Adventures in Agroforestry

Janet E. Hawkes, PhD
5th National Small Farm Conference
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What is Agroforestry

“Agroforestry is an intensive land management system that optimizes the benefits from the biological interactions created when trees and/or shrubs are deliberately combined with crops and/or livestock.”

Association for Temperate Agroforestry
Six Temperate Agroforestry Practices

- Forest Farming
- Alley Cropping
- Windbreaks
- Silvopasture
- Riparian Buffers

+ Woody Crop Plantations
- windbreaks,
- alley cropping,
- silvopasture,
- riparian buffers and
- forest farming
- woody crop plantations

Within each agroforestry practice, there is a continuum of options available to landowners depending on their own goals (e.g., whether to maximize the production of interplanted crops, animal forage, or trees), or optimize all in an integrated system.
Alley Cropping

Josiah, Univ. of Minnesota Extension
Alley width depends on purpose, tree canopy, crop sensitivity, crop rotation, crop or forage grown.
The alley cropping concept

Litterfall and prunings provide mulch. Nutrients are returned to soil when mulch decomposes.

Runoff and erosion reduced by mulch

Crop residues returned to the soil

Soil erosion impeded by trees and shrubs

Nitrogen contribution from leguminous species

Nutrients absorbed by deep-rooted trees and shrubs

New nutrients from weathering rock

Nutrients absorbed by food crops

Nutrients leached and percolated to the subsoil
Riparian Buffers

Josiah, Univ. of Minnesota Extension
Called many things:

- Buffer strips
- Filter strips
- Vegetative filter strips
- Vegetative buffer strips
- Riparian buffers
- Buffer zones
- Forested riparian buffers
- Conservation buffers
- Vegetative buffers
- Contour buffer strips
- Strip cropping
- Wastewater treatment strips
Contour Buffer Strips
(+ grassed waterways and forested riparian buffers)
STREAM BANK BUFFER
Red osier dogwood
*Cornus stolonifera*

Woody florals
Shrubs with market value
$0.35 – $2 per stem wholesale

Riparian Forest Buffers & Income Generation
Windbreaks

Josiah, Univ. of Minnesota Extension
RPM Advantage/Performance

Planting in SW Missouri with NRCS Support

August 2004

August 2007 - 83 trees, NO WATER, 3 died
Purpose: Provide living screens for noise abatement, visual quality, and chemical drift reduction
Silvopasture
Silvopasture Design

Understanding and Taking Advantage of – Interactions --
TWO APPROACHES

Establish trees in pastures

Establish pastures in trees
Thinning natural stands and establishing domestic forages for grazing
INTEGRATING TREES, FORAGES, AND ANIMALS

Silvopasture Management:

- Site Selection
- Tree Species + Density
- Light level
- Forage Species
- Animal Maintenance - (including intensive rotational grazing)
Examples of Desirable Trees
Integrating Silvopastures into Forage-Livestock Systems

- Numerous greenhouse, field and pasture studies show that silvopastures can be productive.

- But... limited research on how silvopastures fit into a “system”

- Missouri Study: Feasibility of introducing silvopasture as part of a whole-farm forage-livestock system
Forage Growth Differences

Silvopasture:
- Forages start growth earlier in spring, continue later in fall
- Forage yields higher in heat of summer

(Kallenbach, Univ. of Missouri Center for Agroforestry)
Results of Silvopasture Research*

Cows in the Integrated system

- Lost approximately 10% less weight over winter
- Had less stress at calving
- Weaned heavier calves

Improved forage quality:

- Reduced lignin & improved digestibility
- Increased or no change in crude protein
- Improved N content

Overall returns in the Integrated system were about $42.63 per pair greater than in the Traditional system

*University of Missouri Center for Agroforestry
Forest Farming

Josiah, Univ. of Minnesota Extension
“Intentional manipulation of forest lands to produce a regular supply of food, medicinal, ornamental and other non-timber forest products.”

- Hill & Buck

“... an intensive, multi-story cropping system for cultivating high-value timber and non-timber forest products”

- Gallagher

Forest Farming

Maple

Medicinals

Mushrooms

Nuts

Fruits

Ornamentals
Woody Crop Plantations
Poplar at 10 x 10 ft (3 m) spacing for biomass
Hazelnut yields ≤ 0.89 tonnes of oil/hectare in the Pacific Northwest.

Greater than the U.S. average of 0.50 tonnes oil/hectare for soybeans).

Development and commercialization of new high-yielding & more widely adapted genotypes (Rutgers and Univ. of Nebraska), could lead to oil yields = 1 tonne/hectare in the northeastern U.S.
6 yr-old RPM Sugar Maple
(planted fall 2003, photo Oct. 2008)

3 yr-old RPM Sugar Maple
Root Production Method (RPM)

A new tool for temperate agroforestry
Root System Comparison

1 year RPM and bare-root seedlings
RPM Nuttal Oak: 7 years, 7-in. dbh, 35 ft tall.
3 year old RPM oaks
White Pine at beginning of 4th growing season
7 Year old white pine

7 Year old black cherry
Earlier Regeneration
RPM walnut orchard, year 1

After 3 growing seasons.

5th yr: 4” caliper
Walnuts after 3rd growing season
RPM Growth Comparison

8 year bare-root Pecan

8 year RPM Pecan
BR vs RPM cross-section @ dbh in 11yr Black oaks
Agroforestry
the specialized application and integration of trees with farming practices
Thank you!