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## Evaluating a Subsurface Drainage Project and Its Alternatives

Brad Carlson, Extension Educator, and Gary Sands, Professor & Extension Engineer,  
University of Minnesota Extension

The use of artificial drainage for agricultural production dates back centuries. Over the last hundred years there have been several periods of increased drainage activity attributable to many factors. Most recently, improved technology for the installation of subsurface drain, coupled with the ability to evaluate yield improvements through the use of yield monitoring equipment, have significantly improved the economics of artificial drainage for many soils. Despite these improvements, drainage still represents a significant financial investment for any farm. If one considers the potential environmental impacts of agricultural drainage (changes in stream flow, nitrate loss to surface water, wildlife habitat loss), the decision is not as straight forward as one would believe. It is for these reasons that land owners should undergo a thorough and thoughtful evaluation of a drainage project before proceeding.



Advances in technology for the installation of subsurface drainage had significantly reduced its cost over the past two decades.

### THE FIRST STEP

The benefits of agricultural subsurface drainage (a.k.a. “tile” drainage) include: reduced crop stress, prevention of stand loss, better utilization of available nutrients because of more extensive crop roots, reduced soil compaction, and the ability to perform field activities (particularly planting) in a timely fashion due to soil trafficability. All of these benefits result in higher yields, and therefore higher income for a crop that already has a fixed input cost. Before planning a drainage project, the farmer should have an idea of what he or she thinks this improvement will mean to the bottom line. Acknowledging that each year is different with respect to climate, the farmer should consider improved profitability for wet years and dry years and consider the likelihood of each over a ten year period.

Every farmer that has done a tiling project knows what the installation cost is on a per foot basis. In addition to this basic cost, there are costs associated with outletting the water. Some of these costs may include: the installation of a new tile main, engineering and design costs, legal fees, easements and permitting, pumping and/or lift stations, and repairs and other improvements to an existing outlet. It is important that the project cost estimates include all these factors. In addition, there may be unwanted environmental costs associated with agricultural drainage, such as increased field losses of nitrate-nitrogen, or increased pressure on downstream drainage infrastructure. Although these environmental effects are difficult to quantify on a dollar basis, they do represent real costs to the public. It is important to

note that some of these costs can be minimized with properly designed systems.

When the increased income versus the project costs are considered over a 15 - 30 year period one can determine the return on investment. This is an important first step, but not the final evaluation.



Differences in crop yields between areas with adequate subsurface drainage and areas with poor subsurface drainage allow for a simple analysis of the return on investment for a drainage project.

### “BIG PICTURE” CONSIDERATIONS

Every farmer that is considering a drainage project should make a visit to their county Natural Resources Conservation Service (NRCS) and Soil and Water Conservation District (SWCD) office early in the planning process. Staff from these agencies will review the project to determine if any wetlands are affected. If you proceed with a drainage project that removes an existing wetland that is not considered to have been drained prior to 1985 you could put your eligibility for USDA farm programs at risk. In addition, violation of the state Wetland Conservation Act (WCA) also requires a mitigation plan before proceeding. Violation of “Swamp Buster” and/or mitigation required for state WCA compliance, could make a small project very expensive in the long run.

The “Swamp Buster” provisions of the farm bill do allow for some drainage of wetlands provided that the loss is mitigated with the

creation or restoration of another wetland. The state WCA has similar provisions. If you choose to follow this route you obviously need to consider this cost as part of the drainage project also.



Violation of Swamp Buster or state WCA by draining defined wetlands could end up costing tens of thousands of dollars in the long run due to mitigation requirements, or ineligibility to participate in federal farm programs.

If you intend to connect to an outlet that is part of the public drainage system you should also visit with your county ditch inspector. In Minnesota the costs of the public drainage systems are shared by the land owners receiving benefits from the specific ditch or tile main. If you are assigned no benefits (meaning that you do not share in the cost of the system) you do not have the right to connect a drainage project to the system.

A final consideration that should be made in a big picture sense is whether existing tile mains and ditches have the capacity to remove the new water in a timely fashion. Tile laterals installed into mains that are already at capacity may have limited effectiveness, and are unlikely to achieve the drainage coefficient (the amount of water that the system can drain in a 24 hour period) that the system is designed for. You should specifically investigate drainage easements that are in place and also whether those downstream currently have flooding problems due to water from existing drainage. Attention to these matters will ensure that a new system works as designed,

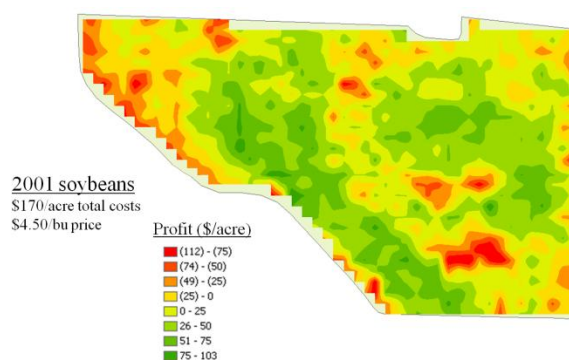
and in addition, will help avoid lawsuits and maintain friendly relations with your neighbors.



