

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD
CONNECTICUT**

ALLEY CROPPING

(Ac.)

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 quality 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.
- Improve air quality.
- Decrease depletion of native topsoil and minimize soil degradation.

CONDITIONS WHERE PRACTICE APPLIES

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

This practice also applies on land where trees and shrubs are grown and harvested as

ornamentals and where an assessment indicates that the soil resource is subject to degradation or depletion by removal of native topsoil. An inventory of existing soil conditions will be completed prior to practice implementation to provide a baseline for restoration.

CRITERIA

General Criteria Applicable to All Purposes

Combinations of crops or forages and woody plants shall be compatible and complementary.

Plants shall be adapted to the climatic region and the soil resource.

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.

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 Connecticut NRCS Standard 612, Tree/Shrub Establishment for further guidance on planting and establishing permanent stands of trees and shrubs.

Refer to Connecticut NRCS Standard 484, Mulching for further guidance on applying plant residues, by-products, or other suitable materials produced off site, to the land surface

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 Improve Air Quality

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

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.

Additional Criteria to Decrease Depletion of Native Topsoil and Minimize Soil Degradation

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

Utilize root-containment bags, pot-in-pot culture, or above ground pot techniques in rows that are on or near the contour of the field slope. Refer to Connecticut NRCS Standard 330, Contour Farming for minimum and maximum row grades.

Topsoil native to the farm (field soil) shall not be used as growth medium inside root-containment bags, pot-in-pot culture, or above ground pots. Growth medium used in containers shall be a manufactured soil mix or soil compost mix. Growth medium used shall not come from sources that degrade other farmland areas.

Topsoil native to the farm (field soil) shall not be stripped and stockpiled to accommodate production.

Topsoil native to the farm that is removed for pot-in-pot and root containment bags shall be handled in a manner that allows full restoration for subsequent agricultural uses.

Select an irrigation system to supply adequate water to the root zone. Refer to Connecticut NRCS Standards 449, Irrigation Water Management and 441, Irrigation System - Microirrigation.

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.

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.

Select crops, forages and woody plants with compatible rooting depths to better utilize available soil moisture.

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

PLANS AND SPECIFICATIONS

Specifications for this practice shall be prepared for each site. They shall include, but are not limited to:

- recommended species,
- seeding rates and dates,
- establishment procedures,
- other management actions needed to insure an adequate stand,
- other management actions needed to protect and restore the native topsoil

Specifications for each site shall be recorded using approved specifications sheets, job sheets, narrative statements in the conservation plan, or other acceptable documentation. Seeding specifications shall be included on all drawings. These documents shall as a minimum, specify the requirements for establishing the vegetation and include the kind, quantity and quality of materials to be used.

AS BUILT DRAWINGS

As-built drawings for structural practices shall include a statement documenting the plant materials used and procedures followed and indicating the status of the seeding or planting at the time of construction completion an listing any maintenance requirements. As built drawings shall be prepared which show all pertinent elements and elevations as actually installed. A copy shall be provided to the owner / operator upon construction completion.

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. Avoid damaging the site and soil and comply with applicable federal, state and local regulations pertaining to on-site and off-site effects.

Mowing and harvest operations in perennial crop systems such as orchards, vineyards, berries, and nursery stock shall be done in a manner which minimizes the generation of particulate matter.

REFERENCES

From: Best Management Practices for Field Nursery Production - Compiled by Christopher Miller, NRCS, Plant Materials Specialist - Unpublished

General reference

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Seeds of Woody Plants in North America by James Young and Cheryl Young. (Formerly USDA Forest Service Ag. Handbook 450) 1992. Dioscorides Press

The Reference Manual of Woody Plant Propagation by Michael Dirr and Charles Heuser. 1987. Varsity Press, Inc.

Nursery design and production references - American Standard for Nursery Stock. 1996. American Association of Nurserymen.

Container Nursery Design by Bonnie Lee Appleton. 1986. American Nurseryman Publishing Company, Inc.

Best Management Practices, Guide for Producing Container-Grown Plants by Tom Yeager, Donna Fare, Charles Gilliam, Alex Niemiera, Ted Bilderback, and Ken Tilt, 1997. Southern Nurserymen's Association.

Best Management Practices for Field Stock Production. T. E. Bilderback, R.E. Bir and M.A. Powell. North Carolina State University. Cooperative Extension Service

Nursery Management (3rd edition) by Harold Davidson, Roy Mecklenburg and Curtis Peterson. 1994. Prentice Hall.

Nursery Production (2nd edition) edited by Charles Heuser and Richard Stinson. 1989. Dept. of Ag. and Ext. Educ. Vol. 28, No. 1T and 1S, Penn State University.

Nursery Production Alternatives for Reduction or Elimination of Circling Tree Roots. Bonnie Appleton. 1993. Journal of Arboriculture 19(6):383-388.

Nursery Production Methods for Improving Tree Roots - An Update. Bonnie Appleton. 1995. Journal of Arboriculture 21(6):265-270.

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Pruning Field Grown Shade and Flowering Trees. By T. E. Bilderback, R.E. Bir and M.A. Powell. Horticultural Information Leaflet NO. 406.

The pour-through nutrient extraction procedure. Robert D. Wright. 1986. HortScience 21:227-229.

Trade publications

American Nurseryman, 77 W. Washington Street, Suite 2100, Chicago, IL 60602-2904 1-800-621-5727; 312-782-5505; published semimonthly (24 issues per year) - fee.

NMPro (Nursery Management & Production), PO Box 1868, Fort Worth, TX 76101 1-800-946-6776; 817-882-4120; published monthly (12 issues per year) – free