Supporting Agroforestry Implementation in the Chesapeake Bay Watershed: AgWG March 21, 2024
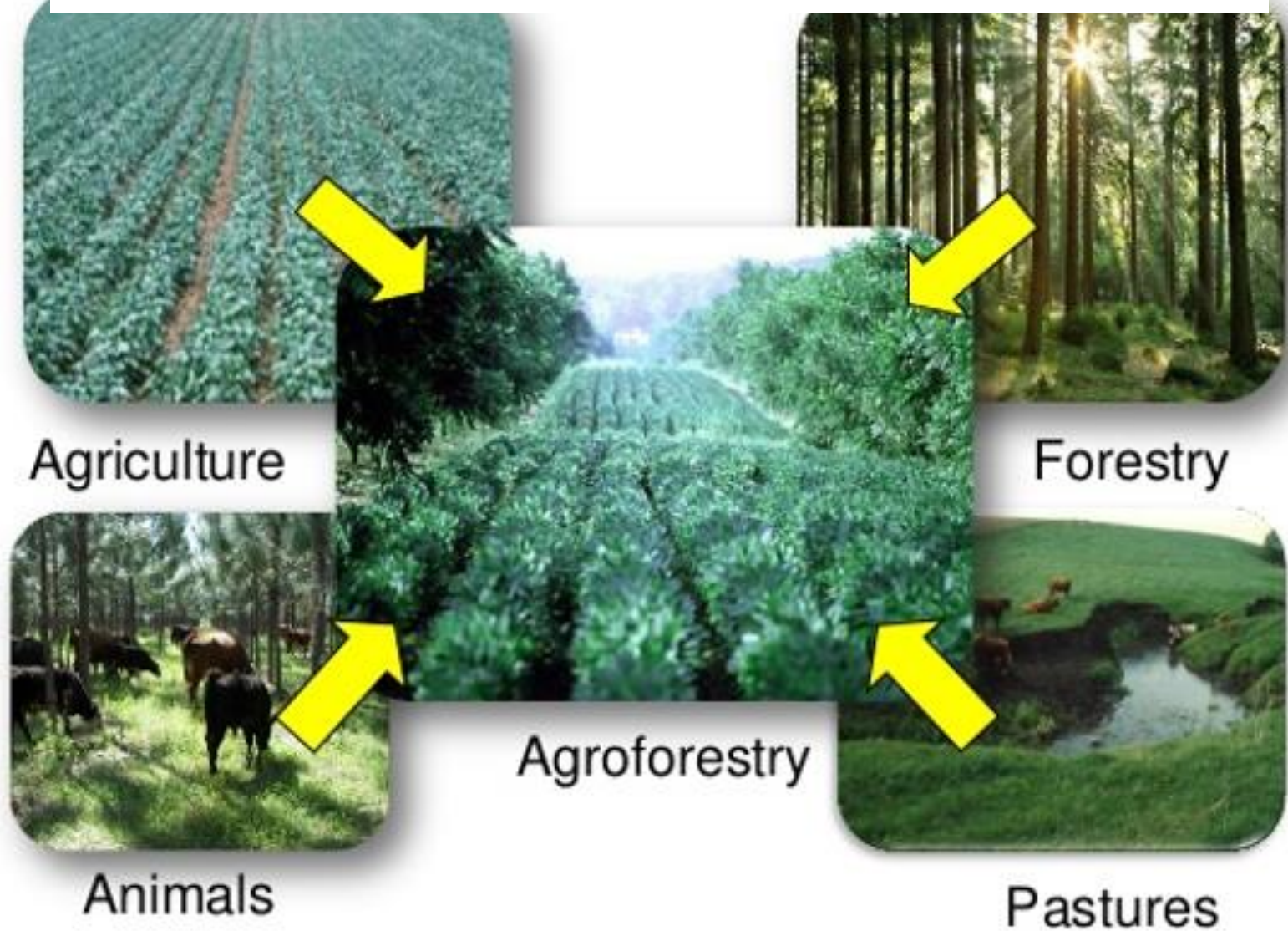

Ruth Cassilly UMD and Katie Brownson USFS

Agroforestry- the intentional integration of trees and shrubs into crop and animal production systems

Agriculture

Forestry

Animals

Agroforestry

Pastures

Current and Future Challenges to Agricultural Production

- Northeast about 21% of the region is agricultural, main commodities: dairy, poultry and perennial fruits.

- Increasing heat waves, heat stress, extreme precipitation events, and flooding pose challenges for growing traditional crops and may lead to decreases in milk production

- Warmer and wetter winters may impact survival and production in fruit- and nut-bearing plants.

- Continued challenges from climatic variability and change, serious threat to food security

- Dairy industry faces price volatility- short highs followed by long lows, cash flow variability- input price changes, labor shortages

- Ag industry trends- rapid consolidation, fewer larger farms

- 142,000 farm decrease from 2017 to 2022 Ag Census (7% decrease- highest in 20 years)

- Numbers in all size categories decreased except farms of 5,000 acres or more

- Challenge: Improve adaptive capacity in agricultural systems, meet food-security needs, enhance C sequestration

