

Cattle and trees don't mix!?: Competing agri-environmental paradigms and silvopasture agroforestry in the Missouri Ozarks

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Silvopasture agroforestry is the intensive, simultaneous management of trees, forages, and livestock. Spatial and temporal interactions among these three components, assuming proper management, can result in superior overall production compared to conventional, segregated livestock or timber enterprises, while providing both regular income from livestock and/or nontimber forest products and intermittent income from timber sales (Clason and Sharrow 2000; Garrett et al. 2004). In addition to production-related benefits, silvopasture systems that introduce trees into pasture can also have positive impacts on wildlife by increasing the structural and species diversity of landscapes that were previously one-dimensional grassland (McAdam et al. 2007).

Despite evidence that adding trees to pasture can result in both improved production prospects and positive environmental impacts, adoption of the practice in Missouri has been sparse. Research has shown that Missouri landowners are averse to planting trees in agricultural land, whether cropland or pasture, primarily due to strong cultural barriers (Raedeke et al. 2003). Farmers and farm families whose forebears struggled to clear forests to establish pastures and cropland, and who have spent a lifetime themselves removing trees to maintain that agricultural ground, simply have a difficult time conceiving of planting trees in it.

In 2000, University of Missouri Center for Agroforestry (UMCA) researchers initiated a research project that, rather than plant trees in pastures, would thin woods enough to plant forage under trees (Field Notes, UMCA Monthly Meeting, March 2005). By 2002, the UMCA had established several silvopasture research plots at the University of Missouri's Wurdack research farm in the Ozark hills. Researchers thinned standing forest, removed all understory species, and established a stand of forage that was predominantly tall fescue (*Lolium arundinaceum*). The silvopasture end product did not change; it was still management of trees, forage, and livestock. What changed was the process of getting there.

This twist in the silvopasture technology sparked a controversy regarding silvopasture's appropriateness for Missouri's forested land. The UMCA's Wurdack silvopasture research and associated promotional efforts brought it into direct confrontation with the Missouri Department of Conservation (MDC), the agency constitutionally charged with the "control, management, restoration, conservation, and

regulations of the bird, fish, game, forestry, and all wildlife resources of the state” (MDC 2007, 8).

This case study research examines that conflict by tracing the actions and reactions of the UMCA, the MDC, and the Natural Resources Conservation Service (NRCS) as they negotiated their respective positions on this shift in silvopasture technology. Using a negotiated revision of Missouri NRCS’s Conservation Practice Standard for silvopasture as a focal point, the case study traces the relational shifts that occurred among these organizations as their paradigmatic orientations clashed over silvopasture policy and practice.

Conceptual Framework: Social Paradigms, Agriculture, and Environment

Social scientists have long examined how adherence to dominant and alternative social paradigms might influence social action. Dominant social paradigms, defined as “a society’s dominant belief structure that organizes the way that people perceive and interpret the functioning of the world around them,” consist of the “values, norms, beliefs, and institutions” that shape the actions of individuals and organizations in society and thus maintain social stability over time (Milbrath 1984, 7). Much research, particularly in the field of environmental sociology, has focused on the tension between dominant social paradigms and oppositional paradigms that arise to challenge the *status quo* (Catton and Dunlap 1978, 1980; Dunlap 2008; Milbrath 1984).

The conceptual framework developed for this research builds on the “conventional and alternative agricultural paradigms” approach that has guided research on paradigmatic differences in agriculture (Beus and Dunlap 1990). Conceived as worldviews that are diametrically opposed on the social and ecological dimensions of agriculture, conventional and alternative paradigmatic orientations are theorized to influence agricultural behavior, particularly the propensity to support or employ specific types of agricultural practices or systems. For example, a conventional paradigmatic stance has been shown to be associated with higher rates of pesticide use (Beus and Dunlap 1991), while alternative affiliations have been correlated with use of organic agricultural methods (Allen and Bernhardt 1995). These dichotomous conceptual categories thus identify numerous sites of fundamental conflict between conventional and alternative agricultural paradigms.

This research reframes the nature of the conflict between the agricultural paradigms to both sharpen the model’s conceptual focus and improve its utility for understanding how paradigmatic dissonance among organizations can affect policy and program outcomes. Instead of using the vague terms “conventional” and “alternative” to characterize a breach between two oppositional poles, the framework for this study posits organizational actors along a continuum of paradigmatic orientation and reframes the core paradigms to better reflect their sources of incompatibility. Conventional agriculture is renamed “productivist” to reflect that the overriding goal of the dominant agricultural worldview is to maximize agricultural productivity, narrowly defined in terms of yield per area of major agricultural commodities (Busch 2005; Buttel 2005). This productivist paradigm maintains many of the aspects that were ascribed to the conventional paradigm: a reductionist model of agricultural research that focuses almost entirely on monoculture yield enhancement, a disaggregated, field-based unit of analysis, dependence on domination of natural processes, and a privileging of decontextualized scientific

knowledge (Kloppenburg 1991). At the other end of the spectrum, the term alternative is replaced with “ecological,” which is a superior descriptor because it captures the essence of the paradigm as one that embraces complexity and diversity, measures productivity in terms of systems at the landscape or ecosystem level, mimics natural processes, values local knowledge (Altieri 1995), and pursues social and ecological health as its overarching goal.

