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Economics of tile drainage

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2009 Farm and Rural Life Poll: Value-added agriculture, continued from page 3*

and had been farming for 39 years. Fifty percent of farmers reported that farm income made up more than half of their overall 2008 household income, and an additional 20 percent earned between 26 and 50 percent of their household income from farming. Copies of this or any other year's reports are available from your county Extension office, the Extension Online Store (www.extension.iastate.edu/store), Extension Sociology (www.soc.iastate.edu/extension/farmpoll.html), or from the authors.

Table 1. Value-added agricultural businesses

	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
	—Percentage—				
Many farmers would rather take an off-farm job than start a value-added enterprise	0	5	25	63	7
Many farmers just don't want to start something new	1	9	23	62	5
Markets for products other than unprocessed major commodities are limited in my area	0	7	27	58	8
Demand for alternative agricultural products is uncertain	0	7	32	57	5
Many farmers would feel uncomfortable trying to market agricultural products directly to customers	0	10	30	56	4
Many farmers don't have sufficient business development experience to start a value-added business	1	11	30	52	6
Start-up costs for value-added businesses are too high for most farmers	0	7	41	47	5
Farmers are not aware of opportunities to start value-added businesses	1	9	40	47	3
Farmers are too busy with their farm operations to get involved in value-added businesses	0	13	36	45	6
By providing a safety net for farmers, commodity programs discourage participation in value-added businesses	0	13	47	36	4
Banks are reluctant to provide financing for non-traditional agricultural businesses	0	7	62	27	4

**Reprinted with permission from the Iowa Farm and Rural Life Poll, 2009 Summary Report, PM 2093. Renea Miller provided valuable layout assistance to the questionnaire and this report. The Iowa Department of Land Stewardship, Division of Statistics, assisted in the data collection.*

Economics of tile drainage

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There are more than six million acres of cropland in Iowa where wetness limits productivity. Slightly more than half of the 375 different soils series mapped in Iowa have problems with excess water. The drainage of farmland is obviously important for improving the productivity of Iowa agriculture. Based on the large number of acres susceptible to excessive wetness and the yield response from removing this wetness, farmers and landowners are becoming increasingly interested in drainage.

The two major methods of farmland drainage are surface drainage where standing water is removed using surface ditches and subsurface drainage where excess water is removed through a system of underground drainage tiles. This article and the associated *AgDM Information File C2-90* deal only with subsurface tile drainage.

The major soil association areas of Iowa are shown in Figure 1. Although artificial drainage can be utilized

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anywhere in the state, it is most prevalent in the "prairie-pothole" (Des Moines Lobe) region of the Clarion-Nicollet-Webster soil association of central and northern Iowa.

Designing a subsurface drainage system[1/]

The purpose of subsurface drainage is to lower the water table in the soil. The water table is the level at which the soil is entirely saturated with water. The excess water must be removed to a level below the ground surface where it will not interfere with plant root growth and development. Root growth requires air to be present in the soil. Both water and air need to be present in the spaces between the soil particles, often in equal proportions. If water fills all of these spaces (saturated), there is no room for air.

Tile drainage should be designed so the water table between tile lines can be lowered within 24 hours after a rain to a level that will not cause crop injury. Generally, most field crops are not injured if the water table is lowered to at least six inches below the ground surface in the first 24 hours after a rain. During the second day after a rain the water table should be lowered to approximately one foot and on the third day to 1.5 feet below the ground surface.

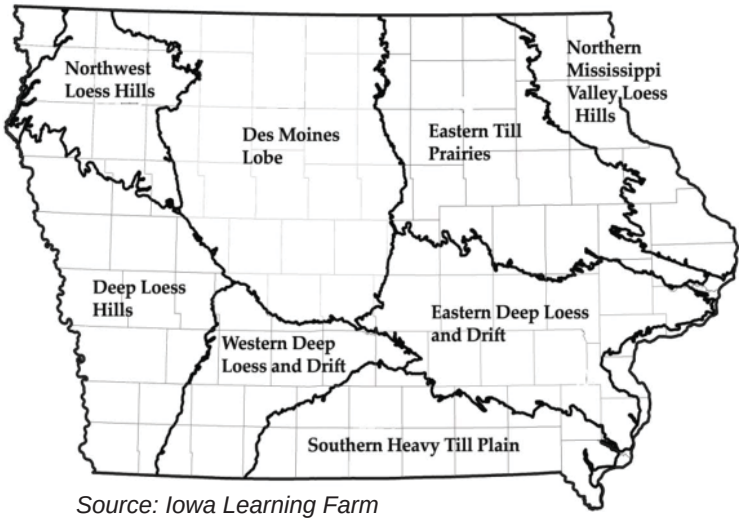
Investment analysis

The major reason for installing subsurface drainage is to improve the productivity of the farmland. Higher yields translate into more returns. This is especially true in recent years due to higher grain prices. So the investment decision is based on whether the higher crop returns will justify the investment in subsurface drainage. A secondary benefit is that fields will dry out quicker, allowing planting and harvesting to be completed earlier in the spring and fall. It also provides a larger window of time for a farmer to plant and harvest the crop allowing it to be done in a more efficient manner in terms of time and money. This is especially advantageous for farmers who have large acreages to cover.

