

TECHNICAL NOTE: IOWA AGRONOMY TECHNICAL NOTE 39 RECOMMENDED COVER CROP SEEDING METHODS AND TOOLS

Cover Crops provide numerous benefits, and these are greatest when a good stand is established with as little soil disturbance as possible. To maximize benefits and to meet the criteria of the FOTG-329- Residue and Tillage Management Standard, the seeding tool or method should have a calculated Soil Tillage Intensity Rating (STIR) rating of 15 or less according to the Revised Universal Soil Loss Equation (RUSLE2).

Cover Crop Establishment

Cover Crop success is dependent on several factors:

- » Seeding date
- » Weather (temperature and moisture) after seeding
- » Seedbed conditions
- » Fertility
- » Mulch or previous crop residue amounts
- » Planting depth
- » Seed soil contact
- » Seeding rate
- » Seed quality (% germination and % purity)
- » Time of freeze after seeding
- » Insects and diseases



Cover crop mix with excellent establishment.

The following are recommended seeding methods and tools which optimize establishment factors. Each has been evaluated for their relative establishment effectiveness for: depth control, seed to soil contact, timeliness and weather conditions.

Seeding Depth Guidance		
Groups	Optimum	Maximum
Brassicas, Clovers, Small Seeded Legumes, Small Seeded Grasses	1/4"	3/4"
Vetches, Sorghums	1/2"	1"
Cereal Grains	3/4"	1 1/2"
Beans, Peas	1 1/2"	2"

No-Till Drilling: Use a no-till drill that is designed to handle heavy crop residues and the type of seed being planted (especially important for small seeded species).



Set properly, the no-till drill will provide good seed-to-soil contact and a planting depth preferred for the desired species to be planted. This should provide for faster and more consistent emergence and is recommended for seeding species during the final days of the approved seeding period. Depth control for most drills is not as precise as a planter, so it is important to set it for the optimum depth, and check often to assure placement doesn't exceed the maximum depth for selected species. Drilling in soils that are too wet can also cause improper seed placement and be antagonistic to the desired soil health benefits. Seed at the full base rate of 100%. (See Table 1)

Narrow Row Planting: Many split-row or narrow row planters (15" row width or less) can be equipped with seed plates, such as those used for sugar beets or sorghum, which work well for many cover crop species. Additional adaptation and/or calibration may be necessary due to variation of seed size among cover crop species and varieties.

This method should provide the fastest and most consistent emergence and is recommended for seeding species during the final days of the approved seeding period. To improve crop diversity at least two species of cover crops could be planted either in alternating rows or combined together. This method should not be used if weed control is the primary purpose. Seed at the full base rate of 100%. (See Table 1)



Narrow row or split-row planter



Two species of cover crops growing in alternating 15" rows.

loss that will reduce the desired benefits of the cover crop. This will be a fast, single pass operation, that can seed many acres in a short period of time. Adjust seed up to 110% of base rate. (See Table 1)



Rotary Harrow Seeding - mounted air delivery seeder in light crop residue



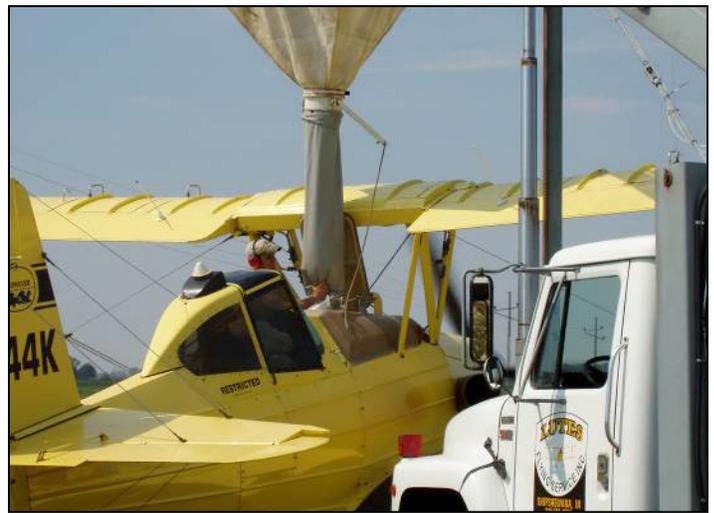
Rotary Harrow Seeding - seed delivery ports

