CHARACTERS IMPLEMENTING AGROFORESTRY PRACTICES IN VIRGINIA, USA: CHALLENGES AND PATHS FORWARD

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Introduction

Challenges of meeting sustainability and production metrics have sparked greater interest in robust, "conservative" cropping systems. Agroforestry aligns well with these goals, offering opportunities to improve resource management, increase output and diversity, provide multiple conservation services, generate additional short- and long-term economic returns, and enhance aesthetic appeal of farmlands.

Agroforestry principles can be used to design farming systems that more closely mimic natural ecosystems. This approach is holistic: interactions among multiple components are used to boost overall productivity rather than eliminating interactions to support production of individual components. I.e., agroforestry increases productivity through increasing complexity.

Integrating trees, crops and/or livestock is considerably more management intensive than conventional agriculture. Knowledge and layout of system components and planning for farm activities are required to avoid labor shortages and potential between land use conflicts (Workman et al., 2003). Herein is a paradox for agroforestry: those same features – diversity and complexity – which create the benefits of agroforestry also are attributes that challenge producers and limit adoption.

Barriers to adoption:

Lack of familiarity is a key hurdle to adopting agroforestry. "Agroforestry" as a term likely has little recognition with producers within agricultural sectors. However, conservation-centered practices such as windbreaks and shelterbelts are well known in the USA and riparian buffers have also become important conservation practices to address stream impairment.

In contrast, silvopasture and alley cropping are much less familiar to producers. Less than 0.2% of farms utilize these practices in the southeastern USA (USDA, 2012) and historical precedent may work against their acceptance. For many farmers, adding trees is anathema to their history and heritage of land clearing. For agents and technical service providers (TSPs), thinning timber stands to support animal production is equally unsettling, given their history of encouraging farmers to fence livestock from forests.

Limited data on system productivity and economics, few guidelines for establishment and maintenance, and the small number of experienced producers and professionals who can provide expertise serve as significant barriers to advancing these practices (Mize 2014). Training and demonstration sites also are essential for promoting these systems (USDA 0211) and was painfully evident when staff affiliated with the USDA's National Agroforestry Center sought a site to visit within close proximity of Washington, D.C. but none could be identified.

Initial agroforestry research efforts in Virginia, USA:

The trans-disciplinary nature of agroforestry lends itself to collaborative, team-based efforts. In Virginia, our multi-agency collaborations involve members of academia, federal and state agencies, non-governmental organizations and producer partners. As a team we have coordinated efforts and pooled resources to create better opportunities for training, attract funding for research and demonstration, and promote agroforestry practices more broadly.

This collaborative philosophy also is evident in the advice we give producers. "Build a team" is our first recommendation for novice practitioners, particularly those looking to engage in more intensive practices such as silvopasture and alley cropping. No individual producer or TSP will likely have sufficient expertise on all components of agroforestry systems. The support of a multi-disciplinary team will likely be essential for the success of most new agroforesters.

Agroforestry efforts and progress at Virginia Tech began in 1995 when two faculty members and a USDA scientist installed a small research and demonstration site. Outputs from this project synch with the establishment and growth of the trees (Bendfeldt et al., 2001; Buergler et al., 2005; 2006; DeBruyne et al., 2011; Fannon-Osborne, 2012; Johnson et al., 2012; 2013). Site visits initially were not linked to active extension and outreach efforts. As such, the research likely was viewed primarily as an academic exercise by most observers, including by the students working at the site. It is telling that one graduate student expressed surprise and pleasure upon seeing a "real life" effort to put similar systems in place on farm – even when that farm was in South Africa.

Challenges of using a single, remote research and teaching site as a means of promoting agroforestry are self-evident. Dedicated extension programs and demonstration sites are essential for pushing these systems forward and this has become central to our efforts in Virginia. We conclude here with information on current programming.

Paths forward – developing programs and guiding adoption strategies:

All forms of agroforestry are suited to Virginia, but our efforts largely have focused on riparian buffers, forest farming, and silvopastures (described below). Windbreaks often are planted but receive little management and alley cropping systems are just beginning to be explored.

Riparian buffers and other conservation practices offer an easy entry point for agroforestry adoption. They are familiar to agents, TSPs, and producers and designed to address or prevent environmental problems. However, market development and credits to reward landowners for adopting these practices could increase their utilization (Trozzo et al., 2014ab). In Virginia, it is difficult for traders to generate credits from agroforestry practices because they have not been evaluated for use in water quality markets under existing regulations. A broad, diverse taskforce was formed to develop recommendations and tools for generating and selling nutrient credits from agroforestry in the Bay watershed. Taskforce teams currently are determining how to assign nutrient value to an agroforestry offset credit and will develop guidelines on how to generate and sell these credits within the current nutrient trading program. In a related effort, nutrient flows from agroforestry research and private farm sites are being monitored; data gathered will be used to assign monetary values to the agroforestry offset credits. Monetizing these ecosystem services should support greater adoption.

Forest farming education has historically been minimal, but growing landowner interest is driving greater outreach and education. Our efforts largely focus on production of medicinal, edible, decorative and handicraft crops, especially American ginseng (*Panax quinquefolius*). Uneconomical prices associated with wild harvest markets and wide product quality and availability have limited the value of other potential crops (Burkhart and Jacobson 2009; Vaughn et al., 2013). However, forest farming education and networking has increased farmer numbers and grown markets. Through the Appalachian Beginning Forest Farmer Coalition Virginia Tech provides technical, administrative, market sales, and state regulatory training and support related to production using forest grown verification, organic production, and best handling and processing practices. This is helping meet the demands of a growing consumer base interested in medicinal product origin, quality, and sustainability. These premium products are improving the financial equation for a growing network of Appalachian forest farmers and has important value for a region dominated by private forests and limited resource communities. With low startup costs, modest acreage requirements, and emerging price premiums, forest farming is an intuitive agroforestry strategy that contributes to Appalachian economic in transition.

Silvopastures have potential for broad adoption but these practices largely are unknown in Virginia. Agents and TSPs often demonstrate awareness of these systems but limited knowledge about implementation and management. Further, encouraging adoption is difficult without better information on profitability. Our initial efforts to promote silvopastures began with "Train the trainer" sessions. National and local experts gave classroom and on-site instruction that provided opportunity to learn, share concerns, and debate merits and challenges of silvopastures. Three months after training respondents indicated the program had increased their knowledge and helped them recognize silvopasture feasibility and over 60% had subsequently discussed silvopastures with producers and training sessions are on-going. Four new widely distributed research and demonstration sites have been developed in the past three years with internal and external funding, demonstrating both thinning and planting implementation strategies.

Shade for animals likely will be the strongest appeal of silvopastures to producers, even though rates of return from trees can be greater than from livestock. Ironically, the buffer strips and stream fencing used to reduce livestock impacts on surface waters may increase

silvopasture adoption. Once excluded from streams, animals often have no access to shade and silvopastures may be seen as a way to deal with this animal welfare issue.

Growth of agroforestry programs in Virginia leaves us optimistic about future outcomes. Opportunities to work with state and federal agencies and influence priorities have helped support programs and adoption. E.g., Virginia recently adopted silvopasture as a conservation practice and producers in the state are beginning to utilize cost share to implement this practice. Although the pace of change is slow at times we take a long view – which is essential when one manages trees.

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