



COVERCROP

VEGETABLE PRODUCTION TRAINING

Session 3

**Cover Crop Establishment
and Termination**

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RESEARCH & EXTENSION
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Outline

- Getting the most benefit out of a cover crop is directly related to the quality of the stand.
- Establishing a good stand is dependent on:
 - seeding date, seeding rate and weather.
- As the cash crop season approaches the cover crop must be killed out in preparation for the cash crop
 - Roller crimp
 - » Effectiveness of different covers with roller
 - Herbicide
 - Strip terminate
- Timing of termination is key to successful integration of cover crops into agricultural systems



Planning For Success

- Ensure good seed depth placement and seed-soil contact
 - Ideal depth is usually 2-3x the diameter of the seed
- Adequate soil moisture
- Adequate soil temperatures¹
 - Rye 34° F
 - Field Peas 41 ° F
 - Buckwheat 50 ° F
 - Cowpeas 58 ° F
 - Sorghum Sudan 65 ° F
- Inoculate legumes with correct inoculum
- Apply manure?
 - *Applied nutrients may be passed to the next crop via the cover crop biomass*
 - *Opportunity to apply manure to comply with food safety regulations for fruit and vegetable crops*



Cover Crop Seeding Methods

Broadcasting, Aerial Seeding

- Seeding depth and placement may be variable, resulting in un-even stands
 - Higher seeding rates
- Doesn't require specialized equipment
- Hand broadcasting only feasible on small areas; will require tillage pass to push large seeded species to depth



Drilling

- Seeding depth and placement is consistent
 - Lower seeding rates
- Mixes of species that require different seeding depths may be difficult to manage
- Ideal for large areas



Cover Crop Seeding Equipment

- Low tech, low cost
- Higher cost, and more technical
(Multiple boxes for different species)



Seeding Rate Calibration

- **Low Tech, Broadcasting**
 - *Know your area size (X)*
 - *$X \text{ sq. ft.} / 43,560 \text{ sq. ft.} = \text{Amount of acre} \times \text{seeding rate per acre} = \text{amount of seed need for the area}$*
 - *Adjust seeder to seed size*
- **Seed Drill**
 - Set drill for seed size
 - Mixes, use the predominant species
 - 100' test run with drive wheel
 - In field test depth placement
 - *Consult seed drill calibration guides for mixes²*



Planting Dates



Winter Cover Crops

- *Limiting factor: shortening days and temperature*
- Establish legumes and brassicas late summer before cold temperatures
 - *In Arkansas: September*
- **Vernalization** of cool season grasses must occur for elongation and optimum biomass production
 - *Exposure to cold temperatures induces plant to enter reproductive stages*
- Adequate soil temperatures

Summer Cover Crops

- *Limiting factor: soil moisture and high heat*
- More flexibility where long summers occur
- Time seeding to achieve optimum biomass production prior to next cover crop
 - *In AR Late May to Early June*
- Adequate soil moisture
- Adequate soil temperatures



Effects of Seeding Date on Biomass

- Seeding date is more critical for fall established winter cover crops
 - Shorter days and cooler temperatures moving into fall restrict plant growth
- Later planting dates in fall have been shown to impact biomass amounts the following spring⁵.
 - Low biomass cover crops will compete poorly with weeds in no-till systems.
- Short windows between cash crops and low rainfall in mid-summer also require timely seeding of summer cover crops for proper establishment
- Timing of establishment is important to achieving the goals set for the cover crop; treat the cover crop like a cash crop!



Cover Crop Termination Methods

No-Till

Terminate by herbicide, roller crimper or a combination of the two and **left on the soil surface**



Strip-Till

Cover crop terminate **in-strips** by mowing and **tilled into the soil** 2-4 weeks before planting. Results in a clean soil surface where rows will be placed and cover crop for weed control in row middles.



Tilled

Terminate by mowing and **tilled into the soil** 2-4 weeks before planting. Results in a clean soil surface.