Figure 1 is a representation of the ecological–productivist continuum. It is a heuristic tool that is employed to situate organizations along that continuum according to their missions, mandates, programs, and activities. The figure is split horizontally into two major sections. The section above the arrow represents social action centered on a broadly conceived concept of environment, and the section below represents agriculture. Each of these sections is further broken down into rows. The top row of the figure presents the overarching goal of each ideal-type paradigm. The driving force underlying the ecological paradigm is social and ecological health. At the opposite end of the spectrum, on the far right, the figure posits individual and corporate accumulation as the fundamental driver of productivism. Organizations dedicated to supporting vibrant, healthy communities, both human and nonhuman, are positioned nearer to the ecological pole. Organizations that are narrowly focused on individual and corporate accumulation of material wealth are placed toward the productivist pole.

Objective	Social and Ecological Health			Individual and Corporate Accumulation	
Orgs	- Earth First! - Greenpeace	- Earth Policy Institute - Cascadia Institute	- Missouri Department of Conservation - State DNRs - Nature Conservancy	- Bureau of Land Management - Forest Service	- Extractive industries
Label	Deep ecology	Ecoregional management	Ecosystem management	Environmentally sensitive multiple use	Dominant/multiple use
Precepts	Ecocentrism			Anthropocentrism	
Precepts	Ecological Reproductivism			Yield-based Productivism	
Label	Ecological agriculture	Sustainable agriculture		“Production ag” and associated BMPs	High-input commodity production
Orgs	- Permaculture Institute - Land Institute	- Leopold Center for SA - Practical Farmers of Iowa - SARE	- NRCS - University of Missouri Center for Agroforestry (UMA) - Soil & Water Conservation Districts - LGU Extension	- Commodity Groups - Input suppliers	

Figure 1. Ecological–productivist continuum.

The rows closest to the continuum arrow contain the essential precepts of the varying environmental and agricultural philosophies associated with differing points along the ecological–productivist continuum. On the environment side, these are ecocentrism on the left and anthropocentrism on the right. On the agriculture side, the guiding precepts range from ecological reproductivism to yield-based productivism. The next rows contain labels that are generally associated with differing approaches to natural and productive processes: from deep ecology to dominant use in the environmental management arena (Yaffee 1999) and from ecological agriculture to high-input commodity production in the agricultural realm. Finally, the outer rows list representative organizations that meet the criteria suggested by the precepts and labels. This figure will

be revisited later to analyze differences in paradigmatic orientation between the UMCA and MDC.

Importantly, research on alternative–conventional agricultural paradigms has shown that organizational actors tend to hew hard to the poles of paradigmatic debate (Beus and Dunlap 1991). Schattschneider (1960) famously argued that every organization is the mobilization of a bias. Organizations are entities established for the explicit purpose of achieving certain goals (Blau and Scott 1962). In the agri-environmental context of this study, these purposes may range from the dogged pursuit of maximum yield to the painstaking restoration of ecosystems undone by yield-maximizing behavior. This study recasts mobilization of bias as mobilization of paradigms and analyzes how differences in paradigmatic adherence impacted the efforts of the UMCA and MDC as they pursued disparate paradigm-oriented goals related to silvopasture.

Methods

This research employed a case study approach to develop a comprehensive understanding of the conflict over silvopasture. Data were collected between 2002 and 2007. Qualitative research methods were employed, including in-depth interviews, participant observation, and content analysis. More than 60 semistructured interviews were conducted, primarily with field and administrative personnel from the UMCA, MDC, and NRCS. Field staff interviewed included foresters, soil conservationists, grassland specialists, and district technicians from the MDC, NRCS, and Soil and Water Conservation Districts. Administrative staff consisted of MDC Division Administrators, MDC Program Supervisors, the NRCS State Forester, the NRCS State Grasslands Conservationist, and NRCS District Conservationists. From the UMCA, the Director, Associate Director, and numerous research staff were interviewed.

Participant observation was a second data collection method and formed a critical component of this research. Data were collected through extensive notes taken at dozens of UMCA events and activities, including monthly and annual meetings, field days at the Wurdack research farm, and workshops. Content analysis of archival data focused on documents from the UMCA, NRCS, MDC, prior ecological and sociological research in the Ozarks, as well as newspaper and other press accounts of pertinent conflicts, controversies, and collaborations.

Situating Actors along the Ecological–Productivist Continuum. As organizations, the UMCA, NRCS, and MDC adhere to different points along the ecological–productivist paradigm continuum, and their institutional missions overlap or conflict accordingly. Their organizational worldviews shape their policies and programs, which in turn guide their approaches to working with the heterogeneous landowners that they view as clients or potential clients, as well as the natural environment that each strives to shape or control. Organizational mandates include reducing the ecological impact of agricultural activities while maintaining or improving productivity (NRCS), promoting agroforestry (UMCA), and restoring ecological communities and enhancing wildlife habitat (MDC). This section provides a brief analysis of each organization’s driving worldviews and situates them along the ecological–productivist continuum.

