Farmers' Attitudes and Behaviors toward Shelterbelts in Kansas

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Introduction

Planting and maintaining shelterbelts are important conservation practices in the Great Plains region. Shelterbelts produce many benefits for farmers such as decreased soil erosion, increased crop yields, reduced livestock stress, control of drifting snow, building maintenance and energy savings, (e.g., Forman & Baudry, 1984; Loucks, 1984; USDA, 1989). Shelterbelts also benefit many wildlife species by providing food, reproductive sites, escape cover and shelter from severe weather (e.g., Cable 1991). Shelterbelts also provide important opportunities for recreation, particularly hunting. (Cable and Cook 1990). This recreation in shelterbelts can have important economic impacts (Cook and Cable 1990). Moreover, shelterbelts have been shown to have a positive influence on landscape aesthetics (Cook and Cable 1995).

Despite these benefits to society and wildlife, studies have reported that the number of shelterbelts is declining (Baltensperger, 1987; Sorenson & Marotz, 1977) and the quality of those that are left is deteriorating (Schaefer, Dronen & Erickson, 1987). Although public agencies, such as the Natural Resources Conservation Service and state departments of natural resources, promote shelterbelt planting and maintenance, little is understood about the motivations of agricultural producers for having, or not having, shelterbelts.

We examined the attitudes and behaviors of agricultural producers regarding shelterbelts. Specifically, the objectives of our study were: (1) to determine the nature and extent of shelterbelt-related actions, (2) to assess Kansas landowners' knowledge and attitudes about shelterbelts, (3) to link these attitudes and actions to landowner characteristics and (4) to assess how landowners prefer to receive shelterbelt information.

Methods

We developed a 10-page questionnaire and conducted the survey using the Total Design Method (Dillman, 1978). The survey gathered data about landowners' experience with shelterbelts; the characteristics of existing shelterbelts; attitudes about the costs and benefits of shelterbelts; landowners' actions regarding planting; maintenance and removal of shelterbelts; sources of plant materials and information; farm characteristics; and standard demographics of respondents. We sent the questionnaire to 3,342 randomly selected agricultural producers in Kansas. Usable responses were received from 1,748 producers, giving a response rate of 52.3 percent.

To check the validity of our sample, we compared selected demographic characteristics of our sample with data from the 1992 Census of Agriculture (U.S. Department of Commerce, 1994) using the chi-square statistic. The demographics and farm characteristics of our sample were not significantly different from the state population in any of the characteristics tested, indicating a likelihood that our sample was representative of the whole population.

We used factor analysis in our examination of attitudes toward shelterbelts. Because of the large sample size and relatively small amount of missing data, we replaced missing data with mean values. We used principal component factor extraction and varimax rotation in our factor analysis.

Results

Presence of Shelterbelts

Sixty-six percent (n=1154) of respondents had never had shelterbelts on their land, 1.0 percent (n=17) had removed all shelterbelts from their land, and 33.0 percent (n=577) currently had shelterbelts on their land. Respondents with shelterbelts reported an average of 2.5 shelterbelts and an average total mileage of 1.1 miles. Thirty-six percent of those respondents reported that their shelterbelts had only one row, 40.1 percent had shelterbelts with 2 or 3 rows, 34.3 percent had shelterbelts with 3 to 6 rows, and 12.2 percent reported having shelterbelts with more than 6 rows.

Respondents with shelterbelts reported the average age for their oldest shelterbelt was 42.7 years. The average age for the youngest shelterbelt was 28.8 years. Over half (52.6 percent) reported that their oldest and youngest shelterbelts were the same age.

Shelterbelt Planting

Less than half (46.4 percent) of the respondents with shelterbelts reported planting shelterbelts themselves. Respondents reported planting an average of 2.1 shelterbelts and an average total mileage of 0.6 miles. Slightly over half (53.4 percent) of the planted shelterbelts, and 52.3 percent of the planted mileage had been planted within the last 10 years. Thirty percent of respondents reported planting their shelterbelts less than 5 years ago, 26.5 percent within the last 5-10 years, 24.5 percent within the last 11-20 years, 18.5 percent within the last 21-30 years, and 20.9 percent more than 30 years ago. Most (64.4 percent) of those that planted shelterbelts ordered their trees and shrubs from the Kansas State and Extension Forestry (now called the Kansas Forest Service).