- Stop consolidation, enable price stabilization, profitability, value added products, regional supply
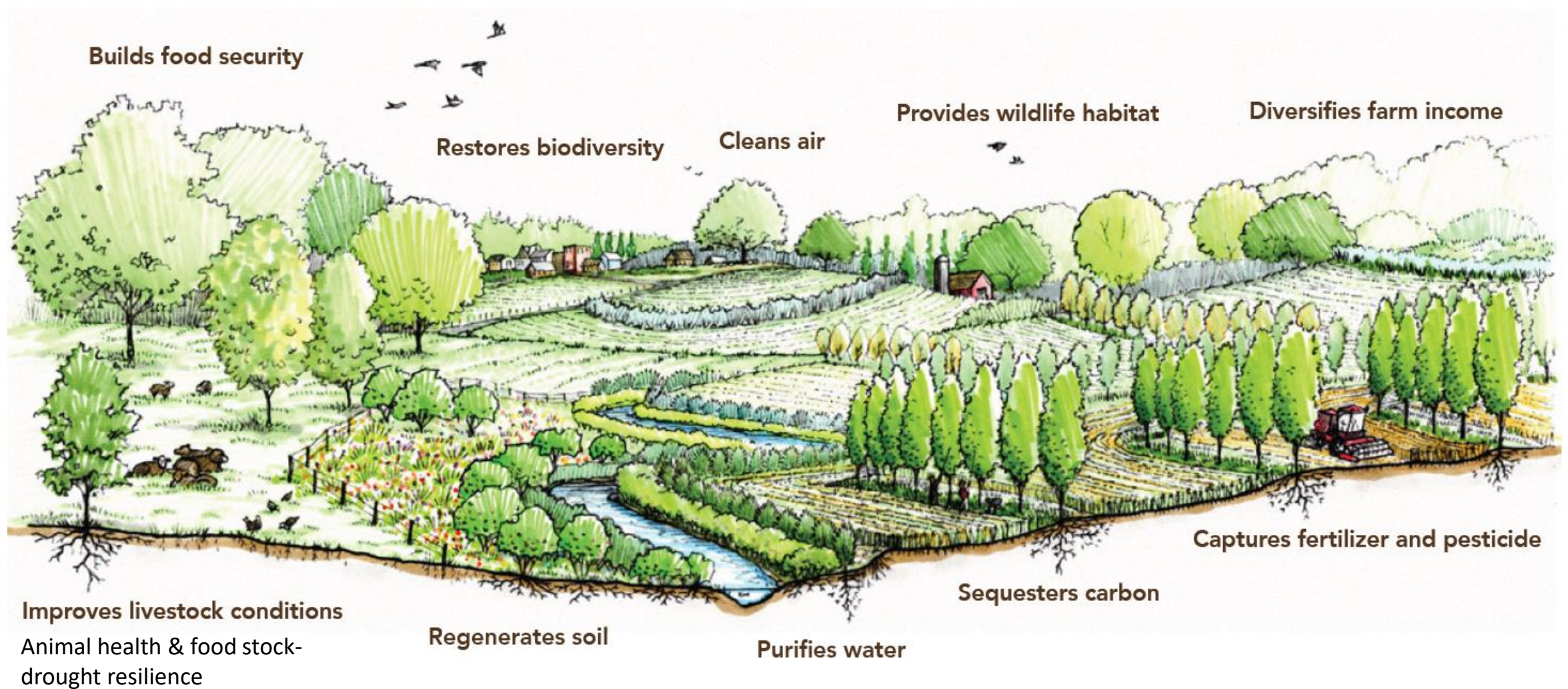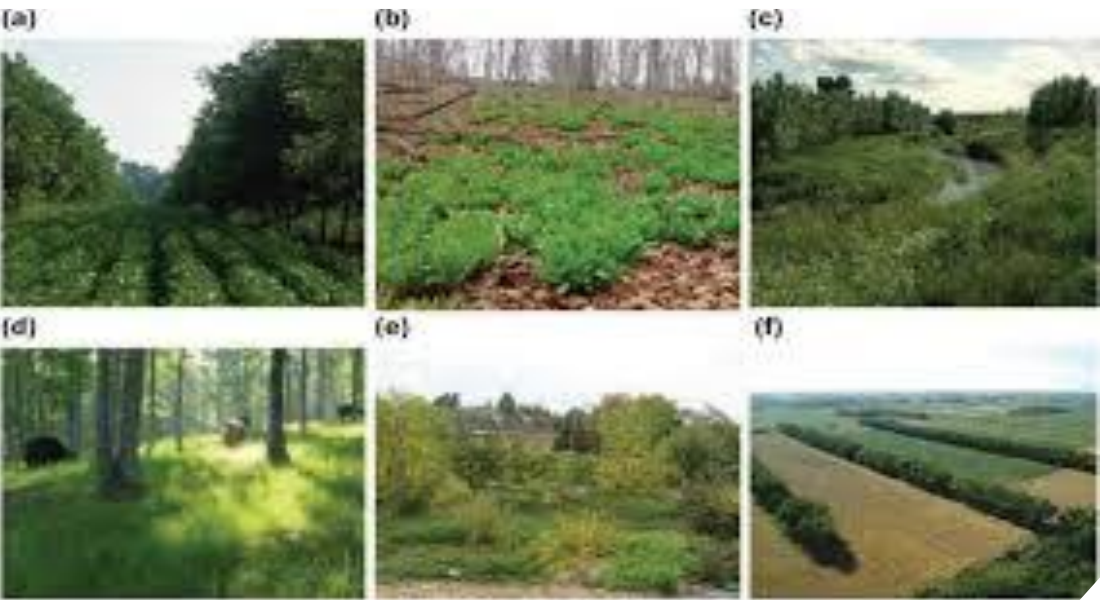
Why Agroforestry?

- Mimics natural ecosystems, cultivates a diverse agricultural landscape, conserve water, prevent and mitigate erosion

- Co-benefit option for farmers and ranchers to build resiliency needed under changing conditions- drought, floods, other weather extremes

- Enables adaptation, food security, carbon sequestration and storage

- Enhances productivity, profitability, biodiversity and environmental stewardship

- Multiple crops spread out labor needs, diversify income, and create beneficial relationships that can lead to more productivity than if crops are grown separately

Agroforestry Practice Benefits

Builds food security

Restores biodiversity

Cleans air

Provides wildlife habitat

Diversifies farm income

Captures fertilizer and pesticide

Sequesters carbon

Improves livestock conditions

Animal health & food stock-drought resilience

Regenerates soil

Purifies water

AgroforestryCoalition.com

ILLUSTRATION: Savanna Institute. Agroforestry systems represented from left to right: silvopasture, a riparian stream buffer, a mature alley-cropping system, and windbreaks along field edges.
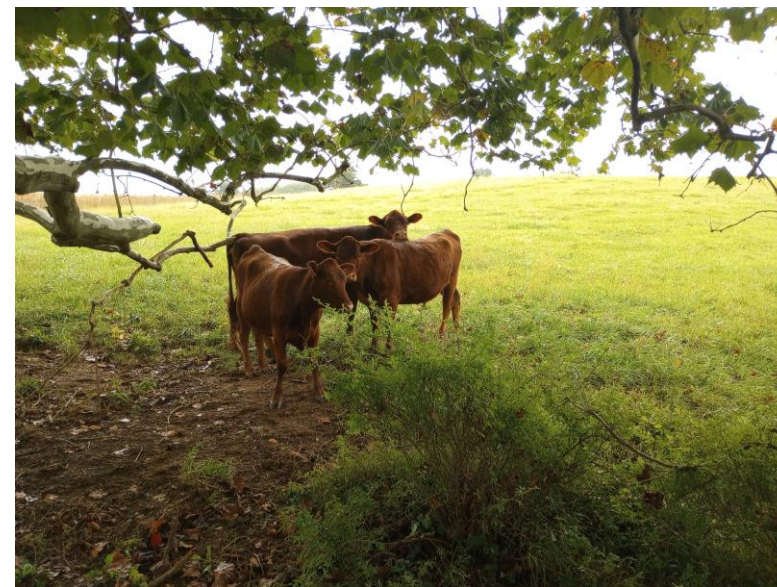
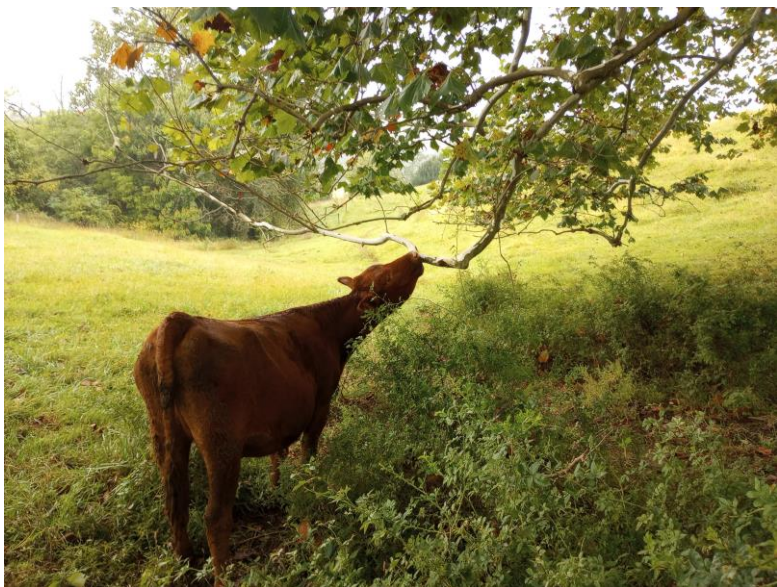Agroforestry Crops for the Northeast

Examples: Hybrid Chestnut, Poplar and Willow, Honey & Black Locust, Persimmon, Red Mulberry, Oak, Pawpaw, Walnut, Hazelnut, Raspberry, Chokeberry, Elderberry

- The United States Department of Agriculture recognizes five agroforestry practices: *alley cropping, silvopasture, riparian buffers, windbreaks* and *forest farming*

Forest farming:

Raising shade-tolerant crops such as mushrooms, medicinal herbs, and woody ornamental material in established forests.

