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Evaluation of Farmer- Versus Contractor-Installed Deer Fencing

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Abstract
A mailed survey and on-site evaluations were conducted to assess effectiveness of deer fencing based on self-installed versus contractor-installed fences. Ninety-five percent of survey respondents who self-installed their fence and 100% of respondents with contractor-installed fences perceived a reduction in deer damage. Most self-installed fences were improperly installed and used sub-par materials relative to contractor-installed fences. Self-installed deer fences may represent a significant cost-savings over a contractor-installed fence. However, savings may not be as dramatic as they first appear when considering that an improperly installed fence may reduce the fence's life span and provide less protection from deer depredation.

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As suburban areas encroach upon rural ones, interactions between white-tailed deer (*Odocoileus virginianus*) and humans are increasing. Perhaps no stakeholder group has been negatively affected by interactions with deer more directly and frequently than the agricultural community. Conover (1997) estimated that deer damage costs agricultural producers nationwide at least $100 million annually. The greatest agricultural damage by deer generally occurs in the northeastern and north central United States, where at least 41% of agricultural producers reported damage (Wywialowski, 1994).

New Jersey is a rapidly developing state with a highly fragmented landscape. This landscape has contributed to an overabundant deer population that has severely affected the state's agricultural community (Drake & Grande, 2002). In response to increasing conflicts between New Jersey's deer population and agricultural production, the New Jersey Department of Agriculture (NJDA) in 1998 appropriated $300,000 to purchase high-tensile woven wire deer fencing. Approximately 850,000 feet of 6-foot high-tensile woven wire fence was purchased and distributed to eligible farmers. High-tensile smooth wire fencing was also purchased and distributed. Two strands of the smooth wire were to be placed above the woven wire at 1-foot intervals.

Upon receipt of the fence, a majority of farmers indicated they planned to install the deer fence themselves. Therefore, we compared farmers' experiences with, and perceived effectiveness of, their high-tensile woven wire fence based on self-installed versus contractor-installed fences. A survey was mailed to determine farmer satisfaction with, and effectiveness of, fencing to reduce or eliminate deer damage. An on-site evaluation was also conducted to assess the physical characteristics and installation details of self-installed versus contractor-installed high-tensile woven wire deer fences.

Methods

During 1998, 154 eligible farmers received fencing through the supplemental deer fence program.

Questionnaires were mailed during July - August 2001 to 125 fence recipients following Dillman's (1978) Total Design Method. Prior to mailing, we pre-tested the survey with nine farmers who did not receive fencing. Surveys could not be mailed to 29 fence recipients due to incorrect or missing addresses on the fencing applications submitted to NJDA. Three separate mailings of the questionnaire were sent, with a post card reminder between the first and second mailing of the survey. Of the 125 questionnaires mailed, 63% of the surveys were returned, and 57% were usable.

Twenty-five of the 46 non-respondents (54%) to our mail survey were randomly selected, and a telephone survey was conducted with them to determine if non-response bias existed. A Chi-square test ($P = 0.05$) was applied to survey answers provided by mail versus telephone respondents to assess non-response bias. No significant differences were detected in responses provided by mail and telephone responders.

The data set was split according to those farmers who self-installed their fence versus farmers who hired a fence contractor to install their fence. Due to the small sample size (7 of 71 survey respondents) of farmers who hired a contractor to install their fence, a statistical analysis could not be conducted beyond calculating and comparing averages and percentages between farmers who self-installed their fence versus farmers who hired a contractor to install their fence.

The mail survey inquired about details regarding the property where the fence was installed. Additional survey questions asked about fence installation, including cost, labor required, and fence construction, as well as perceived effectiveness of the installed fence in mitigating deer damage. Identical questions were asked of respondents to the telephone survey.

To enhance data from the written survey, we visited 25 randomly selected fence recipients in the northern half of New Jersey and 25 randomly selected fence recipients in the southern half of New Jersey between July-August 2001. Upon visiting each of the 50 farms, each installed fence was evaluated based on physical characteristics and installation details. We compared the physical characteristics and installation details of self-installed fences to contractor-installed fences. Because only seven of the 50 fences (14%) we visited were contractor-installed, a statistical analysis could not be conducted beyond calculating and comparing averages and percentages between farmers who self-installed their fence versus farmers who hired a contractor to install their fence.

Results

A majority of survey respondents ($n = 64$; 90%) installed the fence themselves, while 10% ($n = 7$) hired a professional fence contractor to install the fence. The average estimated installation cost for self-installed fences was $446 per acre, compared to $2,400 per acre for fences installed by a fence contractor. On average, it took three people a total of 154 hours to self-install a fence. Information on personnel hours was not available for contractor-installed fences. The majority of survey respondents who self-installed their fence (98%) and who hired a contractor to install the fence (71%) were satisfied with the overall quality of the fencing installation (Table 1).

Ninety-eight percent of survey respondents who installed their own deer fence indicated that they experienced crop damage by white-tailed deer prior to installing the fence, and 65% of those respondents estimated annual crop losses exceeding $5,000. After installing the fence, 95% of those respondents stated that they experienced a reduction in crop damage, and only 5% of respondents estimated crop losses exceeding $5,000. Forty-five percent of those respondents indicated that they experienced no deer damage once the fence was installed (Table 1).

One-hundred percent ($n = 7$) of survey respondents who hired a fence contractor to install their deer fence indicated that they experienced crop damage by white-tailed deer prior to installing the fence, and 71% of those respondents estimated annual crop losses exceeding $5,000. After installing the fence, 100% of respondents stated that they experienced a reduction in crop damage, with none of the respondents estimating crop losses exceeding $5,000. Seventy-one percent of respondents indicated that they experienced no deer damage once the fence was installed (Table 1).

