United States Department of Agriculture

CONSERVATION ENHANCEMENT ACTIVITY

E340G

CONSERVATION STEWARDSHIP PROGRAM

Cover crop to reduce water quality degradation by utilizing excess soil nutrients

Conservation Practice 340: Cover Crop

APPLICABLE LAND USE: Crop (Annual & Mixed); Crop (Perennial)

RESOURCE CONCERN: Water

ENHANCEMENT LIFE SPAN: 1 Year

Enhancement Description

Establish a cover crop mix to take up excess soil nutrients. Select cover crop species for their ability to effectively utilize nutrients. Terminate the cover crop as late as practical to maximize plant biomass production and nutrient uptake. Cover crop shall not be harvested, grazed, or burned.

Criteria

- Plant species, seedbed preparation, seeding rates, seeding dates, seeding depths, fertility requirements, and planting methods will be consistent with applicable local criteria and soil/site conditions **(REFER TO STATE SPECIFIC LISTS)**.
- Determine method and timing of cover crop termination to meet grower's objective and current NRCS Cover Crop Termination Guidelines. *Terminate the cover crop as late as practical to maximize plant biomass production and nutrient uptake.*
- Select species that are compatible with other components of the cropping system.
- Ensure herbicides used with crops are compatible with cover crop selections.

- Cover crops may be established between successive production crops, or companion-planted or relay-planted into production crops. Select species and planting dates that will not compete with production crop yield or harvest.
- Do not remove cover crop biomass or burn cover crop residue.
- Do not harvest or graze cover crop.
- If specific rhizobium bacteria for selected legumes are not present in the soil, treat seed with appropriate inoculum at time of planting.
- Select cover crop species for their ability to efficiently scavenge excess soil nutrients. Nutrient uptake only occurs when the cover crop is actively growing. Once the cover crop is terminated and begins to degrade the plant available nutrients that had been up taken by the cover crop will be released back to the soil. Therefore, it is imperative that the following production crop be planted as soon as possible after cover crop termination to maximize nutrient cycling and minimize offsite transport of nutrients.

CONSERVATION STEWARDSHIP PROGRAM

Documentation and Implementation Requirements

Participant will:

- ☐ Prior to implementation, provide NRCS with the current and planned crop rotation and field operation(s) used for each crop.

Document excess nutrients identified in soil tests: Soil tests should be taken as close to production crop harvest as possible.

Field	Soil Test Date	Nutrient	Soil Test Nutrient Result (ppm or lbs/ac)

Planned Management Rotation Including Cover Crop

Field	Planned Crops/Cover Crop (in sequence)	Planting Date	Harvest/Termination Date

Cover Crop Mix and Seeding Rate

Species	Variety	Seed Size	Typical Seeding Depth	Seeding Rate (PLS lbs/acre)	Percent of Mix (%)

Establishment and Management Considerations:

- ☐ Establish cover crops as soon as practical prior to or after harvest of the production crop.

Task	Provide information and details
Seedbed Preparation	
Seeding Date	
Seeding Depth	
Seeding Method	
Fertilizer, as needed	
Weed Management, as needed	
Termination Date (window)	
Termination Method	

- ☐ Prior to implementation, read and follow current NRCS Cover Crop Termination Guidelines.
- ☐ During implementation, cover crops must not be grazed, burned, harvested or biomass removed.
- ☐ During implementation, notify NRCS of any planned changes in crops, crop rotation, or unharvested areas to verify the planned system meets the enhancement criteria.
- ☐ After implementation, if changes to the cover crop and crop rotation were made, complete the tables above to document the applied Cover Crop for the contract period and provide to NRCS.

NRCS will:

- ☐ As needed, provide technical assistance in selecting cover crop mixes for the crop rotations or substitute species that would meet the criteria of the enhancement.
- ☐ As needed, provide additional assistance to the participant as requested.
- ☐ Prior to implementation, provide and explain the current NRCS Cover Crop Termination Guidelines.
- ☐ During implementation, evaluate planned adjustments in cover crop selected, timing in crop rotation, management, or field operations to verify the new system meets the enhancement criteria.

