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Syngenta Train The Trainer Manual

Contents

Chapter 1

Introduction

This Manual is a source of background information and reference material that will help you, the trainer, in delivering your safe use training meetings and workshops to our customers. It is aligned with the Syngenta Guidelines on Safe Use Training and Good Practice Recommendations, but provides more in-depth information to help you gain a thorough understanding of the safe and responsible use of Crop Protection Products (CPPs) as well as Seed Treatment and Lawn & Garden products. Throughout the training products will usually be referred to as CPPs, however most of the information is applicable to all types of pesticides.

As a member of CropLife and related industry associations globally and in each country, Syngenta is obliged to support and promote the safe and responsible use of CPPs throughout their entire lifecycle. The International Code of Conduct on the Distribution and Use of Pesticides (FAO) contains industry-accepted guidelines that Syngenta fully supports and which are aligned with the Syngenta Guidelines on Safe Use Training and the content of this manual.

Helping Growers and End Users to use our products safely has always been a major focus for Syngenta.

Our stewardship encompasses all of the proactive things we do as a company to help enable the safe and responsible use of our products. It starts from the earliest decisions we make in Research and Development, through the product lifecycle, and up to the advice we offer Growers and End Users on how to dispose of containers and waste.

We are committed to stewardship because we care! We want to see Growers and End Users realize the benefits of using our products, while also helping them to look after their own health, the health of their families, their workers and the environment.

Health through action is one of Syngenta's Values. The constant awareness and care that we display through our stewardship brings this Value to life. Our stewardship activities are also important in enabling Syngenta to meet its commitments under our Code of Conduct and the International Code of Conduct on Pesticide Management (WHO/FAO).

Growers and End Users of Syngenta's products are facing more scrutiny over their use of chemicals in food production than ever before.

Governments, NGOs and the wider public are in turn looking at how Syngenta is supporting Growers and End Users to make safe and responsible use of our products.

This creates both opportunities and challenges.

As Growers and End Users look to Syngenta for more guidance on how to safely use our products, our stewardship leadership provides an opportunity to build trust and Grower and End User loyalty, and realize commercial value.

This also means that the quality, scale and impact of our stewardship is being closely watched – meaning our actions need to match our words.

Our ability to drive meaningful improvement in the safe use of our products is directly linked to our reputation and License to Operate (LTO).

Through our Good Growth Plan commitment to help people stay safe, we are demonstrating our leadership in stewardship, and we have committed to ensuring that training is high-quality and leads to measurable impacts on knowledge, attitudes, and behaviors.

Our Master Trainers program, and our Train The Trainer rollout, will play an essential role in aligning the training messages we deliver around the world on 'what' represents good practice in the safe use of our products, and also bring new consistency and insights of "how" we train people to give us the best chance of driving the adoption of safe use behaviors on farms around the world.

Importantly, through adopting a more consistent and demonstrated approach we will be able to better measure the impact of our training across markets and geographies – demonstrating the improvement we are making.

Thank you for taking on the role and responsibility of becoming a Master Trainer! You have a critical role to play!

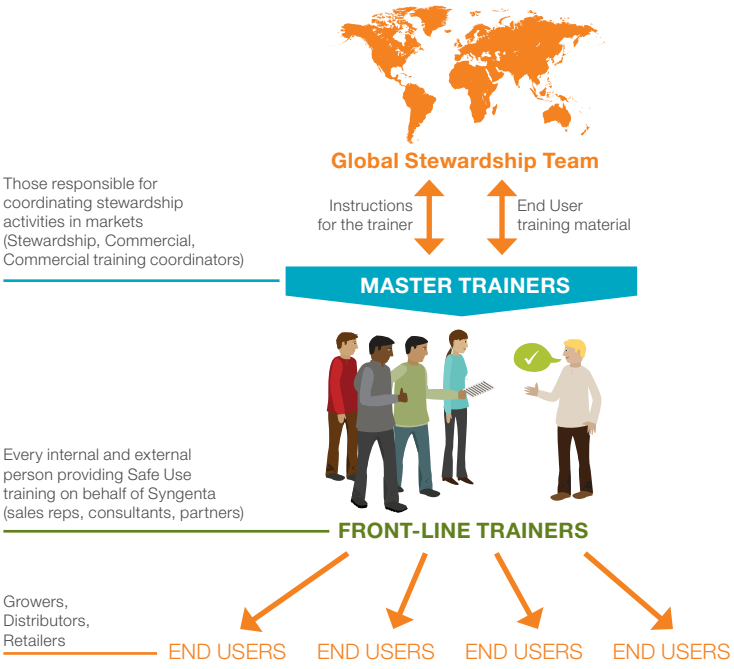
As a Master Trainer you will be asked to take the content and approaches in this Training Manual, and to commit to cascade this approach to the Front-line Trainers in your market - those Syngenta colleagues or external partners who will ultimately deliver our Safe Use Training to Growers and End Users.

Working together we can help Growers and End Users around the world to realize the many benefits that Syngenta's products deliver, while staying safe and farming sustainably.

Chapter 2

How Train the Trainer works

The ultimate target audiences for the stewardship training are Growers, End Users, Retailers and Distributors, however, in order to reach as many Growers and End Users as possible we must first train Front-line Trainers who will go out to the farms and help us reach scale. Front-line Trainers will provide either Awareness Training (15 minutes – 60 minutes) or Dedicated Training (more than 1 hour). Once you complete the 3-day **Train The Trainer** course and with the use of this Training Manual, you will become a Master Trainer.



Awareness Training vs Dedicated Training

A training session that lasts between 15 minutes and 60 minutes is called "Awareness Training" and a training session that is over 60 minutes is called "Dedicated Training". During Awareness Training, a Front-Line Trainer must explain the 5 Golden Rules and depending on the time available may go into more detail about one or more of the rules.

During Dedicated Training, Front-Line Trainers are able to go into detail in all of the 5 Golden Rules as well as explaining the lifecycle of CPPs. To break up the Dedicated Training, as this can be a long session for Growers and End Users, we recommend involving the Growers and End Users as much as possible, for example using demonstrations and Q&As.

Target audiences and roles

Master Trainers

Anyone who has completed the 3-day Train The Trainer course will become a Master Trainer.

Depending on the markets, this may include:
- Local Stewardship Leaders;
- Sales Leaders;
- Technical Leaders;
- Commercial training coordinators;
- External consultants exclusively supporting Syngenta's training;
- Other functions

Roles and Responsibilities:

The Master Trainers will commit to planning and training the Front-line Trainers based on Territory/Country/CU campaign and/or training plans. Some of these Front-line Trainers might only deliver Awareness Training while others will perform Dedicated Training or both.

Furthermore, Master Trainers need to factor in the time needed to train the Front-line Trainers and provide guidance to Front-line Trainers as to how to plan, prepare and deliver training at a local level.

Front-line Trainers

The Front-line Trainers are those trained by the Master Trainer and provide the training to the Growers or End Users.

Depending on the markets, the Front-line Trainers may include:
- Syngenta field colleagues, including salesforce;
- Local Stewardship Managers;
- Retailers;
- Extension workers;
- External trainings consultants paid by Syngenta to provide Safe Use Training on Syngenta's behalf;
- NGOs or other Training Partners

Roles and Responsibilities:

Front-line Trainers will have to understand the need for Safe Use Training and why it is so important for Syngenta, Growers and End Users. They must also know how to use opportunities with Growers and End Users to best deliver the Safe Use Training, and deliver Awareness Training and Dedicated Training in line with CU campaign or training plans. They will also tailor their training delivery to meet the needs of their audience, and collect and report the training numbers, where possible, with evidence of the training.

External Consultants vs Training Partners

External Consultants training on Syngenta's behalf are individuals that have received at least Front-line Trainer training with extra training to cover any gaps. They may also have completed the Train the Trainer workshop and be Master Trainers. They will therefore be able to train Front-line Trainers, whether external consultants or Syngenta employees.

Training Partners are government certification bodies, NGOs or industry associations like CropLife that provide Safe Use Training, and get financial and also technical support from Syngenta to deliver the training. Local teams are best placed to know who would be the most suitable Training Partners, Examples of training include: CropLife; various universities; the US Pesticide Safety Education Program (PSEP); the Consultative Group on International Agricultural Research (CGIAR); the International Maize and Wheat Improvement Center (CIMMYT); and the Sustainable Agriculture Network (SAN).

Both External Consultants and Training Partners are valuable resources to help us meet our challenging training targets, and should not be forgotten when compiling training numbers. In some regions, Training Partners and External Consultants may be the best solution to scale up our training activities, so consider running Train The Trainer workshop for them.

The End Users

The Front-line Trainers then go out into the field and train the End Users.

The End Users are:

- Growers;
- Professional Applicators;
- Local Authorities;
- Extension workers;
- Distributors and Retailers who can play an important role in ensuring the safe use of Syngenta's products.

The best Trainers are well prepared and well-practiced. The first couple of times you arrange a training, a lot of preparation and practice will be required but this will become easier as you become a more experienced Trainer. This Training Manual sets out how the Train The Trainer process works and everything you need to know to become a Master Trainer.

Chapter 3

Delivering training with impact

There are four stages of delivering training with impact. Each step is explained below in more detail.

3.1 Planning your training

When planning your training you need to ensure the training given covers the needs of Syngenta and the needs of the audience.

Irrespective of whether you are delivering a training session to Syngenta's Front-line Trainers, or as a Front-line Trainer training Growers and End Users, there are three key questions to ask:

1. What is stopping the audience from changing their behavior? – The Barriers;
2. How can we get them to start a new behavior? – The Triggers; and
3. What will encourage them to make the new behavior into a regular habit? The Motivators.

Understanding your audience's Barriers, Triggers and Motivators can provide key insights to help plan, prepare and deliver great training. Aligning this understanding with the overall objectives of Syngenta on global, territory and local level is an imperative to make the training fit into tight personal constraints.

Identifying Syngenta's objectives for Safe Use Training

The first question we need to ask when we are developing our training plans for Front-line Trainers, and also for Growers and End Users is: What outcome does Syngenta aim to achieve through delivering this training?

By clearly answering this question, we can then plan, prepare and deliver a training session capable of driving the change we need to achieve our desired outcome.

Our Front-line Training needs to support Growers and End Users to adopt and sustain "good safe use practices" when handling and using our products. However, by making the objective more specific it will be easier to identify what needs to be covered and how we can best deliver our training to change behavior.

Our training objectives should be as clear as possible in identifying the specific behaviors we are looking to change through our training. The SMART Objective format can help in framing our training objectives.

GLOBAL OBJECTIVES

TERRITORY OBJECTIVES

- Encourage the wider use of lockable storage in our Territory
- To encourage Growers and End Users to follow Personal Protective Equipment (PPE) recommendations and good personal hygiene, to minimize the incidence of Subjective Facial Sensation (SFS)
- To reinforce to Growers and End Users the critical importance of proper storage and never decanting products into drink bottles, to reduce the incidence of accidental ingestions in our Territory

Overall, the more specific the local training objective is, the easier it is to define the target audience, decide the best format, get the buy-in of the local field force and deliver effective training.

In many cases, training plans can be developed so that training activities meet the local Syngenta business needs and local Growers' and End Users' needs, while also meeting our global objectives – including The Good Growth Plan and Safe Use Training commitment.

LAMBDA CYHALOTHRIN: EXAMPLE OF OBJECTIVES ALIGNMENT

GLOBAL	TERRITORY	LOCAL
To fulfill our obligations under the Syngenta Code of Conduct to train users and all stakeholders on how to make proper and responsible use of our products	To encourage users to follow PPE recommendations and good personal hygiene, to minimize the incidence of Subjective Facial Sensation (SFS) when using Lambda Cyhalothrin in our Territory	To teach Syngenta Growers, End Users and Retailers buying and using Lambda Cyhalothrin about the specific needs of this product for PPE and the reasoning behind. Start from the Personal Hygiene recommendation as outlined by this manual and complement with SFS-specific information material

Ensuring Safe Use Training supports Syngenta's business needs

We want to see every Grower or End User of Syngenta's products using them safely, however, it is important that we focus our Safe Use Training activities in a way that aligns with and supports Syngenta's business objectives.

We need to prioritize and focus our training activities on the areas of greatest need. As a Master Trainer involved in training planning, it is important that you engage with the business to identify the most important needs from a Syngenta perspective and to build these into your planning.

Some functions to consult and questions to ask include:

Crops:
- Are there aspects of the Crop Strategy that need to be factored into our Safe Use Training objectives? Are there opportunities to build safe use elements into protocol-based, crop-focused offers (e.g. rice, vegetables)?

Assets:
- Are there any asset-specific training requirements which need to be considered (e.g. SFS Awareness Raising, Gramoxone Safety Training)?

Marketing:
- Are there opportunities to build Safe Use Training dimensions into commercial activities such as Learning Centers, Grower and End User meetings, or launch events? Can Safe Use Training differentiate us from competitors?

Sales:
- What are Growers and End Users interested in? What questions are they asking around the use of our products?

Regulatory Affairs:
- What regulatory issues do we need to focus on (e.g. new label requirements, re-registration challenges)

Corporate Affairs:
- What are the stakeholders we working with talking about or concerned about?

LTO Team members:
- What are the LTO priorities?
- Where are our vulnerabilities?

By working across the business to develop training objectives, we can establish the clear business imperative for our Safe Use Training. This can help in securing the buy-in and support we need to ensure effective training delivery.

Ideally, our Safe Use Training activities should be built into Syngenta's commercial campaigns at a Commercial Unit level. This can be best achieved by working with marketing and sales teams at a Territory level, or where relevant, Commercial Unit level to build Safe Use Training into CU campaign master plans, specific campaign plans and execution activities.

What is a Campaign?

Campaigns are the core activities where our strategies and plans become real - the place where we reach out and engage the market today and tomorrow, to build awareness, perceptions, and relationships with Growers, End Users and value-chain participants.

Campaign planning is generally driven by the selling season, so it is important to remain in close contact with marketing teams to understand the timing of the campaign planning cycle and ensure training needs will be built into our campaigns.

Building Safe Use Training into campaign plans can further help to ensure the buy-in of the Front-line Sales Team, to secure resources, to ensure the alignment of Syngenta's messages to Growers and End Users, and to assist in impact measurement.

By engaging the business to develop training plans that address Syngenta's needs, and building our training activities into commercial campaigns, the role and importance of our Safe Use Training will be clear, and training will be recognized as a core valuable part of our commercial activities.

Identifying Grower and End User needs

We want Growers and other End Users of our products to change their behavior and adopt Syngenta's Safe Use Guidelines in their daily life.

Through our Train The Trainer program, we want to change the mindsets of our own Trainers and through doing so, increase the impact of our training in driving a change in the mindset of the Growers and End Users we train. This will ultimately drive a change in behavior on farms around the world.

In thinking about what our training needs to achieve we need to think practically:

- What is the current mindset of our audience and what is it we are trying to change?
- What do they think now, and what do we want them to think and do after the training?

More information is available at:
Syngenta's campaign planning and delivery model
http://reference/sites/x4wem5dkxv/en/Pages/The-CU-Master-Campaign-Plan.aspx

It may be something like this:

	CURRENT MINDSET	FUTURE MINDSET
TRAINERS	Sometimes I feel disconnected from the salesforce and worry that we are not coordinating our efforts to talk to Growers	I feel equipped and confident to spread the word about safe use so it actually changes Growers' behaviour
SALESFORCE	We have very good products which I want to tell the Growers about. Explaining safe use information is time-consuming and sometimes there is not time for this	Safe use information is very important for Syngenta. I can add value to Growers by helping them to use Syngenta's products safely
GROWERS	There is no need to change what I do - I've been OK so far	I must be careful but there are simple things I can do to protect myself and my family

To change mindsets, our Trainers need to recognize the Barriers, Triggers and Motivations that influence their own training behavior.

To change the mindsets of Growers and End Users, the Trainers also need to know: what to teach Growers and End Users to help them overcome their barriers; what kind of Triggers Growers and End Users will respond to; and the main motivations for Growers and End Users that help them to stick with a behavior.

Mindsets of Trainers vs Growers and End Users

	TRAINER	GROWERS AND END USERS
BARRIERS	What hinders you from providing safe use information to Growers and End Users? Not enough time, don't understand the value etc.	What stops Growers and End Users from following Syngenta's Safe Use Guidelines? Doesn't understand the importance, not enough time etc.
TRIGGERS	What would help you include Safe Use Training in your training? A script, a poster, a Grower or End User meeting checklist etc.	What would help the Growers and End Users to follow Syngenta's Safe Use Guidelines? Reminders, easily available PPE etc.
MOTIVATORS	What would encourage you to include safe use information in all of your trainings? Proof that it increases sales, positive feedback from Growers and End Users, evidence of the benefits from Syngenta etc.	What are the benefits for the Growers or End Users to follow Syngenta's Safe Use Guidelines? What would encourage the Growers and End Users to make Syngenta's Safe Use Guidelines a habit? Recognition from his/her village, evidence of better spray results, evidence of the benefits from Syngenta etc.

Understand your audience

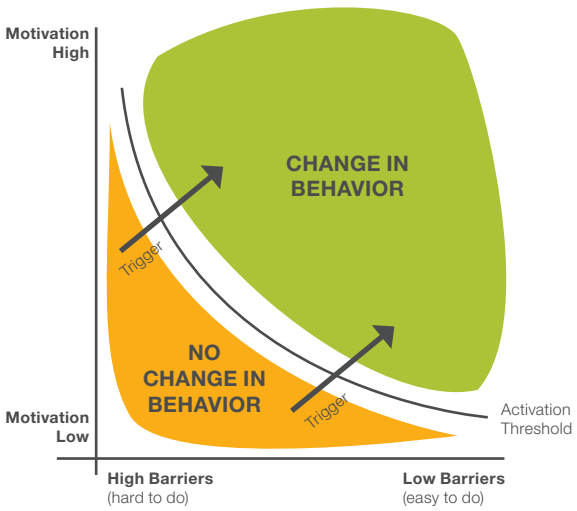
Before you start your training, try to find out as much as you can about the target group by identifying their Barriers, Triggers and Motivators. Do this by talking to local Syngenta contacts, talking to the target groups and observing the target groups' working practices.

The graph below shows how Barriers and Motivators impact our behavior. Below the activation threshold, Growers and End Users do not have the motivation to change their behavior or the Barriers are too high, or both.

If Growers and End Users are above the line then either they are motivated to change or the Barriers to change are low, or both. In this situation they will change their behavior.

We want to move our Growers and End Users from below the line to above it so that they can change their behavior. We can help Growers and End Users to change their behavior by doing one or more of the following things:

1. Decreasing the Barriers,
2. Increasing their motivation; or
3. Providing triggers to help them move over the activation threshold.



Understanding Growers' and End Users' Triggers

If the Trigger is not enough to change the Growers' or End Users' behaviors, consider how you can help the Growers and End Users to overcome or lower their Barriers. In cases where a Grower or End User is close to the activation threshold, a Trigger can be enough to encourage them to practice a safe use behavior. So thinking about Triggers can be a good place to start when setting out to change behaviors.

A Trigger is a single event which can initiate a change in behavior at a particular moment in time. The table below provides examples of different types of Triggers.

TYPE OF TRIGGERS	EXAMPLES
SPARK: A spark is a trigger that motivates behavior.	• Seeing a respected lead farmer performing the behavior (ie: a respected role model) • A family member reinforcing the importance of practicing safe use
FACILITATOR: A faciliator makes behavior easier.	• A simple leaflet summarizing the most important points for knapsack calibration • A video demonstrating how to triple-rinse and properly dispose of used packaging
SIGNAL: A signal indicates or reminds someone to continue or renew a behavior.	• A sticker near the washroom to remind Growers and End Users to wash their hands after product use • A pen labelled with the 5 Golden Rules, that you can easily hand out to the farmer to use in their everyday life or when making notes of the products used, or when writing a list of the products they want to purchase

Understanding Growers' and End Users' Barriers

The first step is to understand the Growers' and End Users' Barriers. Ask them the following questions to identify what the Barriers are and how you may be able to work to lower them.

TYPES OF BARRIERS	EXAMPLES OF QUESTIONS TO ASK TO FIND OUT MORE ABOUT BARRIERS
TIME	Does the Grower or End User have time to put on PPE or check for buffers?
MONEY	Can the Grower or End User afford to buy PPE, new nozzles, more expensive products, or equipment to improve production?
PHYSICAL EFFORT	Is the PPE uncomfortable or too hot?
UNDERSTANDING	Does the Grower or End User understand the importance of the PPE? Can the Grower or End User understand the label?
SOCIAL NORMS	Is the behavior going against social norms? What will their peers think of them?
NOT PART OF A ROUTINE	Will the change of behavior disrupt an existing routine?

Once you have worked with the Growers or End Users on their Triggers and Barriers and behavior change still hasn't occurred it is time to look at their Motivators. It is difficult to influence Growers' and End Users' motivations, however we can encourage behavior change by tailoring our training to reinforce how the recommended safe use practices align with what Growers and End Users see as important (their motivators).

Understanding Growers' and End User's Motivators

Our training will have more impact when we are talking to Growers and End Users about topics that they see as relevant and important. What is seen as relevant and important by an individual Grower or End User (or groups of Growers and End Users) will be shaped by their beliefs and motivations.

If we can demonstrate that our recommendation is consistent with a Growers or End User's motivation, we will have the greatest impact in driving adoption. For example, a farmer may feel strongly motivated to protect their family - so in this case, we will be more likely to encourage them to adopt safe use behaviors by reinforcing how recommended practices will help keep their family safe.

KEY GROWER AND END USER MOTIVATORS	HOW TO TAILOR THE SAFETY MESSAGE
Make more money and increase profitability of the farm	Demonstrate how good knowledge and professional use of CPPs can ensure the highest profitability and best efficiency from CPPs
Access new markets and ensure standards meets requirements	Reinforce how export markets require high standards for safe use of products
Comply with the law	Show how following Safe Use Guidelines and local recommendations makes it possible to comply with local laws
Protect the local environment	Highlight how Good Practices can protect and enhance the local environment
Protect family	Make it clear how the unsafe use of pesticides can negatively affect family members
Protect own health	Emphasize how the unsafe use of pesticides can potentially harm Growers' and End Users' own health
Be seen as leading and respected farmer	Share an example of how the adoption of Safe Use behaviors has helped a local Grower or End User build a successful business and earn the respect of their peers

Adapting your Training to Suit Your Audience

Our Guidelines on Safe Use Training, and this Manual, provide consistent messages on what represents "good practice" in the use of Syngenta's products. We can increase the impact of these messages by thinking about how to frame them in the context of Growers' and End Users' Barriers and Motivators for a particular training audience. Trainers are likely to have a mix of participants in their training session, so there will always be a need to think about the audience you are presenting to, and to be flexible in tailoring what you deliver to maximize its impact.

Understanding the needs of your audience is crucial to delivering effective training. To help you with tailoring your message adequately for the audience, we have identified five different types of Growers and End Users by level of awareness, attitude and understanding of the safe use practices;

The sceptic (motivation low, barrier high):

- S/he is aware of the alleged risks of misuse of products and how s/he should protect her/himself but is unconvinced or does not see how it affects him/her directly.

The new starter (motivation high, barrier high):

- This is a Grower who is new to farming, and has very limited awareness of Syngenta, our products and how to use them safely. S/he has no understanding of the dangers of pesticides or how to keep her/himself safe.

The forgetful (motivation low, barrier low):

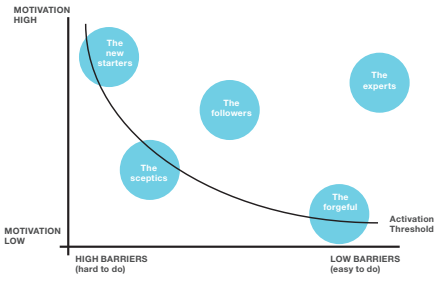
- S/he may have attended training and is aware of the risks and how to keep her/himself safe but has either forgotten it or finds it impractical to implement it.

The follower (motivation high, barrier low):

- S/he may be aware of the dangers and how to protect her/himself but is easily persuaded to attend training and is open to suggestion about how to better use products and keep her/himself safe.

The expert (motivation high, barrier none):

- Understands the dangers and the training and follows all of the guidelines that s/he has been taught. S/he doesn't need training or to change his/her behavior, and understands the importance of following the guidelines. Can help to encourage other people to attend the training and help you to explain to the Growers and End Users why training is so important.



Once you have a feeling what types of Growers and End Users you are likely to have in your training audience - and where they currently sit in terms of Barriers, Motivations, and in turn the Activation Threshold - there are five ways that we can tailor what we deliver to increase our chances of successfully activating safe use behaviors.

Make it Understood

Do people know about the behavior? Do they believe it's relevant to them? This raises awareness and encourages acceptance of the behavior.

For example:

- Explain to them the importance of wearing personal protective clothing by showing them the UV sprayer demonstration (see Demonstration section in Appendix A) and proving that even though they cannot see or feel the CPPs some of them are getting on to their skin and this could lead to irritation.

Make it Easy

Do people know what to do and feel confident doing it? Can they see it fitting into their lives? Is it achievable for them? This establishes convenience and confidence. How can you simplify the message?

For example:

Is there an acronym for the 5 Golden Rules that works in your language and will help Growers and End Users remember each of the rules?

- In English, the following two acronyms might HELP!
  Hygiene
  Equipment
  Label
  PPE
  ! – Exercise Caution

- Or SAFER:
  Stay safe by exercising caution at all times
  Acknowledge the information on the label
  Follow good practices for personal hygiene
  Ensure you wear the correct PPE
  Repair and maintain application equipment.

Make it Desirable

Will doing this new behavior fit with their image of themselves? Does it fit with how they relate to others or want to? We copy the lifestyle/ habits of people we respect - like our parents, or a celebrity - and we follow norms in society.

For example:

- Is there a respected person in the village or town who you can get to support the training or publicly say they will do it?

Make it Rewarding

Do people know when they're doing the behavior 'right'? Do they get some sort of reward for doing it? Can Syngenta reward Growers and End Users who are following Syngenta's Safe Use Guidelines?

For example:

- Give Growers and End Users certificates or benefits if they complete stewardship training and are found to be continuing the correct behavior.

Make it a Habit

Once people have made a change, what can we do to help them keep doing it? This is about reinforcing and reminding.

For example:

- Give Growers and End Users calendars so they can record that they are doing the behavior every day or week. Have trainers or other Syngenta staff visit the Growers and End Users to remind them.

5 different types of Growers and End Users

The table below looks at our 5 different types of Growers and End Users, and provides examples of potential Barriers, Triggers and Motivators that they might each face.

	BARRIERS	TRIGGERS	MOTIVATORS	LEVER OF CHANGE	ASSETS
THE SCEPTIC	Doesn't understand importance e.g. need for PPE	Participates at UV demonstration to understand dangers of not wearing PPE	Keep her/himself and family safe	Make it Understood	UV torch and UV spray demonstration
THE NEW STARTER	Not aware of risks	Sees a safe use poster and becomes aware of risks	Keep her/himself and family safe	Make it easy	Posters, leaflets & stickers
THE EXPERT	None	Knows when to follow the guidelines	Keep her/himself and family safe	Make it desirable for others by acting as a role model	T-shirts, caps & other assets they can show and share with other Growers and End Users
THE FOLLOWER	If friends don't follow guidelines they may not either	A friend shows of their safe use certificate and he/she then wants to get one too	To be seen by her/his community as following the rules	Make it a rewarding	Certificates & stickers
THE FORGETFUL	Difficulty complying with guidance	Starts to use a record sheet to be reminded to follow guidelines	Keep her/himself and family safe	Make it a habit	Diary & record sheets

Best use of training aids to enable attendees to go through the Levers of Change

The table below provides some further examples of materials and equipment to help Master Trainers use the Levers of Change when training Front-line Trainers, and then for Front-line Trainers when training Growers and End Users.

LEVERS OF CHANGE	GROWER OR END USER MATERIAL	TRAINER MATERIAL	TRAINER EQUIPMENT
MAKE IT UNDERSTOOD	▰ Attending presentations given by a trainer ▰ Looking at training videos ▰ Taking part in a demonstration day	▰ Presentation slides ▰ Checklists for demo ▰ Posters	▰ Presentation equipment ▰ Demonstration equipment: UV kit, Knapsack sprayers, PPE kits, Label
MAKE IT EASY	▰ One-pagers ▰ Brochures ▰ Stickers ▰ Everyday items with logo on it (keyring)	▰ Laminated exercise sheets	▰ Know how to access (to order or print) material for Growers and End Users
MAKE IT DESIREABLE	▰ Committed to safe use ▰ Certification to a high standard	▰ Golden Trainer Standard certificates	▰ Certification system and enforcement possibilities such as surprise checks
MAKE IT REWARDING	▰ Benefit case: why follow safe use practices? ▰ Rewards: PPE Kits, Caps, discount coupons	▰ Guidelines on how to make it part of performance objectives	▰ Access to Grower or End User rewards: PPE, caps, T-shirts
MAKE IT A HABIT	▰ Diary and record sheets	▰ Standard operating procedures for data collection, salesforce input	▰ Access to salesforce or data collection tools, or knowing the GGP coordinator

*Expected to be available locally

3.2 Preparing to deliver

Selecting a training format

With a clear view of our training objective, aligned to the needs of our target audience, we can then think about what is the best format for us to deliver our training, to give us the best chance of driving behavior change.

Training Methods

The target groups for these trainings are usually adults, in small groups and with previous experience of the subject. The subject matter normally relates to the actual handling and use of pesticides and must be kept as relevant as possible to "real life". The most suitable training method needs to be assessed on the basis of the training imperative.

Based on your audience, ask yourself why we are doing the training session:

TRAINING IMPERATIVE	MOST SUITABLE TRAINING METHOD	RECOMMENDED TIME FRAME
KNOWLEDGE RETENTION (specific facts, patterns, concepts)	(if time is short) classroom training and lectures (if you have a bit more time) Q&A, quiz	Can be done either in the 15-minute or the 1-hour training session, depending on the audience needs
SKILLS-BASED TRAINING (physical movement, coordination and motor skills)	Demonstrations, case studies, role plays, and small group discussions	Generally requires at least 1 hour (Dedicated Training)
ATTITUDES-BASED TRAINING (realizing feelings, values and motivation)	Role plays, presentations, guided discovery	Generally requires at least 1 hour (Dedicated Training)

Training methods should be as participative as possible:

- to build on the experience of the trainees
- to maintain their motivation
- to encourage them to apply knowledge
- to enable the trainer to monitor the progress of their trainees.

We have two key modes of training at Syngenta:

- Awareness Training – between 15 minutes and one hour - most frequently delivered as part of sales events; or
- Dedicated Training – longer and more focused training, with a duration of more than 60 minutes. Dedicated Training can be delivered:
  - As a longer session as part of a Syngenta sales event
  - As a stand-alone Syngenta training event where safe use is the major focus
  - By external independent consultants training on Syngenta's behalf.

Timing of training Front-line Trainers and End Users

Timing of training of Front-line Trainers:

As the majority of the training will be done by the sales and field forces, training should be given before they begin talking to a group of Growers, End Users, Retailers or Distributors. By building Safe Use Training into our commercial planning, we can ensure that we train our Front-line Trainers at a time that best supports our Growers and End Users training needs, and our plans in different markets (e.g. as part of the technical training when introducing a new product to the market).

