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# Laser Scarecrows: Gimmick or Solution?

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**History of Anti-Avian Lasers**

Lasers have been investigated as a tool for controlling birds since the 1970s. The first effective systems were developed for use at airports in Europe in the 1990s (Briot 2005). Studies of anti-avian laser systems in the US began in 1999. These early studies used hand-held laser units, and focused on disrupting night-time roosting of the target birds. Lasers deployed against wild birds at dusk permanently dispersed double-crested cormorants, and temporarily dispersed American crows, but were not effective against redwing blackbirds (Glahn et al. 2000, Gorenzel et al. 2002, Homan et al. 2010). Using captive birds, Blackwell et al. (2002) found that laser beams did not affect behavior of catbirds or starlings, and that rock doves and mallard ducks became habituated to the lasers. Captive Canada geese avoided areas protected by laser beams, even in daylight (Werner and Clark 2006).

The mixed results from scientific studies have not deterred development of lasers marketed for use in bird control, and both hand-held and automatic models are now available from multiple manufacturers. The automatic models, in particular, are advertised as an effective solution for protecting grapes, cherries, berries, and other crops from flocking birds. We became interested in anti-avian lasers in 2016 when a Rhode Island sweetcorn grower purchased a laser scarecrow developed for use in orchards. Initial grower feedback on the performance of the laser scarecrow was extremely positive, and generated considerable excitement in Rhode Island. However, there have been no reports of controlled studies using automated laser scarecrows on any crop, thus Cooperative Extension was unable to make recommendations. In addition, all of the previous studies had emphasized that lasers were only effective under low-light conditions, but to protect sweet corn the lasers would need to be effective in full sunlight. In 2017 we obtained funding from Northeast SARE to conduct controlled tests of laser scarecrows to prevent bird damage in sweet corn.

**Bird Control in Sweet Corn**

Fresh-market sweet corn is an important crop occupying many acres, particularly in peri-urban areas. It was the number one crop, by acreage, in the 2012 Census of Agriculture for all the New England States except Maine, where fresh market sweet corn ranked second behind potatoes. Blackbirds and starlings can be a severe problem in sweet corn; the birds shred the husks and peck the kernels, rendering the ears unmarketable. Even more frustrating for growers, losses occur just before harvest, after growers have already invested time and inputs into the crop. Large flocks of blackbirds and starlings can ruin a field of ripe sweet corn in less than a day. The preferred bird control method for many sweet corn growers is some combination of scare guns, pyrotechnics, and hunting. This can keep bird damage to a tolerable level, but in peri-urban areas ordinances often prohibit use of firearms, and the noise pollution from scare guns creates problems with non-farm neighbors. In Rhode Island the conflict over scare guns has resulted in legal threats to the Right-to-Farm Law, so farmers, politicians, and regulators are very interested in a practical alternative for protecting crops.

**Study Methods**

We developed an inexpensive laser scarecrow emitting a beam of green light at 535 nm as a research prototype, and deployed five units in commercial sweet corn fields at multiple sites in Rhode Island and southeastern Massachusetts. Scarecrows were placed in fields approximately 3 days before growers expected to begin harvesting and removed once harvest was complete. The scarecrow was adjusted such that the laser beam swept over the field at tassel height on the crop, protecting a circular area approximately 350 feet in diameter. In addition to horizontal rotation, the angle of the beam varied between horizontal and 20 degrees below horizontal. The scarecrows were controlled by light sensors and automatically turned on at dawn and off at dusk. Cooperating growers reported back to us the amount of bird damage in the protected fields, and also in any unprotected fields on their farms.

