PRECIPITATION AND RUNOFF FROM TWO WATERSHEDS

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Introduction

Soil conservation and nutrient management have taken center stage as the major management practices that producers and consultants need to adopt to reduce agricultural non-point pollution. For some producers the implementation of these recommendations will require only minor changes in their farming systems, while others will need to make major changes in practices ranging from feed management, manure storage and handling, nutrient applications, and tillage to potentially their entire cropping system. Two key questions must be considered as we move forward on the requirement that producers adopt these systems:

- Will the adoption of nutrient management plans and soil conservation plans to tolerable soil loss levels achieve the state and federal water quality goals?
- How much money and time will it take before society knows if the adoption of these practices will achieve the water quality goals?

The UW – Discovery Farms Program is working with state agencies, producers and policy makers to determine if the adoption of these management practices will achieve our water quality goals. We are also working with producers to identify how different farming systems affect our environment and how the entire farming system can be changed to reduce sources of non-point source pollution.

To encourage the adoption of best management practices (BMPs), both state and federal governments have established cost share programs that provide payments to producers who implement these practices. The practices have been identified through research on experimental farms and watersheds throughout the country. This research has concluded that a specific practice can reduce nutrient or sediment loss under specific field and weather conditions. But, the questions posed by many farmers are:

- Is my farming system contributing a detrimental load of sediment and nutrients to the waters of our state,
- How will the adoption of this BMP affect my farms profitability,
- Can I adopt these practices without making a major investment in equipment, labor or management, and
- Will the adoption of these BMPs make any difference in the water quality of our lakes and streams?

When we started the Discovery Farms Program we knew farmers felt strongly that their farming system was having little negative affect on the environment. This has been proven many times through on-farm visits and group meetings. What we didn't know going into this program was how many producers feel that their farming system was not losing soil or nutrients; and that the concerns about non-point source pollution was caused by their neighbors and others who were not using the same farming system. This presents a tremendous challenge to university and agency personnel in that if producers don't believe they are causing any of the non-point source pollution, then cost sharing must be at a high enough level to encourage changes strictly from an economic perspective.

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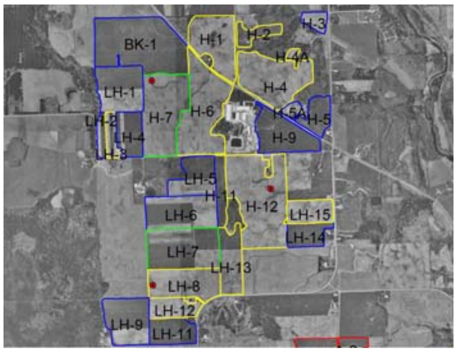
Determining Nutrient and Sediment Losses

An alternative to developing excessively high cost share programs is to work with producers at a field and watershed scale to determine how their farming system is affecting water quality. The following is first year of data from two operations in Wisconsin. These operations have very different farming systems and soils, but both have tremendously high levels of management.



Farm A

Farm B

Table 1. Soil Information on Farms A & B

	Crop 2004	***Soil Texture***	***Slope %***	***OM %***	***Bray P mg/kg***	***Cont. Area acre***
Farm A	alfalfa	silt loam	4	3.5	66	22.3
Farm A	alfalfa	silt loam	4	2.8	28	22.8
Farm A	alfalfa	silt loam	4	2.9	48	13.8
Farm B	corn	silt loam	6	3.5	63	16.9
Farm B	corn	silt loam	6	3.5	63	17.2
Farm B	soybeans	silt loam	6	n/a	n/a	39.5

As indicated in Table 1, our six watersheds are on silt loam soils (though Farm A’s soil has a higher clay content) with slopes ranging from 4 - 6 percent. Farm A has all of the watersheds in hay (field H – 7 was seeded in 2003), while Farm B has two basins in corn and the other in soybeans. Each of these operations surfaced applied manure to these basins either in the fall or during the 2004 crop season.

