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Willingness to pay for aesthetics associated with field windbreaks in Iowa, United States

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HIGHLIGHTS

- Willingness of Iowa's residents and farm operators to pay for aesthetic benefits associated with field windbreaks was examined.
- Respondents were willing to financially support planting of field windbreaks for aesthetic purposes.
- Non-farmers were more likely to make a payment than farm operators.
- Windbreaks' perceived visual appeal and abundance had impact on reported payment amounts.
- Results indicate that field windbreaks contribute to multifunctional agriculture by protecting crops and providing environmental amenities.

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ABSTRACT

The objective of this study was to determine a monetary value of aesthetics associated with field windbreaks in Iowa, United States. A mail survey and contingent valuation method (CVM) were used to determine willingness to pay (WTP) to support planting of field windbreaks for aesthetic purposes. A probit regression was conducted to examine how reported WTP estimates were affected by respondents' opinions on impact of field windbreaks on visual appearance of agricultural lands, perceived abundance of field windbreaks, familiarity with their benefits as well as education and occupation. A mean WTP ranged from US$4.77 to US$8.50. Respondents who were also farm operators were less likely to make the payment than non-farmers, possibly due to perceived opportunity cost associated with placing field windbreaks on agricultural lands. Respondents who found field windbreaks to make agricultural lands visually more appealing were willing to pay from US$1.94 to US$3.05 more than respondents who did not think so. Those who thought that from a visual perspective there were not enough windbreaks present in Iowa's landscape were willing to pay from US$1.67 to US$2.37 more than those who thought that the number of windbreaks was appropriate. The obtained WTP estimates will be useful in determining monetary trade-offs of future land use decisions and policies related to field windbreaks as well as other land use practices. The study results also will be helpful in developing new outreach and incentive programs for agricultural landowners.

1. Introduction

Field windbreaks can biophysically enhance the provision of economically valuable ecosystem services in agricultural landscapes (Brandle, Hodges, Tyndall, & Sudmeyer, 2009; Kulshreshtha & Kort, 2009). Traditionally, the value of agricultural lands has been driven by its productive capacity with more productive lands generating higher sale values (Bastian, McLeod, Germino, Reiners, & Blasko, 2002). In recent years, however, concomitant with increased land use competition for food, fiber and fuel, there has been increasing demand on agricultural lands to provide land owners, farm operators and society a broader array of ecosystem services (Bastian et al., 2002; Hall, McVittie, & Moran, 2004; Jordan et al., 2007). Agricultural lands are multifunctional in that they can be managed for commodity production and simultaneously provide beneficial environmental amenities (Boody et al., 2005; Swinton, 2008). As such, agricultural landscapes are increasingly being considered explicitly for their multifunctional scope (Batie, 2003; Randall, 2002). Importantly for the farm operators who make decisions to manage land specifically for ecosystem services, many of these services are associated with both direct and indirect economic values. These values are potentially capturable in existing and emerging ecosystem service markets such as those

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associated with land, carbon sequestration, wildlife habitat, recreational opportunities, open space, and improved aesthetic quality of the land (Bastian et al., 2002; Grala, Colletti, & Mize, 2009; Ready & Abdalla, 2005; Schoeneberger, 2009; Xu, Mittelhammer, & Barkley, 1993). It is predicted that broad demand for these services will be growing in the future, especially in areas with high population density, lacking open space, and in rural–urban interface (Robertson & Swinton, 2005).

One land management practice that farm operators have at their disposal to enhance the capacity of agricultural lands in providing ecosystem services is the use of field windbreaks (Brandle et al., 2009). Some of the benefits associated with field windbreaks, such as soil erosion control, soil moisture enhancement and livestock and crop protection, enhance productive capacity of the farmland and can contribute to higher land values in agricultural land markets (Huang, Miller, Sherrick, & Gomez, 2006). Additionally, non-production oriented benefits such as biodiversity, wildlife habitat and aesthetics have a status of public or quasi-public goods that are enjoyed, not only by field windbreak owners, but also by the rest of the society (at various scales) and potentially can translate into higher local and regional economic values. Examples include positive impacts on agro-tourism and recreation such as hunting (Barbieri & Valdivia, 2010; Grala et al., 2009).

One of the most readily noticeable public good amenities associated with field windbreaks is their visual impact on agricultural lands, particularly those dominated by row-crops (Grala, Tyndall, & Mize, 2010). In the U.S. Midwest and Great Plains regions, windbreaks have long been noted for their ability to diversify otherwise homogenous agricultural landscapes in ways that are visually and socially pleasing (Baer, 1989; Cable & Cook, 1997; Cook & Cable, 1995; Dearmont, Johnson, & Brandle, 1983; Hall & De Young, 1991). Elsewhere in the world, the positive impact of field windbreaks on visual appearance of agricultural landscapes has been credited with helping shape regional sociocultural identity and renown (Burel, 1996; Burel & Baudry, 1990; Oreszczyn & Lane, 2000). However, as noted by Kulshreshtha and Kort (2009), while many of the amenity benefits of windbreaks have been well articulated qualitatively in the literature, quantitative measures of these benefits in economic terms are limited. This particularly applies to aesthetic benefits.

