

# Organic Cover Crop Seed Production in Georgia



*Julia W. Gaskin, Sustainable Agriculture Coordinator, Department of Crop and Soil Sciences*  
*Amanda R. Smith, Extension Economist, Department of Agricultural and Applied Economics*  
*Ray Hicks, UGA Extension Coordinator, Screven County*

Cover crops are an essential part of an organic production system. There are many benefits of using cover crops. They build organic matter in the soil, recycle nutrients, suppress weeds, and (in the case of legumes) provide nitrogen.

The National Organic Program standards require farmers to use organic seeds when the varieties needed by the farmer are available; otherwise, untreated seeds can be used. Finding organic cover crop seeds can be a challenge for farmers. There is relatively little organic cover crop seed available, and many times the varieties that are available are not the best adapted for growing conditions in Georgia.

For example, cover crop seed is normally produced in the Northwest and Northeast, but varieties developed for the Southeast often do not produce good yields in these areas. This is one reason that it is difficult to find seed for these varieties.

There is a national effort to produce more organic seeds so that the varieties needed for different climates, soils, and crop rotations are available to farmers. Consequently, there has been interest in seeing if cover crop seed production could be a viable enterprise for organic growers in Georgia. If organic cover crop seed production is a viable enterprise for growers, it could improve the availability of varieties adapted to the Southeast; provide a source for locally grown seeds; and provide another profit center for certified organic growers, seed cleaners, and local seed companies.

## Potential Cover Crops for Seed Production



**Figure 1.** Cereal rye cover crop.

### *Cereal Rye*

Cereal rye (*Secale cereale*) and crimson clover (*Trifolium incarnatum*) are cover crops that are commonly used by organic farmers in Georgia. Cereal rye is the workhorse cover crop for providing large amounts of biomass to build the soil, scavenge nutrients, and suppress weeds (Figure 1). It is also commonly used as a winter forage crop in the Southeast, and farmers routinely save their own seed for use as a forage or cover crop. The most common variety of cereal rye adapted for Southern growing conditions is 'Wrens Abruzzi.' This cereal rye is a winter hardy variety and is adapted to growing conditions from the mountains to the coast. It is tolerant of several diseases.



## Crimson Clover

Crimson clover is an annual legume that is commonly used as a nitrogen source (Figure 2 and 3). In the 1930s through the 1970s, it was grown as a seed crop in the Southeast with yields from 90 to 800 pounds per acre. Seed production declined in the 1960s and 1970s due to lack of seed harvest and processing infrastructure, as well as inconsistent yields due to rainfall during harvest, clover head weevil, and reduced demand with increased use of commercial nitrogen fertilizer.

For maximum nitrogen fixation, clovers should be killed when they reach mid-bloom. Two commonly used varieties, ‘Dixie’ and ‘Tibbee,’ reach mid-bloom from 56 to 76 days after February 1, depending on the location and growing conditions. Several earlier blooming varieties have been developed. These include ‘AU Robin’ and ‘AU Sunrise.’ These varieties are useful when an early-planted cash crop such as corn will follow the cover crop. ‘AU Sunrise’ blooms 12 to 28 days earlier than ‘Dixie.’ Unfortunately, due to poor seed production in Oregon, these seed varieties are very difficult to obtain.



**Figure 2.** Crimson Clover cover crop.



**Figure 3.** Crimson Clover seeds after harvest and before cleaning and testing.

## Other Cover Crops

Other cover crops that may be grown for seed are sorghum varieties, millets, buckwheat, cowpeas, or velvet beans. Egyptian wheat, which is in the sorghum family, is grown in Georgia, primarily for deer food plots. A number of different millets are sometimes used as summer cover crops in the Southeast—browntop, Japanese, and pearl.

Browntop millet (*Urochloa ramosa*) is commonly grown in Georgia and can produce yields of 400 to 500 pounds per acre. Buckwheat (*Fagopyrum esculentum*) is very commonly used as a short-term, warm season cover crop. Most buckwheat production in the United States is in the northern Plains and Missouri. Buckwheat seeds may be difficult to combine in the South due to the high humidity. Cowpeas (*Vigna unguiculata* L. Walp.) are the most commonly used summer legume. Iron Clay Pea is a variety preferred in the South. Velvet beans were once widely grown in the Southeast to help fatten cattle. Their use has declined, but they have a high nitrogen fixing capacity. Some velvet bean for cover crops have been produced in Florida, but the lack of demand for the seed and the difficulty with harvesting the seeds has reduced its production.