Offers additional income opportunities for establishing and maintaining woodland areas

Shiitake mushroom production at Ozark Forest Mushrooms

Forest Farming

Cultivation and/or stewardship of non-timber forest products (NTFPs) in the forest understory. Possibilities include:

Edible	Medicinal	Benefits
Ramps	Ginseng	Preserving Appalachian Culture
Mushrooms	Goldenseal	Multi-Story Production
PawPaws	Cohosh	Species Conservation

Stesha Warren: Appalachian Sustainable Development

Perennial Pathways: Planting Tree Crops, Designing and Installing Farm-Scale Edible Agroforestry Savanah Institute
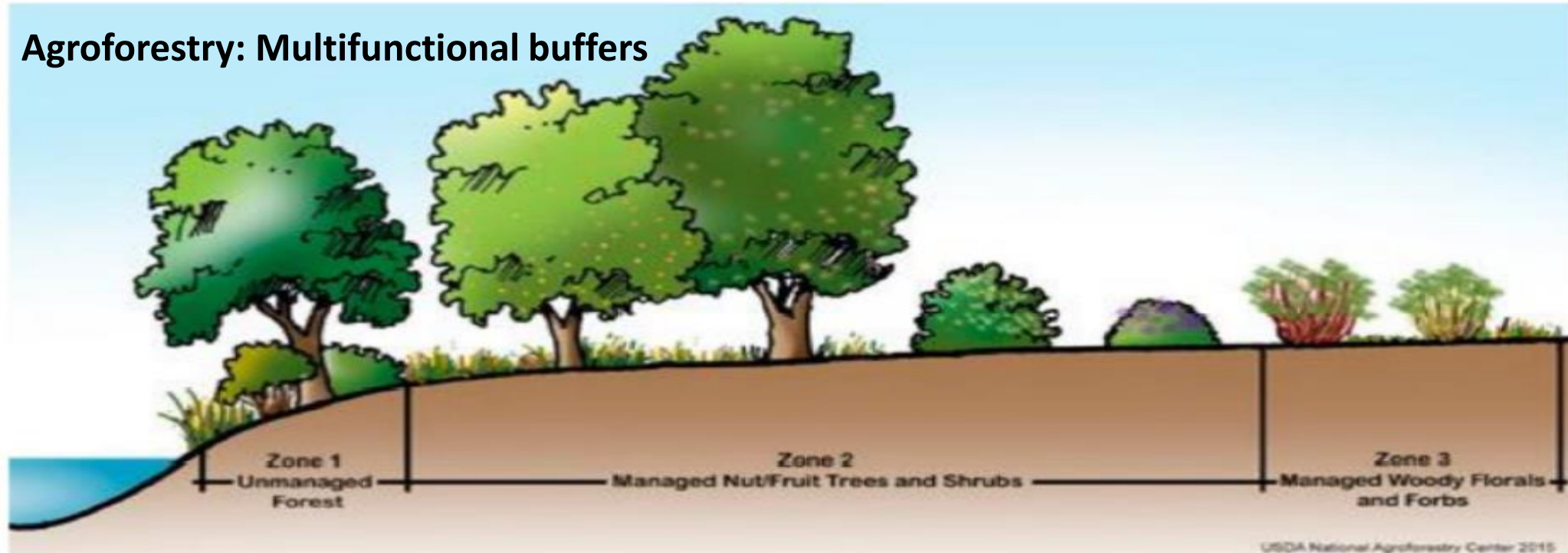
Riparian buffers:

- Planted areas around waterways at risk from erosion, nutrient leaching, or habitat loss
- Trees and vegetation hold soil, prevent erosion, and cool water
- Important role in mitigating the impacts of extreme precipitation events and flooding.

Agroforestry: Multifunctional buffers

Zone 1
Unmanaged Forest

Zone 2
Managed Nut/Fruit Trees and Shrubs

Zone 3
Managed Woody Florals and Forbs

USDA National Agroforestry Center 2015

Perennial Pathways: Planting Tree Crops, Designing and Installing Farm-Scale Edible Agroforestry Savanah Institute

- ***Multifunctional buffers:*** additional economic and environmental benefits, produce perennial crops, native fruits, nuts, floral trees, shrubs, fodder sources

- Floodplains: benefits to placing flood-prone agricultural land in permanent conservation-opportunity for multifunctional buffers

Edibles and florals harvested from multifunctional riparian forest buffers*

Pawpaw

Market Opportunities

With a tropical flavor, custard texture and high nutrient content, America's forgotten fruit can be eaten fresh or made into desserts.

Average Prices

Fresh fruit: $2/lb wholesale
$3+/lb retail
Frozen pulp $6/lb retail
Jam $6/oz jar retail

Persimmon

Market Opportunities

The "Fruit of the Gods," sweet persimmon can be sold fresh or made into pudding, jam, dried fruit and even beer.

Average Prices

Fresh fruit: $2.75/lb retail
Frozen pulp: $8+/lb retail
Dried fruit: $11+/lb retail

Elderberry

Market Opportunities

Coined "Nature's Medicine Chest" for its immune boosting properties, elderberries can be made into syrup, cough drops, juice, wine, jam and food coloring.

Average Prices

Juice: $15-$17/11oz jar
Syrup: $18/4oz jar retail
Wine: $10-$13/bottle retail
Cough drops: $2.50/15 retail

Hazelnut

Market Opportunities

A great source of fiber and 'good' fats, hazelnuts can be sold in shell or shelled and made into flours, candies, butters and oils.

Average Prices

In shell: $3/lb wholesale
Shelled: $6/8oz retail
Oils: $8/8oz jar retail

Woody Florals

Market Opportunities

Woody florals, such as pussy willow and red and yellow twig dogwood, can be coppiced every 2-3 years and sold to the floral industry or used in crafts.

Average Prices

Cuttings: $0.37-0.45/stem retail
Wreaths: $45+ ea retail

Black Walnut

Market Opportunities

This multi-use tree produces valuable timber and heart-healthy nuts sold in shell or shelled.

Average Prices

In shell: $9.25/lb retail
Shelled: $12/lb retail

*Prices can vary considerably by season and local markets.

APPALACHIAN sustainable DEVELOPMENT

Forest Resources & Environmental Conservation at Virginia Tech

USDA National Agroforestry Center

Windbreaks:

Rows of trees planted to prevent wind and soil erosion, manage drifting snow, protect livestock, increase livestock production and crop yield, provide habitat for wildlife/biodiversity, and increase water availability to nearby crops.

