

CHAPTER 7

CHEMICALS AND FARM WASTE



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7.0 CHEMICALS AND FARM WASTE

Farming operations may generate waste and entail the use of toxic substances such as pesticides and farm dairy detergents. These materials must be managed carefully to avoid environmental and health effects.

Wherever possible, the use of toxic substances and the generation of waste should be avoided or minimised. Opportunities to return or recycle materials should also be taken up where these exist.

Particular attention must be paid to the safe storage of hazardous substances and if they are surplus to requirement, to their proper disposal.

7.1 AGRICHEMICAL USE

To be effective, agrichemical pesticides must be toxic to the pest that they are designed to control. However, this toxicity may also pose a risk to people and the wider environment.

As a result, sensible caution must be exercised when using, storing and disposing of pesticides and all other agrichemicals.

Under the Health and Safety in Employment Act, employers must ensure that employees are trained in the safe use of substances they are handling and have the correct protective equipment and appropriate facilities. It is strongly recommended that all agrichemical users attend a GROWSAFE® training course. For further information, phone the NZ Agrichemical Education Trust (04) 472 9997 or check their website www.growsafe.co.nz.

Agrichemical use should be avoided or minimised where possible. Agrichemicals should be used only in response to a specific identified need and only after consideration of alternative methods available.

The agrichemical should be selected that poses least risk to humans, livestock and the environment, yet deals effectively with the identified need. Consider:

- specificity of target species
- manner of application (granules/dust/spray) and volatility
- persistence in the environment
- withholding period and market requirements
- how much agrichemical you need for the job
- whether an approved handler is required
- how you can safely store the agrichemical
- how you are going to dispose of any waste agrichemical.

The use of agrichemicals must be controlled to meet food safety, hazardous substances, quality assurance or Regional Council requirements.

Agrichemical use is a concern amongst overseas markets. Food Safety Authority regulations backed by the dairy industry require that no agrichemicals (apart from animal remedies) be stored or mixed in the farm dairy. Milk containing unacceptable levels of any pesticide cannot be sold or supplied to the public or a dairy company or fed to stock.

Regional Councils may have rules about pesticide application, mixing or storage. These rules are designed to protect air, surface water and groundwater.

Under the Hazardous Substances and New Organisms Act (1996), or HSNO, hazardous substances including agrichemicals are assigned controls that apply regardless of any regional rules. Chemicals have been progressively transferred into the HSNO system and classified. Three types of controls now apply:

- the requirement for an approved handler for some chemicals or uses. Not all farm employees will need to be approved handlers, if they are working under the guidance of an approved handler. Contractors need to be approved handlers. A person can become an approved handler either by completing a training course or by demonstrating prior experience
- the requirement for tracking of the more hazardous pesticides. Tracking keeps a record of a substance from the point of import or manufacture in New Zealand, through to sale, use and/or disposal. Records must be kept of who is the approved handler, the name of the pesticide used and amount held, when and where it is used and disposal records
- the requirement to keep records of use for some pesticides (i.e. a spray diary). This is largely to manage spray drift hazards. There are two separate lists of chemicals requiring spray diaries – chemicals that must be recorded due to risk of public exposure, and those that must be recorded due to risk of environmental exposure.

Whether chemicals are subject to these restrictions depends on how hazardous they are. Approved handlers are required for many agrichemicals, especially where they are being applied near water or being widely dispersed by aerial or ground spraying methods. Examples of common farm chemicals that must now be applied by an approved handler include 2,4-D, MCPA, Escort, Tropotox and Tordon Gold where these are applied aerially or by mechanised ground spraying. Products sold in small household packs are exempt. The pesticides commonly used on dairy farms do not currently require tracking. However, other substances are being assessed for their hazard level including bloat products, drenches and footbaths. Updated information will be available on the ERMA website.

A full list of pesticides requiring an approved handler, tracking controls or a spray diary can be found at the ERMA website listed below. The website lists all substances that have been transferred to the HSNO system. Only chemicals that are approved substances under this system can be sold or used on farms.

For further information:

- refer to the herbicide label or Materials Safety Data Sheet
- contact the manufacturer or supplier
- contact the Environmental Risk Management Authority (ERMA) on 0800 376 234 or go the website www.ermanz.govt.nz

7.1.1 Environmental protection

Environmental concerns with pesticides relate to contamination of groundwater, surface water or soil.

