DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

Agriculture and Natural Resources

FSA2159

Strip-Seeding Strategy for Establishing Clover in Pastures

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Increased nitrogen fertilizer costs have made it difficult for producers to sustain adequate forage productivity in grass pastures. Establishing and maintaining clover in pastures improves sustainability by improving forage quality, yield and animal performance with less nitrogen (N) fertilizer. Addition of clover also helps to extend the grazing season by contributing peak grazing when other forages may not be actively growing. However, over-reliance on unmanaged grazing, N fertilizer applications and lack of understanding of the planting and establishment process have limited establishment of clover by many Arkansas producers.

Clover is usually established by broadcasting or no-till planting in dormant grass sod. In theory, planting clover over 100 percent of the pasture should result in an even distribution of clover over the field; however, in practice, uniform stands of clover are not often achieved. The resulting clover stand is often 25 percent or less of the total pasture sward and is often distributed in patches. The low establishment rate is usually caused by incorrect planter calibration, planting too deep, droughty soils, variable fertility, weeds or heavy grass sod. When clover establishment is less than expected, producers often revert to typical practices, including N fertilization and continuous grazing, which reduce survival of any remaining clover. Producers will manage what they can see, so the likelihood of managing to favor a sustainable clover/grass mixture increases if successful establishment is observed.

The Strip-Seeding Strategy – Problem and Opportunity

Three common problems with planting clover are (1) less than a 25 percent stand is usually established, (2) few people properly calibrate no-till drills or broadcast seeders and (3) many of the calibration charts for drills and broadcast seeders are not accurate for small-seeded legumes. In several demonstrations, it was noted that the drill seed box opening had to be set to "zero" to deliver the recommended rate of 2 lbs/acre of white clover seed.

Producers have historically noted good establishment of forage and weed species from seed in mature hay where the hay was spread during feeding. This concentration of seed from the hay and nutrients in animal manure deposited in the feeding area create a favorable environment for seedling establishment. Forages and weeds that become established in this natural "strip-seeding" manner often spread throughout the pasture over time. White clover can spread in pastures from stolons, and small amounts of hard clover seed can survive passage through the digestive tracts of grazing livestock. Rotational grazing is beneficial to persistence of clover in pastures and has been shown to improve distribution of manure across a pasture, which could help spread seed. The planned use of strip-seeding, spreading growth habit of white clover and seed dispersal by livestock provide an opportunity to improve clover establishment in pastures. Clover can be strip-planted in areas of the field best suited for clover or in areas that can be best managed

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Figure 1. White clover established in fescue pasture by strip-seeding

for clover. Then both vegetative spread and grazing can disperse clover into other areas of the pasture. By using this method, 100 percent of the recommended amount of clover seed for a field is planted on only 25 percent of the area (4X rate), thus increasing likelihood of establishment while reducing labor and planting costs (Figure 1).

Two on-farm research studies were conducted from 2007 through 2009 to test this "strip-seeding" strategy. White clover (variety *'Patriot'*) was planted with a Haybuster 107 no-till drill in tall fescue pastures in Cleburne County on February 20, 2007, and in Van Buren County on February 20, 2008. The pastures were approximately 40 acres each. The drill was set to plant the seed < ¼ inch deep. Both fields were closely grazed (< 2 inches) before planting. Two planting strategies were used: (1) no-till planting of white clover at the recommended seeding rate of 2 lbs/acre (1X) over 100 percent of the pasture and (2) no-till planting of white clover at a rate of 8 lbs/acre (4X) in three strips totaling 25 percent of the pasture area. The same total amount of clover seed was planted for each treatment. The strips were generally 50 to 60 feet wide and 500 to 600 feet long, depending on paddock shape. Each planting method was replicated twice in paddocks of approximately 9 to 10 acres each. Each site received fertilizer and lime according to soil test recommendations for overseeding clover. Paddocks were limit-grazed after planting during March and April to reduce grass competition until the clover began emerging. Beginning in May, each paddock was rotationally grazed with a stocking rate of approximately one mature animal unit per acre through the season. Percent clover stand was determined monthly by counting the number of 5x5-inch squares containing clover in a 5x5 wire frame at 15 locations in each strip, between the strips and along 3 transects across the solid-seeded areas.

