

Stubble management

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Factsheet about integrated weed management



Introduction

Stubble management can help to prevent further weed growth, weed seed development and vegetative propagation in the soil after harvest. After harvest, perennial weeds are often controlled by glyphosate applications in the stubble. Direct nonchemical methods (e.g. mowing or shallow tillage operations) can be used freely unless a cover crop has been established. Early and shallow stubble management stimulates germination of freshly ripened crop and weed seeds, kills the resulting seedlings and reduces the input into the soil seedbank¹.



Figure 1 | Shallow tillage in a maize stubble.

Applicability and efficacy

Mowing is a tactic to hinder weed growth and to prevent weeds from producing seeds. Mowing the stubble might be preferred over tillage as weed seeds are buried by tillage operations. Burying seeds may lead to preservation of the seeds and buildup of the soil seedbank.

The effect of postharvest tillage strategies on the occurrence of annuals depends on the:

- Methods applied
- Composition of the weed flora
- Seed production in the actual year in proportion to the seed bank
- The dormancy status of produced seeds.

Key is to find the right combination between weed composition, the size of the weed seed bank, number of weeds and seed production in the stubble, and the timing and type of the treatment to contribute to integrated weed management with stubble treatment.



For annual grass weeds, stubble management by tillage is not advised. "The annual seed rain constitutes the primary source for maintaining the weed populations. Annual grasses mostly have short-lived seeds, and tilling the stubble to diminish the seed bank might be counteracted by preservation of new seeds"².



Incorporating fresh seeds of among others wild oat, blackgrass, oilseed rape and wild mustard into the soil preserves the weed seeds for a longer time¹.



Stubble cultivation incorporates weed seeds that have been shed prior to crop harvest or spread during harvesting. Furthermore, it stimulates the germination of older seeds in the weed seed bank. Numerous reports suggest that a greater seed loss of freshly shed weed seeds can be achieved if the seeds are left on the soil surface after crop harvest rather than being incorporated into the soil³.

1] Pekrun, C., & Claupein, W. (2006). The implication of stubble tillage for weed population dynamics in organic farming. *Weed Research*, 46(5), 414-423. <https://doi.org/10.1111/j.1365-3180.2006.00525.x>

2] Melander, B., Munier-Jolain, N., Charles, R., Wirth, J., Schwarz, J., van der Weide, R., . . . Kudsk, P. (2013). European Perspectives on the Adoption of Nonchemical Weed Management in Reduced-Tillage Systems for Arable Crops. *Weed Technology*, 27(1), 231-240. doi:10.1614/WT-D-12-00066.1



Poverty brome, soft brome (*Bromus hordeaceus* L.) and volunteer cereals are the main exceptions to the rule that seed loss is larger when seeds are left on the soil surface as compared to incorporating the seeds¹.



For perennial weed, multiple tillage passes in the stubble can reduce perennial weed growth. There may be a trade-off as stubble treatments can lead to increased survival of annual weed seeds after burial³.

Extra information

For an evaluation of seven different tillage modes, including stubble tillage, check out the results from a long-term experiment of Gruber et al. (2012) in Germany⁵.

See <https://iwmpraise.eu/publications/> for all crop diversification strategies and their definitions, and for more information on integrated weed management.

Equipment and costs

Stubble management requires either a regular mower or a shallow tiller.

In general one return to the field should be sufficient. Considering that the machinery is already available, extra costs mainly consists fuel and time required for the operation.

Core results

- Optimal stubble cultivation and ploughing are crucial for successful non-chemical weed control⁴.
- In a study on the effects of different timing of mouldboard ploughing with or without a preceding stubble cultivation period on weeds and spring cereals follows that stubble cultivation and ploughing in spring gave the best total weed control⁴.
- Stubble tillage can reduce perennial weeds but had a variable effect on annual weeds. After 5 years of experimentation, the soil seedbank of the control (where the stubble had been left uncultivated until autumn ploughing) was about doubled, while the aboveground vegetation showed no effect of stubble tillage¹.
- Treatments without stubble tillage and under non-inversion tillage showed higher weed density (ranging between 0.5 and 44 plants m⁻²) and significance differed for the different weed classes⁵.

Contact| Timo Sprangers
M| timo.sprangers@wur.nl
T| (+31)320 29 12 37

Contact| Saskia Houben
M| saskia.houben@wur.nl
T| (+31)320 29 12 09



3| Jensen, P. K. (2009). Longevity of seeds of four annual grass and two dicotyledon weed species as related to placement in the soil and straw disposal technique. *Weed Research*, 49(6), 592-601. doi:<https://doi.org/10.1111/j.1365-3180.2009.00725.x>

4| Brandsaeter, L., Mangerud, K., Helgheim, M., & Berge, T. (2017). Control of perennial weeds in spring cereals through stubble cultivation and mouldboard ploughing during autumn or spring. *Crop Protection*, 98, 16-23. <https://doi.org/10.1016/j.cropro.2017.03.006>

5| Gruber, S., Pekrun, C., Möhring, J., & Claupein, W. (2012). Long-term yield and weed response to conservation and stubble tillage in SW Germany. *Soil And Tillage Research*, 121, 49-56. <https://doi.org/10.1016/j.still.2012.01.015>