CROP CIRCULAR

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IN THIS ISSUE

CONTRIBUTE

We are always looking for news, photographs or event updates from our members.

Please forward your contributions to elriza@croplife.co.za

WELCOME

Rod Bell
Chief Executive Officer
CropLife South Africa

As per the welcome notes I have written for the CropLife SA Crop Circular since Q1 of last year, the subject of the Covid-19 pandemic is still with us. The CropLife SA team unfortunately continues to learn of industry role players, or their family members, succumbing to complications arising from the virus; this pandemic is far from over and we cannot drop our vigilance yet. Thankfully, many people are now fully vaccinated so hopefully we will start to hear of less and less lives being lost in our industry going forward. Our sincere condolences to the families who have lost loved ones to date.

The CropLife SA team and member companies have been exceptionally busy on the regulatory front, with our efforts being driven by Fikile and Gerhard. As you all know, having a local registration is the 'right to operate' in our industry so this is a critical aspect for not only the CropLife SA team, but also the industry as a whole.

A draft regulation in support of the dated Act No. 36 of 1947 was published for public comment and the draft was circulated to all CropLife SA members for their information and action; sincere thanks to those member companies that either supplied comment directly to the authorities, or to CropLife SA for inclusion in the combined response from the CropLife SA team on behalf of the members. Following discussion at ExCo level, it was agreed that the official response should be supported by a legal opinion on certain matters – this was done. Now it is a waiting game to learn the feedback from the authorities – will the draft regulation just be published in the current form, or will the numerous suggestions, corrections and objections raised by CropLife SA member companies be taken into account? The CropLife SA team will keep all member companies updated in this regard.

It is no surprise to registration holders who battle daily with the regulatory process in our country to learn that the backlog in the Office of the Registrar (Act No. 36 of 1947) continues to grow. As previously reported, the situation is receiving the necessary attention from the CropLife SA team and your duly elected ExCo. However, there will not be an overnight solution, so the battle to not only clear the backlog, but to also strive for a sustainable, timeous and fair regulatory process for our members continues.

Another key project that has taken a huge effort from Elriza these past months is the transfer of the CropLife SA Continuous Professional Development (CPD) programme to its new platform. Feedback from distribution member companies and their Skills Development Facilitators (SDFs) is that the new platform is proving to be much more user-friendly than its predecessor and that as SDFs get used to the new format and rules, the system is being enjoyed by all.

The Agri-Intel database continues to be a valuable tool for all industry players plus local South African fresh produce exporters and international importers of fresh produce from our country. New features are continuously added to the database in order to keep it up to date; these efforts keep Chana, Luigia and Liezel exceptionally busy. As you can imagine, the costs associated with the maintenance and ongoing improvements to the database are not trivial, so the CropLife SA team is constantly looking at ways to offset these costs to some degree. The team will keep all parties updated, but the subscription fee system for non-CropLife SA members was the first step in the direction of having the database as close as possible to 'cost-neutral' for member companies.

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CONTENT

The management of empty, triple-rinsed and punctured pesticide containers is another CropLife SA programme (as part of the stewardship foundation pillar of the Association) that gains momentum. More of our member companies are starting to setup collection points for triple-rinsed, punctured, empty pesticide containers in their areas of operation - a trend for which we are very pleased and for which we congratulate and thank our members.

However, we continue to have a number of geographic areas in the country with poor representation in terms of collection points, so should you be interested in doing the right thing and establish a CropLife SA certified collection point, please contact Gerhard. Remember, the Extended Producer Responsibility Act is in force and regulations governing our industry are under development, so participation in a container management programme will soon no longer be an option to participate, but a legal requirement for doing business in our industry.

All member companies are urged to view, and utilise, the excellent promotional material that is being produced by Elriza as marketing and communications manager for the Association; please refer to the CropLife SA website.

Efforts to represent members' interests and promote plant biotechnology in South Africa continue under the management of Chantel. As with the marketing of other plant protection solutions, Chantel and Elriza have produced a number of promotional videos and other marketing material that is available on the plant biotechnology section of the CropLife SA website; please take the time to look at said material and feel free to utilise it in your activities.

Thankfully, the annual membership renewal process is completed, and Nadia can relax after a sterling effort in creating invoices and following up on payments. These membership fees are required to operate the Association – as a not-for-profit company, CropLife SA does not have huge financial reserves to fall back, on so prompt payment of membership fees are required to fund operations.

Please stay safe and best wishes to all members for the coming summer rainfall planting season.

Virtual responsible use training

The Ukhanyo Farmer Development (UFD) programme is a non-profit organisation focusing on black commercial farmer development as well as delivering technical support across the agricultural value chain to rural farming communities in the Eastern Cape.

On the 15th of September, the CropLife SA team provided online training to a group of 15 young mentors from the development programme. The first part of the training focused on responsible use of crop protection products covering topics that included the dangers and risks associated with pesticides, the importance of personal protective clothing, safe handling, storage and application of pesticides, legal requirements, label instructions and protocols related to spillage. The second part of the training focused on responsible use of plant biotech crops addressing the use of herbicide tolerant and insect resistant crops as plant protection tools and related resistance management measures.

We also welcome UFD as the newest CropLife SA associate member. The CropLife SA team looks forward to a fruitful collaboration and delivering more training opportunities to support this youthful consortium of Eastern Cape mentors/farmers.

Update on CPD and training

We're proud to share that the second phase of the CPD platform has been rolled out successfully and the crop advisers can now complete the online CropLife SA modules to supplement their points. In addition, crop advisers and their SDFs can view their progress in real time per category, meaning they don't have to wait to find out how many points they still need in order to reach compliance. We are continuously striving to make the platform more user-friendly and the next developments will include customisation of some of the terminology in the system to better align with our industry terminology, as well as moving towards digital cards instead of the printed versions.

On the Basic Crop Protection course side, we have just over 500 students who have enrolled for the year so far. We are planning to update some of the training material as well as to incorporate a section on plant biotechnology as part of the IPM module, which will be rolled out in 2022.

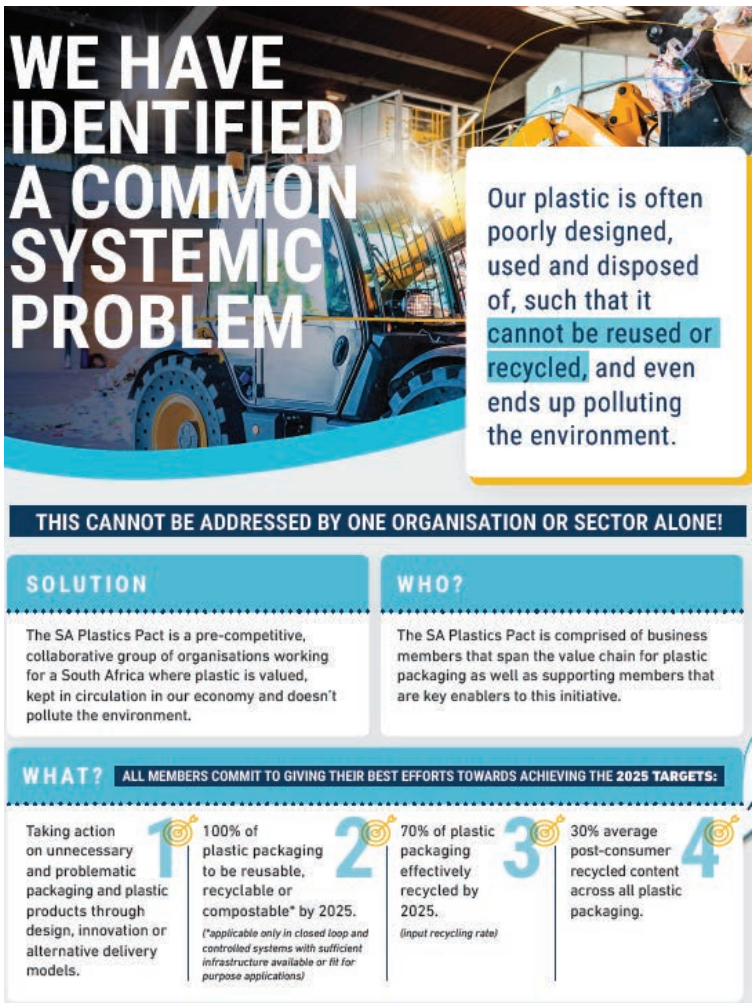
CropLife SA joins The SA Plastics Pact

CropLife SA is extremely passionate about eliminating plastic waste from the environment and the agricultural landscape, which is why it recently joined the South African Plastics Pact.

The SA Plastics Pact aims to change the way plastic products and packaging are designed, used and reused by 2025 to ensure that plastics are valued and never become waste.

Although the industry's contribution to the total quantity of plastic packaging that goes into the South African market is percentage wise rather small, it remains the objective of CropLife SA to strive towards total recovery and recycling of all plastic packaging supplied into the agricultural market. By signing up to the SA Plastics Pact, CropLife SA commits to:

- Taking action on unnecessary and problematic packaging and plastic products;
- Ensuring all plastic packaging is recycled in practice in South Africa;
- Using recycled plastic in packaging and products where possible.



We are fortunate to have a large network of CropLife SA certified recyclers that collect and/or process HDPE and PP bags but, through collaboration, input and advice from other members of the SA Plastics Pact, we are more likely to achieve our goals.

Act No. 36 of 1947: Is it still relevant after 74 years?

Henk van der Westhuizen
Philagro

On June 5th, 1948, the Department of Agriculture became the custodian of the "Fertilizers, Farm Feeds, Seeds and Remedies Act" that was published in Government Gazette number 3977. The Act was applicable from July 1st, 1948. The purpose of the Act was to regulate the importation and sale of fertilizers, farm feeds and remedies, and to regulate the registration process of the aforementioned, as well as that of "sterilising plants" (the sterilising plants had nothing to do with physical buildings, but to register the botanical plants used in the sterilisation of animal bones and other animal products). This Act replaced the Act no. 21 of 1917.