Study Results

Cleburne County – First- and second-year results from the Cleburne County site showed a significant difference in clover stand percentage between strip-seeded and solid-seeded treatments. In 2007, clover stands averaged 65 percent for strip-seeded compared to 42 percent for the solid-seeded treatment (Figure 2). Percent stand of white clover in November 2007 was 2.4 times greater within the clover strips than for the solid-seeded treatment.

In 2008, clover stand percentage in the strips averaged 84 percent for the strip-seeded treatment compared to 61 percent for the solid-seeded treatment (Figure 3). Stand variability was much higher for the

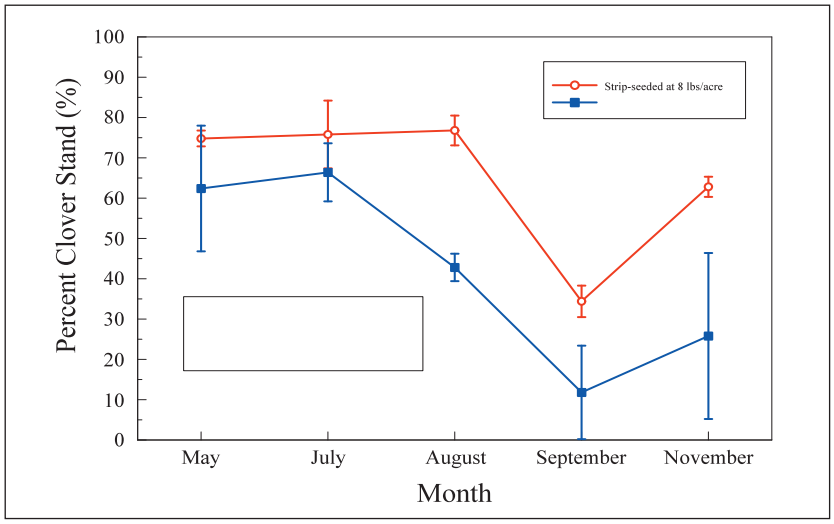

Figure 2. 2007 clover stand percentage of white clover planted in strips at 8 lbs/acre or solid-seeded at 2 lbs/acre – *Cleburne County, planted February 2007.*

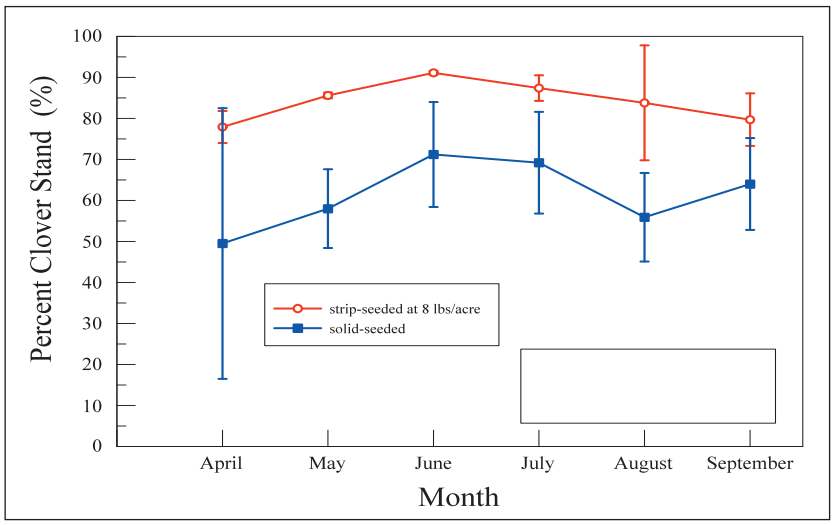

Figure 3. 2008 clover stand percentage of white clover planted in strips at 8 lbs/acre or solid-seeded at 2 lbs/acre – *Cleburne County, planted February 2007.*

Table 1. ***Cleburne County – 2007 and 2008.***
Total acreage containing white clover when clover was either strip-seeded in 25% of the pasture at 8 lbs/acre or solid-seeded in 100% of the pasture at 2 lbs/acre. Clover was planted in February 2007.

