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MICHAEL A. GOLD & MICHELLE M. HALL, EDS.

RECREATIONAL MULTIFUNCTIONALITY AND ITS IMPLICATIONS FOR AGROFORESTRY

Carla Barbieri¹ and Corinne Valdivia²

¹ Dept. of Parks, Recreation & Tourism, University of Missouri
105 Anheuser Busch Natural Resources Building, Columbia, MO 65211

² Dept. of Agricultural Economics, University of Missouri
214 D Mumford Hall, Columbia, MO 65211

Contact: BarbieriC@missouri.edu

Abstract: Multifunctionality occurs when farms provide different services along with food production including recreation and agroforestry. Multifunctional farms simultaneously offer several services suggesting synergies among them that are not yet understood. This study aims to fill this gap, examining the relationships between recreational multifunctionality and agroforestry. In 2006, 353 randomly selected landowners from four Missouri counties were interviewed about their farm characteristics, recreational services and agroforestry perceptions. Statistical tests include cluster analysis followed by ANOVA and chi-square tests.

Responding landowners are preponderantly middle age and male. The majority provide at least one recreational service and on average more than four. The most frequently provided services are hunting, gathering wild edibles and nature contemplation, showing a blend of consumptive/ extractive and non-consumptive recreational uses. Cluster analysis performed over the recreational services revealed two groups of recreational multifunctionals: Farming Lifestyle Landowners - FLL (n=122) and Rural Lifestyle Landowners - RLL (n=199).

Both types of recreational multifunctionals differ in their engagement in agricultural production, types and amount of recreational services provided, socio-demographic and farming attributes. Overall, FLL are not as multifunctional and their farm has a production function. RLL are highly multifunctional and mainly non-farmers who appear to own a farm for non-extractive values. Clusters also differ in their understanding of agroforestry. RLL are more knowledgeable and interested in most agroforestry practices than FLL. Differences between groups on their awareness and perceptions of agroforestry suggest that different strategies should be applied to inform them about the values of agroforestry.

Keywords: Recreation, Multifunctionality, Agroforestry, Agritourism, Cluster Analysis.

INTRODUCTION

The vast majority (91.2%) of farms in the U.S. have annual sales lower than US\$250,000, representing a small share (27%) of the national agriculture production (Hoppe et al. 2007). These farms, labeled as small family farms, control a large proportion (72%) of agriculture productive assets including farmland (Hoppe et al. 2007), which has important implications for rural well-being. Small family farms help mitigate the negative environmental effects from

agricultural production, provide landscape beautification and control for residential sprawl, and foster native and wildlife conservation (Hoppe et al. 2007; Lambert et al. 2006; Valdivia 2007).

The current agriculture context is posing economic challenges to small family farms, which are experiencing a significant reduction of their agriculture income (Hoppe et al. 2007). In response, family farms are adopting several strategies to remain in business or retain their lands. These strategies include revenues diversification through off-farm employment (Hoppe 2001), development of on-farm enterprises and crops diversification among others (Barbieri et al. 2008; Hoppe 2001; Knutson et al. 1998). The economic challenges affecting small family farms demands a holistic approach to better understand the many values, especially those non-economic, which these firms provide to rural societies. Multifunctionality can serve this purpose as it approaches the different functions that farms provide along with food and fiber production, including rural heritage preservation, land conservation and maintenance of agri-biological diversity, among others (Dobbs and Pretty 2004; Marsden and Sonnino 2008).

In this study we use the multifunctionality approach to examine a set of recreational services (i.e., recreational multifunctionality) that small family farms in Missouri provide, because of the myriad of benefits associated with recreation participation in rural settings. These benefits include the increase of farm revenues, revitalization of local economies, preservation of agriculture heritage and natural resources among others (Hegarty and Przezbórska 2005; Wicks and Merrett 2003). Given that farms can concurrently provide different functions (Barbieri et al. 2008; Ploeg et al. 2000), this study further examines associations between recreation and agroforestry. A simultaneous concurrence of on-farm recreation and agroforestry can amplify the positive impacts on farms, local communities and society as agroforestry brings a wide range of benefits including revenues generation, reduction of livestock stress and mortality, decrease of runoff and non-point source pollution, creation of aquatic and terrestrial habitats, carbon sequestration, and scenic beauty among others (Gold and Garret *in press*; Valdivia and Poulos 2009; Williams et al. 1997).

