

COVER CROP ECONOMICS



COVER CROP TRAINING MODULE

TECHNICAL BULLETIN

Peer-reviewed research findings and practical strategies for advancing sustainable agriculture systems



Cereal rye is the most widely planted cover crop in the United States, being used on several million acres for erosion control, weed suppression and soil improvement. Photo by Edwin Ramsberg

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Available at:
www.sare.org/cover-crop-economics, or order free hard copies at (301) 779-1007.

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Cover Crop Economics Opportunities to Improve Your Bottom Line in Row Crops

When it comes to making the big decisions about managing a farm, whether it's to grow a new crop, buy an expensive piece of equipment or upgrade infrastructure, farmers are business people first. If the idea doesn't work out on paper, either by cutting costs or raising revenue, then it likely won't happen.

With the decision to adopt cover crops, a conservation practice that is becoming increasingly popular throughout the country, the economic picture can admittedly be hard to decipher at first. This is because a simple, one-year budget analysis of cover crops, one that just compares the cost of seed and seeding to the impact on the next crop yield, may indeed show a loss.

Yet most farmers who have long-term experience with cover crops and who carefully keep their books have discovered that cover crops do in fact pay. These farmers usually look at cover crops from the broad, holistic standpoint of how they will improve the efficiency and resiliency of the entire farm over time.

"Look at cover crops as an investment rather than a cost," advises Justin Zahradka, who farms 900 acres in North Dakota and has been planting cover crops since 2011. Cover crops allow Zahradka to extend the grazing season for his livestock, grow his soil's organic matter and maintain more consistent yields in wet or dry years.

Or, as he puts it, cover crops help him "be more productive on each acre." (Zahradka's farm is profiled later in this bulletin.)

Economics of Cover Crops

- Examines annual as well as long term financial impacts
- Based on data from 5 years of SARE/CTIC National Cover Crop Survey plus other data
- Get more details in the SARE Cover Crop Economics bulletin available online or as free print copies.

www.sare.org/covercrops

Rulon family farm, Indiana

Two generations and cousins farm together on 6000 acres, long-term no-tillers started using cover crops in 2006

Some key observations:

- After combining cover crops with no-till, soil OM rose 1% or more on some fields over a decade
- Working with Purdue Univ., reduced N leaching by 50%
- For corn, cut N by 35 lbs./ac., P by 20 lbs./ac., and K by 30 lbs./ac.
- Consistently get higher yields than county average, about 7 bushel/ac. for corn and 2 bushel/ac. for beans



Justin Zahradka, North Dakota
Added cover crops and
converted to no-till starting as
FFA project; now farms 900 acres
with 160 cow-calf head

Some key observations:

- Focuses on grazing multi-species mixes
- Uses covers for grazing in rotation with row crops
- Has been raising soil OM by 0.1% a year and increased profit from grazing covers
- Gets by with less labor by letting cows feed themselves on covers rather than hay



Ralph “Junior” Upton, Illinois
Produces corn and soybeans on
1800 acres, long-time no-tiller

Some key observations:

- Likes a three-way mix of cereal rye, annual ryegrass and hairy vetch drilled after both corn and soybeans; the annual ryegrass helps break up fragipan in his fields, vetch adds to weed control and contributes some nitrogen
- Was impressed to find 5 inch tall annual ryegrass had roots 48 inches deep through his fragipan; now drought is less of a concern
- Now uses less fertilizer and has better yields and weed control



What are the costs with cover crops?

	Median cost per acre
Seed (range \$10-40/ac.)	\$25
Planting the seed (range \$0-18/ac.)	\$12
Termination (range \$0-10/ac.)	\$0
Total	\$37

Average cost for seed and seeding the cover crop: \$37/acre, based on 2012-13 SARE/CTIC/ASTA cover crop survey data.

Can seeding be done less expensively?

Species selection

Seeding rate

Seeding method

Seed source





Cover Crop Seeding Costs
Assuming \$37 per acre
but savings are possible

What are the returns with cover crops?

Higher yields?

Lower costs?

Greater resiliency?



Yield Increases Following Cover Crops

Crop Year	Corn	Soybeans
2012	9.6%	11.6%
2013	3.1%	4.3%
2014	2.1%	4.2%
2015	1.9%	2.8%
2016	1.3%	3.8%
2019	2.0%	5.0%

Data provided from hundreds of farmers annually in the SARE/CTIC national cover crop survey. Yield differences are statistically significant each year.