☐ After implementation, evaluate the applied crop rotation or management using information provided from the participant, if any variation to planned evaluation, document that the applied rotation met the enhancement criteria.

NRCS Documentation Review:

I have reviewed all required participant documentation and have determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name _____ Contract Number _____

Total Amount Applied _____ Fiscal Year Completed _____

_____ _____

NRCS Technical Adequacy Signature Date

ALABAMA – E340G Supplement- Cover crop to reduce water quality degradation by utilizing excess soil nutrients

Requirements:

- Applicable where no cover crops or legumes-only have been planted in the past. Cover crops must be grown during all non-crop periods and shall not be harvested or grazed.
- Crops planted following the cover crop must be no-tilled or strip-tilled.
- Calculate before and after soil loss for the field to be planted.
- a recent soil test (within last three years) is required. Nitrogen is the nutrient most likely to leach in Alabama soils; however, soil nitrogen is not measured in a routine soil test. The amount of total nitrogen applied to the preceding crop will be documented along with crop yield. Nitrogen should be applied to crops at rates not to exceed Alabama Cooperative Extension System recommendations. Refer to Agronomy Technical Note AL-73 Nitrogen Leaching Index for Alabama. The amount of N captured by the cover crop should be considered in the nitrogen budget.
- increase seeding rates by 30% if aerially applied.
- Cover crops should be planted as early as possible and terminated as late as practical for maximum biomass production. Do not terminate greater than 30 days prior to crop planting. Refer to Alabama Guide Sheet AL340A, Cover Crop Termination Timing.
- Minimum requirement is a **single species** or **two species mix** that includes any of the following: **small grain, brassicas, or sorghum-sudangrass** (sorghum-sudangrass is a warm season annual that may fit in a rotation with a short-season summer crop)**.** Radish provides excellent early fall growth if planted timely. Ryegrass may not be used. Cover crop should be at least 24 inches tall prior to termination except prior to corn planting.
- Complete the tables on the national jobsheet for documentation. In addition, receipts, copy of seed tags, weight tickets, etc. are needed. Photographs should be taken immediately prior to termination.
- Follow planting guidelines according to NRCS Conservation Practice Standard 340-Cover Crop or plant according to the table below. Other mixes may be approved by the state agronomist.

Nitrogen scavenging cover crops	Minimum lbs./ac
Examples	
1 species-small grain	65 lbs.
1 species-radish	8 lbs.
2 species-small grain, radish	50 lbs. + 3 lbs.
2 species-small grain, turnip	50 lbs. + 1.5 lbs.

*small grains- rye, wheat, oats, barley, and triticale
Legumes-crimson clover, vetch, Austrian winter pea
Brassicas-daikon radish, turnip, rape

Complete the table below:

Tract/field	Cash crop	Total N applied	Yield	Crop year
example	corn	120 lbs./ac.	125 bu.	2019

TABLE 1. PLANTS COMMONLY USED FOR COVER CROPS IN ALABAMA

Forage Crop	Seeding Rate (lb/A)	Seeding Depth (in.)	Planting Date			Remarks
			North	Central	South	
Warm Season Annual Grasses						
Millet, Browntop, Proso, & Foxtail	Drill 20 B-Cast 30	½ - ¾	May 1–Aug 1	Apr 1-Aug 15	Apr 1-Aug15	Well drained, productive soils.
Millet, Pearl	Drill 15 B-Cast 30	½ - 1½	Apr 20-Jul 1	Apr 15-Jul 1	Apr 1-Jul 15	Adapted to clay and loam soils with good summer moisture. Avoid calcareous Black Belt soils.
Sorghum-Sudan Hybrids	Drill 25 B-Cast 35	½ - 1	May 1–Aug 1	Apr 15-Aug 1	Apr 1–Aug 15	Well drained, productive soils.
Sorghum, Forage	Rows 5 B-Cast 20	1	Apr 20-May 15	Apr 20-May 15	Apr 20-Jul 1	Well drained, productive soils.
Sudangrass	Drill 25 B-Cast 35	½ - 1	May 1-Aug 1	May 1-Aug 1	May 1-Aug 1	Light sandy to heavy clay soils.
Cool Season Annual Grasses						
Small Grains (Oats, Rye, Wheat, Barley, Triticale)	90-120	1 – 2	Sep 1–Nov 1	Sep 15–Nov 1	Sep 15-Nov 15	Rye is better adapted to well drained, sandy to loam soil and is more tolerant of soil acidity than wheat or oats; Oats are cold sensitive & subject of winter kill, especially in the northern half of Alabama; Wheat more tolerant of heavy wet soils.

