2020 Perennial Farm Gathering Abstracts

Co-hosted by Savanna Institute & The Association for Temperate Agroforestry

ORAL PRESENTATIONS

ORGANIZED SESSION 1
December 6, 11:00 - 12:00 pm CST

AFTA - Who are we and why should you care?

GaryWyatt, wyatt@umn.edu, University of Minnesota Extension
John Fike, jfike@vt.edu, Virginia Tech
Donna Davis, donna.davis@colostate.edu, Colorado State Forest Service
Uma Karki, ukarki@tuskegee.edu, Tuskegee University

AFTA, the Association for Temperate Agroforestry, serves diverse agroforestry practitioners, educators and researchers in the US and Canada. This panel will discuss efforts and opportunities with AFTA and values of AFTA membership as the organization seeks to expand agroforestry awareness and application more broadly. AFTA hosts the North American Agroforestry Conference (NAAC), a biennial event that facilitates the exchange of scientific and practical information about temperate agroforestry in different regions of North America. As such, the NAAC is the primary forum for agroforestry research, extension and application in North America. AFTA also produces a quarterly newsletter to inform members of agroforestry applications and research findings from across North America and we are working to expand the scope and diversity of this publication. Producer perspectives on these and other activities will be part of the panel discussion, as well as plans for the 2021 NAAC. Meeting AFTA's mission - to promote the wider adoption of agroforestry by landowners in temperate regions of North America - can only occur with engaged membership, come be a part of this discussion.

ADDITIONAL CREDITS
Christine Nieman, christine.c.nieman@usda.gov, USDA
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SESSION 2
December 6, 2:00 - 3:00pm CST

Trees increase the frequency of cool-season grasses in silvopastoral systems on temperate native grasses

Dante Pizarro, UW-Madison Department of Animal and Dairy Sciences
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Silvopastoral systems may provide important production and environmental benefits. The loss of cool-season C3 grasses from temperate grazed native grasslands is associated with selective grazing and excessive solar radiation that limits their survival. Silvopastoral systems integrate trees with grasslands that provide shade to both cattle and herbaceous plants, potentially favoring C3 species. There is limited information on the effect of trees on the species and functional composition of native grasslands in the Campos biome in South America. The objective of this study was to detect gradients in the botanical composition of grasslands associated with isolated native trees under two common soils: Prosopis spp. on solonetz and Acacia caven on brunisoils. Frequency and soil cover of the herbaceous species under three trees in each situation was systematically recorded every 0.5 m in 15 m transects on the four cardinal directions taking each tree as the center. The pastures on brunisoils showed a greater species richness than those on solonetz, and a higher frequency of grasses and legumes. In both situations, there were differences in pasture composition in the different shade regions. Under the canopy (0-5m), the herbaceous layer was enriched with cool-season grasses such as Lolium multiflorum, Stipa setigera, S. hyalina, and Bromus catharticus. At a greater distance (10-15m), warm-season grasses increased in the coverage such as Paspalum notatum and P. dilatatum. The gradients detected allow us to conclude that trees in silvopastoral systems can increase the abundance of cool-season species and therefore the forage nutritive value of the native pasture.

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Environmental impacts associated with converting woodland to silvopasture

Diane Mayerfeld, University of Wisconsin-Madison Extension and Center for Integrated Agricultural Systems
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Many farmers are interested in converting woodland to silvopasture to provide shade for their animals and increase forage stocks. We found that converting a mixed hardwood woodland in southwestern Wisconsin to silvopasture provided these benefits but also had some adverse

impacts on soil condition. We compared soil penetration resistance, water infiltration, understory density, and tree growth and health in three treatments: an ungrazed control, silvopasture with periodic livestock access and forages planted in the understory, and grazed woodland with periodic livestock access but no understory manipulation. Soil penetration resistance increased, and water infiltration capacity decreased in both grazed treatments relative to the ungrazed control. Tree growth as measured by plot basal area increment was slightly greater in the grazed woodland and ungrazed control than in the silvopasture treatment, but the difference was not statistically significant. Trunk and canopy health and the percentage of dead branches were not different among the three treatments, but the silvopasture treatment had a greater increase in epicormic branching than the other two treatments. The sensitivity of soil quality measures to grazing underscores the need for careful management of grazing intensity in silvopasture systems.

