Chapter 1: Defining Agroforestry

Chapter Highlights

- Agroforestry practices must meet the 4 "I" criteria: *Intentional, Intensive, Integrated, and Interactive.*
- The United States Department of Agriculture formally recognizes five temperate agroforestry practices: riparian forest buffers, windbreaks, alley cropping, silvopasture, and forest farming. Among many agroforestry organizations and practitioners, urban and community forest gardens is also acknowledged as a key agroforestry practice.
- In order to successfully expand agroforestry across the U.S. landscape, supportive peer-to-peer learning opportunities, professionals, partnerships, and programs are needed.

What is agroforestry?

Agroforestry is a new word for an ancient set of practices. In simplest terms, agroforestry is the intentional combination of trees and/or shrubs with crops and/or livestock. Agroforestry presents promising opportunities for new market ventures, sustainable agriculture practices, responsible land stewardship and succession planning, farm income diversification, and community development. When appropriately designed and managed, agroforestry systems can improve soil health, conserve water, reduce erosion and non-point source pollution, mitigate damage due to flooding and droughts, enhance air quality, improve biodiversity, and create wildlife habitat. These economic and ecological benefits can be achieved while the system produces nutrient-dense specialty crops with the potential to improve human health and regional food security.

Agroforestry practices can be designed to fit niches that meet specific objectives for farms and communities. For example, agroforestry systems can be designed and strategically located to provide greater resiliency in agricultural landscapes so farmers can meet production objectives when faced with extreme weather (e.g., drought, floods). Tree-based practices sequester significant amounts of carbon that can help meet future potential greenhouse gas reduction goals.

Definition of temperate agroforestry: *intensive land-use management that optimizes the benefits (physical, biological, ecological, economic, social) from biophysical interactions created when trees and/or shrubs are deliberately combined with crops and/or livestock.*

Agroforestry Key Criteria

Four key criteria characterize agroforestry Practices. Application of the 4 "I" criteria are key to determine what is, and what is not, an agroforestry practice.

Intentional

Combinations of trees, crops, and/or livestock are intentionally designed, established, and/or managed to work together and yield multiple products and benefits, rather than as individual elements which may occur together but are managed separately. Agroforestry is neither monoculture farming nor is it a mixture of monocultures.

Intensive

Agroforestry practices are created and intensively managed to maintain their productive and protective functions, and often involve cultural operations such as cultivation, fertilization, irrigation, pruning and thinning.

Integrated

Components are structurally and functionally combined



into a single, integrated management unit tailored to meet the objectives of the land steward. Integration may be horizontal or vertical, above- or below-ground, simultaneous or sequential. Integration of multiple crops utilizes more of the productive capacity of the land and helps to balance economic production with resource conservation.

Interactive

Agroforestry actively manipulates and utilizes the interactions among components to yield multiple harvestable products, while concurrently providing numerous conservation and ecological benefits. For example, specialty mushrooms can be grown on logs in a forest farming practice for additional income throughout the year.

Recognized Agroforestry Practices

The United States Department of Agriculture formally recognizes five temperate agroforestry practices: *riparian forest buffers, windbreaks, alley cropping, silvopasture,* and *forest farming*. Among many agroforestry organizations and practitioners, *urban and community forest gardens* is also acknowledged as a key agroforestry practice.

1. Riparian and upland forest buffers

Riparian forest buffers are strips of permanent vegetation, consisting of trees, shrubs, and grasses, planted or managed between agricultural land (usually cropland or pastureland) and water bodies (rivers, streams, creeks, lakes, wetlands) to reduce runoff and non-point source pollution. Forest buffers are usually planted in three distinct zones near an agricultural stream for stabilizing streambanks, improving aquatic and terrestrial habitats, and providing harvestable products. Upland buffers with cool- or warm-season grass alone or combined with shrubs and/or trees are also used to reduce nonpoint source pollution and prevent gully formation in agricultural watersheds.

2. Windbreaks

Windbreak practices (and variations, e.g., shelterbelts, timberbelts, hedgerows, and living snowfences) are planted and managed as part of a crop or livestock operation to enhance crop production, protect crops and livestock, manage snow distribution, and/or control soil erosion. *Field windbreaks* are used to protect a variety of wind-sensitive row crops, forage, tree, and vine crops to control soil erosion, and to provide other benefits such as improved insect pollination of crops and enhanced wildlife habitat. *Livestock windbreaks* help reduce animal stress and mortality, improve feed and water consumption, enhance weight gain and calving success rates, and control odor. Timberbelts are managed windbreaks also designed to increase the value of the forestry component.

