

Applying Pesticides – workbook

Name _____ Date _____



Contents and learning outcomes

Pesticide Application/Treatment

Learning Outcomes

Chemicals

Outcome	Completed
Understand appropriate use of PPE	
Understand the appropriate law related to applying pesticide chemicals	
Understand how to use, store, and transport chemicals according to the manufacturer's recommendations	
Know that chemicals should only be used by certified personnel	
Observe instructions provided on manufacturers label and COSHH assessments	
Know the use of and meaning of appropriate warning notices	
Demonstrate ability to calibrate equipment and chemicals in line with training and manufacturer instructions	
Observe appropriate hygiene and safety requirements	
Ensure weather and ground conditions are suitable for spraying chemicals and stop immediately if conditions change	
Ensure that empty containers are disposed of appropriately i.e., that they are triple rinsed the recycled as per manufacturer's instructions	

Rough terrain, undercut edges and soft ground

Outcome	Completed
Ensure to wear steel toe capped footwear with good grips on the soles	

Manual handling

Outcome	Completed
Understand that you must reduce the volume of liquid in the sprayer to reduce the load where necessary	
Ensure knapsack sprayer straps are adjusted to ensure the correct position while carrying	
Know that you must always apply safe lifting techniques	
Ensure that you assess the load and the environment prior to lifting	

This material may support learners who are working towards certification in Pesticide Application or as a unit as part of certification in Agriculture.

<https://www.sqa.org.uk/files/nq/H28711.pdf>

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Chemicals (LO1: Understand appropriate use of PPE)

INTRODUCTORY VIDEO

Training Video (Safe use of Pesticides) - YouTube

<https://www.youtube.com/watch?v=3yPD-w6Ubhk>

LO1: Understand appropriate use of PPE

Gloves

Always wear unlined, elbow-length chemical-resistant gloves when handling all pesticides. The elbow-length protect your wrists and prevent pesticides from running down your sleeves and into your gloves.

- Glove materials include:
- Natural rubber (latex) – only effective for dry formulations
- Nitrile – good protection for both dry and liquid pesticides
- Butyl – good protection for both dry and liquid pesticides
- Neoprene – good protection for both dry and liquid pesticides
- Polyethylene
- Polyvinylchloride (PVC)



Never use leather or cotton gloves – they can be even more hazardous than no protection at all because they absorb and hold the pesticide close to your skin for long periods of time.

Body Covering

Regular work clothes of long trousers and a long-sleeved shirt, shoes and socks are acceptable for slightly toxic and relatively non-toxic pesticides. Launder and store separately from all other clothing.

To apply moderately toxic or highly toxic chemicals, wear a clean, dry protective suit that covers your entire body from wrists to ankles. Protective suits are either one or two-piece suits such as overalls and should be worn over regular work clothes.



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Chemicals (LO1: Understand appropriate use of PPE)

Apron

Wear a chemical-resistant apron when repairing or cleaning spray equipment and when mixing or loading. Aprons offer good protection against spills and splashes of liquid formulations, but they are also useful when handling dry formulations such as wettable powders. Nitrile, butyl, and neoprene offer the best protection.

Boots

Wear unlined chemical-resistant boots which cover your ankles when handling or applying moderately or highly toxic pesticides.

Nitrile and butyl boots appear to give the best protection. Do not use leather boots.

Wash your boots after each use and dry thoroughly inside and out to remove all pesticide residue.



Goggles or Face Shield

Wear shielded safety glasses; a full-face respirator; snug-fitting, non-fogging goggles; or a full-face shield whenever the chemical could possibly contact your eyes.

Always wear goggles or full-face shield respirator when you are pouring or mixing concentrates or working in a highly toxic spray or dust.



ACTIVITY

Q1: What are the 3 best types of gloves to use when working with both dry and liquid pesticide formulations?

Q2: True or False: You can re-wear a protective suit without washing it?

Q3: Why should you NOT wear either leather gloves or boots?

Q4: When should you ALWAYS wear goggles or a full-face shield?

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Chemicals (LO2: Understand appropriate law related to applying pesticide chemicals)

LO2: Understand the appropriate law related to applying pesticide chemicals

Pesticides are strictly controlled by law. To gain the Certificates of Competence, it is necessary to know how to use pesticides safely under up-to-date regulations.

Statutory powers to control pesticides are contained within Part III of Food and Environment Protection Act (FEPA). Section 16 of the Act describes the aims of the controls as being to:

- To protect the health of human beings, creatures, and plants
- Safeguard the environment
- Secure safe, efficient, and humane methods of controlling pests
- Make information about pesticides available to the public

The Control of Pesticides Regulations 1986

The mechanism by which these aims are achieved in Great Britain is set out in regulations made under the Act. The Control of Pesticides Regulations (COPR) 1986 (SI 1986/1510):

- define in detail those types of pesticides which are subject to control and those which are excluded
- prescribe the approvals required before any pesticide may be sold, stored, supplied, used, or advertised
- allow for general conditions on sale, supply, storage, advertisement, and use, including aerial application of pesticides.

The 1986 Regulations were updated by the COPR (Amendment) Regulations 1997 (SI 1997/188) and several other pieces of legislation.

Similar legislation applies in Northern Ireland: Control of Pesticides Regulations (Northern Ireland) 1987 (SI 1987/414, as amended).

COPR has largely been overtaken by legislation derived from the EU regulating plant protection products (pesticides to protect plants/crops), and only survives to regulate a few commodity substances and products generated in situ, which fall outside the scope of the more recent legislation.