Since the Act came into being, there have been numerous amendments to the Act, and I thought I would just mention a few interesting ones.

In 1970 a new definition of the word "advertisements" was incorporated, and rules regarding advertisements were specified. At the time the cost of obtaining a registration was "not to exceed R20". The cost of a Wimpy cheeseburger and chips on the 1972 menu was R0.55, and today a Wimpy cheeseburger and chips is around R72, thus 130-fold increase. The actual cost of applying for a registration today is significantly higher than the 130-fold and now stands at R10 836, thus if the same were to apply to a Wimpy cheeseburger and chips, we would be paying R300 for a meal at Wimpy today...

Southwest Africa (now Namibia for the youngsters) was added as a territory in 1972.

In 1977 a definition was set out for advisors and analysts who could be appointed to assist the Registrar in his duties.

Products approved for registration should be "effective for use as specified in the registration application, not contrary to public interest and manufactured in establishments suitable for their manufacture" according to an amendment in 1980.

Various regulations were published, and changes made in support of the Act, and to keep the Act relevant. Nowadays I see many product labels that no longer adhere to the requirements as set out by the Act or the regulations, but that is a topic for another day.

Although the Department of Agriculture (now Department of Agriculture and Rural development) is responsible for the evaluation of all toxicological data submitted when an application is made for a product containing a new active ingredient, this responsibility was delegated many years ago, by mutual agreement, to the Department of Health. The Department of Health is thus responsible for making recommendations about the suitability of a product and active ingredient in the South African environment, and proposals of safe PHIs for a typical South African population food basket. Unfortunately for the past 15 years or so, the Department of Health did not employ personnel with the skillset to evaluate the full tox dossiers, and companies outsource this responsibility at tremendous costs.

Over the last couple of years, the backlog in processing of applications for new products, and amendments of existing registrations, has reached proportions where it will take years to eliminate the backlog, and companies and producers are becoming increasingly more frustrated. But is this as a result of the actual Act no. 36 of 1947?

I believe only partially, and the Act is basically still a sound piece of legislation, with one or two possible major exceptions.

1. The cost of development of new products and uses for existing products is rising rapidly and is set to increase tremendously with the possible implementation of GLP residue trials, and the introduction of GEP for field contractors. Somewhere, the need for IP (intellectual property) protection needs to be implemented to encourage continued expensive development work by all companies involved.

2. Over the past years, the emphasis in the use of agricultural and stock remedies has moved to the toxicological impact of these products on the environment, soil health, human health etc. The second **major** amendment to Act no. 36 should be that efficacy data should be scrapped as a requirement for registration, and more focus should be on the other issues mentioned here. Too much time is wasted by the employees of Act no. 36 to review efficacy data (which after all remains the responsibility of the registration holder).

If these two amendments are included in Act no. 36, I think it will remain relevant...but should the Department of Agriculture and Rural development still be the custodian, or should it be Department of Environmental affairs?

Maybe it is time South Africa follows the example of the UK and other developed countries, and leave this most important task to a body of independent experts, funded by the industry and organised agriculture?

(This is my personal opinion, and does not reflect the views of my employer, nor any member of CropLife South Africa)

Madumbi Sustainable Agriculture rebrands as Andermatt Madumbi

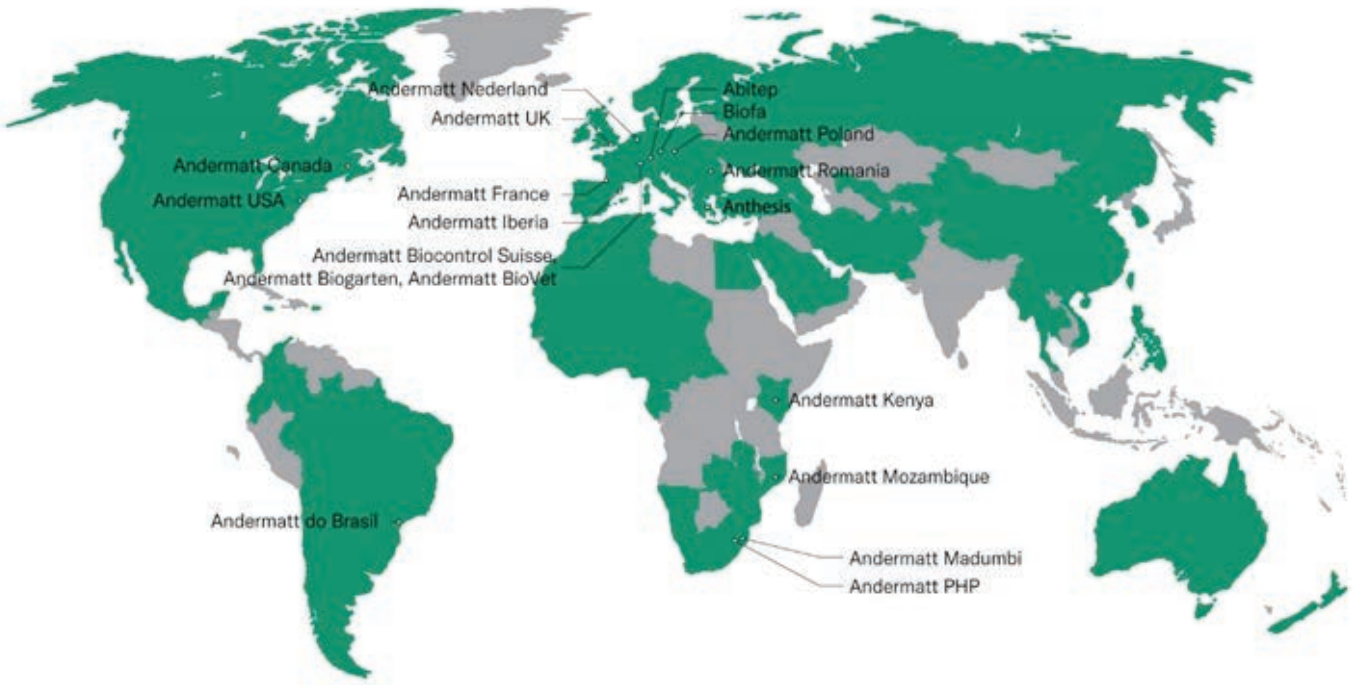
During August 2021, Madumbi launched their rebrand as Andermatt Madumbi.

Madumbi Sustainable Agriculture has been a member of the global Andermatt BioControl group of companies since 2010 and has been 100% owned by Andermatt since 2019.

Andermatt Madumbi, forms part of the global Andermatt BioControl Group and is one of 25 subsidiaries. Local manufacturing and sister company, Andermatt PHP also recently rebranded and the most recent addition to the group is South African company, Andermatt Vital Bugs, a macrobial production company based in Tzaneen, Limpopo.

The precision of a Swiss clock with the heartbeat of an African drum
Andermatt Madumbi sees two organisations with a shared vision, partnering for a better future. With integrity, passion, and innovation as driving forces behind our growth, we have built a reputation for biological excellence in South Africa. This remains core to our values and is deeply important to our team of biological experts.

It is on these solid foundations, and through a united goal of influencing food production locally, throughout Africa and across the globe - that we join forces with Andermatt Biocontrol, the Swiss innovators who share our passion for changing the way food is grown. With more than 30 years in the biological industry and as global leaders in virus technology, Andermatt Biocontrol has an extensive footprint of subsidiaries that deliver expertise and precision to commercial and retail growers across the globe.



Madumbi's purpose, born 20 years ago, was rooted in the gift of giving - shifting mindsets and changing best practices in South Africa's commercial agriculture and retail sector.

Fuelled by the understanding that nature leads innovation and under the leadership of people who care about the environment, two like-minded organisations look ahead to an exciting future with solutions which are backed by science and loved by nature.

Michelle Lesur, Andermatt Madumbi CEO says 'Innovation will continue to be key in our approach to tackling complicated environmental and social challenges both globally and locally. Together we remain committed to improved food security and a vision for a world where food safety is no longer a concern.'

Together, we can contribute to a world where the sustainable delivery of healthy, nutrient-dense food to all our tables is achievable. We are more than just the sum of our parts. In moving forward, we bring together the precision of the Swiss clock, with the heartbeat of the African drum.

This is the new Andermatt Madumbi.

Product stewardship at FMC

FMC is a CropLife SA supplier member and deeply committed to product stewardship by promoting safe, sustainable and ethical use of their products along the product lifecycle. Product stewardship connects all the stages of the product lifecycle, from discovery to product use by the consumer and final disposal of the waste or empty containers.

By taking proactive stewardship actions at each stage of the product lifecycle, FMC aims to enhance its business sustainability.

As part of an FMC initiative to strengthen its product stewardship, in alignment with the company's sustainability goals, FMC South Africa has sponsored the construction of cages for empty agrochemical containers destined for recycling. FMC South Africa has partnered with key distributors throughout the country to construct cages in various areas. The first cage is located in Polokwane and is already being used. More cages will follow in Letsitele, Greytown, Dundee, Ixopo and Underberg.

Along with the construction of the cages, FMC's Area Managers provide training to farmers and agents on the best practices to be adopted when using crop protection products, the safe disposal of waste and the recycling of empty containers.

Food loss and food waste - How plant biotech is making a difference

Chantel Arendse
Lead: Plant Biotechnology

It is disturbing to know that each year one third of all the food produced globally is either lost or wasted. And this food waste is costing us more than just food. Not only is this an economic loss, but also a waste of all the resources that went into producing the food – such as water, land, energy, soil, seeds and other inputs. In addition, wasted food ultimately ends up in landfills where it is estimated to contribute to around 8% of human-related global greenhouse gas emissions, causing as much damage to our planet as plastic waste. Reducing food loss and waste is essential for food security and affordability, as we live in a world where millions of people still go to bed hungry every day.