Timing of training of End Users:

The timing of the training during the year should fit in with local requirements and commercial plans. It is generally best to avoid holding training courses when Growers and End Users will be busy planting or harvesting. Aim for the off-season when Growers and End Users are less likely to be under time constraints. However, it is also good to hold the training at a time when some kind of crop is available so you can give realistic and practical demonstrations during farm visits.

Similarly with Retailers and Distributors, avoid busy periods when you know they are unlikely to be able to give you their full attention.

I. Awareness Raising Training (15-60mins)

An Awareness Raising Training session lasts between 15 minutes and an hour. The training must cover the 5 Golden Rules, where possible going into detail about at least one of the rules.

Depending on Syngenta's training objective, and the needs of the target Growers and End Users, our Awareness Raising Training should also take the opportunity to focus on one or more specific dimensions of Syngenta's Safe Use Guidelines that are most relevant to the audience.

As mentioned, our training objectives should be as specific as possible, and ideally be agreed between the commercial organization and stewardship in advance, and be built into commercial campaign/training plans. In these cases, Front-line Trainers will be provided guidance on the key messages/focus areas for Awareness Training in their particular regions.

In other cases, Front-line Trainers should use their market knowledge and their knowledge of local Growers and End Users to identify specific dimensions of Syngenta's Safe Use Guidelines that are of most relevance to their audience. In this case, additional preparation time may be required.

Time is generally limited during commercial events, and Safe Use Training is only one component of the information that Syngenta needs to get across to Growers and End Users.

We should therefore use the time we have available to deliver the training that gives us the greatest possible chance of achieving our objective and driving the desired behavior change. Some examples of how we can tailor our Awareness Training are below.

Different Awareness Raising Training Scenarios

The table below shows some examples of different types of Awareness Raising Training

	SCENARIO 1	SCENARIO 2	SCENARIO 3	SCENARIO 4
TRAINING OBJECTIVE	To remind experienced Growers and End Users of the 5 Golden Rules and to reactivate good practice behaviors	More detailed session – focusing on what to do before, during and after application	To emphasize safe use of a new product launched by Syngenta	Where we are seeing the same Growers and End Users 4 or 5 times over a season
TIME AVAILABLE	15 minutes	Between 15 and 60 minutes	15 minutes out of a 60 minute new product launch	15 minutes out of a 2-hour Growers or End Users meeting
AUDIENCE MEMBERS	Mixed Audience with some experienced Growers and End Users	Mixed audience	Mixed audience	Mixed audience who will be trained by Syngenta at a demo site multiple times over a single season
PLAN FOR THE SESSION	Intro to each of the 5 Golden Rules, focusing on the most important ones for those Growers and End Users. Summary – Why the 5 Golden Rules are so important.	Intro to each of the 5 Golden Rules and the Safe Use Guidelines lifecycle Deep dive – Before application/During application/After application Summary – Why the 5 Golden Rules are so important.	Intro to each of the 5 Golden Rules and the aspects of the Safe Use Guidelines most relevant to the new product	Intro to each of the 5 Golden Rules – reiterate what they have heard before Deep dive on 2-3 elements of the lifecycle relevant to the crop stage/timing (e.g.: After application – residues, re-entry periods etc.) Summary – Why the 5 Golden Rules are so important
OPTIONS FOR DELIVERY STYLE	Lecture Q&A	Lecture, Q&A, Buzz Groups, short demonstrations	Lecture Q&A	Lecture Q&A Short Demo
SUPPORTING ASSETS	1-pager, poster and video of the 5GRs	Lifecycle poster and relevant posters and leaflets on the deep-dive topics	1-pager and poster of 5 Golden Rules and other relevant posters or leaflets	1-pager and poster of 5 Golden Rules; a poster to demonstrate where we are on the cycle and deep dive material

II. Dedicated Training (more than 60 minutes)

To be considered a safe use Dedicated Training, the minimum requirements are:

- **Duration:** at least 1 hour
- **Content:** the 5 Golden Rules, and an overview of the 8 phases of Syngenta's Safe Use Guidelines Lifecycle with at least one section of the 8 phases in detail (and/or incident management or personal hygiene) in detail. Ideally Dedicated Training should cover all elements of the guidelines.
- **Context:** as part of a sales event or Dedicated Training event

Once again, our training objectives, aligned to the needs of our target audience, should inform our decision to select the Dedicated Training approach. It should also inform what topics we cover in the training and what delivery format we select in order to give us the best chance of achieving behavior change.

Dedicated Training provides us with more flexibility in terms of timing, particularly in cases where specific Growers and End Users' events are organized with a sole focus on safe use. The longer duration of this training allows us to include a higher level of technical detail and practical demonstrations.

It is important to include as much interactive learning as possible, such as practical sessions and demonstrations. However, these take time, so a balance between classroom-style delivery and practical demonstration is needed. Alternating classroom style theory delivery with practical work can help to break up the session and to maintain participants' interest and energy.

If a session is much longer than an hour, breaks help to keep participants (and Trainers) refreshed and energized, and give time for knowledge to sink in. They can also be a networking opportunity.

If a farm visit is to be included in the session then make sure enough time is allocated, including travel to and from the site and allowing for plenty of discussion with the Grower or End User. Farm visits need a minimum of 2 hours to be successful, although this depends on how much there is to see.

Different Dedicated Training Scenarios

The table below shows some examples of different types of Dedicated Training

	SCENARIO 1	SCENARIO 2	SCENARIO 3	SCENARIO 4
TRAINING OBJECTIVE	To inform a group of experienced Growers and End Users about a topic of their choice, either as part of a Syngenta meeting/sales event, or as part of a Safe Use Training event with a Training partner	A dedicated Syngenta stewardship/safe use training event	A dedicated Syngenta stewardship/safe use training event	Scenario 1 but due to equipment and time constrains no practical exercise possible
TIME AVAILABLE	1h up to 3h	3h to 6h	At least 1 day (6h)	1h up to 3h
AUDIENCE MEMBERS	A group of experienced Growers and End Users with a specific question	Mixed audience	Mixed audience	Mixed audience
PLAN FOR THE SESSION	Deep dive on one or more but not all of the 8 main phases of the CPP lifecycle	All 8 main phases of the CPP lifecycle	All 8 main phases of the CPP lifecycle	Scenario 1 with no possibility for practical exercise
OPTIONS FOR DELIVERY STYLE	Mixture of delivery styles. Lecture with demo to provide practical exercise on one of the topics covered, and Q&A to ensure understanding	Mixture of delivery styles. Lecture with demo, and if possible a guided discovery and Q&A	Mixture of delivery styles. Lecture with demo to provide practical exercise on one of the topics covered and Q&A to ensure understanding. May include a farm trip	Mixture of delivery styles. Lecture and Q&A to ensure understanding
SUPPORTING ASSETS	1-pager and poster of 5 Golden Rules. Poster to demonstrate where we are on the cycle and deep-dive material. Materials necessary for demonstration.	1-pager and poster of 5 Golden Rules. Poster to demonstrate where we are on the cycle, and deep-dive material. Materials necessary for demonstration.	1-pager and poster of 5 Golden Rules. Poster to demonstrate where we are on the cycle, and deep-dive material. Materials necessary for demonstration.	1-pager and poster of 5 Golden Rules. Poster to demonstrate where we are on the cycle and deep-dive material.

Range of Training Elements

The following Table outlines a range of Training Elements that are available to build into longer duration training, including Dedicated Training sessions, and their advantages and disadvantages.

	PROS	CONS	BEST USED TO
Q&A	Versatile, engages audience, ensures understanding	If audience is shy they may not respond, and it may demotivate the audience if they don't understand	Check the audience's understanding of the content
BUZZ GROUPS	Engages audience, helps audiences get to know each other	Takes time for groups to discuss and feedback	Engage the audience
HUM GROUPS	Engages audience, helps audiences get to know each other	Takes time for groups to discuss and give feedback	Engage the audience
DEMONSTRATIONS	Shows the Growers or End Users how to put the theory into practice	Requires space and equipment	Show the audience practical information
INSTRUCTIONAL VISITS	Shows the Growers or End Users how to put the theory into practice	Requires a suitable farm, research stations or shop, with transport and travel time to get there	Show the audience practical information
GUIDED DISCOVERY	Allows the participants to discover principles and skills for themselves	Requires one-on-one attention from trainer	Show the audience practical information
LECTURES	Works well for large audiences	Less engaging	Cover a lot of content in a little time with a large audience

Structuring your Training Session: Awareness Raising and Dedicated Training

We are all more likely to remember messages if they are repeated a number of times. Therefore when you are giving training we recommend using the following general structure for each training session:

- **Introduction:** Tell them what you are going to tell them
- **Content:** Tell them
- **Conclusion:** Tell them what you've told them

Introduction

During the introduction, welcome everyone to the training, then introduce yourself and any of your colleagues who are present. If possible, arrange name tags for the Growers and End Users. Explain your role and why you are there. Tell them how long you are going to be talking for and encourage them to interrupt with questions at any time.

Briefly summarize the information you are going to be telling them, for example if it is an Awareness Training session say "Today, we will be talking about Syngenta's 5 Golden Rules: 1) Exercise caution at all times; 2) Read and understand the product label; 3) Practice good personal hygiene; 4) Wear appropriate personal protective clothing; and 5) Take care of and maintain application equipment.
We believe that if you follow these simple rules this is good practice for the safe and effective use of CPPs." You will need to tailor this to the type of training you are doing and what you are focusing on.

Content

This is the main section of the training and will take up most of the training time. This is where you can go into detail about what you want to teach them during the training, such as describing in full each of the 5 Golden Rules or going into more detail if it is a Dedicated Training.

Remember that most people will only do things if they understand WHY they are doing them. If you just tell a Grower or End User to wear personal protective clothing, they may not want to because they do not want to pay for it or its hot or takes time to put it on. However, if they understand that they should do it because CPPs are likely to get onto their skin when they are spraying and this can cause skin irritations, then they might be more likely to wear it. (Remember the Levers of Change!)

Another example is when describing storage and display of pesticides, explain that the reason powders should be stored or displayed above liquids and not vice versa is because liquids falling onto packs of powders below may damage them. If the trainee understands WHY he/she should follow a recommendation, there is a greater chance he/she will adopt it.

Conclusion

Finish your training with a summary of the most important things you told the audience and the parts they need to remember – i.e. the 5 Golden Rules. Think about your training objectives and make sure you covered everything that was important. Always ask participants if they have any questions and try to answer their questions as fully as possible. Thank participants for their time.

3.3
Delivering with impact

Trainers' communication skills

During any training session, it is important to note that the volume and tone of your voice and your body language can be as important as the actual words you speak. Here we give you some tips on how to effectively engage with your audience:

- Project your voice –
  To do this, you need to use full breaths from your diaphragm. Stand straight and tall with your neck and face relaxed. To practice projecting before the training session, do "ha ha" exercises. Put your hands on your lower stomach. Say "ha ha ha ha" until you can feel the breath coming from deep in your body as felt by your hands. Notice how your tone and volume increases as you speak from this deeper location and breath.

- Vary your tone –
  Don't speak in a monotone; it puts people to sleep. Being 'quiet' every once in a while, pausing for effect, can cause people to lean in and pay closer attention. Equally, louder volumes focus attention when many people are talking.

- Be aware of your body language –
  It is great to use your hands when talking, and to move around rather than standing in one place. Most of us, however, are not very conscious of our body language. Work with a colleague to observe each other's body language and give each other feedback. Then practice varying your personal body language style. Watch for negative body language such as crossed arms, looking downwards or speaking with your back to the audience.

- Avoid fidgeting –
  Don't twirl your flip chart markers or play with your clothing or jewelry too much.

- Vary your location and position –
  You don't have to be a prisoner at the front of the room, or rooted like a tree. If you are formally presenting, stand about 5-10 feet from the audience, depending on the audience size. Vary your position for different activities, as this helps keep the audience's attention. Stand up and be at the front of the room when you want to exercise control. Sit with the group when you want to be on more equal ground and encourage trust and openness.

- Exercise eye contact –
  Scan across the room and look at everyone. Hold eye contact for a few seconds. Avoid quickly looking away and glancing back, as this is sometimes perceived as lack of confidence. Don't just look at the most senior people in the room but try to make eye contact with all attendees.

- Pay attention to participants' body language –
  This can help you discern participant attention levels. Pay attention to them as well as your own body language and responses.

- Be aware of the cultural environment you're in – What one tone or body action means in our culture may mean something completely different in another. Be sure to research beforehand whether there are any gestures or words that can be interpreted as offensive and should be avoided.

Just like playing an instrument well, becoming a good trainer and becoming a Master Trainer, requires a lot of practice. You should all maximize the time available to practice your communication skills, to be evaluated and to learn by evaluating others in the group. In addition to this training, we strongly recommend you set some time aside prior to each training session to rehearse what you intend to say and how you intend to say it, for the purpose of improving or mastering the activity. As the saying goes "practice makes perfect".

Front-line Trainers should be aware of their position as role model for the Growers and End Users but should also think of smart ways to find other promoters for the safe use information, like Lead Farmers or Trainings Partners, or even other Growers and End Users who are particularly well respected and are known to follow Safe Use Guidelines.

Front-line trainers should be aware of their position as role model for the Growers, especially when it comes to how to use PPE while handling and presenting the product.

3.4
Measuring impact and reporting

Why we need to measure

It is important to measure the impact of our training. This will allow us to see if our trainings is effective and if not, to give us insights on how we can improve them. It is also important to measure our training so that we can show stakeholders everything we are doing to help Growers and End Users use our products in the safest possible way. By measuring the impact of our training we can show how Growers' and End Users' understanding of how to use our products safely is improving as a result of our training, and how our training is leading to positive safe use behavior change on farms around the world.

How we measure impact

As discussed, it is recommended that some form of post-course assessment be included in each training session. This is to ensure that our training is effective and that we are changing Growers' and End Users' behavior, and ensuring they are using our products as safely as possible. For your training to be included towards our Help People Stay Safe commitment, you must ensure that you capture the names of everyone included in the training or at least record some kind of evidence that the training took place. Before participants leave, record their name and signature and give these documents to your Good Growth Plan Lead or the Stewardship Regional Lead, depending on the region.

What evidence do I need for my training to be included in the commitment?

The number of people attending these trainings needs to be supported with evidence, preferably an attendance list signed by the participants, an individual identifier (such as telephone number for the Grower or End User, or GPS coordinates of the farm and the size of the farm). If this is not possible, other less robust evidence can be used (e.g. request from the farmer via email, or letters from Syngenta defining the training activity). If the training is carried out by a third party then the third party must confirm: the number of Growers and End Users trained, what was covered in the training, and the length of the training time. For more detail see the standard operating procedures on Safe Use Commitment of GGP.

Post-course assessment

Usually, post-course assessment will be delivered at the end of the session; it can be informal or formal. An informal assessment would include asking the participants questions to see if they remember what you have taught them; formal assessment would be in the form of a written quiz. This can happen at the end or it can also be divided into shorter quizzes after every few topics to break up the training and facilitate learning, as answers can be discussed before moving on. If the total session time is only 15 minutes then there will be no time to include post-course assessment but it may still be worth having a Q&A session to ensure participants' understanding.

Assessment of the course itself

It is also important when developing training sessions to get active feedback from participants both at the time of training and at later dates, in order to assess the relevance and practicality of the training. If on subsequent visits it becomes clear the information from the training is not being implemented, you may need to ask:

- Was the information not fully understood at the time of training?
- Was comprehension a barrier – due to literacy levels, or language or dialect differences
- Was information understood without the benefits of implementation being made clear?
- Were the recommended procedures impractical for the trainee to follow?
- Were the recommended procedures initially followed, but have since lapsed and are in need of reinforcement?
- Was there a lack of commitment by the trainees?

It is important to then adapt training approaches in light of your learning.

Follow-up Assessment

Follow-up assessment is the ideal way to measure uptake as this demonstrates that we are really changing the trainee's behaviors and they are implementing what we are teaching them. Sales teams will often visit Growers, End Users and Retailers a number of times, so every time you visit, look at their behavior and make sure they follow safe use guidelines. If they are not, then arrange another training session.

It is very important that we measure the success of our training. This is so that we can constantly improve our training and show that we are helping our Growers and End Users use our products safely and responsibly. This will help to build trust in Syngenta and secure our license to operate.

Chapter 4

Understanding hazard and risk

In order to fully appreciate why the protection of human health and the environment is so important when handling CPPs, it is first necessary to have a good grasp of the inherent hazards of the substances and the risks associated with their use. In this section you will gain a deeper understanding of the terms hazard and risk, how they are related, and how they apply to CPPs.

Assessing the risks associated with any activity is a step-by-step process. The broad principles of risk assessment are common to many areas of life such as assessing financial risk, transport safety and worker safety in factories. The main principles are: hazard assessment, exposure assessment, risk assessment and risk management.

Assessing the hazard associated with a situation is only the first step. This is why it may not always be very informative to rely only on hazard information for chemicals, such as the lethal dose, 50% (LD50) or carcinogenic potential. It is essential to also assess the exposure potential and to understand the relationship between hazard, exposure and risk.

4.1
Hazard assessment

A hazard is something that is capable of causing harm. For CPPs, a hazard is an intrinsic physical, chemical or toxicological property of the substance that may result in adverse effects on humans or the environment. Examples of physical hazards are flammability and dust. Chemical hazards include corrosiveness and oxidizing ability. Toxicological hazards are related to the intrinsic toxicological properties of the substance such as the acute oral toxicity, skin irritancy and reproduction toxicity, as well as ecotoxicity to non-target organisms.

Hazards are all around us wherever we are. Even in the home there are many hazards – sharp utensils, electrical appliances, cooktops, cleaning agents, slippery showers and objects left lying on the floor. Small objects that may be swallowed are hazards for children. Hazards are all around us outside too – sunlight, traffic, waterways, playing sport and driving a car are all hazardous.

A hazard is a POTENTIAL for harm. The actual likelihood of the harm occurring is dependent on the exposure level and timing. For our purposes, the risk of an adverse event occurring is a combination of hazard and exposure.

So if there are hazards everywhere, why aren't we all coming to harm more frequently? Simply because hazard is only one side of the equation.

Let's look at a few examples to illustrate this important principle.

A dangerous animal such as a shark is a hazard. But if the shark is in the water (where they usually are!) and if you are on the shore, then it is impossible for you to be exposed to the shark and there is no risk. But if you swim in the water, and the shark is still present, then your risk of an adverse incident greatly increases.

A peanut might seem like a harmless item of food. But a peanut taken into the mouth by a small child can obstruct the child's airway and cause choking. Therefore keeping the peanut out of the child's reach so that there can be no exposure will ensure that there is no harm. Some individuals are allergic to peanuts so any exposure for them to peanuts can be fatal.

In regard to toxic substances, when they are securely stored in a locked cupboard with the lid tightly sealed, then there is no exposure to people and hence no risk. But clearly there will be times when operators and bystanders will be exposed to CPPs. Therefore in order to understand the risk associated with the use of CPPs, we need to understand both the hazards and the potential exposure.

For CPPs the main hazard is related to the inherent toxicity of the active ingredient and the formulated product. Toxicity is investigated by conducting a range of laboratory toxicology studies over a number of years during the development stage of the CPP. Together these help us to understand the toxicological profile of the CPP and give us a series of results that can then be used as part of the equation when assessing the risk.

A large number of studies are also conducted in order to fully understand the toxicity of the active ingredient and formulated product to non-target organisms such as fish, crustaceans, earthworms, birds and bees. The impact of the active ingredient on soil and water is also studied so that the environmental risk of the use of the CPP in the field can be assessed.

With regard to humans, how the body responds to a toxic substance, i.e., the toxic effect, depends on a number of factors including:

1. The dose received in a given time
2. The exposure situation (such as the weather, and whether it occurred indoors or outdoors)
3. The susceptibility of the person (e.g. overall health, body weight, allergic potential)

The results of the toxicology studies allow us to determine the dose levels that do not cause any adverse toxicological effects for a particular exposure situation. A safety margin is always included as an additional factor, usually 100x (100 times), to allow for the uncertainty associated with applying the results of laboratory studies with animals to real-life situations involving humans (see glossary Section 9.2 for more information on safety factors and toxicology studies).

Let's look at table salt as an example

Dose received:

If a person consumes one spoonful of a substance, for example table salt, in one hour it will have less effect on them than if they take five spoonfuls of the same substance in one hour. Thus, the size of the dose (one spoon versus five spoonfuls) has a direct impact on the effect.

Exposure situation:

If the person consumes five spoonfuls of table salt and has eaten food, the food in the stomach will inhibit the absorption of the salt to some degree and there will at least initially be less effect than if the five spoonfuls were taken on an empty stomach. The route of exposure is also a factor – pouring a solid substance such as salt on the skin has negligible effect compared to oral ingestion.

Susceptibility of the person:

Body weight is an important factor. The lower the body weight the greater the toxic effect if the dose is the same. Another factor is the individual's metabolism. Some individuals can tolerate some toxic substances more easily than others because their system breaks it down more quickly, before toxic effects occur. Another type of susceptibility is allergic potential - some people are allergic to certain substances such as drugs, and so their bodies react in a different and more serious way compared to a non-allergic person when given the same dose of the drug. For many toxic substances, the elderly and people who are unwell are more susceptible to toxic effects than younger and healthier individuals. Therefore, the individuality of the person is a factor.

4.2 Exposure assessment

For CPPs and other pesticides, the next step is to determine how much of a particular active ingredient the operator or other worker will be exposed to when handling the product. For environmental risk assessment, the expected levels of the active ingredient that may be found in the environment following use of the CPP are calculated.

The processes that occur within the human body after exposure to a CPP are absorption, distribution, metabolism and excretion. Other species may react differently, but in most cases there are efficient processes for dealing with undesirable toxins that have been absorbed. Usually, most absorbed active ingredients are excreted through the urine or feces, but the remaining substance may cause toxicological effects to the tissues and organs of the body.

These effects may be acute but transitory, or in some instances, long term and even fatal. Therefore it is essential to avoid absorption of any CPP into the body.

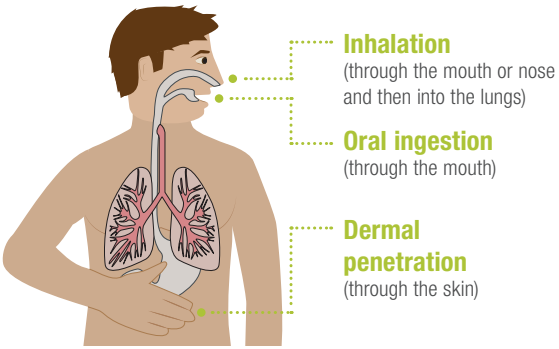
There are other ways that substances can enter the body, such as by intravenous injection, but these are usually used for drugs and are not relevant to CPPs.

For all routes of absorption, exposure to the concentrated CPP is more hazardous than the diluted spray mix due to the higher concentration of active ingredient present. This is why additional PPE is usually required during mixing and loading.

Oral ingestion

Ingestion of CPPs via the mouth rarely occurs during occupational use, but splashes may enter the mouth, and spray droplets may enter the nose and mouth and be swallowed if operators are working in the spray drift.

Absorption of CPPs can occur via:



Dermal penetration

Although the skin is a very effective barrier to most substances, it is also the area most exposed and hence most at risk. Many formulations are irritating to skin but the amount of CPP active ingredient that is actually absorbed is usually low. Several factors influence the amount of absorption that occurs through the skin:

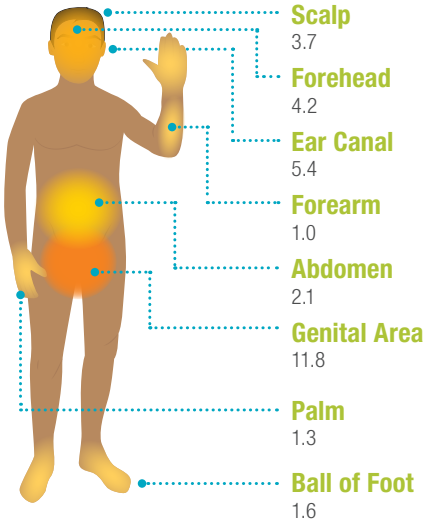
- Characteristics of the active ingredient
- Formulation type
- Intact skin versus skin that has cuts, wounds or abrasions
- The duration of contact with the skin
- Area of the body and amount of hair present. In general, absorption is lower in areas with thicker skin and increases in areas of thinner skin. The amount of hair present can influence absorption as well.

What part of the body is more likely to be exposed to CPPs?

Skin is the part of the body most likely to be exposed to CPPs. This can occur by splashes of undiluted liquid, solid concentrate, or spray mix; contact with droplets; or by re-entering the crop while the sprayed deposit is still wet.

Relative dermal absorption rates of the human body

The genital area and head are particularly vulnerable. The tissues of the eyes are very absorbent, meaning that CPPs that enter the eyes can easily move into the body, leading to poisoning. Similarly, if the CPP formulation is irritant or corrosive, exposure can cause direct damage to the eye. The genital area has the thinnest skin on the body, meaning it is also very sensitive to exposure (almost 12 times more absorbent than the arm). Care should be taken to avoid the movement of any spills of liquid CPP, especially the undiluted product, under the clothing and into this vulnerable area. Operators should also take care not to transfer CPPs from their hands (gloves) to the face, eyes and genitals through unconscious actions such as scratching.



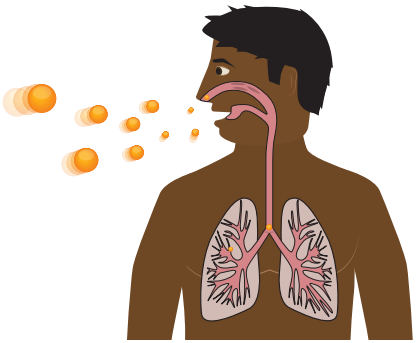
Inhalation

Direct inhalation of an undiluted CPP only occurs for active ingredients that are volatile, i.e. that evaporate into air. The greater the volatility of the CPP the greater the risk of inhalation. These days the majority of CPPs are almost non-volatile so this risk is becoming less common. However, the dust formed by abrasion of seeds that have been treated with Seed Treatment products during handling can potentially be inhaled and the active ingredient either absorbed through the membranes of the nose or mouth, or even into the lungs. Hence inhalation of treated seed dust must be avoided.

Tefluthrin

The seed treatment active ingredient Tefluthrin may cause **Subjective Facial Sensation (SFS) so exposure of the skin or respiratory tract via dust during handling should be avoided by use of appropriate PPE.** (see glossary for more information on SFS).

Inhalation of spray droplets may occur if the droplets are very small. Only spray droplets of less than 2µm are able to be respired by entering into the lung alveoli. All sprays have a range of droplet sizes and the correct droplet size is important not only to minimize inhalation exposure but also to ensure the efficacy of the product and minimization of spray drift to protect the environment. Therefore, spraying very fine droplets should be avoided.



Ecological exposure

For ecological exposure assessments, the predicted concentrations that may be found in the different parts of the environment following the use of the product are compared to the results of the ecotoxicological studies on representative species, to determine if the predicted levels are likely to cause mortality to individuals or effects on populations. Again, a safety factor is usually included.

4.3 Risk assessment

Risk assessment is the pulling together of all of the above information (toxicological data, ecotoxicological data, hazard profile and exposure modeling) to draw conclusions on the probability or likelihood of toxic effects to humans or the environment under the conditions of use, and then decide whether the CPP can be used safely or not. This step is usually carried out by the government regulatory authorities of different countries. Since government regulatory systems have become generally more stringent in recent years, extremely toxic pesticides may no longer pass the requirements and cannot be registered and sold in many countries. In these countries, only pesticides with lower toxicity and exposure potential are able to pass the risk assessment stage.

More information is available at:
www.pesticidewise.com/en/topics/health/wear-the-right-personal-protective-equipment-ppe/

4.4 Risk management

When the hazards are profiled and the risk characterization is complete, many government regulators will nearly always set conditions on the use of the CPP to mitigate or reduce the risks to an acceptable level. Risk management is also the responsibility of the manufacturers, such as Syngenta, and of course the end user of the product. All parties involved with the CPP are responsible for the management of the risks associated with it.

The usual risk management strategies include:

- Product labels showing limits on the amount of active ingredient; number of applications and timing of the CPP use; instructions for PPE use; warnings and precautions; and first aid instructions
- Stewardship and safe use training by manufacturers, governments or industry groups
- Industry guidelines and local best practices.

To summarize, CPPs are hazardous substances and have some level of inherent toxicity to humans and other organisms in the environment. Avoiding or mitigating exposure to an acceptable level through the best practices outlined in this Manual is the key to protecting humans and the environment when handling CPPs.

Chapter 5

The 5 Golden Rules

Exercise caution at all times

- Always handle CPPs carefully, avoiding contamination of yourself and the environment.
- Always clean up spills of CPPs immediately.
- Keep children, animals and bystanders away when handling CPPs.

Read and understand the product label

- Always read and understand the product label, or have someone read it to you. If unsure, seek the advice of local field experts.
- When using CPPs, always comply with local regulations and laws.

Practice good personal hygiene

- Always practice good personal hygiene when handling CPPs.
- Do not eat, drink or smoke while handling CPPs.

Wear appropriate personal protective equipment (PPE)

- Wear the PPE stated on the label or by applicable local regulations. PPE requirements vary depending on the type of product, its toxicity level and the likely exposure level.
- As a minimum, always wear impermeable gloves (e.g. nitrile material) when mixing and loading CPPs.

Take care of and maintain application equipment

- Regularly maintain your spraying and drilling equipment so that it works effectively and does not leak.

The 5 Golden Rules represent core principles to respect when we talk about the safe use of CPPs. In the following sections of the Manual, references to each of the 5 Golden Rules will be made by the relevant matching icon shown below.

More information is available at:
https://www.pesticidewise.com/en/trainers/5-golden-rules/

Chapter 6

Personal hygiene

This section outlines the key points regarding good personal hygiene. These apply when working with all CPPs (also refer to Chapter 4).

- Handling CPPs safely takes skill and your full attention, so you must be fit and well to use pesticides. If your health is not at its best, delay spraying until you are better. Do not eat, chew gum or betel nut, drink or smoke while handling CPPs.
- Check the label to understand which PPE you need to use when mixing and loading, and when applying your CPP – please note that PPE requirements may be different for these different steps of the process.
- Have dedicated PPE, including long-sleeved shirts and trousers, exclusively for use when handling CPPs and make sure it is clean and in good condition.
- The hands are the area most at risk of exposure, particularly when mixing and loading, so always wear impermeable gloves such as those made of nitrile rubber, at this critical stage. Do not wear leather or fabric gloves as they are absorbent and also cannot be washed easily. A long sleeved shirt, long trousers, impermeable boots or impermeable footwear as well as eye protection should also always be worn as the minimum PPE.

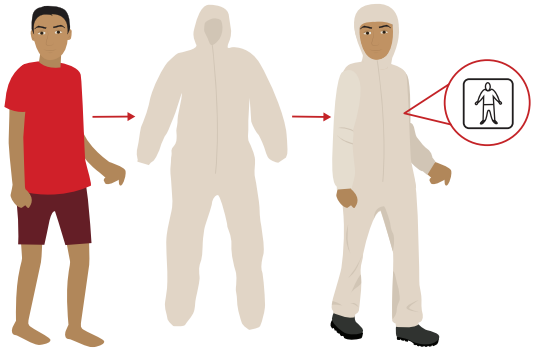
Why is good personal hygiene important?