University of Missouri Center for Agroforestry. The UMCA is a major actor in agroforestry development efforts in the United States. It is an interdisciplinary research, teaching, and technology transfer program that is dedicated to “...contributing to the

science underlying agroforestry” and promotion of agroforestry in Missouri and elsewhere (UMCA 2004, 2). Its mission is “to initiate, coordinate and enhance agroforestry activities to meet the environmental, social, and economic needs of land management within the state of Missouri, North America, and the temperate zone worldwide” (Peters 2000, 1). Technology transfer activities include dissemination of information to landowners, natural resource professionals, and landowner groups through field days, farm visits, workshops, landowner consultation, and print and audiovisual media (UMCA 2002).

The UMCA’s approach to temperate agroforestry differs markedly from approaches that have been followed in tropical settings, where most agroforestry research and promotion has taken place in recent decades. In much of the world, agroforestry refers to production systems that combine trees, shrubs, annual crops, and/or livestock. Agroforestry systems have been promoted as a means to ameliorate some of the negative social and environmental impacts of “Green Revolution” agricultural practices by reinstating “a more ecological rationale into agricultural production” (Altieri 1995, ix). Agroforestry has generally been defined in holistic, agroecosystem terms to highlight the interrelationships among diverse biological components (Rocheleau 1989; Winterbottom 1992).

While a systems orientation has been an integrating concept for agroforestry in the tropical world, the UMCA moved its vision of temperate agroforestry away from the agroecosystem focus of its tropical predecessor. In his seminal piece on temperate agroforestry nomenclature, Dr. Michael Gold, UMCA Associate Director, removed explicit systems terminology from the definition of agroforestry to which the UMCA adheres (Gold et al. 2000, 66):

This definition is slightly modified ... to improve compatibility with traditional agriculture. The main difference is the removal of the word *systems* from the definition. In tropical agroforestry, the use of systems terminology has become the established norm ... In contrast, US agroforestry classification has evolved from our own agricultural traditions wherein an agricultural production system is an aggregation of various practices.

Agroforestry in this context becomes a collection of practices that can be mixed and matched with other practices in a manner compatible with the dominant model of US agricultural production.

This shift from systems to practices signaled a desire to increase agroforestry’s perceived compatibility with productivist agriculture. The modification was meant to augment agroforestry’s palatability among potential adopters and other US agricultural interests, especially natural resource professionals (Gold et al. 2000, 71–72):

For field practitioners and landowners to understand, accept, and use agroforestry, it must be pragmatic, value-adding, and adoptable as possible. Complex systems terminology is not acceptable. Consequently, a simple agroforestry nomenclature has been developed to make agroforestry practices compatible with, and complementary to, agricultural practices.

To demonstrate this compatibility with productivist agriculture, its agroecosystem roots had to be snipped and replaced with a disaggregated, practice-based approach. This shift improved agroforestry's fit with the Best Management Practice (BMP) conservation approach followed by the major agri-environmental agencies, particularly NRCS, and enhanced the potential for promotion and subsidization through federal programs.

Natural Resources Conservation Service. Since its establishment (as the Soil Conservation Service) in the 1930s, on the heels of the depression and in the midst of the Dust Bowl, the NRCS's primary mission has been to maintain and enhance agricultural productivity (Worster 1994). The organization's current vision statement is "Productive Lands-Healthy Environment," a "...vision of the landscape that Americans want—a landscape in which a productive agricultural sector and a high-quality environment are both achieved. Productive use of privately owned cropland, rangeland, pastureland, and forestland is essential to the Nation's security and the health and well-being of its citizens" (NRCS 2005, 2). While NRCS programming certainly has had beneficial ecological effects (Haufler 2005), its primary paradigmatic orientation remains productivist—to maintain and improve agricultural productivity.

Missouri Department of Conservation. In 1936, the Missouri Conservation Commission was established with the objective of putting into place a "non-political, scientifically-based wildlife and forestry program" to address a drastic decline in Missouri's wildlife and forest resources (Keefe 1987, 15). The Conservation Commission founded the MDC and placed improved productivity of natural resources at the heart of its mission, taking as a fundamental tenet "the increased value and productivity of all the lands and waters of Missouri" (Keefe 1987, 40). Until the 1990s, the MDC remained an organization that was primarily focused on developing natural resources for human use. Reflecting the conservation ethic of the day, its goal was to produce a maximum sustained yield of game and timber for human consumption through rational, scientific restoration and management efforts.

The MDC's conservation ethic shifted dramatically over the last decade. By the early 2000s, the MDC was moving away from a game and timber management focus toward a more inclusive, ecosystem-based mission that it calls "All Wildlife Conservation." Far from its original mission to manage economically important timber and game species, the All Wildlife Conservation strategy (Figg 2005, 4) is

...about conserving all plants and animals, and the natural systems they depend upon....This approach of looking at entire natural communities differs from traditional fish and wildlife management, which focuses on single species. Focused management may be necessary to produce an abundance of a species like deer or turkey, but it's too narrow an approach for the diversity we have in Missouri...All Wildlife Conservation is inclusive and comprehensive. It's about nurturing the conditions that nurture the parts—all the parts.

