NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

COVER CROP

(Ac.)

CODE 340

DEFINITION

Crops including grasses, legumes and forbs for seasonal cover and other conservation purposes.

PURPOSE

1. Reduce erosion from wind and water.
2. Increase soil organic matter content.
3. Capture and recycle or redistribute nutrients in the soil profile.
4. Promote biological nitrogen fixation.
5. Increase biodiversity.
6. Weed suppression.
7. Provide supplemental forage.
8. Soil moisture management.
9. Reduce particulate emissions into the atmosphere.
10. Minimize and reduce soil compaction.

CONDITIONS WHERE PRACTICE APPLIES

On all lands requiring vegetative cover for natural resource protection and or improvement.

CRITERIA

General Criteria Applicable to All Purposes

Plant species, seedbed preparation, seeding rates, seeding dates, seeding depths, fertility requirements, and planting methods will be consistent with approved local criteria and site conditions.

Cover crop species, seeding rates, and seeding dates for Louisiana are listed in Appendix 1- Planting Rates for Louisiana by MLRA's.

The species selected will be compatible with the Nutrient Management (590) and Pest Management (595) components of the conservation plan.

Cover crops can be broadcast, drilled, or conventionally planted. Species such as crimson clover, ryegrass, vetch, and singletary peas can be broadcast in row crops without seedbed preparation if moisture is adequate. Cover crops can be seeded directly into rice stubble if drainage is adequate. If seedbed preparation is necessary, select an implement which leaves as much residue on the soil surface as possible.

If fertilizer is needed for cover crop establishment and growth, nutrients should be applied according to soil test analysis and Louisiana Cooperative Extension Service (LCES) recommendations contained in the nutrient management component of the conservation plan. Fertilizer is usually not needed on alluvial soils or following a well fertilized crop.

The species selected will be compatible with other components of the cropping system. Cover crops will be terminated (e.g. frost, mowing, herbicides, etc) to allow sufficient time for residue to start to breakdown and to allow adequate time to prepare for the following crop.

Avoid using plants that are noxious or invasive.

Cover crop residue will not be burned.

Additional Criteria to Reduce Erosion from Wind and Water

Cover crop establishment, in conjunction with other practices, will be timed so that the soil will be adequately protected during the critical erosion period (late winter – early spring).

Plants selected for cover crops will have the physical characteristics necessary to provide adequate protection.

The amount of surface and/or canopy cover needed from the cover crop shall be determined using current erosion prediction technology.

Additional Criteria to Increase Soil Organic Matter Content

Cover crop species will be selected on the basis of producing high volumes of organic material and or root mass to maintain or improve soil organic matter.

The NRCS Soil Conditioning Index (SCI) procedure will be used to determine the amount of biomass required to have a positive trend in the soil organic matter subfactor.

The cover crop will be terminated as late as feasible to maximize plant biomass production and still allow ample time for seedbed preparation for the succeeding crop.

Additional Criteria to Capture and Recycle Excess Nutrients in the Soil Profile

Cover crops will be established and actively growing before the expected period(s) of nutrient leaching.

Cover crop species will be selected for their ability to take up large amounts of nutrients from the rooting profile of the soil.

When used to redistribute nutrients from deeper in the profile up to the surface layer, the cover crop will be killed in relation to the planting date of the following crop. If the objective is to best synchronize the use of cover crop as a green manure to cycle nutrients, factors such as the carbon/nitrogen ratios may be considered to kill early and have a faster mineralization of nutrients to match release of nutrient with uptake by following cash crop. A late kill may be used if the objectives are to use as a biocontrol and maximize the addition of organic matter. The right moment to kill the cover crop will depend on the specific rotation, weather and objectives.

Cereal grains, native, and improved grasses, with their extensive root systems are most efficient at removing excess nitrogen from the soil profile. Grass/clover mixtures are capable of removing significant amounts of phosphorus from the soil profile. Legumes alone use only moderate amounts of phosphorus because they are slower to establish and generally yield less than grasses. Legumes reduce phosphorus in runoff primarily by reducing erosion.

Additional Criteria to Promote Biological Nitrogen Fixation

Only legumes or legume-grass mixtures will be established as cover crops.

The specific Rhizobium bacteria for the selected legume will either be present in the soil or the seed will be inoculated at the time of planting. If a field has a history of a particular legume species, inoculation will probably be unnecessary. If inoculation is needed, prepare slurry of the inoculants with nonchlorinated water and sugar or a cola soft drink. The addition of sugar to water or the use of cola to make the slurry helps the Rhizobium bacteria to adhere to the seed. Pour the slurry onto the seed, mix well to coat the seed, and allow to dry before seeding.

Legume cover crops have the potential to fix large amounts of nitrogen in the soil. Legume cover crops should be killed in the early to mid-bloom stage to maximize nitrogen fixation. Realistically, however, allowing legume cover crops to reach this stage will delay timely planting of the succeeding crop following their destruction. Nitrogen credits for several legume and non-legume cover crops are contained in Table 1 of this standard. The credits in Table 1 are based on cover crop research conducted at the LSU Agricultural Research Stations and by the Cooperative State Research Education and Extension Service (CSREES).

Additionally, Sustainable Agriculture Research and Education (SARE) programs use a rule-of-thumb to estimate availability of nitrogen. Total nitrogen production is divided by 2 if the cover

crop is conventionally tilled into the soil or chemically killed and left on the surface in no-till systems in southern climates. The N credits in Table 1 were derived by dividing the total N values for various cover crops applying the rule-of-thumb.

