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Recreation and agroforestry: Examining new dimensions of multifunctionality in family farms

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A B S T R A C T

Multifunctionality serves as an analytical framework to recognize many services that farms provide to their surrounding communities and society. This study explores an often overlooked dimension of multifunctionality by examining different recreational services provided by landowners in Missouri and analyzing the relationship between recreational multifunctionality and the practice of agroforestry. The latter provides multiple economic, environmental and beautification benefits that involve trees in the landscape. Results show that family farms provide several recreational services for their household members and others, and the existence of synergies between the recreational function of the farmland and agroforestry practices, consistent with the transition to strong multifunctionality. The recreational use of the land is positively associated to the cognitive (i.e., perceived knowledge) and affective (i.e., willingness to adopt) attitudes towards agroforestry. Results also show that the higher the perception of intrinsic (i.e., planting trees for wind protection and carbon sequestration) and economic (i.e., perceived economic benefits and flood protection) values of agroforestry, the more recreational use of the land. This study exemplifies the interactions between two little examined farmland functions providing insights for a comprehensive value assessment of family farms. Other academic and practical implications of the study are also detailed.

1. Introduction

Understanding change is and has been at the center of many studies focusing on rural communities and the role of agriculture in recent decades, more so in Europe and Australia than in North America (Schucksmith, 1993; Raedeke et al., 2003; Lee et al., 2005; Holmes, 2006; Marsden and Sonnino, 2008; Wilson, 2008; Valdivia et al., 2009). Across the USA and Europe, family farms exist in a continuum, from production of agricultural commodities to pluriactivity (Schucksmith, 1993), diversification (Barbieri et al., 2008) and multifunctionality, either as a mechanism to negotiate government transfers to favor agriculture (Dobbs and Pretty, 2004; Ellis, 1998; Marsden and Sonnino, 2008; Wilson, 2008) or more recently as a normative view to understand and to adapt to the process of change (Wilson, 2008; de Haan, 2000). Fleskens et al. (2009) point out that the recognition of the multiple functions of land use is not new; but what is recent in the policy arena of the North is the idea of paying a third party, the farmer, for services they produce alongside food and fiber.

Changes in policies have triggered concerns about family farms, and their ability to negotiate economic and environmental policies, from free trade agreements to climate change negotiations (Dobbs and Pretty, 2004; Marsden and Sonnino, 2008). Family farms throughout the world have faced over the past three decades severe economic challenges due to large-scale commodity production, price instability and reduced government support, and the situation has worsened during recent years. In the USA, between 1995 and 2003, the number of family farms with sales below US$10,000 increased from 48% to 57%, while those with sales ranging from $10,000 to $249,999 decreased from 44% to 34% (Hoppe and Banker, 2006; Skees et al., 1998). Many of these farms are managed by rural lifestyle or hobby farmers, for whom agricultural production is not their main source of income, representing a new element in the current agricultural landscape.

Key to the future of rural communities and how they define their landscapes is the power to negotiate change. Farm-level decision-making pathways to multifunctionality, from weak to strong, are diverse and framed by the productivist and non-productivist action and thought continuum (Wilson, 2008). Ends of

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such continuum are the traditional agricultural use of the farmland through farming (productivist), and a more holistic use even in terms of landscape and recreation (non-productivist). While large farms may in theory have more transitional potential due to their wealth, the dialectic implies that these are also the farms vested in a certain path, such as agribusinesses. Family farms, in turn, have pursued several strategies to cope with this challenging agricultural reality. For example, crop diversification was adopted in order to benefit from government commodity subsidies (Knutson et al., 1998). Some small farms also diversified off the farm adding off-farm employment to the household income (Hoppe, 2001). Another widely used strategy was the development of multiple on-farm enterprises, such as value-added production, contracting or recreational services provided to others (Barbieri et al., 2008). Small family farms in Missouri, a state ranked third in USA agricultural sales (OSEDA, 2002), have followed a similar path. After struggling for survival, small family farms in Missouri have gone through a process of structural transformation including an increase of rural lifestyle landowners, reduction of the farm size and increase in non-farm income (Valdivia, 2007), strategies pointing towards agricultural multifunctionality (Wilson, 2008).

Negotiating change among family farms is important because of the many services, frequently undervalued, that they provide to society beyond the production of food and fiber, including environmental services, conservation of rural heritage, natural resources and agri-biological diversity, landscape beautification and recreation services (Bernardo et al., 2004; Marsden and Sonnino, 2008; Ploeg et al., 2000). In this context, multifunctionality is an alternative analytical framework that encompasses the many services that farms provide to their surrounding communities and society (Dobbs and Pretty, 2004; Marsden and Sonnino, 2008; Ploeg et al., 2000). Recognizing these services is important, not only because of the challenges and changes small farms are going through, but also because of the changing relationship between land and those who are its stewards today, shifting from productivist to non-productivist use of farmland (Wilson, 2008; Marsden and Sonnino, 2008).