In 2020 the Food and Agriculture Organisation (FAO) declared September 29th as the International Day of Awareness of Food loss and Waste (IDAFLW). As we observed the second IDAFLW in 2021, it was once again an urgent call to action for all individuals, public and private entities to accelerate our efforts to cut food loss and waste and ensure the resilience and sustainability of our food systems.

But what exactly is food loss and food waste?
According to the FAO, food loss refers to any kind of loss in quantity or quality of food along the supply chain before it reaches consumers; this typically covers production, transportation, storage and packaging. Current estimates indicate that up to 14% of food produced is lost in the production cycle as result of pre- and post-harvest losses.

Food waste on the other hand refers to food of good quality and fit for consumption, that is not eaten by consumers but is instead discarded or left to spoil or expire. The main contributors of food waste are consumers, retailers and restaurants. Sadly, it is estimated that in developed countries up to 230 million tonnes of food is wasted each year, equivalent to almost all the food produced in sub–Saharan Africa annually.

As this year's IFLFW day drew attention to technology and innovative solutions for food loss and waste, let's take a closer look at how plant biotech is making a difference.

Tackling the challenge of food loss
A planted field is the first place in the supply chain where food loss can occur. Looking specifically at the developing world, up to 50% of all crops are lost due to pests, crop diseases or post-harvest losses. With the right technology and innovations, farmers can improve their harvests.

Plant biotechnology is one such innovative tool that has delivered seed technology to farmers with traits offering resistance to insects, weeds and viral diseases. This has enabled farmers to significantly reduce their production losses making more food available and affordable to more families globally. The expansion of biotech crop technology to lesser known but equally important food staple crops, is another positive step. Already insect resistant (IR) varieties of cowpea are available to farmers in Nigeria, insect resistant eggplant is being grown in Asia and virus resistant cassava varieties will soon be available for cultivation in Kenya. Showing that it's not only the technology that's expanding, but also globally more farmers are benefitting by minimising their crop losses and maximising their yields.

But pests and disease are not the only problem. Food production within the new reality of climate change requires crops that are designed to be more resilient and able to withstand harsher growing conditions. Biotech is already responding to the climate challenge with crops in the pipeline designed to be more resilient to severe heat or cold, flood or drought conditions as well as soils with high levels of salt or metals enabling farmers to reduce crop losses even further during extreme climatic situations. Global crop losses would double each year if farmers couldn't utilise the many crop protection tools provided by plant science innovation.

Challenging the issue of food waste
In developed countries where food is plentiful, food waste at the retail and consumer level is significant. While food spoilage is largely to blame, a considerable percentage of perfectly edible food is rejected due to cosmetic reasons such as browning, bruising, or small imperfections in food appearance such as shape and colour. Here are some of the ways that biotech innovations are stepping in to tackle the food waste challenge.

An excellent example is arctic apples, developed in the U.S. Breeders have used genetic modification technology to reduce one of the chemical compounds that make apples go brown after slicing. The reduced browning of apples cuts down on food waste as they are less likely to be tossed in the bin. US company Simplot has developed the innate potato - a non-bruising, non-browning potato with an added food safety benefit of reduced acrylamide levels during cooking. Innate potatoes are helping both consumers and retailers to maximise the consumption and sale of fresh produce.

Other biotech innovations in the pipeline include delayed fruit ripening in climacteric fruits, such as apples, bananas, apricots, melons and tomatoes. Scientists are exploring different ways to control the ripening process by modifying the amount of ethylene produced in fruit. Delayed ripening technology will extend the shelf life of the fruits that we love to eat, reduce spoilage during transportation and storage and cut down the levels of rotten fruit being thrown away.

These examples demonstrate that biotech is a vital ally in the food waste challenge, providing some unique solutions to meet the demands of consumers and make our food systems more resilient.

Let's all be part of the solution

It's clear that we can't just rely on biotech innovation to make a difference. Food loss and food waste is not just an environmental, economic and social problem. It is also a human problem. So, in honour of IDAFLW lets all take urgent action to curb unnecessary food waste and the resources that go into producing it. Next time we take our trollies for a spin in the fresh produce section, let's be conscious of where our food comes from and how as individuals, we can be part of the food saving solution and not the food waste problem.

The critical role of pesticide maximum residue limits in market access and consumer confidence in potato producers

Principal author: Dr Gerhard Verdoorn
Contributors: Roleen la Grange, Dr Fienie Niederwieser and Desireé van Heerden
CHIPS – July 2021

Pesticide residues are unavoidable in all crops when these essential agricultural inputs are used to control potato pests, potato diseases and weeds encountered in potato production.

It is seldom possible to produce a crop without a residue of the applied pesticide, unless special measures are implemented to manage the residues down to below-detectable limits. A maximum residue limit (MRL) is set for all pesticides (including plant and insect growth regulants) that are registered in South Africa – and potatoes are no exception.

MRLs are published in a regulation by the Department of Health in terms of the Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act 54 of 1972). Potato producers are therefore legally required to only sell produce that meets the published MRLs of all pesticides used on crops. If potato producers follow label instructions for dosages, application timings, repeated applications, application intervals, and pre-harvest intervals, pesticide residues should be below or equal to the published MRLs at the time of harvest. CropLife South Africa's Agri-Intel is the perfect tool for potato producers to ascertain whether pesticides are registered for use on potatoes. It also offers a comprehensive data set on MRLs for local consumption and export markets.

Market requirements

Markets (buyers), processors such as chip manufacturers, retailers and consumers are meticulous about food safety, with a strong focus on pesticides that are used on foodstuffs. Problems that may arise with potato buyers, processors and consumers are as follows:

- If pesticides that are not registered for use on potatoes are applied, buyers, processors and retailers may reject such stock, which will be returned to producers or destroyed at their expense.
- Even if residues of such unregistered pesticides are below detectable limits, they will be within their rights to reject such potatoes.
- If pesticides registered for use on potatoes are not applied strictly according to label instructions – for example exceeding dosage rates, applying more frequently than advised, applying too late in the season (within the pre-harvest interval or during the pre-harvest interval), or any other deviation from label instructions – residues may very well exceed the published MRLs. Buyers, processors, and retailers analyse potatoes for pesticide residues and if the MRLs have been exceeded, they may reject these batches.

Unexpected residue exceedance
It is possible, though unlikely, that the MRL of a certain active ingredient may be exceeded even if producers follow label instructions strictly. In such cases, the potato producer must inform the registration holders of such pesticides immediately for investigation and further action on their part.

An example of such an incident occurred in 2015, when cyromazine residues on potatoes exceeded the South African MRLs. CropLife South Africa members, as well as the registration holders and Potatoes South Africa (PSA), collaborated to elevate the MRLs thereby solving the problem.

Market demands vs taking risks
Potato producers should only use pesticides that are registered for potatoes in South Africa and ensure that MRLs are not exceeded. Potato producers should also take note that the label is the only legal 'advisor' of a pesticide; neither consultants nor crop advisors may advise the use of a pesticide for any other purpose or in any other manner than instructed on the label.

If a potato producer uses a pesticide off-label, any negative consequence of such off-label use is for the account of the producer, even if the producer acted upon the advice of a third party.

The consequences of off-label pesticide usage may be far-reaching and can affect all potato producers in the country. Many producers export potatoes to other countries and a decision by such countries to prohibit import of South African potatoes because of misconduct with pesticides, will affect all South African potato producers.

Trade barriers
The trade in agricultural fresh produce is highly competitive. Certification agencies, buyers and export destinations use the slightest reason in an attempt to terminate trade agreements with countries like South Africa. It is also evident in the retail market that certain retailers mark their foodstuffs as chemical-free, among others. Should unacceptable pesticide residues be found in potatoes, trade may very well become a challenging issue for potato producers. The slightest hint of 'unsafe' potatoes, whether true or not, may also cause unfounded consumer resistance against potatoes and potato-derived products. This is something that producers can ill afford.

Sustainability of local producers
Potato producers have a responsibility towards themselves and their fellow producers to protect their commercial interest by only using pesticides that are registered for use on potatoes and by following label instructions meticulously to prevent unacceptable pesticide residues in potatoes.

Bt-gewasse – Toevlugte noodsaaklik om weerstand te voorkom

Niel Saayman,
Brand Republic namens CropLife SA
SA Graan - Julie 2021

Suid-Afrika is een van slegs agt lande in Afrika waar geneties gemodifiseerde gewasse (GM-gewasse) aangeplant mag word. Uit die 47 lande op die vasteland het produsente slegs in Suid-Afrika, Burkina Faso, Nigerië, Eswatini, Malawi, Kenia, Ethiopië en Soedan amptelike toegang tot hierdie belangrike landboutegnologie.