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Chemicals (LO2: Understand appropriate law related to applying pesticide chemicals)

ACTIVITY

Q1: These abbreviations can be found in the legislation. Use the internet to find the meanings of these terms and write them down:

1. COPR
2. PPPR
3. COSHH
4. PPE
5. RPE
6. NPTC
7. MEL
8. OES

Q2: Which sentence best sums up the meaning of this regulation? Select your answer.

COPR requires:

“Anyone who uses pesticides in the course of business or employment to have received adequate instruction and guidance in the safe, efficient and humane use of pesticides and to be competent for the duties they are called on to perform.”

1. Anyone who has to use pesticides must make sure they do it properly and humanely.
2. Everyone who uses pesticides must be trained and assessed to prove they know how to use them properly.
3. If you use pesticides for your business, you can give others guidance about how to use them safely.

Q3: Put this sentence into your own words:

“Any person who uses a pesticide shall confine the application of that pesticide to the land, crop, structure. Material or other area intended to be treated.”

Q4: Listen to part of the FEPA and use the words in the box to fill in the gaps.

Part III of FEPA _____ to:

- a. Any pesticide; or
- b. _____ substance, preparation or organism _____ or used for any of the following purposes as _____ it were a pesticide:
 - _____ plants or wood or _____ plant products from harmful _____;
 - Regulating the growth of _____;
 - Giving protection against harmful _____.

creatures any
applies organisms
protecting plants
if prepared other

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Chemicals (LO3: Understand how to use, store, and transport chemicals according to the manufacturer's recommendations)

LO3: Understand how to use, store, and transport chemicals according to the manufacturer's recommendations

INTRODUCTORY VIDEO

Pesticide Safety on the Farm - Handling Pesticides English - YouTube

<https://www.youtube.com/watch?v=cIW0qbE0p1M>

Handling pesticide containers

Read the product label before opening any pesticide container. Make sure that you follow the precautions shown on the product label and work in line with any instructions given on the label or in the relevant notices of approval.

Even when the product label does not say you need to wear PPE, it is good practice for you to wear basic PPE (such as overalls, suitable protective gloves, and boots) at all times when handling pesticides or their containers.

All pesticides should be handled in a well-ventilated area to avoid any possible build-up of vapours. Avoid sparks and naked flames as some pesticides may present a fire risk. These products will be labelled with the appropriate hazard symbol and risk phrase.

Take care when moving pesticide containers in and out of the store and never leave pesticide containers unattended unless they are in a secure store.

Transporting pesticides

You will have to make sure that you follow guidance on how to transport pesticides safely and meet the appropriate laws.

One of the most important laws that govern the transport of pesticides is COSHH – the Control of Substances Hazardous to Health Regulations 2002. COSHH requires agricultural employers to assess and control the dangers of pesticides by working towards 3 goals:

1. The elimination of exposure to pesticides
2. The control of such exposure
3. Monitoring the health of all workers who use pesticides

Agricultural pesticides or plant-protection products (but not sulphuric acid) do not have to meet some of these legal conditions as long as they:

- Have been approved under the Control of Pesticides Regulations 1986 (as amended) or under the Plant Protection Products Regulations 2005.

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Chemicals (LO3: Understand how to use, store, and transport chemicals according to the manufacturer's recommendations)

- Are transported in or on an agricultural vehicle or any associated trailer.
- Are diluted ready for use, or supplied in a ready-to-use form; and
- Are being carried from one piece of agricultural land to another within a 50-kilometer radius
- General precautions when transporting pesticides

Drivers or tractors, vehicles which tow trailers and crop-protection equipment will need to check that coupling pins and other fastening devices are secure before moving off. Anyone involved in transporting pesticides must be aware of emergency procedures.

To protect water from risks of pesticide pollution, avoid going through water at all times.

If a pesticide is transported in equipment used to apply it, make sure that there are no leaks or spills. Maintain hoses, nozzles, and other fittings in line with the manufacturer's instructions.

Take care not to overfill equipment as this may cause the contents to spill during transport, especially over rough ground.

Transporting pesticides inside a vehicle

Keep pesticide containers inside vehicles separate from the driver and any passengers by a chemical and vapour-proof barrier.

To prevent containers being damaged, do not carry them in tractor cabs, toolboxes or in other ways which might lead to them being crushed or punctured.

Loading and unloading pesticides

Take care to prevent damage to pesticide containers and associated equipment when loading or unloading trailers or vehicles. Ensure to check:

- The containers are stacked as recommended by the manufacturer
- The trailer needs to have side boards fitted
- The containers can move about (if so, consider restraining them or putting them in any storage facilities fitted to the vehicle)
- The packaging and label need to be protected from the weather (for example, if they are made of cardboard or paper); and
- Machinery is needed or recommended for handling any of the containers (the product label may advise you to use machinery for containers that hold more than 20 litres or weigh more than 25 kilograms)

Further action

After use, thoroughly clean equipment which pesticides have been moved or transported in (including contaminated vehicles) and dispose of the washings in a safe and legal way.

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Chemicals (LO3: Understand how to use, store, and transport chemicals according to the manufacturer's recommendations)

ACTIVITY

Q1 – What are the 3 main goals of COSHH for employers and workers?

Q2 – Do ready-to-use pesticides have to meet the legal requirements of COSHH?

Q3 – What can you use to make sure that any plant protection equipment is secure in a transport vehicle?

Q4 – List 3 things you must check when unloading containers/equipment from a vehicle?

Q5 – True or False: You must always clean out vehicle after transporting pesticide containers/equipment?

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Filling Equipment

Where should you fill the equipment used to apply pesticides?

You should carry out all mixing, filling, or loading well away from watercourses, ditches, and drains. In many forestry areas, where work is carried out at several separate locations, it will be necessary to mix and load pesticides at the site.