All these crops grow well and set viable seed in Georgia’s growing conditions. However, there is no data available on growing these cover crops for seed organically.

## Cover Crop Seed Production

Seed production is a specialized operation. It is not the same as simply growing the crop and collecting whatever seed is produced. Seed producers need to think about maintaining weed and disease free growing conditions as well as the growing conditions needed to produce a high quality seed. They may also need to think about isolation distances to preserve the variety integrity and maintaining an adequate population to collect seeds from to preserve the genetic diversity within the variety.

Growing seed can require specialized harvesting equipment. It may also require seed cleaning capability and proper seed storage. In addition, the humid climate in Georgia can make harvesting difficult during the window when the seed is ready to harvest.

Before going into this niche market, a farmer must carefully look at costs, potential yields, whether new equipment will be needed, and the time and management skills needed for successful production. They should also look at opportunity costs, meaning if they can make more money with other crops on a particular piece of land.

High quality seed will have a high germination percentage and low amounts of weed seeds or other crop seeds. The farmer needs to think about site selection in terms of volunteer plants from a previous crop and weed pressure. Site selection, seed bed preparation as well as timely planting and cultivation are particularly important for organic seed production because weeds can be difficult to control. Avoid fields with heavy weed pressure. Perennial weeds such as nutsedge and bermudagrass can suppress yields. Annual weeds such as wild radish (*Raphanus raphanistrum*) can contaminate the seed and make it unsellable.

Planting into a stale seedbed is a recommended practice for reducing weed pressure. Turn or harrow the field, then use shallow cultivators, such as a tine weeder, to kill weeds at the thread stage before they form leaves

(Figure 4). When done properly and when the weather cooperates, several shallow tillage passes over a two- to three-week period can kill newly germinated weeds and leave a relatively weed-free upper soil surface. Ideally, shallow cultivation is done early in the day in sunny conditions, so that the small weeds dry out and die. Shallow cultivation under moist conditions or followed by a rain may not kill the weeds. Remember, if you can see the weeds, it's too late for a shallow cultivation.

Timely planting, the correct seeding rate, and planting at the proper depth are important to getting quick germination and an even stand that will compete with weeds. A good general reference for organic weed control is “Weed Management on Organic Farms” (Finney and Creamer, NCSU).

Noxious weeds (Table 1) and inseparable crops (other crop seeds that cannot be cleaned from the desired seed source) may need to be hand weeded. For example, in cereal rye cover crop seed production, noxious weeds such as wild garlic, onion, turnip, vetch, and radish cannot be removed from the grain seed with cleaning equipment. Seed producers have to be extremely vigilant about removing these weeds in their fields.



**Figure 4.** Shallow cultivation with a tine weeder to prepare a stale seed bed for planting.

**Table 1. Noxious Weeds Regulated by the Georgia Department of Agriculture Seed Law**

<b>Prohibited Noxious Weeds</b>	<b>Limit Seeds/Pound</b>
Balloonvine ( <i>Cardiospermum halicacabum</i> )	0
Bindweed, field ( <i>Convolvulus arvensis</i> )	0
Bindweed, hedge ( <i>Calystegia sepium</i> )	0
Cocklebur ( <i>Xanthium</i> spp.)	0
Crotalaria ( <i>Crotalaria</i> spp.)	0
Morning Glory, giant or moonflower ( <i>Ipomoea turbinata</i> )	0
Nutsedge, purple ( <i>Cyperus rotundus</i> )	0
Nutsedge, yellow ( <i>Cyperus esculentus</i> )	0
Topical Soda Apple ( <i>Solanum viarum</i> )	0
Tossock, serrated ( <i>Nassella trichotoma</i> )	0
<b>Restricted Noxious Weeds</b>	<b>Limit Seeds/Pound</b>
Bermudagrass ( <i>Cynodon dactylon</i> )	300
Blueweed ( <i>Helianthus ciliaris</i> )	200
Cheat or Chess ( <i>Bromus commutatus</i> and/or <i>Bromus secalinus</i> )	300
Corncockle ( <i>Agorstemma githago</i> )	100
Darnel ( <i>Lolium temulentum</i> )	200
Dock ( <i>Rumex</i> spp.)	100
Dodder ( <i>Cuscuta</i> spp.)	100
Foxtail, giant ( <i>Setaria faberi</i> )	100
Horsenettle ( <i>Solanum carolinense</i> )	200
Johnsongrass ( <i>Sorghum halepense</i> )	100
Knapweed, Russian ( <i>Acroptilon repens</i> )	100
Mustard, wild or turnips ( <i>Brassica</i> spp.) except winter rape ( <i>Brassica napus</i> var. <i>rapa</i> )	27
Nightshade, silverleaf or purple ( <i>Solanum elaeagnifolium</i> )	200
Onion, wild or garlic ( <i>Allium</i> spp.)	27
Panicum, Texas or Texas millet ( <i>Panicum texanum</i> )	27
Plantain, bracted ( <i>Plantago aristata</i> )	200
Plantain, buckthorn ( <i>Plantago lanceolata</i> )	200
Quackgrass ( <i>Elytrigia repens</i> )	100
Radish, wild ( <i>Raphanus raphanistrum</i> )	27
Rice, red ( <i>Oryza rufipogon</i> )	300
Sandbur ( <i>Cenchrus incertus</i> )	27
Sorghum alnum ( <i>Sorghum X alnum</i> )	100
Sorrel, red or sheep ( <i>Rumex acetosella</i> )	200
Thistle, blessed ( <i>Cnicus benedictus</i> )	9
Thistle, Canada ( <i>Cirsium arvense</i> )	100