LITERATURE REVIEW

Agriculture is multifunctional as it provides many functions (i.e., services) to society along with food and fiber production (Ploeg et al. 2000). Multifunctionality is frequently approached to holistically assess the many values of farming outputs, including environmental amenities, agritourism opportunities, food quality, landscape management, preservation of biodiversity, and others (Marsden and Sonnino 2008). Agriculture multifunctionality is synergetic as on-farm functions and enterprises do not operate in isolation but there is interaction among them (Barbieri et al. 2008; Ploeg et al. 2000). Moreover, on-farm recreation appears to be more synergistic than other functions, which can amplify 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 *in press*).

On-farm recreation is a type of agriculture multifunctionality because it provides multiple benefits to: 1) the business unit, such as cross marketing of farm products and revenues generation; 2) the landowner in their accomplishment of entrepreneurial intrinsic goals; and 3) to society in the preservation of the agriculture landscape and heritage among others (Barbieri and

Mshenga 2008; Hegarty and Przezbórska 2005; Wicks and Merrett 2003). It is important to stress that the concept of recreational multifunctionality developed in this study differs from the term agritourism. The latter is commonly placed within the enterprise diversification grand scheme, thus defined as one type of on-farm entrepreneurial endeavor with the purpose of attracting visitors to increase farm revenues or value (Barbieri and Mshenga 2008; Hegarty and Przezbórska 2005). Common activities typified as agritourism include orchard tours, self-recreational harvests, programmed hunting, festivals and special events as they have the capability to capture visitors' fees directly (e.g., activity-based fee) or indirectly (e.g., direct sale of farm value-added products). However, for the purpose of this study, recreational multifunctionality includes eight activities that can commonly occur within the farmland regardless of the landowner economic goals: hunting, fishing, gathering of wild edibles (e.g., berries, mushrooms), wildlife observation or nature contemplation; walking or hiking, use of off-road recreational vehicles, horseback riding and camping.

Agroforestry is defined as an intensive land-use management practice, where trees and/or shrubs are incorporated into the agricultural landscape (Gold and Garrett *in press*). The various physical, biological, ecological, economic and social benefits produced by the biophysical interactions between the trees/shrubs and crops/livestock makes agroforestry multifunctional (Dobbs and Pretty 2004; Gold and Garrett *in press*). The economic benefits include the increase of farms' revenues, the maximization of land production and reduction of production costs (Gold and Garrett *in press*; Gold et al. 2009). Agroforestry also produces important environmental benefits including control of wind erosion, reduction of run-off and non-point source pollution, stabilization of stream banks, improvements of internal drainage and enhance infiltration, and enhancement of aquatic and terrestrial habitats and connective travel corridors, among others (Gold and Garrett *in press*).

DATA AND METHODS

This study explores the extent of recreational multifunctionality among landowners in Missouri and examines possible associations with agroforestry. Specific objectives are: (1) to investigate the occurrence of recreational functionality in terms of types of recreational services provided by landowners; (2) to cluster landowners based on their levels of recreational multifunctionality engagement; and (3) to identify associations between recreational multifunctionals and several agroforestry indicators.

The valid sample frame included 728 landowners, excluding those that the enumerators were unable to contact or reach. This sample was randomly drawn with an automatic number generator with replacement from four counties Tax Assessor's Lists in Missouri. The survey was conducted in 2006 and produced 353 completed surveys (48.5% response rate). In addition, 49.4% landowners refused to participate. The final questionnaire comprised 93 questions inquiring about 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.

Analysis for this study was performed in three stages to address the study objectives. First, descriptive statistics were used to examine the extent of recreational functionality among respondents. Second, a hierarchical cluster analysis was performed over the recreational services to classify respondents. Third, chi-square and ANOVA tests were conducted to determine differences between clusters regarding various agroforestry indicators, including current adoption, knowledge perception and willingness to adopt agroforestry practices.

RESULTS

Profile of Responding Landowners and their Farmland

The majority of responding landowners are male (72.3%) and at least 50 years old (62.7%). Respondents in the sample show strong ties with their farm as the majority (51.7%) occupied their farm for more than 20 years (mean=33.7 years). About a quarter (25.3%) estimated their assets in less than \$200,000 while a third (33.1%) reported over \$500,000 assets, confirming the high level of agriculture assets controlled by family farms (Hoppe et al. 2007).