In response to recent studies (Marsden and Sonnino, 2008; Wilson, 2008), the general aim of this study is to contribute to the normative view of multifunctionality by examining how behavioral, cognitive and affection attitudes (i.e., current practice, perceived knowledge and willingness to adopt) and perceived intrinsic and economic values towards agroforestry affect the recreational consumption of the land. More specifically, Missouri landowners were surveyed to explore how one farmland function (recreation) is captured in the multifunctionality of the agricultural landscape, by attitudes and values of land use practice (agroforestry) that is largely foreign to the USA and Canada. This study also explores some of the synergies that until now have been little known by further examining the concept of recreational multifunctionality introduced by Barbieri and Valdivia (2009, 2010) in North America, as a step in the transitional pathway of agroforestry. A simultaneous examination of both recreational multifunctionality and agroforestry at the farm level, can shed light on the pathway towards a strong multifunctional system which is characterized by an increase in the diversification of activities, local/regional embeddedness and high environmental sustainability (Holmes, 2006; Marsden and Sonnino, 2008; Wilson, 2008). We explore agroforestry because its practices include multiple functions including revenue generation, protection and enhancement of soil, aquatic and terrestrial habitats, landscape beautification, and carbon sequestration (Buck, 1995; Gold and Garett, 2009; Valdivia and Poulos, 2009; Williams et al., 1997), while the recreational function of the land provide several intrinsic benefits to rural societies and farm households including personal development, social bonding, and stress release among others (Edginton et al., 2002).

This study is important when taking the North American agricultural context into consideration, in which small family farms constitute the vast majority (91.2%) of farms in the USA (Hoppe and Banker, 2006). Although these farms' annual sales are less than US$ 250,000 and represent a small share (27%) of total USA agricultural production, they control about three quarters (72%) of the agriculturally productive assets (Hoppe et al., 2007). Specifically, family farms' retention of agricultural assets in terms of land ownership is especially important for rural well-being because of their associated environmental benefits. Their farmland, when used to sustain a rural lifestyle (e.g., hobby farm or income supplement) in their pathway towards strong multifunctionality, can mitigate the negative environmental effects from agriculture such as soil erosion, water pollution, and stream bank erosion (Lambert et al., 2006). Small family farms can also provide other non-economic societal benefits such as landscape beautification, serve as barriers to residential sprawl, and conserve native habitat and wildlife (Gold et al., 2009). Hoppe and Banker (2006) report that 82% of the land enrolled in Conservation Reserve and Wetland Reserve Programs in the USA belong to small farms.

2. Literature review

2.1. Multifunctionality among small family farms

Multifunctionality is a significant contemporary issue in the rural context that raises awareness and acknowledges the values of various farmland outputs, such as environmental amenities, agritourism opportunities, food quality, landscape management, preservation of biodiversity, along with food and fiber production (Bernardo et al., 2004; Marsden and Sonnino, 2008; Ploeg et al., 2000). Multifunctionality is also instrumental in policy development and implementation in three ways: as a palliative to the productivist cost-price squeeze, as regulation to the consumption countryside, and normative of sustainable development (Marsden and Sonnino, 2008).

Wilson (2008) presents multifunctionality as a spectrum defined from weak to strong productivist action and thought. Within this argument, strong multifunctionality which is "characterized by strong social, economic, cultural, moral and environmental capital" (Wilson, 2008, p. 368), is perceived as the desired stage as it is promotes environmental sustainability, enhanced food quality and shortens distribution channels fostering local/regional embeddedness, in spite of its reduced productivity. The agricultural multifunctionality spectrum also appears evident within the Missouri agricultural context. Historically, large-scale family farms in the low lands of Southeast Missouri are consistent with the weak multifunctionality as they feature crops production, and have a high economic land value. Such farms have been resistant to the inclusion of trees in their landscape because they do not represent good farming practices (Raedeke et al., 2003; Valdivia and Poulos, 2009). Northeast Missouri has mixed agricultural systems of crops and livestock supplemented with off-farm employment. These part-time, lifestyle or hobby farmers tend to be highly pluriactive with limited time to fully commit to a productivist path; thus exhibiting a greater potential for multifunctionality as described by Wilson (2008) and for the adoption of agroforestry (Raedeke et al., 2003).

A critical characteristic of multifunctionality is its synergistic nature. Evidence suggests that on-farm functions do not operate in isolation but have an interactive role with other farm functions and enterprises. For example, Valdivia and Konduru (2004) found a higher degree of diversity of the household economic portfolio among farmers in northeast Missouri than in the southeast where commodity crops are important. Barbieri et al. (2008) found a simultaneous development of different on-farm enterprises

among farms in North America, confirming similar patterns described in the European literature (Ploeg et al., 2000; Turner et al., 2003). Evidence suggests that some functions produce more synergies than others. On-farm recreation seems to foster multiple synergies with other farm functions, adding to the values within the farm household as it assists in promoting and encouraging the sales of other farm specialties, or value-added products and services (Barbieri, 2009). In this sense, recognizing the recreational function of the farm is a step towards the normative view of multifunctionality.

2.2. Recreational multifunctionality

Traditionally in the USA, farms have been perceived as a source of leisure and recreational opportunities for household members and outsiders. For example, Limerick (2001) reports that the first dude ranches appeared in the early 1900s offering the *authentic* western American lifestyle to visitors willing to experience the daily duties with cowboys and their cattle drives. Further, the American literature has romanticized the recreational function of the farm when describing experiences, especially from urban residents and/or kids, when visiting farms (e.g., The Jungle by Sinclair; The Importance of Being Earnest by Wilde) in line with the commoditization of the countryside (Holmes, 2006; Marsden and Sonnino, 2008). Recreational land use was used as the basis to develop the *recreational multifunctionality* construct (Barbieri and Valdivia, 2009, 2010) depicting a different perspective on multifunctionality; that is, the recreational function that farmland provides to the farm household and society. In this context, recreational multifunctionality is one dimension of the greater concept of multifunctionality, developed to examine the role of recreation in the rural landscape and to contribute to the overall understanding of the multiple functions that agriculture provides to society beyond the practice of farming.