Shelterbelt Removal

In addition to the 17 respondents (1.0 percent) who had removed all their shelterbelts, 44 respondents (2.5 percent) had removed some shelterbelts. Over one-third (35.6 percent) of respondents said they had removed shelterbelts less than 5 years ago, 30.5 percent said 5 to 10 years ago, 32.2 percent said 11 to 20 years ago, 6.8 percent said 21 to 30 years ago, and 3.4 percent said more than 30 years ago. Over half (56.6 percent) of these shelterbelts that had been removed were removed within the last 10 years, representing 42.0 percent of the miles removed. In the decade before that (11 to 20 years ago) 30.2 percent of the shelterbelts had been removed representing 45.7 percent of the mileage removed. The remaining 13.2 percent of the shelterbelts and 12.3 percent of the miles were removed more than 20 years ago.

From a list of reasons why someone might remove windbreaks respondents could chose reasons why they removed their shelterbelts. The reason most often cited was that shelterbelts reduced tillable acreage (48.3 percent of respondents), followed by reduced crop yields (46.7 percent), trees were dying (26.7 percent), incompatible with farm machinery (23.3 percent), interfered with irrigation (16.7 percent), maintenance was too troublesome (11.7 percent), survival rate was too low (6.7 percent), to put in a new fence (6.7 percent), to put in a new waterway (5.0 percent), attracted animals that damage crops (5.0 percent), government assistance programs are inadequate (3.3 percent), too expensive to keep (1.7 percent), and snow accumulations caused late seeding (1.7 percent).

Respondents then were asked to indicate the most important of these reasons for removal. The most frequently cited most important reasons were reduced tillable acreage (27.3 percent of respondents), reduced crop yields (18.2 percent), interfered with irrigation (18.2 percent), and incompatible with farm machinery (9.1 percent).

Shelterbelt Management

Shelterbelt management activities reported by respondents included: fencing out livestock (43.8 percent of respondents), weed control (28.9 percent), pruning of branches (28.4 percent), and replanting to fill in gaps (27.2 percent). Twenty-two percent of respondents reported tilling or mowing between the rows of their shelterbelts, with an average of 2.9 times per year. Irrigation was reported by 16.1 percent of respondents, and of those who irrigated, 43.0 percent used drip or micro-irrigation, 23.7 percent reported using furrows, 14.0 percent reported hand watering, and 11.8 percent used sprinkler irrigation. Twenty percent of respondents with shelterbelts reported not doing any management.

The Kansas Department of Wildlife and Parks makes a root plow available to landowners to prune shelterbelt roots extending into the fields. This is to counter the effects or perceived effects of shelterbelts draining moisture from adjacent cropland soil. Of those respondents with shelterbelts, only 9.5 percent had used a root plow on their shelterbelts. Of the 15 respondents who reported dissatisfaction with their shelterbelts because they drained crop moisture, only three (20.0 percent) had used a root plow. One-third of those who cited reduced crop yields as a reason for removal had used a root plow on their shelterbelts.

Respondents with shelterbelts reported spending an average of 19.0 hours per year on shelterbelt maintenance, although 29.5 percent reported spending no time on maintenance during the average year. Time constraints were the most important factors limiting the amount of shelterbelt maintenance. Time was mentioned by 60.0 percent of respondents.

Respondents were split more evenly when asked about whether their land management practices were influenced by the practices of their friends and neighbors. Disagreement was expressed by 40.5 percent of respondents, 29.7 percent were neutral, and 29.8 percent agreed or strongly agreed that friends and neighbors influenced their land management decisions. No difference was found between the groups with and without shelterbelts. Respondents tended to disagree that their land management practices were influenced by the opinions of their friends and neighbors. Almost one-half (47.4 percent) of respondents either disagreed or strongly disagreed with the statement; 34.1 percent were neutral about it. Again, no difference was found between the groups with and without shelterbelts.