Whereas earlier conservation efforts focused on manipulating habitats to favor quality timber and wildlife species with human use value, such as deer and turkey, All Wildlife Conservation aims to maintain or restore habitats so that they will be capable of supporting all of the species that are associated with them. Thus, the instrumental, utilitarian conservation stance of MDC's past gave way to a predominantly ecological

one, signifying an increased appreciation for the intrinsic value of nature and a more preservationist ethic.

Situating the Organizations. As this discussion of the historical development of the three organizations suggests, their orientations are not static. Rather, they have evolved with time in response to social, political, and ecological conditions. Nevertheless, we can place each of the organizations along the paradigmatic continuum in figure 1 according to their current missions, policies, and programmatic activity.

By virtue of efforts to move its brand of agroforestry away from its ecological, systems-oriented roots and toward the promotion of disaggregated agroforestry practices, UMCA is situated toward the productivist pole of the continuum (figure 1). UMCA's efforts to make agroforestry compatible with productivist agriculture and the dominant model of BMP-oriented conservation indicates a strong commitment to gaining legitimacy within the productivist realm of agriculture.

Despite its movement toward the productivist pole of the continuum, the UMCA has numerous initiatives that are more properly associated with the sustainable agriculture block of figure 1. As the overlapping lines in the figure indicate, UMCA straddles a conceptual line between productivist agriculture and more ecological forms of farming. On the one hand, agroforestry has deep ecological roots, much of UMCA's literature still maintains agroecosystem language, and it is increasingly trying to reach out to alternative farmers. Nevertheless, UMCA's adoption of a practice-based approach to research and promotion of agroforestry is still in line with NRCS's productivist conservation stance.

The NRCS occupies a similar position on the continuum, but more solidly rooted in productivism. Heritor of the utilitarian conservation ethic that privileges anthropocentric productivity and efficiency in the use of natural resources, NRCS maintains many of the precepts of that ethic. Its primary mission is to maintain or increase productivity on agricultural lands through application of field-level technological interventions. While NRCS has certainly moved toward the ecological end of the continuum in recent years, following similar shifts by other federal agencies, it still adheres to dominant or multiple-use conservation perspectives.

The MDC has steadily moved toward the ecological pole of the continuum. With the recent adoption of its All Wildlife Conservation approach, the agency has traveled far from its productivist roots in the utilitarian conservation movement. MDC's core mission has shifted away from dominant or multiple-use perspectives that emphasized production of game and timber for human consumption toward a more holistic one that stresses the maintenance and restoration of healthy ecosystems.

Paradigmatic Conflict over Silvopasture Agroforestry

Two events defined this case study of interorganizational struggles and negotiations over the appropriateness of silvopasture based on thinning forests. The first was the UMCA's incipient promotion of the practice in Missouri. Led by Dr. Gene Garrett, Director of UMCA and a lead investigator on the Wurdack silvopasture research, UMCA began to outline a case for establishing silvopastures throughout the Central Hardwood Region by thinning existing forests and establishing forages. The second key event was the 2004 release of the NRCS Conservation Practice Standard for silvopasture that could

have allowed the agency to provide technical assistance and cost share to help landowners establish this form of silvopasture in Missouri.

Wurdack Silvopasture in the Central Hardwood Region. In 2004, as the silvopasture research at the Wurdack Farm entered its second summer season, the article “Hardwood silvopasture management in North America” was published in the journal *Agroforestry Systems* (Garrett et al. 2004). The article outlined a series of arguments for establishing silvopastures in existing forests in the Central Hardwood Region. Estimating that of the 6.6 Mha of forested farmland in the region, 2.3 Mha were grazed “without the benefit of intensive management,” Garrett et al. (2004, 22) proposed silvopasture as a means to bring those forested lands under management for production of both quality timber and livestock. They maintained that, “silvopastoral practices should be considered in unimproved hardwood timber...to improve animal productivity and to implement timber stand improvement practices and place millions of hectares of unmanaged forests under management.” UMCA silvopasture promotional materials echoed these claims and also focused on the practice’s potential to provide habitat for game species such as white-tailed deer, bobwhite quail, Eastern wild turkey, waterfowl, and mourning doves (UMCA 2006). A fundamental point of the article was that forests in the Midwest were not attaining their productive potential, and that landowners should consider silvopasture as a means to that end. The article and subsequent UMCA research and promotional activities indicated that UMCA’s vision was to present this form of silvopasture as a land management option to landowners in the Central Hardwood Region.

NRCS Silvopasture Conservation Practice Standard. At approximately the same time, NRCS released its national Conservation Practice Standard for silvopasture to state offices for consideration. Conservation Practice Standards provide the technical guidelines for all of the conservation practices that are employed by NRCS field staff and are compiled in a database called the Field Office Technical Guide (FOTG) (NRCS 2007a). Practice standards are established at the national level through a process overseen by a National Conservation Practice Standards Subcommittee (NRCS 2007c). Following the release of a given standard, NRCS State Conservationists may select it for inclusion into their state’s FOTG if they deem that it is appropriate given the “conservation and resource needs of the state” (NRCS 2007c, 2). This decision is guided by a state technical committee (STC), which provides input on the appropriateness of a given standard (NRCS 2007b). If there are no suggested modifications, the practice standard is included in the FOTG. If STC members suggest modifications, the standard may be modified at the State Conservationist’s discretion. Through this process, “practice standards are modified by each State to that State’s unique resource concerns, State laws, and local ordinances” (NRCS 2007c, 2).