Dos and Don'ts when filling equipment

Do:	Don't:
Use a drip tray to catch any spills and return them to the equipment	Use any filling area where the surface is difficult to clean
Use the foil cutter supplied with the container to remove secondary seals on containers	Use your fingers to break the seal on a container
Re-seal partly used containers	Open more than one container at a time
Pay close attention to the level of the tank contents when filling	Leave the sprayer unattended while filling or allow the tank to overflow
Use the appropriate size of pesticide container to reduce the need for measuring or weighing	Transfer pesticides between containers, measuring equipment and equipment unless you have to
Use pesticides in water-soluble packaging where appropriate	Try to open water-soluble bags
Measure out pesticides using suitable equipment	Use measuring and dispensing equipment which is used for products other than pesticides
Use machinery for handling containers if the product label advises this	Try to shake large containers before use
Avoid foaming by using appropriate induction, stirring, or recirculating systems, and fixing any leaks in the suction system.	Cause foaming by sucking air into the induction system, shaking or stirring the product too much, or adding products likely to foam too early when filling the sprayer
Make sure valves are correctly re-set after using an induction bowl or other filling device	Let the tank contents flow out through the induction bowl or other filling device if the pump is turned off
Follow all label instructions	Begin any procedure without reading label instructions
Measure out powder and fine granules in sheltered conditions	Let the fine particles blow away

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Chemicals (LO3: Understand how to use, store, and transport chemicals according to the manufacturer's recommendations)

When mixing and loading pesticides, it is illegal (and may be unsafe) to:

1. Mix 2 or more pesticides which are anticholinesterase compounds, unless the mixture is allowed under the approved conditions or use
2. Use a pesticide with an adjuvant (a substance that makes the pesticide more effective) unless the adjuvant appears on the authorised list

If a product label does not give guidance on the appropriate order of adding products to the spray solution when tank mixing, you should add different types of product (as shown on the labels) in the following order:

1. first add water-soluble bags; then
2. water-dispersible granules (or soluble granules); then
3. wettable powders (or soluble powders); then
4. suspension concentrates; then
5. emulsifiable concentrates (or oil in water emulsions); and finally
6. adjuvants

ACTIVITY

Q1 – Complete this task using the materials supplied. Order the statements under the correct headings off either 'Do's' or 'Don'ts' when filling equipment.

Q2 – Describe what actions are illegal to do when mixing and loading pesticides.

Q3 – Match the correct number with the correct statement to complete the order you should mix products if there are no instructions on the label.

Wettable powders	1
Add water-soluble bags	2
Adjuvants	3
Suspension concentrates	4
Water-dispersible granules	5
Emulsifiable concentrates	6

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Methods of applying pesticide

You must use pesticides in line with the conditions of the product approval as stated on the label. For approved uses not specified on the label you must also follow the conditions given on the relevant notice of approval. Unless these documents place a legal obligation on you to use, or not to use, a specific type of equipment to apply the pesticide, you may apply the product using methods other than those recommended as long as:

- the equipment you have chosen is suitable for the intended method of applying the pesticide.
- the COSHH assessment, where appropriate, has shown that the proposed method does not involve an increased risk to health or safety compared to the normal method.
- you have assessed the environmental effects of your intended method of applying the pesticide and your assessment shows there is no increased risk to wildlife or the environment; and
- the necessary control measures are in place to reduce, as far as is reasonably possible, the risks to people, wildlife, and the environment.

How you should apply the pesticide to the area to be treated

Before you begin to apply the pesticide, you should consider the order in which you are going to treat the area. You should make sure that you:

- do not have to walk, drive or travel through the newly treated crop or area so that you do not contaminate yourself or your equipment; and
- leave an untreated or under-dosed area for cleaning the equipment and disposing of sprayer washings.

By treating turning areas and access routes to the treated area last, you will help to make sure that:

- you do not contaminate your equipment by travelling through newly treated areas or carrying contaminated soil out of the treated area; and
- you and other people can leave and re-enter the area being treated without being contaminated if machinery breaks down, or there is an emergency or other incident which interrupts the work.