Opinions About Shelterbelt Benefits

We asked respondents who had shelterbelts to choose from a list of reasons why they had shelterbelts. The reason most often selected was that shelterbelts improve wildlife habitat (64.8 percent of respondents), and the next was that they existed prior to the respondent's management (62.2 percent). Other reasons were that shelterbelts increase livestock protection (56.8 percent), reduce soil erosion (50.3 percent), beautify the landscape (47.2 percent), improve management of drifting snow (45.5 percent), reduce wind damage to crops (43.9 percent), increase property value (29.3 percent), provide wood products (25.1 percent), increase crop yields (8.0 percent), and improve water management (7.5 percent).

When asked which of these reasons was the most important, livestock protection was chosen by 26.5 percent of respondents, and shelterbelts existing prior to the respondent's management was chosen by 18.8 percent. Reducing wind damage to crops and reducing soil erosion were each the most important reason to 14.7 percent of respondents. Improving wildlife habitat was the most important reason to only 8.8 percent of respondents.

Most respondents (89.7 percent) were satisfied with the performance of their shelterbelts. Of those who were not (10.3 percent), 26.3 percent were dissatisfied because their shelterbelts drained crop moisture, and 21.0 percent were dissatisfied because their shelterbelts were diseased, old, or dying.

We asked all respondents four general questions regarding their feelings about shelterbelts and their land management practices. Most (82.8 percent) respondents agreed or strongly agreed that planting shelterbelts was a desirable conservation practice for many Kansas farmers. Those people who had shelterbelts agreed more with this statement than those who did not have shelterbelts and those who had removed all of their shelterbelts ($F=16.54$, $df=2, 1687$, $p<0.01$). Many respondents (61.4 percent) believed that it was appropriate for the government to subsidize the establishment of shelterbelts, but 23.1 percent were neutral about the issue. Again, agreement with this statement was higher among those who had shelterbelts than among those who had never had them or removed them ($F=9.17$, $df=2, 1670$, $p<0.01$).

We asked respondents to tell us the extent of their agreement (1=strongly disagree, 5=strongly agree) with 21 statements about shelterbelts. Respondents were most likely to agree with the statements that shelterbelts increase wildlife habitat, increase livestock protection and reduce soil erosion (Table 1). Respondents most strongly disagreed with the statement that shelterbelts decrease property values.

We asked respondents to check items in a list that they felt were good ways to derive supplemental income from shelterbelts. Almost half (48.6 percent) felt wildlife habitat enhancement for game production was a good potential source of income. Other sources were removing aging trees for fuelwood or timber (45.0 percent) and small fruit/nut production (33.3 percent). Slightly over one-quarter (26.4 percent) felt that none of these were good potential sources of income.

Comparison of Attitudes of Landowners With and Without Shelterbelts

We used factor analysis to reduce the 21 items based on the extent of agreement. Factor analysis produced three factors that explained 49.3 percent of the variance. Factor 1 (Eigenvalue=5.97, percent of variance=31.4) was characterized by negative statements about shelterbelts. Factor 2 (Eigenvalue=2.05, percent of variance=10.8) was characterized by the benefits to crops from shelterbelts. Factor 3 (Eigenvalue=1.34, percent of variance=7.0) was characterized by the noncrop benefits of shelterbelts (Table 2).

Two of the 21 items were not included in any factor because of low factor loadings (less than 0.30): shelterbelts provide wood products and shelterbelts are not adequately assisted by government programs. Also, note that although the item "shelterbelts reduce crop yields" is a negative statement about shelterbelts, its highest loading, negative in sign, was on Factor 2.