National Survey* Indicated Yields Gradually Increase the Longer Cover Crops are Used



*SARE/CTIC National Cover Crop Survey

Cover Crop Yield Impact Over Time

	One Year	Three Years	Five Years
Corn	0.52%	1.76%	3.00%
Soybeans	2.12%	3.54%	4.96%

Figures shown are an average of yields based on regression analysis from the 2015 and 2016 growing seasons, with yield data obtained from about 500 farmers each year through the SARE/CTIC National Cover Crop Survey.

Baseline Returns on Cover Cropping

	One Year	Three Years	Five Years
Corn	-\$31.36	\$1.42	\$17.90
Soybeans	-\$23.44	\$0.42	\$10.18

Above figures assume average weather and average management conditions

Details on Baseline Returns

For soybean

- Assuming average of \$9.00 per bushel and 60 bushels per acre

For corn

- Assuming average of \$3.50 per bushel and 200 bushels per acre

• For both crops

- Average savings of \$2/acre for reduced expenses in erosion repair
- Beginning year 3, potential \$10/acre savings in weed control costs

Details on Baseline Fertilizer Assumptions

For soybean

- No change in fertilizer in year one
- Only change in years 3 and 5 is for phosphorous (P)
 - Average P savings of 15 lbs./acre in yr. 3 and 20 lbs./acre in yr. 5 @\$0.42/lb.

For corn

- No change in fertilizer in year one
- Assuming modest reduction in N and P needs as soil health builds
 - Average N savings of 15 lbs./acre in yr. 3 and 30 lbs./acre in yr. 5 @\$0.38/lb.
 - Average P savings of 20 lbs./acre in yr. 3 and 25 lbs./acre in yr. 5 @\$0.42/lb.

Baseline Returns on Cover Cropping

	One Year	Three Years	Five Years
Corn	-\$31.36	\$1.42	\$17.90
Soybeans	-\$23.44	\$0.42	\$10.18

Above figures assume average weather and average management conditions

Do We Invest Only in One Year Payoffs?



Lime application – Photo from SARE

Do we invest just for today
or also for tomorrow?



Credit: John Deere

How do particular management challenges or scenarios affect cover crop economic returns?



#1 Herbicide-Resistant Weeds



With extra herbicide savings of \$27/acre, cover crops pay off in year two for corn and year one for soybeans.

Details on Herbicide Assumptions

- In the 2016-17 SARE/CTIC National Cover Crop Survey, 59% of farmers reported having herbicide-resistant weeds on at least some of their fields
- If herbicide-resistant weeds are a severe problem, costs of control go up (and there may be yield loss and grain dockage)
- Often, one or two extra post-emerge herbicide applications are made and more expensive residual herbicides are used
- Report analysis used savings of \$27 per acre based on:
 - \$12/acre savings from one fewer post-emergence spray (assuming Roundup Powermax at \$4.50/acre plus \$7.50/acre application cost)
 - \$15/acre savings from less expensive residual herbicide(s)

#2 Compacted Soils



With tillage savings of \$15.30/acre from not subsoiling, cover crops pay off in year two for soybeans and breakeven in year two for corn

#3 Fertility Costs



Assuming field situation where cover crops can help with soil fertility, cover crops break even in year two for corn and pay off in year three for soybeans

Possible Extra Savings When Cover Crop Use is Focused on Nutrients, Such as Organic Production

For soybeans, extra \$7/acre savings

- Possible reduction of 10 lbs. P/acre @ \$0.42/lb.
- Possible reduction of 10 lbs. K/acre @ \$0.28/lb.

For corn, extra \$15.20/acre savings

- Assumes legumes used as cover crops and achieve adequate growth
- Extra 40 lbs. N/acre over baseline fertilizer assumption

#4 When Converting to No-till



Assuming savings of \$23.96/acre, cover crops pay off in year two for corn and break even in year one for soybeans

Details on Savings When Using Cover Crops While Converting to No-Till

Assuming normal yield dip that initially occurs when converting from conventional to no-till is avoided

- Cover crops may be helping with reduced compaction, better nutrient availability, improved rainfall infiltration, etc.

