Alley Cropping (Acre) 311

DEFINITION

Trees or shrubs planted in single or multiple rows with agronomic, horticultural, or forage crops cultivated in the alleys between the rows of woody plants.

PURPOSES

Produce tree or shrub products (wood, nuts, Christmas trees, foliage, berries, fodder, mulch, etc.) along with crops or forages to improve or optimize the economic viability of the operation. This practice will be accomplished as part of a conservation management system with one or more of the following purposes:

- Improve crop diversity, quality, quantity, and economic returns.
- Reduce excess surface water runoff and erosion.
- Improve utilization and recycling of nutrients.
- Provide food and cover habitat for wildlife.
- Enhance biological pest control.
- Moderate microclimate for crops or forage.
- Enhance the aesthetics of the area.
- Decrease nutrient/chemical loss.
- Reduce excess subsurface water or control water table depth.

CONDITIONS WHERE PRACTICE APPLIES

On all lands where crops or forages are grown and where diversification of economic or environmental conditions is desired.

CRITERIA

General Criteria Applicable To All Purposes Named Above

- The location, layout, species, and density of the trees and shrubs will accomplish the purpose(s) and intended function(s) for both the agronomic, horticultural, or forage crops, as well as the trees or shrubs.
- Plant species selection will be based on the physical characteristics of the site including: soil texture, drainage, slope, aspect, and climatic factors.
- Combinations of crops or forages and woody plants shall be compatible and complementary and provide the products and crops that meet landowner objectives.
- Crops or forages shall be adapted to the climatic region and the soil resource, marketable, and suited to the landowner's equipment and management capabilities.
- Crop or forage sequence and woody species selection shall be determined using an acceptable nutrient balance procedure. Select crops, forages, and woody species to maximize the utilization and recycling of soil nutrients, animal wastes, and plant residues and to maintain soil organic matter content.
- Select crops, forages, and woody species on the basis of rooting depths, water and nutrient requirements, and possible allelopathic interactions.
- Select pest resistant and compatible crop/forage and tree/shrub varieties.
- Select native woody plants when possible and avoid trees or shrubs, which provide habitat to animals, birds, or insects considered to be pests of the accompanying crop or forage.
- Tree and shrub rows may provide over-wintering sites and refuge for beneficial insects, mites, and spiders. Once established, physical or chemical disturbance to the trees or shrubs should be minimized to less than once every three years. (See NRCS Conservation Information Sheet: Buffers and Beneficial Insects, Mites, and Spiders.)

- Tree or shrub management objectives, light requirements, and growth period of the crops or forages will determine the distance of the trees or shrubs within the rows and between the rows. Erosion control needs and machinery widths will also be considered.

- Crops (woody and herbaceous) shall be grown in a planned conservation management system.

- Site preparation and weed control shall follow recommendations made in the NRCS Conservation Design Sheet 612: Weed Control for Tree and Shrub Establishment and MSU-E Bulletin 434: Weed Control Guide for Field Crops.

Additional Criteria To Reduce Excess Surface Water Runoff And Erosion

Tree or shrub rows will be oriented across the slope or on the contour to control water erosion. Tree and shrub rows will be oriented perpendicular to troublesome winds to control wind erosion or crop damage.

A herbaceous strip (follow guidelines in Michigan NRCS Standard 332 - Contour Buffer Strips) will be developed immediately upslope and parallel to each woody planting row.

Use multi-row woody plantings.

Soil erosion by wind or water will be controlled 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. Calculations for erosion control will account for the effects of other practices in the Conservation Plan.

Climate For Crops - Additional Criteria To Moderate Micro or Forages

Pruning and/or thinning of trees and/or shrubs may be needed to reduce shading and improve crop productivity. Refer to Michigan NRCS Standard 660 - Tree/Shrub Pruning.

Additional Criteria To Improve Utilization Of Nutrients And Decrease Loss Of Pesticides And Fertilizers

A crop budget for nutrient management of crops, forages, and trees/shrubs will be developed according to Michigan NRCS Standard 590 - Nutrient Management. Also see MSU-E Bulletins: EO-550A Fertilizer Recommendations for Field Crops in Michigan, EO-852 Fertilizing Fruit Crops, or EO-550B Fertilizing Vegetable Crops.

Pesticides will be applied at the proper times, amounts, and in accordance to the label and Michigan NRCS Standard 595 - Pest Management. Pesticides will be screened for surface runoff loss and leaching potential using the latest available pesticide screening tools such as: the DOS version of WIN-PST (Windows Pesticide Screening Tool).

CONSIDERATIONS

Observation of planting dates and care in handling and planting the seed or seedlings will assure acceptable plant survival. Only viable and high quality planting stock or seed of adapted woody species will be used for establishing the tree or shrub rows. (See MSU-E Bulletin E-771: Tree Planting in Michigan.)

Crop, forage, tree, and /or shrub varieties selected should be tolerant to herbicides that will be used in the management of the crops, forages, trees, or shrubs.

Spacing between the rows of trees or shrubs may be adjusted to accommodate equipment widths and turn-arounds.

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

Consider species diversity including use of native species to avoid loss of function due to species-specific pests.

Tree or shrub selection should maximize economic returns while meeting other client objectives.

Anticipate possible off-site effects and modify the practice design accordingly.

Woody Species Selection

Base plant selection on site characteristics or limitations, landowner objectives, projected canopy characteristics, and sunlight and moisture requirements for the agronomic or forage crop. Tables 1a, 1b, and 1c list selected woody species that may have potential as an alley cropping choice.

Other species may be used providing they meet the selection criteria listed above.