It has been speculated that the visual impact windbreaks can have on agricultural lands might, in various ways, lead to increased property values (Kulshreshtha & Kort, 2009). Information on the direct value of field windbreak aesthetics is, however, limited. Still, studies on scenic and recreational amenities of agricultural lands provide some indication of the potential indirect value of aesthetic benefits associated with field windbreaks. For example, Bastian et al. (2002) examined the impact of such amenities associated with agricultural lands and determined that visually diverse lands with pleasing scenic characteristics represented by a mix of various wildlife habitats and differing topology were more likely to generate higher values in development land and rural real estate markets. Similarly, Vanslembrouck, Huylenbroeck, and Van Meensel (2005) used a hedonic pricing method to examine how maintenance of agricultural landscapes was valued by tourists. They determined that landscape features defining visual appearance of agricultural lands, such as trees in the landscape, had a positive impact on rental prices for rural accommodations.

While aesthetic appreciation of treed landscapes can increase value of lands acquired for recreational and development purposes, its direct impact on the value of agricultural lands is unknown. Previous research has shown that field windbreaks in landscapes dominated by row-crops can significantly enhance the scenic appearance of these lands as subjectively assessed by both farm operators and the general public (Grala et al., 2010). Yet, it is difficult to determine the incremental economic value of aesthetics associated with field windbreaks because like many amenity benefits visual benefits are effectively unpriced in land markets (Irwin, Nickerson, & Libby, 2003). A better understanding of the total economic value of windbreaks including production, environmental and amenity values will be required to better quantify trade-offs associated with different and often competing land uses. A mix of economic information (market and nonmarket) is required to allow farm operators the opportunity to make informed decisions regarding the private and public benefits of marginal land-use changes (e.g. planting trees). From a farm operator's perspective, the use of windbreaks offers recognizable production benefits that can enhance agricultural production leading to stronger output potential and lower production costs (Brandle et al., 2009; Helmers & Brandle, 2005). Furthermore, field windbreaks are associated with existing and/or evolving ecosystem land use markets, such as fee hunting, carbon offsets, and bioenergy (Gordon, Current, Schoeneberger, & Bentrup, 2008; Grala et al., 2009; Schoeneberger, 2009) that farm operators can utilize to enhance the economic scope of their operations. However, research has made it clear that when dealing with perennial land uses many farm operators desire incentives that aid in the management of opportunity risk as perennial systems require time to biophysically mature and become marketable (Larson & English, 2009). Meanwhile, information regarding public demand for specific ecosystem services in agricultural landscapes (e.g., enhanced landscape aesthetics) is required to justify and guide economic policy and programming needed to incentivize more socially optimal land use (Randall, 2002). Thus far, information regarding the public's economic perspectives on windbreaks and landscape aesthetics has not been available to serve this purpose. Lack of this information is especially important in regions that are experiencing perceived loss of social value (public and private) associated with the homogenized appearance of agriculture such as the U.S. Cornbelt region (Levins, 2000). Furthermore, in the era of rising agricultural rents in this region, all information regarding ecosystem services associated with land use that is not directly crop related will be needed to most efficiently allocate increasingly scarce conservation funding (Burel & Baudry, 1990; Secchi, Tyndall, Schulte, & Asbiornsen, 2008).

Therefore, the goal of this study was to examine the willingness to pay (WTP) for aesthetics of agricultural lands associated with field windbreaks and examine influence of respondents' opinions related to the impact of field windbreaks on visual appearance of agricultural lands, perceived abundance of field windbreaks, familiarity with field windbreaks and their benefits as well as respondents' sociodemographic characteristics on reported WTP values. Using the state of Iowa as a case study, a contingent valuation method (CVM) was used to determine willingness of Iowa residents to financially support new plantings of field windbreaks for aesthetical purposes.

2. Materials and methods

2.1. Study area

The study was conducted in Iowa, a state located in Midwestern United States. Iowa's total land area accounts for 144,700 km^2 (U.S. Census Bureau, 2012). According to the 2007 Census of Agriculture, about 124,430 km^2 of land area was in farms, of which 106,500 km^2 was in crop production, whereas total woodland area constituted about 4830 km^2 (USDA, 2012). About 8300 km^2 of land was enrolled in various conservation practices under programs such as Conservation Reserve, Wetland Reserve, Farmable Wetlands, and Conservation Reserve Enhancement (USDA, 2012).

Iowa, located in the continental U.S. interior and at temperate latitude, is characterized by marked seasonal variations (NOAA, 2001). On average, the growing season in Iowa is 162 days, extending from late April to early October. There is a distinct north to