

# Why stewardship is important for plant biotechnology

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For plant biotechnology to continue to evolve and successfully commercialise improved crop varieties, it requires commitment to product stewardship and regulatory compliance to ensure long term utilisation and efficacy. Considering the high cost of developing biotech crops, an approximate investment of more than \$150 million spanning more than a decade, stewardship has become an important requirement for responsible use and management of biotech crops by innovators, plant breeders and growers alike to ensure not only a return on investment, but also product integrity throughout the product's life cycle.

Plant biotech stewardship encourages responsible management and use by:

- Ensuring safe, effective, and responsible use of the technology
- Maintaining product integrity and longevity
- Maximising the benefits to consumers, farmers, and the environment
- Minimising the risks associated with biotech resistance development
- Facilitating regulatory compliance and monitoring

As plant biotechnology science and innovation advance to produce crop varieties that address emerging pest and disease challenges, the global adoption of biotech crops continues on an upward trajectory. The last twenty plus years have been dominated by input traits such as insect resistance,

herbicide tolerance, and resistance to environmental stresses, such as drought and nutrient-enhanced crops. The recently released 2019 ISAAA report confirms that traits such as insect resistance and herbicide tolerance for both single and stacked events are still preferred by maize, cotton, and soybean growers due to trait performance and benefits. This is also the trend in South Africa with the adoption of herbicide tolerant (HT) crops mostly conferring resistance to glyphosate and insect resistant crops with insecticidal proteins from the soil bacterium *Bacillus thuringiensis* (Bt) conferring protection against lepidopteran pests such as maize stalk borer (*Busseola fusca*) and African cotton bollworm (*Helicoverpa armigera*).

## Overcoming resistance through good agricultural practices

Despite the advantages that biotech crops bring for simplifying agricultural approaches and improving efficacy of pest and weed control, one of the biggest challenges for sustainable use of the technology is the evolution of resistance. While resistance is not a new concept to pest management applications, it remains an ongoing concern for all crop protection users including developers and growers of biotech crops.

## Herbicide tolerant crops

It is well understood that the challenges with herbicide resistance in key weed species is largely attributed to overreliance on a single weed control strategy for example herbicide applications with the same mode of action.

As the cultivation of herbicide-tolerant crops goes hand in hand with the application of herbicides such as glyphosate, the use of diverse weed control strategies is crucial for reducing weed resistance and ensuring the sustainability of HT crops.

For Roundup Ready herbicide tolerant crops, diverse weed control strategies would need to include crop rotations, using multiple herbicidal modes of action, responsible use of herbicides giving special attention to label requirements (dosage rates and timing), understanding local farming conditions, and most importantly good agricultural practices.

Given the longstanding challenges with herbicide resistance, the technology offered by herbicide tolerant crops on its own will not resolve this issue. Instead, the goal for weed control should always be to combine as many weed management practices as possible to sufficiently reduce selection pressure for the development of resistance in weeds.

### **Bt Resistant crops**

Like other crop protection products, insects can also adapt and develop resistance to

biotech crops with inherent Bt insect resistant traits. Resistance to Bt crops in the field has already been documented in several countries where biotech crops are cultivated, including South Africa. The main factors contributing to these cases of targeted Bt pest resistance has been overreliance on Bt crops as a pest management tool without adhering to proper resistance management practices. This reinforces the importance of farmers adopting good agricultural practices based on integrated pest management (IPM) principles for all Bt crops. In South Africa, like other countries where Bt crops are cultivated, resistance management is mandated in terms of legislation such as the Genetically Modified Organisms Act, 1997. This legislation requires that appropriate cultivation practices for Bt crops be complied with by farmers and be monitored by technology developers for reporting purposes.

A key component of an insect resistance management plan for Bt crops is the cultivation of a crop refuge alongside Bt fields consisting of a non Bt variety of the same crop. The idea behind a crop refuge is that it supports a population of Bt susceptible insects



that have not been exposed to selection pressure from the Bt protein. The planting of a crop refuge is only one part of the resistance management puzzle. In addition, management of Bt resistance also requires a good understanding of how the trait technology works in the field and the importance of diversifying Bt traits with different modes of action (single versus multiple traits). Most importantly however, insect resistance management should be approached within the broader context of IPM to include good agricultural practices.

### **Improving stewardship compliance for biotech crops**

For biotech crops, successful implementation of resistance management practices requires a diversified approach, must evolve and be flexible. To accommodate the different agricultural conditions and multitude of farmers that have adopted biotech crops, it is

important that there is adequate knowledge and understanding of the technology relative to how it needs to be integrated with agricultural practices on farm. Improving biotech stewardship compliance requires commitment and continuous investment in advocacy and training directed at all actors in the value chain, but most especially at farm level.

The effectiveness and sustainable use of biotech crops as a pest management tool needs a long-term view towards stewardship. By sharing the stewardship responsibility amongst various stakeholders, the prospects for compliance improves, thus ensuring that the benefits to sustainable agriculture, food security and farmer livelihoods are realised. CropLife SA is committed to stewardship initiatives that ensure safe, effective, and responsible use of plant biotech products within a wholistic IPM strategy as part of the product stewardship life cycle approach. ■



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