As a check of the factors' validity, an ANOVA was run with the factors and the items "planting shelterbelts is a desirable conservation practice for many Kansas farmers" and "it is appropriate for the government to subsidize the establishment of shelterbelts". Factor 1 was

correlated negatively with both statements (first statement: $F=40.62$, df=4, 1683, $p<0.01$; second statement: $F=8.66$, df=4, 1668, $p<0.01$). Factor 2 was correlated positively with both statements (first statement: $F=88.71$, df=4, 1683, $p<0.01$; second statement: $F=37.46$, df=4, 1668, $p<0.01$). Factor 3 also was positively correlated with both statements (first statement: $F=57.79$, df=4, 1683, $p<0.01$; second statement: $F=46.93$, df=4, 1668, $p<0.01$). These were the expected results; therefore, the factors appear to be valid.

An ANOVA of factor scores showed that, for Factor 1, those respondents who had removed all of their shelterbelts had significantly higher scores followed by those who had never had shelterbelts and then those who currently had shelterbelts ($F=45.33$, df=2, 1745, $p<0.01$). However, no difference occurred among the three groups of respondents based on Factor 2 ($F=1.72$, df=2, 1745, $p=0.18$). For Factor 3, those who had never had shelterbelts had significantly lower scores than those who currently had shelterbelts and those who had removed them ($F=15.24$, df=2, 1745, $p<0.01$).

Of those respondents who had shelterbelts, those who were not satisfied with the performance of their shelterbelts had significantly higher scores on Factor 1 ($t=3.68$, df=553, $p<0.01$), significantly lower scores on Factor 2 ($t=5.30$, df=553, $p<0.01$), and were not significantly different on Factor 3 ($t=0.69$, df=553, $p=0.49$) than those who were satisfied.

Attitudes, Demographics, and Farm Characteristics

We examined the relationships between demographic or farm characteristics and the three attitude factors. For gender, only Factor 2 had significant differences with females having more positive attitudes ($t=3.61$, df=1632, $p<0.01$).

For age analysis, we divided the responses into quartiles. The groups were as follows: less than or equal to 45 years (24.3 percent), 46 to 59 (27.2 percent), 60 to 68 (23.4 percent) and 69 and over (25.1 percent). An ANOVA showed that Factor 1 was related positively to age ($F=7.08$, df=3, 1608, $p<0.01$), and Factor 3 was related negatively to age ($F=6.26$, df=3, 1608, $p<0.01$).

For education, we grouped responses into the categories: high school diploma or less (39.0 percent), some post high school (30.2 percent), and college graduates (30.8 percent). Factor 1 was associated negatively with education ($F=5.16$, df=2, 1618, $p<0.01$). Factor 2 was not associated with education ($F=2.19$, df=2, 1618, $p=0.11$), and Factor 3 was associated positively with education ($F=7.74$, df=2, 1618, $p<0.01$).

We used the following yearly household income categories for analysis: less than $20,000 (21.2 percent), $20,000 to $29,999 (24.6 percent), $30,000 to $49,999 (25.2 percent) and $50,000 or more (28.9 percent). Only Factor 1 was significantly different with higher income groups having more negative scores ($F=5.81$, df=3, 1434, $p<0.01$).

For attitude differences between types of farm operations, we compared farms and ranches. Farmers had higher scores on Factor 1 than ranchers ($t=3.67$ df=1452, $p<0.01$), but were not significantly different on Factor 2 ($t=-0.58$, df=1452, $p=0.56$) and Factor 3 ($t=-0.39$, df=1452, $p=0.70$). Using all responses, we found that those whose primary occupation was farming had higher scores on Factor 1 ($t=4.34$, df=1630, $p<0.01$), lower scores on Factor 2 ($t=-3.39$, df=1630, $p<0.01$) and higher scores on Factor 3 ($t=3.29$, df=1630, $p<0.01$). Length of ownership had no significant relationships with attitude factors.

We analyzed the effect of farm size on attitudes towards shelterbelts by dividing response into quartiles: less than or equal to 160 acres (27.4 percent of respondents), 161 to 500 acres (27.3 percent), 501 to 1200 acres (23.1 percent), and greater than 1200 acres (22.2 percent). Farm size was related significantly to Factor 2 ($F=8.40$, $df=3, 1566$, $p<0.01$) with scores becoming lower as farm size increased. Factor 3 was also significant ($F=4.46$, $df=3, 1556$, $p<0.01$) with scores becoming greater as farm size increased.

