The food and agriculture sectors of Indiana, the U.S., and the world have experienced massive changes in the past 30 years, and the pace of change has accelerated. Success belongs to those persons and firms that correctly anticipate change. Plans and investments based on today's conditions characterize tomorrow's also-rans. Planning depends on estimates of future conditions.

Faculty in Purdue's Department of Agricultural Economics have written a book that provides a 10-year projection for agriculture, entitled *Indiana Agriculture 2000: A Strategic Perspective*. The study's objective is to help participants in Indiana's food and agriculture sectors plan for the future.

The authors of each segment of the study were challenged to make their projections as specific as possible, with full knowledge that there would be errors. More important, they were asked to identify key drivers of change that underlie their projections. The study's

user can modify the projections as the driving factors change in ways not now anticipated. The authors' objective is neither to advocate a course of action nor to approve or disapprove of the situation they foresee.

Each section of the study identifies opportunities for business managers and policy makers to adapt to or take advantage of conditions expected to prevail in the 1990s. The authors identify segments or niches that provide opportunities for producers, as well as those segments of agriculture that face more challenging times. The authors also identify the positions of Indiana suppliers, producers, and processors relative to their competitors in other states and the world, and discuss reasons why their position will improve or deteriorate.

Finally, the authors have defined the food and agriculture sectors very broadly. These sectors or industries include the activities and decisions of consumers, processors, producers, and

input suppliers and manufacturers. It includes the traditional livestock and crop commodity industries such as corn, soybeans, hogs and cattle, as well as horticultural and specialty crops and forestry. The events and forces that shape and affect the sector include a changing world economy, the economic and agricultural policy climate, resource and environmental concerns, new technological advances, the shape and strength of the rural community, and the changing structure of and linkages between various segments of the sector. To help public and private decision makers in Indiana's food and agriculture sectors develop a vision for the next decade, the Ag Econ faculty present to you *Indiana Agriculture 2000: A Strategic Perspective*. The full report and a summary version is expected to be available by mid-July from Purdue's Media Distribution Center.

Top Farmer Crop Workshop July 19-22, 1992

Howard Doster, coordinator of the Top Farmer Crop Workshop, anticipates another record attendance at this year's workshop. Farmers from 10 states, mostly in the Corn Belt, have attended in record numbers over the last two years.

This year's workshop, the 25th annual, features the first offering of the new Purdue Crop/Livestock Linear Program (PC-LP). Using PC-LP, workshop participants can test cropping system decisions where timing of field work affects costs and/or returns. Almost 7,000 previous participants, including several of the speakers, have tested changes in their crop rotation, machinery size, tillage system, and/or farm size.

“Remember: this is only a partial list of this year's highlights. The schedule is packed with familiar names and useful sessions!”

Forty speakers, including fourteen farmers, are featured:

- Bill Richards, Chief of the U.S. Soil Conservation Service, speaking about soil and water quality
- Jim Moseley, former USDA Asst. Secretary for Natural Resources, and Clarks Hill, Indiana hog/crop farmer, discussing his three years in Washington, D.C.
- Louis Thompson, Associate Dean Emeritus, Iowa State University, giving his annual analysis of weather cycles, including the El Nino effect
- John Marten, staff economist for *Farm Journal* magazine, analyzing current issues
- Jim Kinsella, Illinois no-till farmer, describing his farming practices
- Indiana farmer Ted Macy, describing how he used Desert Storm's satellites to track his in-field location as he changed seed, fertilizer, and chemical rates on-the-go
- Chris Hurt and Mike Boehlje, Purdue/Minnesota ag economists, presenting Purdue's 10-year projections for agriculture, *Indiana Ag 2000*

Remember: this is only a partial list of this year's highlights. The schedule is packed with familiar names and useful sessions!

Participants will be able to complete a Health Risk Appraisal survey which will be analyzed by the Purdue School of Nursing. At the workshop, several health and well-being tests will be offered, including blood cholesterol and sugar, lung capacity and body mass, and a cardiovascular step test. If this becomes an annual feature, participants can compare their scores from year to year.

Registration begins at 6 p.m., Sunday, July 19th. You must preregister as early as possible because you will need to study homework assignments before the workshop begins.

For more information, and to receive a brochure describing the workshop, contact:

Howard Doster
Dept. of Agricultural Economics
Purdue University
1145 Krannert Bldg., Room 690
West Lafayette, IN 47907-1145
(317) 494-4250

Don't miss this great networking opportunity — see you at the workshop!



Changing Consumer Diets Alter Agriculture

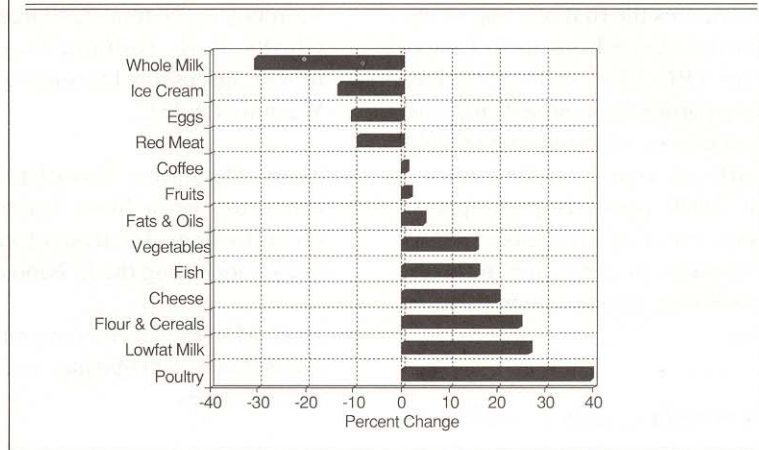
Consumers in the United States continue to alter their diets. As they change the types of food products they eat, the food system must adjust to meet these desires. The figure at right shows some of the basic changes which are taking place in per capita consumption of selected food products. The percentage changes shown in the figure are for 1990 compared to 1983.

Consumers have reduced consumption of products they consider to be high in saturated fats or cholesterol, such as whole milk, ice cream, eggs, and red meats. One exception to the reduction of saturated fats is cheese, where consumption has risen about 20%, presumably because of our increased taste for pizza. Alternatively, consumers have increased consumption of vegetables, fish and seafood products, grains, lowfat milk, and poultry. Increases are especially noted in consumption of fresh products such as fresh fruits and vegetables.

These changes have important implications for the entire food system, from farmers to grocery store managers. Farmers must grow the type of raw food products which processors can convert to the final food products consumers

desire. Participants in the food system who can meet these needs stand a greater chance of financial reward, while those who do not, stand a greater chance of receiving low economic returns over time.

Figure 1. Percentage Change in Per Capita Food Consumption 1990 Versus 1983



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Department of Agricultural Economics
 Chris Hurt
 1145 Krannert Building, Room 575
 West Lafayette, IN 47907-1145