Savings from reduced tillage operations

- Eliminate fall chisel operation (\$11.22/acre) and two seedbed preparation passes, such as field cultivator (2 x \$6.37/acre)

#5 Grazing Cover Crops

Jim Isermann farm, Illinois – Photo credit: Progressive Forage



With extra return of \$49.23/acre from grazing, cover crops pay off in year one

Details on Projected Savings from Grazing Cover Crops

Based on hay replacement model developed by economist Alan Weber

Assumptions:

- Cereal rye generates 1500 lbs. dry matter/acre
- 50% of rye biomass is lost from hoof action & selective grazing
- 750 lbs./acre of rye replaces 1093 lbs./acre of hay
when 78% of hay is utilized and hay is 88% dry weight
- Hay is valued at \$80/ton
- Additional savings of \$5.50 per acre for reduced machinery, fuel, and labor costs from not hauling hay
- Portable electric fencing and water are available

#6 Cover Crop Incentives

NRCS EQIP Rates FY 2019

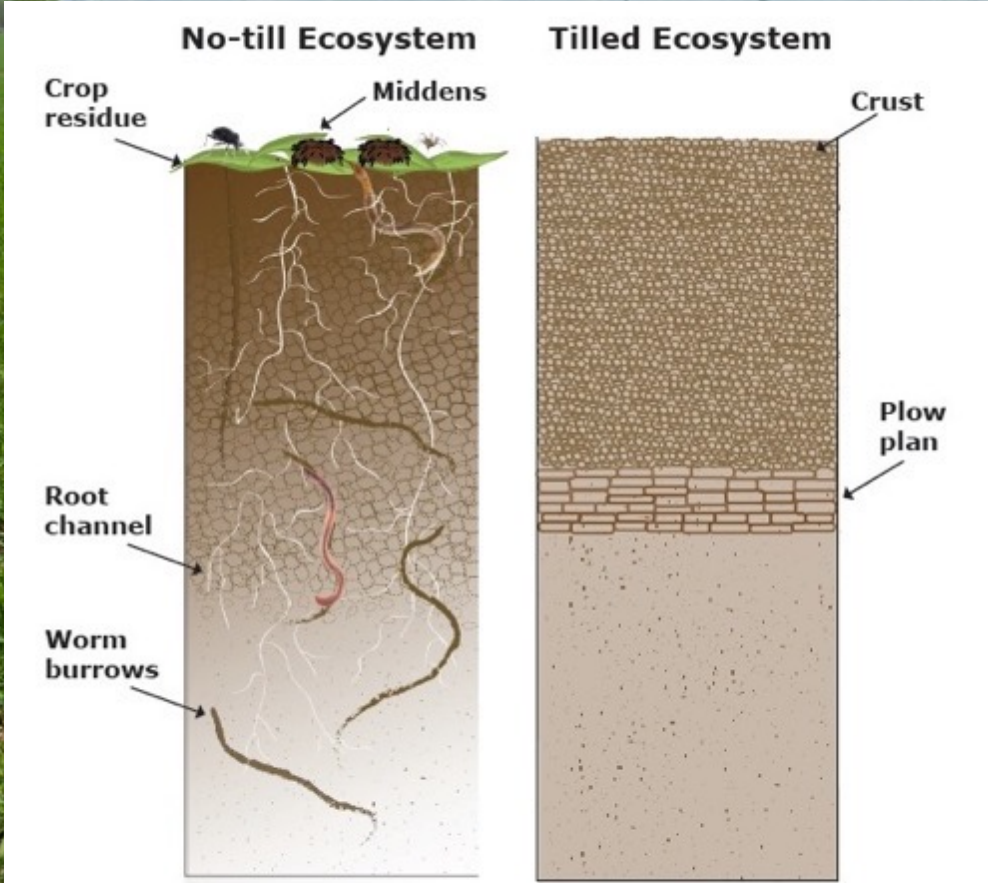
	Basic rate	Multi-species	Highest rate
Illinois	\$51	\$57	\$76
Iowa	\$34	\$38	\$56
Wisconsin	\$51	\$57	\$68
Georgia	\$50	\$56	\$60
Pennsylvania	\$53	\$60	\$79
Idaho	\$49	\$55	\$67
Minnesota	\$34	\$38	\$63
Montana	\$51	\$57	\$61

