

## User Input MS Excel Tool

Partial Budget framework  
User input based on operation  
Tool assesses profitability and affordability (economic analysis and financial analysis)

Available to download from locations:

NRCS MO Soil Health Website:  
<http://www.nrcs.usda.gov/wps/portal/nrcs/main/mo/soils/health/>  
NRCS IL Soil Health Website:  
<http://www.nrcs.usda.gov/wps/portal/nrcs/main/il/soils/health/>

A photograph of a cow in a field. The cow's back is covered with stacks of US dollar bills, symbolizing the financial aspect of the partial budget framework.

## Partial Budget Framework

- Focus only on what changes (not looking at the entire enterprise budget)
- Focus on the costs and benefits realized by the producer
- Focus on the benefits that can be easily monetized

## Time horizon matters...



Short Term = immediate impact of adding cover crops to rotation

Long Term = Continued long term utilization of cover crops may lead to additional economic benefits over 10, 20, 30 years

## Short Term Variables

Costs	Benefits
Cover crop establishment and management	Direct Nutrient Credit
Yield decrease	Herbicide/insecticide/fungicide/ Input Reduction
	Yield Increase
	Erosion Reduction
	Grazing
	Baling
	Seed Production



## Establishment and Management Costs

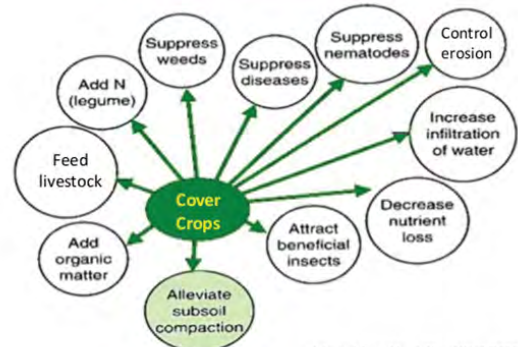
Seeding Rate (lb/ac) \* Seed Cost (\$/lb)  
 + Planting Cost (\$/ac)  
 + Termination Cost (\$/ac)  
 + Increased Management Cost (\$/ac)



The establishment and management costs associated with adding Cover Crops to a row crop system is an added cost of your crop budget.

Whether this is affordable/profitable depends on the benefits...

## CCs affect many agronomic factors simultaneously



Adapted from Magdoff and Weil (2004)

## Not all effects are positive



Adapted from Magdoff and Weil (2004)

## Yield Decrease Costs

Risk  
(allelopathy, poor termination, moisture competition, etc.)



As more research and trials utilizing cover crops becomes available these risks will continue to decrease.



Baseline yield (bu/ac) \* Cash Crop value (\$/bu) \* crop yield decrease (%)

## Short Term Variables

### Costs

Cover crop establishment and management

Yield decrease

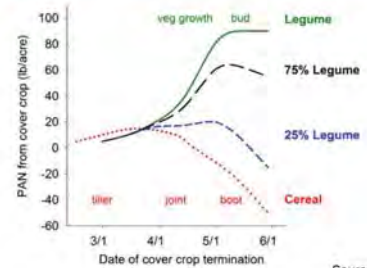


### Benefits

- Direct Nutrient Credit
- Herbicide/insecticide/fungicide/ Input Reduction
- Yield Increase
- Erosion Reduction
- Grazing
- Baling
- Seed Production

## Direct Nutrient Credit

### Cover Crop and Kill Date on Plant Available N



Source: D. Sullivan.

## Direct Nutrient Credit

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What about P & K?

Some cover crops may aid in making these nutrients more plant available (buckwheat).



## Direct Nutrient Credit

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Benefit calculation:

Value of N (\$/lb) \* reduction in purchased N  
+  
Value of P (\$/lb) \* reduction in purchased P  
+  
Value of K (\$/lb) \* reduction in purchased K

## Herbicide/insecticide/fungicide Input Reduction

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Some evidence of reduced herbicide use due to mulching effect of cover crop residues.



The improved diversity may have a beneficial impact by reducing fungicide and insecticide.

## Herbicide/insecticide/fungicide Input Reduction

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Benefit Calculation:

Herbicide Cost (\$/ac) \* Percent reduction  
+  
Insecticide Cost (\$/ac) \* Percent reduction  
+  
Fungicide Cost (\$/ac) \* Percent reduction

## Yield Increase

Cover crops may result in increased yields in the following cash crop.


Research shows this happening more consistently in soybeans than corn (especially in the short term).

