



# WHAT IS THE DEAL WITH HERBICIDE TOLERANT CROPS?



# A BIG ISSUE FOR FARMERS ARE WEEDS

**Weed** is the general term for any plant growing where it is not wanted.



I just want  
to be loved

Weeds not only compete with crops for water, nutrients, sunlight, and space but also harbor insects and diseases; clog irrigation and drainage systems; undermine crop quality; and deposit weed seeds into crop harvests. If left uncontrolled, weeds can reduce crop yields significantly. They can also harm human health by triggering allergies, spreading toxins, or contaminating food supplies.

So you see why weeds are a big issue for farmers!

I will take  
the water



# SO HOW DO FARMERS DEAL WITH WEEDS?

They typically employ a variety of methods, including tillage, hand weeding, herbicides, crop rotation, and, in some cases, lasers for precision farming. Together, this is known as **integrated weed management**.

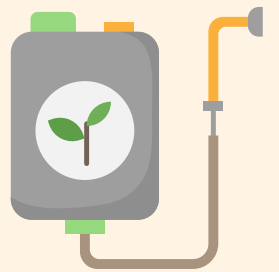


## TILLAGE

Mechanical tools are used to prepare soil, disrupt weed growth, and bury seeds. While effective, excessive tillage can harm soil health.

## HERBICIDES

Plant protection solutions that target weeds, reducing competition with crops. Proper application is key to avoiding resistance and environmental harm.

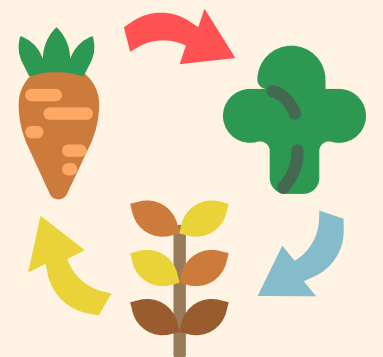


## HAND WEEDING

Physically removing weeds by hand or using tools. It's precise but labour-intensive and impractical for large farms.

## CROP ROTATION

Crop rotation disrupts weed life cycles by alternating crop types, creating unfavourable conditions for weed growth.

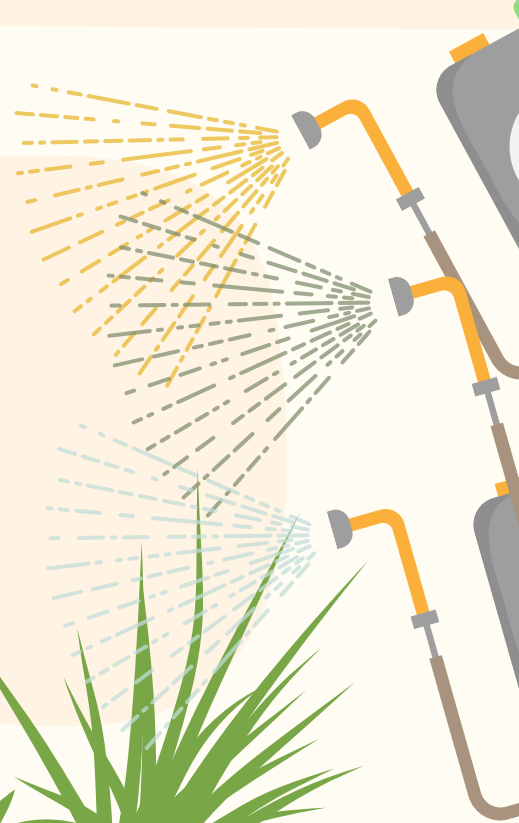




## LET'S FOCUS ON HERBICIDES...

Amongst other practices, farmers can apply broad-spectrum herbicides (i.e., that can kill **all or several species** of plants) to reduce weed growth **before their crops germinate**. This enables more efficient planting of crops and reduces competition for resources with weeds.

But weeds that emerge during the growing season can be controlled using narrow-spectrum or selective herbicides. Unfortunately, weeds of different types could emerge in the field, and so farmers **might have to use several types of narrow-spectrum herbicides to control them**.





## THE ISSUE WITH NARROW-SPECTRUM HERBICIDES

Farmers using narrow-spectrum herbicides must carefully select and apply the right product for specific weed species, which is both time-consuming and prone to error. Managing diverse weeds often requires multiple herbicides, increasing input costs. Also, using narrow-spectrum herbicides requires much more product to be applied.