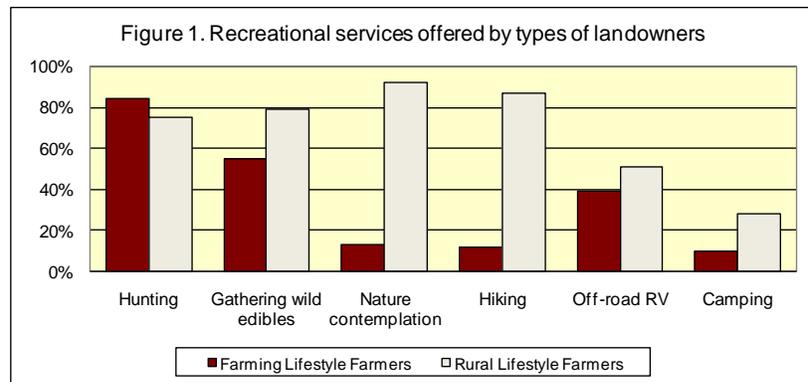
Responding farms are similarly located in urban (50.1%) and rural (49.1%) counties, equally representing both countryside and proximity to urban areas. Average land size was 184 acres, with about half (47.8%) of participants with farms smaller than 50 acres. Given the nature of the sample and the small farm size reported, it is not surprising that most landowners (72.4%) received less than \$1,000 in sales from their agriculture production in 2005 (mean=US\$17,928). On average, about half (48.4%) of the farmland is woodland, either for timber production or non-consumptive purposes (e.g., shade for livestock), followed by hay land and non-wooded pastures (37.7%), with an even distribution between forest and non-forest agriculture production.

There is a low incidence of agroforestry adoption among respondents. Less than a third (30.9%) of respondents are employing at least one of the six agroforestry practices most frequently adopted in the U.S. (i.e., alley cropping; windbreaks; riparian/stream bank plantings; forest farming, trees planting in front of levees, and silvopasture). The agroforestry practices most frequently adopted are windbreaks (17.3%) closely followed by riparian or stream bank plantings (15.9%). Adoption of other practices was very limited. On average, those engaged in agroforestry (30.9%, n=109) are adopting more than one practice at the time (mean=1.31 practice).

Recreational Multifunctionality

The vast majority of participants (92.4%) provides at least one recreational service (i.e., function) to household members and outsiders. On average, they are simultaneously offering more than four of these services (mean=4.16 services). The services provided most frequently include hunting (78.5%), gathering of mushrooms, berries or other wild edibles (70.1%), wildlife observation or nature contemplation (61.7%) and walking or hiking (58.6%), showing a blend of consumptive and non-consumptive recreational uses.

A hierarchical cluster analysis with the recreational services provided by respondents revealed two groups that differ significantly in the types and amount of recreational services provided. First, the *Farming Lifestyle Landowners* – FLL (38.0%; n=122) are not very multifunctional in terms of number of recreational



services (mean=2.99 services), and are mostly associated with recreation linked to the farming lifestyle, such as fishing, hunting and horse-back riding. Second, the *Rural Lifestyle Landowners* – RLL (62.0%, n=199) are highly multifunctional (mean=4.87 recreational services), offering significantly more ($p < 0.05$) recreational services associated with the rural life-style, such as walking or hiking and wildlife and nature contemplation (figure 1). There are no significant differences regarding fishing and horse-back riding between groups.

Recreational clusters also differ in their socio-demographic and their production unit attributes. FLL are predominantly full and part-time farmers (47.1%) for whom the farm is a production unit. On the other hand RLL are mainly non-farmers (72.5%) who appear to own a farm for non-economic values such as nature escapism or recreation ($\chi^2 = 24.76$, $p < .001$) as shown in table 1. Although the majority of respondents reported having off-farm jobs, the proportion was statistically higher among RLL (71.7%) compared to their counterparts (53.8%) ($\chi^2 = 6.56$, $p = .010$). Given the differences found between clusters in labor efforts invested on the farm, it was not surprising that the proportion of revenues derived from agriculture during the last three years was significantly higher among the FLL (26.9%) than the RLL (9.7%) ($F = 26.62$, $p < .001$).