# Regulations and Certification

## *Georgia Seed Law*

Agricultural seeds sold in Georgia must meet the requirements in the Georgia Seed Law. A full copy of this law is available on the Georgia Department of Agriculture website: [http://agr.georgia.gov/Data/Sites/1/medial/ag\\_plantindustry/seed\\_fertilizer\\_feed/files/seedlaw.pdf](http://agr.georgia.gov/Data/Sites/1/medial/ag_plantindustry/seed_fertilizer_feed/files/seedlaw.pdf).

Seeds are usually handled and labeled by lots. A lot is simply a quantity of seed that has been produced and handled in the same way. This would be seeds from a particular field that were harvested on the same day as well as stored and cleaned in the same way.

For agricultural seed, the state law requires a label that includes the variety, net weight, a lot identification number, percentage by weight of weed seeds, identification of the type and amount of noxious weeds, percentage of inert matter, the percentage of germination and hard seed, the month and year of when the germination rate was tested, and the name and address of the person who labeled or is selling the seed. Other information such as seed treatment, coating, or inoculant may also be required. There is a specific format for this information that must be followed.

There are also specific minimum quality standards, which can be found in the Georgia Seed Law rules and regulations at the link above. Agricultural seed, which would include crimson clover and cereal rye cover crop seed, can have no more than 4% inert matter. The percent weed seed cannot exceed 1% and germination must be at least 70%.

There are also limits on the amount of noxious weed seeds (Table 1). As mentioned above, the presence of some noxious weeds will make the seed unsellable. Contamination with these weed seeds may make it necessary to remove them by hand. For others weeds, such as Johnsongrass, there is a limit to the number of weed seeds of that species per pound and the total number of noxious weed seeds per pound. Samples must be submitted to the Georgia Department of Agriculture laboratory for testing. Cereal rye requires a 1 lb sample for purity and germination, and crimson clover requires a 0.25 lb sample.

Seed producers are required to keep records for each lot of seed for two years. They are also required to keep a file sample for each lot for one year after all of the lot is sold. Seed dealers are required to have a license from the Georgia Department of Agriculture. If you are growing and selling seeds as a major part of your income, or if you are growing and selling seed every year, you will need a seed dealer's license. If you are selling directly off the farm to another farmer in small amounts or infrequently, you do not need a license.

This bulletin only provides an overview of the Georgia Seed Law requirements; seed producers should become thoroughly familiar with this law and how it applies to their situation.

## *Plant Protected Varieties: Certified and Registered Seed*

Some seeds are protected by the Plant Variety Protection Act of 1970 that restricts a farmer from selling the seed. These include the early-maturing varieties of crimson clover developed for the Southeast such as 'AU Robin.' Other varieties, such as 'Dixie,' are no longer protected and can be grown for selling seeds. Interested growers should contact the Georgia Crop Improvement Association to determine which varieties have intellectual property protection.