Good personal hygiene is essential to reduce exposure of your body, hands and face to CPPs - and to avoid cross-contamination of CPPs to your family, friends and bystanders, and “clean” areas such as your car and home.

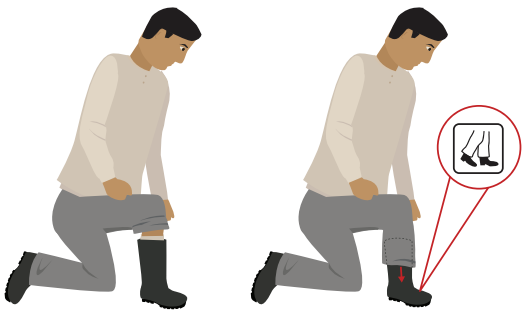
Why should I wear PPE when handling CPPs?

CPPs are hazardous substances and are potentially harmful to your health. The more you are exposed to the CPP (i.e. the greater the quantity and the longer the time), the greater the likelihood of harm. The skin is the area of the body most at risk. This is specifically true for hands, which represent over 80% of the contamination risk. Exposure can occur at all stages of handling including from spills, leaking hoses or equipment, spray drift and during clean-up. It is therefore important you protect yourself from exposure by using the recommended PPE. In most countries it is a condition of CPP use under local legislation that the advised PPE must be worn. Read the label carefully to find out what you need to wear, as it will vary between products and between uses.

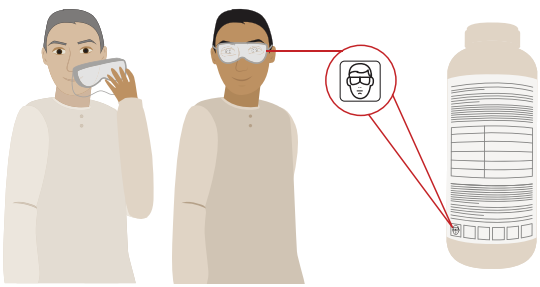
PPE Guidelines



A coverall is the best option to protect your body, however you can also wear a long-sleeved shirt and long trousers if advised on the label.

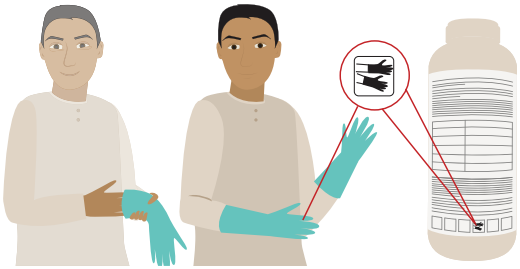


Check that your impermeable boots are clean inside and out, and are in good condition. Wear the coverall/trouser legs over the outside of the boots so that spray cannot run down inside the boot.

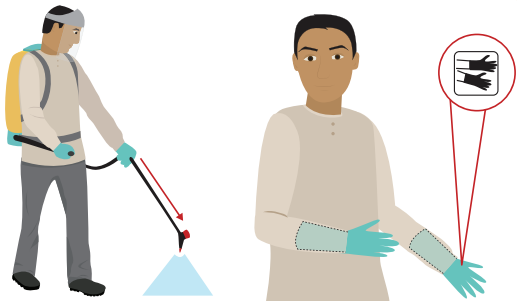


Wear goggles to protect your eyes.

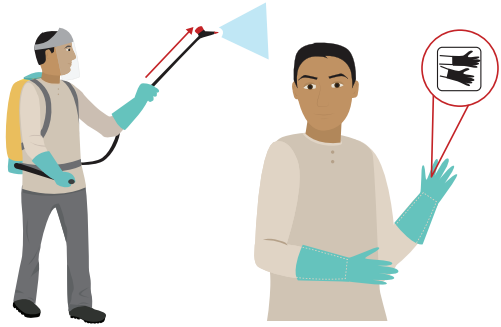
Wear impermeable gloves to protect your hands and wrists when mixing pesticide, spraying pesticide, and cleaning your equipment.



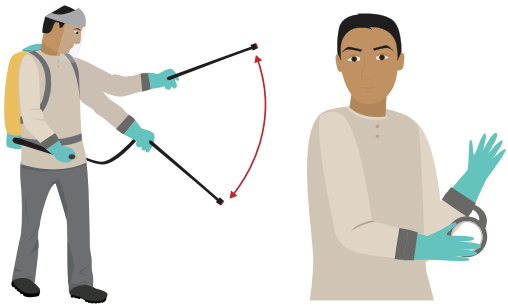
If spraying with a knapsack sprayer downward or laterally, pull the coverall or shirt sleeve out and over the glove so that the glove is worn inside the sleeve.



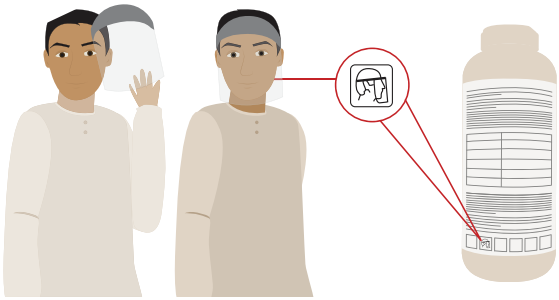
If spraying with a knapsack sprayer upwards, tuck the coverall or shirt sleeve into the glove so that the gloves are worn outside the sleeve.



If spraying with water-resistant a knapsack sprayer both upwards and downwards, use water-resistant tape to seal the join where the glove meets the sleeve.

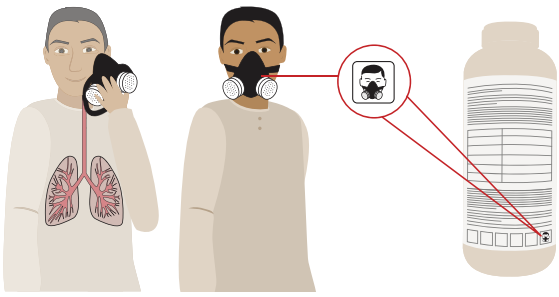


Wear a face shield
to protect your face.



Some CPP labels may recommend the use of respirator. Change respirator filters frequently, following the manufacturer's instructions.

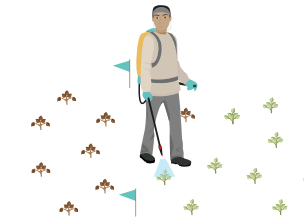
Protect your lungs with a respirator, particularly when applying fine droplets in high crops such as with mist blowers in orchards or crops growing in enclosed spaces.

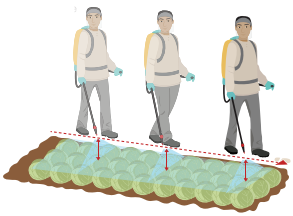


Wearing a hat will give protection from both the sun, frunout from tall crops and fallout from spray drift. Make sure the hat is washable.

Always use the PPE as stated on the label. The level of PPE to wear varies depending on the product, its formulation type and toxicity level. PPE instructions on labels also take into account the potential for exposure, for instance less PPE is generally required when an applicator is spraying from inside a closed and filtered tractor cabin.

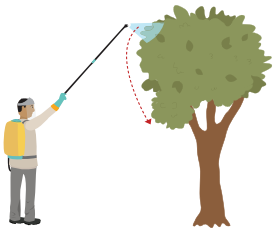
Directed spray in low crops/weeds is likely to result in a low risk of exposure





Spraying crops that are between knee and waist height may give a medium risk of exposure

Spraying higher crops may give a higher risk of exposure



The highest risk of exposure is during mixing and loading, as this is when the undiluted CPPs are handled.

Other factors to consider when mixing and loading

Factors reducing risks:

- Granule formulations
- Water-soluble bags
- Low acute toxicity/irritation
- Closed transfer systems
- Handling small quantities

Factors increasing risks:

- High acute toxicity/irritation
- Solvent-based formulations
- High vapor pressure
- Poor equipment choice/use
- Inappropriate container size/type

Other factors to consider when spraying

Factors reducing risks:

- Tractor-mounted sprayer
- Wel-maintained knapsack sprayer
- Knapsack spraying with nozzle below waist height
- Tractor with cab
- Small area to treat
- Spot treatment
- Bare-soil treatment

Factors increasing risks:

- Leaking knapsack sprayer
- Spraying with nozzle above head height
- High crops (mature corn, sugarcane, cotton)
- Spray-gun use in overhead tree crops
- Greenhouse (confined) crops
- Frequent, long-term use

Cabins and filters reduce exposure

Tractors and mist blowers with closed cabins greatly reduce potential operator exposure. When used with appropriate filters, they can replace the need for PPE (i.e. impermeable gloves, face mask) during application. Clean and change filters regularly, following manufacturer's instructions. Check cabin seals regularly. Do not leave windows open, and ensure the cabin is pressurized. Do not get into the cabin with contaminated PPE.

A tractor is a significant investment and it is therefore important to obtain the maximum benefit from it. Whenever possible, the use of a tractor with a closed cabin is recommended.

The additional investment is largely offset by enhanced safety and comfort for the operator.

Studies show that using a tractor with a closed cabin can reduce operator exposure by approximately 10 times. A closed cabin protects the operator from the external environment (atmospheric agents, spray cloud etc). Closed cabins should be approved and certified (if local certification systems are available), and must comply with minimum standards such as those set by the OECD.

Cabin filters must comply with local regulations. For example in Europe, the European standard EN 15695 has the following categories:

Category	Filtering capacity according to EN 15695
1	No protection against toxic materials
2	Dust ≥ 99%
3	Dust ≥ 99%, Aerosol 99.95%
4	Dust ≥ 99%, Aerosol 99.95%, Vapor

- Never use kitchen utensils such as spoons for measuring CPPs. Have dedicated equipment stored separately from household items.
- Have clean water available when working, for washing off splashes or spills from yourself or your equipment.
- If any contamination does occur to your skin or eyes, take immediate steps i.e.wash your skin with soap and water, or flush your eyes with fresh water for at least 15 minutes. Some CPPs will require further medical assistance in the case of accidents so ensure that you follow the instructions on the product label carefully (see more information in Chapter 7).
- If any spills occur onto the CPP packaging or your equipment, clean them up before proceeding. If using a knapsack sprayer, clean the outside after loading the CPP to ensure there is no cross-contamination to your body during use.
- Try not to touch your face or exposed areas of skin with your gloves when working, to avoid movement of spilled CPPs from the gloves to skin.
- Have a large plastic bag or other suitable equipment available to carry any contaminated clothing from the field if an accident occurs.
- Take care when removing PPE at the end of the work session so as not to cause contamination to yourself with any product which may be remaining on gloves, coveralls or aprons.
- Wash reusable PPE after use. Gloves should be washed before removing them to avoid transfer of CPP to your bare skin (see below). PPE should be washed in a dedicated area. Do not take used PPE into the home or areas where family and bystanders are present so that they are not exposed.

- If your PPE is disposable, do not wash or reuse it. Washing disposable PPE will cause it to lose its protective properties and render it useless.

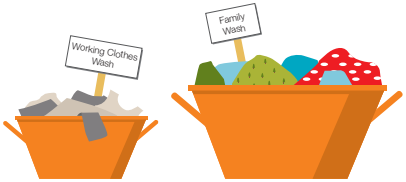
How to remove impermeable gloves:

Partly remove one of the gloves as far as the wrist. Pull the other glove down to thumb level. Grasp the gloves by the insides with your free hand and insert your thumb in the unremoved glove to remove it. Always hold the gloves by their insides until washed.

- Always wash yourself at the end of work in case there are traces of the CPP remaining on your skin. Wash your body from the top downwards. If showering is not possible, at least wash your hands, arms, face and neck with soap and water.

- Wash PPE, including your long-sleeved shirt and trousers, used while handling CPPs—in a dedicated area and separately from everyday clothes. This is critical to avoid contamination.

- Do not allow dirty washing water to enter drinking water sources or other waterways, as the traces of CPP within the washing water can cause contamination of the aquatic environment.



- Take care to avoid contamination of other people such as members of your household or of non-CPP related areas of the farm or home.

What is cross-contamination?

Cross-contamination occurs when CPP residues are transferred from an operator to other objects. Always wash and remove PPE carefully.

More information and materials on personal hygiene on:
www.pesticidewise.com/en/trainers/personal-hygiene/

Chapter 7

Incident management

Sometimes, despite exercising caution and practicing good personal hygiene, accidents can occur. You must be prepared for and understand what actions need to be taken in case of accidents and incidents when handling CPPs.

Wash any spills or splashes from skin and eyes immediately.

- If the undiluted or diluted CPP makes contact with the skin or gets into the eye, stop working immediately.
- For the skin, remove any contaminated PPE or clothing first, being careful not to spread the contamination further, then wash skin with water and also soap if possible. If a large area of the body is contaminated, seek medical attention. Take the CPP package with you so you can show the label to the physician.
- For the eyes, use clean running water, ideally from a tap or eye shower, to flush the eye or eyes constantly for at least 15 minutes, letting the water run into the eye from the side of the face towards the nose. Ensure that contact lenses are removed first if present. Hold the upper eyelid open, if possible, to wash underneath it. Read the label's first aid instructions after the 15 minutes of washing, or have someone read the label for you, to check if further medical assistance is required. Some CPP concentrates are severe eye irritants and it is critical that you seek expert medical attention if any amount of the product gets into the eye. Do not delay – after the 15 minutes of flushing have someone take you directly to a doctor, hospital or medical center. Take the CPP package with you to show the label to the physician.

Basic principles of incident management:

1. Wash any spills or splashes from skin and eyes immediately
2. Clean up environmental spills immediately
3. Seek medical advice if poisoning occurs or if the label states that exposure warrants immediate medical attention

Clean up spills immediately

Liquid spills:
Immediately prevent liquid from running into drains and waterways by placing some soil or solid objects to block the flow. Cover the spill with friable soil, sand or other absorbent material such as cat litter. Collect this material with a shovel and place into a strong plastic bag or container for disposal (see Section 8.7 (Waste management) for more information). For large amounts of spilt liquid, call emergency services immediately and follow their advice.

Solid spills:

If on sealed surface, use a HEPA-filtered vacuum cleaner or industrial vacuum cleaner to collect the material. If these are not available, use a broom and dustpan, being careful not to raise dust in the sweeping action. Wet the spill with a small amount of water first if the material is very dusty or if wind is lifting dust. If spilt on the ground, use a shovel or other tool to collect the spilt material. Place it into strong plastic bags or containers for disposal. See Section 8.7 (Waste Management) for more information.

Follow the label instructions and refer to the Safety Data Sheet for instructions on how to handle a spill, as specific instructions may apply to individual CPPs.

All waste must be disposed of in accordance with local regulations.

Contact emergency services if the spill is too large to handle or if you are in doubt about what to do.

Managing CPP poisoning

Symptoms of poisoning
CPP poisoning may include some of the following symptoms:

GENERAL
Extreme weakness or fatigue.

SKIN
Irritation, burning, redness, excessive sweating, obvious staining.

EYES
Irritation, burning, excessive watering, blurred vision, narrowing or widened pupils.

DIGESTIVE SYSTEM
Burning in mouth and/or throat, excessive salivation, nausea, vomiting, stomach cramps or pains, diarrhea.

RESPIRATORY SYSTEM
Labored, difficult or abnormal breathing, wheezing, coughing, chest tightness and pain, lack of breathing.

NERVOUS SYSTEM
Dizziness, confusion, restlessness, headaches, muscle twitching, staggering, slurred speech, fits or convulsions, unconsciousness.

The above symptoms may be associated with many other conditions other than pesticide poisoning, so try to find out as much information as possible before concluding that pesticide poisoning has occurred.

Assessing the incident:

Ask the patient—if they are conscious—or anyone else available (fellow workers, family etc.)

- What happened? Did an accident occur e.g. contamination?
- What CPP was being used?
- For how long were they using CPPs, and how long ago?
- When did they first feel unwell?
- Do they suffer from any other known ailment?
- Were they taking anything (alcohol, drugs, medicines etc.)?
- How do they feel now?

Observe

- Any evidence of an accident or contamination, such as spills?
- Look for the CPP label or pack
- Signs of ill health
- Any indication of other ailments (medication in pockets, medic alert bracelets etc.)

Smell

- Any evidence of CPP presence? (many have a distinctive smell)
- Any evidence of alcohol?

DO NOT induce vomiting

DO seek medical advice immediately.

DO have first aid training to help safeguard your family, workers and others.

Seek medical advice if poisoning occurs

If you or any other person is exposed to a CPP, especially by oral ingestion, and you suspect poisoning has occurred, seek medical advice immediately. The more toxic the CPP the more urgent it is that you get help. Check the label to determine how toxic the CPP is. Take the pack with you to the doctor, hospital or medical center.

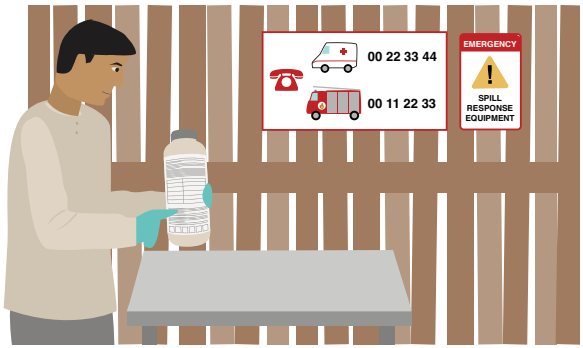
Do not induce vomiting. Incorrect treatment may worsen a patient's condition therefore always seek expert advice rather than initiating treatment. However, if the patient's breathing has stopped then mouth-to-mouth resuscitation should be applied.

It is highly recommended that you have training in First Aid by an authorized organization rather than trying to implement treatments that you are not sure of and that may worsen a situation.

Always keep the label/package of the CPP to show to the treating medical officer. Place it in a plastic bag or container or wrap it in cloth if the outside of the packaging is contaminated with product.

Why vomiting should not be induced

Current medical advice is that vomiting should not be induced following oral ingestion, due to the fact that certain formulations may contain ingredients such as solvents and hydrocarbons, which can be aspirated into the lungs during vomiting. This can cause serious lung damage or death. Therefore vomiting should not be induced. However, if the patient does vomit involuntarily then offer support and obtain medical assistance.



Always read the label and have emergency phone numbers for local or international poison centers nearby.

Synthetic pyrethroids including lambda-cyhalothrin and tefluthrin may cause SFS (Subjective Facial Sensation) in some individuals. This tingling, itching or numbing condition is transient and usually resolves within 24 hours. Recommended PPE should always be worn to minimize exposure and the risk of experiencing SFS (see Glossary for more details on SFS).

Have emergency contact numbers available on the farm

Syngenta labels contain emergency phone numbers for local or international poison centers. This number should be called in case of CPP exposure.

For active ingredients which are very toxic by oral ingestion, such as Paraquat (Gramoxone), call an ambulance or have the patient transported as quickly as possible to the nearest hospital. Do not waste time initiating first aid on site. If possible, phone ahead to the hospital to inform them of the impending arrival of the patient. Take the product label with you if possible.

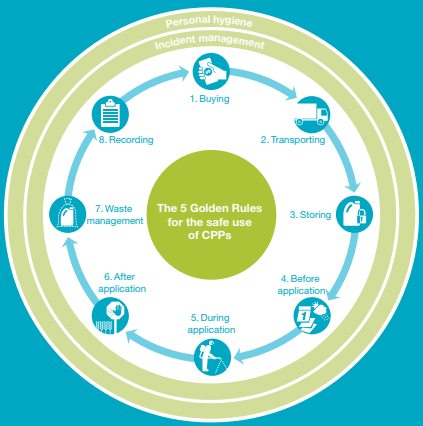
More information is available at:
https://www.pesticidewise.com/en/trainers/incident-management/

Chapter 8

Crop Protection Products (CPPs) on-farm life-cycle

The 5 Golden Rules contain general advice that is mostly applicable across all stages of the CPP lifecycle. We will now look in more detail at safe use during the 8 stages of the on-farm CPP lifecycle.

How do the 5 Golden Rules link with the on-farm lifecycle:



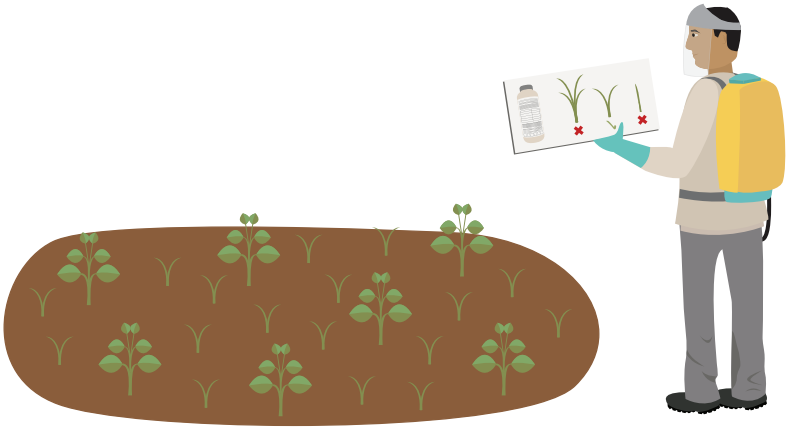
	EXERCISE CAUTION AT ALL TIMES	READ AND UNDERSTAND THE PRODUCT LABEL	PRACTICE GOOD PERSONAL HYGIENE	WEAR APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT	TAKE CARE OF AND MAINTAIN APPLICATION EQUIPMENT
1. Buying CPPs	✓	✓			
2. Transporting CPPs	✓	✓		✓	
3. Storing CPPs	✓	✓			
4. Before application of CPPs	✓	✓	✓	✓	✓
5. During application of CPPs	✓	✓	✓	✓	✓
6. After application of CPPs	✓	✓	✓	✓	✓
7. Waste management	✓	✓	✓	✓	
8. Recording CPP use	✓	✓		✓	✓

8.1
Buying CPPs

This section outlines good practices that need to be considered when buying CPPs.

Read the label or have someone read it to you before purchase to check the product is the correct choice for your needs and that all the critical information is available. If in doubt, ask for advice.

- Always buy CPPs from an official authorized dealer.
- Ensure you are buying a genuine, registered product.
- DO NOT buy damaged products.



Why should non-genuine or counterfeit products not be purchased or used?

- They may not work effectively.
- They may cause damage (phytotoxicity) to the crop.
- The amount of active ingredient may be less than the level stated on the label.
- The active ingredient may not be present in the product.
- The active ingredient may be different to the one stated on the label.
- Levels of impurities may be higher than specifications allow, including possible toxic impurities.
- The quality of the formulation may be poor.
- Packaging may be poor quality, resulting in breakages and leaks, especially around the lids.
- Label directions and warnings may be inadequate, meaning that the product is not used correctly.
- Untested products may have harmful consequences for the user and the environment, or result in undesirable crop residues due to unknown or different levels of the active ingredient.
- The companies making and selling the products are often illegal and by supporting illegal business, you encourage its spread and cause loss of business to genuine manufacturers and retailers.

Check CPPs are genuine and be aware of the risks of counterfeit products.

Genuine CPPs and seed treatment products go through years of strict testing and risk assessments to ensure that they are safe to use and perform as they are claimed to.

Counterfeit and other illegal CPPs may not contain the labeled active ingredient and are often:

- untested
- unauthorized or unregistered
- do not meet appropriate specifications
- of poor quality.

Unfortunately, increasing quantities of illegal and counterfeit products are being produced—some looking very similar to the genuine product—and placed on the market all over the world.

Therefore it is very important to only buy genuine, good-quality products. If you have any doubts over whether a product is genuine or a counterfeit please contact your local Syngenta representative or the police.

CPPs must be in their original, undamaged container with a clear, legible label.

- Ensuring that the product is in its original, undamaged packaging not only protects the Growers from potential spills and incidents during transport and storage, but also acts as an additional guarantee on the quality of the product.
- Check the expiry date of the product.
- Packaging integrity does not necessarily assure that a product is not a counterfeit – labels should be carefully checked to see if elements are illegible or if critical information is missing. If in doubt do not purchase that container and notify authorities.

If the product container is damaged or leaking, do not buy the product. Ensure that the product lid has not been tampered with and if in doubt check the secondary foil seal.

Never accept, or ask for, products to be decanted from their original containers. Buy the pack size that suits your needs.

Do not decant CPPs

They must always remain in the original, labeled container to avoid mistaken use, especially by vulnerable individuals and children, which in some cases can lead to fatalities.

Choose the correct CPP for the crop and target pest you need to control.

- The product label clearly shows the crops and pests that the product can be used for. Therefore, always look at the label to make sure that you are choosing a suitable product for your crop and pest. If the pest you want to control is NOT shown on the label, then it is very likely the product will not control it, its use may be illegal, it could damage your crop, and using the product may be a waste of time and money.
- Seek advice from the retailer or extension officer if unsure what CPP to use.

Only buy the amount of product you need, to avoid unnecessary waste and to minimize risk during storage.

Try to anticipate how much of a product you will need by looking at the label rates and understanding your pest pressure. Then purchase only enough for the current job, or at most a season of applications.

Although most CPPs have a long shelf life, you should not use a CPP past its expiry date, therefore storage of left-over product should be avoided.

Avoid storing partly used CPP packs as they may increase the risk of access by unauthorized persons.

Make sure you have the necessary equipment and PPE to use the CPP.

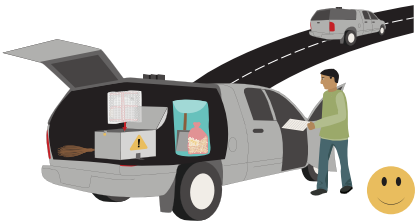
Read the label to find out what type of application equipment should be used and what PPE must be worn to ensure the correct use of the product.

A buying CPPs checklist is available at:
https://www.pesticidewise.com/en/tools/buying-checklist/

More information is available at:
www.pesticidewise.com/en/trainers/buying/

8.2 Transporting CPPs

This section outlines good practices that need to be considered when transporting CPPs.



Be aware of and comply with any local or applicable legislation regarding the transport of products.

- Ensure that vehicles are in good condition and are safe to transport CPPs.
- Make sure CPPs are secure before beginning the journey.

- CPPs should be in a separate compartment from the driver or passengers, or separated by a barrier or container, so that if the container is damaged the spill is less likely to make contact with people in the vehicle.
- When spraying CPP with a tractor on crops that are spread across different parcels of land, it is recommended that the spray mixture is prepared at the field side. Also, the transportation of sprayer tank full of spray should be avoided on public roads. If public roads cannot be avoided, check that the cap of the sprayer is securely closed, that there are no leaking tubes and that the level of the mixture will not cause it to spill.
- Keep CPPs away from the driver, passengers and other items, especially food.

- Make sure there are no sharp objects such as protruding screws that could pierce the container, resulting in leaks or spills.
- Never leave CPPs unattended during transport, to avoid unauthorized access.

Transport CPPs in their original containers.

- Check that the seals are still tight to avoid the possibility of leaks or spills during transportation.

More information is available at:
www.pesticidewise.com/en/trainers/transporting/

Secure CPP containers during transport to prevent them from shifting.

- Small amounts of product should be placed where they will not roll around during transport, for example in another container or carton.
- If buying large amount of product, distribute them evenly within the vehicle, with the heavier packaging at the bottom and ideally occupying the entire surface of the compartment to avoid shifting during transport.
- Secure with ropes or straps if possible, and protect with padding materials to prevent movement and breakage, which can result in leaks and contamination.

Transport CPPs or application equipment separately from food, animals or humans.

- If other people or animals must be transported with CPPs ensure that the products are physically separated (e.g. in separate containers or by barriers or nets).
- Do not put the CPP products in the same bags as food.
- If using public transport, a motorcycle or a bicycle, enclose the CPP in a secure container, box or sealed impermeable bag.

Avoid exposing the packaging to excessive heat, rain, cold or other climate extremes during transportation.

When handling CPP containers during transport, it is best practice to wear the minimum PPE (gloves, a long-sleeved shirt, long trousers and impermeable boots).

If transporting heavy containers, ensure that there is equipment available to enable safe loading and offloading. Do not lift heavy loads without help.

Be prepared for any accidental spillage or emergency situation.

- If transporting large amounts of product, have a spill kit available, including absorbent material and a shovel.
- Clean up any liquid spills using absorbent material such as sand, clean friable soil or cat litter.
- Solid spills such as granules or treated seeds can be shoveled or swept into containers for disposal.
- Do not leave spilt CPP material in vehicles. Clean it away as soon as possible, wearing PPE.
- Call the appropriate authorities if help is required, for example if the spill is too large to be cleaned up with the equipment available.
- When transporting spraying equipment in vehicles after use, ensure it is washed and clean before leaving the field and placing it in the vehicle.
- When transporting CPPs from the home or shed to the field only take what is required for the job, always transport them in their original containers and do not decant them into other containers.

8.3 Storing CPPs

This section outlines good practices that need to be considered when storing CPPs.

Keep products securely stored in an appropriate storage area except when they are in use. Ensure CPPs are out of the reach of children, unauthorized persons and animals, to avoid exposure.

Check and comply with all laws or regulations applicable to storage of CPPs.

Always comply with local or applicable CPP storage laws and regulations applicable to your area.

Why do CPPs need to be correctly and safely stored?

- To protect human health
- To protect the environment
- To maintain product integrity and effectiveness
- To ensure compliance with local or applicable laws

Store CPPs in a securely locked place away from food, humans and animals.

Best practice is to have a storage room, such as a shed, exclusively for storing CPPs and also dedicated measuring devices and equipment used during preparation of CPPs.

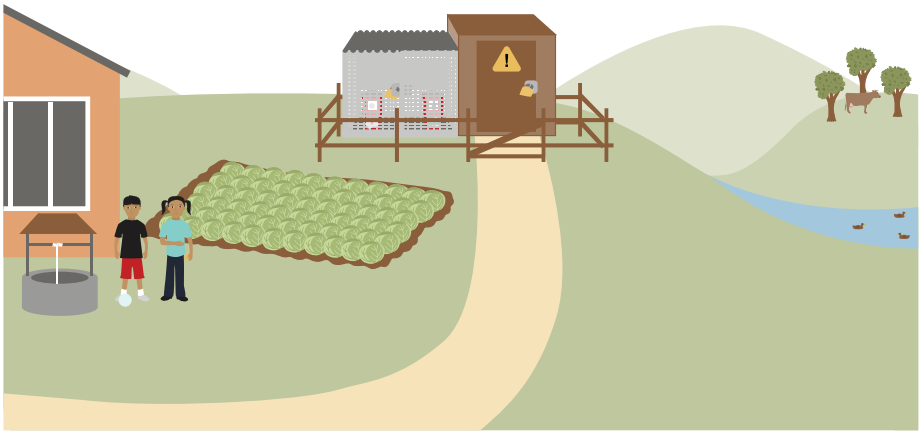
A lockable cupboard or box may also be acceptable for small quantities.

In order to avoid any potential contamination from leaking CPPs, PPE should be stored separately but close to the CPPs.

Do not store untreated seeds, food or farm animals or their feed in the CPP store. However, seeds treated with CPPs should be stored in the CPP store.

Keep storage boxes or rooms securely locked and ideally separated from other buildings, especially residential buildings.

Unauthorized people, children and animals should not be allowed to access chemical storage areas, thereby minimizing any risk of contamination, poisoning or theft.