Few significant differences regarding the farm characteristics were found between clusters. A greater proportion of FLL reported having decreased the number of acres farmed in the past five years compared to the other cluster ($\chi^2 = 6.07$, $p = .048$), which is consistent with the farming exodus and the increased off-farm pluriactivity widely reported in the literature (Hoppe and Banker 2006; Gardner 2000). Interestingly, more RLL have increased their farmed acreage in the same period of time, suggesting that these landowners may be shifting to a steadier farming mode, either as hobbyists or connoisseur farmers. As it would be expected, FLL hired more farming labor in 2005 (36.3%) than RLL (21.5%). No significance differences were found between clusters regarding the location (rural/urban) of the farm and the gross revenues from agriculture production.

Table 1: A comparison of farm household and farm characteristics between recreation multifunctionality clusters.

| Landowner and Farm Descriptors | FLL (n=122) | RLL (n=199) | <i>Sig.</i> |
|--------------------------------------------------------|------------------------|------------------------|------------------------|
| Type of Landowner | | | $\chi^2=24.76, p<.001$ |
| Full-time farmer | 16.0% | 3.1% | |
| Part-time farmers | 31.1% | 24.5% | |
| Non-farmers living on the farm | 36.9% | 59.6% | |
| Non-farmers living away the farm | 16.0% | 12.8% | |
| Landowner Off-farm Pluriactivity | | | $\chi^2=6.56, p=.010$ |
| Currently working off-farm | 53.8% | 71.7% | |
| Do not work off-farm | 46.2% | 29.3% | |
| Household Farming Income (Last 3 years) | | | $F=26.62, p<.001$ |
| Income from farming (in percent) | 26.9% | 9.7% | |
| Farmed Acres Change - Last 5 years (in percent) | | | $\chi^2=6.07, p=.048$ |
| Farmed acreage increased | 16.1% | 20.0% | |
| Farmed acreage remained the same | 62.5% | 74.5% | |
| Farmed acreage decreased | 21.4% | 5.5% | |
| Hired labor in 2005 | | | $\chi^2=4.96, p=.026$ |
| Farms with hired labor | 36.3% | 21.5% | |
| Farms without hired labor | 63.7% | 78.5% | |

Agroforestry Perceptions among Recreational Clusters

Statistical tests were conducted to explore the implications of recreational multifunctionality on agroforestry in terms of current adoption, perceived knowledge and willingness to adopt in the future. Landowners' perceived knowledge regarding agroforestry practices was examined using a five-point Likert type scale ranging from one (very low knowledge) to five (very high knowledge), while willingness to adopt them was measured using a four-point Likert type scale anchoring in one (not interested at all) and four (very interested).

Analysis didn't yield any significant differences between recreational clusters on their level of current engagement in any of the five agroforestry practices included in this study, which is not surprising taking into account the small incidence of agroforestry among respondents. However, ANOVA tests show that there are significant differences between clusters in the understanding and willingness to adopt most agroforestry practices (table 2). Overall, RLL perceive themselves as more knowledgeable about most agroforestry practices than FLL ($p<0.05$), with the exception of silvopasture. Greater differences were found with windbreaks ($F=12.88, p<.001$), alley cropping ($F=9.33, p=.002$), and forest farming ($F=8.18, p=.005$). Worth noting is that clusters rank their knowledge of certain agroforestry practices differently. For example, silvopasture is the third most known agroforestry practice for FLL (mean=1.73), while the least known for RLL (mean=1.78).

Results show a very low (mean<2.0) interest in adopting agroforestry practices in the future (i.e., less than “slightly interested”). Consistent with the perceived knowledge results, RLL are overall more willing to adopt agroforestry practices than their counterparts ($p<0.05$) except in the case of silvopasture. Once more, there is not consistency between clusters in the practices more willing to be adopted. For example, the practices most willing to be adopted are riparian/stream bank plantings (mean=1.55) for FLL, and forest farming for RLL (mean=1.99). In turn, planting trees in front of levees (mean=1.15), and alley cropping (mean=1.45) are the practices least willing to be adopted by FLL and RLL respectively. Further, results show that there is not a complete correspondence between knowledge and willingness to adopt agroforestry practices. For example, while windbreaks is the most known practice (mean=2.91) by rural lifestyle landowners, it is not the preferred one to be adopted (mean=1.76). Conversely, rural lifestyle landowners are more willing to adopt forest farming (mean=1.99), while their knowledge of it is low (mean=2.01).