Specific advantages of tile drainage are:

1. More consistent yields
   - Allows for more efficient use of resources
   - Reduces financial risk
2. Earlier and more timely planting
3. Improved harvesting conditions
4. Less wear and tear on equipment

Figure 1. Major soil association areas of Iowa.



Source: Iowa Learning Farm

5. Less power required for field operations
6. Better plant stand
7. Less plant stress
8. Fewer plant diseases
9. Less soil compaction

Another major advantage of tile drainage is the increase in sale value of the land. If the land will be sold in the future, the advantages listed above will be capitalized into the value of the land.

Subsurface drainage is a long-term investment. The investment is made up-front but the benefits are spread over many future years. So the investment decision should be made with the time-lag in mind.

The most difficult part of computing a tile investment analysis is estimating the yield response from the improved drainage. The size of the expected yield improvement dramatically impacts the economic feasibility of installing tile drainage, as shown in the example below.

Example:
A 10 bushel per acre yield response from corn and a 4 bushel per acre yield response from soybeans will provide an average annual return of $35 for corn at a price of $3.50 ($3.50 x 10 bu. = $35) and $36 for soybeans at a price of $9 ($9 x 4 bu. = $36). If the yield responses are 20 bushels for corn and 8 bushels for soybeans, the returns are double.

There are additional annual costs associated with these higher yield levels. For example, more fertilizer may

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be required to support these higher yields. Also, more hauling, drying and storage is required. In addition, there may be costs associated with the maintenance of the drainage system. So these additional costs need to be deducted from the returns listed above to compute a "net" return per year from installing drainage.

Estimating future returns

In the section above, we assume that the annual income stream will stay constant throughout the entire life of the tile. However, this may not be the case. Corn and soybean yields have increased over recent decades. Corn yields have increased by 2.4 percent and soybean yields by 1.8 percent per year since 1980. Most experts expect this trend to continue, if not increase. The impact of trend yield increases over the life of the tile drainage can be substantial. The yield response to tile drainage can be estimated by comparing the area to be drained to portions of the field with similar soil types that are already adequately drained or don't need drainage.

Information File C2-90, **Understanding the Economics of Tile Drainage,** provides more detail on analyzing the current and future returns from tiled farmland. A *Decision Tool* is also available for estimating the returns to tiled land for a landowner and/or tenant.

Additional information available on the drainage of Iowa farmland

Iowa Drainage Guide (a $25 purchase) includes 1) Iowa drainage laws, 2) drainage guidelines for Iowa soils, 3) subsurface drainage, 4) surface drainage, 5) open channels, 6) pump drainage. www.extension.iastate.edu/store/ItemDetail.aspx?ProductID=6064&SeriesCode=&CategoryID=&Keyword=SR%2013

Iowa Drainage Law Manual www.ctre.iastate.edu/pubs/drainage_law/index.htm

[1/] Iowa Drainage Guide, Iowa State University Extension, Special Report 13, revised June 2008.

Updates, continued from page 1

Internet Updates

The following updates have been added on www.extension.iastate.edu/agdm.

Grain Storage Alternatives: An Economic Comparison -- A2-35 (7 pages)

Understanding the Economics of Tiling -- C2-90 (7 pages)

Building Your Brand with Brand Line Extensions -- C5-52 (2 pages)

Brand Leveraging -- C5-53 (2 pages)

Decision Tools and Current Profitability

The following tools have been added or updated on www.extension.iastate.edu/agdm.

Hay Storage Cost Comparison -- A1-15

Farmland Tile Drainage Investment -- C2-90

Season Average Price Calculator -- A2-15

Corn Profitability -- A1-85

Soybean Profitability -- A1-86

Ethanol Profitability -- D1-10

Biodiesel Profitability -- D1-15

Returns for Farrow-to-Finish -- B1-30

Returns for Weaned Pigs -- B1-33

Returns for Steer Calves -- B1-35

Returns for Yearling Steers -- B1-35