Following this standard protocol, the Missouri NRCS sent the silvopasture standard to the Missouri STC—which includes numerous MDC employees—for review. The portion of the practice standard concerning thinning of woods reads as follows (NRCS 2004, 1):

Where trees will be added to existing pasture, site preparation should be based on existing vegetation and soil conditions. (See Forest Site Preparation Standard 490.) Trees will be planted at the recommended tree density. (See Tree and Shrub Establishment Standard 612.)

For existing forests remove a sufficient number of trees and/or prune existing trees to allow adequate light penetration for forage establishment. Establishment of forage species will be in accordance with Pasture and Hayland Planting Standard 512 or Range Planting Standard 550.

If the standard had been adopted whole cloth, it would have institutionalized the Wurdack model of silvopasture in Missouri and could have allowed the NRCS to provide cost share to help landowners to establish silvopastures by thinning existing forests. This goaded the MDC into action.

Paradigmatic Dissonance: The MDC's Response. MDC's reaction to the proposed standard was vigorously negative, as this passage from an interview with Doug Wallace, NRCS State Forester for Missouri and a contributor to the development of the silvopasture standard, indicates (Field Notes, Doug Wallace, 2005):

Doug: Well, I knew there would be a problem. Like I said, we have a review process. We send out the specifications to different organizations. They had no complaints except for the one section on existing forest.

J: I heard that the MDC had a rather strong reaction to the idea.

Doug: Yeah. I would say horror, really. To put it mildly. Simply because that if they say OK on ten acres, they see it on the 13 million acres out there. With anything like this they take it out to the whole acreage. They made that transition here to 13 million acres. They were horrified, and still are.

The MDC's response to this form of silvopasture, as characterized by Mr. Wallace, shows that the agency saw it as a potential threat to the ecological integrity of all of Missouri's forested land. Indicative of the agency's holistic, landscape-oriented ecological approach to conservation, MDC extrapolated the potential impact of silvopasture from a small land area in research plots out to the whole of Missouri's 10 Mha (13 million acres) of woodland ecosystems. Already aware of and chagrined with the Wurdack research, MDC's new awareness of the provision that might fund conversion of forests to silvopastures led to swift action to contest it.

Following consultation with staff throughout the agency, Lisa Allen, MDC Private Land Services Division Administrator, and Robert Krepps, MDC Forestry Division Administrator, sent a letter condemning the practice to Doug Wallace, with copies to the NRCS State Conservationist and Assistant State Conservationist. The letter dated November 16, 2004, was direct and unequivocal:

We have asked our staff to provide comments to us regarding the Silvopasture Establishment standard that is currently under review within NRCS. Our staff is less concerned about the details of the standard and more concerned about offering cost-share that will allow cattle to graze forest land under any circumstance. As you are aware, MDC has worked for decades to discourage farmers from allowing their cattle to graze forest land, regardless of site index, soil type, or existing vegetation

condition. Our staff do not feel that MDC's position should change regarding introduction of cattle into forests and woodlands for the purpose of grazing. We feel that any practice that promotes forest thinning and grass underplanting is detrimental to the wildlife and forest of our state and should not be implemented...We understand that NRCS is going to offer a Silvopasture Establishment cost-share practice to Missouri landowners. We disagree that this practice, regardless of the particular standards identified, should be offered to Missouri landowners.

MDC's position was clearly stated: the Wurdack model of silvopasture was inconsistent with its policies regarding livestock and forests. The organization saw silvopasture based on thinning of woodlands as a threat to the wildlife and forest of Missouri and wanted it out of the practice standard. The agency prevailed, as Lisa Allen explained (Field Notes, Lisa Allen, 2005):

Well, the letter was sent and the specifications were modified.... Now that fescue and the thinning of forest have been removed...for 50 years we have been preaching "get the cattle out of the woods and don't use fescue."

Why such a vociferous organizational response? Ms. Allen's mention of her agency's struggles with fescue is important because it is a direct reference to the Wurdack silvopasture research. It suggests that MDC's strident response to the NRCS silvopasture practice standard was shaped by its familiarity with the research at the Wurdack Farm.

It is critical to note that MDC considers tall fescue—the European cool-season grass that was the predominant forage in the Wurdack research—to be an exotic, invasive species that has highly detrimental impacts on numerous plant and wildlife species (MDC 2001). In the latter half of the 20th century, millions of acres of Ozark forests were converted to pasture by bulldozer and aerial spraying and seeding (Crawford and Bjugstad 1967, 1). Supported by the Forest Service, the University of Missouri, and other organizations, conversion of hardwood forest to fescue-based pasture continued well into the 1970s (Rafferty 1980, 167). This rapid shift from forest to fescue pasture led some to charge that the Ozarks was being converted into a "fescue desert" (Rafferty 1980, 147). This massive conversion of forestland to fescue pasture is still fresh in the collective consciousness of conservation organizations and forestry interests alike. In addition, eradication of fescue and restoration of native grasses forms a major part of MDC's All Wildlife Conservation strategy; thinning of forest and planting of fescue in the Wurdack silvopasture research, situated in the Ozarks as it was, undoubtedly sparked resistance based on the social and ecological history of the region.