Some farmers want certified seed. Certification ensures that the seed is verified to be correctly labeled as to variety, contains no other crop or noxious weed seed, and meets quality standards. As organic seeds are developed for the growing conditions in the Southeast, the interest in certified seed may increase. The Georgia Seed Law states, "'Certified seed' means the progeny of foundation, registered, or in special cases certified seed that meet standards of the official seed certifying agency."

Foundation seed is seed from the variety developed by the breeder. A grower can also produce registered seed, which meets certain standards of the seed-certifying agency and comes directly from foundation seed.

Specifics on certification standards can be found at the Georgia Crop Improvement Association website ([www.certifiedseed.org](http://www.certifiedseed.org)). The production of certified seed requires certain isolation distances and other requirements.



### *Certified Organic Seed*

Certified organic seed must be produced on certified organic land. In addition, these seeds must be cleaned and stored in certified organic facilities. Organic growers may be concerned about potential contamination from genetically modified crops because these are prohibited under the National Organic Program rules. At this time, there are no genetically modified varieties of cereal rye, clovers, or other cover crops discussed above.

## Cereal Rye Seed Production

Growing cereal rye for seed production is similar to growing it for grain. Timely planting into a well-prepared seed bed as discussed above is critical for good yields. In general, research in Georgia on conventional cereal rye grain production indicates that to encourage the plant to produce grain rather than biomass, you should plant later in the season and use a lower seeding and nitrogen fertilizer rate. In the mountains, cereal rye should be planted between September 15 and October 30. In the Piedmont, the planting window is October 15 through November 15. Cereal rye can be planted from November 15 to December 15 in the Coastal Plain. These planting dates are about 14 days later than recommendations for cereal rye cover crops or for forage.

You should avoid fields that have high populations of noxious weeds or a history of disease. Most diseases of cereal rye can be controlled with proper rotation, using certified seed, and resistant varieties. Always calibrate the seed drill to ensure it is placing the seed at the correct depth and to get the right plant population. Seed should be planted at 1 to 1.5 inches with a grain drill at a rate of 1 bushel per acre (or 50 pounds per acre).

Fertility is best managed using soils tests to determine the pH and the amount of phosphorus and potassium needed. The soil pH should be 5.6 to 6.0. Standard limestone that has been mined and ground is suitable for organic production. Many farmers use 1 to 2 tons per acre of poultry litter as their primary fertility source. The organic nitrogen in the poultry litter must be mineralized or released before the crop can use it. Because cereal rye is planted in cool conditions, this mineralization may be slow.

You should consider the soil texture and how long a field has been managed organically when deciding on an initial nitrogen fertilizer rate. The clay soils of the Piedmont and Mountain regions will hold nitrogen longer than the sandy soils of the Coastal Plain. Fields that have been managed organically for more than four to five years will have residual fertility in the soil that cereal rye can use because it is an efficient nutrient scavenger.

On fields with clay soils or that have been managed organically for more than four or five years, 1 ton per acre of poultry may supply all the needed nitrogen, phosphorus, and potash. However, in some of the sandier soils in the Coastal Plain, particularly after heavy rains, cereal rye may need nitrogen in early winter



**Figure 5.** Cereal rye cover crop nearly ready for harvest in south Georgia.

as it begins its major growth to produce a high quality seed. This can be done with Chilean nitrate, an additional broadcast of about 1 ton per acre of poultry litter, or other approved fertilizers. Always check with your certifier before using any fertilizer or soil amendment.

The cereal rye is ready to harvest when it is at 15% moisture (Figure 5). One way to test this is to shell out seed in your hand and crush them between your teeth. If the seeds crack, the cereal rye seeds should be dry enough to harvest. You can also gather enough seeds to use in a field hand-held moisture tester. The tester needs about a 0.5 pound to several pounds of seed to determine the moisture content. Costs for testers range from \$200 to \$800.

After harvest, the seed will need to be dried to 12% moisture for cleaning and storage. As discussed above, it will need to be tested for germination and purity before it is sold.

## Cereal Rye Economic Analysis

An economic analysis of cereal rye cover crop seed production indicates it could be profitable. On-farm trials of organic cereal rye seed production were conducted for two years in Screven County Georgia. Yields were 12 bushels/acre in Year 1 and 22 bushels/acre in Year 2. The low yields in Year 1 may have been due to low fertility, as fertilizer was not applied in the early winter.