Repeated use of the same herbicide can also lead to resistant weeds, making control harder and necessitating alternative or additional treatments. When some weeds aren't controlled, it may result in crop yield loss, or with farmers needing to spray more narrow-spectrum herbicides.

**A possible solution?** A few broad-spectrum herbicides with different modes of action, applied strategically during the growing season, within approved timeframes to ensure food safety and minimise residue levels. This approach also reduces the amount of herbicide used.

**But how can you do that without harming the crops?**





## BREEDING PLANTS TO HAVE HERBICIDE TOLERANCE CAN BE A SOLUTION!

Then farmers can simply apply broad-spectrum herbicides. ✓

## SO HOW DOES HERBICIDE TOLERANCE WORK?

You shall not pass



A **herbicide** targets **key enzymes** in a plant metabolic pathway - the pathway that guides essential processes in the plant - which disrupts plant food production and eventually kill it.

Some plants elicit tolerance to herbicides naturally! This is because they may have acquired it through selection or spontaneous mutation.



But this tolerance can also be introduced in a plant by traditional plant breeding or innovative plant breeding techniques!

# HERBICIDE TOLERANCE THROUGH PLANT BREEDING

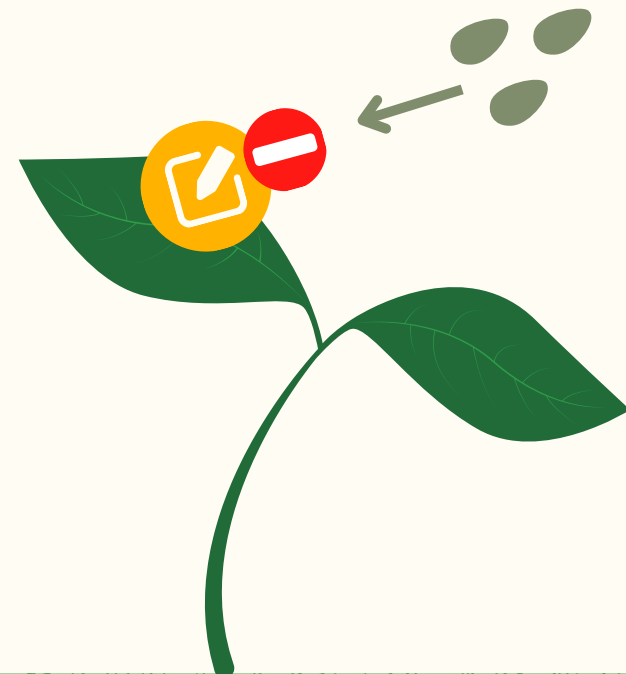
Through plant breeding techniques, we can develop crops that have some degree of tolerance to broad-spectrum herbicides - typically, to glyphosate and glufosinate.



**This tolerance can be achieved via different ways, but two common ones are:**

**1** Altering the plant's existing **target protein** through **random mutagenesis** so that it is no longer affected by the **herbicide**

**2** Modifying the herbicide's **target protein** with **gene editing** so that it will not be affected by the **herbicide**



**BUT I THOUGHT HERBICIDE TOLERANCE WAS BAD?**



**Well, it depends on how it's used!  
(a bit like everything)**

Herbicide-tolerant crops, like those with glyphosate resistance, allow farmers to simplify weed management by using smaller amounts and relying on one main herbicide instead of a mix. This approach can contribute significantly to integrated weed management practices.

**THIS METHOD MAKES WEED REMOVAL MORE EFFICIENT**

Farmers need fewer applications, saving time and resources.

*less is*  
**MORE.**

**IT'S SAFE**

Glyphosate, and other broad-spectrum herbicides when used according to regulatory standards, is rigorously tested and widely regarded as safe for humans, animals, and the environment.

**IT'S BETTER FOR THE ENVIRONMENT**

Using one targeted herbicide reduces the need for multiple formulations. Furthermore, appropriate cultivation practices, guided by stewardship recommendations, help prevent the emergence of resistant weeds. These best management practices benefit developers, farmers, and the environment by minimising herbicide use and prolonging the technology's effectiveness.



# ASK US

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Ask your questions here:

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