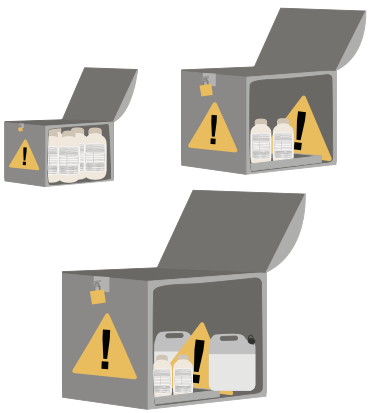
CPPs must be stored only in their original containers.

Storing in the original containers will help to

- Prevent mistaken or unauthorized use by others
- Ensure that you always know what the product is
- Ensure that the original label is present.

Containers should be placed in the store so that the label is easily visible.

CPPs should never be decanted from their original containers into other containers.



Store left-over treated seeds in original labeled container.

Since treated seeds contain chemicals they should be stored securely to prevent unauthorized access, particularly by animals and children.

Any treated seeds that remain at the end of sowing/drilling should be returned back to the original labeled bags, if available, and properly sealed to prevent exposure and contamination risks.

If the seeds were treated on farm, use a suitable, strong bag and label it with an indelible marker with the name of the Seed Treatment product used, the date treated and any warning statements found on the Seed Treatment product label. Then store it in the CPP store.

Untreated seed should be stored separately, outside of the chemical storage area to avoid confusion.

Materials used to build storage rooms should be impermeable and resistant to fire.

- Locate storage rooms away from waterways and wells or areas prone to flooding.
- In warm climates try to use storage rooms that are shaded, to minimize exposure to excessive temperatures.
- In cold climates provide protection against freezing if required and if possible.
- Store rooms must have sufficient ventilation to allow air exchange.

Never eat, drink or smoke in the storage room or close to the storage box.

Store solid products above liquid products.

- This is to ensure that no liquid spills onto the solid products in the event of an accident.

Read the CPP label for instructions on correct storage of each product.

- Some products have specific storage needs.

Periodically check that stored products are in good condition.

- Regularly check that products have not passed their expiry date. (Note: When products have passed their expiry date, ask your supplier if they can be returned. If not, then dispose of them following local best or required practice.)
- It is best to use older products first, so they don't expire.

Keep the store clean and tidy, and avoid trip hazards on the floor.

Be prepared for emergencies.

Have a clearly visible and up-to-date list of emergency phone numbers - such as firefighters, medical assistance and poison information centers-listed on the wall of the storage room or inside the lid of the storage cupboard or box.

Safety Data Sheets should be available for each product in the storage area. These can be obtained through manufacturer's websites or from the local retailer.

Storage rooms should have equipment for dealing with spills and emergencies. Large stores should be able to retain spills and firefighting water. This can be achieved by building a floor a few centimeters below soil level, or by building a bund and waterproofing floor surfaces.

Large stores should be equipped with:

- first aid kit
- fire extinguisher
- sand, cat litter or other absorbent material
- strong plastic bags
- bucket
- brush, dustpan
- water and soap for washing hands
- eye shower.

Home-made eye showers can be made by placing a clean, large (20L) water container with a tap on a shelf at head level, with space underneath to stand if needed.

Keep storage records.

- Record all products in the store, including their delivery and their use.
- Keep these records in a safe place and available for emergency services if required. (See Section 8.8 for more information.)
- Check the condition of products at delivery, if relevant.

Organizing your storage facility: Key points

Product Storage: Purpose-Built Stores on Farms

1. Locked room with controlled access (key, digital code, magnetic card) reserved specifically for storage purposes
2. Facility identified as the "Storage Room"
3. Facility to be located away from residential buildings and watercourses

4a. Room to be well aired or ventilated

4b. High and low-level ventilation grilles on opposite walls

5a. Room to be temperature controlled (+2 to +30)

5b. If heating to air-conditioning is required, use systems that do not pose a fire hazard

6. Leak-proof stone/tiled floor with surrounding edge and/or system for recovering any spillage to prevent contamination of the exterior environment

7a. Electrical installations conform to local regulations

8. Clearly displayed safety instructions (no smoking/drinking/eating; evacuation procedure)

9a. Storage equipment made from non-absorbent, impermeable, non-combustible materials

9b. Keep products off the ground by using wooden pallets or retention pans

10. Products classified as T, T+, carcinogenic (R40, R49, R45), mutagenic (R46, R40, R68) and toxic to reproduction (R60, R61, R62, R63) must be grouped separately

11. ABC power extinguisher located outside the store

12. Raised door threshold (floor slightly lower than door level)

13a. Door opens towards the exterior

13b. Fire door with anti-panic handle

14. Nearby watersupply

15. First aid cupboard with eye shower

16. Container for stocking empty packagaing

17. Telephone and emergency phone numbers close at hand

18. Safey Data Sheets for all products held in stock

19. Stock management book

20. Shower for cleaning up after using products (may be in the house)

21a. Cupboard for Personal Protective Equipment (PPE)

21b. Dual-compartment cupboard (for normal clothes and PPE)

22. Wrapped Seeds

23. Absorbent material for spills (e.g. vermiculite, cat litter)

24. Brush, broom, shovel and other tools reserved solely for CPPs

25. CPPs stocked in their original packaging

26. Separate storage for out-of-date or non-usable products

27. Bin for soiled disposable PPE

28. System for recovering soiled rinse-water (drums or draining to retention tank)

29. Cleaning equipment to clean the store room on a regular basis

KEY
Black: required
Blue: highly advisable
Green: optional

More information is available at:
www.pesticidewise.com/en/trainers/storing/

8.4
Before application of CPPs

This section outlines good practices that need to be considered before the application of CPPs.

The critical information that you must identify and understand includes:

- The active ingredient
- The formulation type
- The particular crops or situations that the product is approved to be used for
- The target pests
- The application rates and water volumes
- Post-harvest interval (PHI) or Withholding period (WHP)
- PPE to use while mixing and applying CPPs
- First aid and emergency information
- Environment protection precautions.

Read more on Integrated Pest Management at:
http://croplife.org/crop-protection/stewardship/integrated-pest-management/

Like all hazardous substances, CPPs must be handled appropriately and responsibly. Plan ahead and be aware of your actions at all times. As in most things, planning and preparation is the key to successful CPP use. There are a number of steps you should take prior to starting to apply CPPs.

Identify the pest/weed and level of infestation, and follow Good Agricultural Practice (GAP – see glossary for definition). Make sure you know what pest or weed you want to control, and that it is at the economic threshold that warrants use of chemical control.

Understand local recommendations for GAP to ensure that you get the most out of the product for your conditions. Seek advice from your local extension officer, retailer or Syngenta representative.

Read the CPP product label. The label contains important information on the use of the product, its features, the risks, and correct measures to take in the event of an emergency. In most countries, CPP use is governed by national or state/provincial laws, so it is essential that you use the product correctly and in line with label instructions.

Why must I read and understand the product label?

It is very important that you read and understand the information on the label so that you know how to use the CPP correctly and safely, and to get the most benefits out of the use of the product. Not using the CPP correctly is a waste of your money and time, and can result in adverse effects to operators, bystanders, consumers and the environment.

If you cannot understand the label then have it read and explained to you, for example by the retailer at the time of purchase, or by your local extension officer.

Other information that is usually shown on the label (depending on the product type) includes:

- Timing of application e.g. weed size, crop stage, pest density, fungal infection stage and Pre-Harvest Interval (PHI)
- Number of permitted applications per season
- Resistance management information
- Specific advice on application equipment to use
- Restrictions on types of application equipment that must not be used (e.g. mistblowers, aerial)
- Nozzle type and sprayer pressure
- Spray quality and droplet size
- Integrated Pest Management (IPM)
- Specific instructions for the protection of the environment, in particular recommendations on buffer zones to protect waterways and pollinators
- Storage and disposal information
- Batch numbers and expiry dates
- Warranty information.

Pre-harvest Interval

Most CPPs have a PHI (Pre-harvest Interval) stated on the label. Adherence to the PHI is critical to ensure that residues of the applied active ingredient (and metabolites, if relevant) in the harvested crop have degraded to below the set MRLs (Maximum Residue Levels). Compliance with MRLs can be essential for Growers to be able to sell their crops (for more information See Appendix J).

PHI specifies the minimum amount of time between spraying a crop and harvesting the crop. For example, a PHI of 2 weeks means that the crop must not be harvested for two weeks after application of the CPP.

Front panel

PLEASE READ THE LABEL COMPLETELY BEFORE USE

This product MUST NOT be used for any purpose or in any manner contrary to the controls and conditions of this registration.

Detailed warnings and precautions, including GHS pictograms and PPE instructions

HSNO classifications: 6.1D, 6.4A, 9.1B

WARNING
May be harmful if swallowed.
May cause eye irritation.
Toxic to aquatic organisms.

PRECAUTIONS

Store in original container, tightly closed, away from foodstuffs.
When mixing or applying, wear protective clothing including cotton overalls, protective gloves and face-shield.
Avoid contact with the eyes.
Wash splashes of concentrate from eyes or skin immediately.
DO NOT eat, drink or smoke while using.
Wash hands and face before eating, drinking or smoking and after work.
Wash protective clothing after use.
Apply with well-maintained and calibrated spray equipment.
Remove protective clothing and wash hands and face thoroughly before meals and after using.
Application and storage should be as described in the Management of Agrichemicals NZS8409.
DO NOT carry on a passenger service vehicle.
Avoid contamination of any water supply with chemical or empty container.

Local disposal information

CONTAINER DISPOSAL:

Ensure the container is empty. Triple rinse empty container and add rinsate to the spray tank. Recycle punctured container without caps through Agrecovery (0800 247 326, www.agrecovery.co.nz). Otherwise crush and bury in a suitable landfill. DO NOT reuse this container for any other purpose.

PRODUCT DISPOSAL:

Disposal of this product only by using according to the label, or at an approved landfill or other approved facility.

First Aid instructions

FIRST AID

If SWALLOWED, DO NOT induce vomiting. Rinse Mouth. Call a POISON CENTER or doctor if you feel unwell.
If SKIN or HAIR contact occurs, remove contaminated clothing and flush skin and hair with running water. DO NOT scrub the skin.
If splashed in the EYES, wash out immediately with water. Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
If INHALED, move the victim to fresh air immediately.
Begin artificial respiration if breathing has stopped. Use mouth to nose rather than mouth to mouth.
Obtain medical attention. Take to hospital without delay.

Local emergency contact phone numbers

For advice, contact the National Poisons Centre 0800 POISON (0800 764 766) medical advice is needed, have product container or label at hand.

Instructions for managing spills

SPILLAGE
Wear suitable protective clothing including face shield, impervious gloves and boots. Prevent the product or spilled material from entering water bodies.
Absorb liquid spills with inert material and place in waste containers. Wash area with water and absorb with further inert material. Dispose of safely.

General instructions on the use of the product

GENERAL INFORMATION
AMISTAR is a broad spectrum fungicide from the strobilurin, or QoI group with systemic, translaminar, protectant and anti sporulant properties. AMISTAR is best used as a preventative treatment during mid-crop development. AMISTAR also controls the late season disease complex in cereals when applied from flag leaf emergence. AMISTAR enhances green leaf area retention and will provide up to six weeks disease control in cereals. Applications made to cereal crops over the flag leaf to head emergence growth stages will provide significant green leaf area retention that can contribute to yield increases. AMISTAR should not affect beneficial species including Parasitic Wasps, Hover Flies, Lacewings and Honeybees.

GROUP	11	FUNGICIDE

Resistance management instructions

RESISTANCE MANAGEMENT
AMISTAR Fungicide contains a member of the strobilurin, or Quinone outside Inhibitors (QoI), group of fungicides. AMISTAR is a Group 11 fungicide. Resistance to this fungicide could develop from repeated use. To minimise this risk use strictly in accordance with label instructions and resistance management strategies. Since the occurrence of resistant fungi is difficult to detect prior to use, Syngenta Crop Protection Ltd accepts no liability for any losses that may result from the failure of AMISTAR to control resistant fungi. Consult your local supplier, consultant, a Syngenta representative or New Zealand Plant Protection Society (Inc), *www.resistance.nzpps.org* for alternate modes of action and the details of resistance management strategies for the crops listed on the label.

Cereals
Apply AMISTAR in mixture with other approved, non-cross resistant, fungicides to control cereal pathogens. Refer to manufacturers' recommendations for rates of partner fungicides. Apply AMISTAR preventatively or as early as possible in the disease cycle. DO NOT rely only on the curative potential of AMISTAR. Split/ reduced rate programs, using repeated applications, which provide continuous selection pressure, MUST NOT be used.

Grapes
Apply a maximum of 3 applications of AMISTAR or a related strobilurin product to the crop in 1 season.

Potatoes and field Tomatoes
Foliar applications of AMISTAR or related strobilurin products should not exceed one third of the total fungicide applications made to the crop in 1 season.

Warning statement relating to the critical risks of the product, in this case apple phytotoxicity

USE WARNING
AMISTAR is extremely phytotoxic to certain varieties of apple. AMISTAR can not be used in any manner that could result in spray drift reaching apple trees. Sprayers used for AMISTAR applications cannot be used to spray apples nor cause drift onto apples even after normal decontamination procedures have been followed.

DIRECTIONS FOR USE
It is an offence to use this product on animals.

Crop	Disease	Examples	More information
Barley	Didymella Leaf Scorch, Leaf Rust, Net Blotch (spot and net form), Ovularia Leaf Spot, Scald, Spot Blotch	750 mL/ha	Apply as a preventative spray. If disease is present, or conditions prior to application have been favourable for disease infection the addition of an approved triazole fungicide is recommended. Re-infection may require further treatment 4 to 6 weeks later. Where Scald infection pressure is high, it is recommended to apply AMISTAR in a tank mix with a fungicide from a different chemical group that is approved for use on this disease.
	Late Season Head Disease complex *(Alternaria, Cladosporium, Microdochium nivale, Stemphylium)*		Apply as a preventative spray after ear emergence; GS 57-69.
Grapes	Powdery Mildew, Downy Mildew, Botrytis*	80 mL/100 litres of water, and apply not less than 800 mL product/ha	Apply at 10 to14 day intervals from early flowering to pre-harvest. Use the shorter spray intervals during periods of severe disease pressure. *When AMISTAR is used in a seasonal spray program it will provide control of Botrytis additional to that of specific botryticides such as Switch®. AMISTAR MUST NOT be used instead of specific botryticides at strategic timings.
Onions	Downy Mildew, Pink Root	500 mL/ha	Apply in a minimum of 400 litres of water/ha for a crop in full canopy to ensure uniform coverage. Apply as a protective spray at 7 day intervals from the 2 leaf growth stage or when conditions favour disease infection but prior to disease development. Add a surfactant at recommended label rates. Use higher spraying pressure or air assisted equipment to enhance penetration in densely foliated crops. Application to established Downy Mildew may not give reliable control. AMISTAR will contribute to the control of Pink Root *(Phoma terrestris)*. DO NOT apply more than 4 applications of AMISTAR per season.
	Neck rot *(Botrytis allii)*		AMISTAR can be applied at key timings for neck rot control i.e. flag leaf and pre harvest. Apply in sufficient water to ensure thorough and uniform coverage. Applications MUST be made with the addition of a non-ionic wetting agent at manufacturer's label rates. Use higher spraying pressure or air assisted equipment to enhance penetration in densely foliated crops. DO NOT apply more than 4 applications of AMISTAR per season.
Peas (NOT of use on Peas to be harvested in pods and consumed whole, eg Snow Peas and Snap Peas)	Ascochyta, Downy Mildew, Powdery Mildew	500 mL/ha	Apply in a minimum of 200 litres of water/ha for a crop in full canopy to ensure uniform coverage. The first application should be made as a protective spray at 5th node to 1st pod formation. A second application 14 to 21 days later is required if disease pressure remains high. The addition of a surfactant at recommended label rates will assist crop coverage and spray distribution. Use higher spraying pressure or air assisted equipment to enhance penetration in densely foliated crops. Before applying AMISTAR ensure the crop is free from any stress caused by environmental or agronomic factors. Application to established Downy Mildew, Ascochyta or Powdery Mildew will not give reliable control. **Note:** See Withholding Period section for information on the appropriate withholding period.
Ryegrass seed crops	Crown Rust (Leaf Rust) Stem Rust	750 mL/ha	Apply as a preventative spray. If disease is present, or conditions prior to application have been favourable for disease infection the addition of an approved triazole fungicide is recommended. Re-infection may require further treatment. The treatment of Ryegrass seed cultivars has not shown to have had any adverse effects on the endophyte levels in the harvested seed.

Crop	Disease	Examples	More information
Potatoes in-furrow planting application	Black scurf, Silver scurf*	10 mL/100 m of row	Apply at planting as an in-furrow spray in 50 to 150 L water/ha. Direct the spray into the furrow just before the tuber is covered with soil as a 15 to 30 cm band ensuring the tuber and immediate surrounding soil is sprayed. DO NOT apply AMISTAR if conditions or seed quality favour bacterial rots as these diseases may be aggravated if seed comes into contact with additional moisture. DO NOT apply AMISTAR if planting in hot, sandy soils as bacterial rots may be aggravated. *suppression only
Potatoes			Apply in a minimum of 500 litres of water/ha for a crop in full canopy to ensure uniform coverage. Apply as a protective spray at 7 to 10 day intervals during periods of active growth. Intervals can be increased to 10 to14 days later in the season as haulm growth ceases. Always use the closer intervals during periods of severe disease pressure. Use higher spraying pressure or air assisted equipment to enhance penetration in densely foliated crops. * Under climatic conditions which create severe Late Blight disease pressure, either tank mix AMISTAR with 1 kg/ha mancozeb (80%) or alternately, apply 1 or 2 sprays of a systemic/protectant fungicide such as Ridomil® Gold MZ WG, then revert to the use of AMISTAR.
Sweetcorn, Maize	Rust *(Puccinia sorghi)*, Northern Leaf Blight *(Setosphaeria turcica)*	1 L/ha	Apply as a preventative spray especially before but no later than tasselling when disease infection is most likely to occur. A second application may be required 14 days later if disease pressure continues. Do not apply more than 2 applications per season.
Tomatoes (field)	Early Blight, Late Blight, Black Mould / Anthracnose	500 mL/ha	Apply in a minimum of 500 litres water/ha for a crop in full canopy to ensure uniform coverage. Apply as a protective spray at 10 to 14 day intervals. Use higher spraying pressure or air assisted equipment to enhance penetration in densely foliated crops. DO NOT apply to field tomatoes with a surfactant or crop oil concentrate.
Wheat	Leaf Rust, Powdery Mildew, Speckled Leaf Blotch, Stripe Rust	750 mL/ha	Apply as a preventative spray. If disease is present, or conditions prior to application have been favourable for disease infection the addition of an approved triazole fungicide is recommended. Re-infection may require further treatment 4 to 6 weeks later. Where Powdery Mildew infection pressure is high, it is recommended to apply AMISTAR in a tank mix with a fungicide from a different chemical group that is approved for use on this disease.
	Didymella Leaf Scorch		Apply as a preventative spray from flag leaf emergence; GS 39.
	Glume Blotch		For protection of the flag leaf apply as a preventive spray from flag leaf emergence; GS 39-55. For protection of the seed head apply after ear emergence; GS 57-69.
	Late season Head Disease complex *(Alternaria, Cladosporium, Microdochium nivale, Stemphylium)*		Apply as a preventative spray after ear emergence; GS 57-69.

DIRECTIONS FOR USE
Restraint - DO NOT apply by air, except on potatoes

TREE AND VINE CROPS
In the following table tree and vine crops, all rates given are for dilute spraying. For concentrate spraying, refer to the Application section.

For all uses in the table Tree and Vine Crops. Apply by dilute or concentrate spraying equipment. Apply the same total amount of product to the target crop whether applying this product by dilute or concentrate spraying methods. When applying AMISTAR 250 SC through low volume application equipment, DO NOT use a concentrate factor greater than 4X. In these cases adequate coverage of all plant surfaces is still required to achieve control of diseases.

Crop	Disease	Rate	WSP	Critical Comments
Almonds	**Anthracnose** (Colletotrichum)	1.1L/ha	4 weeks	Apply using orchard airblast/mister sprayer applying sufficient water to obtain uniform coverage. May be applied as a Dilute or Concentrate spray. Alternate with sprays of other chemical groups. Dilute application: Water volumes typically range from 1800 to 2000 L/ha. Concentrate application: Apply in 800 to 1000 L/ha. Apply as part of an anthracnose disease management program. DO NOT apply more that 3 applications per season.
Avocados	**Stem end rot, Anthracnose**	80mL/100L	7 days	For best results commence the disease control program with an approved fungicide from an alternative chemical group, then apply 1 application of AMISTAR 250 SC during early fruit set. Follow with applications of an approved fungicide from a different chemical group. Apply 2 final applications of AMISTAR 250 SC at 14 to 28 day intervals with the final, spray applied 7 days prior to harvest. Ensure thorough spray coverage. DO NOT use AMISTAR 250 SC curatively. DO NOT apply more than 3 applications of AMISTAR 250 SC per season. DO NOT start the disease control program with AMISTAR 250 SC.
Citrus	**Brown Spot** (Altemaria sp.) **Black Spot** (Guignardia citricarpa)	40mL/100L	-	For best results apply 1 to 2 applications of AMISTAR 250 SC after copper fungicides, at no less than 14 day intervals. Follow with applications of an approved fungicide from a different chemical group. Ensure thorough spray coverage. DO NOT use AMISTAR 250 SC curatively. DO NOT apply more than 2 applications of AMISTAR 250 SC per season. DO NOT start the disease control program with AMISTAR 250 SC.

Instructions on the application of the product, including mixing and compatibility

MIXING

Half fill the spray tank with clean water and start agitation. Shake the closed AMISTAR container. Whilst filling the remainder of the spray tank add the required amount of AMISTAR, adding any tank mix products last. Maintain agitation until spraying is complete. DO NOT leave the spray mix in the sprayer overnight.

APPLICATION

Use at least 200 litres/ha of water by ground. Use higher water volumes in dense or advanced crops. Use not less than 50 litres/ha for aerial application. As there are many factors involved in aerial application, for optimum results, contact your local Syngenta Crop Protection representative for detailed information.
Uniform coverage is essential for best results. Wetting agent additives are not normally required when using AMISTAR.

COMPATIBILITY

AMISTAR is compatible with most commonly used insecticides and fungicides. Before using any tank mixture, consult and comply with the recommendations of the partner product. Each product should be added separately to the bulk of the water in the spray tank whilst filling and agitator working.

WITHHOLDING PERIODS

It is an offence for users of this product to cause residues exceeding the relevant MRL in the New Zealand (Maximum Residue Limits of Agricultural Compounds) Food Standards.

Wheat, Barley, Ryegrass seed crops - grain crops	35 days
Wheat, Barley, Ryegrass seed crops - green feed / silage	28 days
Maize	56 days
Sweetcorn	14 days
DO NOT use on Maize or Sweetcorn intended for green feed or silage Grapes	14 days
Onions	35 days
Peas (garden without pods / process without pods)	14 days
Dry Seed Peas and Dry Animal Feed Peas	35 days
Pea/hay silage	14 days
Potatoes	14 days
Tomatoes (field)	14days

Storage instructions

STORAGE
See safety data sheet for additional storage information. Stores containing quantities of 1000 litres or more require signage and secondary containment.

How to obtain the Safety Data Sheet

SAFETY DATA SHEET
If additional hazard or safety information is required, refer to Safety Data Sheet. For a copy visit our website at www.syngenta.co.nz

Syngenta Disclaimer statement or warranty

DISCLAIMER
This product complies with the specifications in its statutory registration. Implied terms and warranties are excluded. Syngenta's liability for breach of the express or any non-excludable implied warranty is limited to product replacement or purchase price refund. The purchaser must determine suitability for intended purpose and take all proper precautions in the handling, storage and use of the product including those on the label and/or safety data sheet failing which Syngenta shall have no liability.

Trademark statements

Product names marked ® or ™, the ALLIANCE FRAME the SYNGENTA Logo and the PURPOSE ICON are Trademarks of a Syngenta Group Company

Local company name and address

Registered to and distributed by Syngenta Crop Protection Limited, Tower 2, Level 7, 110 Symonds Street, Auckland.

Batch number and expiry date printed on the label or packaging during manufacture

Barcode

Batch No.	
Date of Manufacture	

Local recycling scheme logo

Agrecovery Logo

UN Dangerous Goods Transport information, including UN pictograms

UN 3082
ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.
(azoxystrobin) MARINE POLLUTANT
PACKING GROUP III, HAZCHEM 2X
CONTAIN SPILLAGE

In a transport emergency dial 111, Police or Fire Brigade.
For specialist advice in an emergency only, call 0800 734 607 (24 hours).

Pictograms

There are two groups of pictograms that are most recognized for pesticide use – WHO and GHS.

WHO (World Health Organization) is a global organization whose primary role is to direct and coordinate international health within the United Nations system.

They cover many areas of health including guidelines for the safe use of pesticides.

Further information on safe use of pesticides
www.who.int/about

Read WHO pictograms from left to right:

HARMFUL

The main WHO PPE pictograms:

GHS is the Globally Harmonized System for the Classification and Labelling of Chemicals. This is a worldwide initiative to promote standard criteria for classifying chemicals according to their health, physical and environmental hazards.

It uses pictograms, hazard statements, and the signal words “Danger” and “Warning” to communicate hazard information on product labels and safety data sheets in a logical and comprehensive way.

GHS Health Hazard pictograms

GHS Aquatic Environment Hazard pictograms

Depending on the hazard classification system applied in a country, the responsible authority should assign the color bands either according to either the GHS or the WHO classification, but should not mix them. It is important to understand which system is in operation in your particular country, so that correct information can be provided to Growers and End Users during training sessions.

The FAO has published a set of standard pictograms that are used in many countries:
www.fao.org/ag/AGP/AGPP.Pesticide/Code/Downloads/label.doc
GHS also has a series of pictograms which apply to all chemicals:
http://www.unece.org/trans/danger/publi/ghs/pictograms.html

GHS Acute Toxicity

	HAZARD CATEGORY					
	CATEGORY 1	**CATEGORY 2**	**CATEGORY 3**	**CATEGORY 4**	**CATEGORY 5**	**CATEGORY 6**
PICTOGRAM					no symbol	no symbol
SIGNAL WORD	Danger	Danger	Danger	Warning	Warning	No signal word
HAZARD STATEMENT						
Oral	Fatal if swallowed	Fatal if swallowed	Toxic if swallowed	Harmful if swallowed	May be harmful if swallowed	
Dermal	Fatal in contact with skin	Fatal in contact with skin	Toxic in contact with skin	Harmful in contact with skin	May be harmful in contact with skin	
Inhalation	Fatal if inhaled	Fatal if inhaled	Toxic if inhaled	Harmful if inhaled	May be harmful if inhaled	
COLOR BAND	RED	RED	YELLOW	BLUE	BLUE	GREEN

WHO Acute Toxicity (and for a limited number pesticides also chronic toxicity)

	CLASS IA extremely hazardous	**CLASS IB highly hazardous**	**CLASS II moderately hazardous**	**CLASS III slightly hazardous**	**CLASS U Unlikely to present acute hazard in normal use**
HAZARD SYMBOL			X	no symbol	no symbol
SIGNAL WORD	Very Toxic	Toxic	Harmful	Caution	No signal word
COLOR BAND	RED	RED	YELLOW	BLUE	GREEN

Wind

Check weather conditions. It is very important that the weather is suitable for CPP application.

Wind speed is important – if there is too much wind, spray droplets can be carried away from the target site. This is not only wasteful due to the loss of the CPP (and your money) but can be hazardous to the operator, bystanders and off-target plants, other crops, waterways and residential areas. Lack of any breeze (i.e. calm, still air) is also not good, as fine droplets can be moved upwards by temperature inversions to cause off-target damage. Very fine droplets can be moved long distances (e.g. several kilometers) by temperature inversions, so spraying in these conditions must be avoided.

Wind Speed

Avoid spraying in calm conditions (no wind) or when wind speed is too high. It is not recommended to spray in wind speeds above 5m/s. If spraying in 3 - 5 m/s winds, low-drift nozzles should be used.

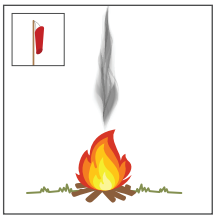
Use indicators around you to help judge these speeds. Wind speed is too high if small branches and leaves on trees are moving constantly. Wind speed is too low if leaves are still and smoke rises vertically. Optimal wind speed is around 2m/sec (6km/h) at nozzle height.

Calm

Visible Signs: Smoke rises vertically

Spraying: Use only medium or coarse nozzles

Risk: Risk of drift through inversion for fine spray

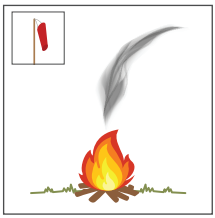


Light air

Visible Signs: Direction shown by drift of smoke

Spraying: Acceptable spraying conditions

Risk: Minimal

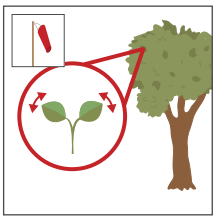


Light breeze

Visible Signs: Leaves rustle, wind felt on face

Spraying: Ideal spraying conditions

Risk: Minimal but drift may be a risk with fine sprays. Spray with nozzle down wind

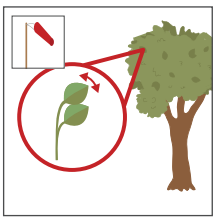


Gentle Breeze

Visible Signs: Leaves and twigs in constant motion

Spraying: Increased risk of spray drift, take extra care

Risk: Use low-drift nozzles, reduce pressure. Spray with nozzle down wind

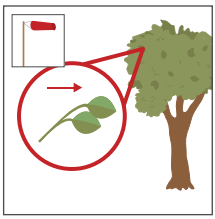


Moderate Breeze

Visible Signs: Small branches sway, dust and paper blown around

Spraying: Do not spray

Risk: Risk of environmental and operator contamination



Climate

Rain and moisture

Ensure target weeds or crops are dry. Rain droplets or heavy dew on target weeds or crops can interfere with the retention and adherence of the CPP to the leaf surface, and lead to loss of efficacy and waste of product and money. Check that leaves and stems are dry before starting to spray.

It is also important not to spray if rain is expected. The rain-fastness or amount of time before application and absorption/adherence of the product to the target site can vary. For some products such as Gramoxone, the rain-fast period is only 15 minutes, but for others it is several hours. If unsure, try to spray only when rain is not anticipated for at least 2 hours. In tropical climates try to use CPPs with a short rain-fast period. Check the label for information on the rain-fastness of the CPP. Rainfall not only reduces the efficacy of the CPP but can lead to off-field movement via runoff and is wasteful.

Air temperature

If the air temperature is too low it may decrease the efficacy of the CPP or cause phytotoxicity. High temperatures can cause the spray droplets to evaporate too quickly, which also leads to loss of efficacy. It is also a health risk for operators to work in very high temperatures due to possible heat exhaustion and dehydration. In general, avoid spraying during the hottest part of the day and if you feel weak or unwell, stop spraying immediately. Have drinking water available but always remove gloves and wash before drinking. See Chapter 6 for more information.