Table 2: A comparison of knowledge perceptions and willingness to adopt agroforestry practices between recreation multifunctionality clusters.

| Agroforestry Indicators | FLL (n=122) | RLL (n=199) | Sig. |
|-----------------------------------------------------|----------------|----------------|-------------------|
| Landowner’s Knowledge Perception¹ | | | |
| Alley cropping | 1.58 | 1.92 | $F=9.33, p=.002$ |
| Windbreaks | 2.41 | 2.91 | $F=12.88, p<.001$ |
| Riparian/stream bank plantings | 2.07 | 2.39 | $F=5.64, p=.018$ |
| Forest farming | 1.67 | 2.01 | $F=8.18, p=.005$ |
| Trees planting in front of levees | 1.51 | 1.84 | $F=6.75, p=.010$ |
| Silvopasture | 1.73 | 1.78 | <i>Not Sig.</i> |
| Landowner’s Adoption Willingness² | | | |
| Alley cropping | 1.17 | 1.45 | $F=7.92, p=.005$ |
| Windbreaks | 1.51 | 1.76 | $F=4.15, p=.042$ |
| Riparian/stream bank plantings | 1.55 | 1.92 | $F=7.44, p=.007$ |
| Forest farming | 1.44 | 1.99 | $F=19.48, p<.001$ |
| Trees planting in front of levees | 1.15 | 1.50 | $F=6.87, p=.010$ |
| Silvopasture | 1.41 | 1.57 | <i>Not Sig.</i> |

¹ Measured using a 5-point *Likert*-type scale defined as: (1)=very low; (2)=low; (3)=medium; (4)=high; and (5)=Very high knowledge

² Measured using a 4-point *Likert*-type scale defined as: (1)=Not interested at all; (2)=slightly interested; (3)=moderately interested; and (4)=very interested

CONCLUSIONS

This study adds to the existing knowledge of agriculture multifunctionality, exploring the recreational functions among Missouri landowners. According to the profile developed, the majority of landowners provide several consumptive and non-consumptive recreational services to household members and outsiders, being the most frequently observed hunting, gathering wild edibles and nature contemplation. A recreation-based cluster analysis revealed two groups of

landowners who differ significantly in the types and amount of recreational services provided, their demographic and farmland attributes, and their attitudes towards agroforestry.

The first cluster, *Farming Lifestyle Landowners* – FLL (38.0%), is mainly composed by full and part-time farmers (47.1%) for whom the farm is a production unit. They provide few recreational services, mostly associated with recreation linked to the farming lifestyle, such as fishing, hunting and horse-back riding. The second cluster, *Rural Lifestyle Landowners* – RLL (62.0%), is mostly composed of non-farmers (72.5%) who appear to own a farm for non-economic values. They offer several recreational services on their land, mostly associated with the rural life-style, such as walking or hiking and wildlife and nature contemplation. Although clusters do not differ on the extent of current involvement in agroforestry, tests show that RLL have a greater understanding of these practices, and more willing to adopt these practices compared to the FLL.

The associations found in this study between recreational multifunctionality and agroforestry have various extension and academic implications. Results suggest that different strategies should be applied in the diffusion efforts of agroforestry, recognizing both types of landowners. For example, communications intended for RLL should emphasize the intrinsic benefits of agroforestry as this cluster is already more knowledgeable and willing to adopt these practices and not constrained by the economic utility of their farmland. In turn, greater efforts are needed to inform FLL about the several economic benefits of agroforestry such as the generation of direct revenues and maximizing returns to the land with additional alternatives.

The recreation-agroforestry associations found in this study also raise questions that need further examination. First, future studies need to closely examine the benefits produced by the concurrent presence of different farm functions (e.g., recreation and agroforestry), as these can expand our holistic understanding of the value of small family farms. Second, this study needs to be replicated, expanding its scope to also include agritourism, which includes recreational activities for entrepreneurial purposes. Finally, inconsistencies found between and within recreational clusters on their knowledge perception and willingness to adopt agroforestry practices suggest further exploration regarding presence of synergies between recreation and agroforestry functions in terms of perceived benefits and barriers associated with the adoption of agroforestry.

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