Calculation:


$$\frac{\text{Erosion Value (\$/ac) * Cash Crop Yield (\$/bu) * Erosion Reduction (\%)}{\text{Erosion Value (\$/ac) * Erosion Reduction (\%)}}$$



## Erosion Reduction



Having a living, growing crop on the soil at all times results in reduced erosion.



The value of reducing soil erosion on farm may be captured in the value of lost fertility and/or the value of erosion repair.

## Erosion Reduction


Calculation:

**Lost Fertility Value** (for erosion where soil is leaving the farm): calculated based on the assumption that on average topsoil consists of 40 pounds of organic matter or 23.3 pounds of carbon. With an average carbon nitrogen ration of 10 to 1, each ton of soil eroded contains 2.32 pounds of nitrogen that would need to be replaced by the producer. The soil also contains 0.05 percent phosphorus, or one pound per ton of soil.

$$\text{Lost Fertility Value (\$/ton)} * \text{erosion reduction (tons/ac)}$$

**Erosion Repair:** machinery and labor costs (\\$/ac) for the field work needed to prepare the field for planting due to erosion within the field such as collection points, rills, cleaning out ditches, etc.

## Grazing



Integrating grazing and crop production, or interseeding cover crops into existing pasture to boost production

Extend grazing into winter  
As an alternative to hay feeding over winter, or increasing stocker returns.

## Grazing

Calculation:

Expected Daily gain (lb/head/day) \* value of gain (\$/lb) \* days of grazing \* stocking rate (head/ac)



Subtract any added infrastructure costs that may be needed (fence, watering facilities) if grazing cropland (\$/ac).

## Baling

Potential for harvesting spring cover crop growth as haylage.



Calculation:

Yield (ton/ac) \* forage value (\$/ton)

Subtract the baling costs (\$/ac)

## Seed Production

Demand for cover crop seed is high, so another option is to consider harvesting cover crop seed.

Timing may be an issue here for integrating into the existing crop rotation.

Calculation:

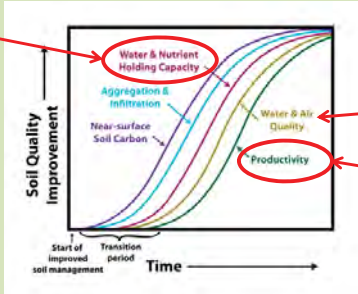
Seed Yield (lbs/ac) \* Seed value (\$/lb)

Subtract the seed harvesting cost (\$/ac)



## Long Term Benefits

Can capture economically



Difficult to quantify economically

??

Continued long term utilization of cover crops may lead to additional economic benefits over 10, 20, 30 years

## Long Term Benefits

Nutrient Holding Capacity/ Overall Soil Fertility Improvement:



Based on the long term improvements to the physical and biological properties of soil.

The science is not completely there yet, but some evidence has indicated that for each 1% increase in SOM yields plant available N, P, K, Sulfur and Carbon. (Future carbon markets?)

## Long Term Benefits

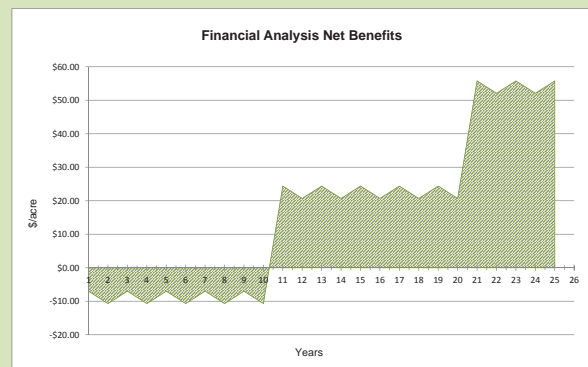
Water Holding Capacity Benefit



Every 1% increase in SOM the soil holds an additional 1 acre inch of water.

Economic benefit = reduced irrigation costs for irrigated land; reduced risk of yield reductions due to drought stress for dryland systems.

Example long term financial analysis output from the tool: illustrates the potential financial impact over a long term time horizon.



## Take Home Messages...

- Assessing the costs and benefits of adding cover crops into a farming operation is an important part of the decision-making process.
- The costs and benefits are highly variable by operation and cover crops selected
- Keep cover crop seed and planting cost as low as possible to meet your objectives

- Good management and a long term commitment to making cover crops work is the key to maximizing the benefits of cover crops
- Utilizing cover crops for additional benefits such as grazing improves the short term economics
- Continued use of cover crops over the long term (greater than 10 years) results in added benefits to the producer through overall soil fertility and improved water storage and infiltration (aka: soil health)

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