7.1.1.1 Groundwater

Contamination of groundwater is a serious consideration because it is difficult to reverse. Therefore prevention is critical. The following practices can reduce the possibility of contamination:

- select products carefully. Avoid highly soluble products that are not absorbed by the soil and are relatively stable, as they have a high risk of contaminating groundwater
- avoid over-applying chemicals or saturating the soil, especially on free-draining soils above shallow, unconfined aquifers or near wells or bore heads
- do not store, mix or clean out agrichemicals near bores and contain all spills
- prevent back-siphoning when filling or cleaning spray equipment
- dispose of waste agrichemicals and containers correctly (refer to 7.2.2 Chemical containers, hazardous substances and waste oil).

7.1.1.2 Surface waterways

Runoff of agrichemicals can pose risks to aquatic life, human and stock health where the water is used for drinking and irrigated crops. Again prevention is critical and the practices listed above for groundwater protection also apply to surface water contamination.

In addition, leave a buffer zone with no spray next to the waterway. Riparian vegetation, or hedges and shelterbelts between the sprayed area and surface water also reduce the risk of contamination.

When spraying within the riparian zone, spot spray target species. Always mix or fill spray containers outside the immediate area and remove empty containers from the field at the end of each day to avoid them getting into waterways.

Special care is needed when herbicides are used to control aquatic weeds (refer to 7.1.8.1 Aquatic weeds).

7.1.1.3 Surplus spray and wash water

Surplus spray can be minimised by mixing only what you need for the job at hand.

After the chemical has been used, equipment should be rinsed and cleaned before storage. Try to produce as little wash water as possible. Use an efficient flush washing system rather than filling the spray tank with water and pumping it through the equipment, generating a large volume of wash water.

Spray tank washings can be stored in a sump or tank and used later to make a further batch of the same pesticide. Otherwise, dispose of washings as follows.

- never dispose of wash water to a drain or surface waterway
- wash water can be applied to the treated crop but this may reduce the efficiency of the last application of the pesticide

- wash water can be applied to an untreated site, spraying it over waste areas at a low application rate. The land must be able to absorb the liquid without runoff or ponding, or risk to wildlife, natural vegetation or waterways.

7.1.1.4 Agrichemical spillages

Extreme care is required to avoid spills when opening agrichemical containers containing concentrates, decanting or adding concentrates into measuring equipment or spray tanks, and mixing. Decant liquid concentrates carefully and cut paper containers cleanly. Ensure that mixing sites are at least 20 m away from any drain, well, bore or waterway.

If a minor spill occurs, contain and clean it up immediately and safely. Prevent any spillage from entering drainage systems, waterways or ponds. Use absorbent materials such as sawdust or dry soil to soak up and stop liquid spills spreading. Do not allow spills to simply soak away. Sweep the contaminated material into leak-proof sealable bags or containers and contact your local Regional Council for advice on disposal. Spilled solids, such as granules, dusts or powders, should also be shovelled into a leak-proof container. They may need to be moistened first to prevent dusting.

Do not hose down the spill with water as this may contaminate nearby drains and watercourses.

For a major spill try to contain it as best you can, but do not put yourself in danger. Call the Fire Service 111 and advise them of the location, nature of the incident, and type and quantity of agrichemicals involved. Call the local Regional Council (many have a Pollution Hotline) if agrichemicals have entered a waterway, or land where they could enter water. Inform those who may be affected.

Make sure the appropriate clean-up equipment is always at hand, such as absorbent material (e.g. sawdust, zeolite, oil absorbent granules or kitty litter), shovels and buckets. Remember to wear appropriate safety gear when cleaning up an agrichemical spill.

For spillages of farm detergents or sanitisers, ensure the spill is fully diluted (i.e. at least 500:1) if it is going into the effluent system. Contact the Regional Council to check on local rules.

7.1.1.5 Soil contamination

Residues from some chemicals remain in the soil for a long time. Therefore, when selecting a herbicide or pesticide to use, it is important to choose one that breaks down as quickly as possible and is least persistent in soil. By preference, use a chemical that does not require an approved handler or tracking, as these are comparatively less harmful chemicals (refer to the Environmental Risk Management Authority website www.ermanz.govt.nz for these lists).

The best known residue in New Zealand is the now-banned organophosphate DDT and its breakdown product DDE. DDT was widely used to treat grass grub from the 1950s to the 1970s. DDT residues can be ingested by grazing animals through soil and plant material and the residues then accumulate in animal fat, including milk.