ADDITIONAL CREDITS
Eric Kruger (1), Mark Rickenbach (1), and Rhonda Gildersleeve (2)
1) University of Wisconsin-Madison; 2) Farmer and retired UW Extension Professor and Grazing Specialist

Abiotic and biotic drivers of soil C cycling change throughout the lifespan of riparian agroforests

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Agricultural landscapes play a major role in global carbon (C) emissions. Rehabilitation of agricultural riparian buffers with trees (agroforestry) provides a unique and elegant solution to enhance carbon storage while also augmenting local biodiversity. Yet the scope and role of riparian plant community diversity in key soil dynamics remains unresolved. Operationalizing riparian age [young (<10 years) and mature (>30 years) since establishment] and forest stand type [coniferous and deciduous dominant], we measure plant functional trait diversity, microbial diversity, abiotic soil conditions and rates of soil CO2 efflux (mg CO2-C m-2 h-1). We use structural equation modelling (SEM) to further refine the role of biotic and abiotic factors on soil C cycling processes in riparian systems. We found significantly lower rates of CO2 efflux ($F = 8.47$; $p<0.01$) and higher total soil C ($F = 3.46$; $p=0.03$) in mature buffers as compared with young buffers. These differences were not significant between forest stand types. Using SEMs, we describe influences on soil C content (marginal r2=61) and soil CO2 efflux (marginal r2=53). Within young buffers, soil C content was significantly predicted by fungal:bacterial ratio and root length density, whereas in mature buffers, soil C content was associated with higher tree leaf functional trait diversity. Soil CO2 efflux was predicted by soil moisture, soil carbon content, and root functional trait diversity. Evidently, leaf and root functional traits in combination with broad soil parameters significantly describe soil C dynamics in the field, with these pathways changing throughout the life cycling of riparian agroforest.

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SESSION 3
December 7, 10:00 - 11:00 am CST

Agroforestry, perennial forages, & perennial grains: Partnering to speed the transition to a perennial agriculture

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Perennial crops in diverse cropping systems are the keystone of a genuinely regenerative agriculture – they have an unparalleled ability to provision both high levels of ecosystem services and abundant food for humanity. Three major communities make up the growing perennial agriculture movement: agroforestry, permanent pasture & grazing lands, and perennial grains. Each of these platforms has a crucial role to play in an overall perennial ag portfolio that can start making a positive impact for soil, water, and climate now while continuing to scale that impact up into the future. But despite the clear advantages of perennial agriculture systems, much of temperate agriculture remains dominated by annual crops. Farmers, researchers, policymakers, and funders aligned with each perennial crop type often end up advocating for their perennial crop platform in isolation. Are we leaving opportunities for synergy on the table? This panel will discuss how the diverse strengths of perennial forage, perennial grains, and agroforestry systems complement one another in an integrated portfolio, how we can work together to better communicate the unique potential of perennials to provide abundantly for ecosystems and the people who live in them – and how we can accelerate the transition to a truly perennial agriculture.

SESSION 4
December 7, 11:00 - 12:20 pm CST

Agroforestry for Regional Food Security

Andria Caruthers, University of Missouri
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The impact of COVID-19 on the US food system led to disruptions in the food supply chain increasing food insecurity, especially among America's most vulnerable populations. Risks and uncertainties made it difficult to get food from farmers to consumers, highlighting a less than resilient supply chain. With nationwide shutdowns keeping food stranded upstream from consumers, local farmers and farmers markets had to pivot their operations and adopt safety protocols to meet the growing demand for locally produced food. The situation revealed the necessity to enhance regional food security and access to healthy and nutritious foods by strengthening regional food supply chains for future stressors. Multifunctional perennial cropping systems, like agroforestry, produce diverse, sustainably grown food products that can build-up local and regional food environments for nutrition and food security while enhancing ecosystem services. This review will look at agroforestry production systems for food and nutrition security and opportunities for agroforestry products in regional and local supply chains.

Desert Laboratory on Tumamoc Hill Aridamerican desert polycultures for resilient lands and communities

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Gary Paul Nabhan, Southwest Center and Desert Laboratory on Tumamoc Hill, University of Arizona
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Across western North America, megadroughts supercharged by anthropogenic warming are threatening human health and testing the limits of conventional crops and industrialized food production. Desert-adapted food plants and Traditional Knowledge, however, can provide a foundation for a new model of climate-smart food production that is more resilient to climate change while benefiting both land and human health. Focusing on arid North America ("Aridamerica") as a laboratory for the future, we constructed a list of candidate crops based on the diets of the Comcaac, O'odham, and Pima Bajo Peoples of the Sonoran Desert. We then screened representative food plant genera for traits related to agroecological functionality, human health, community well-being, and agronomic suitability. Indigenous food plants from at least 80 different genera have a long tenure of broad use across Aridamerica, suggesting wide acceptability and value for climate-smart agriculture. We highlight 17 of these genera with high potential to simultaneously improve agroecological function, human health, and community prosperity in the face of climate change. When assembled into perennial polycultures modeled after arid ecosystems and Traditional Knowledge, desert plants can produce disease-preventing foods and generate rural livelihoods. Furthermore, desert polycultures can be integrated into

solar energy and rainwater harvesting systems that maximize yield reliability while minimizing fossil fuel, agrichemical, and surface and groundwater use. As communities around the world consider a hotter, drier future, arid-adapted food production will be a key component to resilient food systems.