The costs of outletting water, such as improvements to tile mains or pumped outlets can significantly increase the cost of a project.

### DETAILED PROFITABILITY ANALYSIS

The use of precision ag data has allowed for some creative analysis regarding inputs, yields, and economics on a site specific basis. Increased crop prices over the past several years have been matched with greatly increased input costs, a producer should know their input cost on a per-acre basis. It is not always possible to determine exactly what price you will receive for your crop, but most farmers have either an estimate or a target price. From these two figures you can convert a yield map into a profit map. Based on this profit map you can estimate the effects of a drainage project. It is likely that the benefits on one soil type versus another will not be the same. If you consider the potential effectiveness of the project on one part of the landscape versus another you may find that while increases in yield are projected, they might not exceed the breakeven point, or may be highly variable from one year to the next. It is for this reason that many agricultural economists have long advised that farming marginal land is a bad practice, and many farmers have found that these acres consume time and resources that could be devoted to more profitable parts of the farm.



Converting a yield map to a profit map is a useful tool for the economic analysis of a subsurface drainage project.

### CONSIDERING ALTERNATIVES TO DRAINAGE

The simplest evaluation you can make regarding alternatives to drainage is whether it is worth more to you drained, or to someone else undrained. There are many options to consider, some of which may be quite financially lucrative, or fit well with your personal objectives and/or philosophies.

The first overarching question is, “do you own the land or is it rented?” If the land is rented, you will obviously need to involve the land owner in decision making. Some land owners lack the ability to proceed with alternative options for various reasons, so you may need to be involved with the process.

If you own the land, another consideration is whether you wish to continue to own the land. Sale of the property so that the money can be reinvested in other land is always an option. In addition, you may find some creative solutions available to you locally that could be attractive. Specifically, local sportsman’s groups may have project funds, but other groups or individuals may also be looking to work with wetland issues. Staff at your county SWCD will usually know if there are any options like these.

The majority of income-producing alternatives for the property involve the restoration of a wetland on the site. There are many programs at your disposal for proceeding with a wetland restoration. One major difference between many of these options is the length of time which you are committing to leaving the new wetland in

place. There are several parts of the USDA Conservation Reserve Program (CRP) which may cost-share the restoration and require only a 10 or 15 year agreement, but these options do not pay as well as longer term or perpetual agreements. Some of the long-term or permanent programs, such as US Fish and Wildlife Service easements, may pay as much as the value of the land.



Prior Converted wetlands on the edges of farmed areas are excellent candidates for restoration projects.

Another popular option in Minnesota has been to enter into the Wetland Mitigation Credit Bank administered by the Board of Soil and Water Resources (BSWR). The state WCA requires that those that drain wetlands for development, road building or other purposes restore an equal or larger amount of wetlands in exchange. Land owners that obtain prior approval, and then restore a wetland with no public financial assistance, can register their wetlands into the bank and sell their “credits” on the open market. Some of these credits can be sold for significantly more than the actual value of the land (in some cases 2 - 4 times larger).

There are many other program options administered by the various units of government already mentioned (and maybe some others), and local sportsmen’s groups may even have additional funds to put toward projects. Sorting out all of these options may seem confusing and time consuming, but a visit to your county SWCD is a good place to start. They are not the administrators of most of these programs,

but they usually will counsel you toward your most desirable options, and then provide the appropriate contact information. Should you choose to enroll the property in the Wetland Mitigation Credit Bank they can ensure that you follow the necessary criteria to make the project eligible.

One final note to remember is that in most cases the land owner is not required to retain ownership of the wetland once the program obligations have been fulfilled, meaning that the property can then be sold, further increasing income from the project.

### IN SUMMARY

Conducting an artificial drainage project may seem like a straight-forward economic analysis, but this is often not the case. Farmers and land owners considering a project should consider all costs and benefits, as well as the probable efficacy of the project. In addition to artificial drainage, many other options may exist; these should be investigated as to whether they are applicable for the site. After the alternatives to drainage are considered an overall evaluation can be made as to which direction a project should go. Regardless of which course you choose, you should be in contact with your local NRCS, SWCD and Ditch Inspector to ensure that you are in compliance with the rules and regulations.

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### For more information:

On agricultural Drainage Issues:  
[www.drainageoutlet.umn.edu](http://www.drainageoutlet.umn.edu)

For your local NRCS office: [www.mn.nrcs.usda.gov](http://www.mn.nrcs.usda.gov)

To find your county SWCD: [www.maswcd.org](http://www.maswcd.org)