NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

CONSERVATION CROP ROTATION

(Acre)

CODE 328

DEFINITION

Growing crops in a planned sequence on the same field.

PURPOSE

This practice may be applied to support one or more of the following:

- Reduce sheet and rill or wind erosion.
- Improve soil quality.
- Manage the balance of plant nutrients.
- Supply nitrogen through biological nitrogen fixation to reduce energy use.
- Conserve water.
- Manage saline seeps.
- Manage plant pests (weeds, insects, and diseases).
- Provide food for domestic livestock.
- Provide annual crops for bioenergy feedstocks.
- Provide food and cover for wildlife, including pollinator forage, cover, and nesting.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all land where annually-planted crops make up at least one-third of the crop sequence by time basis.

For the purposes of this practice, a cover crop is considered a crop in the rotation.

CRITERIA

General Criteria Applicable to All Purposes

Crops shall be grown in a planned sequence as outlined in Plans and Specifications.

Additional Criteria to Reduce Sheet and Rill or Wind Erosion

The selected crops and the planned sequence shall produce sufficient quantities of biomass or crop residue at the appropriate times so that, when accounting for other practices in the management system, sheet and rill and/or wind erosion is reduced to or below the planned soil loss objective for the planning area.

The amount of biomass or crop residue needed shall be determined using current approved erosion prediction technology. Biomass removal will be managed to retain enough crop residues to limit erosion.

Cover or green manure crops planted specifically for this purpose may be grazed as long as grazing is managed to retain adequate biomass.

Additional Criteria to Improve Soil Quality

The crops grown shall produce a positive OM (organic matter) subfactor value over the life of the rotation, as determined by the Soil Conditioning Index (SCI) procedure in the current version of the erosion models, with appropriate adjustments for additions to or subtractions from biomass on the field.

The planned crop sequence will contain different crop types as specified below. Acceptable crop types are to be grown in a rotation of warm season grass (WSG); warm season broadleaf (WSB); cool season grass (CSG); or cool season broadleaf (CSB).

Examples of acceptable rotations are:

- A two-crop sequence must contain a warm season and a cool season crop;
- A three-crop sequence must contain a warm season and a cool season crop as a minimum, neither of these crops may be grown in two consecutive years;
- A four-crop sequence must contain a mix of warm season and cool season crops with no crop repeated in the rotation.
- Longer crop sequences may have more than two consecutive years of the same crop type, as long as that crop type does not occupy more than ⅔ of the crop rotation.

Biomass will not be removed from fields managed for soil quality improvements.

Additional Criteria to Manage the Balance of Plant Nutrients

Crop selection and sequence shall be determined using an approved nutrient balance procedure. Biomass harvesting will remove nutrients and affect the nutrient balance calculations.

To reduce excess nutrients in the soil profile, use crops with:

- quick germination and root system formation,
- a rooting depth sufficient to reach the nutrients not removed by the previous crop, and
- nutrient requirements such that they can readily utilize the excess nutrients.

Additional Criteria to Supply Nitroen through Biological Nitrogen Fixation to Reduce Energy Use

When crop rotations are designed to add nitrogen to the system, nitrogen-fixing crops shall be grown immediately prior to or interplanted with nitrogen-requiring crops.

Additional Criteria to Conserve Water

Select crops and varieties and the sequence of crops based on local climate potential and/or irrigation water availability, and an approved water balance procedure.

Additional Criteria to Manage Saline Seeps

Select crops to be grown in the recharge area of saline seeps that have rooting depths and water requirements adequate to fully utilize all plant available soil water. Do not use summer fallow. Crop selection and sequence shall be determined using an approved water balance procedure.

If excess subsoil moisture exists below the rooting depth of crops commonly grown in the recharge area, deep-rooted perennial crops shall be established for the number of years needed to dry the soil profile.

Crops grown in the discharge area of saline seeps shall be selected with a tolerance to salinity levels that matches the salinity of the discharge area.

Additional Criteria to Manage Plant Pests (Weeds, Insects, Diseases)

Design the crop sequence to break pest lifecycles and/or to allow for the use of a variety of control methods.

Remove susceptible crops and alternate host crops from the rotation for the period of time needed to break the life cycle of the targeted pest.

Resistant varieties, listed in appropriate university publications or other approved sources, shall be selected where there is a history of a pest problem.

Additional Criteria to Provide Food for Domestic Livestock

Select crops that balance the feed supply with livestock numbers. Determine the required amount of selected crops using an approved forage-livestock balance procedure.

Grazing of crops is the desired method of harvesting forage. Cutting silage or hay from crop fields removes nutrients and surface protection from fields.