3. Alley cropping

This practice combines trees planted in single or multiple rows with agricultural or horticultural crops cultivated in the wide alleys between the tree rows. High-value hardwoods such as oak, walnut, ash, and pecan are favored species in alley cropping practices, and can potentially provide high-value lumber or veneer logs in the long-term. Crops or forages grown in the alleys, and nuts from walnut, pecan and chestnut trees, provide annual income from the land while the longer-term wood crop matures. Specialty crops (herbs, fruits, vegetables, nursery stock, flowers, etc.) can be grown in alleys, utilizing the microclimate created by trees to boost economic production from each acre.

4. Silvopasture

This practice combines trees with forage (pasture or hay) and livestock production. Silvopasture can be established by adding trees to existing pasture, or by thinning an existing forest stand and adding (or improving) a forage component. Trees are managed for high-value timber or sawlogs, and at the same time they provide shelter for livestock, reduce heat stress and improve food and water consumption. In the winter, the protection of trees reduces cold stress — therefore, animals do not lose as much energy keeping warm and are able to gain more weight. Forage and livestock provide short-term income at the same time a crop of high-value sawlogs is being grown, providing a greater overall economic return from the land.

5. Forest farming

In forest farming practices, high-value specialty crops are cultivated under the protection of a forest overstory that has been modified and managed for sustained timber production or other forest objectives and to provide the appropriate microclimate conditions. Shade-tolerant specialty crops like ginseng, shiitake

mushrooms, and decorative ferns grown in the understory are sold for medicinal/botanical, decorative/handicraft, or food products. Overstory trees can be managed to produce timber and veneer logs, or for other multifunctional purposes.

6. Urban and community forest gardens

Forest gardens are multifunctional perennial (woody and herbaceous) polycultures designed and managed to mimic the structure of early successional forests or forest edges, where multiple "layers" of edible, medicinal, or ornamental plants and fungi share a single unit of space. Unlike conventional rural farms, forest gardens may be planted in relatively small areas. They require careful design to accommodate the challenges and opportunities of their high levels of diversity and unique site circumstances. They are intentionally referred to as "forest gardens" (rather than "food forests") in this publication to illustrate their ability to provide more than food products and to highlight their parallels to intensively-managed garden spaces.

A key concern in developing agroforestry nomenclature is overlap and confusion with mainstream land use management disciplines, e.g., forestry, agriculture, and livestock production. There is a fundamental need to develop a definition and criteria that would effectively distinguish practices that are agroforestry from those that are not. Application of the four criteria defining agroforestry (*intentional, intensive, integrative, and interactive*) provide the key to determine what is and is not an agroforestry practice.

Characteristics of Agroforestry Practices

- Land-use practices deliberately integrated into the whole farm
- Contain complex interactions among components suited to particular environments and human needs
- Competition and its management is critical
- Has two or more outputs
- The "cycle" of an agroforestry practice is always more than one year
- Even the simplest agroforestry practice is more complex ecologically (in terms of structure and function) and economically than monocropping
- For the farmer, success is often judged by the bottom line: does it pay?

Perspectives on Farmer Adoption

Although there are efforts underway to quantify farmer adoption of agroforestry via the Census of Agroforestry and the National Agriculture Statistics Service, it is safe to say that the adoption and application of agroforestry practices is rapidly accelerating. A significant focus on access and equity in the expansion of agroforestry in the U.S. will require increased attention on the four "P"s of adoption: peer-to-peer learning, professionals, partnerships, and programs.

Peer-to-peer learning

- Identify diverse and respected farmers who practice agroforestry.
- Connect agroforestry producers with other producers not currently practicing agroforestry.
- Gain understanding of local customs and culture, employing methods and tools such as:
  - Inclusive farmer meets farmer spaces.
  - On-farm demonstration sites and workshops.
  - Social networks, including social media.

Professionals

- Increase the number and diversity of professionals with agroforestry expertise are essential to provide the technical, educational, marketing assistance requested by producers.
- Advance agroforestry literacy through:
  - Regional/state agroforestry training programs (e.g., the Center for Agroforestry Agroforestry Academy)
  - Agroforestry degrees and certificates offered by universities (e.g., online M.S. and graduate certificate offered by the Center for Agroforestry)
  - Certification of agroforestry professionals (e.g., joint national "certified agroforester" program sponsored by professional societies)

Partnerships

- Bringing people together to increase awareness

and understanding of agroforestry, producer objectives, community, and watershed goals.

- Regional partnerships may be most effective. Examples include, but are not limited to: the 1890 Agroforestry Consortium, Agroforestry Northwest, Appalachian Beginning Forest Farmer Coalition, Cornell Agroforestry Program Work Team, Northeast Forest Farmers Coalition, Northeast & Mid-Atlantic Agroforestry Working Group (NEMA), Pacific Northwest Agroforestry Working Group, Southwest Agroforestry Action Network (SWAAN), The Agroforestry Coalition, Vermont Agroforestry Team.
- Lasting partnerships need a clear purpose and tangible project(s) to keep members engaged. For example, NEMA and SWAAN sponsor networking and educational activities to advance regional agroforestry interests.
- Establishing agroforestry communities of practices, e.g. the eXtension Forest Farming community of practice created by a team led by Virginia Tech with USDA support.