Identify sensitive areas

Before applying, it is important that you know the location of sensitive areas including waterways (ponds, ditches), non-target plants or crops, and residences on or around your farm or property, to prevent contamination. This can allow you to take measures to avoid contaminating them through either direct overspray or spray drift. Be ready to observe any stipulated buffer zones (check labels and local regulations). For large farms, keep a map of watercourses so you know which areas need special protection.

Ensure that unauthorized people are not in the immediate area where you are applying the CPP, particularly children, so that they do not come into contact with the spray drift. Warn them to stay away at least until the spray has dried. Erect warning signs around the areas you will spray.

Video on warning signs setup
www.pesticidewise.com/en/videos/setting-up-1/

Why do waterways need to be protected?

All aquatic areas on and around farms need to be protected. Aquatic areas include all surface water, such as drains, canals, ponds, lakes, streams, rivers and the sea, as well as ground water. Aquatic systems must be protected because many organisms live in water and are sensitive to CPPs. Groundwater and other water sources can also end up as drinking water for humans. Population losses of even one aquatic species can upset the ecological balance of the whole system, as it can cause a ripple effect up the food chain. Most herbicides are toxic to algae and other aquatic plants, which are food for lower-order animal species. Other products can be toxic to crustaceans or fish (eg: Solatenol). In most countries there are limits on the levels of contaminants such as CPP active ingredients that are allowed in drinking water, and it is critical as an industry that these allowable levels are not breached.

For these reasons, most CPPs have specific label warning statements for the protection of waterways, and it is essential to follow these instructions carefully.

Equipment

✓ Check PPE

Ensure you have the correct PPE available and ready for use. Check it is clean and in good order. The minimum recommended PPE for mixing and loading CPPs is impermeable gloves, impermeable boots or impermeable footwear, a long-sleeved shirt, long trousers, and eye protection. See Chapter 6 for more information.

✓ Check application equipment

Regularly maintain your spraying and drilling equipment so that it works effectively and does not leak. Check spraying equipment before each use. Any leaks must be repaired.

✓ Check all equipment is in good order before each use

Do not use a leaking knapsack sprayer

A knapsack sprayer leaking from the lid or hose outlet is a major source of contamination to operators, with the spray solution potentially soaking through the clothing and onto the user's back and lower body. In humid conditions, it is not always possible to feel the leaking liquid if the body is perspiring. Therefore it is extremely important to be sure that the sprayer is not leaking before use, particularly when spraying Paraquat.

Leaks from any kind of sprayer can also cause environmental contamination and must be avoided.

Calibrate

Calibrate spray equipment regularly

All spray equipment needs calibration. Calibration should be done at least once in a season depending on the amount of use. Calibration is essential to ensure that the correct dose of CPP is being applied. Calibration of spray equipment is one of the most critical practices to ensure safe and effective use of CPPs.

Calibration is required because there are a number of variable factors that affect the output volume of spray mix from the sprayer, which in turn affects the amount of CPP to be added to give the required dose over a known area (e.g. one hectare).

For hand-held equipment, every operator has their own walking speed and spraying action, and each sprayer setup is slightly different.

For machinery, the speed indicated may not be accurate (or displayed at all) and the output of different nozzles can vary.

Why is calibration so important?

All application equipment including boom sprayers and knapsacks must be calibrated regularly to ensure that the correct amount of CPP is applied per hectare (i.e. accuracy). Inaccurate application can result in too much CPP being applied, or not enough. Applying too much is a waste of product and money, and can cause adverse effects such as phytotoxicity to the crop and environmental damage. Applying too much is also very likely to result in residues exceeding the Maximum Residue Levels (MRLs - see Appendix J). Just as importantly, applying too little is also wasteful of your time and money because the product will not work as well as it should (or may not work at all), and the pests may survive to continue causing damage to the crop, resulting in further applications being needed, or loss of yields.

Applying too little or too much can also contribute to the development of resistance.

The main factors that affect the spray volume accuracy are:

Forward speed of the operator or machine

Nozzle size, type and condition

Swath width

Sprayer pressure

Forward Speed

Forward speed will vary between spray operators and different machinery.

Always calibrate in the actual spraying situation

- crop density and growing conditions will have an effect on walking speed (eg flooded/irrigated crops may slow down the forward speed)
- topography can affect machinery speed and walking speed.

For hand-held equipment, it is very difficult to maintain an even forward speed when trying to walk at an unnatural, forced pace

- Walk at a comfortable, natural speed

Do not use adjusted forward speed to vary the output of hand-held equipment unless there are no other alternatives to achieve the desired application volume.

Operator accuracy

Even with a fully calibrated and checked sprayer, operator accuracy can have a major impact on the final results achieved.

It is important to

- Maintain a constant forward walking speed or driving speed
- Keep the nozzle at a uniform height above/ from the target (applies to both hand-held and booms)
- If using a lever-operated knapsack, maintain a uniform pumping action
- For all equipment, ensure accuracy in mixing the correct dose of product with water in the spray tank.

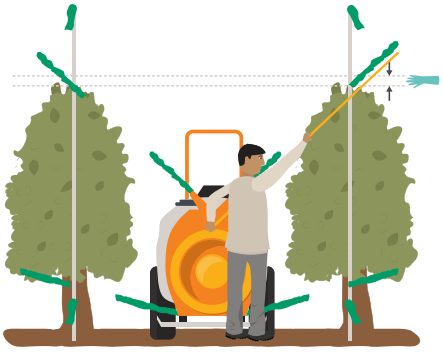
Tips for using mist blowers

- Adjust the spray volume:

Method To increase the spray volume	Method To reduce the spray volume
1. larger nozzle	1. smaller nozzle
2. higher pressure	2. lower pressure
3. lower forward speed	3. higher forward speed

Check the air distribution

- Do a check with clean water (and air) to see that the spray reaches from the base to the top of the foliage of the trees or vines being treated, and not higher or lower. Make adjustments as necessary.
- See Appendix G, method 3, for mist blower calibration.



Nozzle Size, Type and Condition

Choose the correct nozzle for each spraying purpose. Refer to the nozzle manufacturer's selection guide to choose the appropriate nozzle. Check the nozzle is working correctly, and clean or replace it if necessary. Always select the lowest-drift nozzle possible for the job.

Why is the correct nozzle important?

Correct nozzle choice is essential to ensure optimal efficacy of the CPP and to reduce spray drift.

Minimizing spray drift is critical to avoid -

- operator exposure
- bystander and residential exposure
- damage to non-target plants and crops
- contamination of drinking water
- harm to aquatic organisms.

Seek advice from nozzle manufacturers, field representatives or the label.

The lifetime of a nozzle depends on: design (construction), material, pressure used, spray liquid characteristics (e.g. abrasive, corrosive, or containing solvents), and maintenance (e.g. regular cleaning).

Worn nozzles differ from new ones in flow rate, droplet-spectrum, droplet-speed and built-up pressure. Nozzles should be replaced when the flow rate is +/- 5% from that specified by the manufacturer.

Check tire pressure in relation to boom performance - to perform at their best, booms must be level, and the boom suspension, dampers and joints regularly adjusted and lubricated. In addition, tires of the tractor, trailer or self-propelled unit should not be run at too high a pressure as this will reduce optimal efficiency of the boom. Work at the lowest tire pressure possible that still allows for load carrying capacity, amount of road work and boom stability in order to improve performance. Take advice from the tire manufacturer about the lowest safe pressure.

Sprayer Pressure

Nozzles can be tested with water or water containing colored dye to check spray coverage and spray pattern.

Poor spray coverage:

The applied spray mix rate (i.e. water volume rate) is too high, causing runoff at the tips of the leaves, leading to loss of efficacy, and waste of product.

Spray pattern

Spray pattern is uneven, causing some areas to receive too much CPP, others not enough. Example using a knapsack sprayer:

Spray quality

Spray quality can be checked with water-sensitive paper (check this with water before spraying the CPP).

Take appropriate steps to minimize spray drift as much as possible.

Do not clear blocked nozzles with your mouth!

This is to avoid any residues of CPP within the nozzle from entering your mouth. Use a brush, running water or pressurized air to clear blocked nozzles.

- Ensure that you have suitable equipment for the application of the particular CPP, as recommended on the label.
- Check that the equipment is in good condition (e.g. no leaks, split hoses, blocked nozzles or damage to straps of knapsack sprayers).
- Make any repairs before commencing work. If damage cannot be repaired, it is better to borrow or purchase alternative equipment than to use equipment that does not work properly. Equipment that does not work properly can lead to your own exposure, contamination of the environment, and CPP waste.
- Equipment used for seed treatment should also be well maintained. If plastic bags are used, make sure that they have not been used before for seed treatment or other purposes.

For industrial or semi-industrial seed treatment, precautions regarding the equipment use are described in more detail in materials at:
http://teamspace/sites/EAMESAS/Safe%20Use/HSES_Guidelines_Sites_FINAL_LowRes.pdf

How to minimize spray drift for tractor-mounted sprayers

Adjustments can be made to the setup of the spray equipment, as long as functionality and efficacy are not compromised.

- Nozzle selection: use the most drift-reducing nozzle recommended for the job. Larger droplets are less likely to drift than smaller droplets, however required droplet size is dictated by the spray target, pest and type of CPP being applied.
- Wind speed: spray when wind conditions are optimal, as outlined above.
- Boom height: maintain uniform boom height e.g. 50 cm for 100° nozzles at 50 cm spacing. All sprayers new and old should be fitted with a cable tie or similar at the end of each boom cut to 50 cm length, so that the operator can keep a constant visual check on the boom height. If using 80° nozzles then boom height should be increased to 65 – 70 cm.
- Forward Speed: reducing speed reduces spray turbulence and pressure, so drift is reduced. However, some turbulence within the crop is good to draw the droplets downwards and ensure good coverage for foliar applications.
- Pressure: Spray pressure should be adjusted to optimize the performance of the nozzle – where possible, select the lowest suitable operating pressure - 2 bar creates significantly less visual drift than 3 bar.
- Plants: the more foliage that is present, the more eddies (circular movements of air) that are produced, helping draw the spray downwards. A tall crop reduces drift more than no crop.
- Field margins: the use of field margins can help intercept spray drift. Multi-functional field margins will additionally reduce runoff and provide food and habitat for beneficial insects such as honey bees.

Have a dedicated work area for preparation of spray mix

For sprays and on-farm seed treatment, the mixing and loading location should be close to the storage room and if possible should have an impermeable floor capable of retaining accidental spills. Do not prepare CPPs inside the house or close to drains, watercourses or drinking water supplies. Keep animals and bystanders away to avoid unwanted exposure. Have a spill kit ready for use.

Take particular care when opening the container and preparing the CPP for use, whether it is a liquid, granule, seed treatment product or any other, avoiding spills and keeping it away from the body and face

Do not eat, drink, chew or smoke when preparing CPPs. Have all necessary equipment ready before opening the container, including measuring equipment if needed, and PPE. See Chapter 6 for more information.

Take care when mixing and loading CPPs

When working with CPPs, the highest risk of operator exposure occurs during mixing and loading of liquid products, and when treating seed with seed treatment products when the product is in its undiluted form. Operators should therefore take particular care when carrying out these operations, including wearing the correct PPE for mixing. See Chapter 4 and Chapter 6 for more information.

Accurate measurement of the CPP is essential to ensure that the correct rate is applied. Never exceed the rate stated on the label for the specific pest and crop. Using more does not lead to better control of the pest and is a waste of your money!

Use dedicated equipment for measuring, not kitchen utensils

- Ensure measuring jugs have graduation marks with small enough volumes to measure the required amount of CPP

Pour slowly and carefully when measuring liquids

- Do not splash
- Wear impermeable gloves and a face shield

Never use your bare hands to mix spray solutions!

- Stir with a dedicated tool or stick if necessary
- Do not use kitchen utensils

Some CPPs are severe eye irritants, so always wear eye protection as stated on the label, such as goggles or a face shield, when pouring the undiluted products, as this is when splashes are most likely to occur.

Use the correct order of mixing for combining different CPPs in the same spray mix

Check if the mixing of products is permitted in your country, as in some countries it is illegal to mix different CPPs in the spray mix

- If your country allows mixing of different CPPs, check that the CPP products to be mixed are compatible. Read the label or seek advice from a local retailer. For information on physical compatibility testing, see Appendix I.
- Half fill the tank with water before you start.
- General mixing rule: “First the solids, then the liquids.”
- Stir after each addition (never by hand) or have the agitator running if available.
- Add empty container rinsings to the tank and fill with the rest of the water to make the required amount of spray solution.

Follow this order for mixing different CPP formulation types: WG, WP, SC, SE, EW, EC, SL, adjuvant(s).

When using a single CPP and an adjuvant, add half a tank of water first, followed by the CPP and then the adjuvant. Complete the filling by carefully adding the remaining water to reduce foaming.

Be careful when loading mechanical sprayers

When preparing spray mix in large mechanized sprayers such as tractors (boom sprayers or mist blowers) be careful to avoid overflow when filling, as this can lead to point source contamination of drains and waterways. Overfilling is often caused by foaming, which causes the spray mix to leave via the overflow, before the tank is truly full. The 3 most common causes of foaming are:

- Leaving the induction hopper open and sucking in air
- Air leaks in the pipework – their presence is most easily detected by looking into the tank when circulating clean water. Any sign of bubbles, even bubbles as small as those in fizzy drinks, means there is an air leak on the suction side of the sprayer
- Adding products when there is insufficient water in the sprayer – the circulating spray mix shoots upwards inside the tank, mixes with air and creates foam.

As a precaution, place an open drum or large container under the overflow pipe from the spray tank to collect any accidental overflow. Return any overflow to the tank if possible. The addition of antifoam is the best cure for foam in the sprayer – have some on hand for emergencies.

Always have the sprayer agitation system running whilst loading CPPs into tractor-mounted or other mechanical sprayers. The majority of solid and all liquid CPPs can be loaded directly into the sprayer – no pre-mixing is required.

Always have a source of clean water available on or near the field when mixing, and also during application

A source of clean water should be available in case of unexpected incidents such as spills onto equipment or body.

Keep people and animals away from the area being treated

Inform your neighbors as appropriate, including bee-keepers, if applying CPPs which may have the potential to harm bees. Follow label instructions to ensure CPPs do not harm bee populations.

Store CPP containers/packs appropriately

Close the container carefully after loading the required amount into the application equipment and return it to the locked store. Clean up any spills on the outside of the packaging before storing. See sections 8.3, 8.7, and 8.8 for more information.

More information is available at:
www.pesticidewise.com/en/trainers/before-application/

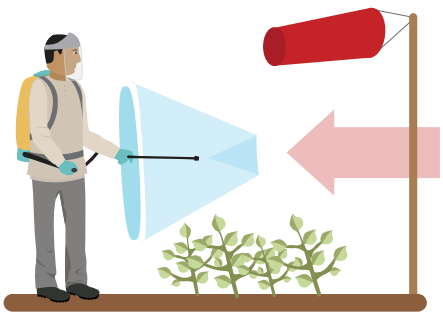
8.5
During application of CPPs

This section outlines good practices that need to be considered during the application of CPPs.

Adhering to best practices during application will ensure maximum benefit from the product and minimal exposure to humans and the environment.

Always read the product label and wear the correct PPE for application of the CPP. See Section 8.4 for more information.

Do not spray while walking into the wind



Avoid spraying during the hottest part of the day if possible, and drink adequate water before and after work to avoid dehydration, but not while applying CPPs. Always remove gloves and wash hands and face before drinking.

Operate tractors, mist blowers and other mechanical sprayers with maximum care:

- Operate the equipment in accordance with the manufacturer's instructions
- Familiarize yourself with the machinery before using it
- Avoid the possibility of the tractor or mist blower overturning on steep slopes or in tight turns
- Do not couple machinery such as spray tanks that are too heavy for the tractor's power
- Avoid working excessively long hours.

Always spray in the same direction as the wind so that any spray drift is away from the operator. Avoid any drift contamination on yourself, off-target plants, neighboring land, waterways or people. Adhere to buffer-zone requirements if applicable.

When applying CPPs by tractor, it is essential to have impermeable gloves present during spraying in case it is necessary to repair the application equipment, e.g. unblocking nozzles. If the operator is the same person who prepared the spray mixture, they should wash the gloves used during mixing, take them off and stow them on the tractor so that they are available to carry out any repairs needed during spraying.

Consider the environment when spraying

You must also take care of the environment. Follow the label instructions carefully, as some products need extra precautions such as buffer zones and the avoidance of spraying when bees are present. Also take care when disposing of the empty containers and any left-over spray mix to ensure that waterways and other sensitive areas are not contaminated. Never throw empty containers into drains or leave them on the field. See Section 8.7 for more information.

Follow label instructions for the protection of pollinators

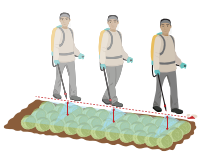
Read the precautionary instructions for the protection of bees and other pollinators carefully. This may include not spraying when the crop is flowering, and avoiding spray drifting onto nearby flowering weeds or other crops.

It is important that the CPP is applied evenly over the target area

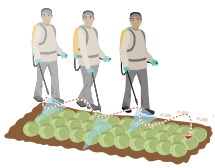
Vertical boom movements may cause nozzles that are too low to be unable to effectively distribute the spray, while nozzles that are too high may cause excessive spray drift.

For hand-held application, maintain steady forward speed and follow a regular pattern through the field. Do not swing the nozzle from side to side as this will result in uneven coverage and loss of efficacy, and it is also likely that the spray solution will contact the lower legs, causing contamination.

Good practice



Bad practice

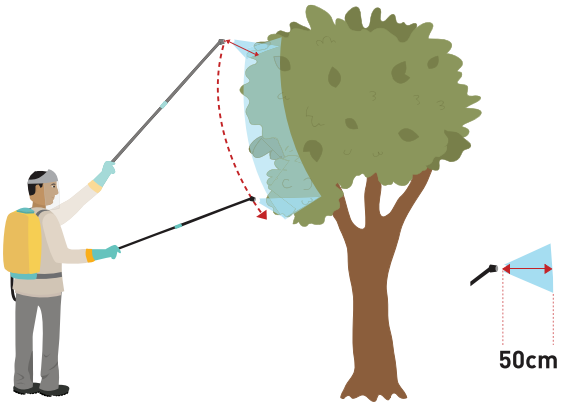


Why are pollinators important?

- The coexistence of modern agriculture and environmental management on the same farm is important to protect and enhance biodiversity while allowing the production of healthy, safe and affordable food. A healthy and vibrant level of biodiversity is beneficial for many aspects of agriculture.
- Honey bees and other insect pollinators have an essential role in the pollination of about two-thirds of food crops. Without insect pollinators yields of many crops would be greatly reduced and food shortages would soon occur. The value of insect pollination is around €153 billion globally. Therefore protection of pollinators is a critical element for the future of our food supply, as part of sustainable agriculture.
- When used properly, at the right time, and according to the instructions on the label, products made from neonicotinoids do not present a risk to honey-bee colonies. Some CPP labels restrict the use of foliar applications within the flowering periods in bee-attractive crops.
- For Seed Treatment products, deflectors should be used with pneumatic drillers to reduce the movement of treated seed dust to non-target flowering crops and weeds. Avoid dispersal of dust when handling treated seeds. Local bee keepers should be informed prior to the use of TMX and other neonicotinoid insecticides so that they can relocate their hives to areas away from the fields that are to be sprayed.
- Other precautions may also apply so always read the label directions carefully.

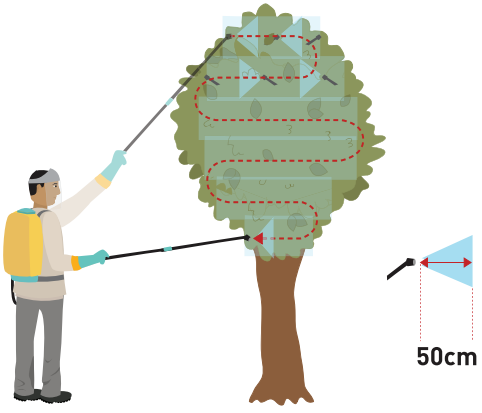
Spraying larger bushes or segregated trees in narrow sections

Spray narrow sections from the top of the bush or tree and work down each section. Keep the nozzle's spraying distance at the correct distance from the target surface. This is normally 50cm. It will also be the distance that you used when you calibrated your sprayer.



Spraying larger bushes or segregated trees in wider sections:

- Spray wider sections by spraying across and then down the tree in a Z-pattern.
- Start at the top of the bush/tree and move the nozzle from left to right to spray across the section.
- Stop spraying and move the nozzle down one swath width.
- Re-start spraying and move the nozzle across the section from right to left.
- Hold the nozzle steady and move it at the speed calibrated.
- Make sure that the spray drops are spread evenly across the target surface.
- If you move your nozzle faster, you will under-dose and spray too little pesticide.
- If you move the nozzle slower, you will over-dose and spray too much pesticide.



Tips for best knapsack spraying:

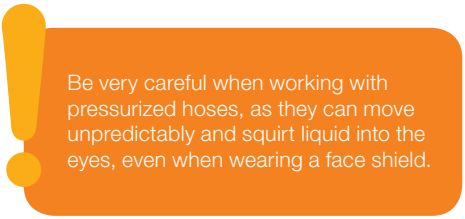
- ✓ use the correct nozzle
- ✓ maintain steady forward speed
- ✓ keep spray height even
- ✓ maintain constant pressure
- ✓ use the correct application rate
- ✓ do not apply by swinging the nozzle from side to side

Tips for tractor spraying:

- ✓ use the correct nozzles and check all nozzles are working correctly
- ✓ Switch off the sprayer when turning the tractor at the end of rows to prevent overspray at row ends
- ✓ maintain steady forward speed
- ✓ keep boom height as low as practical for the nozzle being used (e.g. 50cm)
- ✓ check boom level so spray pattern is even
- ✓ use the correct application rate

Be aware of the effect of speed on spray quality and spray direction (trajectory)

- When using tractors and other mechanical equipment, the speed of travel can affect sprays in several ways.
- For tractors equipped with automatic rate controls, an increase in speed will increase spray pressure by the square of the increase in speed – that is it, multiplies it by a factor equal to the increased speed.
- Thus, for a small increase in speed you need a large increase in pressure to maintain a constant application rate. If the speed is increased too much, the spray becomes much finer and more likely to drift.
- Similarly, as forward speed increases, the spray swath creates its own turbulence, sucking the fine droplets upwards, which also causes drift.
- Therefore it is important to decide on a suitable forward speed before spraying and stick to it. Try not to alter speed during the application process. Automatic rate controllers offer the opportunity to compensate for a reduction in speed when climbing hills.
- However it is important to slow down and apply a coarser quality spray when spraying close to a sensitive area such as waterways or residential areas. See Section 8.4 for more information.
- The faster the forward speed of the sprayer, the less penetration of the spray into dense crops such as cereals, which can reduce efficacy.
- Therefore choose forward speed carefully.

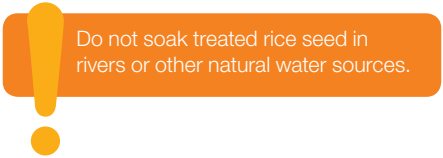


Seed treatment and bagging treated seed

- Keep unauthorized people and animals away from the area where seed is being treated with the product.
- At the end of the treatment process, seeds are usually packed into bulk containers or bags. This packaging process may lead to release of contaminated dust, particularly if larger seed quantities are handled. In industrial seed treatment, implement appropriate engineering controls to avoid dust getting into the work area and environment. In the absence of engineering controls, appropriate PPE must be worn, in particular a face mask or respirator.
- Label all containers or bags containing treated seed appropriately, with the name of the seed treatment product, the date treated and any warning statements shown on the product label.
- Seed treatment products should always be colored with a dye so that treated seeds are distinguishable from non-treated seeds.

Drilling and planting treated seeds

- Wear the appropriate PPE as shown on the product label.
- Handle seed bags gently when moving them to avoid abrasion of seed kernels, which may lead to the generation of dust.
- If using purchased treated seed, read the instructions on the product and bag labels first.
- Stand up-wind when opening the bag and loading the drill or planter, to minimize exposure to dust.
- If using a pneumatic or vacuum driller/ planter, a deflector should be attached to the machine to direct any dust down to the soil and avoid contamination into the air. In some countries deflectors are mandatory.
- During planting, ensure treated seeds are covered with soil, particularly at the ends of rows, to avoid exposure to foraging birds and animals.
- If you are pre-germinating treated rice seeds by soaking seeds in water, care must be taken to avoid potential runoff of CPPs into waterways and other water sources such as rivers, streams, dams and ponds. Treated seeds should be soaked in a bucket or larger containment if required, where any water not absorbed by the rice is retained in the container. The remaining water can then be sprayed onto the crop.
- Ensure that seed drills are closed when lifting at row ends, and that drilling does not take place near waterways.
- If sowing treated seed by hand, always wear impermeable gloves (disposable gloves are best). Also wear gloves when transplanting rice or vegetable seedlings grown with treated seed.
- Do not reuse bags that have stored treated seed for any other purpose. Dispose of bags in the same way as CPP packaging. See Section 8.7 for more information.



For further information on use of Seed Treatment products see the Safe Use of Treated Seed on Your Farm guide on:
http://teamspace/sites/EAMESAS/Safe%20Use/Seedcare%20HSE%20Collection_Safe%20Use%20Treated%20Seed%20Your%20Farm_2014_ENG_V2.pdf

More information is available at:
https://www.pesticidewise.com/en/trainers/during-application/

8.6
After application of CPPs

This section outlines good practices that need to be considered after the application of CPPs.

Follow instructions on re-entry periods as shown on the label

Some CPP labels specify a re-entry period, or the time that must be allowed to pass after spraying before it is safe for people or animals to re-enter the treated area. If no time is specified, re-entry should not occur until the sprayed deposit has dried. In cases where granular CPPs have been dispersed, any re-entry should be delayed until the granules are no longer visible.

Keep people and animals away from the treated area

Place signs to indicate that CPP application has been conducted to warn bystanders and workers to stay out of the treated area for the re-entry time period specified on the label. See Section 8.4 for more information.

Clean and check the application equipment at the end of each day's work, leaving it ready for use

See the manufacturer's instructions on how to properly maintain your equipment. Clean it at the end of each use. Take particular care to clean and check equipment at the end of the application season and prior to off-season periods when equipment is not used.
See Section 8.4 for more information.

Observance of re-entry periods is particularly important following applications into greenhouse crops, especially those with narrow rows that grow above waist height.
It is essential that workers do not re-enter the greenhouse for at least the specified time stated on the CPP label to avoid contact with the CPP remaining on the foliage.

Clean drilling/planting machines appropriately after sowing treated seed

Clean drilling/planting machines appropriately after sowing treated seed.

Clean seed drilling/planting equipment, especially hoppers, to remove dust and remaining seeds with an industrial vacuum cleaner if possible, or brooms and a dust pan. Collect any spilled left-over treated seed and dust from under the equipment as well. Dispose of waste and spilled treated seeds in accordance with the CPP waste instructions. See Section 8.7 for more information.

Clean PPE and return it to a PPE store

Wash your gloves first before removing any other article of PPE. Wash reusable articles of PPE in a dedicated area, ensuring that dirty water does not enter drains, ditches or waterways. Do not wash PPE, including long-sleeved shirt and trousers used while handling CPPs, with household laundry. Impermeable boots should be washed under running water that is trapped for later disposal, while still wearing gloves. Do not use detergents when washing boots, as these may affect their impermeability. Goggles and face shields should be washed under running water; a gentle detergent may be used. Disposable PPE should not be washed or reused. Dispose of used disposable PPE appropriately. See Chapter 6 and Section 8.7 for more information. Always follow the PPE manufacturer's cleaning instructions. For example, certain PPE made of water-repellent materials should be ironed to maintain its water-repellent characteristics.

More information and materials are available on: www.pesticidewise.com/en/trainers/after-application/

Wash all equipment after use, including sprayers

Do not allow contaminated water to enter drains or waterways, as this may result in adverse effects on aquatic organisms or contamination of drinking water. It is preferable to wash large spray equipment in the field if possible so that the CPP remaining in the washings (rinsate) can be applied to the treated field. Otherwise, have a dedicated area for equipment washing that is away from drains and ditches, preferably with bunding and fencing. See the Glossary for more information on bunds.

Also wash the outside of tractors and the spray booms, nozzles, line filters and hoses. Triple-rinse booms and nozzles with water at the end of each day's work. When changing products and treating sensitive crops, clean equipment thoroughly with detergent and water. See Section 8.7 for more information on disposal of rinse water.

Store application equipment securely away from children and animals. Do not store unwashed application equipment outdoors where it can be exposed to rain and climatic extremes. See Section 8.3 for more information on storage.

Continue to monitor the crop or treatment area

Check the crop or treatment area from time to time, to ensure that the CPP has worked as planned, and to learn from any failures and improve methods if necessary. Discuss this with an extension officer if there are any concerns.

8.7
Waste management

This section outlines good practices that need to be considered when managing CPP waste.

Good management of CPP waste is essential for human safety and the protection of the environment.

Always comply with local laws and regulations regarding waste management and disposal

Most regions have specific laws about how left over hazardous materials and empty packaging must be disposed of - ensure that you are aware of your obligations. Burning of plastic (e.g. HDPE or PET) packaging is generally no longer acceptable. Many countries now have recycling schemes for CPPs, so seek recycling as the first option when available.

Empty containers must be triple-rinsed before disposal

Triple-rinsing should be done immediately after loading the CPP. This allows the rinsings to be added directly to the spray tank, and also ensures comprehensive PPE is worn during this process. The same principle applies to seed treatment (add the rinsings to the seeds).

Always comply with local and applicable laws when disposing of unwanted CPPs or waste packaging.

Read the CPP label for waste management instructions

Some products have specific instructions, so always check the label.

Only prepare the amount of spray solution or seed treatment required for the job

It is important that you calculate exactly how much spray or seed treatment solution will be needed for each job so that it can all be used on the day. This can eliminate the need to manage left over diluted product. Left over spray solution must never be thrown into drains, ditches or waterways. If it cannot be used in the field then the next best option is to use an on-farm effluent management system such as a Heliosec or Biobed. As a final resort the spray solution may be placed onto fallow or unused land, as long as there is no risk that runoff or leaching of the CPP will contaminate waterways. Be aware that residual herbicides may have long plant-back periods.

More information here:
https://www.pesticidewise.com/en/questions/waste-management-recording/how-do-i-dispose-of-wash-water/

Remember the points on personal hygiene when managing waste!

The triple-rinsing process

How to triple-rinse a plastic or glass container:

- Drain the container well into the spray tank
- Add clean water to 25-30% of the container capacity
- Replace cap firmly and shake vigorously for at least 30 seconds
- Empty rinsings into the spray tank and drain container for 30 seconds
- Repeat steps 1 to 4 at least twice more (until rinse-water is clear)
- Use the rinsings as part of the spray solution or seed treatment mix

Why is triple-rinsing important?

Triple-rinsing containers with 30% water volume reduces chemical residues 120 times more efficiently compared with double-rinsing with 20% water volume. Rinsing with the correct water volume is more important than the amount of time spent shaking the container.

Thorough manual triple-rinsing will remove 99.99% of chemical residues.

Containers of solid products such as granules only need to be rinsed once. The plastic bag liners of cartons should also be rinsed once, if possible. Check that all traces of the granule or powder have been removed in the rinsing process.