We also conducted a controlled test at the Gardiner Crops Research Center. We planted two one-acre plots of corn at the ends of a 3 acre field, with an acre of cover crops separating the two plots. The plots were seeded with the same mix of eight varieties of bicolor se corn, ranging in maturity from 72 days to 86 days. A laser scarecrow was equipped with a shield so that the rotating beam impacted a semi-circular area rather than a full circle. The unit was set up between the two sweetcorn plots, so that the laser beam passed over one plot at tassel height, but did not impact the other plot. After 3 to 5 days all bird-damaged ears in both plots were counted and removed. and the laser scarecrow was repositioned to protect the previously unprotected plot. The test was repeated for a total of six counting events.

**Results**

The maximum grower-reported bird damage in a protected field was 5%. Damage in unprotected fields ranged from 40% to 100%. One grower in Warwick, RI began the season with a commercial laser scarecrow in his field. Redwing blackbirds were present in the hedgerows around the field, and feeding on sweet corn in one corner where the laser beam did not reach. There was no damage on corn elsewhere in the field, until the motor on the laser scarecrow failed. The field was unprotected for five days; 80% of the ears on the two plantings that matured during this time were rendered unmarketable by bird damage. Once a new laser scarecrow was installed, blackbirds stopped feeding on the corn until the scarecrow was moved to protect a different field. Similar results were seen in Cranston, RI with starlings when the grower had sweet corn maturing at the same time in two different fields, and was only able to protect one field. The unprotected field was a complete loss, while there was no reported damage in the protected field.

The laser scarecrow significantly reduced bird damage in the controlled study at URI. Bird pressure was low at the Gardiner Crops Research Center, but the protected plots consistently had fewer damaged ears than the unprotected plots. Starlings were the primary bird species damaging sweet corn at URI. The birds did not appear to become habituated to the laser beam, and avoided the fields even in full sunlight when the beam was not visible to human eyes. No residual effect was observed – if the laser scarecrow was powered down or removed, birds resumed feeding in the field in less than a day. If field shape or rolling terrain blocked the laser beam from a portion of a field, the birds would congregate in the unprotected area. The height of the laser beam relative to the crop appears to be important – if the beam is too low it will be blocked by the crop, but if it is aimed too far above the crop the birds will not be dispersed

**Conclusions**

Laser scarecrows appear to be effective as a means of preventing starlings and blackbirds from feeding in sweet corn fields. Based on grower reports, they are more effective than scare guns at preventing damage. Commercial laser scarecrows are more expensive than scare guns, but cost less to operate, and avoid problems with noise pollution. Labor requirements are similar to scare guns. A preliminary single-site trial suggests that laser scarecrows are effective at preventing starlings, blackbirds, crows, and flickers from feeding on grapes, but are less effective against catbirds. The scarecrows also may be effective at protecting newly-seeded cover crops from Canada geese. Laser scarecrows are not effective against deer or other mammals (VerCauteren et al. 2006). We will be repeating the controlled studies on sweet corn in 2017, and will be initiating further tests of the laser scarecrows on additional crops and against additional bird species.

**Laser Scarecrow Sources**

Carpe Diem Technologies, Vancouver, BC http://www.carpediemtechnologies.com/ manufactures an automated laser scarecrow with a fixed beam angle. Units sell for ~$3,000. Several RI growers have purchased Carpe Diem units; there have been issues with product quality and customer service.

Bird Control Group, Lake Oswego, OR https://birdcontrolgroup.com/ sells the full configurable Agrilaser Autonomic, which is designed to cover very large areas but is not easily moved. Units start at ~$8,000. They also offer less expensive hand-held units. No Agrilaser Autonomic units are in use in New England.

URI Research Prototype http://digitalcommons.uri.edu/riaes_bulletin/ for growers who wish to construct laser scarecrow units to use on their farm. These units have been developed specifically for use in small fields. Beam angle and vertical motion are configurable to accommodate slopes. The laser can be easily programmed to turn on or off at specific points in the rotation to prevent the beam from interfering with roadways or annoying neighbors. Unit design prevents beam from aiming above horizontal to eliminate risk of interference with aircraft. Materials cost is ~$300 including stand and battery.

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