Restoring the Matrix

Cynthia Lane, Ecological Strategies, LLC
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For a food-producing system to be sustainable and resilient, practices must be ecologically grounded and designed to protect and restore natural ecosystems. Therefore, a critical element of any agroforestry project is the careful planning, protection, and restoration of on-site and neighboring native landscapes. Dr. Lane has a Ph.D. in Conservation Biology, with a minor in Forestry, and a research emphasis in Restoration Ecology. She has worked as a research and applied ecologist for 30 years assessing land health, land planning, and implementing restoration and management plans to protect and enhance the health of natural ecosystems. The focus of her presentation for this conference will be on how to assess a current or proposed agroforestry project at the site and landscape scale. For example, Dr. Lane will provide methods for evaluating and restoring landscape pattern and habitat connectivity. She will provide a framework for how to use site assessment information to inform project design.

Zumwalt Acres: A community-oriented approach to regenerative farming in the corn belt

Gavrielle Welbel, Zumwalt Acres
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Zumwalt Acres is a regenerative agriculture initiative in Sheldon, IL, focused on transitioning a multi-generational family farm of woods, beef cattle pasture, and corn and soybean row crops into an agroforestry-based, carbon-smart farm. Our goal is to create a model showing the environmental and financial benefit of this approach to agriculture, ultimately encouraging surrounding farms to incorporate similar practices. The first step in creating a reproducible model is building a nursery to grow nut trees and fruit shrubs from seeds, based on Savanna Institute's recommendations for Midwestern native species grown for agroforestry. The trees will ultimately be transplanted into an agroforest with wind breaks, alley cropping, and multi-story cropping. Additionally, we are producing biochar, a form of carbonized organic material that has been shown to sequester carbon and increase soil fertility when applied. We will rebuild and revitalize our soil, which has been degraded by years of chemical-intensive agriculture. We will maintain close contact with Sheldon farmers in order to learn about the current systems and constraints they operate within and their hopes for the future of Midwestern agriculture. We will consult with family members who manage the surrounding 1000 acres of corn and soybeans to understand how our research can translate usefully into their practice. We have the opportunity now to be a leader in expanding tree planting, carbon drawdown, and soil-healing practices by conducting systematic field-based studies that demonstrate the immense economic, ecological, and social benefits of regenerative agriculture.

SESSION 5
December 7, 2:00 - 3:00 pm CST

Breeding Strategies for Regionally-Adapted Agroforestry Crops

KarenVanek, Forest Agriculture Nursery
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A growing number of farmers are exploring agroforestry as a means for adapting their farms to endure through the rapid economical and environmental changes they had been experiencing. With this growing interest also comes the interest in achieving more dependability from the woody perennial crops systems. In ecological systems, dependability is reflected through population fitness, biodiversity, and other criteria. What do ecosystems show us when it comes to adapting to a rapidly changing world and how might we apply those principles to add resilience to our agroforestry systems? Do the farmers who are cultivating perennial woody crops at farm-scale also hold a solution to supporting regionally-adapted plant breeding? Forest Agriculture Nursery wants to share an overview of their adaptive genetics plant breeding strategies practiced at New Forest Farm in Viola, WI, and discuss the ways in which applications of mass selection plant breeding may offer viable long-term sustainable options for growers.

Participatory Selection in Tree Crops potential role in mixed species polyculture?

Dr. Andrew Ormerod CF, Global Biotechnology Transfer Foundation
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A review of the finds from my 2018 Winston Churchill Memorial Trust travel research fellowship to Cameroon, Germany and North America to identify methods linked to participatory selection of tree and shrub crops. The original rationale was to understand more about methodology that could be applied to participatory research and learning linked to a model tree crop - Apple tree crops. Since 2010 I have been growing half sib family groups of apple trees to be used in community research and education projects in the UK, I am also interested in its application to other species and if it has a role in mixed species polyculture. I was interested to see what methods were used with participatory apple tree selection in different countries. In addition how the technique is used and promulgated to different community groups - there was particularly useful information from Cameroon in this respect. In addition I was interested in the transferability of ideas between different countries and between annual/field crops and tree crops.

<TITLE?>

Kevin Wolz, Savanna Institute
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Systematic experimental designs that modify species composition or density across a plot (Nelder Fans, Goelz Triangles) can reduce required plot sizes and numbers of individuals, expand the experimental inference space, and better calibrate competition indices. As a pilot

study to test the potential of these designs, we have established experimental plots at two locations (Urbana, IL, USA and Salina, KS, USA). Both locations were planted in spring 2019 with a double Goelz Triangle containing three woody species: hybrid willow (Salix sp.), black locust (Robinia pseudoacacia), and hybrid poplar (Populus sp.). Then, in fall 2019, both locations were planted with a two-species modified Nelder Fan containing intermediate wheatgrass (Thinopyrum intermedium 'Kernza') and alfalfa (Medicago sativa). Having plots at two locations provides a prime opportunity to explore how climate and soil modify species interactions. Urbana receives an average of 1620 mm of precipitation each year, whereas Salina receives half that at only 810 mm per year. Salina also has an annual average temperature about 3 ˚C higher than Urbana.

