



## Importance of Integrated Weed Management

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Integrated weed management may be defined as the combination of two or more weed-control methods at low input level to reduce weed competition in a given cropping system below the economical threshold level.

### Importance of integrated weed management

Weed seeds can contaminate grain, interfere with numerous crop production techniques, and have a detrimental effect on crop output. National research indicates that without efficient weed control, corn and soybean yield can be lowered by almost 50%. The primary method of controlling weeds is the application of herbicides. Herbicide-resistant weeds have emerged as a result of reliance on this one technique. Herbicide resistance cases are rising quickly in the United States, and there are only a few herbicides accessible for application. Herbicides therefore require additional support in order to maintain sufficient weed control. Instead of depending on the agro-chemical business to keep creating new herbicides, it is essential to use non-herbicide weed management techniques to control weeds.

### Different parts of integrated weed management

IWM aims to control weeds by combining various weed management techniques into a coordinated effort. When creating an IWM plan, two important things to think about are (i) the target weed species and (ii) the time, resources, and capabilities required to carry out these strategies. IWM calls for the adoption of strategies other than herbicides, even if it is prudent to be a good steward of herbicide technology by using PRE and POST herbicide applications or tank blends.

### Principles of integrated weed management includes:

**Prevention:** Prevention is a crucial aspect of Integrated Weed Management (IWM). It involves taking proactive measures to prevent weeds from establishing and spreading. This can be achieved through methods such as using weed-free seeds and planting materials, implementing proper sanitation and hygiene practices, avoiding contaminated soil and equipment, using mulches and cover crops to suppress weed growth, maintaining healthy, competitive crops through proper agronomic practices.

**Eradication:** The goal of IWM's eradication principle is to eradicate a weed species entirely from a given region, including its seeds and vegetative propagules like rhizomes, in order to stop it from re-establishing itself.

**Control:** Instead of eradicating weeds entirely, control their growth and competition to a manageable level. It may include cultural control, chemical control, mechanical control and biological control.



- Cultural:** Cultural practices in Integrated Weed Management (IWM) involves modifying farming practices to prevent weed growth and promote crop competitiveness. These practices include crop rotation and intercropping to break weed cycles, adjusting planting dates and densities to optimize crop growth, using competitive crop varieties and cultivars, implementing proper irrigation and fertilizer management, maintaining optimal soil health through organic amendments and conservation tillage. For e.g.

  - *Cyperus rotundus* and *Trianthema portulacastrum* are serious weeds in many kharif crops.
  - *Phalaris minor* infestation can be replaced by replacing wheat with other rabi crops like berseem, raya, winter maize etc.
  - Wild oats can be completely eliminated by growing berseem for 3-4 years.
- Mechanical:** Mechanical practices in Integrated Weed Management (IWM) involve physically removing or controlling weeds through various methods, including hand-weeding or hoeing to remove weeds, using mechanical cultivators or weeders to control weeds between crop rows, mowing or cutting weeds to prevent seed production, using mulching equipment to suppress weed growth, implementing precision agriculture techniques, such as robotic weeding. For e.g.

  - Mulching with straw, hay, paper and films is successful in cash crops.
  - Flooding is an efficient method of weed control for some perennial like *Cyperus* sp, *Cynodon dactylon* and *convolvulus arvensis*.
  - Burning is used to burn crop residues and weeds after the harvest of crops like sugarcane, cotton, maize etc. Burning is used for selective control of annual broadleaf weeds and grasses.
- Biological:** Biological practices in Integrated Weed Management (IWM) involve using living organisms or natural processes to control weeds. These practices include using weed-suppressive crops or cover crops, introducing beneficial insects, such as beetles or wasps, that feed on weeds, applying bioherbicides, such as fungal or bacterial pathogens, to control weeds, implementing allelopathy, where certain crops release chemicals that inhibit weed growth, using grazing or browsing animals to control weeds in pastures or rangelands. For e.g.

  - *Bactra verutana* shoot boring moth feeds on *Cyperus rotundus* in Rice and wheat crop.
  - *Zygogramma bicolorata* beetle feeds on parthenium plants during rainy season.
  - *Lantana camara* (lantana weed) in Andhra Pradesh of India has been effectively controlled by moth *Crociosema lantana*.
  - *Gastrophysa* beetle feeds on rumex sp in rice and wheat crop.
- Chemical:** Chemical practices in Integrated Weed Management (IWM) involve the judicious use of herbicides to control weeds. This approach includes selective herbicide use to target specific weed species, applying herbicides at optimal timings, such as pre-

emergence (for e.g.: Pendimethalin and Atrazine) or post-emergence (for e.g. Glyphosate and 2,4-D), using low- dose or reduced-rate herbicide applications, rotating herbicide modes of action to prevent resistance, integrating herbicides with other control methods, such as cultural and mechanical practices. For e.g.

- Pre-emergence herbicides Pendimethalin (Stomp) is used in wheat to prevent the germination of weed before their emergence.
- Post-emergence herbicides Glyphosate (Roundup) is used in Soybean after weed emergence, to control broadleaf weeds.
- Selective herbicide Bispyribac-sodium (Nominee) is used in rice to control broadleaf weeds and sedges.
- Non-selective herbicides Paraquat (Gramoxone) is used in sugarcane to control weeds before planting or between crop rows.

### Merits

- Improved weed control, less herbicide use, and higher crop yields are just a few benefits of integrated weed management.
- IWM offers an approach to weed management that is more sustainable and successful by combining several control techniques. Additionally, this strategy lessens its negative effects on the environment, encourages soil conservation, and increases biodiversity.
- IWM also increases crop yields and lowers weed management expenses, which boost farm profitability.
- Long-term sustainability is ensured by its adaptability, which enables farmers to adjust to shifting weed populations and environmental conditions.
- IWM is a comprehensive strategy that helps the environment and farmers.

### Demerits

- Putting IWM ideas into practice may necessitate large upfront expenditures for labour, equipment, and training.
- IWM is not impervious to the emergence of weed resistance, even though its goal is to lessen dependency on herbicides and other single techniques. Some weeds may still become resistant to several management techniques if they are not adequately managed, particularly if not all tactics are applied regularly.
- IWM tactics could have to be modified for certain locations or circumstances, which could prevent them from being widely used.
- Rainfall or drought can have an impact on IWM strategies, lowering their efficacy.