Alley Cropping (Acre) 311

DEFINITION

Trees or shrubs 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.

PURPOSES

- 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

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

Design the location, layout, species, and density of the trees and shrubs to accomplish the purpose(s) and intended function(s) for both the agronomic, horticultural, or forage crops, as well as the trees or shrubs.

Select plants that are adapted to the climatic region and the soil resource. *Refer to the Michigan NRCS Conservation Tree/Shrub Suitability Guide (CTSG) in Section II of the Michigan NRCS Field Office Technical Guide and/or other appropriate reference material to assist with tree/shrub selection.*

Select pest resistant plant varieties, if possible.

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.

Select native woody plants when possible.

Determine crop or forage sequence and woody species selection using an acceptable nutrient balance procedure. Select plants that will maximize the utilization and cycling of soil nutrients and plant residues to maintain soil organic matter content.

Incorporate moisture conservation or supplemental watering during plant establishment and growth where natural precipitation is too low for the selected species.

Determine the distance between the sets of trees or shrubs 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.

Control soil erosion by vegetative or other means until the alley cropping design is fully functional.

Refer to the Michigan NRCS Tree/Shrub Site Preparation (490) and Tree/Shrub Establishment (612) Conservation Practice Standards for further guidance on establishing trees and shrubs.

Additional Criteria to Reduce Surface Water Runoff and Erosion

Orient tree or shrub rows along or near the contour to reduce water erosion.

To reduce surface water runoff and erosion, establish herbaceous ground cover immediately upslope and adjacent to the tree or shrub rows. Refer to the Michigan NRCS Contour Buffer Strips (332) Conservation Practice Standard.

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

Control soil erosion by wind or water to "T" for the soil map unit listed in Section II of the Field Office Technical Guide using vegetative or other means until the alley cropping design is fully functional. Account for the effects of other practices in the conservation plan when calculating erosion control.

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 the use of no-till methods.

Additional Criteria to Improve Air Quality

Leave residue from the alley-crop on the surface.

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

Orient tree or shrub rows as close to perpendicular as possible to prevailing wind direction during the critical air period.

Additional Criteria to Decrease Offsite Movement of Nutrients or Chemicals

Develop a crop budget for nutrient management of crops, forages, and trees/shrubs according to the Michigan NRCS Nutrient Management (590) Conservation Practice Standard.

Apply pesticides at the proper times, amounts, and in accordance to the label and the Michigan NRCS Pest Management (595) Conservation Practice Standard.

Assess pesticides for surface runoff loss and leaching potential using the latest available pesticide screening tools such as WIN-PST (Windows Pesticide Screening Tool).

CONSIDERATIONS

Prune and/or thin trees and shrubs to reduce shading and improve crop productivity, if needed. Refer to Michigan NRCS Tree/Shrub Pruning (660) Conservation Practice Standard.

Consider species diversity to avoid loss of function due to species-specific pests or enhance wildlife needs.

Select high value trees or shrubs to maximize economic returns.

Consider the coppice ability of trees and shrubs that 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.

Tree and shrub rows may provide over-wintering sites and refuge for beneficial insects, mites, and spiders. Once established, minimize the physical or chemical disturbance to the trees or shrubs. See the Michigan NRCS Conservation Buffers and Beneficial Insects, Mites, and Spiders Conservation Information Sheet in the MI NRCS Field Office Technical Guide, Sec IV, MI Conservation Sheets, Folder 1, Agronomy.

Where fruit species are planted that are sensitive to frost damage, consider row orientation and air drainage needs in relationship to the landscape and slope direction.

Consider regular tree/shrub root pruning to reduce competition with crops and forages, and "train" tree/shrub roots to move deeper in the soil, increasing crop yields.

PLANS AND SPECIFICATIONS

Use the Michigan NRCS Alley Cropping (311) Conservation Design Sheet, other approved specification sheets, job sheets, technical notes, narrative statements in the conservation plan, or

other acceptable documentation to prepare specifications.

Specifications will include, but are not limited to the following items:

- *Map indicating location of practice*
- *Species to be planted*
- *Number and spacing of trees and/or shrubs*
- *Site preparation and establishment techniques*
- *Timing of planting and other activities*
- Operation and maintenance requirements

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.

Replace dead planted trees and shrubs to retain at least 90% survival with no two adjacent plants missing within a row, and to maintain the function of the practice.

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.

REFERENCES

Garrett, H.E. and R.L. McGraw. 2000. Alley Cropping Practices. p. 149-188. *In* H.E. Garrett, W.J. Rietveld and R.F. Fisher (eds.) North American Agroforestry: An Integrated Science and Practice. American Society of Agronomy, Inc. Madison, WI.

Hodge, Sandra, H.E. Garrett, and J. Bratton. 1999. Agroforestry Notes: Alley Cropping. AF Note – 12. USDA National Agroforestry Center. Lincoln Nebraska. http://www.unl.edu/nac/agroforestrynotes/an12ac01.pdf

USDA Natural Resources Conservation Service. 1999. Chapter 3a, Alley Cropping. p. 13-20. *In* Core4 Conservation Practices: The Common Sense Approach to Natural Resource Conservation. USDA-NRCS. Washington, D.C. http://www.nrcs.usda.gov/technical/ecs/agronomy/core4.pdf

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