For the value of products sold from the farm, the following groups were used: less than $10,000 (35.2 percent), $10,000 to $49,999 (33.3 percent) and $50,000 and over (31.5 percent). Factor 2 had significant differences with more negative scores for higher levels ($F=11.02$, $df=2, 1490$, $p<0.01$) and Factor 3 had significant differences with more positive attitudes for higher levels ($F=4.81$, $df=2, 1490$, $p=0.008$).

Incentives for More Shelterbelts

We asked respondents to consider a list of incentives to plant more shelterbelts on their farms. Respondents favored having more regionally adapted trees and shrubs available and improving management methods that would save time (Table 3.)

We wanted to find out what respondents thought were the difficulties in getting new shelterbelts started. We asked them to choose from a list of factors that they believed limited the survival of newly planted shelterbelts in their area of Kansas and then identify the most important limiting factor. The most frequently chosen response was drought (87.4 percent); followed by management after planting (56.5 percent); weed competition (50.8 percent), weather damage (wind, snow, hail, etc.) (50.4 percent); limited cash or labor (43.5 percent); disease (29.9 percent); insects (28.2 percent); wildlife damage (25.8 percent), and poorly adapted trees and shrubs (24.8 percent). The most important reasons were drought (53.6 percent), management after planting (16.5 percent), weather damage (9.3 percent) and limited cash or labor (7.6 percent).

We asked respondents whether they were aware of and whether they had enrolled in shelterbelt assistance programs. A majority of respondents were aware of only two of the five programs listed. For the Conservation Reserve Program (CRP), 50.9 percent of the respondents were aware of the program but not enrolled, and 19.6 percent were enrolled. For the Agricultural Conservation Program (ACP), 45.5 percent were aware but not enrolled, and 11.4 percent were enrolled.

Communicating Shelterbelt Information

Over half (59.6 percent) of the respondents did not want any more information on shelterbelt management. Of the those who did want more information (40.4 percent), 32.5 percent would prefer to receive the information through extension publications, 28.5 percent from newspaper and magazine articles, 14.8 percent had no preference, 8.1 percent preferred workshops, 5.9 percent preferred farms visits, 5.3 percent preferred demonstration projects and 5.0 percent preferred videos or TV. The most requested topic of information was maintenance (37.2 percent of respondents who wanted more information) followed by: how to establish shelterbelts (34.6 percent), how to select species (31.4 percent), how shelterbelts are economical (20.5 percent) and weed control (11.5 percent).

Discussion and Conclusions

It appears that shelterbelt planting may be keeping up with shelterbelt removal. In fact, our results indicate a possible resurgence of interest in shelterbelts. One-third of our respondents with shelterbelts reported that their youngest shelterbelt was 10 years old or less, and over half of the respondents who planted shelterbelts reported planting them within the last 10 years.

Maintenance of existing shelterbelts continues to be a problem for many Kansas farmers. One-fifth performed no maintenance at all. Many respondents reported performing one or more maintenance activities, but few hours were spent each year doing maintenance. Limited time was the biggest constraint preventing more maintenance.

Kansas farmers believe that shelterbelts are an important conservation practice. Although only one-third of the respondents had shelterbelts on their land, over 80 percent felt that planting shelterbelts was a desirable conservation practice. Those farmers that had shelterbelts were happy with their performance, and most of those without shelterbelts would consider establishing them if more effective incentive and management programs were available.

Conservation professionals have communicated the benefits of shelterbelts to farmers, but they could be doing a better job of communicating information about incentive programs and encouraging participation in them. Over 70 percent of our respondents were unaware of two of the five programs that help producers establish and maintain shelterbelts. For example, although producers know that shelterbelts improve wildlife habitat, over half of them were unaware of the Wildlife Habitat Improvement Program.