Table 1.
Number of Respondents and Select Responses to a Mail Survey from New Jersey Farmers in 2001 Who Self-Installed a Deer Fence Versus Farmers Who Hired a Contractor to Install the Deer Fence

	Farmer-Installed Deer Fence	**Contractor-Installed Deer Fence**
Number of respondents (%)	64 (90)	7 (10)
Avg. per acre installation cost ($)	446	2,400
% respondents satisfied with installation quality	98	71
% respondents indicating deer	98	100

damage pre-installation		
% respondents indicating deer damage post-installation	5	0

Of the 50 farms we visited, 86% self-installed their deer fence, compared to 14% who hired fencing contractors to install their fence. The average height of a self-installed fence was 6.5 feet, compared to 8 feet for a contractor-installed fence. Many self-installed fences (40%) did not have smooth wire above the woven wire mesh fence to increase the overall height of the fence, whereas the majority (86%) of contractor-installed fences had three strands of smooth wire installed above the woven wire mesh fence.

Thirty-eight percent ($n = 16$) of self-installed fences used round corner posts, compared to 100% ($n = 7$) of contractor-installed fences. Furthermore, 42% of self-installed fences had corner posts that were leaning inward, and 22% were lifting out of the ground. None of the corner posts on the contractor-installed fences we examined were leaning inward or lifting out of the ground. All of the contractor-installed fences used proper corner post reinforcement (i.e., H-bracing, diagonal wire), compared to 28% of farmers who self-installed their fence.

Table 2.
Comparison of Attributes of Farmer-Installed Versus Contractor-Installed Deer Fences on Select New Jersey farms, 2001.

	Farmer-Installed Deer Fence	**Contractor-Installed Deer Fence**
Number of fences inspected (%)	43 (86)	7 (14)
Average height of fence (ft.)	6.5	8
% of fences with round corner posts	38	100
% of fences with proper corner post reinforcement	28	100

Discussion

Farmers who installed the fence themselves and those who hired a contractor to install the fence all expressed satisfaction with the perceived effectiveness of the installed fence in reducing or eliminating deer depredation. However, there were divergences between the two types of fence construction, mostly related to types of materials used to install the fence and how the fence was installed. For example, upon our on-site fence examination, we discovered that only 38% of self-installed compared to 100% of contractor-installed fences used round, pressure-treated wood corner posts. Corner post construction is arguably the most vital part of a high-tensile woven wire fence. Round corner posts are preferred because the pull from the high-tensile woven wire is more evenly distributed over the surface area of a cylindrical post compared to a non-cylindrical post (B. Sorge, personal communication, June 3, 2001).

Improperly installed and reinforced corner posts can compromise the effectiveness of a high-tensile woven wire deer fence because corner posts carry the majority of the load exerted by a properly installed fence (British Columbia Ministry of Agriculture, Food, and Fisheries, 2001). Most self-installed fences lacked the appropriate corner post reinforcement (i.e., H-bracing) compared to contractor-installed fences. Corner posts leaning inward or lifting out of the ground result in a fence that sags or leans, making it easier for deer to enter the fenced area.

Perhaps the largest contrast between self- and contractor-installed fences was the installation cost. Farmers who hired a contractor to install their fence spent, on average, > 7 times as much money per acre as farmers who installed the fence themselves. The total estimated cost figure reported by survey respondents included the cost to install the fence plus any material costs. Most of the per acre cost difference between self-installed and contractor-installed fences involved installation costs because the cost for many of the materials should be roughly equal due to the fact that each installed fence requires similar materials.

The sub-standard installation of many self-installed fences relative to contractor-installed fences may suggest lack of experience on the part of farmers who either intended to save money or felt confident that they were capable of installing the fence themselves. Installing a high-tensile woven wire fence represents a substantial cost. We suggest that the overwhelming majority of farmers who received deer fence through the New Jersey Supplemental Fence program installed the fence themselves for reasons of cost-savings.

Although a properly installed high-tensile woven wire fence may have a 30-year lifespan, and the total cost of a fence may be amortized over the life of the fence, all of the relatively expensive material and installation costs are front-loaded, making it difficult for many farmers to afford high-tensile woven wire deer fence. Many of the sub-standard installations may have been a result of

farmers not able to afford the extra materials required to properly install the fence. Self-installing a deer fence may represent a significant cost-savings over a contractor-installed fence initially. However, the savings may not be as dramatic as they first appear when considering the fact that an improperly installed fence may reduce the life span of the fence, increase maintenance costs, and ultimately, provide less protection from deer depredation.

Management Implications

High-tensile woven wire fencing is effective in reducing or eliminating deer depredation to agricultural crops. One of the biggest drawbacks to high-tensile woven wire fencing, however, is the relatively large front-loaded cost to purchase and install the fence. Therefore, it is recommended that cost-sharing funds and low-interest loans be made available to assist farmers in off-setting the cost of high-tensile woven wire deer fence. An annually subsidized fencing program can help farmers continue farming in areas with high deer densities. Low-interest loans would provide farmers the money necessary to properly install a fence, thereby maximizing the life span and benefits of a high-tensile woven wire fence.

Another recommendation is the establishment of farmer cooperatives in order to purchase fence posts and materials in large quantities at a discounted price. Collectively, each farmer would be able to purchase posts and materials at a lower price than if they bought posts and materials as an individual consumer.

A final recommendation is that farmers who intend to install fencing themselves be required to attend a fence-installation workshop conducted by professionals familiar with installing high-tensile woven wire fence. A hands-on demonstration can help farmers fully understand how-to properly install a high-tensile woven wire fence. A fence installation workshop can help farmers circumvent common mistakes, save them time and money, and improve the installation, life span, and benefits of a deer fence.

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