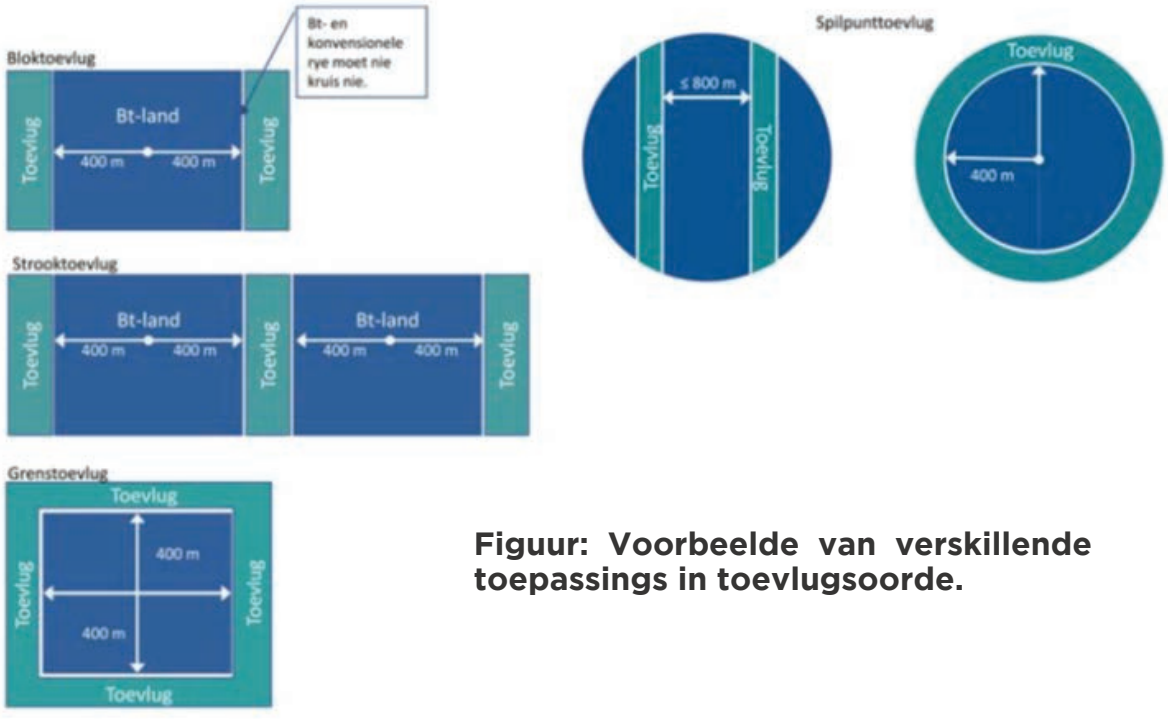
Dr Kingstone Mashingaidze, programbestuurder by LNR-Graangewasse, sê geneties gemodifiseerde organismes (GMO's) word geklassifiseer as enige organisme waarin genetiese materiaal van 'n ander organisme oorgeplant is, wat dit dan spesifieke karaktereienskappe gee.

Volgens Corné Louw, landbou-ekonoom van Graan SA, is 'n goeie aanduiding van die doeltreffendheid van GM-gewasse, veral GM-mielies, die vinnige aanvaarding van dié tegnologie sedert die 2000's. Corné sê tussen 80% en 85% van mielie-aanplantings in Suid-Afrika is met GM-saad, wat 'n kombinasie van die Roundup Ready-geen en Bt-gene bevat. Roundup Ready maak die gewas bestand teen glifosaatonkruiddoder en die Bt-gene gee die plant weerstand teen insekplae soos stronkboorder (*Busseola fusca*).

Daar is egter in 2006 vir die eerste keer weerstand teen Bt-mielies onder stronkboorderbevolkings aangeteken. Dit word toegeskryf aan die nienakoming van die toevlugsvereistes deur kommersiële produsente op die Hoëveld en veral in die besproeiingsgebiede en in die Oos-Vrystaat. In 2011 is 'n nuwe weergawe van die tegnologie in Suid-Afrika bekend gestel om stronkboorders met weerstand teen MON810 te beheer. Die nuwe MON89034 gee uitdrukking aan twee Cry-proteïene, naamlik Cry1A.105 en Cry2Ab. Hierdie proteïene, wat die plant self vervaardig, is onverteerbaar vir die stronkboorderlarwe en indien die larwe aan die plant vreet, vrek dit. Dié proteïene het geen invloed op enige ander insekte, diere of die mens nie.

Die weerstandigheid wat in 2006 aangeteken is, het beklemtoon hoe belangrik dit is dat die tegnologie deur produsente beskerm word. 'n Onafhanklike landboukonsultant, Andrew Bennett, sê dit kos saadmaatskappye meer as $136 miljoen om nuwe gene te ontwikkel en in saad in te bou – en dit neem tot 13 jaar om te ontwikkel. Indien die teikenpes weerstand opbou, moet ontwikkelingswerk van voor af gedoen word.

Dr Sybrand Engelbrecht, 'n landboukonsultant wat saam met saadmaatskappye werk om produsentevoorligting te doen, sê dit is uiters belangrik dat produsente streng by die vereistes van die tegnologie-ooreenkoms hou wat hulle onderteken wanneer GM-saad aangekoop word. Volgens die ooreenkoms moet 'n produsent minstens 5% van sy aanplantings toewy aan konvensionele saad, in sogenaamde toevlugsoorde. Toevlugsoorde is gedeeltes in 'n land waar peste soos stronkboorders onverstoord kan voortbestaan om te verseker dat daar altyd 'n bevolking is wat vatbaar bly vir die Bt-tegnologie. Daar is verskeie vereistes waaraan hierdie toevlugsoorde moet voldoen.



Figuur: Voorbeelde van verskillende toepassings in toevlugsoorde.

Dr Engelbrecht verduidelik dat produsente hierdie vereistes, wat nie eers so ingewikkeld is nie, beslis nie gering moet ag nie:

- Vir elke 100 ha wat met GM-mielies beplant word, moet 5 ha uit konvensionele mielies bestaan wat nie die Bt-gene bevat nie.
- Die toevlug moet rondom die GM-aanplantings gedoen word. Dit moet onder dieselfde agronomiese toestande wees.
- Besproeiingslande asook droëlandaanplantings moet elk hul eie toevlugsoord hê.
- Toevlugsoordaanplantings moet binne sewe dae van die GM-aanplantings gedoen word sodat die plante regdeur die seisoen in dieselfde groeistadium is.
- Die mot van die stronkboorder moet nooit verder as 400 meter hoef te vlieg om 'n toevlug te bereik nie. Dit wil sê dat toevlugte 800 meter uit mekaar kan wees (sien Figuur 1 op bladsy 59).
- Toevlugsareas mag nie teen Lepidoptera-peste bespuit word met chemikalieë wat die Bt-geenwerking het nie.

Jaco Minnaar van die plaas Uitsny, naby Hennenman in die Vrystaat, boer onder meer met witmielies onder droëlandtoestande. Hy pas verskillende bewerkings op sy lande toe, van geenbewerking tot skeurploeg in die ry, afhangend van die grondtipe. Jaco sê Bt-mielies is 'n groot deel van sy plaagbeheerstrategie, veral later in die seisoen. Hy sê die Bt-tegnologie het 'n merkbare verskil aan sy bespuitingkoste gemaak. Hy volg die 5%-toevlugreël en plant die kopkante van sy lande met konvensionele mielies. Hy sê gedurende 'n normale jaar met min stronkboorderdruk, is daar nie werklik 'n opbrengsverskil tussen die GM- en konvensionele mielies nie en hy is heeltemal tevrede om dit aan te plant. Jaco sê stronkboorder kan groot skade aanrig indien die toestande reg is en Bt-mielies bied groter gemoedsrus. Hy beklemtoon egter dat dit produsente se verantwoordelikheid is om die tegnologie te beskerm.

Danie Bester boer onder meer met geelmielies in die Balfourdistrik van Mpumalanga. Hy doen geenbewerking en GM-mielies bied aan hom 'n "veiliger manier om teen die stronkboorders te baklei". Danie gebruik selfstuur op sy trekkers en ry-vir-ry-beheer op sy planter en plant sy toevlugsoorde eerste. Daarna volg hy dit op met Bt-aanplantings. Danie meen die tegnologie is goeie waarde vir geld en indien weerstand teen die geen opbou en produsente nie meer dié voordeel het nie, daar beslis opbrengsverliese sal wees.

Dr Engelbrecht sê ongeveer 90% van kommersiële produsente voldoen aan die vereistes om toevlugte te plant, maar beklemtoon dat die oorblywende 10% van produsente die hele bedryf bloot stel aan die risiko dat stronkboorders weerstandig kan word teen die huidige tegnologie. Volgens dr Mashingaidze geniet Suid-Afrika voedselsekerheid juis omdat plaaslike produsente, anders as die meerderheid van ons buurlande, toegang tot GM-gewasse het. Hierdie tegnologie moet tot elke prys beskerm word.

Formulering belangrik vir werking van middels

Dr Gerhard Verdoorn
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Augustus 2021

Suid-Afrika, soos die meeste ander lande ter wêreld, beskik oor 'n groot getal geregistreerde gewasbeskermingsmiddels wat vir die beheer van plantplae, plantsiektes en onkruide gebruik word. Die omvang van die verskeidenheid middels is soms verwarrend, want hoekom is daar byvoorbeeld tientalle verskillende handelsmerke van glifosaatbevattende onkruiddoders?

Vryemarkekonomieë floreer juis vanweë onbeperkte, dog goed gereguleerde, industrialisasie en dit skep die geleentheid vir enige individu of maatskappy om in die gewasbeskermingsbedryf te belê.

Daar is geen beperking op iemand om 'n glifosaatbevattende onkruiddoder te ontwikkel en te bemark as daardie middel wel geregistreer word nie. Kompetisie is gesond – dit hou 'n vinger op die pols van pryse, veral van generiese gewasbeskermingsmiddels. Produsente kan gevolglik billike pryse vir sulke middels beding en betaal.

Verskille tussen soortgelyke gewasbeskermingsmiddels

Ten einde die argumente verstaanbaar te maak, word glifosaat steeds as voorbeeld gebruik. Daar bestaan 'n beginsel van ekwivalensie wat kragtens die Wet op Misstowwe, Veevoedsel, Landboumiddels en Veemiddels, 1947 (Wet Nr. 36 van 1947) gevestig is. Dit beteken dat twee onafhanklike gewasbeskermingsmiddels wat dieselfde aktiewe bestanddeel teen dieselfde konsentrasie in soortgelyke formulerings besit, wel as ekwivalent beskou mag word.