Cover Crop Roller Crimper Termination

A roller mechanically lodges the crop and the crimper cuts the stems



[↑ Click for video](#)



Percent Termination of Various Cover Crops by Roller Crimper Alone⁺

| Season | Cover Crop | % Kill | Notes |
|--------|----------------|--------|---|
| Summer | Sorghum Sudan | 40-60% | <i>Some re-sprouting of the stems was observed</i> |
| | Pearl Millet | 90-95% | |
| | Cowpea | 0-10% | |
| | Sunflower | 100% | |
| Winter | Austrian pea | 15-20% | <i>When planted with a grass, improved roller crimper termination of the grass observed</i> |
| | Winter wheat | 75-80% | |
| | Cereal Rye | 80-90% | |
| | Crimson Clover | 0-10% | |

⁺Assessments are based off of roller-crimper alone. Herbicide can be combined with a roller crimper in order to get a higher rate of termination. Data is from preliminary trials conducted in AR³, other studies have seen different results with just a roller⁴. Cover crops were terminated at or just after flowering.



Cover Crop Termination Equipment

Roller crimper



Herbicide Sprayer



Flail Mower



Walk Behind Mower



Tillage Implements



Cover Crop Termination in Plasticulture Systems



- **Cover crop termination in a plasticulture system should be timed to ensure adequate biomass decomposition prior to laying plastic**

- Un-decomposed biomass may interfere with bed laying equipment or tear the plastic

- The biomass should be incorporated in the soil “Green” and should be buried and allowed to sit for 2-4 weeks

- Decomposition rates will be influenced by soil moisture, soil temperature and C:N ratio of the material

- Grasses that are highly lignified will be slower to decompose



Termination Timing for No-Till Systems

- Roller-crimpers are most effective on grasses and legumes after they have reached their reproductive stage
 - At pollen shed or later is ideal for many grasses
- Nitrogen content is highest in legumes around flowering but prior to seed set
- Termination should occur before cover crops set seed
 - Become weeds later
 - Nitrogen is tied up in the seed
 - Grasses become more lignified at and after pollen shed -> they will break down more slowly
- If pollinator habitat is desired the cover crop should be allowed to flower



Herbicide Termination Timing

- Effectiveness of herbicide termination is dependent on:
 - Herbicide used
 - Herbicide rate
 - Higher rates may be required on young cover crops
 - Coverage
 - Good spray coverage will ensure effective termination
 - Systemic vs. contact herbicides
 - Growth stage of the cover crop
 - After flowering cover crops tend to be more susceptible to herbicide.
 - Air temperature and weather
 - Herbicides are more effective during warm and dry weather



Potential Problems

- If cover crop germination fails and it is too late to re-seed
- If biomass is in-sufficient to achieve weed control in a no-till system
 - Tillage or herbicide application maybe the only course of action
- The cover crop goes to seed and becomes a weed in a later cash crop
- Roller-crimper or herbicide kill is in-sufficient
 - *Cover crop re-sprouts*



Sorghum Sudan re-sprouting after roller-crimping



Crimson clover germinating after self-sowing



Watermelon in a no-till failure



Take Home Message

- Choose your seeding rate and methods carefully based on the equipment available
- Spend time calibrating seeding equipment
- Plan for the termination method and timing prior to planting the cover crop
- Have a “plan B” if things don’t go as planned



Authors and Acknowledgements

This presentation was prepared by Drs. Amanda McWhirt and Jackie Lee with support from a **Southern SARE Professional Development Program Grant (RD309-137 / S001419 – ES17-135)** and are provided by the USDA-SARE program to educators and producers for outreach and educational purposes. These presentations were further reviewed by Dr. Trent Roberts and Dr. Bill Robertson.



Resources and Sources

¹ Clark, A., editor. 2012. *Managing Cover Crops Profitably, 3rd Edition*. Sustainable Agriculture Research and Education. Handbook Series Book 9.

<https://www.sare.org/Learning-Center/Books/Managing-Cover-Crops-Profitably-3rd-Edition/Text-Version/Printable-Version>

² CALIBRATING A SEED DRILL FOR COVER CROP MIXTURES. Technical Note, NRCS
https://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/idpmctn13250.pdf

³2018 Summer Cover Crop Trial

<https://www.uaex.edu/farm-ranch/crops-commercial-horticulture/horticulture/ar-fruit-veg-nut-update-blog/posts/2018summercovercroptrial.aspx>

⁴ Summer Cover Crops Horticulture Information

[Leafletshttps://content.ces.ncsu.edu/summer-cover-crops](https://content.ces.ncsu.edu/summer-cover-crops)

⁵ Cover Crop Establishment and Potential Benefits to Arkansas Farmers

<https://pdfs.semanticscholar.org/d837/f33acb4bd764597d356f1c5eed1a6b8fb3b2.pdf>