Productivity in aboveground biomass will initially be the primary metric by which the impact of diversity is assessed. To measure the aboveground biomass of woody plants, the basal diameter of each plant stem will be measured annually during the dormant season using a digital caliper. Allometric relationships for each species from the literature will be used to estimate biomass. For the herbaceous plants, aboveground biomass will be measured directly by cutting and weighing biomass periodically. Other ecosystem service indicator metrics, such as insect biodiversity, soil nitrate concentration, and soil moisture, may also be measured periodically across gradients in each set of experiments.

SESSION 6
December 8, 10:00 - 11:00 am CST

Supporting Beneficial Birds and Managing Pest Birds

Jo Ann Baumgartner, Wild Farm Alliance
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Beneficial birds eat pests when farms provide for their needs. Researchers around the world are partnering with farmers to use new science and build on more than 130 years of avian pest control studies. Nest boxes placed in vineyards increased W. Bluebird abundance and diversity and their pest control services by a factor of four. Hedgerows and other woody margins also increase beneficial bird presence and reduce insect pests. If birds are a problem, they are managed with scaring and exclusion techniques and cultural practices. With this session and the associated "Supporting Beneficial Birds and Managing Pest Birds" booklet (www.wildfarmalliance.org/bird_resource), we will help farmers, conservationists and academia understand how to make the most of birds on farms.

Advancing agroforestry and biodiversity in the Pacific Northwest

Abel Kloster, Resilience Permaculture Design, LLC
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This presentation will highlight grants and cost share funding available in the Pacific Northwest for agroforestry projects that enhance habitat and biodiversity. Case studies from projects in oak savannas, riparian hardwood forests, and upland conifer forests will be discussed. We will explore a framework for leveraging technical and financial support for both the planning and implementation phases of projects.

Food Forest Initiative of Cape Cod Food Forest Initiative: Restoration Ag Under the Power Lines in Cape Cod

Rand Burkert, Food Forest Initiative of Cape Cod (Secretary), Orleans Farmers' Market (Board), Nauset Food and Research Garden
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Power line Right-of Ways are often a no-man's zone of lanes crisscrossing the world. What if they could be lanes for biodiversity and assisted migration? Food Forest Initiative of Cape Cod is a small, agile bioregional collaborative which works non-hierarchically to problem solve in public spaces. Applying Restoration Agriculture principles, we installed a public Walking Commons on land owned by the Harwich Water Department, with a Right-of-Way easement managed by Eversource. By committing to volunteer vegetation management, we obtained permission to plant 16 species and improved varieties of native edible plants and some experimental introductions. The project, to be observed by Eversource, is a proof of concept; by example, we hope to show that community management is possible, and that mixed agroforestry (with species that grow within meet state-imposed vegetation height limits for power lines) can bolster research into potential economic benefit of mixed perennial plantings. We also intend, through outreach to local schools, to develop citizens-science sub-projects to involve local schools in questions of carbon sequestration and biodiversity. The public space is a valid testing ground both for restoration agriculture and for social permaculture models of civic transformation. The power lines section in question is 90 feet wide by 300 feet. "Integrated Vegetation Management" as practiced by Eversource is accomplished through sub-contracts to arborists who apply herbicide; what if sub-contracts instead were awarded to agro-foresters and harvesting cooperatives who could use the space productively, diversifying power line right of ways to make them nature corridors?

ADDITIONAL CREDITS
Nauset Regional High School Food Forest Initiative Core Members: Tom Fettig, Kristin Knowles, Dave Scandurra, Marina Matos, Patrick Otton, Clara McLardy, Sandy McLardy

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SESSION 7
December 8, 11:00 - 12:00 pm CST

Join Us to Help Shape an American Forest Farming Council

John Munsell, jfmunsel@vt.edu, Virginia Tech University

Forest farming has increased across the United States in recent years. Practitioners are better positioned than ever in the marketplace and greater attention is being paid to the role and relevance of their enterprise. However, farmers and stakeholders currently lack a professional association where they can transfer knowledge, address scientific and technological needs, advocate, and celebrate community. The American Forest Farming Council (AFFC) is envisioned as a premier professional forest farming association guided by an organizational charter that ensures cooperative problem solving, consistent member services, and a culture that is inclusive, abides by antitrust laws, and respects diverse viewpoints. Membership will be open, but is anticipated to consist of forest farmers and wild stewards, NTFP-dependent industry representatives, NTFP procurement specialists, agency professionals, academics and extension, economic developers, and forest conservationists. Potential focus areas include: a) increasing recognition of NTFPs as agricultural crops; b) forest farmer and wild steward support; c) supply stock and value-added systems; d) research and precision technology; and e) external affairs and public awareness. During this session, findings from previous stakeholder discussions and results of a short survey provided beforehand to registered attendees will be shared. Work in small breakout groups will also occur to help refine ideas about the AFFC's structure and function. Furthermore, there will be opportunities to voice thoughts on the general needs of forest farmers through moderated discussion. Results will help define the role of forest farming in the nation's bio-economy.