Harrow Seeding: Rotary harrows, coultter harrow type vertical tillage tools or similar tools can be used to aid in fluffing or cutting residue to allow improved seed to soil contact over broadcasting alone but may lack the depth control of planters and drills. Air delivery seeders can be mounted to these tools to deliver the seed to the soil as the residue is lifted or cut. The implement will be set to run no deeper than 1" and not be designed to invert the soil or to bury the crop residue. Coultters will be set to run straight and not be cupped or concave. Tools with multiple operation gangs should only utilize the coultters with the rear harrow gangs raised or detached. This prevents excessive soil disturbance and moisture and carbon



Coulter Harrow (vertical tillage tool) Seeding - air delivery seeder on a coultter harrow in heavy crop residue

Broadcast Seeding: Seed may be inexpensively broadcast into light residue crops without a seedbed preparation if completed in a uniform manner. Expect only fair seed-to-soil contact with no planting depth. This method relies on rain, freeze/thaw cycles, or snow to incorporate the seed. Heavier seeds such as cereal grains are more adapted to this method when seeding into freshly harvested crop residues. Seeding rates should be adjusted up to 120% of base rate. (See Table 1) Pre-mixing the seed with 200 lbs. per acre of pelletized lime or blended with the fertilizer intended for the subsequent crop is acceptable if using an airflow applicator. Seed blended with fertilizer should be immediately spread to prevent damage to the seed. Wind speed should be 15 m.p.h. or less when broadcasting light seed, such as annual ryegrass.



Aerial Inter-Crop Seeding



Airflow Applicator

Aerial Inter-Crop Seeding: Broadcast via a plane, helicopter or high-clearance spreader into existing vegetation or standing crops. This method relies on rain, freeze/thaw cycles, or snow to incorporate the seed. Timing in the fall should be just prior to leaf drop or early crop maturity stage for most cover crops. This method may provide more timely seeding for species that require an earlier establishment. Some shade tolerant species may be adapted to earlier seeding. Earlier seeding is desirable when the cover crop is to be used for fall forage. An attempt should be made to seed just ahead of predicted rain. Seeding rates should be adjusted up to 120% of base rate. (See Table 1) Only seed mixes of species with similar density should be considered. Aerial applicators should be knowledgeable of the spreading width and the weight of the planned species. Wind speed should be 15 m.p.h. or less when broadcasting. It does not include a seedbed preparation. In dry years, this method may provide poor or inconsistent emergence compared to planting or drilling.



Aerial Inter-Crop Seeding - established in standing soybeans



High-Clearance Sprayer, converted to air seed cover crops
(photo courtesy of Mike Shuter)

Other approved Innovations: Air delivery seeders can be mounted to combine heads to deliver the seed to the soil as the residue is being cut or shredded. As the residues exit the back of the combine they are spread as mulch over the seed to allow improved seed to soil contact and emergence rates over broadcasting alone. Mixes with smaller seed size may be preferable to reduce seed hopper filling frequency. Seed at 110% of base rate. (See Table 1) Additional seeding innovations are likely and should be evaluated on a case by case basis.



Air seeder mounted to corn head (photo by Ray McCormick)

Table 1

Late Summer and Fall Cover Crop Seeding Rates

Species Common Name	Winter Hardy?	Drilled Base Rate (lbs/acre of PLS)	Broadcast with Incorporation Base Rate = 1.1 x base rate (lbs/acre of PLS)	Broadcast on Surface Base Rate = 1.2 x base rate (lbs/acre)
Rye, Winter Cereal	Yes - all cultivars	55	61	66
Triticale, Winter	Yes - most cultivars	55	61	66
Wheat, Winter	Yes - many cultivars	55	61	66
Barley, Winter	No	60	66	72
Oats	No	60	66	72
Ryegrass, Annual	No/Sometimes	12	13	14
Mustard, Oriental	No	3	3	4
Radish, Oilseed	No	5	6	6
Rapeseed	No	3	3	4
Turnip, Forage type	No	3	3	4
Vetch, Hairy	Usually/Slow Growth	12	13	14

PLS (Pure Live Seed) - Expression of seeding rate in pounds per acre

PLS = (% germination + dormant seed x % purity) ÷ 100

Late Summer and Fall Cover Crop Recommended Planting Dates

Zone (See Map ²)	Drilled or Incorporated Planting Date ¹ for Winter Hardy Cover Crops	Drilled or Incorporated Planting Date ¹ for Cool Season Non-Winter Hardy Cover Crops
Zone 1	October 21	September 9
Zone 2	October 28	September 16
Zone 3	November 5	September 23

¹When surface broadcasting, plant 7 days earlier than the recommended date to compensate for slower establishment and variable rainfall. Surface broadcasting becomes less effective because of reduced tillering or branching later in planting windows, especially after non-winter hardy planting dates.

²See "NRCS Technical Note 38: Cover Crop Management" for Zone map.