Recreational multifunctionality is a broader and more complex construct than agritourism, a term more commonly found in the literature. First, recreational multifunctionality may or may not entail an entrepreneurial endeavor (i.e., the pursuit of an economic gain or other entrepreneurial goals), while agritourism always does (Barbieri and Mahoney, 2009; Barbieri and Mshenga, 2008; McGehee and Kim, 2004; Nickerson et al., 2001; Ollenburg and Buckley, 2007; Hegarty and Przezbórska, 2005). Second, recreational multifunctionality may occur for the recreational enjoyment of the farmland by farm household members and their visitors (e.g., friends and relatives), whereas agritourism always seeks to attract the public. Hence, recreational multifunctionality extends beyond agritourism, capturing the essence of the recreational function of the farmland independently from the economic or entrepreneurial pursuits that this activity could entail and independently of who is exercising that recreational use. In this sense, recreational multifunctionality is understood in this manuscript as any recreational service provided by the farmland to household members, their visitors, neighbors and/or the public with or without any economic gains (Barbieri and Valdivia, 2009, 2010). In particular, our normative view of recreational multifunctionality seeks to understand in which ways this represents the action and thought of landowners who may be transitioning to strong multifunctionality in the productivist to non-productivist spectrum.

2.3. Agroforestry and its multifunctional facet

In the USA and Canada, agroforestry is defined as an intensive land use management practice, where trees and/or shrubs are incorporated into the agricultural landscape. The biophysical interactions between the trees/shrubs and crops/livestock optimize the physical, biological, ecological, economic, and social benefits derived from farmland (Gold and Garrett, 2009). This study includes the five types of agroforestry practices recognized in USA and Canada: riparian and upland buffers, windbreaks, alley cropping, silvopasture and forest farming (Gold and Garrett, 2009; Merwin, 1997). Currently, some rural landowners lack a cultural appreciation for the positive roles trees may play in the landscape, often perceived as a detriment to agriculture (Lassoie et al., 2009).

Agroforestry enables agricultural multifunctionality as it produces multiple services and benefits including those that are economic (both direct and indirect) and environmental in nature (Dobbs and Pretty, 2004; Godsey et al., 2009). Because of these benefits, many professionals perceive agroforestry as a sustainable land use management strategy (Lassoie et al., 2009); thus agroforestry fits in the strong end of the multifunctionality spectrum (Wilson, 2008). Direct economic benefits include the increase in farms revenues from harvestable products and the value of the farms timber and non-timber forest product component. For example, high-value specialty crops grown in the alleys between trees or forest understory (e.g., ginseng, log-grown shiitake mushrooms, and spring ephemerals) are sold for food, decorative (e.g., handicraft), landscape, medicinal or botanical purposes, while the tree crops produce saleable nut crops and/or timber (Brandle et al., 2009). Indirect economic benefits of Agroforestry are associated with productivity enhancement, either maximizing land production or reducing costs. For example, reduced wind speed reduces animal stress and mortality, feed and water consumption, protects a variety of wind-sensitive row crops, forages and vine crops, and improves bee pollination (Gold and Garrett, 2009). Finally, agroforestry produces important environmental benefits, such as wind erosion control, reduction of runoff and non-point source pollution, stabilized stream banks, improved internal drainage and enhanced infiltration, protection of marginal lands, fosters carbon sequestration, increases scenic beauty and improves/creates aquatic and terrestrial habitats (Buck, 1995; Gold and Garrett, 2009; Valdivia and Poulos, 2009; Williams et al., 1997).

3. Data and methods

3.1. Study purpose and research design

As previously stated, the purpose of this study is to examine the associations between recreational functions of the farm and the practice of agroforestry among landowners in Missouri (USA). Specifically, this study examines: 1) the associations between the attitudes towards agroforestry and recreational multifunctionality; and 2) the associations between the perceived values of agroforestry and recreational multifunctionality. Multiple linear regressions were performed to determine the degree of association between recreational multifunctionality (dependent variable) and agroforestry attitudes and perceived values (independent variables). The dependent variable represents an index constructed from the number of recreational uses (0–8 uses) provided on the farm that were examined in this study (i.e., hunting, fishing, gathering of wild edibles, wildlife observation or nature contemplation, walking or hiking, use of off-road recreational vehicles, horseback riding and camping).

Attitudes are favorable or unfavorable dispositions towards an object, person, institution or event and are defined by three components: behavior, cognitive and affect (Breckler, 1984). Hence, three independent variables were regressed as indicators of the attitudes towards agroforestry to examine the normative of multifunctionality: 1) current adoption (i.e., behavior); 2) perceived knowledge (i.e., cognitive); and 3) willingness to adopt (i.e., affect). Current adoption was measured by the number of agroforestry