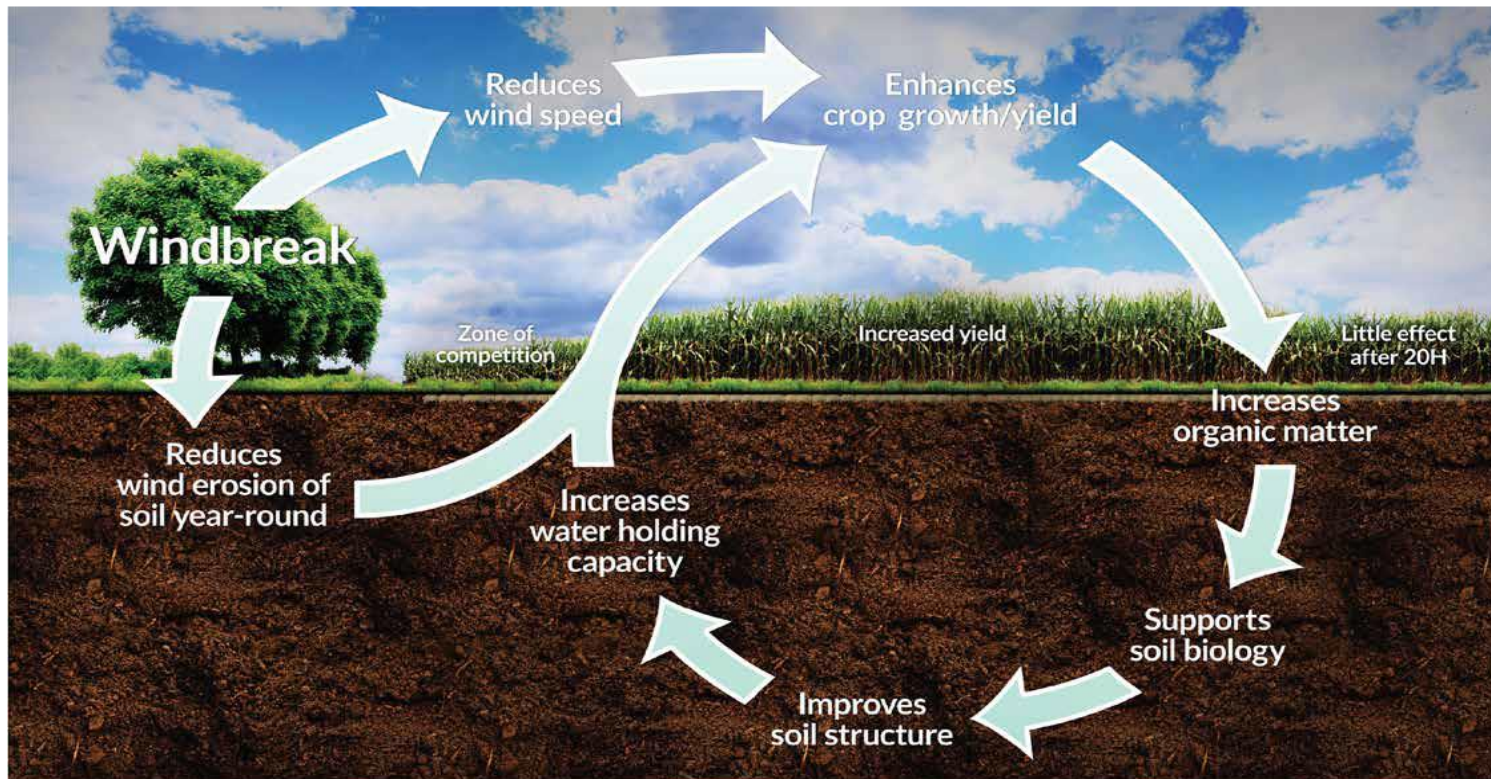Protected zone: 8-10 times the maximum tree height

Windbreak in MN

Figure 3.2.—Benefits of windbreaks for soils. (Courtesy graphic by National Agroforestry Center)

UW Madison Extension Forestry

Alley Cropping:

Growing field crops between rows of trees

Trees: timber, fruits, nuts, fodder
Crops: grains, vegetables, specialty crops, biomass or forages cut for hay

PHOTO BY KEVIN WOLZ

Walnut and soybean alley crop at the University of Guelph, Ontario

Buffer effects of warmer temperatures on crops and livestock, help boost populations of beneficial insects, slopes

trees reduce windspeed and wind erosion

tree shade moves throughout the day

trees create organic matter

increases habitat diversity

improves capture of excess nutrients

organic matter decomposes

carbon sequestration

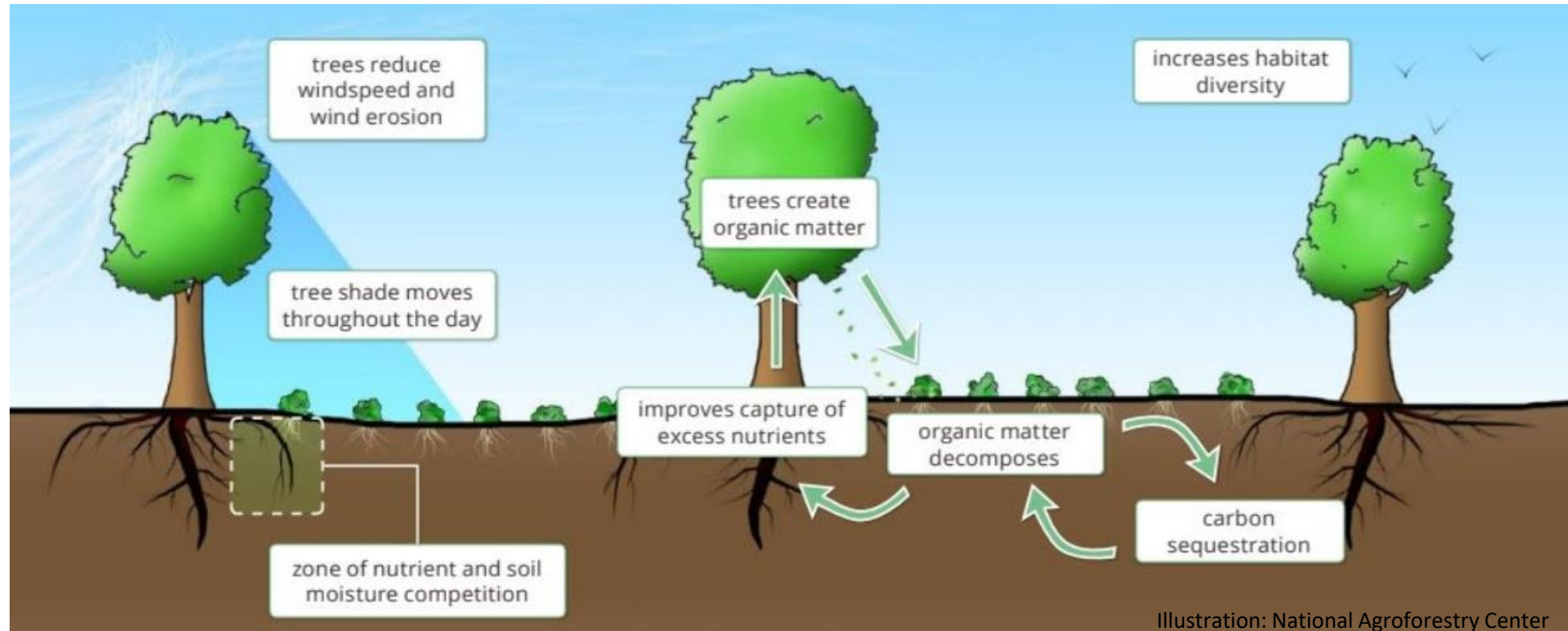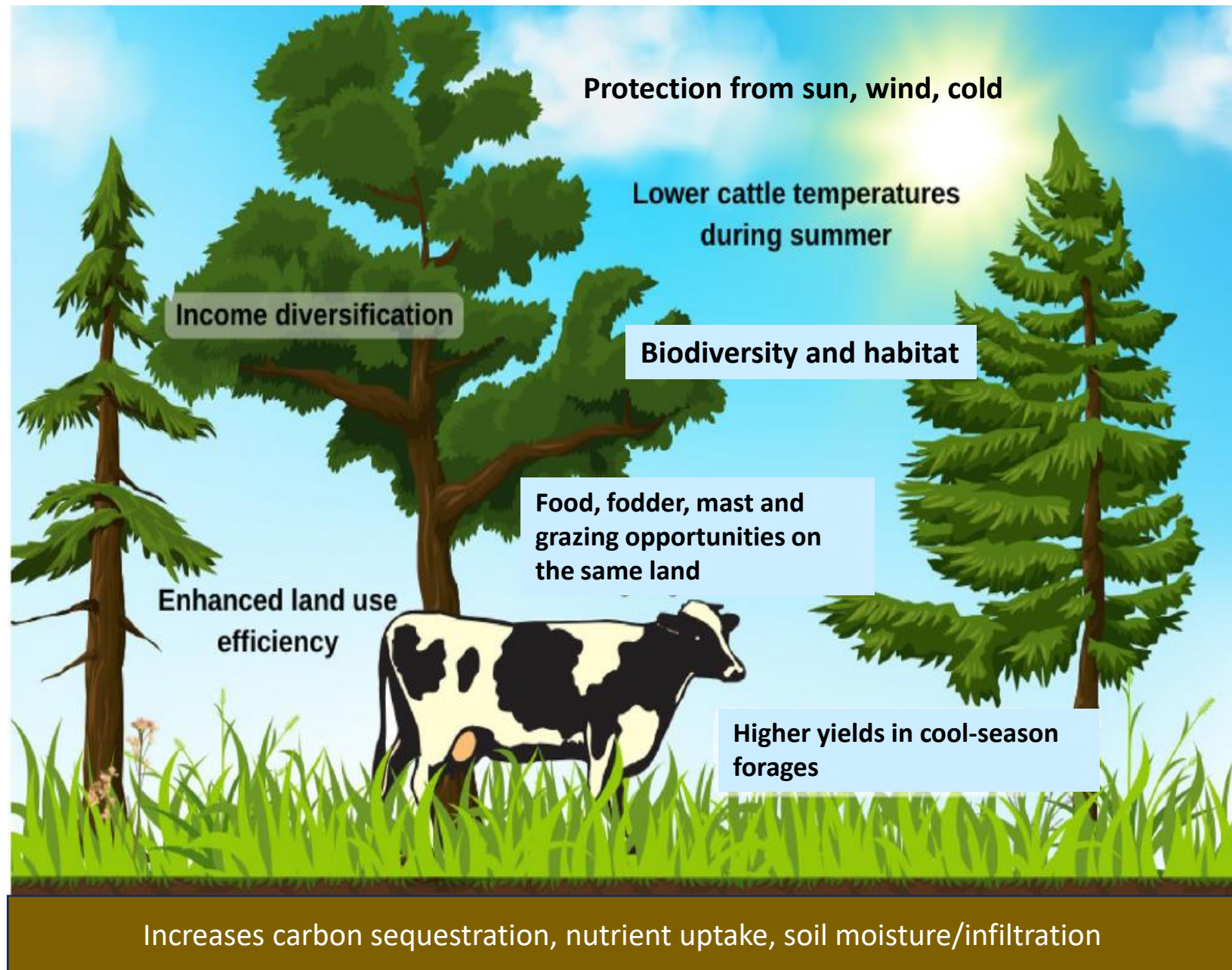zone of nutrient and soil moisture competition