Interviews with Bill White, MDC's Private Lands Program Supervisor, and further discussion with Lisa Allen buttressed the conclusion that the Wurdack silvopasture research had exacerbated MDC's response to the practice standard and provided further insight into the organizational processes that led to MDC's rejection of the practice (Field Notes, Bill White, 2005; Lisa Allen, 2005):

J: When did you learn about the silvopasture research at the Wurdack Farm and what did you think about it when you heard about it?

Bill: Early. It's probably been two or three years ago, Wurdack had a field day. Some of our staff went down to take a look at what they had done. It was shocking to us. The area that we were shown was essentially an overstory of oaks with fescue. Basically forest converted to a park-like setting. From a wildlife standpoint it's devastating....We've battled forest conversions for who knows how long, since before I came to Missouri, with folks aerial spraying woods then seeding with fescue. Silvopasture looks like another way of converting forestland.

Lisa: ...my first impression was that a fully stocked stand of upland forest had been thinned to wooded pasture with cool-season grass. My first impression was that forest conversion had occurred....Especially that type of site, with hills and such a low site index. It is unrealistic to think that landowners would pull cattle off for regeneration purposes. Also, I believe fescue was included in the cool-season mix, and that got a very negative reaction because we as an organization spend a lot of time promoting warm-season grasses...So my impression was that number one, forest conversion had occurred, and number two, it was not very wildlife friendly. I'm all for planting trees in pastures, but I think the other way around—converting forestland to wooded pasture—is detrimental to the forest resource and is forest conversion.

These exchanges illustrate the MDC's initial reactions to the Wurdack silvopasture model and provide us with a better understanding of why the agency had such a vehement reaction. Foremost on Mr. White's mind were the potential effects on wildlife, which he would later detail. Both officials were clearly concerned with any kind of forest conversion. Mr. White's recollection of past conversion of forest to fescue pasture through aerial spraying and seeding evoked the social and ecological history of the region and indicated that the Wurdack research struck a nerve still raw from earlier forest conversion in the Ozarks.

The potential ecological impact of further forest conversion was the clincher. From the MDC's ecological standpoint, thinning of forest to establish silvopastures would be devastating, as the following exchange demonstrated (Field Notes, Bill White, 2005):

J: But silvopasture has been stated as beneficial to wildlife.

Bill: I'm not sure how they could promote wildlife benefits. The detriments to wildlife are clear. The diversity of wildlife would be drastically reduced, not to mention fescue competition with woody species. It may help robins and squirrels or things that grow in a park. Dozens of species use the forest. If you make it a park you reduce it to a dozen or less. With removal of the debris on the forest floor, it disrupts the whole food chain. This eliminates most of the invertebrates that would use the forest floor, which fuel much of the forest food chain. It will also affect the many reptiles and amphibians which use the forest floor. While staff at Wurdack see more turkey and deer, it is probably a function them being more readily seen

with the removal of the understory. Once you expand to something on a larger scale, it will affect turkey nesting, deer browse, deer fawning, etcetera.

Taken together, these interview excerpts demonstrate that silvopasture based on thinning of forests, specifically as configured in the UMCA's Wurdack research, forced the MDC's hand. All of the major elements of the research and research site—steep slopes, livestock among trees, and conversion of the forest floor into fescue-dominated grassland—directly opposed major tenets of MDC's ecological worldview.

The MDC has worked to convince landowners to exclude cattle from forests for decades, especially in the Ozarks (Missouri Conservation Commission 1970), and periodically releases publications and publishes articles in its popular *Missouri Conservationist* magazine to educate landowners about the negative impacts of livestock in forests (DeWitt 1989; Palmer 2000; Dalbom 2001; Gaskins 2006). While this tradition was born out of concern for timber quality and food availability for game species such as deer and turkey, exclusion of livestock from woodlands is also central to MDC's All Wildlife Conservation goals and continues to be an essential component of its increasingly ecological mission (Chasteen 2007). The following quote is representative of opinions voiced by all MDC administrators and field staff that were interviewed (Field Notes, MDC Forestry Program Supervisor, 2005):

A lot of the views about silvopasture are from the cows in the woods thing, something we've been fighting for a long, long time. The silvopasture practice that consists of planting trees in pasture is no problem, but cows in trees? Introducing trees into open land systems is silvopasture, not thinning forest. There are some things, like ginseng and shiitake mushrooms that can work in the woods, but cows and...we have a history in the Ozarks with cattle in the woods, and we sure don't want to promote that.