Table 1. (cont.) Plants Commonly Used for Cover Crops in Alabama

Forage Crop	Seeding Rate (lb/A)	Seeding Depth (in.)	Planting Date			Remarks
			North	Central	South	
Warm Season Annual Legumes						
Lespedeza, Annual	30	¼ - ½	Feb 15-Apr 1	Feb 15-Apr 1	-	Needs good drainage; tolerant of drought; low fertility and soil acidity. Avoid lime soils of Black Belt.
Cool Season Annual Legumes						
Austrian Winter Peas	40	1-2	Sept 1-Oct 15	Sept 1-Oct	Sept 1-Oct 15	Best on well drained soils.
Caley Peas	50	½ - 1	Sep 1-Oct 15	Sep 1-Oct 15	Sep 1-Oct 15	Adapted to alkaline and moderately acid Black Belt soil. Seeds are toxic.
Clover, Arrowleaf *(see note "F" if seed is coated)*	6	0 – ½	Aug 25-Oct 1	Sep 1–Oct 15	Sep 15–Nov 1	Overseed 5 weeks later. Best on well drained soils. Avoid Black Belt soils.
Clover, Ball *(see note "F" if seed is coated)*	4	0 – ¼	Sep 1-Oct 31	Sep 1-Oct 31	Sep 1-Oct 31	Adapted to most soils. Reseeds well and tolerates wet soils and flooding.
Clover, Crimson *(see note "F" if seed is coated)*	25	0 – ½	Aug 25-Oct 1	Sep 1–Oct 15	Sep 15–Nov 1	Avoid high pH soils. Best on well drained soils. Overseed 5 weeks later.
Clover, Red *(see note "F" if seed is coated)*	Drill 8 B-Cast 15	¼ - ½	Sep 15-Nov 15 Or Feb 1-Apr 1	Sep 15-Nov 15 Or Feb 1-Apr 1	Sep 15-Nov 15 -	Fertile, well drained soils.

Table 1. (cont.) Plants Commonly Used for Cover Crops in Alabama

Forage Crop	Seeding Rate (lb/A)	Seeding Depth (in.)	Planting Date			Remarks
			North	Central	South	
Clover, Subterranean *(see note "F" if seed is coated)*	10	¼ - ½	Aug 25-Oct 1	Sep1-Oct 31	Sep1-Oct 31	Best on well drained, productive soils.
Vetch, Common *(see note "F" if seed is coated)*	35	1-2	--	Sep 1-Oct 15	Sep 15-Nov 1	Best on well drained soils. Certain varieties can freeze if planted late, especially in north Alabama. Nova II is the least cold tolerant.
Vetch, Hairy *(see note "F" if seed is coated)*	25	1-2	Sep 1 –Oct 15	Sep 1-Oct 15	Sep 15-Nov 1	Best on well drained soils.
Brassicas **Daikon radish** (Tillage radish)	5	0.25 – 0.5	Aug 30	Sept 15	Sept 20	Adapted to most soils.
Rape/Canola	5	0.25 – 0.75	Aug 15	Aug 30	Sept 15	Adapted to most soils.
Turnip/Purple top	5	0.25 – 0.75	Aug 20	Aug 30	Sept 15	Adapted to most soils.