Dispose of empty packaging appropriately

The disposal of empty pesticide containers is a two-step process:

1. Ensure the container is clean, by triple-rinsing
2. Puncture the container and dispose of in a way that follows local laws and/or best practice guidelines

If there is a time gap between steps 1 and 2 then the container should be kept securely (for example in the CPP store) to avoid potential misuse.

More information on disposal
www.pesticidewise.com/en/questions/waste-management-recording/how-do-i-dispose-of-pesticide-packs/

Empty CPP packaging must never be reused for any other purpose.

Always puncture empty CPP containers so they cannot be reused.

Dispose of empty treated-seed bags carefully

Empty treated seed bags should be carefully folded so that the dust inside does not escape. Seed bags should then be placed into a strong plastic garbage bag and disposed of according to to local regulations.

Dispose of clean, empty packaging responsibly and according to local laws

Even small packs such as sachets must be disposed of correctly to avoid contamination of the environment and people. The options (from most preferred to least preferred) are:

Most Preferred → **Least Preferred**

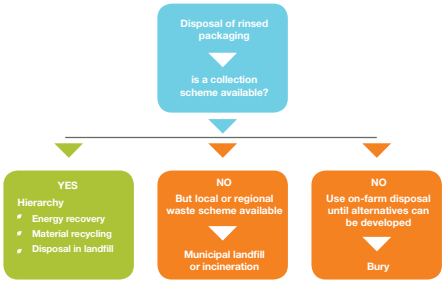
Collection schemes for reuse as fuel. Some countries (e.g. Greece) have collection schemes where instead of recycling, the material is used for energy production—for example at concrete manufacturing plants. Ensure containers are triple-rinsed before taking them to the collection point.

Recycling through a dedicated CPP recycling scheme. Many countries such as Taiwan, Canada, France, Australia and Brazil have excellent schemes which should be used. Ensure plastic containers are triple-rinsed before taking them to the collection point.

Disposal at local landfill. If permitted, clean and punctured CPP containers may be taken to the local landfill. Puncturing is essential to ensure that others do not take the containers for reuse.

Incineration. Some regions have industrial incinerators for disposal of hazardous substances. Empty CPP packaging may be able to be taken to these points, but it is likely to be expensive.

If the above options are not available and your regulations allows, then bury packaging on the farm in on-site waste areas. These must be located where there is no risk of contamination of waterways by runoff or seepage, and preferably securely protected by a fence and lockable gate. Burial should be more than 50cm deep.



Always clean up spills immediately and dispose of the leftovers responsibly

Spills of liquid concentrate, solids, spray solutions or seed treatment slurries must be cleaned up immediately.

For liquids, spread absorbent material such as sand, friable clean soil, cat litter or vermiculite on top of the spill to soak up the liquid.

Then collect the entire mass with a shovel or other suitable tool and place into strong plastic bags or impermeable containers.

For solids such as granules, collect the spilt material with a shovel or other suitable tool. Dispose of the collected waste according to local regulations. One of the best options is to take it to a hazardous substances disposal depot.

If one of these options is not available then take it to a local landfill where disposal of hazardous substances is permitted. On-farm burial is a final option, where allowed.

Do not contaminate the environment

- It is very important from an environmental perspective but also for the protection of the reputation of the CPP industry that waste and empty packaging is not allowed to contaminate any part of the environment, including the edge of fields, roadways, ditches, drains, ponds, rivers and residential areas.
- Crop Protection is a large industry globally and a considerable amount of waste is generated through agricultural activities. It is therefore paramount to stress the importance of correct and responsible disposal of CPP waste.
- All of the practices outlined above are predominantly in place to avoid contamination of the environment, and must be followed.
- Left over CPPs carelessly dispersed into sensitive areas can lead to ecological damage with mortality for non-target animal species, plants and beneficial insects. Some of these effects may be long term.
- Not only is environmental damage unacceptable, but the reputation of the industry as a whole is also damaged by irresponsible waste management, potentially leading to product restrictions and a loss of control options for farmers.

8.8
Recording CPP use

This section outlines good practices that need to be considered when recording CPP use.

Keep records of CPP use along with other farm records

Recording the use of CPPs and the treatment of seeds is an important step in improving your overall safety, ensuring efficient product use and demonstrating compliance with regulations. Good records can be valuable in informing future product selection (i.e. knowing what worked well), managing resistance development, and also when handling emergencies and insurance claims.

It is important to record CPP use for compliance with PHIs

Recording is essential for ensuring compliance with pre-harvest intervals (PHIs). PHIs are usually stated on the product label. It is also helpful to record information relating to growing protocols and resistance management, particularly if required for Grower schemes for local or international markets.

Maintain records of all farm activities

In addition to CPP use and effectiveness, it is also good practice to maintain records of health incidents, monitoring and incident investigations for future learning.
It is also useful to keep records of equipment maintenance and calibration, training sessions and PPE renewal.

You can keep your CPP records with other farm records such as planting and harvest dates, yields, crop rotations, land management and labor costs.

Below are some examples of records for CPPs and seed treatment products:

CPP usage records

- Product name:
- Quantity:
- Batch no:
- Expiry date:
- Product use:

CROP	FIELD NAME	CPP NAME	DATE	OPERATOR	AMOUNT USED	AMOUNT REMAINING

CPP application records

CPP product name:

DATE	CROP	GROWTH STAGE	TARGET PEST	OPERATOR	EQUIPMENT USED	APPLICATION RATE	WATER VOLUME	WEATHER CONDITIONS	OBSERVED RESULT

Seed treatment records

Seed treatment product name:

DATE TREATED	OPERATOR	CROP/SEED TYPE	SLURRY CONC.	EQUIPMENT USED	PLANTING DATE	SEED LOADING	PLANTING RATE	COMMENTS

See Appendix H and www.pesticidewise.com/en/trainers/recording/ for other examples of records.

Chapter 9

Glossary

9.1 General terms and their meanings in relation to CPPs

ACTIVE INGREDIENT:
The part of a formulated product that gives it pesticidal properties with specific action against pests such as plant diseases, insect pests, weeds, rodents or mosquitos. "Active substance" is a similar term.

ADJUVANT:
An adjuvant is broadly defined as any non-pesticide material added to a pesticide product or pesticide spray mixture to enhance the pesticide's performance and/or the physical properties of the spray mixture.

AERIAL APPLICATION:
Applying a CPP from an aircraft (either fixed wing or helicopter) in flight.

APPLICATION RATE:
The amount of a CPP that is applied over a defined area, usually expressed as volume per hectare for liquids or weight per hectare for solids. "Dose rate" is a similar term.

APPLICATION VOLUME:
The volume of water with which the CPP is to be diluted for use at a prescribed rate, usually expressed as liters per hectare (L/ha).

APPROVED/APPROVAL:
CPPs must be approved before they can be advertised, stored, sold, supplied or used. An approval will only be given when all the required data on the safety and effectiveness of the product has been submitted, evaluated, and considered acceptable. "Registered" is a similar term.

BIODEGRADABLE:
A substance that can be decomposed by bacteria or other biological means. Other forms of degradation are by light (photolysis) and chemical degradation.

BUFFER ZONE:
Unsprayed land, normally a strip, between the sprayed field/orchard/crop and a neighboring sensitive area such as drain or river. These zones are designed to intercept any spray drift or runoff that might move away from the sprayed area to prevent any CPP entering the sensitive areas. Buffer zones are more effective when planted with grasses, shrubs and/or trees. Buffer zones are often mandated by regulatory authorities and stated on the CPP label. "No-spray zone" is a similar term.

BUNDS/BUNDED AREA:
In storage areas, bunds are areas that are either sunken or have a raised barrier at floor level in order to retain any spills within the bund and prevent them from running into drains or other sensitive areas.

BYSTANDER:
Any person who is present or near the area where a CPP is being applied or has recently been applied, and who is not directly involved in the use of the CPP.

CALIBRATION:
The preparation, adjustment and checking of spray equipment to ensure the application of a CPP in the correct manner. Dose, water volume and spray quality are key requirements that are mainly ensured by adjustment to nozzle emission rates and spraying speed.

DEFLECTORS:
Air deflectors are mechanisms that may be attached to pneumatic precision drillers to slow down exhaust air and direct chemical particles onto the ground, minimizing dust drift. Deflectors are important to reduce off-field movement of insecticide seed treatment products such as Thiamethoxam, which can result in bees being exposed to the CPP. Deflectors are mandatory in some countries.

DEGRADATION:
The breakdown of an active ingredient in the environment, for example in plants, soil or water, to form other molecules and eventually CO^2.

DISSIPATION:
The reduction or disappearance of an active ingredient or metabolite from the environment. This can be by degradation or by movement away from the application site such as by leaching.

DRIFT (OFF-TARGET DRIFT, SPRAY DRIFT):
The movement of a CPP outside of the target area due to air currents. Mainly applies to sprays, but also to fine granules and dusts.

DOSE, DOSE RATE:
See "Application rate."

DIRECTED SPRAY:
Spray that reaches and is retained by the intended target surfaces within the treated zone.

EMULSION, EMULSIFIABLE CONCENTRATE (EC):
A type of CPP formulation that is usually made with a solvent that, when diluted with water, is dispersed to form very small droplets of oil suspended in the water.

ECONOMIC THRESHOLD:
The point at which the pest population level causes economic losses greater than the cost of controlling the pest. An important Integrated Pest Management principle.

EFFICACY:
The biological performance or effectiveness of a CPP. Biological testing determines the optimum application rate at which a CPP should be used. In most countries this is then approved by the regulators and the final agreed application rate is shown on the CPP label as part of the directions for use. CPPs must be efficacious (i.e. work well) against their target pests.

ECOTOXICOLOGY:
The study of the effects of substances on biological organisms, especially at the population, community and ecosystem level.

ENVIRONMENT:
A general term referring to the area around us. Can be divided into three main compartments: water (drains, ditches, canals, ponds, lakes, streams, rivers, seas); terrestrial, land or earth (farmland, amenity or public areas, residential areas and places of work); and air. Also includes the living things found in those compartments, such as domestic animals, livestock, wildlife, food and humans.

FAO:
Food and Agriculture Organization. A division of the United Nations. The FAO has published recommendations and specifications for pesticide manufacture and use, including Active Ingredient specifications, and the International Code of Conduct on the Distribution and Use of Pesticides.

FORMULATION:
The physical structure and chemical composition of a CPP as prepared by the manufacturer for use. The formulation is the carrier of the Active Ingredient, ensuring that it is delivered to the target effectively and safely.

FUNGICIDE:
Any substance or preparation that is prepared or used for controlling fungal pests (plant pathogens).

GOOD AGRICULTURAL PRACTICE (GAP):
A set of agreed practices that define the optimum way to use a CPP. Includes efficacy (application rate, method of application), compliance with MRLs, and protection of operators and the environment.

GROUNDWATER:
All water that is below the surface of the ground in the saturation zone and in direct contact with the subsoil.

HAND-HELD APPLICATOR:
Any equipment carried by the operator for application of a CPP, or where the delivery nozzle is held directly by the operator. Includes knapsack sprayers and backpack sprayers.

HERBICIDE:
Any substance or preparation that is prepared or used for controlling plant pests (weeds). Terms applied to herbicides include:

PRE-PLANTING:
Applied before the crop is planted

PRE-EMERGENCE:
Applied before the crop or weeds emerge from the soil

POST-EMERGENCE:
Applied after the crop and weeds have emerged from the soil

INCORPORATED:
Mixed by cultivation into the top layer of soil

SURFACE APPLIED:
Applied to the soil surface, where it forms a continuous film.

CONTACT:
A product that controls weeds, by destroying the parts of the plant to which it is applied. The same term can apply to fungicides and insecticides

TRANSLOCATED:
Absorbed into the plant and moves within the plants tissues, killing parts of the plants (e.g. the roots) to which it has not necessarily been applied

SELECTIVE:
A herbicide which, when applied to both crop and weeds, kills only the weeds, leaving crop plants undamaged. The same term applies to insecticides and fungicides

NON-SELECTIVE:
A herbicide that kills or damages all plants to which it is applied.

INSECTICIDE:
Any substance, preparation or organism that is prepared or used for controlling insect pests.

INTEGRATED PEST MANAGEMENT (IPM):
A set of guidelines designed to assist Growers to minimize the economic damage caused by pests while having minimal adverse effects on humans and the environment. Includes practices such as scouting for pests, setting economic thresholds, choosing the correct CPP to use, and using beneficial insects.

The definition of IPM given by Food and Agriculture Organization (FAO) of the UN is:

"A system that, in the context of the associated environment and the population dynamics of the pest species, utilizes all suitable techniques in as compatible manner as possible, and maintains the pest populations at levels below those causing economic injury".

LABEL:
A printed document attached firmly to the exterior of the CPP packaging. The label is a legal document and forms part of the regulatory approval of a CPP. Includes information on the safe and effective use of the CPP as well as the product name, supplier name and emergency information.

LEACHING:
The movement of residues (small amounts) of the CPP active ingredient or metabolites down through the soil profile by water found within the soil.

METABOLITE:
A molecule formed by the degradation, breakdown, or chemical change of an Active Ingredient after entry into the environment or into a living organism such as a plant or animal. Most CPPs have at least several known metabolites. The metabolites found in different areas such as in soil, water, crops or plants can be different. Major metabolites are usually identified and tested so that their safety profile is understood.

MAXIMUM RESIDUE LEVEL (MRL):
Set by regulators to establish the upper level to which residues of CPP active ingredients are allowed in food and feed. Used for trade of commodities between countries and also domestically. While not strictly safety levels, compliance with MRLs are used to ensure acceptable levels of exposure for consumers of treated food.

MSDS:
Material Safety Data Sheet. Also called SDS, Safety Data Sheet.

NON-SELECTIVE HERBICIDE:
A herbicide that has an effect on all or virtually all types of plants (within certain conditions such as size or age) and so can control many kinds of weeds but can also damage the crop if present and not protected.

OECD:
Organization for Economic Co-operation and Development. An international organization of 34 countries that are committed to democracy and market economy. The OECD has an agreed set of guidelines for the conduct of toxicology and ecotoxicology studies, which are accepted by most regulatory authorities.

OPERATOR:
Any person directly involved in using a pesticide, for example handling, mixing, loading or applying a CPP; calibrating or cleaning equipment; or handling freshly treated plant material.

OVERSPRAY:
The accidental or deliberate application of a CPP to protected surfaces such as waterways. "Spray drift" is a similar term.

PERSONAL PROTECTIVE EQUIPMENT (PPE):
Devices or clothing designed to be worn or held by an individual for protection against health and safety hazards of the CPP, e.g. impermeable gloves that prevent contact by the CPP with the skin of the hands and wrists.

PEST:
Any organism that is harmful to plants such as crops and trees or plant products, including unwanted plants (weeds), and pathogens, and insects that cause damage to crops or harvested produce.

PESTICIDE:
Any substance, preparation or organism that is prepared or used for controlling any pest. Some types of pesticides and the pests they control are shown below:

PRODUCT	PESTS CONTROLLED
Acaricide	Mites, spiders, ticks
Aboricide	Trees, shrubs
Avicide	Birds
Bactericide	Bacteria
Fungicide	Fungi
Herbicide	Weeds
Insecticide	Insects
Nematicide	Nematodes (worms)
Ovicide	Eggs
Rodenticide	Rodents (rats, mice)

PRE-HARVEST INTERVAL (PHI):
The length of time that must pass before a crop can be harvested after application of a CPP into that crop. PHI is related to the potential residues of the CPP active ingredient remaining in the harvested commodity, that is, the level must fall below the MRL before harvesting.

PRODUCT SAFETY TESTING:
CPPs are thoroughly tested to understand the environmental and human hazard profile; the likely exposure levels to humans and the environment; and the potential risks associated with their use. The main categories of studies conducted include toxicity, metabolism, ecotoxicity, environmental fate and crop residues. Other studies on the physical hazards of the CPP such as flammability are also conducted.

RESIDUE:
A remaining amount. Usually refers to the levels of active ingredient or metabolites found in the crop or harvested food after application of the CPP. Also used in reference to remaining levels of active ingredient or metabolites in soil, water or other parts of the environment after application.

RESIDUAL, SUCH AS RESIDUAL HERBICIDE:
A CPP that has a long-lasting effect. For example residual herbicides are applied to soil and then control the target weeds for a number of weeks.

SELECTIVE HERBICIDE:
A herbicide that only has an effect on certain types of plants and so can be used within or on top of certain crops to control target weeds without damaging the crop.

SPRAY QUALITY:
A classification reflecting the particle or droplet size distribution of spray. The usual categories are: ultra-fine, very fine, fine, medium, coarse, very coarse, extremely coarse and ultra-coarse. Spray quality can be important for many reasons, particularly to ensure efficacy of the CPP and to minimize spray drift.

STEWARDSHIP:
Responsible and safe management of a CPP from its discovery through to its ultimate use and beyond.

SURFACE WATER:
Water in the environment that is above ground level, such as ponds, lakes, rivers and canals.

SURFACTANT:
A substance either incorporated into the formulation of a CPP or added to the tank mix that affects the physical properties of the spray solution to improve the efficacy of the CPP, e.g. by increasing wetting of the target plant surface by lowering the surface tension of the retained droplets. “Adjuvent” is a similar term.

SWATH:
The width of an area being treated with a single pass of a sprayer.

SYSTEMIC:
Able to be moved (transported) within a living organism, such as a plant or mammal, and hence get into the various biological systems within that organism.

SYSTEMIC INSECTICIDE:
An insecticide that can move within a target plant over time and exert its insecticidal effect away from the original application site of the CPP.

SPRAY MIX (TANK MIX):
A spray solution prepared by the user containing a mixture of CPPs, water and sometimes other additives such as surfactants.

VOLUME MEDIAN DIAMETER (VMD):
A measure of the droplet size in CPP sprays. Droplet size can range from 10 – 1000µm, but the majority are in the range of 200 – 300µm. The spray quality depends on droplet size, i.e. fine sprays have mainly smaller droplets and coarse sprays have mainly larger droplets.

WATER COURSE:
Any flowing surface water such as streams, creeks, rivers, canals, drains or ditches with water in them.

WATERWAY:
Any significant area of surface water or an area capable of containing surface water, including canals and drains.

WORLD HEALTH ORGANIZATION (WHO):
An international organization whose primary role is to direct and coordinate international health within the United Nations’ system. See www.who.int/about.

WITHHOLDING PERIOD (WHP):
The same as PHI.

9.2
Terms relating to CPPs and human safety

ABSORPTION:
The process of a substance entering the body.

ABSORPTION RATE:
How fast a substance is absorbed relative to another substance in the same situation.

ACUTE TOXICITY:
The level of toxic effect following a single exposure/dosage or short-term repeated exposure/dosage (e.g. one week).

ACCEPTABLE OPERATOR EXPOSURE LEVEL (AOEL):
The exposure level for a particular pesticide use that has been shown to be safe in various studies.

CARCINOGENICITY STUDY:
A study performed in test animals to investigate the potential for a substance to form tumors or cancer over an extended period of time.

CELLULAR REPAIR:
The ability of cells to repair damage caused by toxic substances.

CHEMICAL PROPERTIES:
Properties that change the chemical nature of matter. Examples are pH, electromotive force, heat of combustion, and reactivity with other substances.

CHRONIC TOXICITY:
The level of toxic effect following repeated exposure or dosage over a long period of time such as a lifetime. For example, smoking tobacco regularly over a 40-year period may lead to toxic effects. Chronic toxicity may also refer to the long-term toxic effects seen after a single exposure to a substance, for example a single exposure to asbestos can result in mesothelioma in the long-term i.e. many years later.

DISTRIBUTION:
The transfer of a substance within the body.

DOSE:
The quantity of a substance administered or taken into the body. Can be given by various routes e.g. through the mouth (oral) or via the skin (dermal).

DOSE RESPONSE CURVE:
A graph showing how observable effects change relative to increasing dose, for a specific substance administered in a specific test.

DOSE RESPONSE EVALUATION:
The determination of the quantitative relationships between internal dose and effects observed.

ECOTOXICOLOGY:
A range of studies and assessments designed to understand the effect of a substance on organisms in the environment, as opposed to humans. Includes a set of standard studies conducted in fish, daphnia, algae, terrestrial plants, earthworms, bees and beneficial insects, plus a wide range of supplementary studies.

ENVIRONMENTAL FATE:
A range of studies performed to understand the path of a CPP within the environment following application, including its movement (transportation) and degradation in soil, water, air and plants.

EXCRETION:
The elimination of waste products from the body. In mammals, types of excretion are via the kidneys in urine; via the lungs in air (e.g. carbon dioxide); as biliary excretion which is via the bile; as fecal mucociliary excretion which is via the mucous from the respiratory tract (e.g. blowing the nose), and perspiration via the skin.

EXPOSURE:
Coming into contact with a substance. For mammals, CPP exposure can occur through the mouth (oral), skin (dermal), lungs (inhalation) and eyes.

EXPOSURE MITIGATION:
Processes or controls to minimize the chance of exposure or the effect of exposure.

EXPOSURE MODELING (OPERATORS):
The exposure to operators and bystanders is usually assessed using internationally available CPP operator exposure models.

In exposure modeling, all the typical exposure scenarios are included i.e.:
- Opening the container
- Mixing up the diluted spray or treating seed
- Loading the spray tank, measuring out granules or powder, or loading the planting equipment with treated seed
- Performing the spraying or dispersing the granules/ powder, or planting treated seed
- Re-entering the field after application
- Cleaning the equipment
- Disposing of waste

Factors included in the model are:
- Maximum application rate
- Water volume
- Number of applications per season
- Pack size
- Formulation type
- Application equipment
- Hours working with the CPP in a typical working day
- Number of days that an operator will handle the CPP
- The type of crop, including crop height, field, orchard, greenhouse, or sowing rate

The result of the modeling calculation is then compared to the results of the toxicology studies and relevant endpoints such as the Acceptable Operator Exposure Level (AOEL). The model will give a result that either says the use of the CPP is acceptable without wearing PPE, or it will specify what level of PPE is required to allow acceptable exposure. A safety margin is included, usually a factor of 100 (see Safety Margin).

Another way of assessing exposure when handling CPPs is to actually measure the exposure in the field while the operator is working. One way of doing this is to measure the amount of active ingredient that contaminates the clothing, boots, gloves, hat and respirator of the operator. This process is quite complex as the clothing and PPE has to be carefully removed then washed individually or cut up and washed, with all of the rinsings being collected and then analyzed for the presence of the CPP. Because it is a difficult process this type of exposure monitoring is only done if there is a need to refine the results of the exposure modeling described above.

The final way to assess operator exposure is by biological monitoring, i.e. analyzing the levels of CPP in the blood and urine of the operator after handling the product. This is an invasive method that requires the use of human volunteers and is rarely conducted unless there is an imperative to do so.

GENOTOXICITY STUDIES:
Tests to determine the effect of a substance on DNA or chromosomes, in particular mutagenicity effects such as induction of DNA damage, gene mutations or chromosome aberrations. Most genotoxicity tests are conducted in vitro, i.e., not in living animals.

GLOBALLY HARMONIZED SYSTEM (GHS) FOR THE CLASSIFICATION AND LABELING OF CHEMICALS:
A global system for the classification and labeling of chemicals. This is a worldwide initiative to promote standard criteria for classifying chemicals according to their health, physical and environmental hazards. It uses pictograms, hazard statements, and the signal words “Danger” and “Warning” to communicate hazard information on product labels and safety data sheets in a logical and comprehensive way. The primary goal of GHS is better protection of human health and the environment by providing chemical users and handlers with enhanced and consistent information on chemical hazards.

GOOD LABORATORY PRACTICE (GLP):
A set of agreed standards and principles for conducting laboratory studies. It also refers to the certification system for testing laboratories and the studies they conduct.

HAZARD:
A situation that under certain circumstances has the potential to do harm. Potential harm may be a threat to life, health, property or the environment. Most hazards are dormant or potential, with only a theoretical risk to do harm. However, an active hazard can create a serious or emergency situation. There are many ways of classifying a hazard, but in respect to CPPs, physical hazards and health hazards are particularly relevant.

HAZARD PROFILE:
A list or review of all the known hazards of a substance or situation.

HAZARDOUS SUBSTANCE:
A substance with the potential to cause harm to people or the environment.

HAZARD STATEMENT(S):
A phrase assigned to each hazard category that describes the nature of the hazard. Examples of hazard statements are: “Harmful if swallowed,” “Highly flammable liquid and vapor,” and “Harmful to aquatic life.” GHS and other classification systems define hazard statements.

HUMAN EXPOSURE ASSESSMENT:
Determining how people might be exposed to a substance under specific circumstances. Takes into account the source, route, magnitude and frequency of exposure.

LD50:
Abbreviation for “Lethal Dose, 50%”.The amount of a substance that causes one half of the animals in a specific test to die. A measure of the lethal dose to 50% of the organisms tested.

METABOLISM:
A set of chemical reactions that occur in living organisms in order to maintain life, including breaking down food to provide nutrients, and breaking down poisons or toxins to remove them from the body.

MG/KG BW:
The abbreviation for milligrams per kilogram of body weight, which means the quantity of the dose administered in milligrams, divided by the weight of the individual or animal in kilograms. This allows for direct comparison of results of different tests that involve animals or people of different body sizes and weights.

NOAEL:
No Observed Adverse Effect Level: in a toxicological study, the dose level below which no undesirable toxic effects are seen or measured. The observed effects are compared statistically to those of non-treated controls in the same test.

NOEL:
No Observed Effect Level: in a toxicological study, the dose level below which no effects at all are seen or measured, compared statistically to non-treated controls in the same test.

PHYSICAL AND CHEMICAL PROPERTIES:
Measure aspects of a substance or thing.

PHYSICAL PROPERTIES:
Properties that do not change the chemical nature of matter. Examples are boiling point, melting point, color, smell, density, opacity, viscosity, magnetic attraction or repulsion, and physical state (solid, liquid or gas).

PHYSICAL HAZARD:
A hazard that results from a physical property.
E.g. flammability and explosivity.

PICTOGRAMS:
Diagrams included on labels to show hazards of a CPP without the use of words.

The FAO has published a set of standard pictograms that are used in many countries. GHS also has a series of pictograms that apply to all chemicals.

REFERENCE DOSE:
The maximum acceptable oral dose of a toxic substance (USEPA).

REPRODUCTION AND DEVELOPMENTAL TOXICITY STUDIES:
Studies performed in test animals to evaluate the toxic effects of a substance on their reproductive ability and the development of offspring. Includes evaluation of effects on fertility, abnormalities during gestation and toxic effects on the fetuses.

RISK:
The probability that a particular adverse event (or harm) will occur during a stated period of time under specified conditions. Risk is dependent on both hazard and exposure, therefore if there is no exposure to a hazardous substance then there is no risk.

RISK MANAGEMENT:
Following risk identification and assessment, risk management is the coordinated and economical application of resources or processes to minimize, monitor or control the probability and/or impact of unwanted events. “Risk mitigation” is a similar term.

SAFETY:
The probability that harm will not occur under specified conditions. The opposite of risk.

SAFETY MARGIN:
A number, factor or allowance to ensure safety. For CPPs, it is an additional margin between the NOAEL and the measure exposure level for a particular use situation and a particular substance. A common safety margin is 100. Applying a safety margin of 100 to stopping a car would mean if it takes 50m to stop the car at a pedestrian crossing by applying the brakes normally, then stipulating a distance of 5000m (5 kilometers) to stop—that is, starting to apply the brakes 5 kilometers before reaching the pedestrian crossing.

SUBCHRONIC TOXICITY:
Toxic effects seen in the medium term, e.g. between 4 weeks and 90 days in animal studies.

SUBJECTIVE FACIAL SENSATION (SFS) OR PARAESTHESIA:
A temporary skin reaction including a tingling, burning or numbing sensation usually to the face and or arms, resulting from exposure to certain synthetic pyrethroids such as lambda-cyhalothrin and tefluthrin. Inhalation of treated seed dust can cause the SFS to the back of the nose and throat. The symptoms may occur quickly but do not last for more than a day and will resolve without treatment. Only some individuals are susceptible. The sensation is not harmful but is not pleasant while it lasts. Symptoms can be relieved by washing with cold water. Always wear the appropriate PPE as stated on the label and follow good personal hygiene practices to avoid exposure. If unsure about the symptoms, seek medical advice.

SURVEILLANCE:
In relation to CPP use, ongoing observation of people potentially exposed to CPPs to determine real levels of exposure. “Monitoring” is a similar term.

SUSCEPTIBILITY:
How sensitive an individual is to a particular hazard situation compared to other individuals. How much an individual would suffer if exposed to a particular substance, compared to others. For example, certain people have a greater reaction to skin irritants and skin sensitizers than others.

TOXICOLOGY:
The study of adverse health effects of substances on living organisms.

Chapter 10

Frequently asked questions (FAQs)

Q: Why should I always read the CPP label?
A: Labels are printed sheets of information that are fixed to the container of CPPs and other pesticides. You should read the label so that you are aware of everything you must do to use the product safely so that you do not put yourself, consumers, the environment or your harvest at risk. All advice on the label has been thoroughly tested, and has been reviewed and approved by independent regulatory bodies. It is important to read the label each time you buy the product as there may have been changes to the advice notes or the conditions of use. Some conditions of use may be required by the law of your country or, if you export your harvest, by the international markets.

Q: Why must CPPs only be used on the pests that are stated on the label?
A: Because these are the pests the CPP is designed to control, and these are the only uses approved by the regulators. If you use the CPP against the wrong (non-approved) pests and the wrong crops, in the wrong way, you are likely to cause damage to your crops and may cause damage to your soil or the environment, or leave residues in the food higher than MRLs. It may also increase the pest's resistance to chemical control. For these reasons it is likely to be against the law in your country to use the CPP on pests or in crops which are not on the label.

Q: Why do I have to use the CPP rate shown on the label? Does it matter if I put a bit more in?
A: The stated rates on the label are the only ones for which the product's use has been tested and approved. Increasing the rate is not likely to increase the effectiveness of either the CPP or the control non-listed pests. It will, however, increase risk of harm such as phytotoxicity and ecological damage, and may lead to unacceptable residues in the harvested crop. In most countries using a higher rate is illegal.

Q: What are pesticide residues?

A: The word residue has two meanings in the context of CPPs. Usually it refers to the active ingredient or its metabolites that can be detected in the harvested crop after the CPP has been applied. Residue levels normally reduce over time as they break down in the plant. The maximum level of a pesticide or its metabolites that may remain in the harvested crop is known as the Maximum Residue Level (MRL). These are set by regulatory bodies. Residue may also refer to the spray liquid or CPP that is retained after the sprayer or pesticide container has been emptied and cleaned, or to detections of the active ingredient in the environment e.g. soil residues, water residues.

Q: What is spray drift? Why does it matter?

A: Spray drift is the movement of small airborne drops containing pesticide that are blown by wind from the area being treated (the treatment zone) to another area, usually downwind. Spray drift should be avoided because although the actual volumes of spray drift may be low, their presence or activity on sensitive plant/animal species may cause harm.

In addition, drift deposits may build up in one area of the treatment zone to form a higher concentration of pesticide, and drifting droplets that alight on non-sprayed vegetation causing damage. Herbicides in particular can cause damage to neighboring crops, and harvests may be "tainted" by residues from spray drift. Spray drift may also contaminate water in rivers, wells or drains, or be deposited on bystanders or residential areas. Therefore it is essential that spray drift is minimized. Use the correct application equipment and technique. Drift-reducing nozzles are recommended.

