Agroforestry

photo from National Agroforestry Laboratory

Potential value of agroforestry practices	
Direct profit potential	• Fruit, nut, or timber crop for sale (pays for itself) • Diversify farm enterprise • Improved animal productivity • Increased crop yields
Indirect benefits	• Hold nutrients • Prevent soil erosion • Carbon sequestration • Reduce energy consumption • Increase property values • Suppression of insect pest and weed populations • Greater resiliency during drought or floods • Products for use by farm family
Community and compliance benefits	• Reduce soil and nutrient load into surface waters • Proactive compliancy with potential water regulations
Quality of life benefits	• Bird, pollinator, and wildlife habitat • Fruit crop for farmers' use • Aesthetic and recreational opportunities

Read a more in-depth look at agroforestry as a strategy for resilience in the face of climate and weather related stress here:

Climate Risk Adaptation by Smallholder Farmers: The Roles of Trees and Agroforestry. Lasco, R.D., R.J.P. Delfino, D.C. Catacutan, E.S. Simelton, and D.M. Wilson. 2014. Curr. Opin. Environ. Sustain. 6: 83–88
http://www.sciencedirect.com/science/article/pii/S1877343513001619

Add the following practices to crop and livestock production in any combination:

Alley Cropping

- Two or more sets of single or multiple rows of trees or shrubs at wide spacings.
- Create alleys within which agricultural, horticultural, or forage crops are cultivated.
- Valuable hardwood species, such as nut trees, or trees desirable for wood products.
- Shrubs can provide nuts, fruit or other products.
- Sometimes called intercropping and multi-cropping.

Alley cropping; photo from "Training Manual for Applied Agroforestry Practices" Chapter 3: Alley Cropping. The Center for Agroforestry, University of Missouri

More information about Alley Cropping and how to implement this practice on the farm:

Training Manual for Applied Agroforestry Practices – 2015 Edition
http://www.centerforagroforestry.org/pubs/training/chap3_2015.pdf

Link to National Agroforestry Center alley cropping publications:
http://nac.unl.edu/alleycropping.htm

Example: Alley cropping

The two photos below show establishment of an agroforestry planting in strips through cropland. Annual row crops are planted in the spaces between woody-species rows.

Photos from Jason Fischbach, Univ. of WI-Extension

Silvopasture

- Combines trees with forage and livestock production.
- Establish trees into an existing pasture, or establish forages in the woods.
- Improved nutrient cycling.
- Diversified farm enterprise.
- Improved growth of high quality trees.
- Improved animal productivity.
- Enhanced wildlife habitat.
- Grazing can enhance tree growth.
- Economical control of weeds and brush without herbicides.
- Maintains fire breaks.
- Reduces habitat for gnawing rodents.
- Livestock manure recycles nutrients to trees and forage.
- Trees have a climate-stabilizing effect to reduce heat stress and windchill of livestock.
- Trees can cut the direct cold effect by 50% or more and reduce wind velocity by as much as 70%.
- Livestock require less feed energy, so their performance is improved and mortality is reduced.

Silvopasture; photo from "Training Manual for Applied Agroforestry Practices" Chapter 4: Silvopasture. The Center for Agroforestry, University of Missouri

More information and how to implement Silvopasture on the farm:

Training Manual for Applied Agroforestry Practices – 2013 Edition. The Center for Agroforestry, University of Missouri
http://www.centerforagroforestry.org/pubs/training/chap4_2015.pdf

Silvopasture. National Agroforestry Center.
http://nac.unl.edu/documents/workingtrees/brochures/wts.pdf

Silvopasture online course. National Agroforestry Center.
http://www.silvopasture.org/about.html

Productive Windbreaks

Properly placed rows of trees and/or shrubs of sufficient height to create a wind shadow:

- Increase production.
- Reduce wind erosion.
- Shelter livestock and crops.
- Capture water runoff and nutrients.
- Provide wildlife habitat.
- Protect structures
- Disperse snow.
- Improve aesthetics and property value.
- The USDA-NRCS estimates a 10% to 25% energy savings from having a good windbreak around your home.
- Can pay for themselves by providing a harvestable crop.