Illustration: National Agroforestry Center

Silvopasture:

Incorporating livestock into an intentional mix of trees and pasture, spacing of the trees is planned to allow enough sunlight for the forages below, livestock are kept from damaging the trees.

Protection from sun, wind, cold

Lower cattle temperatures during summer

Income diversification

Biodiversity and habitat

Food, fodder, mast and grazing opportunities on the same land

Enhanced land use efficiency

Higher yields in cool-season forages

Increases carbon sequestration, nutrient uptake, soil moisture/infiltration

Silvopasture: Feed Benefits

Silvopasture systems can provide: Mast (nuts and fruits produced by woody plants), fodder, forage and browse

Trees: provide nutrition, medicine, and drought/flood resistant food sources

Examples:

Willow, rapid growth, high condensed tannins in leaves reduces methane emissions and controls parasites

Red Mulberry, leaves and fruit high mineral content, livestock, pigs, chickens

*Honey Locust*- edible pods, high sugar content, leaves- high protein content, comparable to alfalfa

Hybrid poplar- rapid growth, balanced nutrition

Trees for Livestock Food and Medicine- Steve Gabriel

Coppicing and Pollarding

- Dating back to the Middle Ages in Europe, coppicing and pollarding were used to continually harvest juvenile shoots off the same trees

- Cut a deciduous tree when it is dormant, it will send up fresh shoots in the spring, these are harvested when they reach the desired size — oak, hazelnut, ash, chestnut, locust and willow work well

- Keeping the tree in a perpetual juvenile state promotes vigorous growth and extends the life of the tree sometimes by hundreds or even thousands of years

- There are still stands of continuously pollarded trees that date back to that time
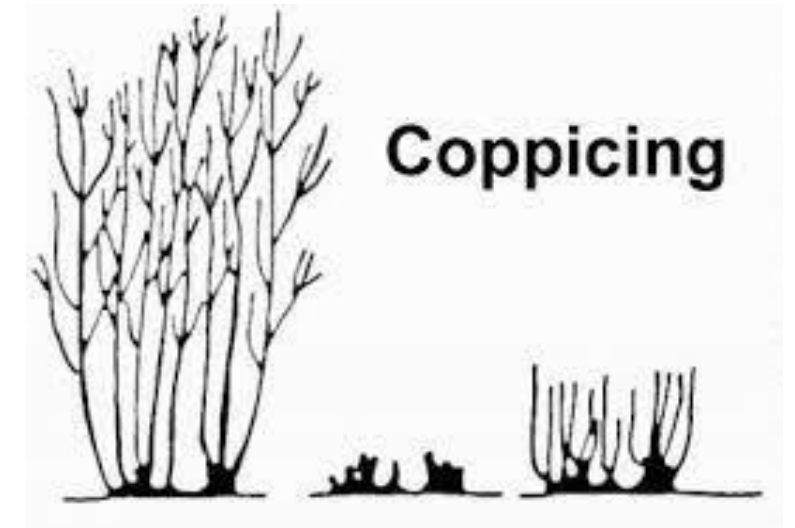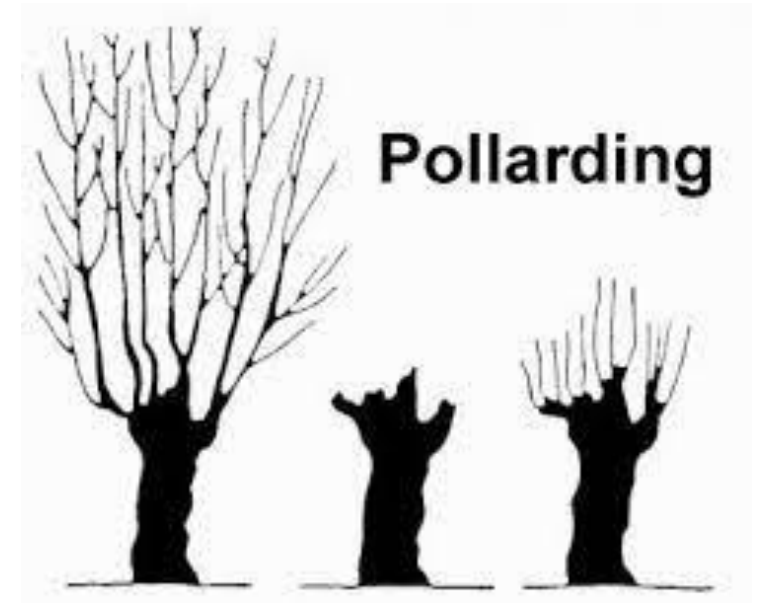
- These practices are being used and could be expanded in agroforestry systems to increase productivity

- Typically, coppicing is used to manage woodlands and pollarding is used in pasture systems

https://midwestpermaculture.com/coppicingpollarding/#:~:text=Coppicing%20and%20pollarding%20are%20two,for%20wildlife%20and%20native%20plants.

