

NATURAL RESOURCES CONSERVATION SERVICE
MONTANA CONSERVATION PRACTICE STANDARD

ALLEY CROPPING (ACRE)

CODE 311

DEFINITION

Trees or shrubs are planted in sets of single or multiple rows with agronomic, horticultural crops or forages produced in the alleys between the sets of woody plants that produce additional products.

PURPOSE

- Enhance microclimatic conditions to improve crop or forage quality and quantity.
- Reduce surface water runoff and erosion.
- Improve soil health by increasing utilization and cycling of nutrients.
- Alter subsurface water quantity or water table depths.
- Enhance wildlife and beneficial insect habitat.
- Increase crop diversity.
- Decrease offsite movement of nutrients or chemicals.
- Increase carbon storage in plant biomass and soils.
- Develop renewable energy systems.
- Improve air quality.

CONDITIONS WHERE PRACTICE APPLIES

On all cropland and hayland where trees, shrubs, crops and/or forages can be grown in combination.

CRITERIA

General Criteria Applicable to All Purposes

Combinations of crops or forages and woody plants shall be compatible and complementary, **and provide the products and crops that meet landowner objectives.**

Plants shall be adapted to the climatic region and the soil resource. **Plants shall be marketable and suited to the landowner's equipment and management capabilities.**

Species must be suited and adapted to the soils, climate and purpose [see Montana Field Office Technical Guide (FOTG), Section II, Conservation Tree/Shrub Suitability Group (CTSG) for a detailed listing of species suited to the soils at the site].

Crop or forage sequence and woody species selection shall be determined using an acceptable nutrient balance procedure. Plants selected will maximize the utilization and cycling of soil nutrients and plant residues to maintain soil organic matter content.

Moisture conservation or supplemental watering shall be provided for plant establishment and growth where natural precipitation is too low for the selected species.

Select pest resistant plant varieties.

Avoid selecting tree or shrub species, which provide habitat to pests of the accompanying crop or forage.

Select crop, forage, tree and/or shrub varieties based on their tolerance to agriculture chemicals that will be used at the site.

NRCS, MT
June 2011

Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard contact the Natural Resources Conservation Service.

NOTE: This type of font (**AaBbCcDdEe 123..**) indicates NRCS National Standards.
This type of font (**AaBbCcDdEe 123..**) indicates Montana Supplement.

Refer to FOTG, Section IV, Practice Standards and Specifications, Range Planting (Code 550) and/or Forage and Biomass Planting (Code 512) for suitable forage species.

Design for Montana

Plant trees or shrubs in a set or series of single or multiple rows with crops or forages cultivated in the alleys between the rows of woody plants.

The distance between the sets of trees or shrubs will be determined by the following:

- Tree or shrub management objectives;
- Light requirements and growth period of the crops or forages in the alleys;
- Erosion control needs;
- Machinery widths and turning areas.

Soil erosion will be controlled by vegetative or other means until the alley cropping design is fully functional.

Refer to FOTG, Section IV, Practice Standards and Specifications, Tree/Shrub Establishment (Code 612), for further guidance on planting trees and shrubs.

Avoid planting trees or shrubs where they will interfere with structures and above or below ground utilities.

Planting dates, care in handling, and planting the seed, seedlings, or cuttings will be accomplished to assure acceptable plant survival.

Only viable and high quality planting stock or seed will be used for establishing the tree or shrub rows.

Site preparation shall be sufficient for establishment and growth of selected species and appropriate for the site.

Additional Criteria to Reduce Surface Water Runoff and Erosion

Tree or shrub rows will be oriented on or near the contour to reduce water erosion.

To reduce surface water runoff and erosion, herbaceous ground cover will be established in conjunction with the tree or shrub rows.

To reduce wind erosion, tree or shrub rows will be oriented as close as possible perpendicular to erosive winds.

Selected species of trees and shrubs will be relatively deep rooted to encourage infiltration.

Additional Criteria to Increase Carbon Storage

Select tree and shrubs species with rapid growth rates.

Plant/manage the appropriate density for the site that will maximize above and below ground biomass production.

Minimize soil disturbance through use of no-till methods.

Additional Criteria to Develop Renewable Energy Systems

Select plants that can provide adequate kinds and amounts of plant biomass to supply identified bioenergy needs.

Intensity and frequency of energy biomass removals will be managed to prevent long-term negative impacts on the system.

The harvesting of energy biomass shall be accomplished in a manner that will not compromise the other intended purpose(s) and functions.

Additional Criteria to Improve Air Quality

Residue from the alley-crop shall be left on the surface.

Use plant species in the alley that provide full ground coverage during establishment and harvest operations.

Select and maintain tree/shrub species with foliar and structural characteristics that optimize interception, adsorption and absorption of particulates.

Tree or shrub rows will be oriented as close to perpendicular as possible to prevailing wind direction during the critical air period.

CONSIDERATIONS

Species diversity including use of native species should be considered to avoid loss of function due

to species-specific pests or enhance wildlife needs.

Consider the invasive potential when selecting plant species.

High value trees or shrubs should be selected to maximize economic returns.

Coppice ability of selected species of trees and shrubs should be considered when they are to be pruned or harvested periodically.

Select crops, forages and woody plants:

- for water requirements not to exceed available soil water
- with compatible rooting depths to better utilize available soil moisture
- **based on their tolerance to agriculture chemicals that will be used at the site.**

Consider modifying microclimatic conditions and habitat to enhance biological pest management.

Fencing may be necessary to protect plantings from livestock and/or wildlife.

Consider the use of a weed fabric barrier in woody plantings to control vegetative competition, increase plant survival, improve plant vigor and growth, and reduce maintenance measures.

PLANS AND SPECIFICATIONS

Plans and specifications for applying this practice shall be prepared for each site and recorded using approved specification sheets, job sheets, technical notes and narrative statements in the conservation plan, or other acceptable documentation.

As a minimum, the Alley Cropping practice will have the following components in its plan and specifications:

- **A narrative that describes the producer's goals and objectives. Identify why the practice is needed and feasible.**

- **An environmental assessment of the planned practice that includes the potential impacts on soil, water, animals, plants, air and humans.**
- **An alternatives narrative that identifies and describes several methods that could be used to address the resource issue. Also identifying the producer-selected method.**
- **The Montana Alley Cropping specification and practice job sheet.**
- **Plan map and soil map of site with location of practice on the map.**
- **Operations and maintenance instructions.**

OPERATION AND MAINTENANCE

The trees, shrubs, crops and/or forages will be inspected periodically and protected from adverse impacts including insects, diseases or competing vegetation.

The trees or shrubs will also be protected from fire and damage from livestock or wildlife.

All other specified maintenance measures and techniques of tree/shrub establishment will continue until plant survival and establishment are assured. This includes replacement of dead and dying trees or shrubs, pruning of dead or damaged branches for safety reasons, periodic pruning of selected branches for control of product quality, and control of undesirable competing vegetation.

Any removals of tree or shrub products, use of agricultural chemicals, and maintenance operations shall be consistent with the intended purpose of the practice.

The type, use and timing of maintenance equipment will be appropriate to accomplish operation and maintenance tasks. Avoid damaging the site and soil and comply with applicable federal, state, tribal, and local regulations pertaining to on-site and off-site effects.

Root pruning of the tree/shrub row may be necessary to control moisture/nutrient competition with adjacent crop or forage.