Daar skuil egter 'n paar geheime agter die meeste landboumiddels en dit lê in die totale samestelling daarvan wat hulle doeltreffendheid, gewasveiligheid, die afbraakkurwe van die aktiewe bestanddeel en menslike sowel as omgewingsgesondheid van matig tot drasties mag beïnvloed. Uit die oogpunt van die wetenskaplike – chemikus, mikrobioloog (onthou biologiese gewasbeskermingsmiddels) en selfs fisikus – kan geen twee soortgelyke landboumiddels as identies beskou word nie. Daar is net te veel parameters wat opgeweeg moet word en presies dieselfde moet wees vir twee onafhanklike middels om identies te wees.

Rol van die aktiewe bestanddeel

Die aktiewe bestanddeel is die belangrikste komponent van die gewasbeskermingsmiddel, want dit is die komponent wat die taak namens die produsent verrig om die plaag, patogeen of onkruid aan te val en te beheer. Sonder 'n aktiewe bestanddeel is die mengsel bloot nie 'n gewasbeskermingsmiddel nie. Aktiewe bestanddele, hetsy chemies of biologies van oorsprong, moet in streng gekontroleerde aanlegte vervaardig word. In die geval van die meeste chemiese middels, word aktiewe bestanddele gesintetiseer deur basismolekules aan 'n reeks chemiese transformasiereaksies te onderwerp totdat die verlangde aktiewe bestanddeel verkry is.

Natuurlike chemiese middels, soos abamektien en asadiragtien, word met ingewikkelde prosesse uit die mikrobes en plante geëkstraheer wat hulle as sekondêre metaboliete natuurlik sintetiseer en dan na die hoogste moontlike graad gesuiwer. Biologiese gewasbeskermingsmiddels, soos *Bacillus thuringiensis*, word in steriele toestande gekweek en dan gesuiwer van die kweekmediums waarin hulle gekweek word.

Al hierdie prosesse verg diepgaande wetenskaplike en tegniese kundigheid en vaardighede om die aktiewe bestanddele – of tegniese materiaal soos dit ook bekend staan – te vervaardig of uit lewendige organismes voort te bring.

Geen aktiewe bestanddeel is ooit 100% suiwer nie; daar is meestal een of ander vorm van onsuiwerheid of kontaminant, alhoewel in 'n baie klein persentasie. Die regulatoriese vereiste belas die vervaardiger van die aktiewe bestanddeel om alle onsuiwerhede te identifiseer en te kwantifiseer. Dit is noodsaaklik om te verseker dat sulke onsuiwerhede nie risiko's vir die omgewing of gewasse inhou nie.

'n Goeie voorbeeld is die debakel wat dekades gelede in Viëtnam met die gebruik van 2,4-D en 2,4,5-T ontstaan het. Die mengsel van twee onkruiddoders wat as ontblaringsmiddel gebruik is, was met kankerwekkende dioksiene gekontamineer. Dít het 'n uiters groot risiko vir mense ingehou, alhoewel die twee onkruiddoders feitlik skadeloos vir mense is. Maatskappye wat gewasbeskermingsmiddels in Suid-Afrika wil registreer, moet met behulp van die

sogenaamde vyflot-analise bewys dat die tegniese materiaal of aktiewe bestanddele herhaaldelik deur die vervaardigers voorsien kan word met dieselfde graad van suiwerheid (met ander woorde alle komponente reeds geïdentifiseer en gekwantifiseer) en in dieselfde graad van kwantiteit (dit wil sê dieselfde konsentrasie). Dit is ook waarom 'n registrasiehouer van 'n bepaalde landboumiddel ingevolge Wet Nr. 36 van 1947 die aktiewe bestanddeel slegs vanaf goedgekeurde vervaardigers, ook bekend as bronne, mag aankoop. 'n Goeie vervaardiger se proses is gewaarborg om altyd 'n aktiewe bestanddeel van dieselfde gehalte te lewer.

Die rol van die formulering

Weinig aktiewe bestanddele word as suiwer gewasbeskermingsmiddels aan die mark voorsien, met die uitsondering van byvoorbeeld dichlorovos en 'n paar ander wat as 100% aktiewe bestanddeel voorsien word. Die oorgrote meerderheid aktiewe bestanddele word in 'n formulering met ander koformulante, ook inerte komponente genoem, vermeng om 'n geskikte landboumiddel vir produsente daar te stel. Selfs biologiese middels soos Trichoderma en *Bacillus* word geformuleer en nie net so beskikbaar gestel nie.

Die inerte komponente van landboumiddels sluit 'n wye verskeidenheid chemiese stowwe in. Een van die hoofkomponente in vloeibare gewasbeskermingsmiddels is die oplosmiddel/s wat water, ligte mineraalolies of selfs plantaardige olies mag wees. Daar is 'n legio oplosmiddels beskikbaar, terwyl verdunningsmiddels of basismiddels soos byvoorbeeld gips, kalsiet, dolomiet of talk gebruik word in droë formulerings.

Bindmiddels en verspreidingsmiddels is uiters belangrik om die aktiewe bestanddeel in gewasbeskermingsmiddels effektief oor die geteikende oppervlakte te versprei en dit daar te bind ten einde hul funksie te verrig. Vloeibare middels kan emulsifiseerders, suspensiemiddels, fase-oordragreagense en stabiliseerders bevat om die gewasbeskermingsmiddels oor lang periodes in 'n stabiele toestand te hou.

Heelwat formulerings bevat pigmente of kleurstowwe om bepaalde kleure aan die middels te gee. Veiligheidsreagense soos 'n emitikum (braakmiddel) of denatoniumchloried (geweldige bitter middel) word verder dikwels by uiters giftige gewasbeskermingsmiddels soos parakwat en knaagdierdoders gevoeg om noodlottige inname per mond te voorkom. Vir korrel- en vloeibare poeierformulerings is 'n middel om samekoeking van die onderskeie partikels te voorkom, meestal nodig.

'n Gewasbeskermingsmiddel se formulering kan die middel maak of breek. As die formulering nie die aktiewe bestanddeel sy funksie ten volle laat verrig nie, is die middel van geen waarde vir die produsent nie. Daar is soms gevalle waar die formulering bloot nie reg aan die aktiewe bestanddeel laat geskied nie. Produsente kom dit vinnig agter as die middel nie na wense werk nie. Sommige gewasbeskermingsmiddels kan heelwat duurder as ander middels met dieselfde aktiewe bestanddeel wees, moontlik omdat die koformulante of bymiddels van so 'n aard is dat dit buitengewone goeie werksverrigting aan die aktiewe bestanddeel verleen. Registrasiehouers voeg ook soms bindmiddels by om te verseker dat die spuitmengsels binne 'n kort tyd reënvas op die teiken is en nie deur reën of oorhoofse besproeiing afgewas sal word nie.

Fisiese eienskappe van gewasbeskermingsmiddels is 'n direkte funksie van hul formuleringsamestelling. Enige samestelling van stowwe het altyd 'n stel fisiese eienskappe wat aan bepaalde standaarde moet voldoen. Daardie standaarde word wêreldwyd aanvaar as dit wat deur die Verenigde Nasies se Organisasie vir Voedsel en Landbou (FAO) beskryf is. Eienskappe soos vloeibaarheid, mengbaarheid, oplosbaarheid, suspendeerbaarheid, partikelgrootte, kleur en reuk is alles die formuleerder se verantwoordelikheid.

Hoe beter die formulering, hoe langer sal die gewasbeskermingsmiddels stabiel bly. Gewoonlik word 'n raklewe van twee jaar aan 'n landboumiddel toegeken, maar as daardie middel se formulering vir een of ander rede nie volgens spesifikasie is nie, sal die raklewe noodwendig korter wees. Dit beteken dat die onderskeie komponente van die formulering kan skei en dat die aktiewe bestanddeel sedimenteer, wat doodsake vir 'n gewasbeskermingsmiddels is.

Mengbaarheid en versoenbaarheid
Gewasbeskermingsmiddels se etikette dui aan met welke ander middels dit versoenbaar is. Ongelukkig slaan sommige gewasadviseurs en produsente nie ag op etiketaanwysings nie en maak skrikwekkende tenkmengsels aan, wat die effektiwiteit van die middels ernstig kan benadeel of totaal kanselleer. Produsente moet altyd mengbaarheidsvoorskrifte op etikette lees en dit streng navolg.

Daar is 'n ongewenste standaardpraktyk om piretroïedinsekdoders met glifosaat te meng en dan net voor plant aan te wend ten einde opslagonkruid en snywurms te bekamp. Benewens die droë plantmateriaal wat op bewaringsbewerkingslanderye agterbly en feitlik alle spuitmengsels opslurp sodat dit nie teikens bereik nie, is baie van die gewasbeskermingsmiddels wat so vermeng word nie versoenbaar nie en verminder dit die effektiwiteit van die onderskeie middels.

'n Goed aangepaste spreekwoord is "goedkoop spuit is duur spuit" en is van toepassing op sulke ongeregistreerde tenkmengsels. Aangesien die onderskeie registrasiehouers nooit hul formulerings saam op die proef gestel het nie, hang daar 'n groot vraagteken oor die versoenbaarheid van sulke middels.

'n Laaste knelpunt: raklewe
Soos reeds genoem, is die sogenaamde raklewe of stabiliteitstydperk van 'n gewasbeskermingsmiddel 'n direkte funksie van die middel se formulering. Natuurlik sal die gehalte van die formulering 'n bepalende rol in die langdurige stabiliteit van die middel speel. Swak geformuleerde middels se onderskeie koformulante skei baie maklik uit; dit kelder die suksesvolle werking van die aktiewe bestanddeel al sou die konsentrasie van die aktiewe bestanddeel steeds binne spesifikasie wees.

