Cover Crop Roller Crimper

Definition:

Cover crop rolling is an advanced no-till technique. Typically, it involves flattening a high-biomass cover crop to produce a thick, uniform mat of mulch. A cash crop is then notilled into the mulch. The rolling process itself will kill the cover crop. This means burndown herbicides can be reduced or eliminated. Cover crop rolling has been used for decades on Millions of cropland acres in South America. It has also been used successfully by individual farmers and researchers in Iowa and the Midwest, but has yet to see widespread adoption in the U.S.

- USDA Natural Resource Conservation Service

Rye

Timing Termination

- Flag leaf
- Anthesis
- Early milk

Percent Kill

Chain Rolling in Brazil

The Cover Crop Roller Crimper

What is Roller-crimping?
Why is it relevant?

Erin Silva, University of Wisconsin Madison

Jeff Moyer, Rodale Institute
A little Perspective to Start

1983 row cultivation of corn

1993 No-till corn into alfalfa
The World’s Dead Zones
The Second Largest Dead Zone
The Mississippi Drains 41% of the US
How much responsibility falls on Ag?
Benefits
- Improves Soil
- Suppresses weeds
- Improves yields
- Reduces compaction
- Saves water
- Can make money!
Continued...

“The Chevron-pattern on the crimp roller prevents soil disturbance and reduces vibration in the tractor. The blunt edges snap the rye stem without cutting it.”

Photo by Jason Johnson, USDA-NRCS
Continued...

“The group of SE Iowa farmers crimp rolled cereal rye just after, or about 10 days after planting soybeans into the living grass. Many farmers also roll the cover crop and plant simultaneously.”

Photo by Jason Johnson, USDA-NRCS
Alternative Termination Methods

- Naturally
- Chemically
- Mechanically
90 lbs. N  0 lbs. N
Thank you

Levi Lyle
Roll-crimp Iowa
Keota, IA
www.rcimfg.com

Find us on Facebook
and listen to the Roller-crimp song.
The First Roller?

Built in 1900 by Best Manufacturing Co. for the Middle River Farming Co., Stockton, Calif. This tractor had wood cover drive wheels 19' 6" wide and 9" diameter. Total weight: 41 tons.

Title

• Developing Sustainable Roller Crimped Cover Crop Systems for No-Till Corn and Soybeans

• Churdan, Greene County, Iowa (15 miles N of Jefferson)

• Two-year Project
Hypotheses

1) If cereal rye can develop enough biomass, then after-crimping weed pressure will be minimal in a no-till vs conventional till system before soybeans.

2) If a bio-soil enhancer can promote increased microbial activity, then N uptake and nodule development will accelerate canopy formation, facilitate prolonged weed pressure control and improve pest resistance.

3) If a bio-soil enhancer can improve fall hairy vetch root formation, then winter hardiness will improve, along with subsequent after-crimping spring N mobilization before corn.
Trial design

• Here is the trial design of 8, 2.5ac plots on each farm with 4 replications of with or without the bio-soil enhancer:
Aphid and Cyst Resistant Seed Mix
Blue River Hybrids 19AR1 and 21C6

Total area = 20 acre
Methods

• Apply cereal rye 9/15/15 into standing corn
Two days

Four days
Nine days
38 days…right after harvest on 10/23/15
Early Spring, 2016
March 12, 2016 at George’s (2bu/ac)
April 20, 2016 at Billy's
Soon to be tilled

April 20, 2016 at George’s
5/11/16 George’s
5/18/16 at George’s (about 5’ average…20% anthesis)
Roller Crimper Manufacturing
Ready for assembly…15’6” roller crimpers
Planting beans (170k/ac), 15” rows and crimping rye on 5/20/16
5/22…6’ tall at Billy’s first pass
5/22 crimped twice at George’s

Tilled, planted 30” rows

No-till, planted 15” rows
5/25/16…3 days after crimping twice at Billy’s
Initial Biomass Results