Input costs were collected during the on-farm trial included: seed, fertilizer, fuel and lubricants, repairs and maintenance on equipment, labor, as well as hauling and cleaning of the seed. The total cost of production, excluding land, was \$511.88/acre in Year 1, and the cereal rye seed was sold at \$42/bushel for an income of \$495.28. This produced a loss of \$16.60/acre in Year 1.

In Year 2, cereal rye yields were 22 bushels/acre. The cereal rye was sold at \$42/bushel resulting in an income of \$924/acre. The total cost of production, excluding land, was \$585.55/acre. This produced a profit of \$338.45/acre in Year 2.

A sensitivity analysis for organic cereal rye cover crop seed production indicated that yields of at least 17 bushels/acre, sold at \$36/bushel would be profitable, assuming there were no additional land costs. The analysis did not include storage costs. If the organic cereal rye cover crop seed is going to be stored before being sold, the storage of the seed will result in an additional cost of \$0.0728 per bushel per month.

Marketing certified organic cereal rye seed is a relatively new endeavor in Georgia. Therefore, no readily available markets have been established, especially when compared to conventional grains. If the organic cereal rye seed is to be sold and not used on the farm for an organic cover crop, producers should secure a market prior to planting. Securing a place to market the certified organic cereal rye seed can help reduce the potential variability in prices received.

Costs will vary with pest pressure and the type of equipment used. The on-farm trials indicate that organic cereal rye cover crop seed production is more labor-intensive than conventional cereal rye seed production. This increased labor requirement may limit producers' ability to grow organic cereal rye seed on a large scale.

One risk is that there are not any certified organic seed cleaners in the state as of fall 2014. This means a farmer wanting to produce certified organic cover crop seeds might have to work with a seed cleaner to obtain certification or buy seed cleaning equipment themselves. There are certified organic farmers who have purchased seed cleaning equipment for their own use and may be interested in doing custom cleaning.

An example of a production budget has been prepared based on the average prices, costs, and inputs used during the on-farm trials. Compare the costs provided in the budget with those on your farm to help determine the price needed to grow organic cereal rye profitably (Tables 2-4).

**Table 2. Organic Cereal Rye Cover Crop Seed Enterprise Budget. Screven County, GA, On-Farm Trials, Average 2009-2010, vs. Your Farm**

Gross Receipts	Unit	# of Units	\$/Unit	Receipts/Acre	Your Receipts
Organic Cereal Rye Cover Crop Seed	bu	17	\$42.00	\$709.64	
<b>Variable Costs</b>					
Variable Costs	Unit	# of Units	\$/Unit	Cost/Acre	Your Receipts
Cereal Rye Seed	lb	170	\$0.35	\$59.50	
Lime (Spread)	ton	-	\$31.25	-	
Organic Fertilizer (Chicken Litter)	ton	3	\$32.50	\$97.50	
Nitrogen	lb	-	\$0.48	-	
Phosphorus	lb	-	\$0.28	-	
Potash	lb	-	\$0.58	-	
Weed Control	acre	1	-	-	
Insect Control	acre	1	-	-	
Preharvest Machinery Fuel	gallon	3.8	\$2.88	\$10.96	
Preharvest Machinery Repairs & Maintenance	acre	1	\$9.45	\$9.45	
Harvest Machinery Fuel	gallon	6.1	\$2.88	\$17.46	
Harvest Machinery Repairs & Maintenance	acre	1	\$13.68	\$13.63	
Labor	hrs	11	\$11.00	\$121.46	
Land Rent	acre	1	-	-	
Interest on Operating Capital	percent	330	7.5%	\$12.37	
Hauling & Cleaning	bu	21	\$3.08	\$65.06	
<b>Total Variable Costs</b>				<b>\$407.38</b>	
<b>Fixed Costs</b>					
Fixed Costs	Unit	# of Units	\$/Unit	Cost/Acre	Your Receipts
Machinery: Depreciation, Taxes, Insurance, & Housing					
Preharvest	acre	1	\$24.78	\$ 24.78	
Harvest	acre	1	\$75.83	\$ 75.83	
General Overhead	% of variable costs	407	5.00%	\$20.37	
Management	% of variable costs	407	5.00%	\$20.37	
<b>Total Fixed Costs</b>				<b>\$141.34</b>	
<b>Total Costs Excluding Land</b>				<b>\$548.71</b>	