	Strip-Seeded		Solid-Seeded	
	Acres including clover	Percent of field with clover	Acres including clover	Percent of field with clover
2007 – April	1.8	11	5.9	37
November	4.1	**25**	4.1	**27**
2008 – April	7	44	7.8	49
October	14.6	**92**	11.2	**70**

Table 2. ***Van Buren County – 2008-2009.***
Total acreage containing white clover when clover was either strip-seeded in 25% of the pasture at 8 lbs/A or solid-seeded in 100% of the pasture at 2 lbs/A. Clover was planted in February 2008.

	Strip-Seeded		Solid-Seeded	
	Acres including clover	Percent of field with clover	Acres including clover	Percent of field with clover
2008 – May	5	26	10	53
October	5	**26**	18.8	**99**
2009 – April	5.9	31	18.6	98
October	11.2	**59**	18.8	**99**

solid-seeded treatment compared to the strip-seeded clover treatment. Because the percent stand of clover was better within the strips, the total percentage of the field covered by clover for each treatment was not different at the end of the first growing season and averaged 25 percent for the strip-seeded treatment compared to 27 percent for the solid-seeded treatment (Table 1). Clover in both treatments covered approximately ¼ of the field even though 25 percent of the area was planted in the strip-seeded treatment compared to 100 percent of the field for the solid-seeded treatment. In early 2008, clover in the Cleburne County site began volunteering into the unplanted area between the strips and spread significantly by October. In October 2008, after two growing seasons, total percentage of the field covered by clover (Table 1) was significantly higher for the strip-seeded treatment (92 percent) than for the solid-seeded treatment (70 percent). The large increase in clover percentage in the unseeded portions of the strip-seeded treatment fields is attributed to seed dispersal by grazing cattle and by vegetative spread of the clover. In spring of 2009, clover stand percentage averaged > 88 percent in planted areas for both treatments.

N Fixation by Volunteer Clover Plants – A concern with volunteer clover spread by livestock is that seed are not inoculated and thus would not actively fix N for the forage system. In spring of 2009 at the Cleburne County site, clover plants were excavated from the strip-seeded treatment from the strips and from volunteer clover between the strips to determine nodulation of volunteer clover plants. Clover plants in both the strips and between the strips were nodulated and the interiors of the nodules for both treatments were observed to have a pink/red pigment indicative of active N fixation. The source of inoculum for the volunteer clover plants is assumed to be naturally occurring.

Van Buren County – Weather and planting conditions in 2008 were nearly ideal for clover establishment and growth, resulting in excellent clover stands for both the strip- and solid-seeded treatments in Van Buren County. Percent clover stand in May averaged 95 percent within the strips for the strip-seeded treatment and 53 percent for the solid-seeded treatment (Figure 4). By October 2008, excellent clover stands of 99 percent were established over the entire planted area for both treatments. In April 2009, clover stands in both treatments averaged > 95 percent in planted areas for both treatments (Figure 4).

In this location and year where conditions were nearly ideal, either planting method produced good stands, but the solid-seeded treatment resulted in the greatest amount of clover. At the end of the first growing season (October 2008), the total percent of the field covered was 26 percent for the strip-planted treatment and 99 percent for the solid-seeded