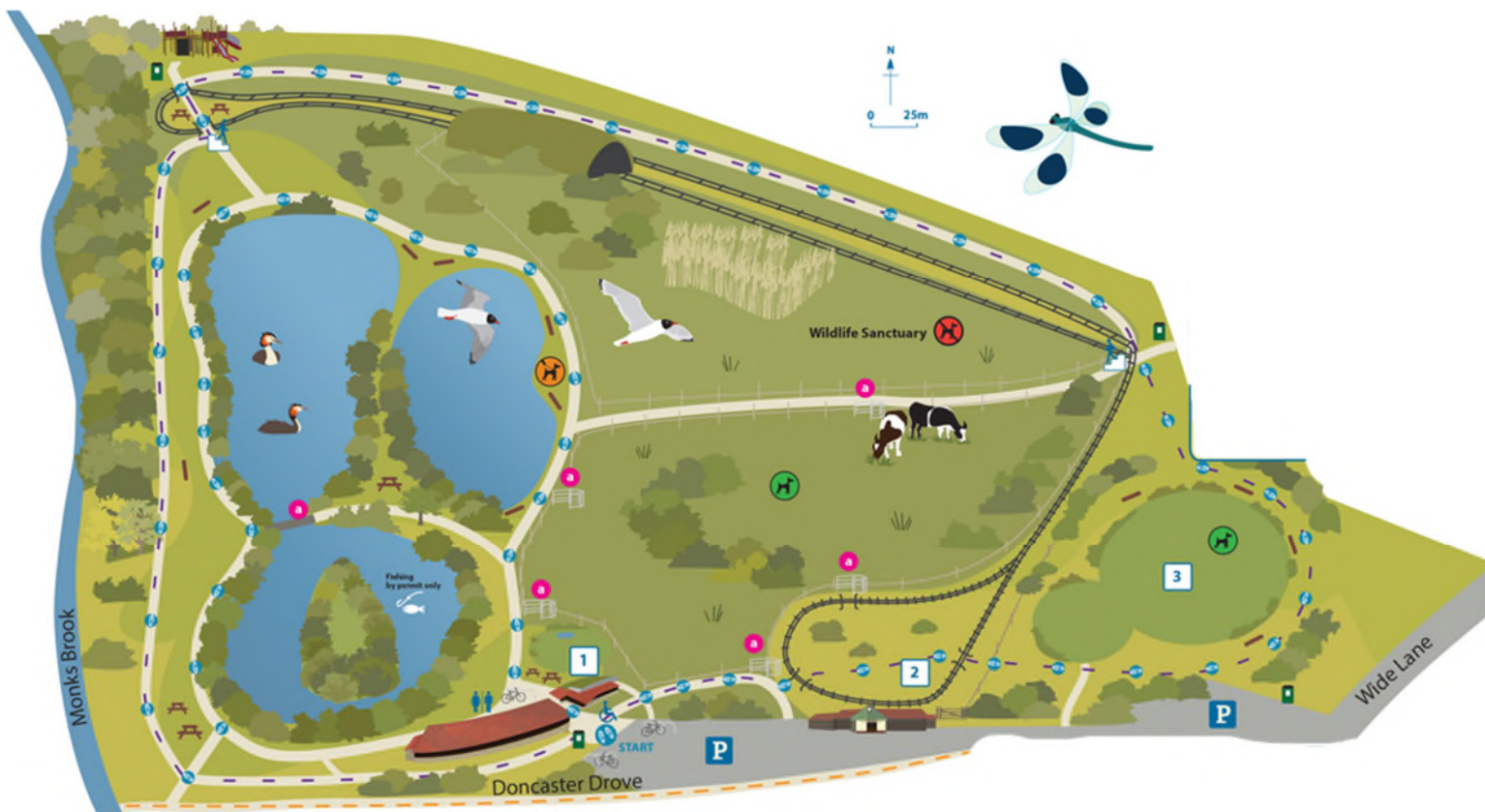
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ACTIVITY

1. Using the image below identify the areas where you would not use pesticides or you would need be careful when treating.



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Chemicals (LO3: Understand how to use, store, and transport chemicals according to the manufacturer's recommendations)

Ground-based reduced-volume spraying

'Reduced-volume spraying' is where the concentrate being sprayed is diluted with a lower volume of water than the minimum volume recommended on the label for that dose. This guidance **does not** apply to:

- application as fogs and mists.
- use as a concentrated solution through weed wipers.
- approved use of pesticides at low volumes through rotary atomisers, or similar equipment; or
- applying a pesticide concentrate (for example, for some products approved for chemical thinning in forestry).

The application methods listed above should **only** be used when recommended on the product label.

You should not use reduced volume spraying if the label (or the relevant notice of approval):

- bans reduced-volume spraying (for example, if there is a maximum in-use concentration or minimum application volume); or
- states that PPE must be worn when the product is at the dilution ready for use; or
- has 'corrosive', 'very toxic', 'toxic', or 'risk of serious damage to eyes' on the product label.

In all other cases you may choose to apply a pesticide as a reduced-volume spray as long as:

- the concentration of the 'reduced-volume' spray is no greater than 10 times the maximum concentration recommended on the label.
- you meet all the conditions of the product approval, including the maximum individual dose of the product.
- you fully understand how to use the spraying equipment and know exactly how to control the spray.
- you use a spray quality no finer than 'fine' for ground-based vehicle mounted or trailed sprayers and no finer than 'medium' for equipment that is hand controlled.
- you have assessed the risk to human beings (made a COSHH assessment, where appropriate) and the risk to other creatures, plants and the environment (based, where appropriate, on advice from a competent adviser), and made sure that the necessary controls are in place.

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Chemicals (LO3: Understand how to use, store, and transport chemicals according to the manufacturer's recommendations)

ACTIVITY

1. What is meant by 'ground-based reduced-volume' spraying?
2. Why would you not use reduced-volume spraying?
3. You may choose to apply a pesticide as a reduced-volume spray. Complete the following statements:
 - i. The concentration of the 'reduced volume' spray is no greater than _____ recommended on the label.
 - ii. You _____ how to use the spraying equipment and know exactly how to _____ the spray.
 - iii. You use a spray quality _____ for ground-based vehicle-mounted or trailed sprayers and no finer than _____ for equipment that is hand controlled.

Fogs, mists, and smokes in enclosed spaces

These are treatments normally used in enclosed spaces or indoors, where any possible drift is contained. Fogs (like smokes) use finer particles than mists, and so these stay in the air for considerably longer. If you are not sure whether the equipment you are planning to use is suitable for the relevant method, get advice from the supplier.

You might use directed sprayers (manually operated by a person) or fixed-position sprayers (can operate without direct human supervision).

Directed Sprayers:

High-Volume Hydraulic Sprayer (common sprayer and can be used to apply many pesticide formulations and can be used for spot treatments)



Cold Fogger (uses high air pressure to spray out the fogging liquid as fine droplets and can be used with water or oil-based formulations).



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Chemicals (LO3: Understand how to use, store, and transport chemicals according to the manufacturer's recommendations)

Hand-held and backpack sprayers (use compressed air to deliver the spray and the tank must be pumped frequently to maintain pressure).