Challenges to Agroforestry Implementation:

- Lack of region-specific and culturally relevant technical assistance
- Lack of agroforestry demonstration and education sites
- Few producer incentive structures/Lack of financial planning assistance to account for startup costs
- Lack of consistent and standardized data on agroforestry implementation over time
- Rented lands
- Lack of nursery capacity and germplasm development
- Undeveloped supply chains and product markets
- Lack of seedling and saplings supply readily available
- Challenges of diversity

Challenges of Diversity

- Increasing species diversity makes management and planning more complex
- Agroforestry crops may require special harvesting and/or processing equipment and additional labor
- Complex systems: considering varied seasonal timing, nutrient needs, tree spacing, pest control, and livestock compatibility for each species of tree
- Integrating animals with young trees

Perennial Pathways: Planting Tree Crops, Designing and Installing Farm-Scale Edible Agroforestry, Savanah Institute

Trees for Graziers: Silvopasture in PA: Auston Unruh

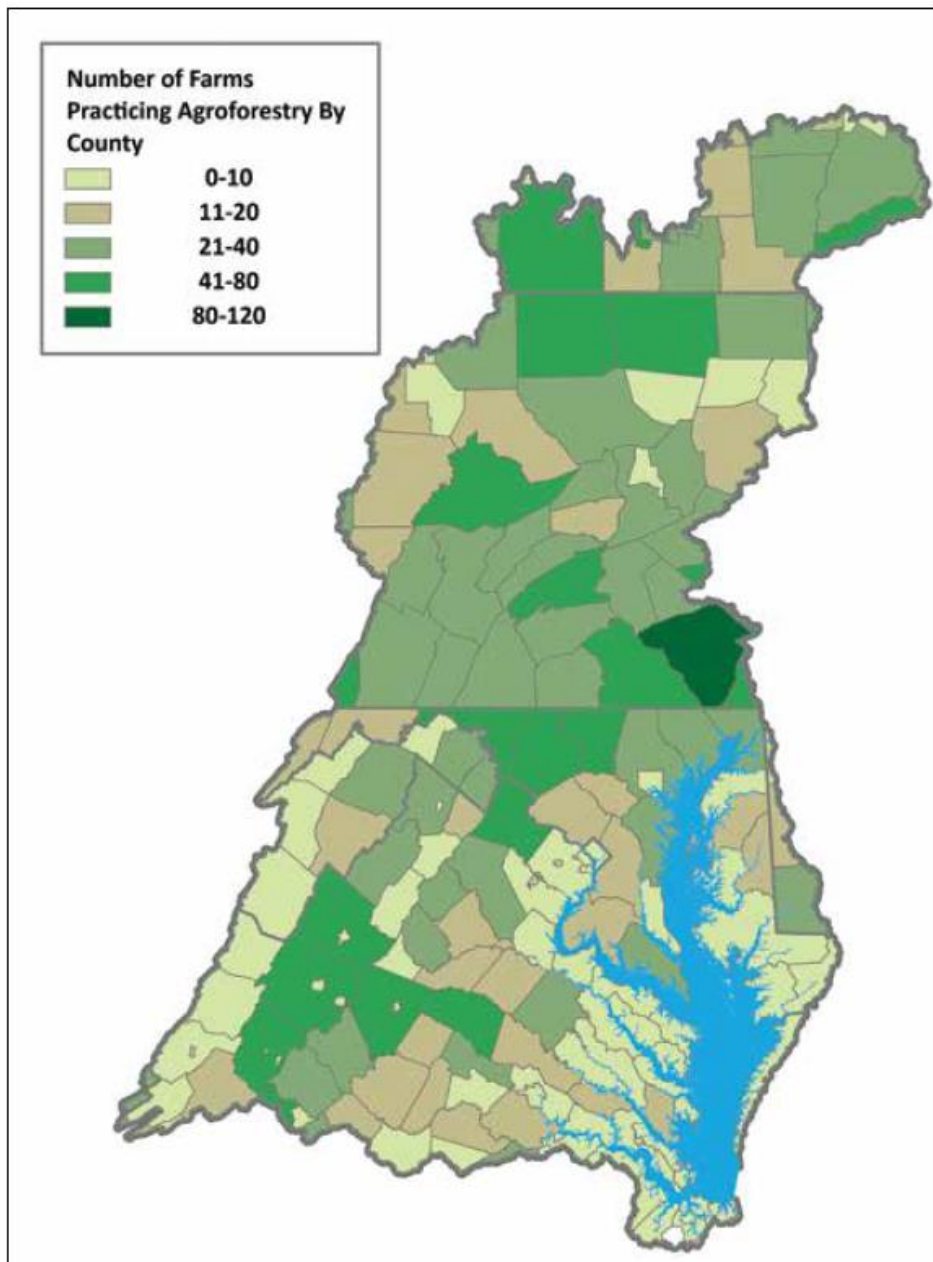https://www.youtube.com/watch?v=IK-1tWdt420

Sheep grazing alleys during tree establishment

An aerial view of the silvopastures at Fiddle Creek Dairy in Lancaster County, PA. (Photo courtesy Savanna Institute)

CBW Agroforestry Implementation

State	# of Farms 2017	# of Farms 2022
DE	48	28
MD	473	513
NY	1187	1350
PA	1657	1610
VA	1526	1534
WV	384	377
US Total	30,853	32,717

Ag Census Question: Practiced alley cropping, silvopasture, forest farming, or had riparian forest buffers or windbreaks

Number of farms practicing agroforestry by county. (Courtesy graphics by Chesapeake Bay Program and 2017 Census of Agriculture. Courtesy map by Nora Jackson, Chesapeake Research Consortium)

Gauging Interest in Agroforestry Practices

Appalachian Sustainable Development- Landowner Interest Survey:

- 96 alley cropping respondents- 56% interested in this practice
- 66 silvopasture respondents- 80% interested in this practice
- Identified programmatic needs: financing and technical assistance, demonstration sites, training and education

Nonprofit- Central Appalachia- parts of VA and WV: Works with farmers to strengthen local and regional economies https://www.asdevelop.org/

Stesha Warren-Appalachian Sustainable Development

Support for Agroforestry in the Chesapeake Bay Watershed

- **USDA: $60 million Partnerships for Climate-Smart Commodities** grant is set to promote agroforestry, $36 million of this funding is going directly to farmer incentive programs, USDA is collaborating with many entities to apply this funding

- Additional support from state forestry agencies and consulting foresters, non-profits, land-grant university and extension departments, and local soil and water conservation districts

- For more detail- See list of funding and technical assistance resources on last 3 slides
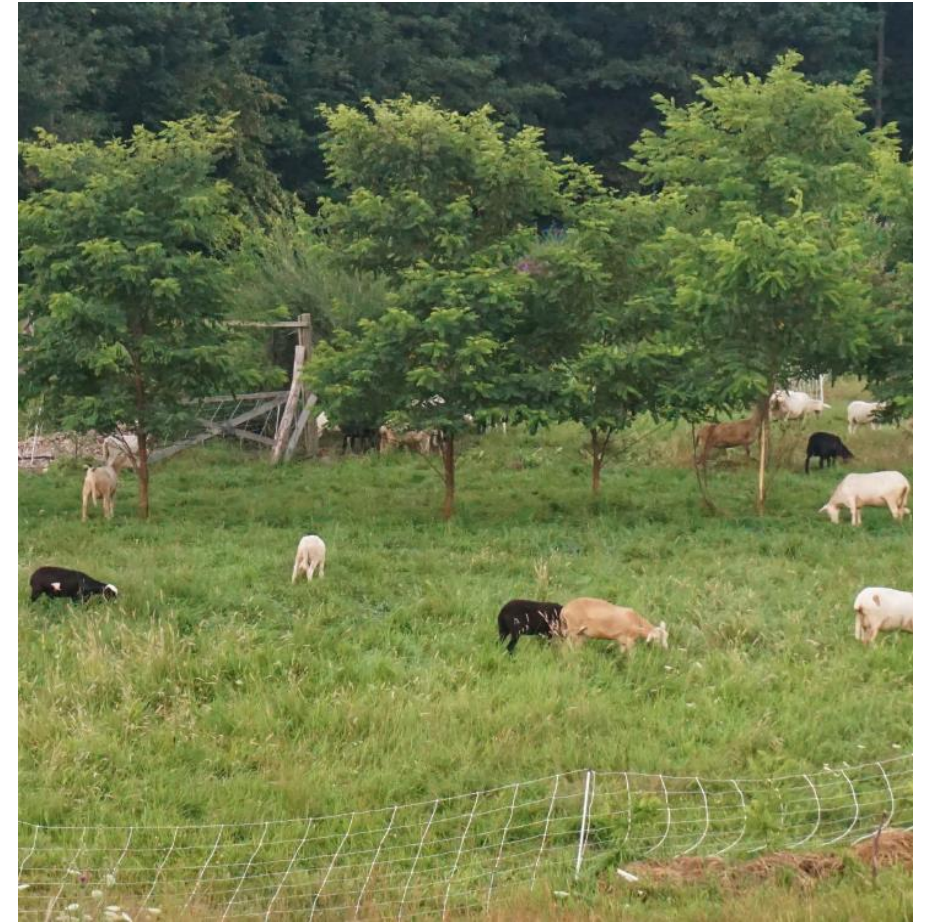
Support for Agroforestry in the Chesapeake Bay Watershed