**Table 3. Sensitivity Analysis of Organic Rye Cover Crop Seed**

Net Returns Above Total Costs Per Acre Varying Prices & Yield (Organic Cereal Rye Cover Crop Seed)					
	bu/acre				
\$/bu	-25% 13	-10% 15	Yield 17	+10% 19	+25% 21
\$30	\$(169)	\$(93)	\$(42)	\$9	\$85
\$36	\$(93)	\$(1)	\$60	\$120	\$212
\$42	\$(16)	\$90	\$161	\$232	\$338
\$46	\$34	\$151	\$229	\$306	\$423
\$50	\$85	\$212	\$296	\$381	\$507



**Table 4. Estimated Labor and Machinery Costs per Acre of Organic Rye Cover Crop Seed**

<b>Preharvest Operations</b>				
<b>Operation</b>	<b>Labor Use (Hr.)</b>	<b>Fuel Use (Gal/Ac)</b>	<b>Machinery Repairs (\$/Ac)</b>	<b>Fixed Costs (\$/Ac)</b>
Disk Harrow with 75 hp 4WD Tractor	0.6	1.1	\$2.63	\$6.98
Spread Fertilizer with 75 hp 4WD Tractor	1.0	0.8	\$2.20	\$5.65
Lay Plots with 75 hp 4WD Tractor	0.6	0.6	\$0.98	\$2.68
Conservation Drill with 75 hp 4WD Tractor	0.6	1.3	\$3.65	\$9.48
<b>Total Preharvest Labor, Fuel, Repairs, Fixed</b>	<b>2.8</b>	<b>3.8</b>	<b>\$9.45</b>	<b>\$24.78</b>
<b>Harvest Operations</b>				
<b>Operation</b>	<b>Labor Use (Hr.)</b>	<b>Fuel Use (Gal/Ac)</b>	<b>Machinery Repairs (\$/Ac)</b>	<b>Fixed Costs (\$/Ac)</b>
2 Row Combine with Small Grain Header	5.8	5.7	\$12.65	\$73.43
Grain Cart with 75 hp 4WD Tractor	0.3	0.4	\$0.98	\$2.40
<b>Total Harvest Labor, Fuel, Repairs, Fixed</b>	<b>6.1</b>	<b>6.1</b>	<b>\$13.63</b>	<b>\$75.83</b>

## Crimson Clover Seed Production

Crimson clover should be planted into a well-prepared, stale seedbed on a well-drained soil. Fields should be relatively weed free as discussed above. Clover prefers a slightly acid to neutral pH (6.0 to 7.0) and moderate to high soil test phosphorus. Fresh inoculant should be used to ensure good nitrogen fixation.

Seed should be drilled at 15 to 18 lbs/acre at 0.25- to 0.5-inch depth. Cultipackers can be used to ensure good seed to soil contact. Clover should be planted six weeks before the first frost, but not too early. Early planted crimson clover may produce so much vegetative growth in the fall and early winter that it can make seed harvest problematic (some problems include crop lodging, reduced ground speed of combine, excessive biomass through the combine resulting in more seed loss, etc.). In general, crimson clover should be planted September 10–30 in the Mountains, September 20 to October 15 in the Piedmont, and October 1–30 in the Coastal Plain.

Clover seed production requires bee pollination. Crimson clover is self-fertile, but still requires insects to trigger the floret to pollinate. The clover florets open from bottom to top. In cool, cloudy weather, florets open more slowly and yields tend to be higher because bees can visit each flower. Honey bees have been shown to increase seed weight per head, the number of seeds per head, and consequently, the pounds of seed per acre. One to two hives per acre is recommended for good pollination. Native bees such as bumblebees are also good pollinators. Preserving native pollinator habitat on the farm will help ensure these are available to help pollinate.

After a floret is pollinated, it withers quickly (within one day). An indicator of good pollination is bright, open florets at the top of the head and withered florets below.

Crimson clover is ready to harvest when the seed is dry. You should crush the seed head in your hand and test a couple of seeds by biting them with your front teeth. If the seeds pop when bitten, then they are dry enough for harvest.

Crimson clover will likely have a high percentage of “hard” seed. This is when the seed coat becomes impermeable and excludes the moisture needed for immediate germination. This impermeability decreases quickly after seed maturity in crimson clover. Different varieties produce different percentages of hard seed. Hard seed level of ‘Dixie’ ranges between 60 to 80% at harvest.