Additional Criteria to Increase Biodiversity

Cover crop species shall be selected that have different maturity dates, attract beneficial insects, increase soil biological diversity, serve as a trap crop for damaging insects, and/or provide food and cover for wildlife habitat management.

Additional information on cover crop species that are beneficial for wildlife can be found in the conservation practice standards Upland and Wetland Wildlife and Wildlife Habitat Management (645 and 644 respectively).

Additional Criteria for Weed Suppression

Species for the cover crop will be selected for their chemical or physical characteristics to suppress or compete with weeds.

Cover crops residues will be left on the soil surface to maximize allelopathic (chemical) and mulching (physical) effects.

For long-term weed suppression, reseeding annuals and/or biennial species can be used.

Additional Criteria to Provide Supplemental Forage

Species selected will have desired forage traits, be palatable to livestock, and not interfere with the production of the subsequent crop.

Forage provided by the cover crop may be hayed or grazed as long as sufficient biomass is left for resource protection.

Additional information on grazing cover crop species can be found in the conservation practice standards Pasture and Hayland Planting (512) and Prescribed Grazing (528).

Additional Criteria for Soil Moisture Management

Terminate growth of the cover crop sufficiently early to conserve soil moisture for the subsequent crop. Cover crops established for moisture conservation shall be left on the soil surface until the subsequent crop has established a stand or throughout the growing season if moisture is a limiting factor.

In areas of potential excess soil moisture, allow the cover crop to grow as long as possible to maximize soil moisture removal.

Additional Criteria to Reduce Particulate Emissions into the Atmosphere

Manage cover crops and their residues so that at least 80% ground cover is maintained during planting operations for the following crop.

Additional Criteria to Minimize and Reduce Soil Compaction

Select and manage cover crop species that will produce deep roots and large amounts of surface or root biomass to increase soil organic matter, improve soil structure and increase soil moisture through better infiltration.

CONSIDERATIONS

Plant cover crop in a timely matter to establish a good stand.

Maintain an actively growing cover crop as late as feasible to maximize plant growth, allowing time to prepare the field for the next crop and moisture depletion.

Use deep-rooted species to maximize nutrient recovery.

Use grasses to utilize more soil nitrogen, and legumes utilize both nitrogen and phosphorus.

Avoid cover crop species that harbor or carryover potentially damaging diseases or insects.

For most purposes for which cover crops are established, the combined canopy and surface cover is at nearly 90 percent or greater, and the above ground (dry weight) biomass production is at least 4,000 lbs/acre.

Cover crops may be used to improve site conditions for establishment of perennial species.

Use plant species that enhance bio-fuels opportunities.

Use plant species that enhance forage opportunities for pollinators.

Follow NRCS policy on cultural resources.

PLANS AND SPECIFICATIONS

Plans and specifications will be prepared for the practice site. Plans for the establishment of cover crops shall include:

- Species or species of plants to be established.
- Seeding rates.
- Recommended seeding dates.
- Establishment procedure.
- Planned rates and timing of nutrient application.
- Planned dates for destroying cover crop.
- Other information pertinent to establishing and managing the cover crop.

Plans and specifications for the establishment and management of cover crops may be recorded in narrative form, on job sheets, or on other forms.

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OPERATION AND MAINTENANCE

Control growth of the cover crop to reduce competition from volunteer plants and shading.

Control weeds in cover crops by mowing or by using other pest management techniques.

Control soil moisture depletion by selecting water efficient plant species and terminating the cover crop before excessive transpiration.

REFERENCES

Bowman, G., C. Cramer, and C. Shirley. A. Clark (ed.). 1998. Managing cover crops profitably. 2nd ed. Sustainable Agriculture Network Handbook Series; bk 3. National Agriculture Library. Beltsville, MD.

Hargrove, W.L., ed. Cover crops for clean water. SWCS, 1991.

Magdoff, F. and H. van Es. Cover Crops. 2000. p. 87-96 *In* Building soils for better crops. 2nd ed. Sustainable Agriculture Network Handbook Series; bk 4. National Agriculture Library. Beltsville, MD.

Reeves, D.W. 1994. Cover crops and erosion. p. 125-172 *In* J.L. Hatfield and B.A. Stewart (eds.) Crops Residue Management. CRC Press, Boca Raton, FL

Table 1. Nitrogen Credits From Various Cover Crops in Louisiana

COVER CROP	N CREDITS (LBS/ACRE)
Arrowleaf Clover	68
Austrian Winter Peas	43
Ball Clover	55
Barrel medic	62
Berseam clover	60
Big flower vetch	48
Bur Clover (Circle Valley)	69
Bur Clover (Serena)	75
Common Vetch (Cahaba White)	53
Crimson Clover (Chief)	75
Crimson Clover (Tibbee)	66
Hairy Vetch	60
Lupin (Tifblue78)	72
Red Clover (Chesapeak)	66
Singletary Peas	65
Sour Clover	57
Subterranean Clover (Meteora)	48
Subterranean Clover (Mt. Barker)	59
Subterranean Clover (Woogenellup)	59
Soybeans (Grain)	20
Soybeans (Cover) Fallow	17
Ryegrass (Gulf)	25
Wheat	24