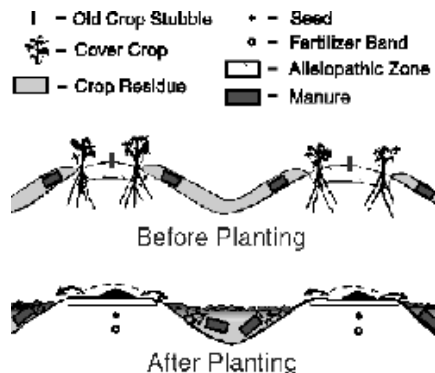


Weed Management in Ridge tillage

Many farmers, agricultural professionals, policy makers, and members of the general public have questions about the manner in which weeds are controlled in row crops: Are trade-offs between tillage and herbicides inevitable? What are the environmental effects of herbicides and row cultivation? A number of PFI cooperators evaluated options for weed control in cropping systems based on ridge tillage (strip tillage on ridges). Their experience had indicated that ridge till offered unique possibilities for herbicide reduction.

In five weed management trials in corn (1990-1991), mechanical-only weed control resulted in an average increase in weed counts of approximately 10 percent. In 17 weed management trials in soybeans (1989-1991), chemical/mechanical weed control resulted in weed counts averaging about 40 percent higher than mechanical-only control. In these ridge tillage trials taken as a whole, equivalent yields were obtained in mechanical-only and chemical/mechanical treatments. Broadleaf weed numbers were approximately equivalent, with counts in almost all trials in the "low" range (<1 per 100 ft²). Per-acre profit was greater in the mechanical-only systems. PFI cooperators Ron and Maria Rosmann evaluated broadleaf weed control in ridge tillage and conventional disk-tillage soybeans. In their system, in which herbicides are not used, ridge tillage produced fewer broadleaf weeds by an order of magnitude.



Over a seven-year period, in 21 corn trials and 30 soybean trials by PFI (six replications per trial), there was less than a bushel per acre difference between the average mechanical treatment and the average herbicide treatment. (See figure above.) In these 51 trials by PFI, the mechanical-only treatments saved an average \$5.82 per acre in corn and \$5.95 in soybeans compared with herbicide-based management.

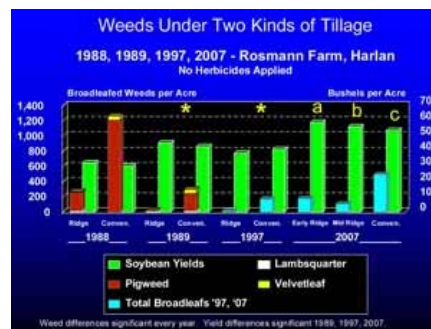
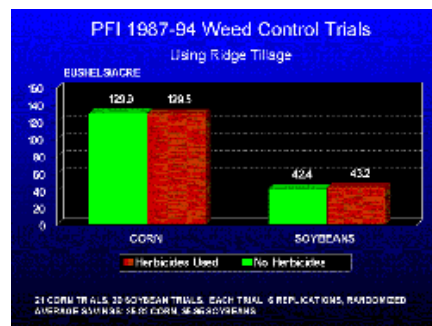
While the intended result of tillage is usually the elimination of weeds, the weed-stimulating aspect is equally important. Before herbicides were commonly used, farmers depleted the weed seed bank with a series of early spring tillage passes, each of which eliminated weeds and brought on a new flush of weed seed germination. As a contemporary example, weeds are frequently evident in disked endrows of no-till and ridge-till fields that otherwise enjoy good weed control. Ridge tillage avoids early season soil disruption and the stimulatory effect it has on some weeds.

Ridge tillage planting can involve almost no soil disturbance. Generally, though, part of the ridge top is shaved off using a sweep (blade, or "shovel") or a horizontal disk. The soil from the ridge is thrown between the rows, incorporating any spring-applied manure, but removing this much of the ridge also has a weed management function. The operation removes from the row most weed seeds that fell onto the soil surface the previous year. Forcella and Lindstrom (1988) found that the sweep of the planter removed 80 to 100 percent of weed seeds from the row in a corn-soybean rotation.

The specific factors that stimulate weed seed germination may involve combinations of light, temperature, scarification, physical displacement, oxygen potential, and available nitrogen. Further, different species are likely to have different environmental preferences. Buhler and Daniel (1988) found that without herbicide, different tillage systems had very different effects on two weed species, velvetleaf (*Abutilon theophrasti* Medik.) and giant foxtail (*Setaria faberi* Herm.). Foxtail, which germinates best at shallow depths, presented the greatest problem in no-till. Velvetleaf, whose seeds are long-lived, was most evident in systems where tillage first buried and then unearthed them. In the Buhler and Daniel study, ridge tillage was the only system that had low numbers of both foxtail and velvetleaf in the absence of herbicides.

Buhler, D. D., and T. C. Daniel. 1988. Influence of tillage systems on giant foxtail, *Setaria faberi*, and velvetleaf, *Abutilon theophrasti*, density and control in corn, *Zea mays*. *Weed Sci.* 36:642-647.

Forcella, F., and M. J. Lindstrom. 1988. Movement and germination of weed seeds in ridge-till crop production systems. *Weed Sci.* 36:56-59.



For more information on using ridge tillage for weed management, see:

Exner, R., and R. Thompson. 1992. Reducing weed pressure in ridge-till. Iowa State Univ. Coop. Ext. Serv. Bull. SA

Exner, D.N., R.L. Thompson, and S.N. Thompson. 1996. Practical experience and on-farm research with weed management in an Iowa ridge-tillage-based system. J. Prod. Agric. 9(4):496-500.