ADDITIONAL CREDITS
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SESSION 8
December 8, 2:00 - 3:00 pm CST

Nature's Path Foods Agroforestry Criteria

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Nature's Path Foods has developed an agroforestry criteria aimed at offering validity and transparency to agroforestry-labeled products sold in North America. We have a mission of reducing climate change through better agricultural practices, and a commitment to constantly improving the soil used to grow the ingredients we use in our products. We understand the complexity of reaching consensus on a new set of agroforestry standards that embrace a diverse set of stakeholders, so we have actively solicited feedback from the community of agroforestry researchers and practitioners during the development of our set of agroforestry criteria.

Our goal is to achieve alignment with Agroforestry Best Practices, and we hope our criteria will contribute to the process of improving a standard that is both:

1. Universally applicable across multiple soil and climate conditions, and
2. Meaningful for practicing long-term soil stewardship within diverse organic farming systems.

Our intent is to initiate a set of agroforestry criteria which is rigorous enough for building confidence with the general public, yet flexible enough to incorporate a wide range of agroforestry practices in both tropical and temperate environments. The agroforestry criteria aims at nurturing a system of agriculture which builds a deep level of health and resiliency into an entire farm ecosystem while sequestering long-term storage of carbon. To this end, it encourages farmers to employ their creativity and utilize agroforestry practices that are specific to their operations. As we begin implementation of our program, we continue to encourage feedback from the agroforestry research community.

Food Forests: Definition and Examples

Gary Wyatt, University of Minnesota Extension
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Families have a growing interest in producing vegetables and fruits on their own property or from community food gardens. This trend was happening before COVID, but now has accelerated. Producing and purchasing local foods is very popular. This presentation will discuss what a food forest is, examples of food forests, plants producing edible fruits and nuts and

resources to find more information. Learn more about food forests, forest farming, and how you can be involved or educate others in your community. Gary Wyatt, wyatt@umn.edu, University of Minnesota Extension.

Tools You Can Use! From the USDA National Agroforestry Center

Kate MacFarland, USDA National Agroforestry Center
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"It takes as much energy to wish as it does to plan." – Eleanor Roosevelt

Creating effective agroforestry systems that achieve one's goals and objectives requires juggling numerous considerations and information. To address this challenge, planning and design tools can help landowners navigate this decision-making landscape. The USDA National Agroforestry Center has developed a wide range of tools you can use to design agroforestry practices on your farm, calculate their economic viability, and learn from other agroforestry approaches. In this session, you will hear more about many tools from the National Agroforestry Center and its partners, including tools for site assessment, tools for planning and design including the Conservation Buffer Guide and AgBufferBuilder, economic tools like the Non-Timber Forest Products Calculator and other crop enterprise budgets, as well as resources for finding others involved with agroforestry. The SARE Agroforestry Project Index showcases over 220 SARE-funded projects that are related to agroforestry and the Agroforestry Webinar Library holds 164 videos on a range of agroforestry topics. The Inside Agroforestry Article Library allows one to find pertinent articles from 20 years of this publication. You will also hear about the limits to using these tools and how to find ones relevant to your management objectives. Finally, the session will allow for time for the audience to provide feedback and suggestions on future tool and resource development.

ADDITIONAL CREDITS
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SESSION 9
December 9, 10:00 - 11:00 am CST

Making Agroforestry Research Relevant to and Useful for Farmers

Kevin Wolz, kevin@savannainstitute.org, Savanna Institute
Meghan Giroux, meghan.giroux@gmail.com, Interlace Commons & Interlace Agroforestry
Fabien Balaguer, fabien.balaguer@agroforesterie.fr, Association Française d'AgroForesterie

Agroforestry research today encompasses everything from long-term field studies and biophysical computer modeling to stakeholder surveys and market analyses. But what does it all

mean for an agroforestry farmer? Is this research helping farmers to be successful? Does research aid in making farms more profitable, productive, efficient, or resilient? Given the many urgent ecological issues that agroforestry plays a role in solving, it is critical that our limited research capacities be as focused as possible on the key needs of farmers and landowners as they adopt and scale agroforestry. This panel will discuss the role of research in agroforestry across multiple disciplines and continents from the perspective of NGO leaders that are poised at the nexus of research and application.

SESSION 10
December 9, 11:00 - 12:20 pm CST

North Shore AgroEcology Center/Organic Consumers Assoc. Regenerative Farming in NE Minnesota - The North Shore AgroEcology Center

Stefan Meyer, Farm Manager - North Shore AgroEcology Center
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A new regenerative farm and educational site is being developed by the Organic Consumers Association on the Minnesota North Shore. Join us as we walk through the land development work that has happened over the last 4 years; from design to earth works, to soil improvement and hugelkultur. We have incorporated multiple elements, such as: mushrooms, bees, fruits and nuts, a deep winter greenhouse, grape mash/wood chip/mushroom composting windrows, herb gardens, woodland management for sugarbush, solar arrays, to a multrum composting toilet. We are trialing out hazelnut and elderberry varieties for our area. The farm will be used for education, demonstration and experimentation of regenerative agriculture techniques.