- USDA/NRCS Conservation Practice Standards (CSPs) are a key component for delivery of technical and financial assistance for practice implementation from NRCS to its cooperators

- Not every state in the CBW recognizes all 5 NRCS agroforestry practices, this can affect the financial and technical support the practices receive from the state

Recognized NRCS Agroforestry Practices by State

State	Riparian Buffers	Windbreaks	Alley Cropping	Silvopasture	Forest Farming
DE	X	X	No	No	No
MD	X	X	X	X	No
NY	X	X	No	No	X
PA	X	X	X	No	X
VA	X	X	X	X	X
WV	X	X	X	X	X

https://www.fs.usda.gov/nac/practices/conservation-practice-standards.shtml

Support for Agroforestry in the Bay Watershed

- In 2020, partners released an updated Chesapeake Forest Restoration strategy which was the basis for a shared stewardship agreement between the watershed states, D.C. and the U.S. Forest Service

- The strategy highlighted the important role for agroforestry in improving water quality, increasing climate resiliency, and providing habitat and identified priority actions for increasing adoption

- Partners working on agroforestry in the watershed started meeting quarterly to provide a forum for advancing priority actions.

- Group is called "Chesapeake Agroforestry Network": provides a forum for discussion on key topics, guest presentations, and sharing among practitioners, researchers, and other natural resource professionals, have developed a strategic planning document
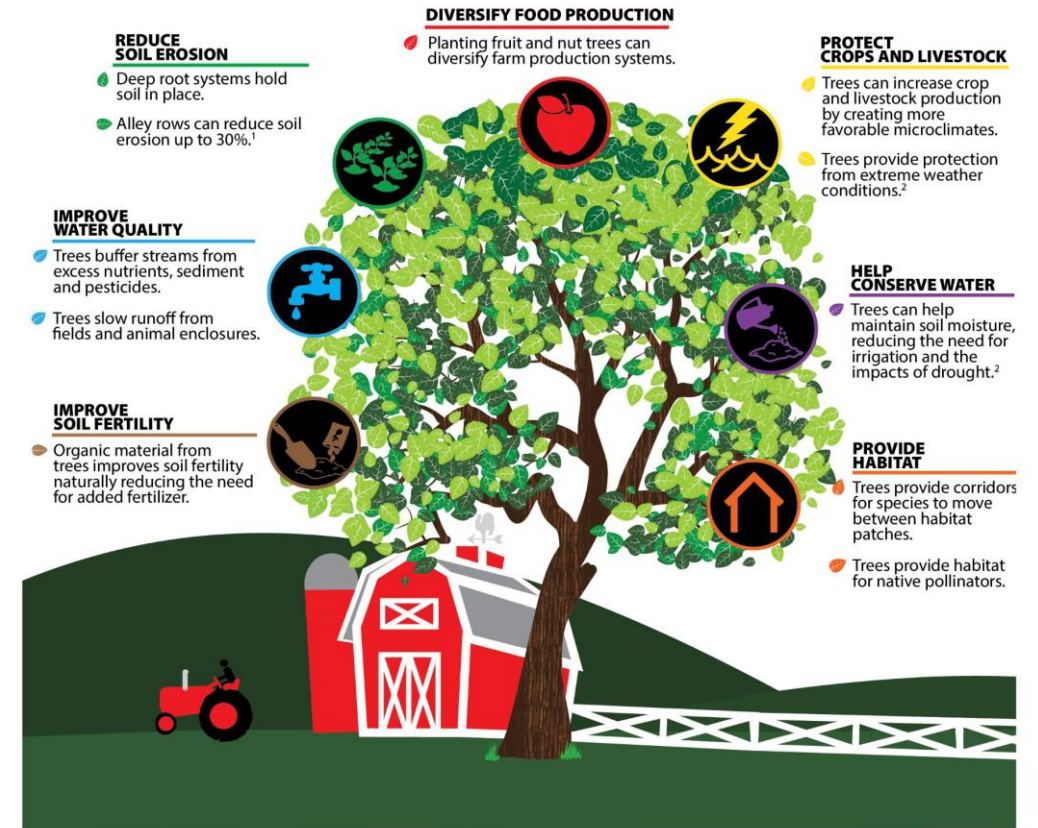
Benefits of trees on farms. (U.S. Forest Service illustration by Cheryl Holbrook)

Chesapeake Bay Agroforestry Network:

Mission/purpose statement: **Increase adoption and awareness of agroforestry practices across the Chesapeake Bay watershed**

Key Strategies:

Partner communication and coordination: Increase coordination, communication and information sharing between partners working within the watershed and with external groups concerning agroforestry practices, their benefits and best practices

Education and outreach: Increase public awareness through education and outreach concerning agroforestry practices, their benefits, best practices and technical and financial resources available for implementation

Agroforestry crediting and incentives: Improve crediting and incentives for agroforestry practices within the Chesapeake Bay Program and through major state and federal programs

Seed and tree supply: Improve seed sourcing and tree supply availability for agroforestry within the Chesapeake Bay watershed

Demonstration sites: Expand the network of high-quality agroforestry demonstration sites within the Chesapeake Bay watershed, include suggested research needs for considered implementation

Economic/market development: Support the development of markets for regional agroforestry products to help economically incentivize further adoption of agroforestry

Capacity building: Support building a more robust workforce for implementing agroforestry practices in the region

Current NRCS Agroforestry Practices Credited in CAST

NRCS	Practice ID	CAST BMP
Alley cropping	311	
Silvopasture	381	
Wind Breaks	380	Tree Planting
Riparian buffers	391	Forest Buffer
Forest farming	379	

- The Forestry WG has briefly discussed the possibility of crediting silvopasture as a CBP BMP by using or altering existing BMP definitions, reporting or crediting options
- Input from the AgWG on this subject is needed and appreciated

Considering CAST Crediting:

NRCS Practice	Practice ID	NRCS Definition
Alley cropping	311	Trees or shrubs planted in sets of single or multiple rows with agronomic, horticultural crops or forages produced in the alleys between the sets of woody plants that produce additional products.
Silvopasture	381	Establishment and/or management of desired trees and forages on the same land unit.