## Crimson Clover Economic Analysis

The economic analysis of a two-year, on-farm trial indicated that certified organic crimson clover production could be profitable. The trial had a yield of 75 lbs/acre in Year 1 and 319 lbs/acre in Year 2. The low yields in Year 1 may have been due to harvesting equipment that lost too much seed out of the back of the combine.

Again all the input costs were collected during the on-farm trial, including seed, fuel and lubricants, repairs and maintenance on equipment, labor, and hauling, cleaning, and drying of seed. The total cost of production, excluding land, was \$206.95/acre in Year 1, and the crimson clover seed was sold at \$2.00/lb for an income of \$150.22/acre. This produced a loss of \$56.73/acre in Year 1.

In Year 2, the income was \$638/acre. The total costs of production, excluding land, was \$282.18/acre, which produced a profit of \$355.82/acre. A sensitivity analysis for organic crimson clover cover crop seed production indicated that yields of at least 150 lbs/acre, sold at \$2/lb would be profitable, assuming there were no additional land costs. Again, this does not include storage costs. If the organic clover cover crop seed is going to be stored before being sold, the storage of the seed will result in an additional cost of \$0.0013 per pound per month.

Commercial clover seed is usually produced in Oregon due to dry conditions during harvest. Growers there have developed specialized harvest equipment and methods to maximize yields. Oregon clover seed producers routinely obtain yields of about 800 lbs/acre. A U.S. Department of Agriculture NRCS Technical Note indicated that 'AU Early Sunrise' crimson clover could be harvested by direct combining with yields of 100-200 pounds of clean seed per acre. Similar yields could be expected for other crimson clover varieties. These yields would be substantially less than those in Oregon, but within the profitability range indicated by the sensitivity analysis.

Marketing organic crimson clover seed is also a relatively new endeavor in Georgia. Like organic cereal rye seed, no readily available markets have been established. Several organic seed catalogs sell certified organic crimson clover seed, but do not sell the specific varieties adapted to the Southeast. Local seed and farm dealers may also be able to handle certified organic cover crop seed, if it is already bagged. The certified organic seeds should be stored away from chemicals or treated seeds. Another potential market is direct sales from the farm. Producers should secure a market prior to planting to help reduce the potential variability in prices received.

The cost of production varies depending on pest pressure and the type of equipment used. And like cereal rye, organic crimson clover seed production is more labor intensive. This increased labor requirement may limit producers' ability to grow seed on a large scale.

As with the cereal rye discussed above, one risk is that there are currently no certified organic seed cleaners in the state. Additional costs for working with a seed cleaner to obtain certification or for buying seed cleaning equipment are not included in the example budget.

An example of a production budget has been prepared based on the average prices, costs, and inputs used in the on-farm trials. You can use this to compare the costs provided in the budget with those on your farm to help determine the price needed to grow organic crimson clover seed profitably (Tables 5-7).



**Figure 6.** Crimson clover cover crop ready for harvest in south Georgia.

**Table 5. Organic Clover Cover Crop Seed Enterprise Budget. Screven County, GA, On-Farm Trials, Average 2009-2010, vs. Your Farm**

Gross Receipts	Unit	# of Units	\$/Unit	Receipts/Acre	Your Receipts
Organic Clover Cover Crop Seed	lb	197	\$2.00	\$394.00	
Variable Costs	Unit	# of Units	\$/Unit	Cost/Acre	Your Receipts
Clover Seed	lb	20	\$0.95	\$19.00	
Lime (Spread)	ton	-	-	-	
Organic Fertilizer (Chicken Litter)	ton	3	-	-	
Nitrogen	lb	-	-	-	
Phosphorus	lb	-	-	-	
Potash	lb	-	-	-	
Weed Control	acre	1	-	-	
Insect Control	acre	1	-	-	
Preharvest Machinery Fuel	gallon	2.9	\$2.88	\$8.45	
Preharvest Machinery Repairs & Maintenance	acre	1	\$7.25	\$7.25	
Harvest Machinery Fuel	gallon	6.1	\$2.88	\$17.45	
Harvest Machinery Repairs & Maintenance	acre	1	\$13.68	\$13.63	
Labor	hrs	7.8	\$11.00	\$85.71	
Land Rent	acre	-	-	-	
Interest on Operating Capital	percent	151	7.5%	\$5.68	
Hauling, Cleaning, & Drying	lb	246	\$0.06	\$13.54	
<b>Total Variable Costs</b>				<b>\$136.01</b>	
Fixed Costs	Unit	# of Units	\$/Unit	Cost/Acre	Your Receipts
Machinery: Depreciation, Taxes, Insurance, & Housing					
Preharvest	acre	1	\$19.13	\$ 24.78	
Harvest	acre	1	\$75.83	\$ 75.83	
General Overhead	% of variable costs	\$136	5.00%	\$6.80	
Management	% of variable costs	\$136	5.00%	\$6.80	
<b>Total Fixed Costs</b>				<b>\$108.55</b>	
<b>Total Costs Excluding Land</b>				<b>\$244.56</b>	