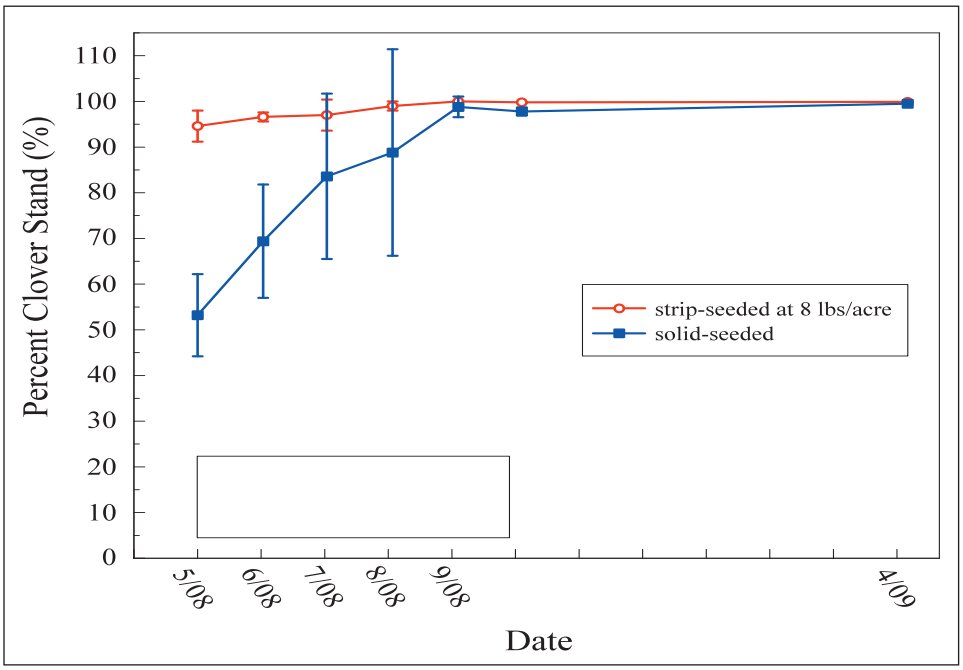

Figure 4. 2008-2009 clover stand percentage of white clover planted in strips at 8 lbs/acre or solid-seeded at 2 lbs/acre – ***Van Buren County, planted Feb. 2008.***

treatment (Table 2). Volunteer clover was not noted between the strips during 2008 but appeared in spring 2009 (Table 2). At the end of the second growing season (October 2009), the total field coverage of clover increased from 26 percent to 59 percent in the strip-seeded treatment. This spreading of clover during the second year was similar to that observed in Cleburne County.

Conclusions

Based on no-till drill rental ($10/acre) and fuel costs ($3/acre), estimated savings for a 40-acre field, not including labor, were about $9.75 per acre for planting 25 percent of the field compared to planting 100 percent of the field. In the Cleburne County site, clover stands were equivalent or better for strip-seeding vs. solid-seeding. In the Van Buren County site, strip-seeding produced higher initial stands, but the solid-seeded treatment provided the highest amount of total clover by the end of the first year. For the second year in both locations, clover began to fill in the unplanted areas due to spread of ingested seed by cattle and vegetative spread of the clover (Figure 5). Bloat was not observed in cattle at either location when grazing the thick clover stands, but basic precautions were used to reduce bloat risk. Cattle not accustomed to grazing clover were not turned in when hungry or when the fields were wet with rain or dew.

Figure 5. Patches of volunteer white clover spread by cattle grazing mature clover seed.

Strip-seeding uses the same amount of clover seed per field, but it is planted in strips instead of solid-seeding the entire field. Strip-seeding clover into fescue pastures at a high seeding rate is a viable establishment option because it reduces the requirement for precise calibration of imprecise planting equipment. However, checking the planter calibration will help ensure an accurate seeding rate. For an easy step-by-step method for calibrating drills and seeders, refer to FSA3111, *Calibrating Drills and Broadcast Planters for Small-Seeded Forages*. Other possible benefits of strip-seeding are weed control and improved grazing distribution. With careful planning, weeds between the strips can be controlled with non-residual herbicides if needed during the first year. Planting on the far side of a field away from the water source may improve grazing distribution. Planting clover strips along the sides of a pasture would allow the clover strip to be protected with a temporary electric fence for wildlife or would allow good seed set before grazing to improve seed dispersal by livestock.

Basic Steps for Strip-Seeding Clover

1. Select an appropriate clover species, variety and planting date. Refer to FSA3137, *Annual and Perennial Forage Clovers for Arkansas*, and FSA2035, *Forage Legume Inoculation*.
2. Soil test to get the proper fertilizer and lime recommendations (ask for Crop Code 116, "Legumes Over-Seeded Into Grass Sod," when submitting soil samples).
3. Graze the grass sod very short (2 inches or less) before planting.
4. Calibrate the planter to deliver a high seeding rate (4X in this project), and plant the clover in strips over 25 percent of the field. Do not plant the seed deeper than ¼ inch. Refer to FSA3111, *Calibrating Drills and Broadcast Planters for Small-Seeded Forages*.
5. Rotationally graze to manage the grass canopy and reduce competition.

This project and publication were funded by an On-Farm Research Grant from the Southern Region Sustainable Agriculture Research and Education Program.

Printed by University of Arkansas Cooperative Extension Service Printing Services.

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FSA2159-PD-7-2016RV