CAST BMP Name	BMP Definition	BMP Type
Alternative Crops	Accounts for those crops that are planted and managed as permanent, such as warm season grasses, to sequester carbon in the soil, C sequestration refers to conversion of crop to hay land	Land-use Change
Land Retirement to Ag Open Space	Converts land area to hay without nutrients, takes marginal and highly erosive cropland out of production by planting permanent vegetative cover such as shrubs, grasses and/or trees	Land-use Change
Land Retirement to Pasture	Converts land area to pasture, takes marginal and highly erosive cropland out of production by planting permanent vegetative cover such as shrubs, grasses and/or trees	Land-use Change
Tree Planting	Includes any tree planting, except riparian buffer establishment, targeting highly erodible lands or critical resource areas	Land-use Change

Financial Assistance in the Chesapeake Bay Watershed:

USDA Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program, Conservation Stewardship Program, Regional Conservation Partnership Program, Expanding Agroforestry Project (see below)

USDA Farm Service Agency: Conservation Reserve Enhancement Program (CREP), provides cost-share and rental payments to establish riparian forest buffers, among other practices.

National Fish and Wildlife Foundation (NFWF) Chesapeake Bay Stewardship Fund to State and local agencies, universities, and non-governmental organizations, support implementation and education around practices that will restore water quality, including buffers

Appalachian Sustainable Development: "Ask An Agroforester: Funding Edition" webinar:
Agroforestry Funding Table three funding programs presented in the webinar

Expanding Agroforestry Project
Catalyzing Agroforestry Grant Program

Pennsylvania agroforestry funding opportunities: http://bit.ly/PAagroforestryassistance
PA Resilient Food Systems Infrastructure Program

MD Healthy Soils Competitive Fund now includes funding for Agroforestry practice implementation:
https://mda.maryland.gov/resource_conservation/Pages/Soil-Health.aspx
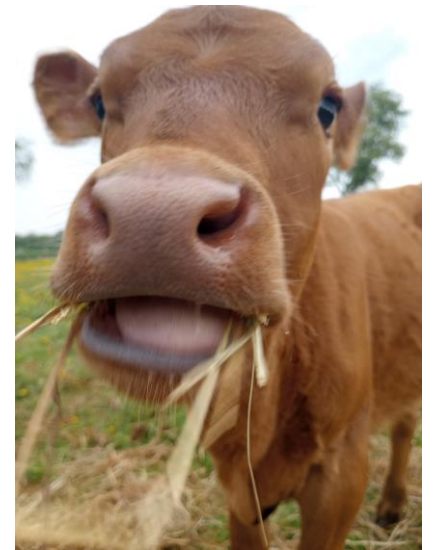
Links to Technical and Educational Assistance in the Chesapeake Bay Watershed:

Northeast/Mid-Atlantic Agroforestry Working Group (NEMA) is a consortium of technical service providers, agency staff, researchers, practitioners, and experts focused on educating, promoting, and implementing agroforestry systems in the region. The group is open to anyone interested in agroforestry and hosts workshops, webinars, and regular conference calls. https://www.capitalrcd.org/nemaagroforestry.html

USDA National Agroforestry Center works with State, Federal, non-profit, and private partners throughout the region to accelerate the adoption of agroforestry. https://www.fs.usda.gov/nac/

National Agroforestry Coalition: Savannah Institute https://agroforestrycoalition.com/

PASA: TNC https://pasafarming.org/agroforestry/

PASA'S Community Board (email list) : join to get Agroforestry funding, educational and technical assistance opportunities in PA and elsewhere

Appalachian Beginning Forest Farmer Coalition (ABFFC) https://www.appalachianforestfarmers.org/about

Appalachian Sustainable Development: https://www.asdevelop.org/programs-resources/agroforestry/

   Upcoming Ask an Agroforester sessions: sign up for Ask an Agroforester Alerts

MDDNR (Francis Smith)/FITCI: New Agroforestry 101 Continuing Education course: https://form.jotform.com/fccmarketing/agroforestry2024

Virginia Tech, Sustainable Agriculture Research and Education (SARE), ASD, VABF: Expanding the Agroforestry Regional Knowledge (ARK) Exchange Network in Virginia https://projects.sare.org/sare_project/spdp23-020/

Steve Gabriel- Well Spring Forest Farm- Cornell Small Farms Program- Author: Silvopasture, A Guide to Managing Pasture Animals, Forage Crops and Trees in a Temperate Farm Ecosystem

Multifunction Buffer STAC Workshop: https://www.chesapeake.org/stac/document-library/establishing-multifunctional-riparian-buffers-how-do-we-accelerate-riparian-buffer-plantings-across-the-chesapeake-bay-with-the-greatest-economic-social-and-environmental-impacts/

Informational Videos:

Alley Cropping: Planting Trees for Economic & Ecological Diversity:
https://www.youtube.com/watch?v=DTix2Iy-tRQ

Trees for Graziers: PA Auston Unruh: https://www.youtube.com/watch?v=IK-1tWdt420

Honey Locust pods: https://www.youtube.com/watch?v=eWg5oEt-EhM

Tree Fodders in Silvopasture- 2018 Webinar Steve Gabriel:
https://www.youtube.com/watch?v=gJ9G66pluqA

Multifunctional Buffers: PA Alliance- Ryan Davies:
https://www.youtube.com/watch?v=QqBH1dSuZBg

Pollarding and Coppicing:
https://www.youtube.com/watch?v=FkRuMqVuJDE
https://www.youtube.com/watch?v=-AStex4g3zw

Stop: Reference Slide

FIGURE 3. Water Infiltration Improves with Alternative Crop and Soil Practices
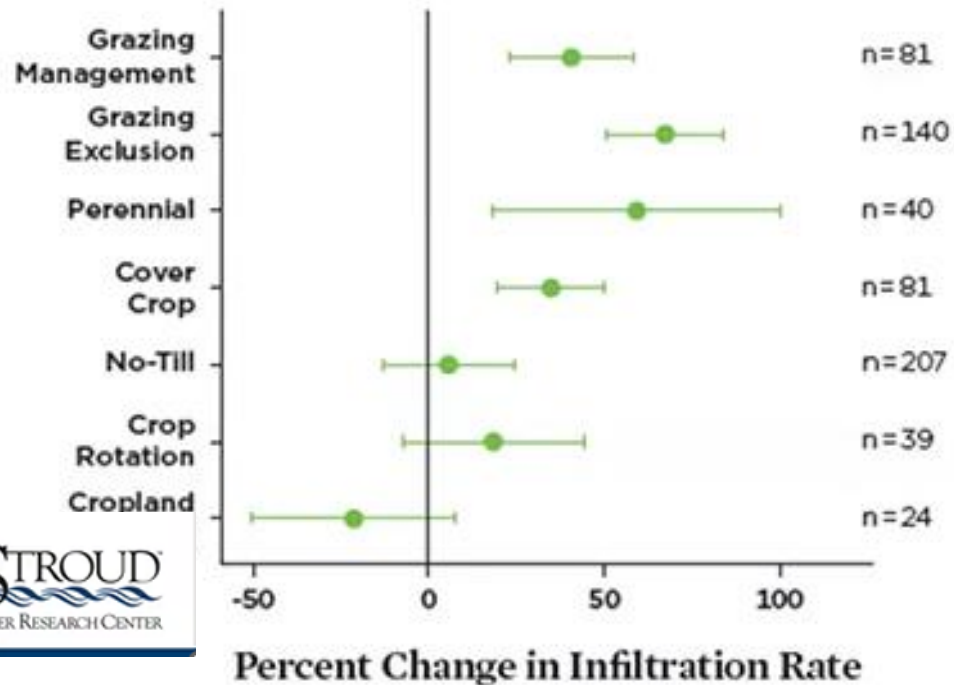
Perennial crops can build soil fertility while producing marketable crops, reducing need for inputs.

Ex. Tree crops and integrated livestock build a resilient farming system more resistant to volatile markets and labor, droughts and floods, and extreme rainfall events. Research shows that resilient farms integrate perennial crops to optimize management efficiency with diversity.

Keefe Keeley, Executive Director, Savanna Institute