Windbreaks; photo from "Training Manual for Applied Agroforestry Practices" Chapter 6: Windbreaks. The Center for Agroforestry, University of Missouri

More information and how to implement Productive Windbreaks on the farm:

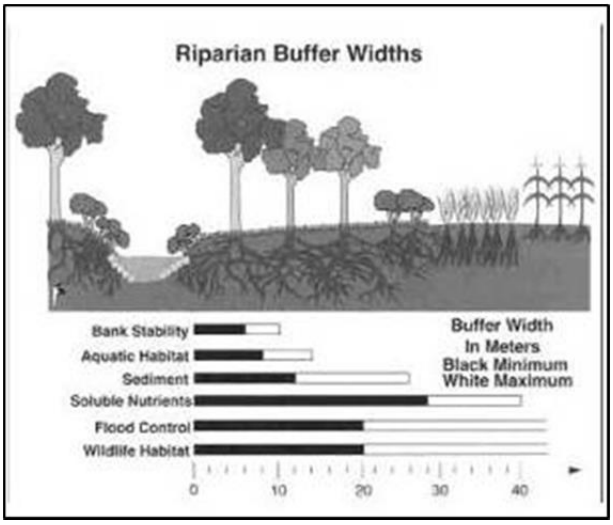
Training Manual for Applied Agroforestry Practices – 2013 Edition. The Center for Agroforestry, University of Missouri.
http://www.centerforagroforestry.org/pubs/training/chap6_2015.pdf

Living Snow Fences: Functions and Benefits. University of Minnesota | Extension
http://www.extension.umn.edu/environment/agroforestry/components/UMN-Extension-LivingSnowFences.pdf

Iowa State University – Extension and Outreach publications.
https://store.extension.iastate.edu/ProductList?Keyword=windbreaks

Forest Buffers

- Permanent strips of trees, shrubs, and grasses.
- Strategically placed on the landscape for multiple benefits.
- Riparian buffers between agricultural land and water bodies reduce runoff and non-point source pollution.



Riparian Buffer Widths; from "Training Manual for Applied Agroforestry Practices" Chapter 5: Upland & Riparian Forest Buffers. The Center for Agroforestry, University of Missouri

- Upland forest buffers are narrower and are located in areas to reduce erosion, non-point source pollution, and to prevent gully formation.
- Increase carbon storage in soils.
- Create wildlife habitat.
- Stabilize eroding stream banks.
- Provide a harvestable crop of timber, fiber, forage, or fruit.

Additional benefits include improved water infiltration rates, habitat for beneficial insects, and wind impact reduction.

More information and how to implement Forest Buffers on the farm:

Training Manual for Applied Agroforestry Practices – 2013 Edition. The Center for Agroforestry, University of Missouri. http://www.centerforagroforestry.org/pubs/training/chap5_2015.pdf

Establishment of Riparian Forest Buffers. University of Minnesota | Extension http://www.extension.umn.edu/environment/agroforestry/riparian-forest-buffers-series/establishment-of-riparian-forest-buffers/

Conservation Buffers. National Agroforestry Center. http://nac.unl.edu/buffers/index.html

Lon Strum, Story County, Iowa: "…The buffer has also added to our wildlife habitat. This is the hunting paradise of Story County right here, especially for pheasant hunting. People have come from Alaska, Michigan, and all over Iowa. The demand is very large."

Ron Risdal Grows corn and soybeans on his 1,000 acre farm in Story County, IA. Since installing a riparian buffer, he no longer loses crops during wet years and no longer gets his tractor stuck.