Shrub Willows as Living Snow Fences in Minnesota

Gary Wyatt, University of Minnesota Extension
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Living snow fences (LSFs) are rows of trees, shrubs, grasses, or standing corn that are strategically placed to control drifting snow on rural roadways. LSFs are an agroforestry practice that can provide a range of environmental benefits, including wildlife habitat and carbon sequestration. Blowing and drifting snow adversely affects winter driving conditions and increases road maintenance costs. Despite incentives and financial assistance by state and federal agencies, farmer adoption of LSFs is low, due to concerns about removing cropland from production, among other reasons. There has been an interest in using shrub-willows (Salix spp.) as LSFs in Minnesota?, because they have been successfully implemented for LSFs in other states and are considered a short-rotation woody crop for bioenergy production. To evaluate the potential of shrub willow LSFs for multiple benefits in Minnesota, a right-of-way demonstration LSF was established in 2017. This LSF was so successful that the Minnesota Department of Transportation (MnDOT) has planted several more willow LSF around the state. Learn more about the willow LSF story in Minnesota.

The Influence of Environmental Factors on Plantings of Wild-Simulated American Ginseng

Karam Sheban, Post-Graduate Research Fellow at Yale University, School of the Environment
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Anna Plattner, General Manager at American Ginseng Pharm
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Forest farming is the cultivation of high-value crops under the protection of a tree canopy. Due to reliable markets and its high commodity value, American ginseng (Panax quinquefolius L.) is often the focus crop of forest farming operations in the Eastern United States. By number of growers, American ginseng is primarily grown using wild-simulated planting techniques aiming to mimic the natural habitat of wild ginseng.

Wild-simulated ginseng producers largely rely on conventional wisdom—learned from wild-harvesting ginseng—when selecting sites for intentional cultivation; sites are selected based on slope, aspect, and presence of indicator species. However, these are all proxy variables and do not reveal how plants are interacting with the direct environmental variables that influence plant growth (e.g., light, moisture, nutrients). Sites which seem comparable based on their slope, aspect, and associated species yield very different rates of germination and ginseng survival over time, resulting in mixed success of plantings.

In partnership with American Ginseng Pharm—a wild-simulated ginseng farm with plantings across more than 1,000 forested acres in the Catskill Mountains—Karam Sheban conducted research funded by the USDA's SARE program into the environmental factors responsible for the growth and development of plantings of wild-simulated ginseng. Project results contribute to our understanding of what environmental variables are most critical for the success of wild-simulated ginseng plantings.

In their talk, Karam and Anna will present on this research—currently in preparation for publication—and how it has helped guide American Ginseng Pharm's management. They will also discuss the implications for forest farmers across the region.

Using Bark Mulch to Control Weeds and Build Soils In Organic Apples

Chris McGuire, Two Onion Farm
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Most new commercial apple orchards are planted with dwarf trees, which provide a rapid return on investment, reduce labor requirements, reduce disease pressure, and improve fruit quality. However, dwarf trees compete poorly with neighboring plants. Non-organic growers typically use chemical herbicides to control weeds under trees, but organic growers have fewer options.

We share results, including material costs and labor requirements, from our ten years of experience raising organic apples in southwestern Wisconsin. We mulch under our trees with hardwood bark, which discourages vole pests, builds soil organic matter, and suppresses weeds. Annual mulching in our orchard requires $2.50 per tree per year for bark and 3 minutes per tree per year in labor.

We have found several challenges with this mulch system: (1) Weeds with wind-dispersed seeds (dandelions) germinate atop the mulch and require additional wedding. (2) Slow-spreading grass and clover from the aisles in between tree rows gradually encroach into the mulch. Tractor cultivation of a narrow strip between the sod and the mulch controls this problem. (3) Perennial weeds with deep rhizomes, such as Canada Thistle, can establish in the mulch and form dense patches. Established patches can be controlled by repeatedly killing weed shoots during the growing season. Organic herbicides, string-trimming, and hoeing are all effective methods of killing shoots, each with different advantages and costs.(Part of this presentation is based on the results of a USDA-SARE farmer rancher grant to study methods of Canada thistle control in mulched organic orchards.)

POSTER PRESENTATIONS

December 8, 3:00 - 4:00 pm CST
All presentations are 5 minutes

Carbon Farming: Agroforestry and Soil Data

Dr. Linda F. Hezel, Owner/operator Prairie Birthday Farm LLC, flavor@prairiebirthdayfarm.com
Molly Gosnell, GISP, Midwest GeoInfo LLC, Owner is a certified geographic information systems (GIS) Professional and certified arborist. molly@midwestgeoinfo.com
Dr. Bob Kremer, Consulting Soil Scientist and Adjunct faculty, School of Natural Resources, Professor of Soil Microbiology, School of Natural Resources and Division of Plant Sciences, University of Missouri, KremerR@missouri.edu

Development of a Carbon Farming Plan through Assessment of Tree/Shrub Agroforestry Data for Increased Production, Resource Valuation, Carbon Sequestration and Related Ecosystem Benefits

Problem: According to recent climate reports emphasizing rising greenhouse gases, Midwest farmers face more weather extremes (heat, drought, torrential rains, humidity) with more crop diseases and pests.

