Factors that Influence Shelterbelt Retention and Removal in Prairie Agriculture as Identified by Saskatchewan Producers

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Abstract

The role of shelterbelts in prairie agriculture is changing. Traditionally, shelterbelts were promoted and adopted for soil stabilization and protection of farm infrastructure, equipment, and livestock from harsh weather elements; however, advances in production technology, larger scale operations, and the removal of a subsidy (distribution of free seedlings) have changed the context in which shelterbelts are currently being maintained, planted, or removed. This research identified the factors that are influencing producer's management decisions related to retention and adoption of shelterbelts in the early 21st century in Saskatchewan, Canada. In the summer of 2013, surveys were conducted with producers from throughout the province of Saskatchewan (and several from Alberta). From the surveys, costs, benefits, and factors influencing producer's management decisions, related to shelterbelts in the farm operations, were identified. Survey results show that 40% of the produces removed shelterbelts from their operations. Reasons for such decisions included: high labor requirements, difficulty in the operation of large equipment, and loss of land for production. Those who did not remove shelterbelts recognized their non-economic values more than those who removed them. Shelterbelts have the potential to play a major role in climate change mitigation by sequestering significant amounts of atmospheric CO_2 into the soil and as biomass carbon in aboveground and belowground biomass of planted shelterbelt trees or shrubs within the agricultural landscape, both presently and in the future. As a result, understanding the context in which producers are making decisions related to this agroforestry practice will be important from a policy perspective.

Keywords

agroforestry, agricultural producers, climate change, management, policy, shelterbelts

Introduction

Shelterbelts are linear arrangements of shrubs and/or trees that provide a variety of positive impacts, goods, and services within agricultural landscapes (Kulshreshtha et al. 2010). Some of the positive impacts to land owners include, but are not limited to: soil stabilization and erosion reduction to maintain soil fertility (Brandle et al. 2009), wind current modification (Cleugh, 1998), agricultural crop yield benefits (Kuemmel, 2003), privacy and beauty around farmyards (Kulshreshtha et al. 2010), shelter for livestock (Broster et al. 2010), and increased soil moisture through snow capture (Kort et al. 2012). In addition to these private impacts, recent studies have looked into some of the ecological goods and services provided by shelterbelts and have indicated that their presence within agricultural landscapes has positive benefits for the ecosystem and

society as a whole. Some of these types of positive impacts include carbon sequestration (Schoeneberger, 2009), maintenance of biodiversity (Lovell & Sullivan, 2006), protection of soil at a landscape level (Kulshreshtha & Kort, 2009), and promotion of pollinators (Kroeger & Casey, 2007) and pollination (Kuemmel, 2003). It is within the context of private landowner decisions and management choices impacting their operation, as well as society and the ecosystem, that this research was conducted.

As aforementioned, shelterbelts provide many positive impacts within the landscape to both the private land owner and society as a whole. Many of these impacts are difficult to quantify and/or to observe. As agricultural practices have changed, farm sizes have increased, and more recently subsidy (free seedling distribution by the Agroforestry Development Centre, Indian Head, of the Government of Canada) for shelterbelts has been eliminated, today's agricultural producers face many challenges to shelterbelt adoption and retention. As greater priority and emphasis is placed on climate change, and its surrounding policy, mitigation, and adaptation, shelterbelts may play an important role (Johnson et al. 2000). With this new emerging role of shelterbelts in the landscape, it is imperative that the factors that impact producer's current management decisions, related to retention or removal of shelterbelts, are documented and understood. This study looked to identify and document the impacts and barriers that prairie producer's face related to shelterbelts within their operations.

Materials & Methods

In the summer of 2013 farm visits and phone calls were conducted in order to gather participants for the research study. The study sample included 61 producers (58 producers from Saskatchewan and 3 from Alberta). In total, 110 surveys were handed out in person at various farm visits (AAGP project), at farmer educational events (i.e. Conservation Field Day), and through snowball sampling techniques (i.e. neighbour/brother stopping in while on a farm visit). In the surveys several types of data/questions were asked. They included demographic information on the participant, their operation description data, and open questions about the factors that impact shelterbelt management.

The survey was coded for open response questions as well as for statistical analysis using the IBM SPSS 21 statistical analysis software. For the identification of factors influencing shelterbelt retention and removal, producers were stratified into two groups: 1) those who indicated shelterbelt removal and, 2) those that indicated no shelterbelt removal. All participants in the survey had shelterbelts of some kind (farm yard, field, livestock, or other) in their operation. The survey sample was compared to 2011 Statistics Canada data (2012) related to farm and farm operators. This analysis was done to determine the important factors that influence the retention and removal of shelterbelts in the province.

Results

Overall, participants were more willing to share knowledge and discuss shelterbelts in person. When the producer had time to complete the survey during the farm visit, there was near 100% return rate with only one person declining to participate in the survey. The return rate dropped significantly when the producer did not have time to go through the survey with the researcher during the farm visit. This is evident in the 55% return rate for the total study.

A summary of the comparison between survey results from this survey work (year 2013) and 2011 Statistics Canada Data on farm and farm operator data (Statistics Canada, 2012) is shown in Table 1- Comparison of 2011 Statistics Canada data, on farm and farm operators in Saskatchewan, to the 2013 survey sample... This comparison emphasized that the 2013 survey sample was representative of the population in terms of age, gender, farm size, and farm type as the survey sample means were similar to the population means. The results of the survey showed that 40% of producers in the sample (n=24) have removed shelterbelts from their operations and that 60% (n=37) have not removed shelterbelts in their operation.