Middels wat formulerings met emulsie-olie in water (EW) en suspensiekonsentraat (SC) is, is meer geneig om te verval as byvoorbeeld oplosbare formulerings (SL). Dit is dus noodsaaklik dat alle gewasbeskermingsmiddels in koel, droë omstandighede geberg word sodat hoë temperatuur en vogtige toestande nie die formulerings kompromitteer nie.

Wanneer spuitmengsels voorberei word, moet die totale gewasbeskermingsmiddelhouer eers deeglik geskud word voordat dit na die maatbeker oorgegiet word om te verseker dat die formulering homogeen vermeng is. Indien dit nie gedoen word nie, bestaan die risiko dat die aktiewe bestanddeel onder in die houer versamel en nie eenvormig in die formulering vermeng is nie.

Gewasbeskermingsmiddels wat naby die einde van hul raklewe kom, kan weer aan toetse onderwerp word om te bepaal of dit steeds binne die chemiese en fisiese spesifikasies is. Kontak die registrasiehouers vir sulke ondersoeke.

Integrated strategies needed to protect future crops

Elriza Theron
Grain SA
Nampo edition

If we consider how plant science has evolved over the last 30 years, we can only expect tremendous innovations in crop protection technology in the years to come – on an exponential scale. Just take the amount of active ingredient required today versus the 1960s as an example. Where producers had to apply kilograms per hectare then, it is now as little as grams per hectare in some instances.

The future of crop protection no doubt lies in the principles of integrated pest management (IPM), which means that there is no single crop protection strategy that will be the silver bullet, but rather a combination of various suitable strategies or techniques to keep pests, diseases and weeds below levels that cause unacceptable crop loss. These different strategies are usually placed under the main headings of mechanical, cultural, sanitation, biological and chemical methods of pest management.

New ranges of crop protection products that include natural and synthetic chemicals as well as microbiological and macrobiological organisms, require a paradigm shift. Producers need to integrate all these new tools, including information technology, into an integrated strategy to be able to sustain their farming operations.

Biologicals
As technology improves, it is becoming easier to discover more targeted, safer and effective biologicals. The biological market is very dynamic and has grown by more than 500% over the past ten years, meaning that increased investment is leading to further research and development. Some laboratories have over a hundred thousand frozen microbial strains in their culture collections, and they are continuously uncovering new potential benefits.

Plant breeding
Because of our increased understanding of plant physiology, molecular biology and genetics, plant breeding tools continue to evolve. Current examples include gene or genome editing (CRISPR/Cas 9 and site-directed mutagenesis) and cisgenesis. These technologies are imperative to address issues such as food security and climate change.

With regard to food security, plant breeding innovation assists in being able to produce affordable, more nutritious food with consistent quality and longer lasting freshness, meaning less food waste. Future biotech traits to address environmental stresses include varieties with improved nitrogen fixation, heat-tolerant varieties of rice and wheat, salt tolerance in rice, as well as varieties with improved yield stability.

RNAi
RNAi is a natural biological process that can be used to 'turn down' the expression of certain genes and has many potential applications, including to prevent pests and diseases from destroying crops. One application that researchers are working on is an option to spray the RNAi onto canola crop leaves to protect them from the canola flea beetle. The pest consumes the leaves and it then specifically turns down a gene that is required for feeding, thereby protecting the crop. Another very exciting application is in honeybee health, where the technology can be used to turn down a gene in the Varroa mite that reduces its ability to infect and cause damage to the bee.

Because approximately a third of our crops are pollinated by bees, it goes to say that if we can protect them, we protect our crops as well. Besides the specificity of the technology, the fact that it is naturally present in the environment is another useful aspect, meaning that it gets recycled by microbes very quickly.

Formulations
The formulation of a crop protection product is a combination of 'inert' ingredients that are added to the active ingredient to improve its efficacy, safety and deliverability – in other words, the formulation is the 'delivery system' of an active ingredient. Plant scientists are increasingly using 'micro-encapsulation', a type of formulation that can trigger an active ingredient into action in specific ways, for example by temperature or by exposure to sunlight. The rate of the active ingredient being released can also be controlled, such as releasing it faster or slower.

Computer chemistry
Artificial intelligence has become a powerful ally in the development of agricultural technologies, of which agrochemicals are no exception.

Computers can help in not only reducing the time and cost of developing pesticides, but also to make them safer. Instead of using plastic models to make up molecules and through a time-consuming process establish how each molecule might interact with a target protein, chemists can now use machine learning and artificial intelligence to run a series of simulations.

This gives researchers insight into how a pesticide might interact with target or non-target pests or how it might impact the environment. As technology advances, so do the possibilities for improvements, some of which include a further reduction in the amount and toxicity of active ingredients needed, combatting resistance and ensuring the design behind the pesticide interaction is as precise and effective as possible.

Diagnostic apps
Many diagnostic apps are being developed to capture and record field data to help producers determine if they need to use a pesticide, what the best treatment is, how to apply it and how to avoid resistance to the pest building up. In addition to offering producers real-time assistance, trends can also be picked up and predictive models created so that producers can receive early warning alerts about possible pest threats to their crops. As more and more data get collected, the predictive ability becomes more accurate, which will become an invaluable tool for producers as growing conditions become less predictable.

Drones
Drones can help producers collect vital information about their crops, helping them understand which crop protection products and nutrients they need, in what amount, and where and when to use them. They are also showing promise as a way of applying crop protection products that are registered for aerial application. Because of targeted application, drones can deliver the active ingredient exactly to where it is needed on the plant and it also uses up to 90% less water, which is an important benefit for a water-scarce country such as South Africa.

As we face a global challenge of feeding a growing population in a continuously changing environment, these are just some of the ways in which the crop protection industry is innovating to provide producers with the tools that allow them to be productive, not only now, but into the future.

Pesticide behaviour in soil: Adsorption, mobility and leachability

Dr Gerhard Verdoorn
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August 2021

A pesticide molecule is hardly ever dispensed as a pure compound. It is mostly formulated with other substances such as solvents, stabilisers, spreaders and emulsifiers to take the molecule to the required point of activity, but it is the molecule itself that does the job. Each molecule (and there are more than 10 million organic molecules known to science) is totally unique in its properties and environmental fate. Scientists cash in on that uniqueness of each molecule to perform certain functions.

Solubility and bioaccumulation
For the sake of explanation, a couple of well-known molecules will be used to explain how the physical chemistry of molecules determine their performance and environmental fate. Any molecule of whichever chemical group is soluble in every solvent – the solubility ranges from a few micrograms per litre to a few hundred grams per litre of solvents.

Since water is the principal carrier medium for pesticide spray mixtures and the 'liquid of life', focus will be placed on the water solubility of pesticides. Along with that goes something

called water-octanol partition coefficient or K_{ow}, which is a parameter used to categorise a molecule in terms of its potential to bio-accumulate in the environment. The fact that a molecule is highly soluble in water does not mean it will automatically leach easily, because other factors such as soil adsorption also play a very important role in the molecule's environmental fate.

Glyphosate for example, has a water solubility of 10,5 g/ℓ, while deltamethrin is only soluble in water at less than 0,2 µg/ℓ. 2,4-D is soluble at 20 g/ℓ water at neutral pH and much higher at 34 g/ℓ at pH 9. So even the acidity or alkalinity of the water has an influence on the molecule's water solubility. Chlorpyrifos is only soluble in water at 1,5 mg/ℓ. Most of these organic molecules (organic means molecules built on a carbon skeleton with hydrogen, oxygen, sulphur and other elements like chlorine) have much higher solubility in organic solvents such as alcohols and chlorinated alkanes like chloroform. Chlorpyrifos, for example, is soluble in 6 300 g/ℓ methanol.

The main issue for agriculture, however, still lies in water solubility, because pesticides are applied to crops or soils from where it may leach if it is highly soluble in water. The K_{ow} has to be taken into consideration: the higher the octanol solubility of the molecule compared to its water solubility, the better the chances of it bio-accumulating in plants and animals. Organochlorine molecules like the old DDT and dieldrin have a very low water solubility and a very high octanol solubility. This means the molecules are lipid (fat) soluble, making their bio-accumulation potential very high.

The water solubility of pesticides is sometimes regarded as a reason for their presence in the aquasphere (any water body), but other factors may prevent some molecules from entering the aquasphere. Those factors are discussed below.

Soil adsorption, soil mobility and leachability
Molecules can be classified as highly polar, medium polar or of low polarity and the polarity relates to their molecular structures. Polarity plays a very important role in how molecules behave in the lithosphere (the soils and rocks, meaning the solid geomorphology of the earth's surface). Soil structure and minerals also play a significant role in how molecules behave in soil.

Soils are broadly categorised into sandy soils, loam, and clay soils – with each of these having different minerals and structure. Sandy soils contain a high percentage of silica, which does not have a high affinity for adsorbing polar molecules. The term adsorption means the physical process in which a molecule binds onto the surface of a particle. It is vastly different from absorption, which is the ability of soil to 'soak up' substances such as water.

Clay particles, consisting of clay minerals like kaolin and montmorillonite, have a very high affinity to adsorb polar molecules. That is why soil applied preemergence herbicides indicate different dosage rates for different clay percentages in soil. The herbicide is applied to the soil and adsorbed on the surfaces of clay particles, which inactivates the herbicides by binding them virtually irreversibly to their surfaces.

Those molecules may still sit there, but are not biologically available to control weeds. Molecules such as paraquat dichloride and glyphosate, that reach soil while being sprayed as contact herbicides onto weeds, suffer the same fate. On top of that, they are not absorbed by the roots of weeds. Over time these clay-adsorbed molecules are decomposed by solar radiation, high temperature and soil-borne microbes, but the time frame may be decades.

Does this pose any risk to plants? Not really, especially for contact herbicides such as paraquat dichloride, glyphosate and glufosinate ammonium, because they are not root absorbed. However, others such as acetochlor and 2,4-D are slowly released from clay particles while also being slowly decomposed as explained for the others.