Fixed-position Sprayers:

Thermal Pulse-Jet-Fogger (can be used with pesticides that vaporise with heat. atures using either gas (usually propane) or electricity. A liquid fogging solution is pumped into the heat barrel where it is vaporized. This produces a thick fog which is easily visible so fog can be adjusted to the target and there is less risk that people will be inadvertently exposed)



Air-assisted Electrostatic Sprayers – (create a positive electrical charge on the spray droplet as it leaves the nozzle)



ACTIVITY

1. True or False: Fogs, mists, and smokes are treatments normally used in enclosed spaces or indoors?
2. Fogs use finer particles and does this mean they stay in air for longer or less (than other pesticides)?
3. You might use directed sprayers (manually operated by a person) or fixed-position sprayers (can operate without direct human supervision). Put the following equipment under the correct label of either **directed sprayer** or **fixed-position sprayer**.
 - i. Thermal-Pulse Jet fogger
 - ii. High Volume Hydraulic sprayer
 - iii. Hand-held and backpack sprayers
 - iv. Air-assisted electrostatic sprayers
 - v. Cold fogger

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Chemicals (LO3: Understand how to use, store, and transport chemicals according to the manufacturer's recommendations)

Fumigants

Fumigation is a very specialised task. Because of the nature of fumigants and the risks associated with using them, no-one should carry out fumigation work until they have received proper training. Any fumigation has to be properly planned to prevent the fumigant spreading beyond the area to be treated.

Dusts, granules, pellets, and baits

When using pesticides in the form of a dust, apply them only in suitable conditions and take care to avoid breathing in dust or allowing your skin to become contaminated. Take similar precautions when handling and applying fine granules or granules that give rise to a dust which may be dangerous. You will need to take extra care when applying these products by hand (if allowed) or hand-held equipment.

Pesticides which some granules release as a vapour (especially in warm conditions) may also be dangerous, particularly in confined spaces. It is important to follow all instructions on product labels and make sure that you use appropriate equipment to apply the pesticide. Clear up and safely dispose of spilt granules or baits. If it is recommended, make sure that granules are incorporated into the soil, compost or so on correctly and within the time specified.

Seed treatments

If you are using mobile seed-treatment equipment you should make sure that the seed-treatment product is supplied in containers which are not too large to be carried, handled, and used safely.

Take care when you are cleaning seed-treatment or seed-drilling equipment. If possible, do not remove dry or dusty deposits using air lines and take care when brushing to prevent the dust being carried in the air.

Some seed treatments leave a dusty deposit on the seed and a residue in the seed container and drilling equipment. Be careful to avoid breathing in the dust or contaminating your skin, especially when handling treated seed, setting equipment and cleaning equipment after use. Dispose of seed bags, other contaminated material, and unused treated seed safely and take care to avoid contaminating people or the environment. Make sure that all the treated seeds you plant are completely covered with the appropriate depth of soil and, if you spill any treated seed, clear it up straight away.

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Chemicals (LO3: Understand how to use, store, and transport chemicals according to the manufacturer's recommendations)

Spray Drift

The effects of spray drift

By law, pesticides must only be applied to the land, crop, structure, material, or other area you are treating. Spray drifting off target is a common result of misusing pesticides and causes problems between pesticide users and their neighbours.

What causes spray drift?

A combination of factors may contribute to spray drift, including:

- the speed of the wind.
- the height of the spray nozzles, the design of the equipment and ground conditions.
- the spray quality (which will depend on the choice of nozzles and the spray pressure).
- the type of crop or other vegetation, if any.
- the speed of the vehicle the spray is being applied from.
- local atmospheric conditions.
- the condition of the equipment used to apply the pesticide; and
- the equipment settings.

Weather conditions

Do not apply pesticides in a way which may lead to drift. You should think about:

- if the wind direction and speed would cause the pesticide to drift away from the target; or
- there is a chance that air movement will carry spray droplets or vapour away from the target area.

After working with pesticides

A brief checklist of what you need to do when you have finished applying a pesticide:

✓	Clean the equipment you have used, inside and out, preferably before leaving the treatment area. Dispose of unused spray solution and sprayer washings safely and legally.
✓	After cleaning, store the sprayer (or other equipment) under cover.
✓	Return any unused pesticide concentrate to your pesticide store.
✓	Keep appropriate records.
✓	Remove warning notices when they are no longer needed.
✓	If you have given warnings to beekeepers, tell them that you have finished using the pesticide.
✓	Make sure that you: <ul style="list-style-type: none">• dispose of used PPE safely and legally (if it is not designed to be used again or is unfit for further use); or• where appropriate, clean re-usable PPE before you store it and dispose of washings safely and legally; and• report and faults with engineering controls or PPE.
✓	Let the appropriate manufacturers know (either directly or through the supplier) if you have found any product-related, packaging-related or equipment-related problems when mixing, loading or applying the product.

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Chemicals

(LO4: Observe instructions provided on manufacturers label and COSHH assessments)

LO4: Observe instructions provided on manufacturers label and COSHH assessments

The COSHH assessment

When do COSHH regulations apply?

Many pesticides are dangerous to health. In these regulations, the danger is explained in terms of the 'hazard' and the 'risk'. A substance is hazardous if it could harm people, plants and creatures not being treated, or the environment. The risk from a substance is the chance of it causing harm, given the way in which it is, or will be, used.

The COSHH regulations apply to a pesticide product if it:

- is classified as 'very toxic', 'toxic', 'harmful', 'irritant' or 'corrosive';
- includes a substance which has a 'workplace exposure limit' (WEL) under the COSHH regulations
- includes a micro-organism which may be a danger to health;
- includes dust which may be present in a 'substantial concentration' in the air (as explained in the Health and Safety Commission 'General approved code of practice on the COSHH Regulations', COP 29) when the pesticide is used; or
- includes any substance not mentioned above which creates a similar danger to health.