Our results have implications for conservationists as they attempt to establish new, or improve existing, shelterbelt programs and communicate the advantages of shelterbelts to farmers. First, water management is an extremely important issue to farmers. The major complaint of those who were dissatisfied with their shelterbelts was that they drain crop moisture. Drought was cited as the cause of most damage to existing shelterbelts and of most problems in establishing new ones. Adapting trees and shrubs for regional conditions also ranked highly among incentives that would encourage people to establish shelterbelts.

Conservationists can take some actions to help farmers control water use. First, they could make root plows more readily available and encourage their use. Few respondents had used a root plow on their shelterbelts. Shelterbelt programs that lower the cost of irrigation would encourage more planting of shelterbelts. Research should aim toward developing more drought-tolerant species and efficient planting techniques.

The second area for concentrating efforts to encourage shelterbelt establishment and maintenance is reducing time for maintenance. Conservationists need to explore time-saving maintenance techniques or offer financial assistance for additional labor.

As conservation professionals create programs to encourage the establishment and maintenance of shelterbelts, they should appeal to the reasons that people have shelterbelts. In addition to the agricultural benefits of reduced soil erosion and increased livestock protection, wildlife benefits should be stressed. Wildlife habitat improvement was the reason most often cited for having shelterbelts and ranked third in importance. It also was the most agreed upon attitude about shelterbelts, and the potential for game production was the most frequent response for a good potential source of supplemental income. Wildlife benefits should not be overlooked in shelterbelt promotion.

If conservation professionals want to change attitudes to affect behavior, then they should target their persuasive messages. Older people had more negative attitudes and lower positive attitudes toward the noncrop benefits. Therefore, messages targeted at older people need to concentrate on changing the negative images of shelterbelts and increasing awareness of noncrop benefits. A similar targeting scheme would exist for education level, where people with lower levels of education had more negative attitudes and lower positive attitudes towards the noncrop benefits.

Farm size, based on acreage, and the value of products sold had similar patterns; operators of larger farms had lower positive attitudes about the crop benefits of shelterbelts and higher positive attitudes about the noncrop benefits. This may be because larger farms are more diversified and depend more heavily on shelterbelts to provide noncrop benefits such as livestock protection and wildlife habitat. Therefore, messages to operators of larger farms need to target increasing the positive attitudes towards the crop benefits of shelterbelts.

Farmers still want the messages through traditional media. The print media, either extension publications, magazines, or newspapers, are the ways producers would prefer to receive information about shelterbelts.

Summary

Shelterbelts will continue to play an important role in conservation efforts on the Great Plains. Although shelterbelts continue to be removed, new ones are being planted. Even producers who currently do not have shelterbelts have a favorable impression of them. With the right types of incentive programs or time- and labor-saving practices for establishment and maintenance, producers might be willing to establish more shelterbelts.

Most landowners know about the benefits of shelterbelts. To increase shelterbelt planting and maintenance conservationists should target those, such as the elderly and less educated, who do not appreciate the multiple benefits of shelterbelts, and concurrently continue to reinforce the beliefs of those who do value shelterbelts.

Although many know about shelterbelt benefits, most do not carry through with planting or maintaining shelterbelts. Conservationists must make it easier for all landowners to put their beliefs into action. Economic barriers prevent behaving in a manner consistent with the generally positive attitudes found in this study. Many farmers consider the costs of shelterbelt establishment and maintenance to exceed the benefits received by them. Conservationists need to do a better job of lowering the cost of shelterbelts by encouraging participation in existing or new shelterbelt cost-share programs, developing labor-saving techniques for establishing and maintaining shelterbelts, and offering better-suited plant materials. Concurrently, conservationists must continue to quantitatively document and communicate the benefits that accrue to landowners from having shelterbelts. If shelterbelt planting is to continue into the 21st century, farmers must be convinced that shelterbelts are good investments.

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Table 1.
Respondents attitudes about shelterbelt benefits and disadvantages.