Tillage, planting, and harvest operations will be managed to leave adequate residue for resource protection based on the approved erosion prediction technology.

Additional Criteria to Provide Annual Crops for Bioenergy Feedstocks

Select crops suitable for the site conditions and the bioenergy feedstocks objectives.

Additional Criteria to Provide Food and Cover for Wildlife

Select the crops and crop management activities that provide either food or cover for the targeted wildlife species using an approved habitat evaluation procedure.

CONSIDERATIONS

When used in combination with the Strip-cropping (585), the crop sequence should be consistent with the stripcropping design.

Soil compaction can be reduced by adjusting crop rotations to include deep rooted crops that are able to extend to and penetrate the compacted soil layers.

Where improving water use efficiency on deep soils is a concern, rotating or combining deep-rooted crops with shallow rooted crops can help utilize all available water in the soil profile.

Where pesticides are used, use a combination of pesticide application methods and crop rotation to reduce the potential for pesticide carryover or adverse affects on aquatic wildlife or habitat through runoff.

Additional Considerations to Reduce Sheet and Rill or Wind Erosion.

When used in combination with the Residue and Tillage Management practices (codes 329, 345, and 346), selection of high-residue producing crops and varieties, use of cover crops and adjustment of plant population and row spacing can enhance production of the kind, amount, and distribution of residue needed.

Crop damage by wind erosion can be reduced with this practice by selecting crops that are tolerant to abrasion from wind-blown soil or tolerant to high wind velocity.

If crops sensitive to wind erosion damage are grown, the potential for plant damage can be reduced by crop residue management, field windbreaks, herbaceous wind barriers, intercropping, or other methods of wind erosion control.

Additional Considerations to Improve Soil Quality

Soil organic matter levels are more sensitive to tillage than to long rotations with perennial vegetation. Therefore, reducing or eliminating tillage from a management system will increase soil organic matter quicker than rotations with several years of perennial vegetation.

The effects of this practice can be enhanced by utilizing animal wastes or applying mulches to supplement the biomass produced by crops in the rotation.

Additional Considerations to supply Plant Produced Nitrogen to Conserve Energy

Select crops that have a potential to provide larger amounts of biologically fixed nitrogen.

Select crop and management strategy to match the nitrogen release from residues of nitrogen-fixing crops, taking into account climate, soil physical and chemical properties C:N ratio of residues of the nitrogen-fixing crop, and timing of nitrogen demand by the subsequent crop.

for Wildlife, Beneficial Insects, and Pollinators

Crop residues may be a valuable food source for wintering wildlife where winter browse is sparse. Leaving several rows unharvested around the edges of the field, or planting borders of various forbs will provide protection and/or food for overwintering wildlife and for beneficial insects and pollinators.

Crop plantings may be developed to benefit particular communities, species or life stages of wildlife. Food plots or crops for wildlife could be provided as part of a habitat restoration project as an initial food and cover source for wildlife until food and cover producing vegetation becomes established.

Retaining bolting or flowering crops for some time after harvest may provide beneficial insects with an important nectar source when and where pests are active.

Biological control of various crop pests can be provided by:

- crop rotations that include plant species that provide habitat for beneficial insects such as buckwheat or *Phacelia;*
- the use of plant species that produce chemical substances that control nematodes or other disease causing organisms (allelopathy)
- the use of insectory field borders, and

- intercropping of species that provide forage and nesting resources for beneficial insects.

Careful consideration should be given to pesticide use if applied to crops raised for wildlife, particularly if nesting habitat or pollinator forage species are present.

When insect-pollinated crops are part of the rotation, planting them no more than 800 feet from their previous location may help maintain local populations of native bees that have become established because of the presence of that crop.

To maintain stable pollinator and beneficial insect populations, ensure that the same overall density of floral resources is maintained from year-to-year. For example two years of flower-rich plantings, followed by a year of only grasses, will be undesirable causing a rapid decline in pollinator populations.

PLANS AND SPECIFICATIONS

Plans and specifications shall include:

- field number and acres
- purpose(s) of the crop rotation
- the sequence of crops to be grown,
- the crop types to be grown
- length of time each crop/crop type will be grown in the rotation, and
- total length of rotation

Specifications shall be recorded using approved specification sheets, narrative statements in the conservation plan, or other acceptable documentation.

OPERATION AND MAINTENANCE

Rotations shall provide for acceptable substitute crops in case of crop failure or shift in planting intentions for weather related or economic reasons. Acceptable substitutes are crops having similar properties that will accomplish the purpose of the original crop.

Evaluate the rotation and the crop sequence to determine if the planned system is meeting the planned purposes.

REFERENCES

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