NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

CONSERVATION CROP ROTATION

(Acre)

CODE 328

DEFINITION

Growing crops in a recurring sequence on the same field.

PURPOSES

This practice may be applied as part of a conservation management system to support one or more of the following:

- Reduce sheet and rill erosion.
- Improve soil quality.
- Reduce soil erosion from wind.
- Maintain or improve soil organic matter content.
- Manage the balance of plant nutrients.
- Improve water use efficiency.
- Manage saline seeps.
- Manage plant pests (weeds, insects, and diseases).
- Provide food for domestic livestock.
- Provide food and cover for wildlife.
- Supply nitrogen through biological nitrogen fixation to reduce energy use.
- Conserve water.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all land where crops are grown, except:

This standard does not apply to pastureland, hayland, or other land uses where crops are grown occasionally only to facilitate renovation or re-establishment of perennial vegetation.

CRITERIA

General Criteria Applicable To All Purposes

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

Crops shall be adapted to the climatic region, the soil resource, and the goals of the producer. Adapted crops and varieties, listed in appropriate university publications or other approved sources, shall be selected.

A conservation crop rotation may include crops planted for cover or nutrient enhancement.

Crops shall be selected that produce sufficient quantities of biomass at the appropriate time to reduce erosion by water or wind to within acceptable soil loss levels. In those instances where crops selected do not produce sufficient biomass to meet this criteria, a cover crop (see Cover Crop, 340) or other appropriate practices shall be used. The amount of biomass needed shall be determined using current approved erosion prediction technology. Soil loss estimates shall account for the effects of other practices in the conservation management system.

Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact your Natural Resources Conservation Service Oregon NRCS State Office or visit the Field Office Technical Guide.

Pesticides used in a conservation crop rotation shall be registered and applied in accordance with authorized uses, consistent with directions on the label and other federal, state and local requirements.

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, with appropriate adjustments for additions to or subtractions from biomass.

Additional Criteria To Maintain Or Improve Soil Organic Matter Content

Crops shall be selected that produce the amount of plant biomass needed to maintain or improve soil organic matter content, as determined using the current approved Soil Conditioning Index Procedure or determined by approved research.

If partial removal of residue by means such as baling or grazing occurs, enough residues shall be maintained to achieve the desired soil organic matter content goal.

Cover and green manure crops planted specifically for soil improvement may be grazed, as long as grazing is managed to retain adequate biomass.

Refer to Oregon Agronomy Technical Note No. 33, May 2000, Soil Conditioning Index for Cropland Management Systems to determine the relative effect on soil organic matter. The minimum soil condition index rating for the crop rotation shall be 0.00.

Additional Criteria To Manage the Balance of Plant Nutrients

Crop selection and sequence shall be determined using an approved nutrient balance procedure.

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

To reduce excess nutrients, crops or cover crops having rooting depths and nutrient requirements that utilize the excess nutrients shall be grown.

Additional Criteria To Improve Water Use Efficiency

Selection of crops and varieties, sequence of crops, or the annual decision to plant a crop or to fallow, shall be determined using an approved water balance procedure.

Additional Criteria To Manage Saline Seeps

Crops grown in the recharge area of saline seeps shall be selected for rooting depths and water requirements adequate to fully utilize all plant available soil water. Summer fallow will not be used. 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 for their tolerance to salinity levels in the discharge area.

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

Crops shall be alternated to break the pest cycle and/or allow for the use of a variety of control methods. Affected crops and alternate host crops shall be removed 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.

Reclamation strategies for severe pest infestations utilizing residue removal will be performed only after a full evaluation of the impacts on soil, water, air, plant, animals and human resources. Soil erosion estimates for the rotation will account for the amount of residue removed. Estimated erosion will be controlled within the soil loss tolerance (T) or any other accepted soil loss objective.

Additional Criteria To Provide Food For Domestic Livestock

Crops shall be selected to balance the feed supply with livestock numbers. The needed amount of selected crops shall be determined using an approved forage-livestock balance procedure.

Additional Criteria To Provide Food And Cover For Wildlife

Crop selection to provide either food or cover for the targeted wildlife species will be grown, managed, or left unharvested as per the needs of the targeted wildlife as determined by an approved habitat evaluation procedure.

Refer to Oregon Biology Technical Note No. 27, Wildlife Habitat Evaluation Guides to evaluate and determine criteria for wildlife food and cover.

Additional Criteria to Supply Nitrogen 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.

CONSIDERATIONS

Typical crop rotations may include small grains, pulse crops, oilseed crops, row crops, grass and/or legume crops grown for seed or forage in recurring sequences. Crop rotations may be from 1 up to 14 years in length and may include double cropping in one year. Generally, when annually tilled crops in rotation with pasture or hay production are less than 20 percent of the expected rotation cycle, the appropriate landuse is pasture or hay and the Conservation Crop Rotations standard is not used.