		(percent of respondents)[1]					
SHELTERBELTS:	n	1	2	3	4	5	0
increase wildlife habitat	1667	0.5	0.6	4.0	55.2	39.7	4.33
increase livestock protection	1653	0.8	2.3	8.3	56.4	32.2	4.17
reduce soil erosion	1671	1.1	2.3	9.5	55.2	31.8	4.14
improve management of drifting snow	1668	0.8	1.3	9.4	63.7	24.8	4.10
beautify the landscape	1672	0.9	2.9	12.8	54.7	28.7	4.07
reduce tillable acreage	1651	1.9	7.9	23.0	57.5	9.8	3.65
increase crop protection	1656	1.9	10.6	29.3	46.6	11.6	3.55
increase property value	1663	2.0	11.1	34.7	40.3	11.9	3.49
provide wood products (firewood, posts, etc.)	1650	1.8	13.5	30.7	46.5	7.5	3.45
improve water management	1617	1.6	11.3	50.9	31.7	4.6	3.26
are not adequately assisted by government programs	1624	2.7	13.8	54.4	23.9	5.2	3.15
increase crop yields	1644	3.9	21.7	45.9	25.5	3.0	3.02
attract animals that damage crops	1647	4.6	30.2	39.1	22.8	3.8	2.90
interfere with irrigation	1607	5.9	22.0	52.1	17.3	2.7	2.89
reduce crop yields	1632	7.4	34.1	36.8	18.9	2.8	2.76
cause late seeding by accumulating snow	1632	4.0	33.9	48.5	12.7	0.9	2.73
are incompatible with farm machinery	1641	7.4	36.3	36.3	17.2	2.9	2.72
have low survival rates	1624	5.2	36.5	44.5	11.5	2.2	2.69
are too troublesome to maintain	1641	8.0	38.0	36.7	14.8	2.5	2.66
are too expensive to keep	1646	9.9	38.0	38.9	10.7	2.6	2.58
decrease property values	1655	13.4	45.9	32.7	6.2	1.9	2.37

[1]1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree

Table 2.
Rotated factor matrix of attitudes about shelterbelts items.

SHELTERBELTS:	Factor 1		Factor 2		Factor 3	
are too troublesome to maintain	0.73	*	-0.28		-0.13	
are too expensive to keep	0.70	*	-0.21		-0.14	
interfere with irrigation	0.66	*	-0.13		-0.03	
are incompatible with farm machinery	0.64	*	-0.23		-0.10	
have low survival rates	0.63	*	-0.06		-0.10	
cause late seeding by accumulating snow	0.59	*	0.07		-0.13	
attract animals that damage crops	0.57	*	-0.14		-0.08	
decrease property values	0.54	*	-0.35		-0.19	
reduce tillable acreage	0.45	*	-0.29		0.23	
increase crop yields	-0.15		0.77	*	-0.02	
increase crop protection	-0.08		0.73	*	0.19	
increase property value	-0.27		0.63	*	0.26	
reduce soil erosion	-0.12		0.58	*	0.43	
improve water management	-0.16		0.53	*	0.23	
reduce crop yields	0.44		-0.52	*	0.06	
increase wildlife habitat	-0.08		0.10		0.77	*
improve management of drifting snow	-0.09		0.16		0.76	*
increase livestock protection	-0.09		0.09		0.68	*
beautify the landscape	-0.23		0.42		0.55	*

* Indicates highest loading in absolute value.

Table 3.
Incentives for planting more shelterbelts on the farm.

Would consider establishing more shelterbelts if:	n	(percent of respondents)[1] 1	2	3	4	0
Improved management methods could be implemented to save time.	1543	4.1	27.9	40.9	27.0	2.91
Regionally adapted trees and shrubs were available.	1549	4.3	27.3	42.1	26.3	2.90
Producers were paid for land taken out of production.	1574	8.1	29.2	34.0	28.7	2.83
Regional research results indicated that shelterbelts increased crop yields.	1550	4.8	29.4	44.9	20.8	2.82
Herbicide injury was not a problem.	1515	5.6	36.0	35.2	23.2	2.76
Greater tree planting incentives were available.	1571	7.1	33.0	37.7	22.2	2.75

[1] 1=absolutely not , 2=probably not, 3=maybe, 4=yes