Tree Spacing And Layout

See Michigan NRCS Standard 612 - Tree/Shrub Establishment for within row spacing guidance. When multiple row woody plantings are used, stagger row plantings. Use Michigan NRCS Standard 332 - Contour Buffer Strips as a guide for determining the spacing distance between woody plant rows when erosion control is a concern. See Michigan NRCS Standard 612 - Tree/Shrub Establishment for within row spacing guidance. When multiple row woody plantings are used, stagger row plantings. Use Michigan NRCS Standard 332 - Contour Buffer Strips as a guide for determining the spacing distance between woody plant rows when erosion control is a concern.

PLANS AND SPECIFICATIONS

Specifications are to be prepared for each field according to this standard. Specifications include the amount and species of vegetation, establishment methods, as well as the operation and maintenance required to assure that the practice achieves its intended purpose. Consult Michigan NRCS Standard 612 - Tree/Shrub Establishment and use applicable approved Michigan Conservation Design Sheets, Job Sheets, or narrative statements in the conservation plan for documentation.

OPERATION AND MAINTENANCE

Integrated Pest Management (IPM) principles will be used to inspect trees, shrubs, crops, and/or forages to protect them from adverse impacts from insects, diseases, or competing vegetation. The trees or shrubs will also be protected from fire, wildlife, and livestock damage.

All other specified maintenance measures and techniques of tree/shrub establishment are assured. This includes replacement of dead and dying trees or shrubs and control of undesirable competing vegetation.

Any removal of tree or shrub products and use of fertilizers, pesticides, and other chemicals shall be conducted in accordance with all laws and labeling and in a manner that maintains the intended purpose.

The type, use, and timing of maintenance equipment will be appropriate to accomplish operation and maintenance tasks while not damaging or degrading the site and soil conditions.

After the fifth year following establishment, woody lateral roots shall be pruned regularly. See Interim Michigan NRCS Standard 747 - Woody Root Pruning.

Table 1a - Potential Shrub/Small Tree Species for Use in Alley Cropping

Common Name (denotes non-native species)*	*Upland*	*Bottom Land*	*Human Products*	*Wildlife Food*	*Showy Flowers*	*Plant height (ft.)*	*Comments*
American Plum	x	x	x	x	x	15-20	Jellies, preserves, and wine
* Apple, Cherries, Pears	x		x	x	x	variable	Use commercial varieties
Blackberry, Raspberry	x		x	x		6-8	Use commercial varieties
* Crabapple	x	x	x	x	x	20-25	Jellies, preserves
Hazelnut	x		x	x		3-10	Sweet nuts
Pawpaw	x	x	x	x		Up to 30	Large, edible, nutritious, fruit
Serviceberry	x			x	x	20-30	Excellent for wildlife
Witch Hazel	x		x		x	Up to 30	Medicinal uses

Table 1b - Potential Pine Species for Use in Alley Cropping						
Common Name (* denotes non-native species)	***Wood Products***	***Christmas Trees***	***Wildlife Food and Habitat***	***Nursery Material***	***Windbreak Value***	***Comments***
* Concolor Fir		x		x	x	Beautiful foliage color, shallow roots
* Blue Spruce		x	x	x	x	High ornamental value, spreading, shallow roots
White Pine	x		x		x	Does best on well drained sites, moderately deep roots
White Spruce	x	x	x		x	Adaptable to wide range of sites, shallow roots
Eastern Redcedar	x		x		x	Adaptable to wide range of sites, deep roots
White Cedar	x		x		x	Shallow, spreading roots, adaptable to wet sites

Table 1c - Potential Hardwood Tree Species for Use in Alley Cropping										
Common Name (* = non-native)	***Upland***	***Bottom Land***	***Wood Products 1***	***Bio-mass Fuel-wood***	***Food Products***	***Wildlife Food***	***Leaf Initia-tion 2***	***Leaf Drop 3***	***Canopy Shade***	***Comments***
Basswood	x		x				Early	Mid	Full	Wood used for carving, honey production, deep roots
Black Locust	x		x	x			Mid	Mid	Light	Excellent fuel wood, very deep roots, seed pods poisonous
Black Walnut	x	x	x		x	x	Late	Early	Light	Deep well drained sites, deep, wide spreading roots
Bur Oak	x	x	x			x	Late	Late	Full	Drought tolerant, deep roots
Butternut	x				x	x	Late	Early	Light	Well drained sites, taproot with shallow laterals
White ash	x	x	x				Mid	Mid	Medium	High quality hardwood, deep roots
Honey Locust	x	x		x		x	Mid	Early	Light	Use thornless variety, wide, deep roots
* Hybrid Poplar	x		x	x			Mid	Early	Light	Fast growing, shallow rooting
N. Red Oak	x		x			x	Late	Late	Full	Wood is prized in the Orient, deep roots
Sugar Maple	x		x		x		Early	Mid	Full	Maple syrup and quality wood, shallow, wide spreading roots
White Oak		x	x	x	x	x	Late	Late	Full	Fine hardwood, deep rooting
Yellow-Poplar	x	x	x				Mid	Mid	Medium	Fast growing, deep, wide spreading roots
Green Ash	x	x	x				Mid	Mid	Medium	Adapted to a wide range of sites, shallow roots
Black Cherry	x		x			x	Mid	Mid	Medium	Fine hardwood, moderately deep roots

1 - Includes: fruits, nuts, jellies, jams, wine, syrup, honey, herbals, etc.
2 - Start of leaf growth -Early: by mid-April; Mid: mid-April to May 1; Late: after May 1.
3 - Begin of leaf drop - Early: before mid-October; Mid: mid-October to November 1; Late: after November 1.