As indicated in Figure 1 (below), both farms received significant rainfall from November of 2003 through July of 2004. Farm A had on average 8% rainfall runoff from the fields, while Farm B had on average 4% rainfall runoff. Figure 2 provides a closer examination of the number of runoff events. As indicated, half of the rainfall events on Farm A produced runoff, while 20% of the rainfall events on Farm B produced runoff events (even though Farm B had slopes greater than Farm A). Closer examination of the data reveals that of the seven runoff events on Farm B, one occurred in March, three in May and three in June. Figures 3 and 4 provide a summary of the rainfall and runoff that occurred on Farm B during the months of May and June. As indicated in the graphs, each runoff event was preceded by significant rainfall.

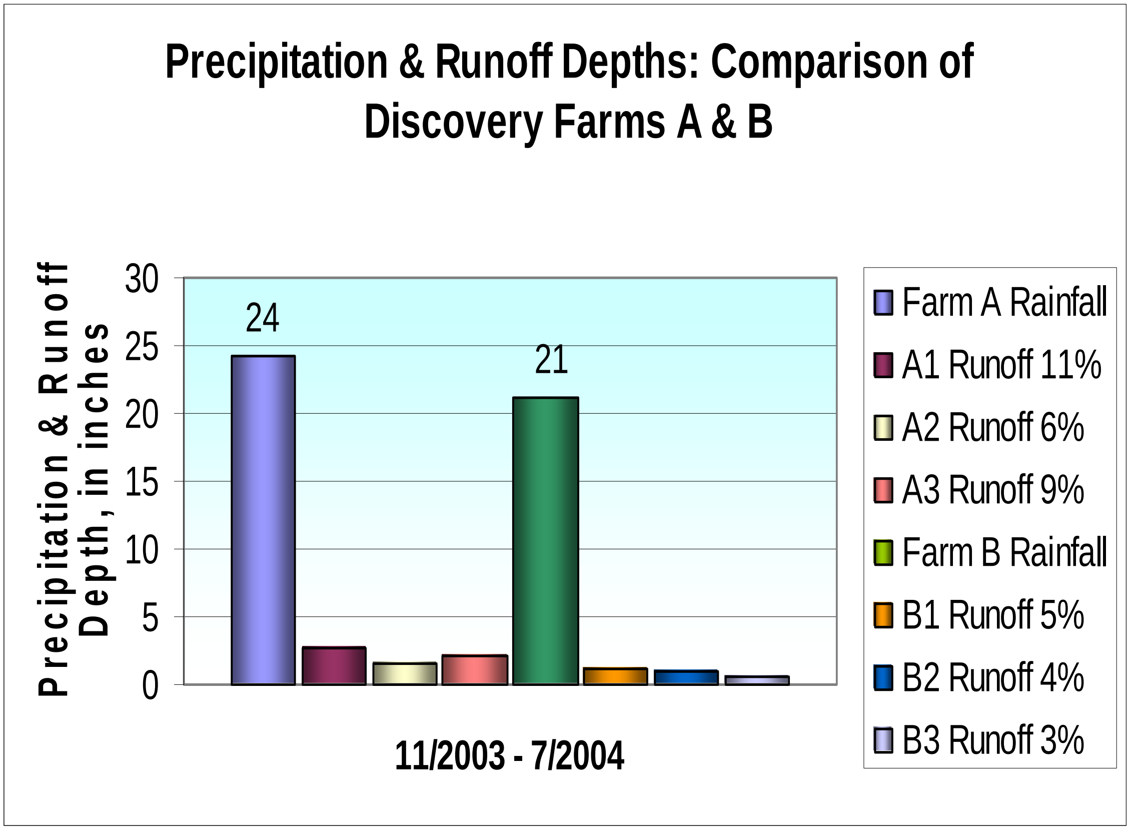


Figure 1 Precipitation and runoff events