Molecules that are very strongly adsorbed by soil clay particles have a low leachability due to their low soil mobility. On the other hand, there are molecules such as the organochlorines that leach easily, because they are not bound by clay particles in the soil. They can, however, remain in the soil for many years because their water solubility is very low and they do not leach out easily.

Loam soils are less prone to pesticide binding, while sandy soils are like sieves, with water filtering through and disappearing into other zones. Sandy soils also normally have little biological activity to aid the decomposition of pesticide residues. Their production potential is also limited by their inability to retain nutrients, unless vast quantities of organic matter are worked into the soil. A little bit of clay in sandy soils is beneficial, because it retains moisture and helps to bind soil-applied pesticides so that they are not leached out by normal precipitation.

Soils may have a 'pesticide memory'

It is highly likely that most crop fields – and even veld and grazing areas – have a pesticide memory. That memory is the residues of pesticides that were applied any time from 50 years ago to the present. As time goes by, the soil slowly releases the pesticide residues. The Karoo region has a gamma-BHC memory from the massive quantities of this persistent organic pollutant pesticide that was dispensed by the state over four decades to control the brown locust.

A scientist who understands pesticide behaviour and environmental fate can easily determine how long ago the pesticide was applied to the area which is sampled for analysis. Some of the cash crop fields have memories of neonicotinoids and fungicides that are used as seed dressings due to the year-on-year planting of the same crop with the same seed dressings. It is even likely that most soils have a glyphosate memory due the general use of this herbicide. The question is whether the pesticide memory poses any health risk to people and the environment. That is a debate for another day. However, producers must remember to use all pesticides according to the label instructions – not only for human health and environmental safety, but also for the sake of their own crop safety.

Biotech crops – Transforming agriculture

Chantel Arendse
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Many years of human intervention, either through domestication of wild species or selective breeding, has given us the food crops that we eat today. However, advances in plant science based on our improved understanding of genetics, has accelerated crop improvement to become a more exact science with the deployment of plant biotechnology tools, such as genetic modification (GM). Biotech crops, genetically modified crops or genetically modified organisms (GMOs) are the common terms used to describe plants that have been improved with this technology, which generally involves making targeted changes in the plant's genetic code to promote beneficial characteristics.

Here are some of the ways that biotech crops are transforming agriculture and making a difference to farmers, consumers and environment.

Benefitting farmers

While genetic modification technology has been around for almost 30 years, biotech crops on the market have been dominated by input traits that assist farmers improve their production efficiencies by minimising crop losses due to pests and diseases. These have primarily included traits that confer resistance to targeted insects, provide tolerance to specific herbicide applications and resistance to various diseases.

The global adoption of biotech crops with input traits, including here in South Africa, has given farmers the advantage, by helping them fight pests and diseases, improve crop yields and ensure a more efficient and sustainable means of growing our food.

Further afield, the technology is catching up to also protect against pests and diseases that undermine yields in lesser-known food staple crops. This has included the successful introduction of Bt eggplant varieties in Asia as well as the more recent approval of Bt cowpea in Nigeria, thus ensuring that developing nations and their farmers have access to innovative tools to ward off pest threats and improve their food security status.

But pests are not the only problem. Significant progress has also been made to address plant viruses as a contributor to yield losses in several key crops. Biotech crops on the market with resistance to viruses include papaya ringspot resistant varieties that played a significant part in saving the papaya industry in Hawaii.

Other notable developments on the African continent include modified resistance in cassava to two viral diseases namely Cassava Brown Streak Disease (CBSD) and Cassava Mosaic Disease (CMD), which very recently was given the greenlight for cultivation in Kenya.

Considering that cassava is an important food security staple in East Africa, developments in Kenya should encourage other countries on the continent to reconsider and adopt a more scientific and pragmatic approach towards deploying biotech crops as a tool to boost agricultural output.

Benefitting Consumers

Improved production efficiencies of farmers with the cultivation of biotech crops have not only brought benefits to agriculture, but significant increases in yield have also ensured that consumers have continuous access to an affordable and safe food supply. In addition, better production practices linked to biotech crops have translated into food being produced more sustainably, using less land and inputs with reduced environmental impact. Therefore, giving some reassurance to consumers with concerns about how their food is produced and its impact on the environment.

But are there any biotech crops that directly address consumer needs? Indeed, there are crops on the market with enhanced nutritional qualities as well as those that limit food spoilage and waste. Biotech foods with nutritional enhancements include canola and soybean with higher levels of healthy fats, like omega-3 fatty acids, as well as “golden rice” varieties with extra beta carotene to prevent vitamin A deficiency in developing nation populations.

Other ways that biotech crops are helping to address consumers needs is by removing undesirable characteristics to ensure that some of our fruits and vegetables last longer. Examples include arctic apples, which do not turn brown after slicing, as well as the innate potato - a non-bruising, non-browning potato with an added food safety benefit of reduced acrylamide during frying. By improving the manner in which we grow our crops, as well as improving the nutritional quality, safety and shelf life of our foods, this technology is helping to shape the way we think about the food that we eat.

Future prospects
Looking ahead, biotech crops of the future will need to be more precise and effective to address the unpredictable challenges that threaten our food supply. There are currently many different biotech crops with new traits under development and while it is not possible to know exactly when these crops will enter the market, they will without question be invaluable for the future of agriculture.

With increased pest and disease pressure due to changing climate, future resistant management traits will need to be more effective against a growing list of damaging pests and diseases to mitigate yield losses and secure the future of our food. As droughts, floods and heatwaves intensify and become the norm, climate resilient crops will also play an important role. Various research efforts are underway to bring biotech crops to market with traits for drought tolerance, heat stress, cold and salt tolerance, making crops more adaptable to survive under these extreme climatic conditions. Biotech traits that help crops grow in areas with marginal soils are also on the horizon. Staple food crops such as wheat, maize and rice are already being adapted to improve their efficiency of nitrogen uptake, helping to reduce the use of nitrogen fertilisers and their environmental impact.

Apart from applications in agriculture and the environment, future innovations will also focus on consumer needs. As the science develops, so too will the technology, by exploring innovative ways of making our food even more nutritious, stay fresher for longer, with less allergens and added immune boosting properties.

The possibilities are endless with biotech crops, but only time will tell whether future innovations will reach farmers' fields where they are most needed and make their way on to the supermarket shelves. The crops of the future may not look very different from the ones that we eat today, but the innovative technologies being used to transform agriculture and our food supply, will play a significant role in boosting production efficiencies of farmers and helping to secure enough food now, and into the future.

Wetgewing oor leë plaagdoderverpakking is oppad

Dr Gerhard Verdoorn
AgriAbout
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Dwarsoor die wêreld heen is plastiekbesoedeling 'n knaende gonswoord wat omgewingskundiges bekommerd maak oor die veilige voortbestaan van byvoorbeeld mariene organismes wat deur plastiekbesoedeling bedreig word. Plaagdoderplastiek is nog een erger as gewone plastiek omdat dit met gevaarhoudende stowwe besoedel mag wees wat verder as net plastiekbesoedeling die aarde bedreig.

Gelukkig is die plastiek van meeste plaagdoderverpakkings hoë-digtheid poliëtileen (HDPE) of polipropileen (PP) wat gesogte materiale by plastiekverwerkers is. Die grootste uitdaging lê daarin om die verpakking sodanig te reinig dat die plastiek nie meer gervaarhoudend is nie en veilig ingesamel, vervoer en verwerk kan word.

CropLife Suid-Afrika het riglyne saamgestel vir naas elke tipe verpakking se deeglike reiniging sodat dit weer in die plastiekstroom opgeneem kan word en besoedeling uitskakel. Daar is tans meer as 115 CropLife SA gesertifiseerde verwerkers wat plaagdoderverpakking inneem en verwerk en tussen hulle het hulle tydens 2020 (ondanks die groot negatiewe uitwerking van die Covid-19 epidemie) meer as 76% van alle HDPE houers ingesamel en verwerk. Daar is bitter min ander lande wat dit oortref het behalwe waarskynlik Brasilië en Australië. Europa is, sover ons kennis strek, baie ver agter Suid-Afrika wat die herwinning en verwerking van leë plaagdoderverpakking betref.

CropLife SA en die netwerk van gesertifiseerde verwerkers werk hard daaraan om teen die einde van 2021 meer as 85% van alle plaagdoderverpakking in te win en te verwerk.

Die groot uitdagings met insameling en verwerking van leë plaagdoderverpakking
Die grootste kopseer lê maar altyd by die mens: sommige individue is oningelig en ongewillig om leë plastiekplaagdoderhouers drie maal te spoel sodat dit totaal vry van plaagdoderresidue is. Mens staan verstom as jy by 'n plaas verbyry en daar brand 'n berg leë houers!

Dit is nie net onwettig nie, maar dit ontneem iemand anders die geleentheid om 'n lewe uit skoon gespoelde leë plaagdoderhouers te maak. CropLife SA se slagspreuk *"It's the right thing to do"* is al baie goed by meeste van die uitvoerprodusente gevestig want hulle word deur Global.G.A.P. ge-oudit oor, onder andere, die beveiliging en herwinning van leë plaagdoderverpakking.

Ons grootste uitdaging lê by die graanbedryf waar 'n groot persentasie produsente nog nie aan die herwinning van leë houers deelneem nie. Dit is deels omdat hulle dikwels nie deur gewasadviseurs daaroor ingelig is nie, en deels omdat daar nog nie genoeg versamelpunte landswyd beskikbaar is nie. CropLife SA probeer sy bes om nuwe versamelpunte te skep en daar behoort teen die einde van 2021 meer as 130 landswyd beskikbaar te wees.