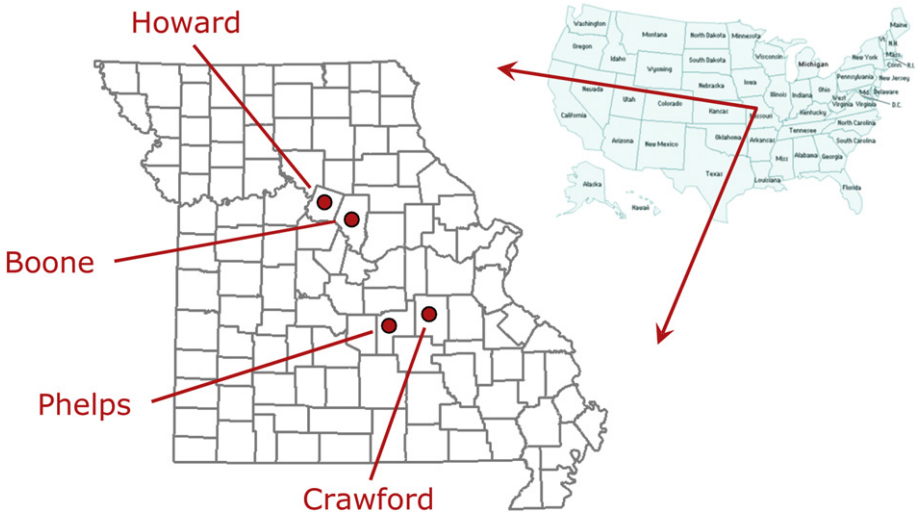

Fig. 1. Study location, Missouri (USA).

practices in use (0–5); willingness to adopt these practices was measured in a four-point Likert scale ranging from one (not interest at all) to four (very interested) and perceived knowledge was measured on a five-point Likert scale ranging from one (very low) to five (very high).

Eleven types of intrinsic and economic benefits, measured on a four-point *Likert* scale ranging from one (not important at all) to four (very important), are used as independent variables defining the perceived values of agroforestry. These variables were first reduced to their underlying dimensions using a principal component factor analyses with varimax rotation using eigenvalues over one and factor loadings over 0.5 as thresholds. Cronbach's reliability alphas over 0.6 within each factor were expected following the minimum recommended coefficient (Nunnally and Bernstein, 1994).

3.2. Sampling and survey development

The study sample was drawn from four counties representing Missouri's agricultural central region and Ozark landscape: Boone, Howard, Crawford, and Phelps (Fig. 1). Selection criteria ensured a mosaic of urban–rural settings, agroecological diversity and dominant natural systems, a diversity of landowners (e.g., part- and full-time farmers), and sites with the presence of a Land Grant University, agricultural research farm, or center. Hence, the sample was drawn to capture the weak-to-strong spectrum of multifunctionality. A random sample with replacement was drawn from all 13,431 landowners with ten or more acres in four counties' Tax Assessor's lists. The valid sample frame included 728 landowners, excluding those who could not be located.

A survey draft was developed and distributed to 17 employees from public and private organizations working with private landowners to make sure that the instrument was collecting information addressing different contexts and needs.[2] Specifically, these informants were asked to comment on the type of farm and conservation programs available, agricultural production and conservation policies and the various types and formats available for information in their region. Once the survey was revised incorporating informant feedback, it was pre-tested among different types of landowners (e.g., row-crops farmers, livestock production ranchers and non-farming landowners) for content validity. The final survey instrument included 93 close-ended questions organized in ten sections. Specifically, the survey gathered information regarding: involvement with farming, land resources and use, participation in programs and contact with organizations, experience and attitudes towards trees, marketing, environmental problems, sources of information, social networks, perceptions of farming, non-farm land use questions, agroforestry practices, attitudes, knowledge and adoption, and personal background information. The survey was conducted in 2006 using 20 enumerators, who were semi-retired or retired extension agents, farm wives, part-time workers, and students. These enumerators were trained together to ensure survey consistency. During the interview process, pictures with brief descriptions were shown to study participants to elicit responses regarding knowledge and adoption of agroforestry practices. A combination of mail and phone survey was conducted among landowners who did not live in the area. The survey sample frame yielded 353 completed surveys (48.5% response rate).

3.3. Profile of responding landowners

Responding landowners were mostly middle age and male. The majority of respondents (62.7%) were at least 50 years and averaged 57.7 years, which was close to the mean within the state (54.4 years) as reported in the last USA agricultural census (USDA: NASS, 2007). Almost three quarters (72.3%) were male operators. Over a third of respondents (38.1%) had 12 years of formal education, which is equivalent to a high-school degree. Another third (36.3%) had between 13 and 16 years of education, which is equivalent to an undergraduate degree. On average, respondents had 14.1 years of formal education. Respondents showed a strong family farm bonding. The majority (51.7%) had occupied their farm for more than 20 years and about a third (30.8%) for at least 40 years (mean = 33.7 years). Respondents showed a fairly good distribution of asset holdings. About a quarter (25.3%) estimated their assets at less than $200,000, while a third (33.1%) reported over $500,000, confirming the high level of agricultural assets controlled by family farms (Hoppe et al., 2007). A very interesting characteristic was that the majority of landowners (58.6%)

[2] Public organizations' employees interviewed included USDA's Farm Service Agency (FSA), Natural Resources Conservation Service (NRCS), the Missouri Department of Conservation (MDC), Soil and Water Conservation Districts (SWCD), and the University of Missouri. Private sector groups included the Missouri Cattlemens' Association.

reported being at least 70% debt free, which is consistent with studies suggesting that debt alleviation is not an important goal for farm enterprise diversification (Barbieri and Mahoney, 2009). These results may suggest that these landowners were well established in farming, or that they may have had other sources of income contributing to their asset acquisitions. Although not examined in this study, the high percentage of debt-free farms suggests the existence of landowners investing or willing to invest in the near future on their farmland for the beautification of their rural landscape. This merits further inquiry as the propensity of retired people with more disposable income and few financial responsibilities, moving to rural areas for non-farming purposes is growing in the USA (USDA: NASS, 2007).