NOTES:

A. Drill = Drilled and B-Cast = Broadcast.

B. Where legumes are seeded with grasses, use the seeding dates for the grasses.

C. Where two or more grasses are used in a mixture, reduce the seeding rate of each by about one-third. Reduce the

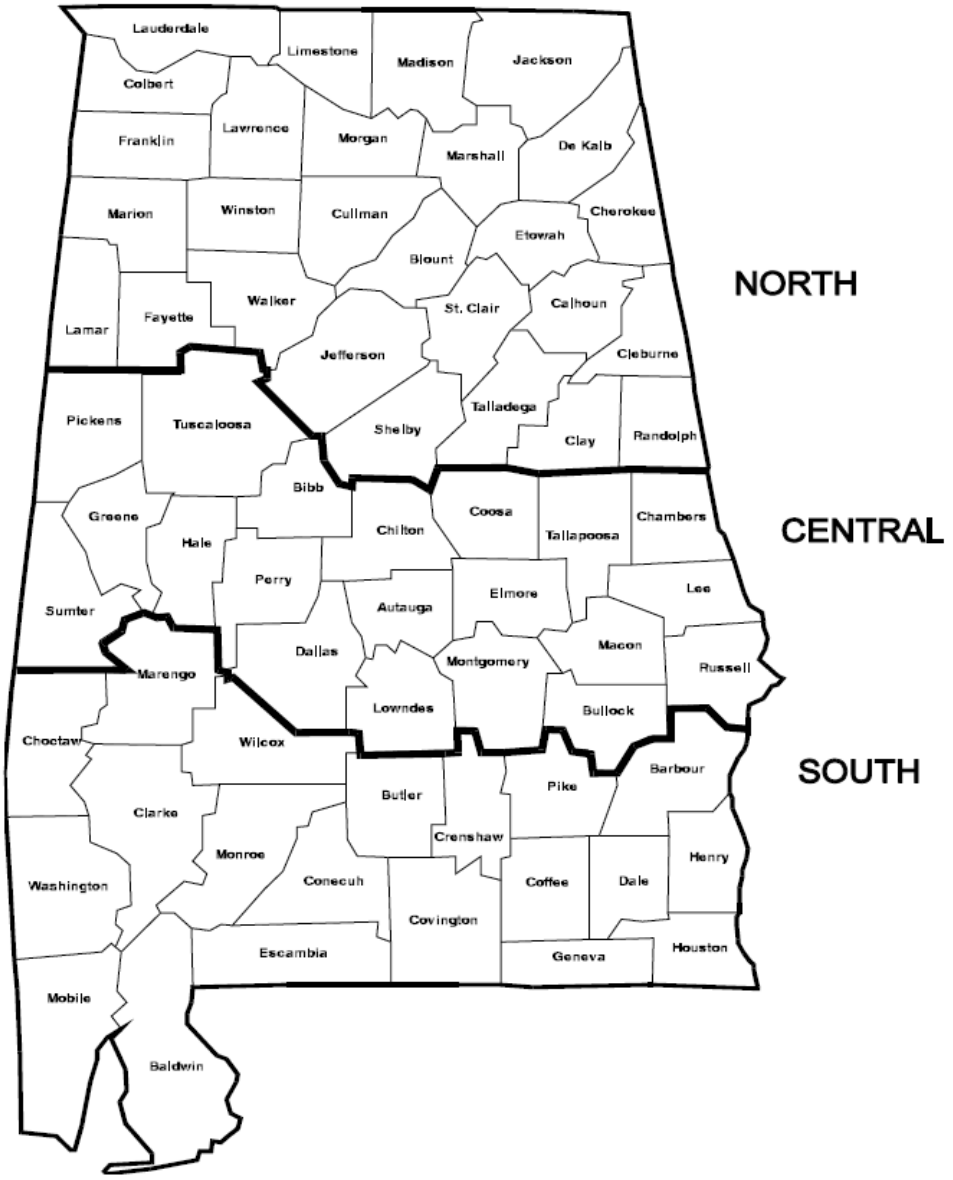
seeding rates of legumes by about 50% when used in the mixtures of three.