When is an assessment suitable and sufficient?

A COSHH assessment will be suitable and sufficient if you use a well-thought-out approach to identifying risks by:

- considering the dangers posed by the pesticide you intend to use;
- deciding who could be harmed and how;
- identifying what action you need to take to prevent or control exposure;
- recording the results of the assessment; and
- revising the assessment when necessary.

The level of detail needed in the COSHH assessment will depend on the activities you are carrying out and the level of risk involved in your work.

Finding out about the dangers

The danger a product poses depends on the nature and concentration of the product's active ingredients and the other ingredients (co-formulants), and its form (for example, whether it is a liquid, granule, powder, gas or other type of product).

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Chemicals

(LO4: Observe instructions provided on manufacturers label and COSHH assessments)

Most information on the dangers associated with a pesticide is on the product label, which will show:

- the hazard classification (for example, 'Irritant');
- the risk and safety phrases (for example, 'Irritating to eyes' and 'Wear eye protection...');
- any restrictions relating to who should use the product (for example, certain people may have been advised not to work with anticholinesterase compounds – see glossary 1 in annex C); and
- other safety-related restrictions and conditions.

Assessing the risks, who might be harmed and how?

Employers or self-employed people need to consider whether any person might be at risk from being exposed to pesticides. In doing so, they need to bear in mind how and where the product will be applied, how long it will be used for, how containers will be handled, and the possibility of an accident. Talking with workers' safety representatives, if your business has them, will help you to identify risks from particular working practices.

Remember to consider:

- your employees (even those not using the pesticide);
- other people on the premises;
- anyone else in, or near, the area where the pesticide is used; and
- anyone likely to enter treated areas or be in contact with treated materials after the pesticide has been applied.

Assessing how employees and other people might be affected will mean using the information printed on the product label and applying it to the circumstances of the work to be carried out. In particular you should consider the following:

- Who could be exposed and how (through the skin or by breathing in or swallowing the pesticide):
 - Absorption through the skin from handling the concentrate or contaminated equipment, and from exposure to spray drift, is likely to be the main route of exposure for most pesticides.
 - Breathing in a pesticide, especially with active ingredients that are volatile (that is, evaporate quickly at normal temperatures) and from approved indoor uses.
 - Swallowing a pesticide (possibly from hand-to-mouth or object-to-mouth).
- Whether the types of contamination listed above may also affect people entering treated areas or handling treated material.
- The extent of the exposure and what could happen if the control measures fail.
- What harmful effects the pesticide can have through the most likely routes into the body.

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Chemicals

(LO4: Observe instructions provided on manufacturers label and COSHH assessments)

Deciding what needs to be done to control exposure

The next stage in the assessment is to identify which control measures are needed, and decide how to put these into practice, and then properly maintain them. As an employer or self-employed person, you will need to consider whether you and your employees:

- are suitably and sufficiently trained in using pesticides safely and using engineering control systems and PPE (see table 2) correctly;
- manage the risks associated with the hazards;
- understand the information on the product label and on any relevant data sheets;
- have suitable equipment to handle, mix, load and apply the pesticides safely;
- have systems or equipment (including PPE) which will prevent or, where this is not reasonably practical, adequately control, exposure;
- can take effective action if equipment fails or breaks down; and
- know the sort of ill-health effects that could be linked to being exposed to pesticides and what signs or symptoms to look out for.

Recording the assessment

You must record assessments except where the results can be explained easily and at any time. You should tell employees (or their representatives) the results of the assessment, especially the parts relating to any work they have to do.

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Chemicals (LO5: Know the use of and meaning of appropriate warning notices)

LO5: Know the use of and meaning of appropriate warning notices

How to read the label

The pesticide label is your best guide to using pesticides safely and effectively. The main sections of a pesticide label are described below:

Brand Name

This will be found on the front panel of the label that you commonly use to identify the product, such as Rounup or Sevin.

EPA registration number

This number tells you that EPA has reviewed the product and determined that it can be used with minimal or low risk if you follow the directions on the label properly.

Ingredient's statement

Active ingredients are the chemicals in the pesticide that kill or control the target pest(s). Inert ingredients often improve the effectiveness or safety of a pesticide. This section provides the chemical name of each active ingredient, the percent by weight of each active ingredient, and the percentage by weight of all inert ingredients.

Signal words

The signal words – Caution, Warning , or Danger – indicate the acute toxicity of the product to humans, based on one or more potential routes of exposure. The statement “keep out of reach of children” must also appear with signal words on the label of ALL pesticides.

CAUTION – pesticides that are the least harmful to you

WARNING – more toxic than those with a Caution label

DANGER - Very poisonous or irritating and should be used with extreme care because they can severely burn your skin and eyes. Most pesticides with DANGER signal word are restricted-use pesticides and are not available to the general public.

Precautionary statements

This part describes the protective clothing, such as gloves or goggles that you should wear when using the pesticide. The section also tells you how to protect children or pets by keeping them away from areas treated with pesticides.

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Hazard symbols



Explosive (Symbol: exploding bomb)



Flammable (Symbol: flame)



Oxidising (Symbol: flame over circle)



Corrosive (Symbol: corrosion)



Acute toxicity (Symbol: skull and crossbones)



Hazardous to the environment (Symbol: environment)



Health hazard/Hazardous to the ozone layer (Symbol: exclamation mark)



Serious health hazard (Symbol: health hazard)



Gas under pressure (Symbol: gas cylinder)

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- *After studying this Learning Outcome, you should be able to:*
- *Name different application procedures and types of equipment*
- *Identify the factors (e.g., nozzles, volumes, pressures, and speeds) that affect calibration*
- *Explain the importance of calibrating application equipment*
- *Show how to calculate the size of the application area*
- *Know how to determine the pesticide application rate*

What is Calibration?