Table 1- Comparison of 2011 Statistics Canada data, on farm and farm operators in Saskatchewan, to the 2013 survey sample..

Characteristic	2011 Statistics Canada Data	2013 Survey Sample Data
Age (mean age)	52.2 years	55.2 years
Gender (%)	22.9% of farm operators female 77.1% of farm 0perators male	24.6% participants female 75.4% participants male
Farm Size (mean in acres)	1,668 acres	1,718 acres
Farm Type (%)	60.1% Crop production operations 20.2% cattle farms	36.7 % Crop production operations 26.7% mixed operations 15 % livestock

Landowners who indicated that they have removed shelterbelts listed more negative impacts (26 in total) of shelterbelts than positive impacts (21 in total). The producers in this group tended to be in the category of large farming operations (mean size of the farm 3,375 acres) with large lease holdings (mean leased area of 1,198 acres). The majority of farms in this group (54 %) were crop production operations. The majority of negative impacts listed by this group were related to crop production efficiency losses that they equated or associated with having shelterbelts in their fields (i.e. competition zone, labour, nuisance/hassle, overlap, loss of land). The majority of positive factors associated with farmyard types of shelterbelts were the impacts that were directly related to personal quality of life and wellbeing (i.e. beauty, enjoyment, protection, less snow plowing). Table 2- Top 3 negative and positive impacts of shelterbelts as indicated by producers who have removed shelterbeltsshows the top three negative and positive factors identified by the producers who indicated that they have removed shelterbelts from their operations; ranking of each factor was based on the total number of responses by all producers.

Table 2- Top 3 negative and positive impacts of shelterbelts as indicated by producers who have removed shelterbelts

Top Negative Impacts	Top Positive Impacts
Labour requirement (n=14)	Protection for my home (n=8)
In the way of large equipment (n=12)	Protection from blowing snow and wind (n=8)
Land out of production (n=9)	Reduced soil erosion (n=5)

* (n) designates the number of times producers in this group indicated this particular impact in the open question responses

Landowners who indicated that they have not removed shelterbelts on their land and that they are retaining shelterbelts identified more positive impacts (33 in total) than negative ones (21 in total). The producers in this group tended to have smaller land holdings (mean 1771 acres

owned; mean 356 acres leased). The majority of producers (60%) with a farm size of 160 acres or less had not removed shelterbelts. Landowners who had removed some shelterbelts in this sub-group indicated tree death as the top reason and of 70% of these producers had already replanted shelterbelts to replace the removed trees. The most commonly listed negative impacts were associated with the additional labour requirements of having shelterbelts on the farm (i.e. tree maintenance, tree planting, extra time in field; etc.). This group also identified a more diverse suite of positive impacts of shelterbelts in their operations. For example, landscape level benefits, such as wildlife habitat, erosion reduction, habitat for bees and birds, were included in their responses. Table 3- Top 3 negative and positive impacts of shelterbelts as indicated by producers who have not removed shelterbelts shows the top three negative and positive impacts of shelterbelts identified by producers who have not removed shelterbelts, ranking of each factor was based on the total number of responses by all producers.

Table 3- Top 3 negative and positive impacts of shelterbelts as indicated by producers who have not removed shelterbelts

Top Negative Impacts	**Top Positive Impacts**
Labour requirement (n=21)	Snow capture (n=9)
Maintenance (n=16)	Beauty in the landscape (n=7)
Spraying for insects or disease in shelterbelts (i.e. needle cast) (n=5)	Protection from the wind (n=7)

* (n) designates the number of times producers in this group indicated this particular impact in the open question responses

Discussion and Conclusion

Based on the positive and negative impacts identified by the producers several trends were identified. These trends can be used to identify potential barriers to adoption and retention of shelterbelts. It can be concluded that landowners who are removing shelterbelts are identifying and recognizing negative impacts largely related to production efficiency or market costs; however, this same group is not recognizing the full suite of private, societal, and ecological positive impacts that shelterbelts may provide. This combination of the perceived negative production impacts and lack of positive impacts will be a major barrier to retention of current shelterbelts or more adoption in the future. Additional education related to overall positive impacts of shelterbelts, as well as potential policy tools to negate the negative impacts, will be essential to encourage this group of landowners to retain or plant additional shelterbelts.

Conversely, the group of producers who indicated shelterbelt retention and identified themselves as not having removed shelterbelts seem to have a more robust understanding of the positive and negative impacts of shelterbelts in their production systems. This more full-bodied understanding is likely contributing to this group's decisions related to shelterbelt retention and continued adoption. The smaller land base available to this group of producers may limit the scale at which shelterbelt retention and adoption is occurring in the province; however, this group is

likely to respond well to incentives that encourage the retention and further adoption of shelterbelts as a farm management practice.

An important finding from this work was that sequestration and storage of carbon in shelterbelts, both within the soil and in the biomass of planted trees or shrubs, was not ranked as a top positive or negative impact by either of the two groups of producers. This illustrates that either producers are not aware of this positive impact or that they do not see it as a positive or negative impact on their decision making process. This lack of awareness, acceptance, or acknowledgement related to this particular positive benefit could act as a barrier to adoption of future policies aimed at encouraging producers to plant or retain shelterbelts in their operations for the purpose of climate change mitigation or carbon sequestration. This is an area where further research is required to gauge what the support for or response to a policy related to climate change, through shelterbelt retention and adoption, would be.

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