D. Seeding rates should be increased at least 30% when aerially seeded.

E. Seeding rates for a cost-share program shall be the rate specified by the program.

F. Consider the weight of the coated seed in your seeding recommendation to adjust for the proper PLS rate.

GEOGRAPHICAL AREAS FOR SPECIES ADAPTATION AND SEEDING DATES



U.S. Department of Agriculture

Natural Resources Conservation Service

Auburn, Alabama

AGRONOMY TECHNICAL NOTE

AL- 73

September 2014

Nitrogen Leaching Index for Alabama

A Planning Tool to Assess & Manage N Leaching

Non-leguminous crops typically require more nitrogen than Alabama soils provide in a growing season. Fertilizer, manure and legumes can all be sources of nitrogen that are required for economical crop production in Alabama. On the same note, too much available N may result in lower yields, reduce crop quality and become an environmental concern. If soil N as nitrate (NO_3^-) supply is greater than crop demand, the excess NO_3^- may leach and enter ground or surface water. Therefore, a nutrient management approach that utilizes nutrient budgeting, risk assessment and the 4 R's (Right Source, Right Rate, Right time, and Right Place) is warranted in Alabama to reduce economic and environmental risk.

NITROGEN CONCERNS IN THE ENVIRONMENT

Nitrogen is in organic and inorganic forms in soils. As much as 90 percent of soil nitrogen is in the soil organic matter, plant residue and/or animal manure/litter in an organic form. This organic nitrogen consists of proteins, amino acids, amino sugars, or in very complex unidentified substances in advanced stages of decomposition. The soil organic nitrogen, unlike inorganic forms of nitrogen, is not available for plant uptake or leaching.

The majority of nitrogen that is in the soil in an inorganic form is the result of the mineralization of organic material or the result of commercial fertilizer applications.

Organic sources of N are mineralized into the ammonium ion form (NH_4^+). Ammonium is positively charged and is attracted to negatively charged sites on soil particles, as are other cations. It is available to the plants, and will not leach. The N (NH_4^+ form) is converted to nitrate (NO_3^-) soon after its formation or addition as fertilizer.

Negatively charged nitrate remains in the soil solution and moves with soil water. Nitrate may leach out of the root zone when rainfall and/or irrigation water is excessive of plant use plus evaporation. The nitrate that leaches out of the root zone may enter the ground water and negatively affect water quality.

Consequently, in soil where the leaching potential is great, best management practices (BMP) should be instituted to reduce the risk of nitrogen leaching.

NITROGEN LEACHING INDEX CONCEPT

The Nitrogen Leaching Index (NLI) is an indicator of the potential for nitrates to reach groundwater. Nitrate, because it is water soluble, moves downward as water percolates through the soil. The extent of percolation depends on permeability, pore-size distribution, soil depth to a restrictive layer, artificial drainage, and precipitation amount and distribution over the year. For a given precipitation pattern, excessively well drained soils have a greater leaching potential than less well drained soils.

The Nitrogen Leaching Index is the product of the Percolation Index (PI) and the Seasonal Index (SI) (Williams and Kissel, 1991): NLI = (PI x SI). The Percolation Index is a function of the county annual average precipitation (AP) and soil hydrologic group. Current hydrologic groupings for each Alabama map unit can be found in the NRCS

Soil Data Mart and Web Soil Survey (WSS) by generating the "Water Features Report". Table 1 contains the NLI for all four hydrologic groups in all of the counties in Alabama.

Management Implications

An NLI below 2 indicates that the potential for nitrate leaching below the root zone is low. An NLI between 2 and 10 are moderate, between 10 and 20 are moderately high, and greater than 20 indicates that the potential for nitrate leaching below the root zone is high.

All soils in Alabama have an NLI greater than 2 and will require management to reduce the risk of nitrate leaching. In order to meet the N leaching requirements of the NRCS nutrient management standard (590), producers shall apply all nitrogen at the **"right rate"** and the **"right time"** according to the following criteria.