Calibration is the process of measuring and adjusting the amount of pesticide your equipment will apply over a target area. It is a critical “first step” in making certain that your equipment is applying pesticide uniformly and at the correct rate. Calibrating your equipment will save you money, by not wasting pesticides from overapplication; and time, by preventing the need for re-application from underapplication. Overapplying pesticides also can result in excess residues on or in plants, soil, and surface or groundwater. Remember that exceeding the label rate of application is a violation of the law!

Whenever possible, calibration should be done using water or another non-toxic carrier. Wear the appropriate protective equipment whenever using a pesticide.

Remember to always read and follow all of the pesticide label information.

When calibrating a sprayer, there are 3 things that affect the amount of spray material applied per area of measurement (e.g., gallons per acre or gallons per 1,000 square feet):

1. Nozzle flow rate
2. Ground speed of the sprayer
3. Width sprayed per nozzle

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Nozzle tip selection

Nozzle tips must be selected according to the spray coverage, droplet size, and application volume desired. Follow these steps to select a nozzle for a particular application:

1. Read the pesticide label for the recommended spray volume in gallons per acre (GPA) for your situation. The spray volume is the gallons of carrier (water, fertilizer, etc.) and pesticide applied per acre.
2. Measure and work out the area of ground you want to spray – you will need to know how to calculate the area of a surface space.
3. Work out your walking speed in kilometres per hour – you will need to work out your walking speed in order to control the application of spray. You will need to be confident in the following skills: measuring, timing, dividing, and working out averages.
4. Swath widths and nozzles
5. Measure the flow rate with the selected nozzle – you will need to know how to read liquid levels.
6. Calculate the spraying volume per hectare

Techniques to reduce drift

Application techniques and equipment greatly influence the amount of spray drift that occurs. Off-target movement is affected by the type of nozzle, nozzle orifice size, sprayer pressure, and the height or distance of the nozzles from the target.

Of the many nozzle types available for applying pesticides, several are specifically designed to reduce drift. Select nozzles to give the largest droplet size that gives enough coverage at the intended application volume and pressure.

In addition to the size of the nozzle orifice, some new nozzle designs help reduce drift by incorporating air into the spray to form an air-fluid mix. These air-induction nozzles, known as venturi nozzles, form a larger spray droplet, produce fewer fine particles, and provide energy to help transport the droplets to the target. These nozzles, however, require higher spray pressures (40 to 100 pounds per square inch) to be effective. Even at these higher pressures, venturi nozzles still dramatically reduce the likelihood of drift.

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Table 11.1. Recommended Techniques to Reduce Drift

Recommended Technique	Explanation
Follow label directions for reducing drift.	Read the label and reference the nozzle manufacturer's guide to determine which nozzle and pressure combinations are needed.
Select a nozzle to increase droplet size.	Large droplets are less prone to drift. Use the largest droplets that provide necessary coverage.
Increase nozzle size resulting in higher application volumes.	Larger capacity nozzles can reduce the amount of spray deposited off-target.
Consider using new technologies.	Certain nozzles (e.g., air-induction and venturi nozzles) may help reduce drift.
Lower boom height.	The higher the boom height is above the target, the greater the potential for drift. Lowering the boom height a few inches can reduce off-target drift.
Maintain appropriate travel speed.	High travel speeds may result in an unstable boom, high boom positions and increased drift potential.
Keep nozzle close to the target.	When using hand-held equipment, keeping the nozzle close reduces the potential for drift.
Avoid high application ground speeds or major speed changes across the field.	Speed changes may result in pressure adjustments, causing droplet size variability. Sudden increases in speed may create high pressure that results in more drift potential.
Avoid applications during times of high wind speeds.	More of the spray volume moves off-target as wind increases. Wind currents can drastically affect spray droplet deposition.
Do not spray in the presence of a temperature inversion.	Temperature inversions prevent the dissipation of spray particles.
Consider using buffer zones/no-spray zones near sensitive areas.	Leave a buffer zone/no-spray zone if sensitive areas are downwind.
Use a drift-control additive when needed.	Drift-control additives increase the average droplet size produced by the nozzles. These additives must not become your only drift reducing technique. They do not make up for poor spraying practices.

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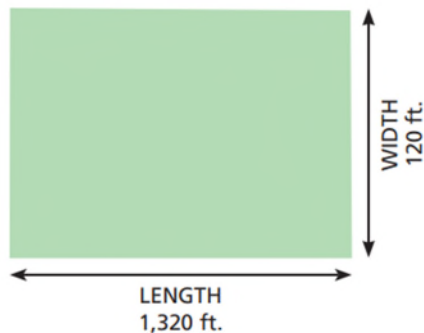
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Calculating Area

For the best application, you need to know the size of the area to be treated. The following examples show how to figure out the size of rectangular, triangular, and circular areas.

Rectangular Areas

You want to apply a pesticide to an area that measures 1,320 feet by 120 feet. What is the area in square feet and acres?



$$\text{Area} = \text{length} \times \text{width}$$

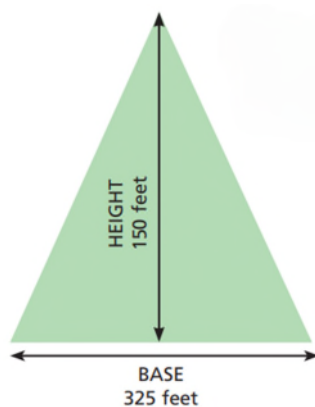
$$\text{Area in square feet (sq. ft.)} \\ 1,320 \text{ ft.} \times 120 \text{ ft.} = 158,400 \text{ sq. ft.}$$

$$\text{Area in acres (A)} = \frac{158,400 \text{ sq. ft.}}{43,560 \text{ sq. ft./A}} = 3.6 \text{ A}$$

Note: 1 acre (A) = 43,560 sq. ft.