**Table 6. Sensitivity Analysis of Organic Clover Cover Crop Seed**

Net Returns Above Total Costs Per Acre Varying Prices & Yield (Organic Cereal Rye Cover Crop Seed)					
	bu/acre				
\$/lb	-25% 148	-10% 177	Yield 197	+10% 217	+25% 246
\$1.00	\$(97)	\$(67)	\$(48)	\$(28)	\$2
\$1.50	\$(23)	\$21	\$51	\$80	\$125
\$2.00	\$51	\$110	\$149	\$189	\$248
\$2.25	\$88	\$154	\$199	\$243	\$310
\$2.50	\$125	\$199	\$248	\$297	\$371

**Table 7. Estimated Labor and Machinery Costs per Acre of Organic Rye Cover Crop Seed**

<b>Preharvest Operations</b>				
<b>Operation</b>	<b>Labor Use (Hr.)</b>	<b>Fuel Use (Gal/Ac)</b>	<b>Machinery Repairs (\$/Ac)</b>	<b>Fixed Costs (\$/Ac)</b>
Disk Harrow with 75 hp 4WD Tractor	0.6	1.1	\$2.63	\$6.98
Lay Plots with 75 hp 4WD Tractor	0.6	0.6	\$0.98	\$2.68
Conservation Drill with 75 hp 4WD Tractor	0.6	1.3	\$3.65	\$9.48
<b>Total Preharvest Labor, Fuel, Repairs, Fixed</b>	<b>1.8</b>	<b>2.9</b>	<b>\$7.25</b>	<b>\$19.13</b>
<b>Harvest Operations</b>				
<b>Operation</b>	<b>Labor Use (Hr.)</b>	<b>Fuel Use (Gal/Ac)</b>	<b>Machinery Repairs (\$/Ac)</b>	<b>Fixed Costs (\$/Ac)</b>
2 Row Combine with Small Grain Header	4.2	5.7	\$12.65	\$73.43
Grain Cart with 75 hp 4WD Tractor	0.3	0.4	\$0.98	\$2.40
<b>Total Harvest Labor, Fuel, Repairs, Fixed</b>	<b>4.5</b>	<b>6.1</b>	<b>\$13.63</b>	<b>\$75.83</b>

## Summary

Organic cover crop seed production is a specialized niche market, but there is demand for regionally adapted certified organic seeds. Limited data from Georgia indicates certified organic cereal rye and crimson clover seed production can be profitable, but yields are lower than in other parts of the United States. Farmers should explore the market possibilities and test the feasibility of producing high quality cover crop seed on their farm on a small scale to see if organic cover crop seed production will work for them.

### *Additional Resources*

Some information on organic small grain production can be found in Chapter 4 of the “North Carolina Organic Grain Production Guide”; however, this chapter largely focuses on wheat production: [www.organicgrains.ncsu.edu/cropproduction/Production%20Guide/chapter4.htm](http://www.organicgrains.ncsu.edu/cropproduction/Production%20Guide/chapter4.htm).

Saving Our Seeds has information for farmers wanted to produce seeds: [www.savingourseeds.org](http://www.savingourseeds.org)

Other information on organic seed production from the Saving Our Seed project in the Southeast though focused on vegetable seeds can be found at: <http://www.carolinafarmstewards.org/seed-production-guides>

Production information can be found in “Managing Cover Crops Profitably”: [www.sare.org/Learning-Center/Books](http://www.sare.org/Learning-Center/Books)

### *Acknowledgements*

Many thanks to Relinda Walker of Walker Farms for working with us to conduct the on-farm trials. Also we would like to thank Jeff Wilson for providing a plot harvester in Year 1. This on-farm research trial was funded by the Organic Farming Research Foundation, and we greatly appreciate their support.

*extension.uga.edu/publications*