Working Trees for Carbon Cycle Balance

Agroforestry: Using trees and shrubs to produce social, economic, and conservation benefits.

Carbon based energy sources like coal, gas, and oil all originated from the conversion of sunlight energy by plants. A dominant consideration for rebalancing the global carbon cycle is to find ways to promote the increased growth of trees and shrubs. Agricultural activities occur on approximately half of the land in the contiguous U.S., so much of the opportunity to store carbon through afforestation will occur on farms and ranches.

Agroforestry does not convert agricultural land to forests, but rather leaves land in production agriculture, while integrating trees into farm and ranch operations to accomplish economic, environmental, and social goals. Several agroforestry practices can lead to substantial storage of carbon and removal of atmospheric carbon dioxide:

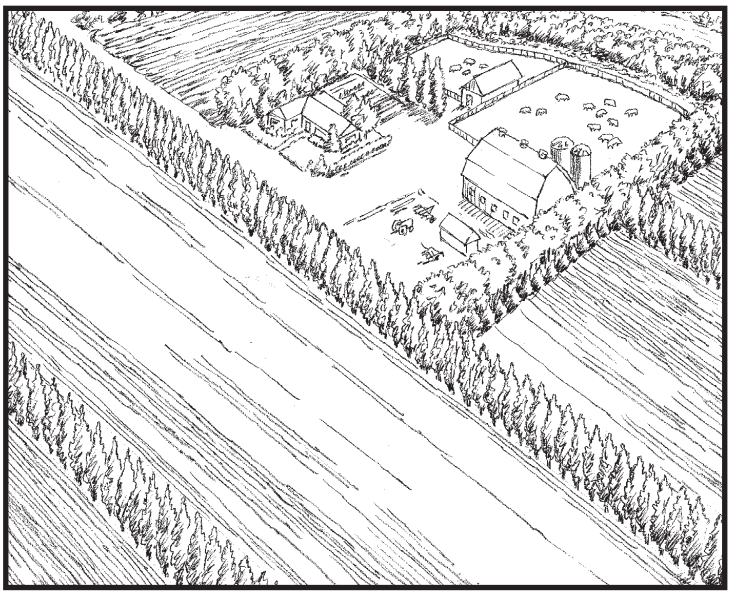
Windbreaks – store carbon as they protect farmsteads, livestock, roads, people, soils, and crops. Field windbreaks reduce evaporation and plant transpiration rates such that crop yields per field are typically improved, even though a portion of the field has been converted to windbreaks. Optimal tree planting levels have been estimated at five percent of the cropped field.

There are 185 million acres of tilled land in the Great/Central Plains. Planting only 2.5 percent of this field area to 30-foot-wide tree windbreaks would span 1.3 million miles and cover 4.6 million acres. As trees continue to grow, more carbon is stored. Carbon dioxide removal, based on 20-year-old plantings, would exceed:

80 million metric tons

Additional CO_2 reductions would result from:

- Lower heating costs for farmstead homeowners
- Lower cost of snow removal
- Reduced need for crop fertilizer
- Lower feeding demands of winter livestock
- Improved water use efficiency



Riparian Forest Buffers – Trees grow rapidly in riparian zones due to favorable moisture and nutrient conditions. When suitable trees and shrubs grow in these moist environments they also filter out excess nutrients, pesticides, animal wastes, and sediments coming from adjacent agricultural or urban activities.

- USDA has committed to planting 2,000,000 miles of conservation buffers. If one-fourth of these buffers were 100 foot wide forested riparian buffers, CO_2 removal would exceed:

110 million metric tons

Silvopasture – Timber/grazing systems managed on the same area of land can increase net carbon storage. In areas like the Southeastern U.S., loblolly pine silvopasture systems are both economically and environmentally attractive. When both the tree and grass components are properly managed, an increase in net carbon storage versus pasture or forest alone, can be achieved.

Estimated Carbon Dioxide Removal in 35-year-old Loblolly Pine Stand

Metric tons CO_2 per acre

(To convert CO_2 to C, divide by 3.67)

	Forest*	Grassland*	Silvopasture**
Plant Carbon	345	180	525
Soil Carbon	176	345	261
Total	521	525	786

** U.S. Department of Energy 1999.*
***Louisiana State University, Hill Farm Research Station 1999.*

Short Rotation Woody Crops (SRWC) – Low prices for traditional crops have increased the interest of farmers in fast-growing woody crops, like hybrid poplar trees, for fuel and fiber. These SRWC systems provide a way of increasing on-farm income, while also being designed to treat agricultural, livestock, community, and industrial wastes. The rapid growth of SRWC results in high rates of nutrient uptake and large amounts of carbon storage over rotation lengths as short as five to 15 years.

- SRWC systems increase on-farm income
- SRWC systems can treat agricultural and municipal wastes
- In the Pacific Northwest, 10-year-old irrigated plantations remove 180 to 330 metric tons of CO_2 per acre
- Soil carbon levels during the first rotation increased by 40 or more tons per acre
- Net carbon benefits are realized if the wood fiber is used for solid wood products or fuel

References

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USDA National Agroforestry Center

A partnership of

USDA Forest Service, NRCS Natural Resources Conservation Service

The USDA National Agroforestry Center (NAC) is a partnership of the Forest Service (Research and Development and State and Private Forestry) and the Natural Resources Conservation Service. It is administered by the Forest Service, Southern Research Station; and its program manager and headquarters are located in Huntsville, AL, on the campus of Alabama A&M University, while its research, clearinghouse, and technology transfer staff are concentrated in Lincoln, NE, at the University of Nebraska. NAC's purpose is to accelerate the development and application of agroforestry technologies to attain more economically, environmentally, and socially sustainable land use systems. To accomplish its mission, NAC interacts with a national network of partners and cooperators to conduct research, develop technologies and tools, establish demonstrations, and provide useful information to natural resource professionals.