Management Criteria

- **Right Rate**: Total nitrogen applied shall be within 10% on field bases of the ACES recommendation (table 2). If yield potential is significantly greater or less that average, nitrogen rate may be based on "per unit of yield" for some crops. If nitrogen rates are based on "per unit of yield", realistic yield goals must be established based on historical yield data, soil productivity information, level of management, and local research results considering comparable production conditions. Realistic yield goals are often within 125% of a 3 to 5 year average yield.

- **Right Time**: All nitrogen application shall correspond as close as practical with plant nutrient uptake. Nitrogen sources should not be applied more than 30 days prior to planting (annual crops) or 30 days prior to the beginning of the growth cycle (perennial crops). Table 2 lists the "right time" for the major crops in Alabama and should be used as an indicator of crop growth and nutrient uptake. At a minimum, split applications shall be made according to ACES recommendations in table 2. Additional splitting of nitrogen applications can be made to maximize efficiency as long as the nitrogen applied is proportional to the expected growth and nutrient uptake of the crop. Since manure/litter releases nutrients over time, when it is used, two split applications can be made simultaneously on all crops. When applying the last split application of nitrogen to hay, another cutting of hay should be expected during the current growing season and for pasture, another 45 days of grazing should be expected after this last application of nitrogen.

Management Considerations

The following should be considered in all cases regardless on NLI.

- Plant small grain cover crops or over-seed perennial sod with annuals to scavenge residual nitrogen. (In situations where the previous crop did not reach the yield goal, residual nitrogen in the soil is likely.)
- Implement conservation practices to improve soil health and promote plant health and vigor.
- When available use application equipment that utilizes rate controllers, GPS guidance, automatic section control or any combination of all 3 to improve application rate and placement.
- Use variable-rate nitrogen application based on expected crop yields, soil variability, or chlorophyll concentration.

REFERENCES

Mitchell, C.C. and G. Huluka 2012. The Basis of Soil Testing in Alabama. Agronomy and Soils Departmental Series No 324A. Alabama Agricultural Experiment Station. W. Batchelor, Director. Auburn University.

Mitchell, C.C. and G. Huluka 2012. Nutrient Recommendation Tables for Alabama Crops. Agronomy and Soils Departmental Series No 324B. Alabama Agricultural Experiment Station. W. Batchelor, Director. Auburn University.

Williams, J.R., and D.E. Kissel (1991). Water percolation: an indicator of nitrogen- leaching potential. In: R.F. Follet, D.R. Keeney, and R.M. Cruse (Eds.). Managing nitrogen for groundwater quality and farm profitability. Soil Science Society of America, Inc. Madison, Wisconsin. pp 59-83.

Table 1. Alabama Nitrogen Leaching Index. (H=high leaching potential, MH=moderately high leaching potential, M=moderate leaching potential L=low leaching potential)