Die vraag is hoe die plantbeskermingsbedryf die boodskappe oor drie-maal spoel en herwinning by die landbougemeenskap uitkry en deel van die daaglikse operasionele bedrywighede op die plaas maak? Produsente moet hul CropLife SA geakkrediteerde gewasadviseurs daaroor takel en vereis dat al die inligtingstukke soos deur die bedryfsorganisasie saamgestel, aan produsente beskikbaar gestel word.

CropLife SA het riglyne oor drie-maal spoel, plakkate in sewe landstale, 'n lys van al die CropLife SA gesertifiseerde verwerkers wat leë houers inneem, gereelde onderhoude op landbou radioprogramme en televisieprogramme en CropLife SA se hulplyn naamlik 082-446-8946 vir enige navrae.

Eenvoudige skoonmaakprotokol
Meeste gewasprodusente maak van meganiese toediening van plaagdoders gebruik, met ander woorde trekker-aangedrewe spuitapparaat wat volgens alle inligting van die mees modernste op die aarde is. Wanneer die plaagdoderhouers se volume op sy einde kom, word die houer dan vir 30 sekondes oor die spuittenk gehou om die laaste bietjie plaagdoder uit te giet.

Daarna word die houers met een kwart van die houer se volume vars water gevul, die prop word opgedraai en die houer word vir dertig sekondes geskud waarna die spoelwater in die spuittenk oorgegiet word. Die proses word twee keer herhaal en dit is wat drie-maal spoel beteken. Dus word al die plaagdoder gebruik – dit wat die produsent voor betaal – en niks word op die grond gestort of vermors nie.

Alle plaaswerkers wat spuitoperateurs is, kan binne tien minute oor die skoonmaakprotokol opgelei word. Sodra die houers dan heeltemal leeg is, moet gate ingekap word om dit onbruikbaar te maak en die proppe moet in aparte sakke gehou word. Sulke skoon gemaakte houers en proppe moet dan aan CropLife SA se gesertifiseerde verwerkers oorhandig word.

Ons hoor dikwels "ek het nie tyd om houers drie maal te spoel nie" en dis blatante onsin want dis meestal die spuitoperateurs wat die spuitwerk doen, en om 'n houer drie maal te spoel neem slegs vyf minute.

Wat sê die wetgewing tans en hoe lyk die toekoms vir leë plaagdoderverpakking?
Die Nasionale Omgewingsbestuur: Afvalbestuurwet, 2008 (Wet Nr. 59 van 2008) se regulasies klassifiseer leë plaagdoderverpakking as gevaarhoudende afval en ongeag aan wie sulke houers behoort, is dit onwettig om sulke gevaarhoudende afval sonder 'n geldige afvalbestuurslisensie te berg.

Tog is daar uitkoms in terme van die SABS standaard SABS10402 wat bepaal dat enige verpakking van gevaarhoudende stowwe, wat voldoende gereinig is, as gewone afval geklassifiseer word. Dit beteken dat drie-maal gespoelde leë houers op die plaas geberg mag word totdat dit na 'n CropLife SA gesertifiseerde verwerker vervoer kan word en verwerk kan word.

In die nabye toekoms kom daar regulasies onder die naam Uitgebreide Vervaardiger Verantwoordelikheid (Extended Producer Responsibility of EPR) wat die verpligting vir herwinning van alle leë plaagdoderverpakking op die vervaardiger of verskaffer van die plaagdoder plaas.

Dit klink eenvoudig, maar die staat magtig die vervaardiger of verskaffer om alle moontlike maatreëls in plek te stel om alle verpakking deeglik te laat reinig en te laat herwin. Vervaardigers en verskaffers mag dus bepaalde reëls neerlê oor die reiniging en herwinning van hulle verpakking. CropLife Suid-Afrika sal die EPR regulasies namens al sy lede in plek stel en daar sal maatreëls wees om te verseker dat elke enkele leë plaagdoderhouer herwin word.

Watter materiale is ter sprake?

Alle materiale wat vir die verpakking van plaagdoders gebruik word, is onderhewig aan die bepalings van die EPR. Dit sluit met ander woorde alle HDPE, PP, lae-digtheid poliëtileen (LDPE), poliëtileen tereftalaat (PET), papier, karton, staal en aluminium wat gebruik word. Gelukkig kan al die verpakkings met die regte drie-maal spoel protokol gereinig word en daarvoor het CropLife SA die reinigingsprotokols op die webtuiste onder *Container Management.*

Die enigste van die materiale wat nie herwin en verwerk kan word nie, is die wit PET houers wat meestal as 1 liter verpakkings en soms as gereed-vir-gebruik spuitbottels gebruik word, maar sulke houers se dae is getel en sal binnekort uit die mark verdwyn ten gunste van HDPE wat 'n uiters gesogte plastiek by alle verwerkers is.

Die een verpakkingsmateriaal waaraan groot aandag geskenk moet word is die PP saadsakke want dit is benewens 'n gesogte materiaal ook ongelukkig die een wat massiewe plastiekbesoedeling veroorsaak omdat dit in die son verbrokkel.

As die saadsakke (wat meestal plaagdoderbehandelde saad bevat) omgedop word en vir net 30 sekondes met water gespoel word is die sakke skoon en kan ook verwerk word. Produsente word versoek om dringend aandag aan saadsakke te gee.

Mikpunte vir 'n plastiekafval-vrye landbousektor

CropLife Suid-Afrika is oortuig dat die Suid-Afrikaanse landbousektor binne drie jaar 95% van alle verpakkingsmateriaal insamel en verwerk as al ons planne uitwerk. Dit gaan egter ook die samewerking van alle produsente beteken, hetsy kontantgewasse of uitvoergewasse.

Wat ook nodig is, is 'n ernstige gewaarwording van die impak wat die mens se besoedeling op die aarde het. Die landbousektor werk met materiale wat hoë waarde vir herwinning en verwerking het: wat die boer se afval is, is iemand anders se lewensaar. CropLife SA doen dus 'n beroep op alle boere om saam te werk om die mikpunt van 95% herwinning teen die einde van 2023 te bereik.

Responsibility of role-players in the pesticide value chain to strictly adhere to label instructions

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The label is the legal document of a pesticide. Regulation No R1716 of 26 July 1991, of the Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No 36 of 1947) stipulates that a pesticide must be used strictly according to label instructions. This means that a pesticide may only be used for the crop or situation indicated on the label; for the pest, disease or weed indicated; in the dosage indicated; and by the application methods indicated on the label.

Pesticide usage recommendations

Whether verbal, written, printed or electronic, recommendations for the use of a pesticide made by any person or institution of whatever nature, must be strictly according to the label instructions. No person may offer advice, guidance, or recommendations on pesticides contrary to their label instructions. Manufacturers, registration holders, distributors, agents, crop advisors, technical advisors, consultants, co-operative personnel, retail personnel or any person in whatever capacity, may only advise producers on the use of pesticides according to the label instructions of the products.

Sales and application

Pesticides may only be sold or offered for sale for the purposes and applications as directed by the label instructions. No person in whatever capacity may sell or offer a pesticide for sale for any other purposes, or for any other application methods, than those instructed by the label.

A pesticide may only be applied for the purposes and by the application methods as instructed by the label. A producer who experiences poor pesticide performance or whose crops suffer damage due to applying pesticides contrary to label instructions (off-label) of his or her own accord, or whether upon the advice, guidance or recommendation of any other person or institution, has no claim against any other party, since the producer contravened Regulation No R1716 of the Act.

Any person who advises, guides, or recommends the use of a pesticide to a producer, 'sells' the pesticide to the producer because the definition of 'sell' in Act No 36 of 1947 covers all forms of promoting the use of a pesticide. A consultant, distributor, crop advisor, agent, sales representative or any person or institution of whatever nature who advises, guides, or recommends the use of a pesticide, or sells such a pesticide contrary to its label instructions, contravenes Regulation No R1716.

Producers' responsibility

It is the producer's duty to ascertain whether the advice, guidance or recommendation offered by any person or institution of whatever nature, corresponds with the label instructions of the pesticide for which such advice, guidance or recommendation is offered. It is also the producer's duty to check whether pesticides offered for sale are offered according to the purposes and application methods as directed by the label instructions.

Common contraventions

Some of the most common contraventions of Regulation No R1716 include:

- Offering advice, making recommendations, or offering guidance contrary to label instructions of the pesticide.

- Accepting off-label advice, guidance or recommendations from any person or institution, and implementing such advice, guidance or recommendations when applying the pesticide.
- Selling or offering a pesticide for sale for purposes or application methods not indicated on the label.
- Disposing of (giving away or donating) a pesticide for purposes or application methods other than those directed by the label instructions.

Pesticides are developed for specific purposes and specific application methods. The data is submitted by the manufacturer or supplier to the Registrar of Act 36 of 1947, who registers pesticides for the purposes and application methods as applied for, based on the data submitted. Any other purposes or application methods can therefore not be verified or validated and are not approved by the Registrar, since the Registrar cannot evaluate any purposes or application methods that have not been submitted for evaluation.

Consequences of off-label use
Most cases of crop damage and poor pesticide performance can be traced back to off-label use. Producers who apply pesticides off-label are at great risk of crop damage or losses due to poor pesticide performance or phytotoxicity.

Apart from pesticide performance failure and crop damage due to off-label use, the Registrar is mandated in terms of Act 36 of 1947 to impose certain conditions upon any registered pesticide, such as restricting its use to pest control operators.

The Registrar may also cancel the registration of any pesticide if he is of the opinion that the pesticide is being misused, such as for off-label use. This means that off-label use of a pesticide may result in the pesticide being cancelled and no longer being made available to farmers, or being restricted for usage by pest control operators only.

We're Here to Help

If you require assistance, would like to become a member, or if you have general feedback, we would love to hear from you. Please contact any member of our team:

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