

The future of crop protection lies in IPM



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Since the dawn of agriculture, farmers have been dealing with the challenges of managing pests, weeds and diseases that threaten our ability to produce enough safe and healthy food for the population. Thankfully the strategies to control pests have evolved over the years and continue to do so. New technologies and innovations have enabled, for instance, a reduction in the amount of pesticide needed to address a specific problem from kilograms per hectare in the 1960s to grams per hectare in certain instances today. And as these technologies progress, so do our agricultural practices to keep up with the global food demand, while considering societal expectations as well.

The future of pest control undoubtedly lies within the domain of integrated pest management (IPM), meaning that we need to focus on managing pests effectively rather than just eliminating them. The first step in doing this is to grow a healthy crop that is more able to withstand the effects of pests than a weak or stressed crop. Many people believe that IPM means using different types of pesticides such as biologicals alongside synthetic pesticides, but IPM means using all suitable techniques or strategies to keep pests below levels that cause unacceptable crop

loss. These different strategies could include mechanical or physical, cultural, biological, and chemical methods of pest management, as well as biotechnology. The choice of which pest management method to employ will depend on the crop and pest situation, as well as the availability of resources. This means that pesticides are applied only when necessary, and only in quantities that are required and that are approved for use. The benefits of IPM are numerous, for instance the use of inputs is optimised, crop losses are reduced, biodiversity is maintained, crop production is sustainable and, importantly, pest resistance to crop protection solutions is managed. But it must be kept in mind that IPM is not a set package to be incorporated in the same way on every farm, rather it is location and condition specific, sometimes even down to the field level or crop growth stage.

Proper and regular inspections are fundamental to IPM. Early detection of any pest, weed or disease gives the farmer an opportunity to investigate alternative, less harsh methods of crop protection than if the pest, weed or disease has already grown to devastating populations. It also provides a farmer with intel because the information regarding threshold values for damage, and the life cycle of the pest, weed or disease,

can be compared with previous seasons to determine the risk associated with the occurrence of the disease or pest.

Integrated disease management

Choosing which disease management method to employ will depend on the crop and disease situation as well as the availability of resources.

Cultural control methods aim to help plants avoid contact with a pathogen and to eradicate or reduce the amount of pathogen in a field or area. Examples of cultural control methods include crop rotation, sanitation and creating unfavourable conditions for the pathogen.

Biological control methods aim to improve the resistance of the host or favour micro-organisms antagonistic to the pathogen. Examples include suppressive soils and trap plants.

Physical methods of control on the other hand aim to protect the host from pathogens by using methods such as heat treatment (soil sterilisation by heat, hot water treatment of propagation material or hot air treatments), drying of products, refrigeration, or radiation. Chemical control methods include soil treatment, fumigation, disinfection of warehouses and packhouses and control of insect vectors.

Integrated weed management

For optimal weed control, it is beneficial to understand the biological properties of various weeds because this can assist in understanding which herbicides, if any, would be best suited for the purpose. Other than chemical weed control, organisms like bacteria, viruses, fungi, and insects can also be used for biological control of weeds.

Mechanical control methods have changed considerably, especially with the advent of minimum and no-till cultivation practices. Although these practices bring about many benefits to the environment, they also pose some challenges with regards to weed control, such as requiring increased herbicide use. The smart thing to do in an IPM programme is to incorporate ploughing occasionally, even if it's only every four years or so, which will still maintain the no-till cultivation practice.

Biotechnology in the form of herbicide tolerant crops is another vital tool available to farmers in the IPM package, especially in the fight

against resistance.

Integrated insect management

There are a variety of chemical and non-chemical insect management methods available to ensure the effective incorporation of IPM. Some of the natural processes include the use of natural predators such as beneficial insects and nematodes in the pest management programme. Other options include deploying *Bacillus* bacteria as a biological control agent, incorporating natural insecticides such as azadirachtin from neem oil, or using pheromones to disrupt mating.

As mentioned, mechanical control is not a matter of simple year-on-year ploughing anymore, however, incorporating the practice selectively as part of an IPM strategy could assist in burying unwanted pests such as stalk borer or host plants for insects. Other agricultural practices to consider are crop rotation, mixed cultivation, strip cropping or establishing trap crops.

Plant biotechnology also offers insect resistant technologies such as Bt-maize, which has the advantage of reducing the use of certain chemical control measures.

When using any form of chemical crop protection product, it is of utmost importance that the label directions are followed to a tee. Not only is the label the only legal "adviser" of the product, but it contains essential information for resistance management to ensure that these products remain effective and can be available as a crop protection solution well into the future.

Although only a few examples were mentioned, there are many possibilities available for farmers to effectively incorporate IPM into their agricultural production. No single technology will be the answer to meeting the growing food demand in a sustainable manner, however, at the rate of agricultural innovation, the available options of scientifically sound pest control methods are increasing exponentially, to the benefit of producers, consumers, and the environment. It is up to us to use it effectively.