Responding farms were equally located in urban (50.1%) and rural (49.1%) settings, confirming a good representation of both countryside and metropolitan areas. Most farms were small in terms of acreage,[3] with about half (47.8%) reported having less than 50 acres. The average farm size was 184 acres, which is below Missouri average (269 acres) according to the last agricultural census (USDA: NASS, 2007). This may be explained by two factors. On the one hand corporate farms, which tend to be the largest, were excluded from the sample as our purpose was to survey non-corporate family farms to capture the transition to multi-functionality. On the other hand, the sampling frame was based on the county Tax Assessor list, which included a population of landowners larger than that of the farmers actively involved in farming. Consistent with the nature of the sample and the small farm size reported, most landowners received less than $1000 from their agricultural production in 2005 (mean = US$17,928). On average, about half (48.4%) of the farmland was woodland, either for timber production or non-consumptive purposes (e.g., shading for livestock), followed by hayland and non-wooded pastures (37.7%), showing an even distribution between forest and non-forest agricultural production.

As intended in the study design, the survey captured a wide range of landowners, from those who appear to own a farm for non-economic values such as nature escapism or recreation to those for whom the land is their primary income source through farming capturing the mosaic from productivist to non-productivist landowners. The majority of respondents were non-farmer landowners (66.0%) or employed off-farm (62.1%) as shown in Table 1. The majority also reported being little or no dependent on agricultural income; 64.1% received less than 1% of their household income from farming activities. On the other hand, about a third (33.0%) of respondents were either full or part-time farmers and 37.9% did not hold an off-farm job. Although over a quarter of respondents (27.6%) have hired labor on their farm, only 6.3% reported that the majority (51% or more) of their household income was derived from agriculture. These results may suggest that other indirect economic gains (such as keeping the land for future generations) or other intrinsic drivers may be driving the practice of farming (Barbieri and Mahoney, 2009), evidencing transition to strong multifunctionality. Respondents worked an average of 706.6 h per year on their farm, which translates to working more than one and a half days (13.6 h) per week on their land. Confirming the farming exodus widely reported in the USA (Hoppe, 2001; Hoppe and Banker, 2006; Gardner, 2000) and European literature (Bateman and Ray, 1994), 13.5% of respondents decreased the number of acres farmed in the last five years. However, it is worth noting that about a fifth (19.3%) had increased their farming acreage in the same period of time. The relatively high number of hours invested on the farm and the increased farmed acreage may be suggesting that even those not engaged in the practice of farming (i.e., non-farmer landowners) are viewing this experience in a different light, no longer as their primary income source but may be perhaps as hobby. Further research is needed on this topic.

[3] Farm size was calculated by adding acres owned and rented from others, and then subtracting those acres rented to others.

Table 1
Economic profile of responding landowners and their lands.

Economic indicators	Number	Percent
Type of landowner ($n = 347$)		
Full-time farmer	29	8.4
Part-time farmers	89	25.6
Non-farmers living on the farm	177	51.0
Non-farmers living away the farm	52	15.0
Land manager	0	.0
Landowner off-farm pluriactivity ($n = 211$)		
Currently working off-farm	131	62.1
Do not work off-farm	80	37.9
Landowner on-farm labor per year ($n = 185$)		
Less than 100 h/year	36	19.5
100–499 h/year	56	29.8
500–999 h/year	29	15.5
1000–1499 h/year	37	19.8
1500 or more hours/year	27	14.4
Mean (hours/year)		(706.6)
Percent of household income from farming during the last 3 years ($n = 320$)		
Less than 1%	205	64.1
1–10%	48	15.0
11–50%	47	14.6
51% or more	20	6.3
Mean (in percent)		(11.40)
Change of the number of acres farmed in the last 5 years ($n = 119$)		
Farmed acreage decreased	16	13.5
Farmed acreage remained the same	80	67.2
Farmed acreage increased	23	19.3
Hired labor in 2005 ($n = 203$)		
Farms with hired labor	56	27.6
Farms without hired labor	147	72.4

4. Results

Results show a strong recreational function of the land among responding landowners suggesting the commoditisation of the countryside in Missouri. The vast majority of participants (92.4%) provided at least one recreational service to household members or outsiders. On average, landowners were simultaneously offering about four of these services (mean = 3.8). The most frequently provided services were hunting (72.2%), gathering of wild edibles such as mushrooms or berries (64.6%), wildlife observation or nature contemplation (56.7%) and walking or hiking (53.5%), showing a blend of consumptive and non-consumptive recreational uses. The strong presence of recreation multifunctionality found in this study is striking given the little attention focused on recreational services in the literature. This finding is also important when taking into account the many benefits associated with leisure and recreational participation, such as personal development, social bonding, relaxation and even therapeutic healing (Edginton et al., 2002). Therefore, study results suggest that in addition to other societal benefits that farms can provide (e.g., habitat and biodiversity conservation, preservation of rural heritage), those associated with recreational services should also be recognized (Table 2).

4.1. Attitudes towards agroforestry and recreational multifunctionality

Overall, respondents had negative attitudes towards agroforestry in their behavioral, cognitive and affective dimensions. Regarding the behavioral dimension, results show little adoption of

Table 2
Incidence of recreational services and agroforestry practices.