Source: "Training Manual for Applied Agroforestry Practices" Chapter 5: Upland & Riparian Forest Buffers. The Center for Agroforestry, University of Missouri

Incorporating STRIPS

More information about STRIPS:

http://www.leopold.iastate.edu/strips-research-team

Research at Iowa State University shows that by strategically converting as little as 10 percent of a row-cropped field to perennial prairie—in narrow patches along contours and foot slopes – farmers and landowners can:

- ✓ Reduce sediment movement off field by 95 percent
- ✓ Reduce total phosphorus loss by 90 percent
- ✓ Reduce total nitrogen loss by nearly 85 percent.

STRIPS pay for themselves by saving soil and nutrients. Make them profitable by adding a saleable woody species crop.

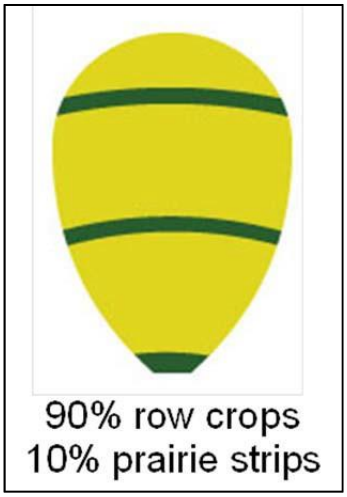


Photo from Matt Helmers, Iowa State University

Create wildlife habitat with agroforestry practices

- Increased number of pollinators
- Predatory insects and bats control pest insects
- Predators prey on seed-eating mice
- Game species to be enjoyed by farmer or income from leasing land to hunters
- Improved water quality for game fish

Agroforestry practices can be used to reduce the negative consequences of fragmentation by lessening habitat isolation through the use of plantings that are well thought out and well-connected with other habitats.

Note: the creation of habitat may attract undesirable wildlife as well as desirable. Additional management may be required to strike the right balance on the farm.

Create winter habitat for pheasant:

http://www.extension.umn.edu/environment/agroforestry/docs/winter-habitat-for-pheasants-2012.pdf

Plants that support pollinators:

http://www.xerces.org/fact-sheets/

https://plants.usda.gov/pollinators/NRCSdocuments.html

Restore an existing agroforestry practice

More information on evaluating and renovating an existing agroforestry practice:

Great Plains Windbreak Renovation and Innovation Conference. National Agroforestry Center.
http://nac.unl.edu/multimedia/conferences/Great_Plains/windbreakrenovation20120724.htm

Fruit & Nut Crops in Agroforestry Plantings

Fruits and nuts hardy to the upper Midwest:

Minnesota Hardy http://www.extension.umn.edu/garden/yard-garden/landscaping/minnesota-hardy/#look

National Arboretum hardiness zones & representative plants
http://www.usna.usda.gov/Hardzone/hrdzon4.html

USDA Hardiness Zone Map
http://planthardiness.ars.usda.gov/PHZMWeb/

Growing Fruit in the Upper Midwest http://www.upress.umn.edu/book-division/books/growing-fruit-in-the-upper-midwest

Management

Agroforestry practices require management through all phases. If that reality doesn't match the farmer's interests, there are still ways to get agroforestry practices in place:

- Consider contracting to another farmer to manage the agroforestry practices
- Apprentice a young famer with interest in agroforestry
- Bring another family member into the overall farm operation
- Lease land to an experienced agroforester

Where to start with Agroforestry:

- Steepest slopes; >14% slope should never be row-cropped.
- Toes of slopes
- Boundary of steep slope to a gentler slope
- Along in-field waterways
- Wind eroded areas
- Field edges and fencelines
- Streambanks and riparian areas
- Around houses and farm buildings

Resources:

Training Manual for Applied Agroforestry Practices – 2013 Edition. The Center for Agroforestry, University of Missouri. http://www.centerforagroforestry.org/pubs/training/

National Agroforestry Center publications. http://nac.unl.edu/publications/index.htm

University of Minnesota | Extension. Agroforestry. http://www.extension.umn.edu/environment/agroforestry/

AFTA | Association for Temperate Agroforestry. http://www.aftaweb.org/