Bio-soil enhancer had not been applied yet...just the initial biomass

<table>
<thead>
<tr>
<th>Field</th>
<th>Treatment</th>
<th>rye biomass (kg)</th>
<th>in lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS</td>
<td>Suma</td>
<td>3,396</td>
<td>7,471</td>
</tr>
<tr>
<td>BS</td>
<td>No suma</td>
<td>2,370</td>
<td>5,213</td>
</tr>
<tr>
<td>GN</td>
<td>Suma</td>
<td>3,463</td>
<td>7,618</td>
</tr>
<tr>
<td>GN</td>
<td>No suma</td>
<td>3,345</td>
<td>7,360</td>
</tr>
</tbody>
</table>
Soybean emergence 6/01/16
10 days after planting, 67° soil temp
Soybeans 6/04 at Billy’s
Soybeans 6/04 at George’s
Tilled beans planted 6 days earlier

6/10/16 bio-soil enhancer application
6/11/16 at Billy’s
6/29/16 Rye regrowth about 10%
7/01/16 at George’s after mowing…tilled beans on right were planted 6 days earlier
7/10/16 at George’s
7/21/16 at Billy’s
7/21/16 at George's
8/07/16 at George’s
8/15/16 at Billy’s from rear of field looking south
8/15/16 at George’s (caught up with tilled field)
Underground livestock doing their thing 9/03/16
9/06/16 at George’s
9/20/16 at George’s
10/01/16 at George’s
9/25/16 Vetch/Oats at Billy’s…flown on 9/13/16
31lbs vetch and 2bu oats per acre
9/25/16 another pic of the Vetch/Oats
9/25/16 Vetch/Oats at George’s tilled field
9/25/16 at George’s…no Vetch/Oats portion of tilled field
10/08/16 weighing plot-yield samples at George’s
Original Hypotheses

• 1) If cereal rye can develop enough biomass, then after-crimento weed pressure will be minimal in a no-till vs conventional till system before soybeans. (confirmed)

• 2) If a bio-soil enhancer can promote increased microbial activity, then N uptake and nodule development will accelerate canopy formation, facilitate prolonged weed pressure control and improve pest resistance. (very possible)

• 3) If a bio-soil enhancer can improve fall hairy vetch root formation, then winter hardiness will improve, along with subsequent after-crimento spring N mobilization before corn. (not sure yet)
What we’ve learned so far
• **Cultivar selection** ...winter hardy AND early maturing. We crimped at the 25 - 50% anthesis rate due to incoming storms and the later maturing cultivar (Rymin). Using an earlier maturing cultivar (Aroostook or Elbon) and waiting until a higher rate of anthesis would lessen the need to crimp twice.

• **Planting rye** ...drill vs broadcast. This depends upon harvest date. Broadcast provides better distribution of seed and cover when there is adequate moisture. Drilling provides better assurance of germination in drier conditions, but with gaps, which tend to offer enough light for weed growth.

• **Biomass** ...retains moisture, provides adequate weed suppression and builds organic matter. Three – four bu/ac seems necessary to provide adequate biomass for weed suppression and prolonged allelopathic effects.

• **Anthesis rate at crimping** ...the higher the level, the better initial termination. However, in comparison to some neighbors who crimped at a higher level of anthesis, yields and weed suppression effects did not differ.
Work plan for next year
As a cover crop, we aerially applied a combination of oats and hairy vetch onto each of the soybean fields on 9/13/16. The bio-soil enhancer was ground applied on trial plots 10/17/16.

We want to determine if the bio-soil enhancer helps the hairy vetch to over-winter and the extent to which N mobilization reduces the need for any additional fertilizer.

Growth records and soil-health data collection will follow a similar protocol as in Year 1.
Vetch growth 10/31/16 at Billy’s
Take Away
• Roller crimping offered an alternative non-chemical mechanical approach to termination of a rye cover crop

• Density of the rye stand was a primary factor in termination rate

• Thinner stands were more resistant to termination at lower levels of anthesis and provided less weed suppression

• The bio-soil enhancer showed promise to facilitate accelerated nodule development, enhanced root growth, improved overall soil health and higher yields