If allowing cattle to consume the forest understory is an ecological transgression, the introduction of the Wurdack model of silvopasture represents a further step in habitat removal. The practice, as followed at Wurdack, prescribes the total removal of woody understory vegetation; only desired trees remain. Conversion of the forest floor to grass, as it requires the removal of leaf litter, deadwood, and brush piles, virtually eliminates the most biodiverse habitat associated with the forest. As MDC's Bill White stated, the forest floor is home to a vast array of arthropods, gastropods, herpetofauna, and other creatures that live in and on the decaying detritus. Conversion of that component of woodland habitat to grass, especially tall fescue, represents a significant reduction in habitat for such species.

Indeed, for the MDC, the introduction of tall fescue into the Wurdack silvopasture research was akin to salting the earth and a tipping point in terms of the MDC's overall response to the research. As discussed above, tall fescue is defined by the MDC as an exotic invasive species that is harmful to many species of wildlife, and reconversion of fescue stands to native grasses and forbs is a fundamental All Wildlife Conservation goal. The incorporation of tall fescue as the dominant forage plant added insult to the habitat injury that thinning of woodlands, introduction of cattle, and conversion of leaf litter to grass already represented.

Paradigmatic Ships Passing in the Night. This case study represents a striking example of how incompatibilities between productivist and ecological paradigmatic worldviews can lead to organizational conflict. The MDC was unequivocal in their resistance to the Wurdack silvopasture model, yet the UMCA's response to the MDC's ecological critiques suggested that the organization did not understand or take seriously the agency's concerns (Field Notes, MDC Administrator, October 2006):

J: There was a recent article in a journal called *Agroforestry Systems* that suggested silvopasture as a way to get woods that are currently grazed indiscriminately under management. Does that make sense to you?

MDC Administrator: No. That rationalization is like being a little bit pregnant. It's like saying the woods are already being abused, so it's alright if we abuse them a little less.

While the quote above was representative of MDC staff reactions to arguments supporting the Wurdack form of silvopasture, the quote below, from the UMCA Director, is representative of UMCA responses at the time (Field Notes, Gene Garrett, UMCA Monthly Meeting, 2005):

The MDC objects violently. I was called out on the carpet by all the leadership. They asked us to stop doing the work. But one of our problems is that we have 14 million acres of forest, and less than ten percent of it is under management. I do know nothing much will change unless someone becomes creative. Landowners need profit, and we're trying to be the catalyst....When you see Dusty's presentation you'll love that look. It's park-like...and it's a *big advantage for wildlife*. Most production practices have *negative* impacts on wildlife. The point is that there are all kinds of benefits.

The UMCA's primary reaction to critique was continued espousal of this form of silvopasture's productive and wildlife benefits. The quote and others like it indicated that while the UMCA leadership understood that the MDC was concerned about the research and implications of its potential diffusion across the landscape, they appeared to privilege their own claims over those of the MDC.

From UMCA's perspective, the Wurdack research was a reasonable, hypothesis-driven field experiment that deserved a chance to run its course and assess the productive and ecological outcomes of converting a closed canopy hardwood forest into a silvopasture system. Recognizing that the goals of private landowners are diverse, UMCA was attempting to develop a practice that, from a production perspective, would provide an alternative that might be an improvement over grazed woods or complete conversion to pasture, and one that would potentially provide habitat for game species, particularly turkey and deer.

While arguments for increasing overall productivity of timber, livestock, and game species through silvopasture might have been appreciated by the MDC in the past, such production and wildlife claims came into direct conflict with the organization's current ecological worldview. The MDC is no longer moved by management for timber or game

species for human use. For MDC, the term “wildlife” no longer encompasses only game species, and the term “management” no longer connotes manipulation of habitat to maximize production of deer, turkey, timber, and other species for human consumption. From the ecological perspective that is at the heart of MDC’s All Wildlife Conservation strategy, arguments that propose silvopastures as superior to indiscriminate grazing of woodlands are specious; simply leaving woodlands alone or managing them for timber and wildlife are management strategies that are far superior to converting them to silvopasture. The UMCA’s focus on productivist dimensions of its Wurdack research and inattention to MDCs’ ecological orientation as it designed the research and began to promote the Wurdack model of silvopasture put it on an inevitable path toward the conflict that arose.

Returning to Agroforestry’s Ecological Roots?

As this research came to a close, several observations pointed to remaining challenges, but also to potential pathways that could ameliorate the conflict. MDC administrators were still wary of the Wurdack model of silvopasture, even after NRCS modified the practice standard, because the model was still out there at the Wurdack Farm. Bill White described MDC’s lingering concern (Field Notes, Bill White, 2005):

J: So does the MDC feel like the silvopasture problem is resolved now that the NRCS has agreed to your stipulations?

Bill: At this point, if Wurdack is going to go promoting this to landowners, that's going to be a problem. We've resolved it with the NRCS, but if Wurdack is going to promote it, the NRCS resolution will be partial. If the NRCS had placed that in a standard, they could have put a cost-share on it. At least that won't happen.

A lot of people respect University of Missouri Extension. If they're down there and say that it's great, and if they say that it's beneficial to wildlife, people are going to believe what they hear....That said, there are areas that were historically savannah and glades. We would, and do, promote the restoration of savannah and glades, but not with fescue, with native prairie plants or plants that were part of the ecology.