	------- Hydrologic Soil Group -------					------ Hydrologic Soil Group -----			
	A	B	C	D		A	B	C	D
AUTAUGA	H	MH	MH	MH	HOUSTON	H	MH	MH	MH
BALDWIN	H	H	MH	MH	JACKSON	--	H	MH	MH
BARBOUR	H	MH	MH	M	JEFFERSON	--	H	MH	MH
BIBB	H	H	MH	MH	LAMAR	H	H	MH	MH
BLOUNT	H	H	MH	MH	LAUDERDALE	--	H	MH	MH
BULLOCK	H	MH	MH	MH	LAWRENCE	H	H	MH	MH
BUTLER	H	H	MH	MH	LEE	H	H	MH	MH
CALHOUN	H	MH	MH	MH	LIMESTONE	H	H	MH	MH
CHAMBERS	H	H	MH	MH	LOWNDES	H	MH	MH	MH
CHEROKEE	--	H	MH	MH	MACON	H	MH	MH	MH
CHILTON	H	H	MH	MH	MADISON	H	H	MH	MH
CHOCTAW	H	H	MH	MH	MARENGO	H	H	MH	MH
CLARKE	H	H	MH	MH	MARION	H	H	MH	MH
CLAY	--	H	MH	MH	MARSHALL	H	MH	MH	MH
CLEBURNE	--	H	MH	MH	MOBILE	H	H	MH	MH
COFFEE	H	H	MH	MH	MONROE	H	H	MH	MH
COLBERT	H	H	MH	MH	MONTGOMERY	H	MH	MH	MH
CONECUH	H	H	MH	MH	MORGAN	H	H	MH	MH
COOSA	--	H	MH	MH	PERRY	--	H	MH	MH
COVINGTON	H	H	MH	MH	PICKENS	H	H	MH	MH
CRENSHAW	H	H	MH	MH	PIKE	H	MH	MH	MH
CULLMAN	--	H	MH	MH	RANDOLPH	H	H	MH	MH
DALE	H	MH	MH	MH	RUSSELL	H	MH	MH	M
DALLAS	H	MH	MH	MH	SHELBY	--	H	MH	MH
DE KALB	--	H	MH	MH	ST CLAIR	--	H	MH	MH
ELMORE	H	H	MH	MH	SUMTER	H	H	MH	MH
ESCAMBIA	H	H	MH	MH	TALLADEGA	--	H	MH	MH
ETOWAH	--	H	MH	MH	TALLAPOOSA	H	H	MH	MH
FAYETTE	H	H	MH	MH	TUSCALOOSA	H	H	MH	MH
FRANKLIN	H	H	MH	MH	WALKER	--	H	MH	MH
GENEVA	H	MH	MH	MH	WASHINGTON	H	H	MH	MH
GREENE	H	H	MH	MH	WILCOX	H	H	MH	MH
HALE	H	H	MH	MH	WINSTON	--	H	MH	MH
HENRY	H	MH	MH	MH					

Table 2. Nitrogen (N) management criteria for row crops, forage and pastures, based on Alabama Cooperative Extension System recommendations.

Crop	Type	Right Rate	Right Time	Additional Information
Row Crops				
Canola			Apply 40 to 50 lb of N near planting in the fall, apply 90 to 120 lb N in February just prior to crop bolting.	If canola follows a good legume in the fall (peanuts or soybean), reduce the fall N application to 20 lb per acre.
		160 lb/ac		
Corn				
	Non- Irrigated	120 lb/ac	Apply 25% to 50% of N near planting and side dress the remainder when plants are about knee-high.	
	Irrigated	200 lb/ac		
	Silage	200 lb/ac		
Corn rate per unit yield				
	Non- Irrigated	1 lb/bu up to 120 bu any amt. over 120 bu will have a rate of 1.25 lb/bu	Apply 25% to 50% of N near planting and side dress the remainder when plants are about knee-high.	
	Irrigated			
	Silage	10 lb/ton		
Cotton			Apply N near planting; or 20 to 30% near planting and side dress the remainder prior to early square bloom.	On land where excessive growth causes a problem reduce N rate by 20 to 30 lb/ac; when vegetative growth has been inadequate increase N rate by 20 to 30 lb/ac.
		90 lb/ac		
Peanuts			N is not required for legumes.	N in the form of manure/litter can be applied to peanuts up to a rate of 100 lb/ac available N near planting.
		0 lb/ac		
Small Grains			Apply 20 lb/ac N near planting and 60 to 80 lb/ac N at Feeke's growth stage 4 for south Alabama and growth stage 4-6 for north Alabama.	If a small grain is following a heavily fertilized corn crop, a good peanut or soybean crop, or a drought-damaged crop that could not utilize all the fertilizer N applied, often no fall N will be needed.
	Harvest Grain	100 lb/ac		
	Cover Crops	30 lb/ac	Apply 30 lb/ac N near planting	