When used in combination with CROSS WIND STRIPCROPPING (589B) or STRIPCROPPING CONTOUR (585), the crop sequence should be consistent with the stripcropping design.

When used in combination with RESIDUE MANAGEMENT practices, 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.

With some low residue crops such as vegetables, dry or green peas, lentils, annual clover seed, etc., it may be necessary to use no till or direct seed to meet residue management practice criteria.

Where maintaining or improving soil organic matter content is an objective, the effects of this practice can be enhanced by managing crop residues, tillage practices, utilizing animal wastes, or applying mulches to supplement the biomass produced by crops in the rotation.

Where excess plant nutrients or soil contaminants are a concern, utilizing deep rooted crops or cover crops in the rotation can help recover or remove the nutrient or contaminant from the soil profile.

Where precipitation is limited, seasonal or erratic moisture can be conserved for crop use by maintaining crop residues on the soil surface to increase infiltration and to reduce runoff and evaporation. Where winter precipitation occurs as snow, additional moisture can be obtained for crop use by trapping snow with standing residue, windbreaks, or other barriers.

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.

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.

Where pesticides are used, consider application methods and the crop rotation to avoid negative impacts on the following crop due to residual herbicides in the soil or adverse affects on aquatic wildlife or habitat through runoff.

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, as well as avoiding crops that require field operations when the soils are wet.

Leaving several rows unharvested around the edges of the field will provide protection and/or food for overwintering wildlife.

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.

Crop residues may be a valuable food source for wintering wildlife where winter browse is sparse.

Careful consideration should be given to pesticide use if applied to crops raised for wildlife.

This practice has the potential to have either a positive or negative affect National Register listed or eligible (significant) cultural resources (archeological, historic or traditional cultural properties). Care should be taken, especially during site preparation and maintenance, to avoid adverse effects to these resources. Follow NRCS state policy for considering cultural resources during planning and maintenance.

PLANS AND SPECIFICATIONS

Specifications for establishment and operation of this practice shall be prepared for each field or treatment unit according to the Criteria, Considerations, and Operation and Maintenance described in this standard. Specifications should include the sequence of crops to be grown, length of time each crop will be grown and total length of rotation.

Specifications shall be recorded using Cropland Specification Sheets OR-CONS-20 and 21, other approved specification sheets, job 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 meet the criteria for all the resource concerns identified for the field or treatment unit.

In areas where summer fallow is practiced, the decision to plant a crop or fallow shall be made annually based on soil moisture at planting time. Fields shall be fallowed

only when soil moisture is not adequate to produce a crop. If moisture supply is adequate but limited, short-season shallow-rooted crops shall be selected and grown. Deep-rooted crops shall follow shallow-rooted crops in subsequent years, if needed, to utilize all plant available water in the root zone.

The decision to use a small grain-fallow rotation in the dryland crop region of eastern Oregon shall be guided by economics, operator objectives and Agronomic Zone criteria as described in PNW Extension Bulletin, PNW 345, September 1990.

REFERENCES

Pacific Northwest Conservation Tillage Handbook, Chapter 4, Disease Control, Chapter5, Weed Control, Chapter ^, Fertility, Chapter 7, Plant Development, Chapter * Crops and Varieties, Northwest Extension Bulletin, University of Idaho, Oregon State University, Washington State University.

Crop Residue Management to Reduce Erosion and Improve Soil Quality, Northwest, May 1995, USDA, Agricultural Research Service, Conservation Report Number 40.

Long-Term Management Effects on Soil Productivity and Crop yield in Semi-Arid Regions of Eastern Oregon, Station Bulletin 675, November 1989, USDA, Agricultural Research service and Agricultural Experiment Station, Oregon State University.

Agronomic Zones for the Dryland Pacific Northwest, PNW 345, September 1990, Pacific Northwest Extension Publication, Idaho, Oregon and Washington.

Grass seed Production in Oregon, Oregon, NRCS, Agronomy Technical Note No. 8.

Effects of Crop Rotation and No Till Crop Establishment on Grass Seed Production Systems in the Willamette valley, Oregon, Oregon, NRCS, Agronomy Technical Note No. 30.

Soil Conditioning Index for Cropland Management Systems Oregon, NRCS, Agronomy Technical Note No. 33.

Section I, Erosion Prediction, Oregon Field Office Technical Guide.

Pulse Crop Alternatives for Pacific Northwest Crop Rotations, Oregon, NRCS, Agronomy Technical Note No. 28.