These statements indicated that if the UMCA continued to promote silvopasture as configured in the Wurdack research, especially if those promotional efforts touted wildlife benefits, it would lead to continued conflict with the MDC. However, Mr. White’s mention of savannah suggests potential openness to the Wurdack form of silvopasture, if it were configured differently.

Indeed, the UMCA was contemplating a change. At the 2007 UMCA annual meeting, Associate Director Mike Gold signaled a desire to move UMCA’s research agenda back toward the ecological, systems-oriented pole of the ecological–productivist continuum: “We’ve been doing research on separate practices now for a number of years and we know a whole lot more about how they work by themselves. Now it’s time to try to put them back together as agroforestry systems” (Field Notes, UMCA Annual Review, 2007). With this statement, he points to a potential shift back to the agroecosystem approach to agroforestry research and promotion.

Interviews with MDC personnel indicated that such a shift would be welcome. If UMCA researchers had designed the Wurdack silvopasture research to more closely match natural ecosystems in the area, the MDC would likely have approved, as this comment from Lisa Allen reveals (Field Notes, Lisa Allen, 2005):

J: If the Wurdack research had been done in an area that was historically savannah and with native species would the reaction have been different?

Lisa: It would have been totally different. If the site had been a historically savannah or glade community, everybody would have been OK with it. But keeping in mind that the cattle would still have been an issue. But we might have been able to get around the cattle in the woods problem. As a matter of fact, we are looking at using large herbivores in prairie management... One of the best habitats for wildlife is savannah, for grassland birds and such. A native mix of grasses and forbs is great. If we're thinking about wildlife, we want native plants, not fescue and other exotics.

Bill White expressed similar sentiments (Field Notes, Bill White, 2005):

J: What if the Center for Agroforestry had chosen a different site—like a savannah—and different species, would the MDC have reacted differently to the research?

Bill: If they had chosen a site that was historically savannah and reseeded native prairie, we would have been all for it.

Had UMCA fully considered MDC's ecological orientation when designing the Wurdack silvopasture research, the conflict might have been avoided. As the quotes above suggest, if the research site had historically been savannah and the investigators had used native species as the forage components, MDC would have been entirely supportive.

As UMCA staff came to understand that MDC would accept silvopasture established through thinning of woods as long as it passed ecological muster (i.e., couched as savannah restoration and native species are planted as the forage component), they began to respond to MDC concerns. UMCA researchers are now developing a project at the Wurdack Farm that will establish mixed pine-hardwood savannah silvopasture plots using native short-leaf pine species and native warm season grasses (Field Notes, Silvopasture Forum, 2007). The findings of this study suggest that the new silvopasture project will be more compatible with MDC's ecological principles and more readily accepted by the agency as a potential practice for Missouri landowners.

General Implications

This research represents a single case study that is specific to Missouri and was shaped by a unique social and ecological historical context due to its location in the Ozarks. Nevertheless, several observations and conclusions have important implications for research and promotion of silvopasture in other states and agri-environmental

programming in general. The research showed that dissonance between organizational worldviews—in this case manifested in conflict over the appropriateness of cows in woods and tall fescue as a forage—can lead to distinct interpretations and conclusions regarding the appropriateness of research and promotion of agricultural practices. If conflicts arise, as they did in this case, project success can be imperiled.

Regarding the prospects of silvopasture, this research suggests that silvopasture based on thinning of woodlands could meet with significant resistance in other states within the Central Hardwood Region. While NRCS has not incorporated the silvopasture standard in any other states in the region, if a state office were to do so, it would likely engender resistance from ecologically oriented agencies and organizations. The research also suggests, however, that potential conflicts might be ameliorated or avoided altogether through careful attention to potential paradigmatic flashpoints during project design and implementation. If research and promotional efforts focus on silvopasture's potential as a tool to restore savannah landscapes or otherwise provide ecological benefits, and avoid use of controversial species such as tall fescue, negative reactions on the part of departments of natural resources, environmental non-governmental organizations (NGOs), and other actors could be prevented.

This research also points to an important strategy for averting conflict associated with agricultural and environmental programming in general. Potential for ecological-productivist conflicts over rural landscapes is increasing. In many areas of the country, rural areas are undergoing rapid demographic and economic change, and societal values regarding conservation and wildlife are shifting with those changes (Manfredo et al. 2003). Ecologically oriented uses of rural areas increasingly confront the productivist objectives of resource extraction and conventional forestry and agriculture. The MDC's move from a utilitarian conservation approach to a more ecological, preservationist paradigm of land and wildlife management is one that is occurring among conservation agencies and groups across the country. As constituent stakeholders and their expectations concerning the value of natural communities become more ecological and less productivist, conservation agencies are finding it necessary to change to maintain institutional legitimacy (Jacobson and Decker 2006).

Numerous organizations seek to shape rural environments according to their own missions. As this research suggests, inadequate assessment of potential paradigmatic dissonance between such organizations can lead to conflicts and risk of project failure. Conversely, careful analysis of paradigmatic worldviews among all relevant stakeholders throughout planning and implementation processes may reduce the potential for conflict and lead to broadly accepted agri-environmental policies, programs, and practices.

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