Recreational services ($n = 351$)	Number	Percent
Recreational services ($n = 351$)		
Hunting	255	72.6
Gathering of mushrooms, berries, or other wild edibles	228	65.0
Wildlife observation or nature contemplation	200	57.0
Walking or hiking	189	54.0
Fishing	156	44.4
Use of off-road recreational vehicles	150	42.9
Horseback riding	101	28.8
Camping	69	19.7
Recreational Multifunctionality Index (mean)[a]		(3.84)

[a] Average number of recreational services provided on regular basis.

these practices among Missouri landowners, confirming previous studies of landowners along the Mississippi (Arbuckle et al., 2009; Valdivia and Poulos, 2009). Less than a third (30.9%) of respondents were employing at least one of the five agroforestry practices promoted in temperate regions (i.e., alley cropping; windbreaks; riparian/stream bank plantings; forest farming; and silvopasture), suggesting a weak multifunctionality in relation to these farming practices. The most common adopted practices were windbreaks (17.3%) and riparian buffers or stream bank plantings (15.9%), while other practices were little observed. These practices are associated with protection of the natural resources (e.g., protection against winds and erosion), and are often promoted by federal and state agencies within the practice of agriculture, as landowners can receive payments to help offset costs. These practices also contribute to the scenic beauty of the landscapes, consistent with studies that find scenic beauty among the top reasons for interest in agroforestry (Flower et al., 2005; Valdivia and Poulos, 2009).

Regarding the cognitive dimension, results show a very low understanding of agroforestry practices among these Missouri landowners, which is consistent with previous studies suggesting that the low incidence of agroforestry practices in the USA is associated with lack of awareness (Flower et al., 2005; Valdivia and Poulos, 2009; Workman et al., 2003). Using a five-point *Likert*-type scale ranging from 1 (very low knowledge) to 5 (very high knowledge), the practices that were most known by respondents were windbreaks (mean = 2.70) and riparian buffers/stream bank plantings (mean = 2.25) as shown in Table 3. Silvopasture (mean = 1.76) was the least known practice. Results also showed little interest in adopting agroforestry practices, which is consistent with the previously discussed findings. Certainly, it is hard to adopt a practice if little is known about it. Using a four-point *Likert*-type scale anchoring with 1 being not interested at all, and 4 very interested, forest farming (mean = 1.78) and riparian buffers/stream bank plantings (mean = 1.78) were the practices landowners were more willing to adopt. These results are interesting, because although landowners had a very low understanding of forest farming (mean = 1.88), it was the practice more were willing to try. This finding deserves further research to unveil the reasons behind the inverse association between knowledge and willingness to adopt this practice. Alley cropping was the practice landowners were least willing to adopt (mean = 1.36) perhaps because this practice is not traditionally related to farming and may be perceived as an obstacle rather than a benefit as suggested by Raedeke et al. (2003).

Table 3
Current adoption, perceived knowledge and willingness to adopt agroforestry practices.

Agroforestry practices ($n = 321$)	Adoption	Knowledge perception[a]		Willingness to adopt[b]	
	Percent	Mean	S.D.	Mean	S.D.
Individual practices					
Windbreaks	17.3%	2.70	1.22	1.68	1.04
Riparian/stream bank plantings	15.9%	2.25	1.17	1.78	1.09
Silvopasture	4.8%	1.76	.95	1.54	.95
Forest farming	1.4%	1.86	1.02	1.78	1.06
Alley cropping	.6%	1.77	0.97	1.36	0.79
All practices					
Overall mean[c]	.40	2.06	.83	1.66	.78

[a] Measured using a 5-point *Likert*-type scale where 1 = Very low knowledge and 5 = Very high knowledge.
[b] Measured using a 4-point *Likert*-type scale where 1 = Not interested at all and 4 = Very interested.
[c] Average number of agroforestry practices adopted on the farm.

Multiple linear regressions performed on the agroforestry indicators produced three statistically significant models suggesting that attitudes (i.e., affect, cognitive and behavior) and perceived values of the practice of agroforestry are associated with the recreational use of the land. The first statistically significant model ($R^2 = .055$, $p < .001$) shows that the higher the perceived knowledge ($\beta = .361$, $p = .010$) and the more willingness to adopt agroforestry ($\beta = .291$, $p = .052$), the more recreational use of the land (Table 4). However, current involvement in agroforestry is not a determinant of the recreational use of the land, which may be due to the overall low use of these practices among respondents. These results are important, especially for those non-farming landowners, because they suggest agroforestry can support the recreational use of the land, thus approaching strong multifunctionality. Further, results suggest that an increased promotion of agroforestry should convey recreational benefits, especially among those landowners who are not primarily dedicated to the commercial agricultural production.

4.2. The perceived values of agroforestry and the recreational function of the farm

Given that little attention has been paid to understanding how farmers perceive agroforestry in terms of the capacity to bring multiple economic and intrinsic values to farmers and society (Matthews et al., 1993; Raintree, 1983; Raedeke et al., 2003), this study investigated to what extent Missouri landowners perceived eleven values associated with planting trees. Interestingly, taking into account the low adoption of agroforestry among respondents, results show that most of the values associated with agroforestry (i.e., "planting trees on their farmland") were important to landowners. The highest ranked benefits were "For future generations" (mean = 3.0), "Wildlife conservation" (mean = 2.9); and "Control/prevention of erosion" (mean = 2.9) as Table 4 shows. The principal component factor analysis conducted over the eleven perceived agroforestry values resulted in two factors (variance = 57.9%; Cronbach's alpha = 0.96). The nature of the values that loaded in each factor was used to label them as follows: (F1) Intrinsic Values and (F2) Economic Values (Table 5).