Triangular Areas

You are applying a pesticide to a triangular area that has a base of 325 feet and a height of 150 feet. What is the area?



$$\text{Area} = \frac{\text{base} \times \text{height}}{2}$$

$$\text{Area in square feet} = \frac{325 \text{ ft.} \times 150 \text{ ft.}}{2} = 24,375 \text{ sq. ft.}$$

$$\text{Area in acres} = \frac{24,375 \text{ sq. ft.}}{43,560 \text{ sq. ft./A}} = 0.6 \text{ A}$$

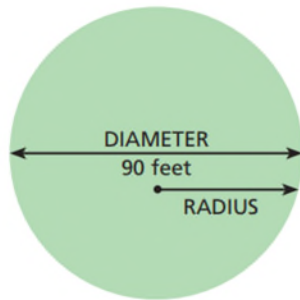
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Circular Areas

If you have a circular area that has a 90-foot diameter, the radius (r) is 45 ft. What is the area?



$$\text{Area} = 3.14r^2$$

Note: 3.14 (π) is a constant.
Radius is 1/2 diameter.

Area in square feet =

$$3.14 \times 45^2 = 6,358.5 \text{ sq. ft.}$$

$$\text{Area in acres} = \frac{6,358.5 \text{ sq. ft.}}{43,560 \text{ sq. ft./A}} = 0.15 \text{ A}$$

Calculating the Application Rate

Use the volume from your calibration test area to determine the amount of pesticide product and total spray mixture needed for your application area.



Calculate the application rate and measure the amount of pesticide needed.

1. Convert your calibrated rate to one based on the areas units found on the label. For example, let's say you calibrated the sprayer and it delivered 2 gallons of water over a 250-square-foot test area. Your application area measures 1,000 square feet. So, you need to use 8 gallons of spray mixture to cover 1,000 square feet (multiplying 2 gallons of water by 4).

2. Check the pesticide label to determine the amount of pesticide to add to the spray mixture. For example, if the label recommends adding 4 ounces of a liquid pesticide product to give a desired finished spray mixture of 1 gallon, you will add 4 ounces of product to 124 ounces of water (1 gallon equals 128 fluid ounces). . If you needed to apply 8 gallons of spray mixture to cover 1,000 square feet, then you must add 32 ounces (8 times 4 ounces) of pesticide product to 7.75 gallons of water. If the tank capacity of the sprayer is 4 gallons, you need to fill up the tank twice, using 16 fluid ounces of product each time.

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Calculating the Application Rate

You determined from a calibration test that your boom sprayer delivered 10 gallons of water over a one-quarter (0.25) acre test area. You need to apply a pesticide product to a 10-acre field (43,560 square feet = 1 acre). The pesticide label recommends that 4 ounces of liquid product be added to give a desired finished spray mixture of 1 gallon (there are 128 fluid ounces = 1 gallon). How much spray volume and how much product are needed?

Step 1. How much spray mixture is needed for the 10-acre application area? Always use information from the calibration test. In this example, 10 gallons of water was used over a 0.25-acre calibration test area.

$$\frac{10 \text{ gallons}}{0.25 \text{ acre}} = \frac{Y \text{ gallons}}{10 \text{ acres}}$$

Cross multiplication:

$$Y = \frac{(10 \text{ gallons} \times 10 \text{ acres})}{0.25 \text{ acre}} = 400 \text{ gallons of spray mixture needed}$$

Step 2. How much pesticide product is needed to make up 400 gallons of spray mixture? Use the label rate of 4 oz. product per 1 gal. spray.

400 gallons spray mixture x 4 ounces of liquid pesticide product per gallon = 1,600 ounces of product needed

Step 3. How many gallons of product are needed? Remember, 128 ounces = 1 gallon.

$$\frac{1,600 \text{ ounces of product}}{128 \text{ ounces/gallon}} = 12.5 \text{ gallons of product}$$

Final result: To treat 10 acres, you need a total final spray mix of 400 gallons that includes 12.5 gallons of the concentrated product.

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ACTIVITY

1. Which statement about sprayer nozzles is true?

- A. A nozzle that produces fine droplets is likely to minimize off-target drift.
- B. Coarse-sized droplets provide maximum coverage of the target.
- C. Nozzles control the amount of material applied and type of pattern created.

2. Which statement about granular applicators is true?

- A. Ground speed has no effect on the application rate.
- B. In a rotary spreader, lighter granules are thrown farther than heavier ones.
- C. Drop spreaders are superior to rotary spreaders when more precise placement of the pesticide is desired.

3. Which technique would help reduce off-target drift?

- A. Spraying during a temperature inversion.
- B. Using the largest droplets practical to provide necessary coverage.
- C. Increasing the height of the nozzles above the target.

4. You are applying a pesticide to a triangular area that has a base of 60 feet and a height of 30 feet. How many square feet is the area?

- A. 450.
- B. 900.
- C. 1,800.

5. You are applying a pesticide to a circular area with a 20-foot diameter. How many square feet is the area?

- A. 128
- B. 314
- C. 400

6. You have calibrated your equipment to spray 50 gallons per acre. You need to spray 1 acre. The label calls for 3 pounds of formulation per 100 gallons of water. How many pounds of formulation should you add to the tank to make 50 gallons of finished spray?

- A. 1.5
- B. 3.
- C. 6.