Q: Why does runoff matter?

A: Runoff occurs when too much spray solution is applied and the spray deposit on the target (for example foliar washoff) is more than that surface can retain (hold back). The excess pesticide runs off, is wasted, and may contaminate your soil or pollute nearby waterways. Normally runoff increases when the used-water volume rates are too high for the particular combination of crop and CPP formulation. Thus several different water volume rates may be quoted on the label depending on the charcteristics of the crop and/or the particular CPP being used. For instance, lower water volume rates may be needed where the crop leaves are waxy and sloping downwards.

The term runoff is also used to describe the movement of the CPP off the field by water such as after heavy rain, which can cause contamination of waterways and ecological damage. Both types of runoff must be avoided. Waterways near fields can be protected by planting buffer zones of grass or other herbage between the field and the water. These act as filters of the contaminated water as runoff passes over them. Buffer zones can also be designed to intercept spray drift and/or to encourage beneficial insects. These are called multi-functional field margins. While buffers can be effective in reducing the negative effects of runoff, better soil management in the cropped part of the field can reduce runoff at the source, increasing the effectiveness of buffers. Farmers should start by improving practices in the field, particularly since this can often also improve productivity.

Q: What is water volume rate?

A: The water volume rate is the amount of spray solution (the pesticide and water mix) that is sprayed over a known area. In most conventional uses, the amount or volume of water making up the solution is much greater than the amount or volume of CPP. Thus the amount of water and the amount of spray solution are often regarded as the same when it comes to calculating the water volume rate or the spray solution rate. Labels usually refer to water volume rates rather than spray solution rates and may state water volume rates such as 100 to 300 L/ha. This means that the pesticide must be diluted and dispersed in water such that when the nozzles are correctly used, the water volume rate that you have chosen and calibrated for will, when sprayed from the nozzles uniformly over the treatment area, apply that known rate and therefore the treatment intended.

Q: What is spray quality?

A: Spray quality refers to the optimal droplet size of a CPP spray. The scheme was introduced by the British Crop Protection Council. There are six sizes:

- Very fine – for use in protected crops/ greenhouse crops
- Fine - for grass weed herbicides
- Medium – for systemic products and other herbicides
- Coarse – for soil applications plus some other new products
- Very coarse – low-drift spraying (low risk)
- Extra coarse – for very low-drift spraying (very low risk)

A nozzle forms a thin sheet of spray liquid at its orifice, which breaks down into drops. Drops produced by this “sheet break up” method are not uniformly sized, but rather have a range of sizes. The average size of the drops will depend on the size of the nozzle orifice, its design and the pressure. Different CPPs are now known to be more effective when applied in a particular size range, so make sure you understand your specific CPP’s requirements.

Q: What is point-source pollution? Why does it matter?

A: CPPs may cause contamination of surface water such as creeks, rivers, or ponds, which can put aquatic organisms at risk. Contamination of groundwater may threaten drinking water quality. One of the main sources of contamination in agriculture is by point sources—that is, contamination arising from spills that drain directly into channels or drains. Every care must be taken to avoid this. Point-source contamination occurs due to a combination of poor farmer practice and lack of proper infrastructure. It is different to diffuse pollution as it is confined to a specific area, whereas diffuse pollution occurs over a wider area—for example, from spray drift or runoff.

Q: What is a spray pattern? What is a good distribution pattern?

A: The spray pattern is the distribution of spray, the pattern or footprint formed by the accumulation of spray droplets when they impact over the target surface. Spray projected by a nozzle forms a swath of spray that is designed to impact a target surface at a distance typically of about 50cm. Conventional individual nozzles on knapsack sprayers are designed to apply swaths of 1 meter wide at a height of 50cm. For field crop sprayers, nozzles at 50cm spacing across a boom produce individual triangular patterns that overlap with each other to form a uniform swath. Overlapping patterns help to minimize the effects of boom height changes to the spraying pattern. You can check your spray pattern visually by spraying water over a flat, dry surface such as a concrete yard or a road. When the volume of sprayed water is uniform across the swath, the spray pattern is good and every target surface treated will be exposed to the same application of CPP.

Q: Why does it matter what nozzle I use when spraying CPPs?

A: A nozzle controls both the speed of the flow of spray liquid (flow rate) and the range of spray drop sizes that are emitted and directed at the surface to be treated (target surface). Using the drop size advised is important, as it also reduces the risk of spray drift and operator exposure.

To spray in the best way, you need to use the right nozzle to produce the right/required drop size. This helps to achieve the right spray quality and the correct distribution pattern in order to maximize the capacity of the CPP to achieve its desired effect (efficacy) in controlling the pest.Flat fan nozzles are often used on booms in linear arrays. They are recommended for overall, uniform swath spraying such as on tractor-mounted booms for field crops or for minibooms on knapsack sprayers. Hollow cone nozzles may be advised for insecticide and/or fungicide spraying as they produce small drops. Reflex nozzles are good for knapsack sprayers, as they produce a wide pattern from a single nozzle, can be used at low heights, and do not block easily.

Q: Why should I wear protective clothing when handling CPPs?

A: All chemicals are potentially harmful to your health. The more you are exposed to the chemical, i.e. the greater the quantity and the longer the time, so the risk of harm is likely to increase. The skin is the area of the body most at risk. This is specifically true for hands, which represent over 80% of contamination risk. It is a condition of CPP use that the advised personal protective equipment (PPE) must be worn. Read the label carefully to find out what you need to wear, as it will vary between products and between uses. The label requirements are the minimum. Always follow good personal hygiene practices. The minimum recommended PPE is impermeable gloves, impermeable boots, a long-sleeved shirt, long trousers and eye protection.

Q: Why do I need to wash my hands, face and body after working with CPPs?

A: Even if you didn't notice any contamination of the CPP concentrate or spray onto your skin or body, you probably have received some level of exposure to the spray droplets if using a liquid, or to dust if using a solid formulation. If not washed, this can over time lead to health effects such as irritation and dermatitis, or the contamination can be transferred to food, food utensils or other people when you touch them. This cross-contamination can lead to adverse health effects, especially to sensitive individuals such as babies. Therefore always wash yourself thoroughly after handling CPPs and before eating, drinking, performing any other activity such as driving a vehicle, and before re-entering the home.

Appendices

Appendix A: Training methods in detail

- Q&A
- Buzz Groups
- Hum Groups
- Demonstrations
- Instructional Visits
- Guided Discovery
- Lectures

Q&A

The most versatile method of involving participants is through the use of question and answer techniques (Q&As). The most commonly used forms of questions are:

- Overhead questions that the trainer puts to the group as a whole so anyone is free to answer. These are useful to 'break the ice' with a new group or to introduce a new topic. They do, however, favor the most outspoken participants at the expense of the others, who, as a result, may participate even less.

  Directed questions are those the trainer puts to the group, letting his/her eyes scan all participants and then after a pause of a few seconds, naming the person who will answer.

  This allows the trainer:

  - to encourage slower participants
  - to regain attention from individuals who may be distracted
  - to check a participant's understanding
  - to rely on the experience of more participants.
- Questions from the group should be encouraged at appropriate points during the training session. Again, care should be taken to prevent the more extroverted participants from asking all the questions, and to stop the trainer putting off questions that are not timely or are irrelevant to the current session.

The type of question asked is also important.

OPEN QUESTIONS start with “why”, “who”, “which”, “where”, “when”, “how”, and “what” and should always be used in preference to CLOSED QUESTIONS such as “is the ...?”, “do you ...?”, “are you …?”, “have you …?”, or “do you think that …?”

Closed questions can be answered by a simple “yes” or “no”, which does not necessarily mean the person answering truly knows the answer. In comparison, an open question probes for knowledge or understanding and encourages the participant to speak (for example: “what do you mean by that?”) or prompting for a desired response (“Would you agree that …?”).

On the other hand, RHETORICAL QUESTIONS – in which the answer is provided in the question – are not very useful for training purposes. (e.g. “Do you think that …, of course you do,” or by ending questions with “... isn’t it, doesn’t it?”)

To check understanding, ask the participants questions about what you have just taught them, for example: “How many Golden Rules are there?” or “Can you name one of the Golden Rules?” Avoid asking “do you understand?” or “is that clear?” as these invariably get the response “yes” whether the participant understands or not!

The effective use of Q&A sessions requires considerable practice, so those new to training should not be discouraged if they find it difficult to start with. Trainees often take some time to adjust to the Q&A model if they are traditionally used to more directive training methods.

Why do we use questions in training? Key reasons include:

- to involve participants
- to make them think, not just passively listen
- to check knowledge or understanding
- to ‘force’ participants to work out the answer (thus making them more likely to learn)
- to ensure a high level of concentration among the audience

When can we use questions in training? Fundamentally, at all times during participative training, for example:

At the start of a session, to introduce a new subject, or to check knowledge

- During a theoretical session
- During a demonstration
- During trainee practice (to check understanding and correct errors)
- At the end of a session, to check objectives

How do we run a Q&A session? Through a series of actions such as:

- Posing the initial question and rephrasing it if necessary
- Writing all answers on a flip chart
- Prompting for any missing answers
- Going back over the list to discuss important points.

All the answers should be written down, even if they are not exactly what the trainer is looking for. Failure to write down a participant’s answer can lead to demotivation. If an answer is clearly wrong, the trainer gently lead the participant to the right answer by asking more questions.

The trainer should have his/her own list of key points to refer to, when compiling the participants’ list of answers, so that the trainer can easily check if an item is missing.

COMMUNICATION EXERCISE 1

Discuss the different forms of asking questions.

1. Trainer to ask the group whether they can remember the different type of questions. Trainer checklist includes:
   a. overhead (to the whole group)
   b. nominated or directed (to a named individual)
   c. open, closed, rhetorical questions
2. Trainer to ask the group whether they can think of advantages and disadvantages of **overhead questions**. Non-exhaustive trainer checklist:
   a. Advantages: less threatening, as someone else may answer; a participant is likely to know the answer so it may be quicker way of advancing through the course
   b. Disadvantages: could demotivate individuals who are not named; makes it more likely for quieter people to be left out; trainer will not know whether all participants understand.
3. Trainer to ask the group whether they can think of advantages and disadvantages of **nominated questions**. Non-exhaustive trainer checklist:
   a. Advantages: can test individual understanding; everybody concentrates as anyone might be asked a question
   b. Disadvantages: may embarrass or demotivate a participant if s/he doesn't know the answer; generally perceived as more threatening by participants
4. Trainer to ask group what they think the most appropriate type of question is. Why? How can it be made less threatening?
   a. Expected answer: a nominated question can be made less threatening by asking the question first, then naming someone to answer, rather than asking "John - tell me …" It also makes everybody think about the answer because no-one knows who will be asked.
5. Trainer to conclude the exercise with the following key message: both overhead and nominated questioning should be used, but it is preferable to use more **overhead questions** early in a course or session and switch to **nominated questions** later on to check participant's understanding and the course objectives.

COMMUNICATION EXERCISE 2

Discuss the use of questions in demonstrations and practice sessions.

After the trainer has captured all answers on a board or a flip chart, s/he could conclude the exercise by asking one final session question:

Q: For training purposes, is it better to ask or to tell?
A: The aim of this question is for trainees to come to the conclusion that it is always better to ask rather than tell because, in this way, trainees are 'forced' to work out the answers and thus think rather than just passively listen. It is then also possible to check whether they've really understood the content of the training.

COMMUNICATION EXERCISE 3

Trainer to give a list of statements which should be written down as questions by each trainee.

Examples to use could include:

1. I am going to show you how to dismantle a sprayer, as this will help you understand how it works.
2. This is a piston pump type of sprayer.
3. The piston-pump can generate higher pressures than the diaphragm pump.
4. This is the lance with the on/off trigger control.
5. Remove the piston carefully - do not drop the ball valves.

6. You could do that more easily with a screwdriver instead of pliers.
7. That leaks because you have not tightened it evenly.
8. Pesticides can be classified by target pest, by chemical group, by mode of action or by hazard class.
9. It is important in planning training to start by considering the target group.
10. The recovery position ensures the airway is kept clear even if the patient vomits.

The trainer should expect open questions. Using sentence no. 1 as an example, the expected answer would be: "How should one dismantle a sprayer?" or "Show me how you would dismantle a sprayer".

If the participant offers a closed question such as "Is this the right way of dismantling a sprayer?" ask him/her if they can think of an open question to ask instead.

Trainers should always think of asking rather than telling. A good use of questions is the key to successful participative training. Emphasize that this is not an easy skill to acquire. It requires practice because it can make the session more difficult to manage, as the questions can take the discussion in a different direction from where the trainer wants it to go.

The duration of this session will vary depending on the number of participants involved. Trainers need to practice this skill and it is important to allocate sufficient time for all to practice without boring participants with endless repetitive sessions.

Group Discussions

Group discussions are another useful way of involving the participants in a training session. They can be used as the basis for complete sessions, but more commonly, are combined with a more trainer-centered approach.

One form of group discussion is known as the 'buzz group' - so called because of the buzzing sound made when the groups are at work. Here, the trainer presents topics for discussion to groups of 4-5 participants, allowing them a specified time to reach their conclusions, and then invites a representative from each group to report back these findings to the class as a whole.

Despite the limited input from the trainer during the session, they have an important role in preparing and managing the exercise:

- The objectives of the session must be clearly identified.
- Questions for discussion must be carefully formulated to ensure participants move towards these objectives.
- Questions should be left on display for reference while groups are working.
- The topic must be clearly introduced.
- Clear instructions must be given to the groups regarding topic, time allowed for discussion and method of reporting back.
- The trainer should not interfere with the groups' work, but should move away and watch discreetly, only advising if directly requested by a group.
- The trainer must be prepared to add any elements that have been missed, and provide any structuring or summary required to ensure session objectives are met.
- Seating arrangements must be sufficiently flexible to enable the buzz groups to be formed in circles or around tables.

COMMUNICATION EXERCISE 4
(BUZZ GROUP)

Typically buzz groups are used when topics for discussion are more complex or more research from reference material may be needed.

Let's use the prevention of pesticide poisoning as an example:

1. The trainer will first outline possible routes of entry of pesticides into the body.
2. S/he could divide participants into three groups and ask each to discuss ways that Growers and End Users can prevent contamination by one of these routes when handling pesticides.
3. After the specified discussion period, a representative of each group is asked to present the group's findings. In this example, the methods of preventing poisoning through the skin, inhalation, and swallowing would be discussed.
4. The trainer could then use these reports (presented on a chart) to further describe safe use by filling in and reinforcing any points where necessary, or inviting further discussion should there be disagreement.

COMMUNICATION EXERCISE 5
(HUM GROUP)

This is best used early in the course when participants do not know each other well, and may be inhibited when working in larger groups.

The 'hum-group'- so called because of the humming sound made when the groups are discussing their topic - is a second type of discussion group. Here, topics are discussed by participants in pairs and, rather than having complete feedback from each pair, the trainer usually accepts one or two points from each pair to build up a composite picture that is then developed further.

For example the trainer might distribute pesticide labels to each participant, ask them in pairs to make a list of all the categories of information found on that label, and then contribute one or two points to a list that the trainer compiles on, say, a flip chart before using it as a basis for further development.

Management of hum groups is similar in some respects to that of buzz groups:

- Leave the question on display for reference while groups are discussing.
- Divide pairs clearly, especially if there is an odd number of participants requiring one group of three.
- If different groups are working on different topics, ensure each group knows which topic is theirs.
- Tell participants what is required - this is usually "prepare a list".

- Advise participants of the time limit. For hum groups this is usually relatively short (5-10 minutes) or whenever the trainer observes that the majority of groups have finished. While groups are discussing, the trainer should not interfere.
- It is inhibiting if participants feel they are being closely watched, but discreet observation is necessary to bring the discussion to a close when it is clear that most groups have finished.
- Request feedback in a very structured way - one point from each group in turn around the room and build up a composite list on the board or chart.
- Aim to write every point on the board or chart, but if someone gives the wrong answer or a repetition of a previous statement, gently steer them towards a different articulation before capturing it.
- Use different colors to make the list clearer.
- When all groups have had an opportunity to contribute, either go round again in turn but this time ask the other member of the pair to read out a point from their list, or ask for contributions from any group.
- The Trainer then consults his/her own checklist for any important points missed. If there are any, the trainer should preferably lead participants to the answer via a good use of questioning.
- Highlight the best points to help participants remember the most important lessons.
- Conclude the exercise or link to the next part of the session.

COMMUNICATION EXERCISE 6

(OPEN QUESTION)

Trainer to ask the group about the advantages of working in small groups.

Non-exhaustive checklist includes: stimulates participation; shy participants can contribute more easily; less threatening method of probing knowledge; exchange of ideas and opinions; experienced participants can help less experienced ones.

Demonstrations

These are an important part of pesticides training, providing the link between theory and practice. Demonstrations must be prepared carefully beforehand by:

- Ensuring equipment is complete and in good condition – for example, if a sprayer is to be dismantled it should be well cleaned, the connections should be eased, and the appropriate tools and safety clothing should be at hand
- Practicing to ensure the demonstration will be carried out smoothly and confidently
- Practicing the instruction so the explanation will be clear and logical.

If the procedure/skill is complicated or unfamiliar to the trainer, a careful analysis of the skill can greatly improve the clarity of the presentation. This is ideally done by having an experienced/ skilled operator do the task while the trainer identifies and notes down the stages, details of the method and any key points. This can best be done across a sheet of paper like this:

Stages	Method	Key Points

Presenting in such a structured way with emphasis on the important points will make it easier for the participants to assimilate the procedure/skill.

All participants should be able to see and hear during a demonstration, so rearrange seating if necessary. Use small cards if you want to have a reminder of certain key points.

[Open Q]: "what is the definition of a skill?"
A: It is the knowledge of a procedure and the ability to carry it out efficiently and safely, without making mistakes. Speed is also an essential element in being able to practice a skill, but obviously speed develops with practice.

[Open Q]: "why is it necessary to analyze a skill?"
A: When considering a skill that we are intending to teach, it is easy to forget all the elements that make up the skill. A systematic analysis of the skill enables the trainer to break the skill into components or stages that the participant can assimilate more easily. It also helps to ensure that nothing is forgotten and that essential points, especially safety matters, can be emphasized at the right time during the training. It further helps to avoid damage to equipment.

You know someone who is about to learn how to drive a car. What are the steps they need to learn about getting into the car parked at the side of a busy street and moving off into traffic?

Practical Instruction: 'Learning-by-doing' should be the principle underlying any practical activity, so wherever possible, demonstrations should be followed by trainee practice.

COMMUNICATION EXERCISE 7 (LEARNING BY DOING)

DEMONSTRATION 1

1. Trainer introduces the procedure/skill. S/he discusses its importance and relevance to motivate participants, and highlights essential safety aspects
2. Trainer demonstrates the skill once at normal speed
3. Trainer demonstrates a second time, slowly
4. Trainer selects one trainee to perform the procedure or skill.

(Followed by) PRACTICE GROUPS

1. Participants are divided into small practice groups with their own set of equipment. Alternatively, one group practices while the others comment or correct their practice. The aim is to have as many people practicing as possible.
2. Trainers do not interfere unless necessary – the ideal situation being when a participant realizes that something is wrong they can work what to do to rectify it.
3. Trainers should intervene to correct mistakes if they are likely to result in injury or harm to the participant, or damage to an expensive piece of equipment.
4. Having intervened at the appropriate time, the trainer should guide the trainee using questions: "why did I intervene?", "how did it happen? What did you do?", "why is it important?", and "what is the correct procedure?"

REPORTING

1. All participants should discuss any errors seen during trainee practice.
2. Trainer to reinforce key points.

Instructional Visits

Instructional visits include visits to farms, research stations or pesticide stores. They are an essential feature of most pesticide-related courses. However their success in training terms depends very much on the preparation done by the trainer.

The trainer should ideally visit the place beforehand and details of date, time, participant numbers, and objectives of the exercise discussed with the key person there.

Before the visit, participants should be well briefed with background information, the visit program and specific tasks they will need to complete. This usually involves preparing a visit sheet with a series of tasks or questions to be answered.

A feedback session (normally back at the training center) is essential to discuss the visit findings, and reinforce and discuss points that occurred during it.

To explain the purpose of the instructional visit, use the analogy of learning a new sport (e.g. football, cricket etc.). By listening to the radio, we might learn a little bit about the sport (e.g. the basic rules). However we would not be able to play it. If we watched the sport on television, we would learn still more, but would still not possess the skills to enable us to play. It is only by doing the sport ourselves that we acquire the skills to enable us to play it, and the more practice we have, the better we get.

The same is true of any skill associated with using pesticides safely and effectively. People learning the skill need to be given enough time to practice it under supervision, so they can safely do it on their own later.

[Open Q]: What examples of learning skills have we dealt with on this course?

Non-exhaustive trainer checklist includes: dismantling and reassembling sprayers; sprayer calibration; first aid techniques (e.g. induction of vomiting, recovery position); training skills (e.g. use of Q&A)]

Explain that in this session, we will be looking at techniques of carrying out and managing demonstrations, followed by trainee practice sessions.

Explain that there are different ways we can approach the teaching of a skill, but all involve trainee practice at some stage. For example, the most straightforward approach is for the trainer to demonstrate the skill, and then the participants practice it. (Write this up onto flip chart as option no.1)

1. Trainer demonstrates, then one or more participants demonstrate, then participants practice
2. Trainee demonstrates under guidance, then participants practice (i.e. no demonstration by trainer)
3. Trainer demonstrates and participants practice simultaneously
4. No demonstration, only trainee participants (guided discovery)

Explain that different approaches will suit different skills and situations.

Q: Ask for examples/reasons why.
A: Example: if the skill being learned is potentially hazardous, it is better to go for approach no. 2; if time is limited, approach 4 may take too long.

Q: Ask for examples of when the different approaches have been used during the other sessions on the course.
A: Example: No. 1 - when learning to dismantle a sprayer, No. 2 - during first aid, No. 4 - during calibration card learning etc.

Explain that this training method can be divided into three phases: (the three Ps)

- Planning
- Preparation
- Performance.

Emphasize that for this training method, the emphasis must be on the Planning and Preparation phases to ensure that the performance is effective.

Q: What are the things that should be considered in the **planning phase**?
A: Trainer checklist includes:

- How many participants are they? Who are they? What are their training needs?
- Do they need transport or accommodation?
- Do they need to be allocated to particular groups? What will group sizes be for practice session?
- How many Trainers should be present? Two Trainers are usually better than one because it spreads the workload, it allows for different areas of expertise, and it introduces a change of style and voice that will help to maintain the attentiveness of the group.
- Would guest speakers help or hinder?
  - Are they experts in areas in which Trainers are not knowledgeable?
  - Do they lend credibility to the course as recognized experts?
  - Are they good presenters?
- Is a skills analysis required?
- What are the objectives of the session?
- Where is the relevant technical content?
- How much time is available and needed?
- Devote AT LEAST 70% of total session time to trainee practice.
- What are the methods that should be used? How will the demo be done?
- What equipment will be required, and how much of each?
- What visual aids need to be prepared? Are handouts or instruction sheets required?
- Where will it be carried out? (for example – indoors/outdoors)

Q: What should be done in the **preparation phase**?
A: Trainer checklist includes:

- Assemble equipment (use checklist)
- Prepare equipment, for example - loosening screws
- Prepare visual aids and handouts
- Practice demonstration to ensure it can be done easily and quickly
- Make sure all technical aspects of the session are fully understood by trainer
- Prepare location and venue.

Q: What things need to be considered in the **performance phase** of the demonstration?
A: Trainer checklist includes:

- Make sure everyone can see the demonstration and any visual aids
- Ensure that any small parts are shown clearly
- Carry out the demonstration in a logical order to ensure nothing is missed out
- Emphasize the key safety points
- Use Q&A to ensure attention and interaction during the demonstration, and to check knowledge and understanding
- Ensure good time management to allow sufficient practice time (AT LEAST 70% of total session time for participant practice)
- If applicable, ensure effectiveness of guest speakers:
  - Advise him/her of allocated time and try to ensure he/she sticks to it
  - Assist him/her with visual aids to ensure adequate quality
  - Try and encourage the use of participative techniques.

Q: What are the important aspects in managing participant practice in a skills learning session?
A: Trainer checklist includes:

- Groups should not be too large so that all participants have the opportunity to practice
- There should be enough trainers to supervise all groups/participants adequately
- Trainers should actively address timing difficulties, such as groups working at different speeds
- Equipment should be ready for all groups, to avoid wasting time
- "Stand-by" activities should be ready for groups that finish well before others
- There should be the least interference possible - use questions instead of telling if participants ask for help, otherwise leave them to learn for themselves
- Errors should be handled in a constructive way (refer to a later session on this topic)
- Beware of guest experts and knowledgeable onlookers, who may interfere with the "discovery learning" process.

Explain that judging when and how to correct errors in trainee practice is a complex subject that will be dealt with in a separate session.

Guided Discovery

Allowing participants to discover principles and skills for themselves is a very powerful training method.

As open-ended discovery is very time-consuming and time is limited on short courses, the exercise needs to be 'guided'. This implies that the trainer has done sufficient preparation to ensure that participants follow the desired route.

For example, in teaching calibration, the trainer could introduce the subject by defining calibration, discussing its importance in enabling accurate dose rates to be applied, and identifying the equipment needed to carry out a sprayer calibration. S/he could then divide the participants into small groups, providing each with a set of equipment, a product label and a calibration aid (outlining the procedure), and ask them to calibrate the sprayer for that product.

The feedback and summary element of this type of session is vital. There will be a variety of answers and misunderstandings. These must be used in a constructive way to reinforce the training points.

Lectures

Straight lectures are rarely appropriate for training purposes. However, there are occasions where they need to be used, for example: where large numbers of participants are involved where a large amount of information has to be covered in a limited time if time for preparation is limited; or if a session is being conducted by a local high-ranking official. Remember that very little of the information presented will be remembered afterwards.

If this method has to be used, its effectiveness can be maximized by ensuring the subject matter is relevant and interesting; is presented in a clear and logical manner; and is illustrated with visual aids where possible.

It is best in this case to have lecture notes available for distribution to participants after the session.

Varying methods

Front-Line Trainers may have to repeatedly give training to the same group of farmers. Varying the training method is a good way of keeping the participants' attention. For example the first time you give the training to a Grower or End User you may want to use a Lecture format and the next time you may what to use a Q&A and go into detail of one of the 5 Golden Rules.

Learning aids

In the learning process, a relatively small proportion of knowledge is gained by simply listening. Learning can be greatly enhanced by seeing and even more by doing. A simple way to express this is:

> "To hear is to forget, to see is to remember, to do is to understand."
> Confucius

This section deals with the use of visual materials as an aid to learning and discusses their most optimal uses.

Real Materials

Some examples of real materials include:

- Specimens
- Plant and weed samples
- Insects and insect damage
- Diseased plant material
- Sprayers
- Nozzles
- Protective clothing
- Pesticide pack samples
- Labels
- Local photos.

Real materials provide a vivid way of illustrating a session, particularly if participants are able to handle the materials. It is therefore useful to have a few examples available, especially if they are small. This will ensure participants have sufficient time to inspect the materials and still hear the important information that needs to be shared.

In demonstrating the use of protective clothing, it will be a more memorable exercise if participants can watch a colleague put on and wear the clothing rather than merely holding the item.

Other visual aids can be used in conjunction with real materials. For instance, a diagrammatic picture of how a nozzle works will also improve the participants' understanding.

Boards and flip charts

- Try not to speak while facing away from the audience when writing on the board
- Use lettering large enough to be read from the most distant part of the room
- Position the board so that it can be clearly seen by all participants
- Use non-permanent marker pens
- Use a range of colors to highlight key points in the script or illustrations
- Print letters individually rather than using cursive or joined-up writing.

Video

As long as the screen is large enough to allow all participants to have a clear view, video can be used to enliven a training session, to give the session trainer a break, and to give the participants a change from the trainer's voice.

Appendix B: Pesticide nomenclature

There are several systems of nomenclature applicable to CPPs. Most refer to the active ingredient.

Chemical name:
Describes the chemical identity of a molecule based on its component elements.

Common name:
An internationally agreed, relatively easy-to-use name of a chemical, to avoid having to use complex chemical names.

IUPAC name:
Chemical names can differ slightly depending on the nomenclature system used, so sometimes the system such as IUPAC (International Union of Pure and Applied Chemistry) is stated. This system is used for organic chemical compounds.

Trade name, brand name:
These are the specific manufacturer's names for the formulated pesticide product. Different products with the same active ingredient may have many different trade names. Some Active Ingredients also have trade names, such as Superscript ™.

Molecular formula:
The number and identity of the elements in a chemical compound.

Appendix C: Pesticide classification

There are a number of different ways that pesticides are classified. Classification helps us to understand things by grouping them by common characteristics. For example, living organisms are classified by the agreed system of kingdom, phylum, class, order, family, genus, species.

The main ways that pesticides are classified are by:

Classification type	Examples	More information
Target pest	herbicide, insecticide, fungicide, rodenticide	
Formulation type	WG, WP, SL, SC, EC, FS,	Catalogue of Pesticide Formulation Types and International Coding System, May 2008, CropLife International http://croplife.org/wp-content/uploads/2014/05/Technical-Monograph-2-Revised-May-2008.pdf
Chemical family	Triazines, neoniciotinoids, strobilurins	
Mode of action	Dehydrogenase Inhibitors (SDHIs). Inhibition of acetyl CoA carboxylase (ACCase inhibitors) Nicotinic acetylcholine receptor competitive modulators	Insecticides: http://www.irac-online.org/modes-of-action/ Herbicides: http://www.hracglobal.com/pages/classificationofherbicidesiteofaction.com Fungicides: http://www.frac.info/docs/default-source/publications/frac-code-list/frac-code-list-2015-finalC2AD7AA36764.pdf?sfvrsn=4
Hazard	Toxic, harmful, irritant	Global: GHS (Globally Harmonized System for Classification and Labeling of Chemicals) http://www.unece.org/trans/danger/publi/ghs/ghs_welcome_e.html Europe: European Chemicals Agency (ECHA) http://echa.europa.eu/web/guest/regulations/clp

Appendix D: Legislation

Pesticides are highly regulated in all countries. There are four general levels of legislation applying to pesticides: pre-market registration, control of use, compliance legislation, and international laws and conventions. Within the broader legislative framework there are usually regulations and guidelines that prescribe the management of pesticides in increasing detail.

Pre-market registration

All CPPs must be approved by the appropriate country regulatory authorities prior to being placed on the market. The EU also has an approval process in addition to member-state approvals, and in some countries such as the US, some states also have independent regulatory systems. In the US, regulatory authorities are usually affiliated with the larger governing bodies such as the Department of Agriculture, Environmental Protection Agency and Department of Health. Different countries have different names for these regulatory authorities and governing bodies. In order to gain approval or registration, manufacturers such as Syngenta must provide these agencies with a complete data set including a large number of safety, chemical, residue, and efficacy studies, as well as operator and environmental risk assessments. Other information that must be provided includes an application form, the draft label text and safety data sheet. The regulatory agency then conducts a thorough evaluation of the data, which can take up to three years depending on the country. Usually questions are raised and additional data are requested. At the end of the process, a regulatory approval is (hopefully) granted; the direction for use of the product and safety warnings are agreed on; the label text is finalized; and the product can be placed on the market. The entire process from generation of the studies to approval takes 10 years on average.