Table 4
Multiple linear regressions of agroforestry indicators on the recreational use of the farm.

Independent variables	DV – Recreational Multifunctionality Index		
	β	St. β	p-Value
Current agroforestry adoption	.165	.054	.343
Perceived knowledge of agroforestry	.361	.149	.010
Willingness to adopt agroforestry	.291	.112	.052
p-Value	.000		
R	.233		
R^2	.055		

Table 5
Mean and rotated factor matrix of the perceived values of agroforestry practices.

Agroforestry perceived values: factors and items	Mean[a]	Factor loadings	Explained variance (%)	Eigenvalue
Intrinsic values – F1 ($\alpha = .882$)[b]			35.10	5.34
Wildlife conservation	2.92	.818		
Scenic beauty	2.78	.809		
For future generations	3.01	.725		
Erosion control/prevention	2.88	.695		
Water quality protection	2.77	.665		
Wind protection	2.21	.572		
Carbon sequestration	2.26	.553		
Values Factor Mean Score 1 (VF1)	(2.71)			
Economic values – F2 ($\alpha = .947$)			22.76	1.02
Other benefits[c]	1.74	.755		
Economic benefits	2.26	.630		
Tax benefits	2.22	.608		
Flood protection	2.14	.584		
Values Factor Mean Score 2 (VF2)	(2.22)			
Total variance			57.87	

[a] Measured using a 4-point *Likert*-type scale from 1 = Un Important to 4 = Very Important.
[b] Cronbach's alpha reliability coefficients for domains. Overall reliability ($\alpha = .963$).
[c] These include, providing privacy to the farmland, noise control and help the environment among others.

The *Intrinsic Values Factor* (F1) was comprised of seven types of societal values associated with agroforestry, either within the individual/family or community domains (variance = 35.1%; eigenvalue = 5.3; Cronbach $\alpha = .88$). These values were related to the conservation of wildlife, natural resources (i.e., soil, water) and landscapes, and the protection of the environment (e.g., carbon sequestration) specifically in terms of benefits for both present and future generations. The second factor, *Economic Values* (F2) is associated in various ways to the financial and economic well-being of the farm or farm household members derived from agroforestry, including the potential for increasing revenues, tax deductions and flood protection (variance = 22.8%; eigenvalue = 1.02; Cronbach $\alpha = .95$). This second factor also includes "Other benefits", an open-ended category that included responses with strategies mixed in nature. For example, some responses refer to intrinsic benefits related to the enhancement of the environment (e.g., "help the environment"), while others refer to strategies that could reduce farm expenses, such as planting trees for privacy or shade, which are less expensive than building structures. The high loading obtained on the "Other benefits" category along with other economic benefits may suggest that unexplained responses could be associated with perceived agroforestry economic values. However, the limited information gathered in this question was a limitation in this study. The composite mean of each agroforestry value factor (*Value Factor Mean Score*), calculated by averaging the means of the variables loaded in each factor (VF1 and VF2), revealed that intrinsic values that agroforestry could bring to the landowner and society (VF1 = 2.71) are perceived as more important than the economic ones (VF2 = 2.22).

Tests revealed high collinearity among several values within each dimension; hence these were removed. Four items were retained (i.e., wildlife conservation, water quality, wind protection, and carbon sequestration) to describe the intrinsic values of agroforestry, while the economic benefits and flood protection were retained as descriptors of the economic values. Multiple linear regressions performed on the perceived intrinsic and economic values of agroforestry resulted in two statistically significant models suggesting that these values are associated with the recreational use of the land. The first significant model ($R^2 = .063$, $p < .001$) shows that planting trees for wind protection (β.164, $p = .024$) and for carbon sequestration ($\beta = .245$, $p = .044$) are positively associated with the recreational use of the land (Table 6). The second significant model ($R^2 = .037$, $p = .002$) shows that the perceived economic benefits ($\beta = .201$, $p = .048$) and flood protection ($\beta = .193$, $p = .045$) are positively associated with the recreational use of the land. These results are important as they suggest that no matter the type of values (i.e., intrinsic or economic) that landowners associate with planting trees on their farm, agroforestry practices facilitate a greater enjoyment of their land through recreational services. Hence, these results suggest other benefits of agroforestry (i.e., recreational use) that need to be accounted for when assessing the overall benefits of agroforestry.

Table 6
Multiple linear regressions of the agroforestry perceived values on the recreational use of the farm.

Independent variables by factors	DV – Recreational Multifunctionality Index		
	β	St. β	p-Value
Intrinsic values – F1 ($p < 0.001$; $R = 251$; $R^2 = .063$)			
Wildlife conservation	−.055	−.033	.593
Water quality or protection	−.099	−.005	.937
Wind protection	.284	.164	.024
Carbon sequestration	.245	.137	.044
Economic values – F2 ($p = 0.002$; $R = 191$; $R^2 = .037$)			
Economic benefits	.201	.115	.048
Flood protection	.193	.117	.045

5. Conclusions and insights for further research

This study adds a different perspective to the existing literature on agricultural multifunctionality, examining the concept beyond those most often discussed in the production and environmental services literature. Specifically, we build on the *recreational multifunctionality* construct defined as the recreational use of the land regardless of their entrepreneurial nature or landowners' goals or intentions (Barbieri and Valdivia, 2009, 2010) to identify synergies with the practice of agroforestry that could boost the multiple economic and non-economic values associated with recreation services and various agroforestry practices. In particular, we adopt a normative view of multifunctionality thought and action (Wilson, 2008; Marsden and Sonnino, 2008), to understand how the recreational function of the farm enables the transition to agroforestry as a pathway from a productivist to a non-productivist use of the land in the USA. Further, an examination of the synergies between recreational services and agroforestry can elucidate the pursuit of strong multifunctionality, a desired type of multifunctionality as Wilson (2008) postulates, that is more sustainable, fosters rural development and well-being and produces several environmental benefits.