Programs

- USDA and other state/local programs provide vital resources that make it possible for professionals to provide the assistance that supports planning and establishment of agroforestry practices.
- USDA assistance helps advance agroforestry adoption and practice application includes:
  - The Natural Resource Conservation Service's (NRCS) Environmental Quality Incentives Program (EQIP) provides agricultural producers with financial resources and one-on-one help to plan and implement conservation practices.
  - The Sustainable Agriculture Research and Education (SARE) offers grants to farmers, ranchers and agricultural professionals for on-farm research, education, and professional and community development.
  - The National Institute of Food and Agriculture (NIFA) Renewable Resources Extension Act and McIntire-Stennis Cooperative Forestry Research programs.
  - The U.S. Forest Service's forest stewardship programs as well as their research & development programs.
  - The USDA Census of Agriculture collected in 2012, 2017, and 2022 track the growth in agroforestry in the US.
  - In 2023, the USDA invested in many agroforestry-focused Partnerships for Climate-Smart Commodity programs, including a $60M, 5-year project involving 29 States, titled The Expanding Agroforestry Project.
- Non-profit organizations such as Appalachian Sustainable Development, Savanna Institute, Interlace Commons, and the Appalachian Beginning Forest Farmers Coalition serve to collect, curate, and convene for agroforestry implementation and knowledge exchange.
- Farmer-led cooperatives connect both established and emergent specialty crops producers to support a wide variety of services including support with processing, marketing, distribution, and consumer awareness.
- The private sector, including farmland trusts and finance companies create financial opportunities and incentives for capital needs in agroforestry.

Additional Resources

Garrett, H.E., Jose, S. and Gold, M.A. (eds). (2022). *North American Agroforestry*. (3rd edition). Agronomy Society of America, Madison, WI.

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Kellerman, T., Feibel, S., Smith, M.M., Bentrup, G., Batcheler, M., and MacFarland, K. (2025). Agroforestry across the United States: Results of the 2022 Census of Agriculture. *Agroforest Syst* 99 (34).

Schoeneberger, M.M., Bentrup, G., and Patel-Weynand, T. (eds). (2017.) Agroforestry: Enhancing resiliency in U.S. agricultural landscapes under changing conditions. Gen. Tech. Report WO-96. Washington, DC: USDA Forest Service. p. 228

Gruley, K. and Keeley. K (eds). (2018). *Perennial Pathways: Planting Tree Crops*. Savanna Institute.

USDA. (2019). Agroforestry Strategic Framework, FY 2019-2024. Washington, D.C.

Please note: this is not an exhaustive list. When you begin researching agroforestry in your region and/or within your interest areas, you will find many more examples of relevant agroforestry organizations and events!

Agroforestry Organizations	Events for learning and building community	Website
Center for Agroforestry, University of Missouri	• The Agroforestry Symposium • Agroforestry Training Academy • Webinars, workshops, and field days	www.centerforagroforestry.org
Association for Temperate Agroforestry	• North American Agroforestry Conference	www.aftaweb.org
Cornell Agroforestry & Cornell Cooperative Extension's Agroforestry Resource Center	• Webinars, workshops, and field days	www.cornellagroforestry.org
Green Lands Blue Waters	• Continuous Living Cover Conference • Working groups	www.greenlandsbluewaters.org
Extension Forest Farming Community	• Webinars	www.forest-farming.extension.org
Midwest Cover Crops Council	• Annual meeting	www.mccc.msu.edu
Savanna Institute	• Perennial Farm Gathering • Webinars, workshops, and field days	www.Savannainstitute.org
USDA National Agroforestry Center	• Webinars	www.fs.usda.gov/nac
Virginia Tech Agroforestry	• Webinars, workshops, and field days	www.agroforestry.frec.vt.edu
Appalachian Sustainable Development	• Ask an Agroforester webinars • Trainings for natural resource professionals	www.asdevelop.org
ATTRA Sustainable Agriculture	• Annual conference • Latino Farmer Conference • Webinars, workshops, and field days	attra.ncat.org/topics/agroforestry/
The Agroforestry Coalition	• Working Groups	www.agroforestrycoalition.org
Southwest Agroforestry Action Network (SWAAN)	• Annual conference • Webinars	https://swaan-site.org/
The Appalachian Beginning Forest Farmer Coalition (ABFFC)	• Virtual office hours • Forest farming conference	https://www.appalachianforestfarmers.org/
Interlace Commons	• Field days and trainings	www.interlacecommons.org
Northern Nut Growers Association (NNGA)	• Annual Conference	https://nutgrowing.org/
Rural Action	• Webinars, workshops, and field days	https://ruralaction.org/

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