Control of use

All countries have laws and regulations which govern the use of hazardous substances including CPPs. These laws and regulations are particularly relevant for our safe use training, as mentioned throughout this manual. It is critical that you are aware of your local laws and regulations so that you can answer questions and give correct advice to course participants. More information should be available from various government agencies such as the local Department of Agriculture office.

Compliance

Some countries also have laws and regulations governing the standards and quality of CPPs, such as impurity levels, formulation specifications, labeling, and product quality. We are confident that Syngenta's products always comply with these laws, however, some manufacturers sell poor-quality and counterfeit products which do not comply and can be hazardous to humans and the environment. Therefore it is good to be aware of the local legislation and the possibility of inferior products being available on the market in your area.

International laws and conventions

There are a number of internationally agreed governance systems that may apply to particular CPPs. These include international transport laws (UN Recommendations for the Transport of Dangerous Goods); trade agreements such as Maximum Residue Levels (MRLs) and Prior Informed Consent (PIC); classification systems such as GHS; and conventions such as the Stockholm Convention on Persistent Organic Pollutants and the Rotterdam Convention.

Appendix E: Packaging

The packaging of any product, including CPPs, is a vitally important factor that can sometimes be taken for granted.

Packaging is important for the following reasons:

- To physically contain the substance for ease of transport and use
- To ensure maximum shelf life and integrity of the product by giving protection
- To protect users, the public and the environment from contamination
- To enable adherence of the product label
- To enhance the appearance and marketability of the product

The main features of good CPP packs include:

- Strength to resist breakage, even if dropped or handled roughly. Syngenta's packs must pass the "drop test"
- Material resistant to chemical attack over long storage periods and at temperature extremes
- Material resistant to UV light over long periods
- Pack designed for ease of handling, e.g. handle on larger packs, easily gripped
- Sturdy base so pack stands steadily
- Pack shape to allow items to be neatly stored and transported together so as to use minimal space without waste and to fit securely onto a shipping pallet
- Pack designed to drain contents easily
- Pack shape and opening of neck designed to prevent glugging of liquids (coming out in large unpredictable spurts)
- Neck and opening designed to pour easily without spillage
- Opening and lid designed to be easily resealed
- Lid to be tamper-proof so that it is evident at purchase that pack is new and has not been opened
- Pack size relevant to user (i.e. amount that would be used in one season or less)
- Pack design to be easily cleaned and unattractive for re-use
- Pack material able to be recycled
- Pack supports the label clearly and securely
- Pack design should not be easily confused with those of other goods, especially food
- Traceability (pack without label can still be linked to Syngenta).

Appendix F: Course assessment

Assessment quizzes need to be tailored to the topics and material delivered in each individual training course. Use a combination of multiple-choice and short answer questions for variety. Try to write your own questions, but some examples are given below.

The quiz can also be delivered orally to the entire group at once if you believe that the writing skills of the participants are poor or if time is short. Read out the questions and ask participants to shout out answers, as in a classroom.

The quizzes should take a maximum of 15 minutes to complete and will probably only be able to be included in training sessions of 3 hours or more.

Sample quiz for post-course assessment of participants' learning.

1. What is the first thing that should be done before using a CPP?

a) Put on personal protective equipment
b) Clean out the sprayer
c) Read the product label
d) Go into the field

2. The Active Ingredient of a CPP is

a) The substance in the CPP that controls the target pests
b) An ingredient in the product that helps to stabilize the formulation
c) Always has the longest chemical name of all the ingredients
d) Is the same ingredient in all CPPs

3. Why is it important to read the application rate for the target pest and crop of a sprayed CPP?

a) To know how much time I will spend in the field
b) To know exactly how much of the CPP to add to the spray tank
c) To decide if other pests can be controlled at the same time
d) To be able to share the left over product with my neighbor

4. What is phytoxicity?

a) Control of weeds
b) Undesired side-effects to fish
c) Unwanted damage to non-target plants or crop
d) The use of a herbicide before the weeds have emerged

5. What are the potential effects of herbicide spray drift?

a) Damage to non-target plants
b) Exposure of the spray to bystanders and operator
c) Contamination of waterways
d) All of the above

6. Application equipment should be cleaned

a) After every use
b) At the end of the week
c) Once per season
d) Never

7. What are the first aid instructions for the management of splashes of a CPP into the eye?

a) Put on safety glasses then splash fresh water onto the face.
b) Remove contact lenses if present, hold the eye open and flush with fresh water from the side of the face towards the nose for at least 15 minutes.
c) Keep the eyes closed and ask someone to take you to the hospital.
d) Remove contact lenses if present, hold the eye open and flush with fresh water from the side of the face towards the nose for a maximum of three minutes.

8. If you spill some of the CPP while preparing the product for application, you should

a) Wait until after you have finished the treatment in the field then clean it up
b) Wait for a few days for it to settle before cleaning it up
c) Clean it up immediately
d) Clean it up at the end of the season

9. The part of the body that is most at risk of exposure when using CPPs is

a) The legs
b) The back
c) The neck
d) The hands

10. You should be careful not to purchase counterfeit or illegal CPPs because

a) They may not contain the active ingredient stated on the label
b) They may have impurities
c) The quality of the formulation may be poor
d) All of the above

11. List the 5 Golden Rules

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12. Why must you never decant CPPs into other containers?

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13. Name 3 items that should be included in a CPP store, other than the products

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12. Why should you seek medical advice if you suspect a poisoning incident has occurred to yourself or a co-worker?

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Sample quiz for pre- and post-course assessment of participants' learning.

Project Nr.-Interviewer Nr-Farmer Nr	B001 – 001 – 1

Name:		Date:	
Address:		Phone:	

Age:		Sex	☐ Male	☐ Female	Education:	

A Pesticide use status		
☐ Applying CPP at one farm only	☐ Contracted only for spraying on several farms	☐ Other

A¹ If working on one farm only: What is the size of the farm	☐ ≤ 0.4ha	☐ > 0.4ha ≤ 2ha	☐ > 2ha

A² If working on one farm only: Do you own the farm?	☐ YES	☐ NO

F Have you been trained yet in the safe use and application of pesticides?		☐ YES	☐ NO
F¹ If YES: Which entity provided the training and was it only safe use training or a technical training/event including safe use information (SU or T+SU)?			
☐ Government		☐ SU	☐ T+SU
☐ NGO		☐ SU	☐ T+SU
☐ Industry association (e.g. Crop life)		☐ SU	☐ T+SU
☐ Pesticide company	☐ Syngenta	☐ SU	☐ T+SU
	☐ Other company	☐ SU	☐ T+SU
☐ Pesticide distributor		☐ SU	☐ T+SU
☐ Employer (farmworker or contracted only for spraying)		☐ SU	☐ T+SU
☐ Family member/relative			
☐ Other			

Question to be answered with one of 5 possible levels and note the reasoning
1. Buying: How do you choose your pesticides?
• I ask an independent agricultural expert (technician) • I ask a pesticide seller (shop owner) • I ask my father or uncle • I ask another farmer who is not a member of the family • I try to find out myself by testing different products in the field
Additional notes and reasoning for the answer
2. Transport: How do you transport pesticides to your farm?
• In a car/truck on a separate compartment to the rest of the load • In a car/truck not separated to the rest of the load • On a motorcycle or bicycle • On my back, walking on foot • In a public bus
Additional notes and reasoning for the answer

3. Storing: How do you store your pesticides?
• I store them at home • I hide the packages from the children at home • I lock some of the products away • I lock all products away in a self-constructed box • I lock all products away in a special official lock-box
Additional notes and reasoning for the answer
4. Before application: What do you keep in mind before applying pesticides in your field?
• I prepare PPE to wear and I always check if the weather conditions are appropriate • I prepare PPE to wear and I check to make sure the wind is not blowing too strongly • I do not prepare any PPE but I check the weather • I do not prepare any PPE but I check to make sure the wind is not blowing too strongly • I neither prepare any PPE nor check the weather
Additional notes and reasoning for the answer
5. During application: Do you buy PPE and wear it during the product application?
• No, I cannot buy PPE anywhere and I never wear PPE when handling crop protection products • I rarely wear long trousers or a long-sleeved shirt • I often wear the following PPE _____ • I regularly wear the following PPE _____ • Yes, I always wear bespoke PPE. I buy the PPE from_____
Additional notes and reasoning for the answer
6a. After application: What is the re-entry period?
• The re-entry period is _____ and I mark the fields to restrict access according to the label • The re-entry period is _____ but I cannot mark the field to indicate restricted access • The re-entry period is _____ and it is unnecessary to mark the field to restrict access • The re-entry period is _____ and I can check the label to find out the exact re-entry period • I do not know what a re-entry period is
Additional notes and reasoning for the answer
6b. After application: What do you do with the PPE after applying CPP?
• I throw away the disposable parts and wash the rest separately after each CPP use • I clean it separately and wash my clothes at least every two days • I clean it separately and wash my clothes at least every two weeks • I wash it together with all my clothes • I put it back with all my other equipment and never wash it
Additional notes and reasoning for the answer
7. Waste management: What do you do with your empty containers?
• I triple-rinse it and reuse it for storing food items or drinking water • I clean it and reuse it for transporting other items (but not food or drinking water) • I do not clean the pack and I leave it on my land • I clean the pack and bury or burn it • I triple-rinse the pack and take it to a recycling point
Additional notes and reasoning for the answer
8. Recording: What kind of CPP records to you keep?
• I have written records of all pesticide name, quantity, date of use and weather conditions • I have written records of most pesticide name, quantity and date of use • I remember most pesticide name, quantity, date of use and weather conditions • I remember some pesticide name, quantity and date of use • I do not keep track of the products I apply
Additional notes and reasoning for the answer

Appendix G: Field visit checklist

Choose a location that is comfortably accessible from the training venue, ie within one hour travel distance, and arrange suitable transport.

Choose a farmer/Grower that you or a Syngenta colleague has met before.

Discuss the visit with the Grower/farmer in detail at least a couple of weeks prior to the date, to be sure that they are prepared and know what to expect. Also discuss the availability of facilities such as toilets.

Check insurance (HSE) needs and local regulations.

Try to have at least one crop in the ground for viewing, preferably one that has been or will soon be treated with a relevant CPP or seed treatment product.

Aim to include viewing of:

- a good storage facility
- spray equipment in good condition
- PPE
- good cropping practices
- buffer strip or multi-functional field margin.

Try to arrange some kind of on-farm activity to be demonstrated such as:

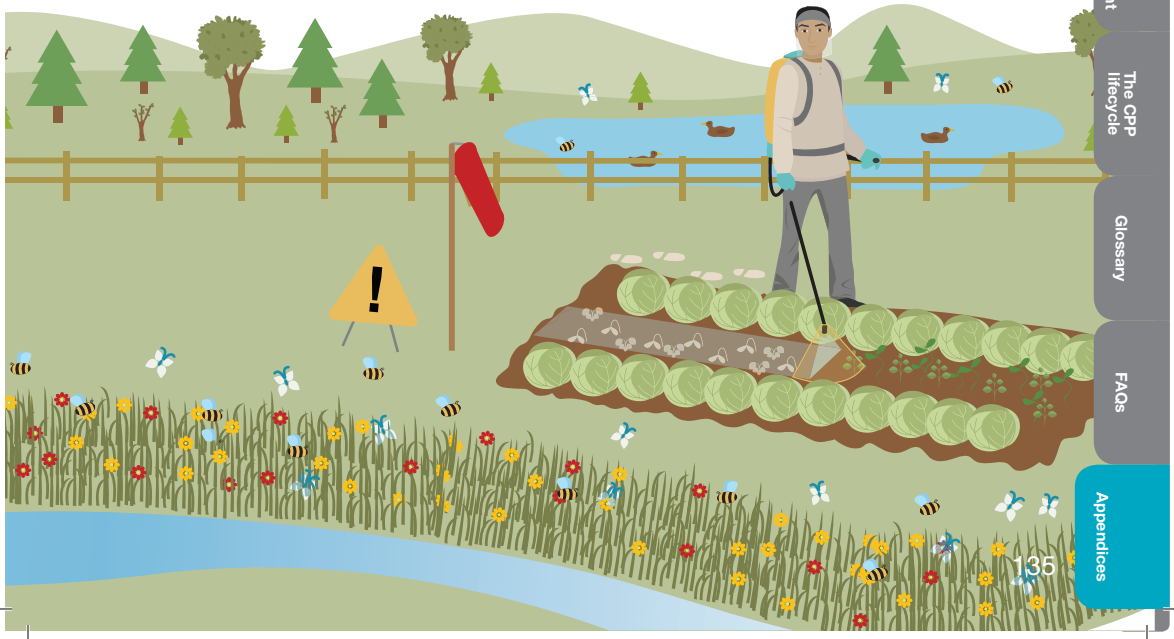
- use of PPE (putting on, taking off)
- mixing and loading of a CPP
- on-farm treatment of seed
- use of deflector on drilling machine
- spraying or granule application (but keep participants away from any possible spray drift)
- triple-rinsing empty containers
- calibration of spray equipment
- washing spray equipment
- on-farm waste management
- record keeping
- spill kit use.

Ensure participants bring drinking water, hats, sunscreen, comfortable shoes, notepad (i.e. give advice prior to the day).

Engage participants during the visit by asking questions and having them take part in activities.

Consider handing out a questionnaire, checklist or quiz on the visit.

Ensure transport is available to return participants to their starting location at the end of the day.



Appendix H: Calibration

There are many different methods for calibrating spray equipment. Provided here are two easy methods designed for knapsacks sprayers, but the principles are the same for larger sprayers and the methods can be adapted accordingly.

Method 1

Recommended materials*

- Sprayer
- Paper/pencil
- Bucket
- Measuring jug or measuring cylinder
- Stopwatch or other timer
- Tape measure
- Calculator

*Note – you may adapt other materials as alternatives to the above if necessary

Reminders

- Calibration is individual for every operator
- Walk at a natural speed
- Check the sprayer for leaks first
- Use clean water for calibration
- Start with the current spray settings – you need to determine the current flow rate and your forward speed so that you can calculate the current water volume of the sprayer and then compare that to the water volume needed for the CPP being sprayed and make the necessary adjustments to the sprayer
- When doing the calculations, take care with the units and make necessary conversions as explained below

Instructions

1. Measure the forward speed. Using the stopwatch or other timer, measure the time taken to walk (or drive) 100m using the same speed and style as you would use if spraying. (note: 100m is the distance usually used for mechanical sprayers. For knapsacks, a shorter distance can be used but be sure to adjust the formula below accordingly.)

2. Convert this time to walk 100m in seconds to km/h by multiplying by a factor of 3.6 (Note - 1m = 0.001km, 1 hour = 60 x 60 seconds therefore 1m/s = 0.001 x 3600 = 3.6km/h)

   Formula 1:

   $$\frac{\text{Distance in meters} \times 3.6}{\text{Time in seconds}} = \text{time in km/h}$$

   Example:

   $$\frac{100\text{m} \times 3.6}{100\text{ sec}} = 3.6\text{ km/h}$$

3. Measure swath width using the desired nozzle height (e.g. 0.5m)
4. Measure current flow rate of the sprayer. Using the stopwatch or timer, operate the sprayer for 1 minute while collecting the output water in a bucket or other vessel. Measure the collected water with a measuring jug and note the volume in liters, to give flow rate in L/min. Note this figure.

Please see these additional websites for other methods:
http://www.ecpa.eu/page/application
http://www.teejet.com/english/home/calculator/calibration-calculator.aspx
https://www.greencast.co.uk/media/250382/art%20of%20application%20sprayer%20tu%20uk%20jan%202011%20lr%20-%20final.pdf
http://www.hardi-international.com/global/service-support/spraying-technique#
http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0007/186379/boom-sprayers.pdf
http://www.agf.gov.bc.ca/pesticides/boom_calib.pdf

5. To calculate the current spray volume, combine current flow rate, number of nozzles, swath width and forward speed in the following formula:

Formula 2:

$$\frac{\text{Flow rate (L/min)} \times \text{no. of nozzles} \times 600}{\text{swath width (m)} \times \text{forward speed (km/h)}} = \text{X L/ha}$$

(Note – 600 is the conversion factor to L/hectare)

Example:
If flow rate = 1.2 L/min,
no. of nozzles = 1, swath width = 1m
and forward speed = 3.6 km/h,

$$\frac{1.2 \times 1 \times 600}{1 \times 3.6} = 200 \text{ L/ha}$$

6. Compare this current water volume to the needed water volume for the job.
7. To calculate the correct flow rate for the CPP to be applied (check label for spray volume), use this formula:

Formula 3:

$$\frac{\text{speed (km/h) x swath width (m) x desired spray volume (L/ha)}}{600 \times \text{no. of nozzles}} = \text{flow rate L/min}$$

Example:
If forward speed = 3.6 km/h,
swath width = 1m, desired spray volume = 400 L/ha and no. of nozzles = 1

$$\frac{3.6 \times 1 \times 400}{600 \times 1} = 2.4 \text{ L/min}$$

If your flow rate was found to be 1.2 L/min (Step 7), then in this example the flow rate of the sprayer needs to be increased (doubled) to give the needed flow rate.

8. It is then necessary to adjust the various parameters of the sprayer in order to give the correct flow rate and hence the correct spray volume per hectare. Make the desired adjustments and then test the flow rate again. Keep making adjustments and checking until the flow rate is correct.

How to make appropriate adjustments to equipment:

To increase flow rate and spray volume:	To decrease flow rate and spray volume:
Larger nozzle	Smaller nozzle
Higher pressure	Lower pressure
Slower forward speed	Faster forward speed
Narrower swath width	Wider swath width

9. To calculate the amount of CPP to add per tank for the desired water volume and rate, use the following formula:

Example:
If CPP label rate is 400 mL/ha, with water volume of 200L/ha, tank capacity = 20L and has already been calibrated to give 200L/ha water volume as above, then

$$\frac{\text{sprayer output (L/ha)}}{\text{tank size (L)}} = \text{no. of tanks/ha} = \frac{200}{20} = 10 \text{ tanks/ha}$$

(remember each tank will apply 20L)

$$\frac{\text{CPP rate mL/ha}}{\text{Tanks/ha}} = \frac{\text{CPP rate mL}}{\text{tank}} = \frac{400}{10} = 40\text{mL/tank}$$

Remember that making any more changes after calibrating, such as height of the nozzle above the ground, forward speed, pressure, or using a worn nozzle, will alter the actual rate and lead to errors in the application of the CPP being applied.

Method 2

Easy calibration method for knapsack sprayers (from Evan Thornhill's Do-It-Yourself Calibrator for Knapsack Sprayers, IPARC).

Below are the instructions for making a simple home-made calibrator to determine the water volume rate of your sprayer, and then the calculations required to work out the amount of CPP to add to your spray tank.

You will need:

- Empty tin can, 400mL size (or 400g), or you can use a measuring jug
- Clear drinking straw (or dry stick)
- Pencil or felt-tip pen
- Strong plastic (polythene) bag (500mL to 1000mL capacity)
- Elastic band or string
- Tape measure
- Water

Tin can:

Ensure the tin can is clean and its capacity is 400mL or up to 430 grams (see can label). Or use a measuring jug with graduations up to at least 400mL.

Drinking straw:

Take the straw and place it upright in the vertical tin and mark the straw with a pencil/ felt pen where the top of the can reaches. Then also mark the straw at three-quarters of the way up the can, halfway up the can and at one-quarter depth. You can also use a dry stick though a straw is better. (You can do this by adding 100mL of water to the can then marking the straw, then add water up to 200 mL and mark the straw, then up to 300 mL and mark the straw. Tip out this water.)

Prepare sprayer:

Check the sprayer is clean, works correctly without leaks, is fitted with the nozzle you intend to use, contains clean water and will spray the correct pattern at the intended pressure.

Polythene bag (strong plastic):

Attach the polythene bag securely over the sprayer nozzle to trap all liquid that is sprayed. Use a strong elastic band or string to hold it in place.

To calculate water volume rate:

Measure out an area on the ground of 10 square meters ($10m^2$):

- If your nozzle has a 0.5m swath (ie, will spray a swath 0.5m wide), then measure in a straight line with the tape measure and make a mark 20m away)
- If your nozzle has a 1m swath then mark out 10m distance with the tape measure

This will give you an area to be sprayed of $10m^2$.

Spray 10 m^2:

Now spray over the distance you have marked at the walking speed and in the manner that you would normally use when spraying, collecting all the sprayed water for that time in the polythene bag.

Measure volume sprayed out:

Carefully remove the plastic bag and pour the water collected in the plastic bag into the tin. Take the straw and hold it upright in the collected water. Place your finger over the top of the straw and remove the straw from the water. Note height of water in straw against the marks you made. Or pour the collected water from the plastic bag into the measuring jug.

Read the calibrated water volume rate: if the can (and straw) is

- One quarter filled then you have sprayed a little over 100 liters/hectare
- Half-filled then you have sprayed at 200 liters/hectare
- Three-quarters full then you have sprayed at 300 liters/hectare
- Full then you have sprayed at 400 liters/hectare

To calculate the calibrated water volume rate:

Remember that 1 liter = 1000mL and that 1 hectare = 10,000m^2

Calibrated water volume rate in liters per hectare = [(can capacity (mL) x fraction can is filled) x (10,000m^2 /area sprayed)]/1000

So if the can is one quarter full then -
400 mL x ¼ = 100mL has been sprayed over 10m^2
10,000m^2/10m^2 = 1000.
A hectare contains 1000 lots of 10m^2.
So if you were to spray one hectare you would use 1000 x 100mL = 100,000mL of water,
or to express as liters, 100,000mL/1000 = 100L/hectare

Now calculate the correct amount of concentrated CPP to be added to the tank*

$$\text{Quantity of CPP per tank} = \frac{\text{CPP rate mL/ha x tank size (L)}}{\text{calibrated water volume (L/ha)}}$$

Remember to read the label for the correct application rate

Example 1:
If the CPP application rate is 1L/hectare, ie 1000mL/hectare
Your calibrated sprayer water volume rate is 200 liters/hectare
Your sprayer tank has a capacity of 20 liters,
Then the quantity of concentrated CPP per tank in mL =

$$\frac{1000\text{mL} \times 20\text{L}}{200\text{L/ha}} = \frac{20{,}000}{200} = 100\text{mL}$$

Example 2:

- If the CPP application rate is 150mL/hectare
- Your calibrated sprayer water volume rate is 300 liters/hectare
- Your tank has a capacity of 15 liters,
- Then the quantity of concentrated CPP per tank in mL =

$$\frac{150\text{mL} \times 15\text{L}}{300\text{L/ha}} = 7.5\text{mL}$$

*Or use calibration dosage wheel for this final calculation.

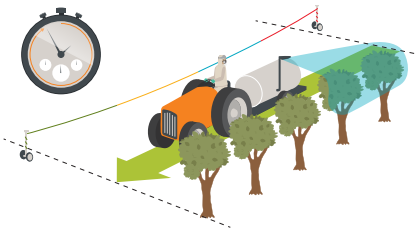
Note that your sprayer water volume remains the same as long as you spray in the same manner each time with the same nozzle, but the rate of CPP to add to the tank will vary depending on CPP used and the pest and crop. Always read the label to find the correct CPP rate/hectare and then do the calculation for your calibrated water volume.

Method 3 – calibration of mist blowers

1. Forward speed

1. Measure out 100m of similar land to be sprayed
2. Measure time in seconds to travel 100m (record gear and rpm)
3. Record time
4. Carry out three times (use average time)

$$\text{Speed (km/h)} = \frac{\text{Distance (m)}}{\text{Time (s)}} \times 3.6 = ??? \text{ km/h}$$



2. Required flow rate check

1. Slip the hoses over the nozzles (secure with O rings if necessary).
2. Collect water for 1 minute from each nozzle (at the engine rpm noted for the test plot).
3. Compare the quantity obtained with the quantity calculated.
4. If the individual values are too high or too low, adjust the pressure.

$$\frac{\text{Speed (km/h) X row width (m) X spray volume (1/ha)}}{\text{600 X number of nozzles}} = \text{1/min}$$

Example:

$$\frac{\text{5.5 km/h X 4.0 m X 300 1/ha}}{\text{600 X 12}} = \text{0.92 1/min}$$

Flow from each nozzle

Calibration

Slip on hoses

Slip on hoses and secure with O ring

If nozzles differ from each other by more than +/- 5%, check:	
Nozzle blocked	Clean
Filter blocked	Clean
Worn out nozzle	Replace
Wrong nozzle	Replace
Wrong anti-drip valve	Replace

3. Calibration formulas:

$$\frac{\text{Flow rate (p.n.) } \mathbf{0.921/min} \times \text{Nozzles } \mathbf{12} \times \text{Factor } \mathbf{600}}{\mathbf{4.0\ m}\ \text{Row width} \times \mathbf{5.5\ km/h}\ \text{Speed}} = \text{Spray volume } \underline{\mathbf{300\ 1/ha}}$$

Appendix I: Examples of record forms

Record form for CPP use

Operator's name:	
Date:	
Job Reference:	
Site treated:	
Field/farm name/map reference:	
Crop/cultivar/variety:	
Crop growth stage/condition:	
Reason for treatment/pest/weed/disease:	
Nozzle type, size, pressure:	
Water volume:	
Spraying speed:	
CPP used: trade name	
Active ingredient:	
Rate used: (g/ha, L/ha)	
Weather conditions/temperature/wind:	
Soil conditions:	
Start time:	
Finish time:	
Total hours worked:	
Warning signs displayed/removed:	
Neighbors notified/beekeepers informed:	
Re-entry period:	
PHI:	
Crop assurance scheme/global GAP:	
Any issues/comments:	

Knapsack sprayer checklist

Operator's name:	
Date:	
Sprayer type/number:	
Sprayer condition: Is it clean? No apparent damage? Straps and fixing points secure?	 ☐ ☐ ☐
When filled with water: Will straps hold weight of full sprayer? Is sprayer stable when filled?	 ☐ ☐
Check for leaks: Any leaks found when upright?	 ☐
Function check: Check pressure release valve to max. limit Spray out – does cut-off valve work? Is spray pattern correct? Is nozzle undamaged? Is nozzle flow rate within 5% of manufacturer's stated output?	 ☐ ☐ ☐ ☐ ☐
Internal residue: Spray out until fan collapse and air appears Is remaining liquid less than one cupful?	 ☐ ☐
Following use with CPP: Rinsed using water and detergent? Triple rinse with water? Clean nozzles and filters with water and soft brush Clean outside of tank and straps Follow waste disposal method for rinsings	 ☐ ☐ ☐ ☐ ☐

Calibration record form

Date:	
Operator:	
Type or number of sprayer:	
Sprayer tank size:	
Field/farm name/map reference:	
Nozzle type and number:	
Sprayer pressure:	
Time taken to walk 100m:	
Nozzle height (cm):	
Swath width (m):	
Sprayer output (collected water volume):	
Spray volume (liters per hectare):	
Flow rate (L/min):	
No. of tanks per hectare:	
Calculated CPP amount per tank:	

Incident reporting form

Location:	**Date:**
Reported by:	**Reviewed by:**
What happened:	
Injury or health effect and who was involved:	
State actions taken:	
Suggestions to ensure incident does not happen again or changes implemented:	

Appendix J: Jar test for physical compatibility testing of CPPs for potential spray tank mixing

Check first if the mixing of products is permitted in your country, as in some countries it is illegal to mix different CPPs in the spray mix.

1. Use a clean jar with tightly fitting lid
2. Add clean water to fill to 80% capacity of the jar
3. Add the first CPP to the jar (follow order below)
4. Replace lid
5. Invert jar 5 times to mix
6. Add further CPPs following mixing order, inverting 5 times between each addition
7. Add remaining water and replace lid
8. Invert jar another 5 times
9. Examine jar contents for signs of incompatibility (see below)
10. Let jar stand for one hour
11. Re-examine contents for signs of incompatibility
12. Place mesh over opening and strain contents through mesh into another container (avoid contact – wear impermeable gloves)
13. Examine mesh for signs of incompatibility

Signs of incompatibility in the mix:

- Settling
- Separation of liquids
- Solid residues
- Heat
- Gelling
- Lumps

If settling, solid residues or separation of liquids occurs, rotate jar 20 times, if mixing is then satisfactory the mix may be used but maintain thorough agitation at all times. If products are not mixed satisfactorily, they are incompatible so DO NOT TANK MIX.

If solid residues, lumps or gel remains on mesh after straining (step 12) then products are physically incompatible so DO NOT TANK MIX.

If heat is generated (jar feels warm), products are physically incompatible – DO NOT TANK MIX. Dispose of test mix according to local legislation.

Order of mixing (if compatible):

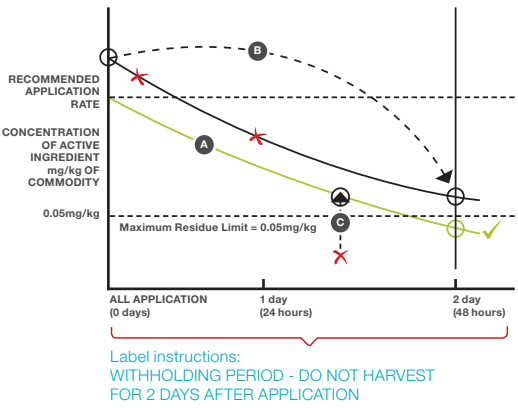
- 60 – 80% of water
- Water conditioners/acidifiers
- Solid formulations - WG, WP, WDG, SC, SE, EW, EC wetter if using ECs, EC, SL
- Adjuvant
- Remaining water

Appendix K: Crop residues, PHIs and MRLs

To ensure safety to consumers following the use of CPPs and seed treatment products in food crops, it is essential to understand the levels of the active ingredient that may be remaining within the food commodity at harvest.

The residue profile is tested as part of the safety testing of the CPP during the development stage. Field residue trials are conducted to determine the level of AI and significant metabolites at various points in time after application of the CPP, and at normal harvest time. Maximum Residue Levels (MRLs) are set by regulators for each AI in the crops for which they are registered.

FIGURE 1
The importance of label instructions in avoiding MRL breaches



MRLs are used domestically, by grower groups, food retailers and importing countries as an assurance that compliance with the label directions for the relevant CPP and with Good Agricultural Practice have been followed by the grower. They are also important to protect consumer health from high residues in food. The use of the correct application rate and adherence to PHIs are therefore critically important.

To ensure that residues of the AI have fallen to below the relevant MRL at harvest, most CPPs have a PHI (Pre-harvest Interval) (sometimes called Withholding Period, WHP). PHIs should be stated on the product label. Adhering to the PHI is critical to ensure that residues of the applied active ingredient (and metabolites if relevant) have degraded to below the relevant MRL for that crop at harvest. See diagram below:

✓ **A** By adhering to recommended label rates and pre-harvest intervals growers can ensure their produce/commodity will be below the relevant domestic Maximum Residue Limit*

✗ **B** Applying products at greater than the recommended label rate is illegal and can result in the MRL being exceeded at the time of harvest (even if the PHI is followed).

✗ **C** Harvesting produce prior to the pre-harvest period passing can result in the MRL being exceeded.

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Important: Use Crop Protection Products safely. Always read the label and product information before use. The document does not replace the product label and local rules and regulations take precedence over any recommendation made in this document.