This study shows that family farms provide recreational services to society and rural communities, along with the provision of food and fiber. The strong presence of recreational multifunctionality suggests that further academic attention needs to be placed on farm recreational services besides its entrepreneurial nature (i.e., economic revenue generation), because of the many benefits associated with leisure and recreational participation, such as personal development, social bonding, relaxation and even therapeutic healing (Edginton et al., 2002). In this sense, recreational services need to be recognized when assessing the values that family farms provide to society and rural communities. This is especially true in the case of those landowners who may not be in the business of agricultural production per se, but see themselves as stewards of the land and produce other benefits associated with their farmland, suggesting an existing transition in Missouri from a productivist to a non-productivist consumption of the farmland.

Results show that respondents have limited behavioral, cognitive, and affective attitudes towards agroforestry, which is consistent with the relative lack of knowledge of these practices found in previous USA research (Arbuckle et al., 2009; Flower et al., 2005; Valdivia and Poulos, 2009; Workman et al., 2003). Although study results show a disconnect between attitudes and values towards agroforestry practices, this should not be discouraging, especially taking into consideration that multifunctionality transition is characterized as being temporally non linear (Wilson, 2008). A diffusion of agroforestry, recognizing differences among landowners based on their multifunctionality status and farming values, can change this disconnect as Barbieri and Valdivia (2009) suggested, facilitating the pursuit of strong multifunctionality as a desired agricultural state (Wilson, 2008).

Given the negative attitudes towards agroforestry, it was interesting to find that respondents strongly perceived different benefits associated with planning trees on the farmland, especially those that are non-economic (e.g., wildlife conservation, scenic beauty). These findings have important implications for the diffusion and promotion of agroforestry. The low incidence of current adoption, understanding and willingness to adopt agroforestry practices, along with a strong perception of the benefits associated with "planting trees" on the farmland, suggest a disconnect that extension agents can tackle by addressing agroforestry in non-technical language, as findings suggest that landowners do not associate the concept of agroforestry with its meaning (i.e., integrating trees into the landscape). Findings also suggest linking the benefits of agroforestry to values the landowner perceives as important, such as planting trees for scenic beauty. In this regard, it is important that diffusion messages should recognize a diversity of landowners, tailoring the diffusion message to the interests and values of the landowners (Barbieri and Valdivia, 2010). For example, those landowners for whom the farmland is a productive resource rather than a rural amenity (i.e., farmers) could be more receptive to agroforestry practices if informed about its several economic values.

Results show interesting synergies between the recreational function of the farmland and agroforestry practices. First, the attitudes towards agroforestry are partially associated with the recreational use of the land, as it is positively associated to the cognitive (i.e., perceived knowledge) and affective (i.e., willingness to adopt) attitudes dimensions. Although agroforestry (i.e., current involvement) did not show any significant result, this should not be considered conclusive, as this may be due to the very low use or adoption of agroforestry practices among respondents. Second, results show that the higher the perception of intrinsic (i.e., planting trees for wind protection and carbon sequestration) and economic (i.e., perceived economic benefits and flood protection) values of agroforestry, the more the recreational use of the land.

Associations found in this study are important because these suggest that agroforestry practices favor another use of the land (i.e., recreation), an additional benefit that should be recognized and assessed when examining the overall benefits of incorporating trees and shrubs into agricultural production. These results also suggest that those promoting the adoption of agroforestry practices should convey the associated recreational benefits, especially among those landowners who are not primarily dedicated to commercial agricultural production including non-farming landowners. Finally, taking actions to enable a greater recreational use of the land, and recognizing this function, are important because recreation produces a myriad of benefits among landowners, communities and overall society, direct benefits of strong multifunctionality. In this regard, further examination of the costs and barriers would shed light on the economic opportunities that could be developed in the recreation–agroforestry interface.

This study captured how one farmland function (i.e., recreation) relates to another function (i.e., agroforestry). However, recognizing the limitations associated with a quantitative approach, future studies may consider qualitative methods to further the normative of multifunctionality, especially through recreational services. In specific, in-depth interviews with different types of landowners can shed more detailed insights regarding landowners perceived values of recreational services and their interactions (e.g., benefits) with other farmland products and services (e.g., farming, value-added production, agroforestry). Focus groups with private and public stakeholder groups (e.g., commodity producers, community supported agriculture, state department of agriculture) can be also useful to better capture the state of agricultural multifunctionality within the weak–strong continuum and to elicit perceptions of how the multiple agricultural functions are shaping their livelihoods and the future of their communities.

Intended as a framework for analysis, future studies are also needed to map other farm functions (e.g., biodiversity conservation, environmental services and historic preservation) and their interactions. A closer examination of different types and interactions of farmland functions can expand our holistic understanding of the values of small family farms and increase our normative understanding of the weak–strong multifunctional spectrum postulated by Wilson (2008). This understanding is especially critical at a time when changes are driven by external forces like economic pressures and climate change. Understanding the behaviors and perceptions of the various types of stewards of the land, such as the recreational multifunctionals, can inform and encourage policies supporting structural changes that foster rural development.

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