Where incentive payments are over \$32/acre, cover crops pay off in year one

#7 Managing Soil Moisture



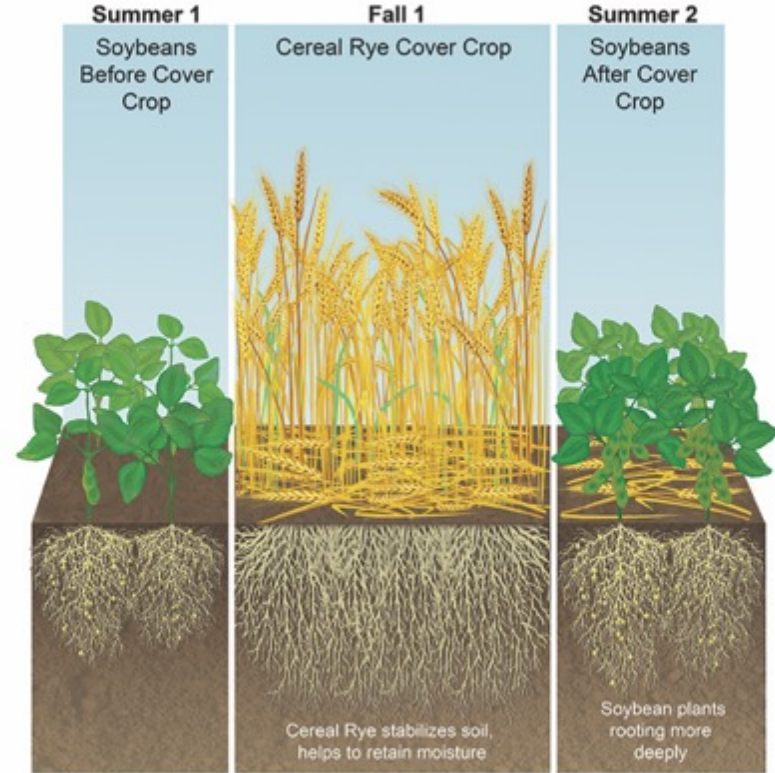




Cereal rye mulch layer in soybeans



Extension of Corn Root Surface Area through Mycorrhizal Fungi



With extra return of \$58/acre on corn and \$65/acre on soybeans, cover crops pay off in year one in a drought year

Cover Crop Benefits for Resiliency



Photo credit: Russ Jackson

“Planting green” - soybeans into standing rye



Photo credit – Dave Robinson

Three Key Aspects of Cover Crop Economics

1. Evaluating cover crop profitability is best done from a holistic perspective, looking at how to **gain efficiency** as part of soil health improvements with the overall cropping system.
2. Much like applying lime or buying equipment, in most cases farmers need to **use a multi-year timeline** to evaluate the return from cover crops.
3. One of the most-often cited economic benefits of cover crops by experienced users is their **impact on the resiliency** of the cropping system. As with federal crop insurance, the “premium” paid for planting cover crops will pay off big in some years, but not every year.

— BOTTOM LINE —
Value cover crops both for their immediate benefits and as an investment in the long-term success of the farm.



Ag Innovations Series

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COVER CROP ECONOMICS OPPORTUNITIES TO IMPROVE YOUR BOTTOM LINE IN ROW CROPS

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COVER CROP ECONOMICS OPPORTUNITIES TO IMPROVE YOUR BOTTOM LINE IN ROW CROPS

When it comes to making the big decisions about managing a farm, whether it's to grow a new crop, buy an expensive piece of equipment or upgrade infrastructure, farmers and business people fear if the idea doesn't work out on paper, either by cutting costs or raising revenues, then it likely won't happen.

With this decision to adopt cover crops, a common question that is often asked is: how long will it take to see the benefits? The economic picture can certainly be hard to decipher at first. These benefits can be seen in a number of ways, but the most common is the cost of seed and planting in the spring on the next crop cycle may be reduced. For example, if you have a cover crop that is planted in the fall, the soil is better protected from erosion and the cover crop will help to reduce the need for fertilizers. These benefits have been documented in a number of ways, but the most common is the cost of seed and planting in the spring on the next crop cycle may be reduced. For example, if you have a cover crop that is planted in the fall, the soil is better protected from erosion and the cover crop will help to reduce the need for fertilizers.

Look at cover crops as an investment rather than a cost," advised Justin Schabert, who farms 500 acres in North Dakota and has been planting cover crops since 2011. Cover crops allow Schabert to extend the grazing season for his livestock, give his soils organic matter and improve water conservation, which is vital to his crops.

So, in the end, a cover crop helps him "to have production on each acre," Schabert says. Agriculture.com is the publisher.

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