1. Ecologically sound land stewardship via carbon farming is best accomplished by understanding and acting upon the complex and interdependent value of ecosystem benefits of agroforestry land management. Carbon farming is a collection of crops and agricultural practices that sequester and store carbon in the soil and trees/shrubs.

2. Economically Viable - Quantifying carbon farming benefits is necessary to monetize agroforestry. It prepares farmers to participate in emerging carbon markets.
3. Socially Responsible - Agriculture and ecosystems are necessary for survival. Conservation and valuing of ecosystems services can no longer be left to voluntary, undervalued, non-reimbursed chance.

Project Objectives:

1. Measure and increase carbon farming by focusing on the current and potential role of trees/shrubs on this small-scale peri-urban farm (PBF).
2. Identify, inventory, and map the farm's existing agroforestry tree/shrub data.
3. Analyze and monetize the carbon farming and agroforestry related ecosystem services.
4. Design, develop and produce a carbon farming plan that values current agroforestry practices and increases carbon sequestration and storage for regeneration, resilience, diversity, and sustainability – in progress.

Data Collected to Date: ecosystem services on 866 trees and shrubs.

Stories of creativity and collaboration: how women access land for perennial ag in the Midwest

Barbara Decre, decre@wisc.edu, UW Madison Nelson Institute

Secure land tenure is a requirement for any farmer to feel confident about investing in perennial agriculture. However, the trend current in the US is towards the consolidation of land into large farming operations, and accessing land is increasingly more challenging for young farmers. Acquiring land is especially difficult for individuals without a farming family and no prospects for acquisition through inheritance. Land access for women farmers can therefore be a big challenge.

Women farmers leading their own activities tend to farm smaller parcels of marginal land that they most often rent. They are innovative and creative and oftentimes approach farming differently than most men who farm. They are more attracted to alternative practices than to monocropping and rely on community markets. These collaborative tendencies have led to creative and innovative ways to access agricultural land.

For this research, I interviewed twelve women interested in perennial agriculture in the Midwest about their land access story and the role that networks played in the process. This work is a compilation of those stories - from more traditional land access stories to unconventional ownership agreements. This work aims to highlight the challenges that women farmers face in accessing land for perennial agriculture and celebrating the ingenuity of these farmers. These narratives will shed light on existing pathways towards land access and raise awareness about land access challenges that women encounter.

Prairie and Tree Planting Tool PT^2 (1.0): A conservation decision support tool for Iowa

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Melanie Bogert, mgbogert@iastate.edu, Department of Natural Resource Ecology and Management, Iowa State University

With the PT2 (1.0) users locate Iowa farms or properties of interest in an online aerial photo and mapping geographic information system (GIS). Users explore areas for tree or prairie plantings by examining different data layers: aerial photos, soil maps, 2-foot contour elevation map, LiDAR hillshade, and a map of current land values (based on estimated land rent). Once an area of interest is delineated, users select from drop down menus tree/shrub species or prairie seed mixes that are suitable for the soils present, and select basic long-term management options. PT2: 1.0 estimates total annualized costs for planned tree or prairie establishment, long-term management, and opportunity costs (based on area weighted expected soil rent), and factors in the potential benefit of utilizing government cost-share programming, e.g., Environmental Quality Incentive Program (EQIP) or the Conservation Reserve Program (CRP). PT2 1.0 calculates a 50-foot "buffer area" surrounding all tree/prairie areas designated as pollinator habitat. This area data is input data for the parallel spreadsheet based decision support tool (PT2 - IPM) allowing users to select various Integrated Pest Management options so as to determine total field costs of not just the pollinator habitat, but also all ancillary management changes relative to adjacent cash crops (e.g., costs of IPM). The code is open source and we actively seek partners to expand the data set to other states.

Hedgelaying 101

Jim Chamberlin, jchamberlin@hugllc.com

Hedgelaying is a centuries old practice used to build and maintain a living fence that will hold livestock and deter predators. This poster will describe the hedgelaying process, explore the various traditional hedgelaying techniques used in Europe, and describe our first experience with laying a hawthorn hedge at Island Lake Farm.

Soil Nutrient Dynamics in Mid-Stage Hardwood Silvopasture Compared with Open Pasture

Sanjok Poudel, sanjokp@vt.edu, School of Plant and Environmental Sciences, Virginia Tech