Row Crops (cont.)				
Small Grains rate per unit yield			Apply 20 lb/ac N near planting and the remainder at Feeke's growth stage 4 for south Alabama and growth stage 4-6 for north Alabama	
	Barley	1.4 lb/Bu		
	Oats	1.0 lb/Bu		
	Rye	1.7 lb/Bu		
	Wheat	1.7 lb/Bu		
Sorghum			Apply 25% to 50% of N near planting and side dress the remainder approximately 30 after planting.	
	Grain	80 lb/ac		
	Silage	200 lb/ac		
	Sweet	80 lb/ac		
Sorghum rate per unit yield			Apply 25% to 50% of N near planting and side dress the remainder approximately 30 after planting.	
	Grain	2 lb/cwt		
	Silage	10 lb/ton		
Soybean				N in the form of manure/litter can be applied to soybeans equal to the estimated N removal in harvested plant biomass near planting.
		0 lb/ac	N is not required for legumes.	
Pasture and Forage Crops				
Alfalfa				N in the form of manure/litter can be applied to legumes equal to the estimated N removal in harvested plant biomass as growth begins.
		0 lb/ac	N is not required for legumes.	
Annual Legumes				N in the form of manure/litter can be applied to legumes equal to the estimated N removal in harvested plant biomass as growth begins.
Arrowleaf clover, ball clover, crimson clover, caley peas, lespedeza and vetch		0 lb/ac	N is not required for legumes.	
Bermuda or Bahiagrass Hay			Apply 100 lb/ac as growth begins in spring and after each cutting up to September 1, or apply 50 pounds N per ton of anticipated hay removed in the next cutting.	
Improved varieties		100 lb/ac/cutting		
Bermuda or Bahiagrass Hay per unit yield				
Improved varieties		50 lb/ton		

Pasture and Forage Crops (cont.)				
Cool Season Annual Grasses			For planting made in early September, apply 100 pounds of N per acre near planting and 60 pounds per acre in early spring.	If planted in late fall, apply 60 pounds of N per acre near planting and 60 pounds per acre in early spring. Ryegrass planted alone for grazing should receive no more than 60 pounds of N in the fall and up to 100 pounds N in the early spring
	Pasture or Hay	160 lb/ac		
Cool Season Annual Grasses rate per unit yield			For planting made in early fall, apply 60% of the N near planting and the remainder in early spring.	
	Pasture or Hay	50 lb/ton		
Cool Season Annual Grasses with legumes			Apply 60 lb/ac N near planting. If legumes make up at least 50% of the ground cover in late winter or early spring do not apply additional N.	
		60 lb/ac		
Cool Season Perennial grass				
	Pasture	120 lb/ac	Apply 60 lb/ac N around September 1st and 60 lb/ac in February	
Cool Season Perennial Grasses rate per unit yield			Apply 40 lb N/ton of anticipated yield in February.	If forage is needed in fall for grazing apply up to 60 lb/ac N around September 1st. For hay 35 lb of additional K2O per ton of anticipated yield may be needed.
	Hay	40 lb/ton		
Cool Season Perennial grass with legumes			Do not apply N if legumes make up 33% or more of the ground cover.	If legumes do not make up 30% of ground cover apply 60 lb/ac N around September and 60 lb/ac in February
	Pasture	0 lb/ac		
Sericea Lespedeza			N is not required for legumes.	N in the form of manure/litter can be applied to legumes equal to the estimated N removal in harvested plant biomass as growth begins.
		0 lb/ac		

Pasture and Forage Crops (cont.)				
Warm Season Annual grass			Apply 60 lbs/ac of N in spring before growth begins and an additional 60 lbs/ac of N after each hay cutting or after each time the forage is grazed down up to September 1	
	Pasture or Hay	60 lb/ac/cutting or grazing period		
Warm Season Annual Grasses rate per unit yield			Apply N rate per yield for expected yield in spring before growth begins and an additional N rate per yield for expected yield after hay cutting or after each time the forage is grazed down up to September 1	For hay 35 lb of additional K2O per ton of anticipated yield may be needed.
	Hay	40 lb/ton		
Warm Season Perennial grass			Apply 60 lbs/ac of N in spring before growth begins and an additional 60 lbs/ac of N when more growth is needed up to September 1	
	Pasture	60 lb/ac/grazing period		
Warm Season Perennial grass with perennial or late maturing legume			If legume makes up 33 percent or more of the stand, do not apply N. Apply 60 pounds of N per acre if legumes do not makes up 33 percent and extra growth is needed.	
		0 lb/ac		