

Weeds. We all know the importance of controlling them early on in the season. Especially during the critical weed free period, when competition with other plants has the greatest impact on crop yield potential. However, sometimes our efforts to control weeds early on in the season just don't go as expected. That's why a key part of an effective integrated weed management plan is to have reliable late-season control practices for managing weeds that escape initial spray applications, as well as for control of herbicide resistant populations. Electrical weeding is a new option for eliminating escaped weeds and is being applied in a number of different cropping systems, including Michigan vegetable production.

Like many pieces of ag technology, electrical weeding started from humble beginnings. Electricity was originally used in the late 19th century to control vegetation growing on railroads, as can be seen in the patent drawings for early steam-powered electrical weeder. The first commercial equipment was developed in the United States in the 1970s with the invention of the EDS Lightning Weeder. However, electrical weeding was soon eclipsed by the success of new herbicides released at that time, such as glyphosate. Now with the rise in herbicide resistant weeds, electrical weeding is once again being considered as a viable option.

The resurgence of interest in electrical weed control has led to a wave of innovation in companies around the world. Electrical weeding is being applied in a number of different cropping systems, including vineyards, field crops, and even domestic use by homeowners and groundskeepers. How does electrical weeding actually work? So, we have our energy source: the diesel fuel in the tractor which is used to run the power takeoff shaft which spins the generator. The current produced from the generator is stepped up to a higher voltage using a transformer integrated into the rear of the unit. This high voltage electricity is transferred to the front of the machine through a cable where it charges the applicator electrode. This electrode is what contacts the weed, whereas the current is conducted through the plant and a certain amount of that electrical energy is converged into heat due to the plant's natural resistance. That heat causes fluids within plant cells to vaporize, leading to an internal pressure buildup that bursts cell walls, resulting in widespread tissue death. The current then returns back to its source through the soil and some sort of grounding device, such as a coulter, or in this diagram a return electrode.

Electrical weeding has a few key environmental advantages. Unlike mechanical cultivation, this method does not disturb the soil which promotes physical, biological, and chemical soil health. Electrical weeding also does not require the use of any chemicals making it another tool for growers to use in organic systems. While cultivation and herbicide application are still highly useful practices, this technology can control weeds that have become too large for mechanical or chemical control while having a little negative impact on the agroecosystem.

Like all weed management methods, electrical weeding has its trade-offs. Current equipment is non-selective, limiting its application to low-canopy crops like soybeans, sugar beets, and various vegetables. This means that there's some potential for foliar damage to the crop if it comes into contact with the electrode. The efficacy of electrical weeding can depend on a number of environmental factors such as weed species and their morphology, the weed density in a field, and plant and soil moisture. Operational variables such as speed, electrode height, and voltage level also have an impact on weed mortality. Depending on these factors multiple passes through the field may be required to get sufficient control. Current research at Michigan State University is studying the performance of electrical weeding in carrot and green bean production to get a better understanding of this new technology. The research objectives are to evaluate electrical weeding in terms of weed control, crop injury, profitability, as well as its effects on weed seed germination and microbial communities in the soil. By exploring these areas researchers in the department of horticulture at MSU hope to gain greater insight into electrical weed control, which will contribute to the scientific literature and help growers improve their production systems.

While electrical weeding may not be a perfect solution for all situations this technology shows promise for eliminating escaped weeds, reducing the weed seed bank, and improving integrated weed management in vegetable production.