Black walnut (Juglans nigra) and honeylocust (Gleditsia triacanthos) trees have gained particular interest for use in silvopastures and other temperate agroforestry systems. Changes in forage species and improved animal performance have been reported in black walnut (BW) and honeylocust (HL) based silvopastures. However, soil physiochemical properties and nutrient dynamics in these deciduous hardwood silvopastures have received less study. Our objective was to assess soil physiochemical properties and nutrient dynamics in 25-year-old BW and HL silvopastures in comparison with soils of open pasture (OP) systems. The study site consists of three treatments (BW, HL, and OP) replicated three times in a randomized complete block design. Soil samples (topsoil; 0-10 cm) were collected and analyzed for total C and N stocks, inorganic N, organic matter (OM), and pH. Soil samples, collected using a core sampler, were oven-dried to determine the soil bulk density (BD) and gravimetric water content. Total C and N did not differ ($p \geq 0.14$) between OP and silvopasture systems, but C:N ratios were greater ($p \leq 0.05$) in silvopastures. Soil OM was 5.6±0.50, 6.4±0.50, and 5.5±0.50 for BW, HL, and OP

respectively with trends towards greater OM in HL vs OP (p=0.06) and BW (p=0.08) systems. Soil BD was 1.26±0.078, 1.30±0.078, and 1.35±0.078 gcm-3 in BW, HL, and OP respectively did not differ among treatments. BW and HL trees in the silvopastures impact soil physiochemical properties and nutrient dynamics. These changes depend upon tree characteristics and age of the system, and have important practical applications for agricultural sustainability in the long-run.

ADDITIONAL CREDITS
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Exploring the potential of woody perennials to integrate conservation and production in Missouri

Raelin Kronenberg, rlk5hp@mail.missouri.edu, the University of Missouri Center for Agroforestry

Multifunctional landscapes are able to provide numerous environmental, economic, and social functions simultaneously. Agroforestry plantings are multifunctional in nature, producing multiple benefits such as reduced soil erosion, decreased nutrient runoff, increased biodiversity, and greater farm income stability. This makes them a promising ecological-based model for agricultural production that also provides conservation benefits. Missouri offers a unique sociopolitical context for the application of agroforestry tree plantings in established conservation initiatives due to the recent Environmental Quality Incentives Program (EQIP) dedicated agroforestry and woody crop establishment fund pool. Missouri is currently the only state with this agroforestry-specific funding. To gather information on the potential for multifunctional landscapes, conservation professionals from several prominent agencies were interviewed. The purpose of these conversations was to gather in-depth knowledge on conservation planting designs that include trees and shrubs, the interests of landowners in these programs, and the relationships between landowners and conservation agencies. We also explored to what extent local natural resource professionals understand the practices of agroforestry and promote their use by landowners. Together, these insights provide a snapshot of agroforestry knowledge and interest in Missouri conservation. Several themes emerged from the dialogue including the challenge of limited program funding and landowner awareness of conservation programs, the difficulty of building long-term relationships between conservation professionals and landowners, and a general desire among professionals to have a greater knowledge of agroforestry plantings.

ADDITIONAL CREDITS
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Ramps - A Potential Forest Farming Crop?

Pabitra Aryal, apabitra@vt.edu, School of Plant and Environmental Sciences, Virginia Tech

amps (*Allium tricoccum*), “spring ephemeral” wild leeks are native to temperate deciduous forests in the eastern United States and Canada. Ramps grow in moist, nutrient-rich soils in these forested systems. The peoples of the Appalachian region have strong historic and cultural ties to ramps, but more recently, many celebrity chefs have promoted ramps as a gourmet food item, and restaurants have begun to serve them. Growing awareness of and demand for the plant outside of the Appalachian region has spurred increased harvest, putting pressure on sustainability and the regional economic potential, because the primary means of supply has been through “wild harvest”. Producing ramps using sustainable forest farming techniques could create greater product value, both reducing pressures on natural populations while meeting the demands of global markets. Our project aims to determine the potential to produce ramps with a forest farming approach. As part of this project, we will assess if the best planting approach is to start from seeds and whether inoculation with arbuscular mycorrhizal fungi (AMF) supports more rapid stand establishment and better growth rates. If successful, these techniques would increase sustainability and long-term economic potential of the crop. In addition, this project will result in the creation of regional habitat suitability maps for potential ramp farmers. With this project, we expect to enhance ramps production and promote the sustainability and resilience of forest farming practices in Appalachia.

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A Pilot Geospatial Model to Identify Wildlife-Friendly Farming Sites in the NY Champlain Valley

Alex Caskey, barredowlbrook@gmail.com, Barred Owl Brook Farm

The unique working landscape of the New York Champlain Valley, located inside the Adirondack Park, hosts numerous farms, and agriculture is a crucial sector of the local rural economy. The region is also home to an abundance of diverse wildlife habitat and is a focus area for conservation organizations. Wildlife-friendly farming (WFF), a set of farm management practices ranging from non-lethal predator control to the establishment of wildlife habitat on the farm, has emerged as a possible solution for mitigating some of the negative impacts associated with traditional farming activities while maintaining a farm’s economic viability. However, little information currently exists to inform initial WFF implementation efforts. The focus of this analysis was to create a pilot geospatial model utilizing publicly available datasets to identify agricultural land that is most suitable for the implementation of WFF practices. The analysis used fuzzy membership and reclassify, two geoprocessing tools in ArcMap, to create a composite agricultural land suitability map to identify potential implementation sites. While there are many non-spatial factors that influence where WFF is likely to be successful, results indicate that the model has the potential to help focus initial efforts. The model could also be modified to include spatial characteristics of interest relevant to specific agroforestry or other farming practices.