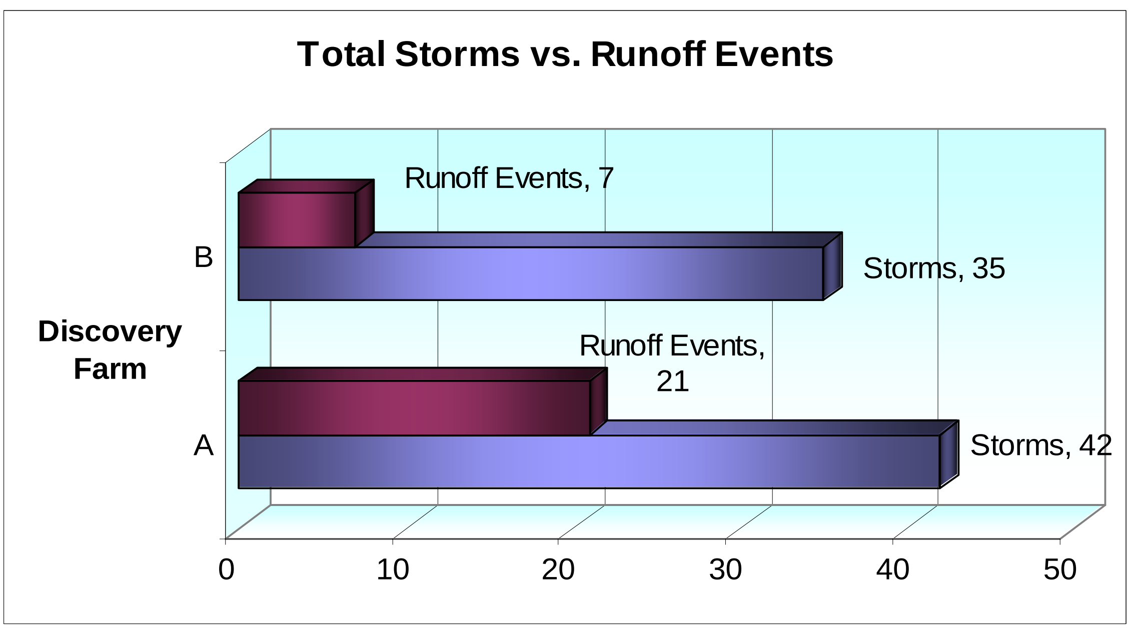


Figure 2 Total Storms and Runoff Events

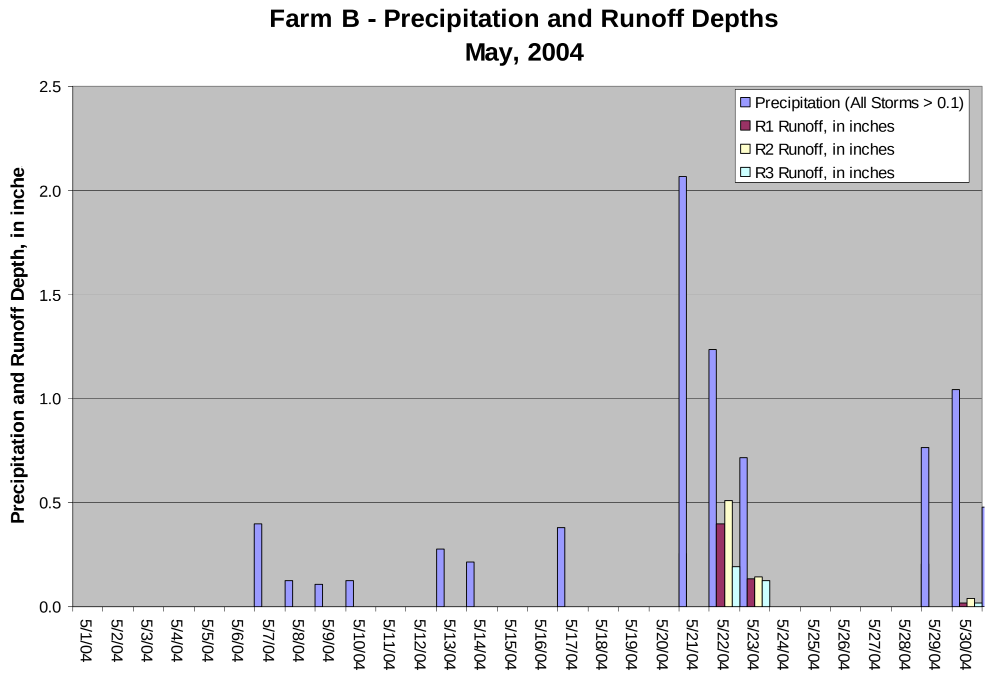


Figure 3 May Rainfall versus Runoff

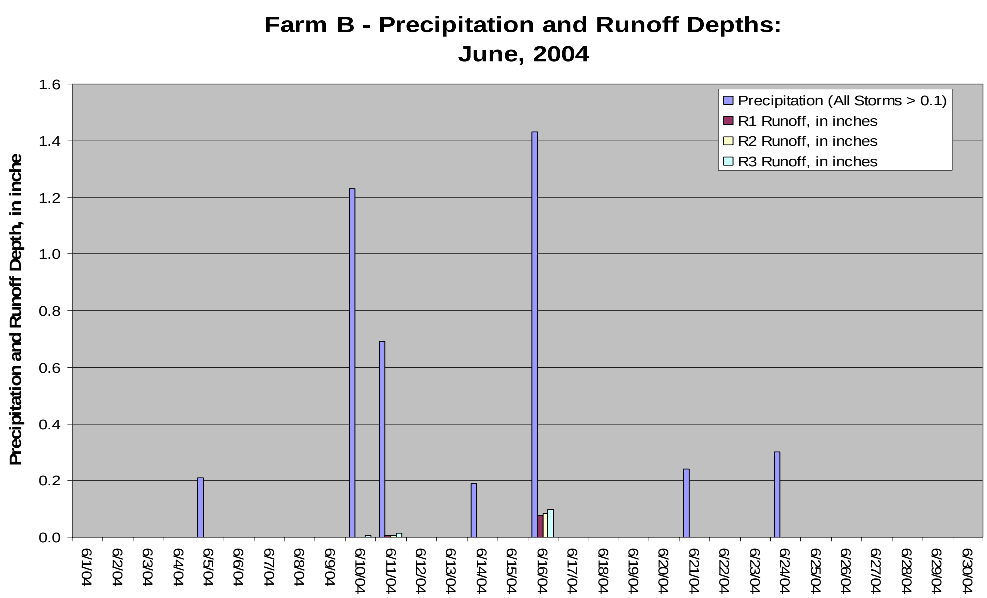


Figure 4 June Rainfall versus Runoff

As indicated in the figures above, these two farming systems produce significant differences in volume of runoff compared to rainfall. This may be due to soil types as well as farming practices. Farm A uses a minimum tillage system to plant crops and incorporate their manure. Farm B uses a direct plant system and does not use tillage throughout the rotation.

Conclusions

It is much too early to draw conclusions from these data, but the assertion that no-till farming systems reduce nutrient and soil loss can be inferred from these data. It is clear that the direct plant farming system decreases runoff events. However, just because there were fewer events, does this mean that these events produced less nutrient and sediment losses? The presentation at this conference will evaluate not only the runoff events, but also the loss of nutrients and sediments throughout the cropping season.

This project is providing valuable information in terms of runoff events, nutrient concentration and loading rates under differing farming systems. It has also identified other research needs including:

- Better understanding of the water budget for these fields including the water leaving each field through tile drainage systems,
- Would incorporation of manure decrease the nutrient loading rates,
- Would incorporation of manure increase sediment losses and therefore increase nutrient losses,
- Is it necessary for either of these producers to adopt any best management practices or are the nutrient and sediment losses from these farms at an acceptable level?