Milk is now regularly tested for DDT/DDE residue and the level of DDT/DDE in soils restricts land from being used for dairying in some areas. Soil levels of DDT/DDE need to be checked before deciding to buy a property for dairy conversion.

Milk levels of DDE generally peak in the first 6 weeks of lactation as body fat is used up and the residues accumulated by the cow while dry are released into the milk. The levels are largely determined by:

1. The cow's condition at calving.
2. The soil DDT residue levels of winter and heifer grazing areas.

To minimise problems on an existing farm:

- test the level of DDT/DDE in your soils
- winter graze cows on soils with the lowest DDT levels (i.e. less than 0.2 ppm)
- priority graze early calving cows, cows to be induced and young, low-condition cows on the lowest DDT winter grazing. Lower priority can be given to older and later calving cows
- calve cows in good condition (condition score of 5) by drying off at a condition score of 4.5 or better, and feeding well during autumn and winter

- graze replacements on low or zero DDT soils
- if using green feed crops, ensure that they are grown on the lowest possible DDT residue soils
- if expanding the farm or purchasing a runoff block, test for DDT first
- fence out high DDT areas.

Another potential source of soil contamination on dairy conversions are historic sheep dips which used dieldrin or arsenic. Residues of these chemicals can enter milk and meat. These should be fenced from stock.

7.1.2 Personal hygiene and protection

Toxic agrichemicals may be ingested by inhalation, swallowing or direct skin contact. Inhaling dusts or sprays should be avoided and you should never eat or smoke while spraying or dusting.

Always read the label before opening the container and using any agrichemical. Safety information is always on the label, covering safe handling, application and disposal. Follow the instructions and note warnings and cautions. Re-read the label each time the agrichemical is used. Safety information on labels may outline:

- contact re-entry – minimum time required to elapse after application before unprotected re-entry into a treated area where skin contact is likely to take place
- non-contact - minimum time required to elapse after application before unprotected re-entry into a treated area where no skin contact with any surface can take place
- animal handling interval – minimum permissible time required to elapse before any unprotected handling of the animal can take place after application.

For additional use and safety information, refer to the Novachem Manual or the NZ Agrichemical Manual (www.agrichemical.co.nz). The Code of Practice for the Management of Agrichemicals (NZS8409:2004) sets out practices that comply with all hazardous substances legislation.

The specific requirements for personal protective clothing and equipment to be used with each type of agrichemical should be clearly stated on the product label. This is the minimum standard required. Where more than one agrichemical is being mixed or applied, the protective clothing applicable to the most hazardous agrichemical should be worn.

The correct mask or respirator described on the label should be used. A simple fabric dust mask will only protect you from non-hazardous dust and liquid particles. A cartridge or canister-type respirator should be used where:

- there are toxic dusts or vapours
- the chemical is present as dust or mist or the droplet size is very small
- spraying will occur indoors or in confined spaces.

Always check the shelf life of respirator filters. Change the filter immediately if you start tasting or smelling the fume or have difficulty breathing while using the mask. Storing the respirator in an airtight container when not in use can extend the filter life.

Wear safety glasses, goggles or a face shield when mixing pesticides and whenever there is a possibility of spray drift. The spraying of pesticides while wearing soft contact lenses is not advised.

Put protective clothing on before mixing and spraying, and while cleaning up equipment.

If a spill occurs, remove the contaminated clothing and wash the skin immediately with cold water. In the event of eye contamination, flush immediately with clean water. Soap and water should be available at the storage area/loading site and on the spray rig, to allow prompt washing of exposed areas if skin contact occurs.

After working with agrichemicals, the applicator should wear the protective clothing for no longer than is necessary, and then take a cool shower (hot water opens the skin's pores) and put on freshly laundered clothes. Clothing worn during spraying should be laundered separately to household washing prior to reuse. Protective clothing and equipment should be cleaned thoroughly and examined for damage after use.

Always have on hand a first aid kit containing basic items, plus those specifically required for the treatment of agrichemical poisoning. The agrichemical container label will carry instructions on the correct first aid treatment for that product. Familiarise yourself and your staff with the signs and symptoms of poisoning and the recommended actions to be taken in the event of an accidental poisoning, including where to obtain medical assistance.

Users regularly working with organophosphates or carbamates should have periodic cholinesterase tests.

The National Poisons and Hazardous Chemicals Information Centre in Dunedin operates a 24 hour service for URGENT information: 0800 POISON (0800 764 766)

For non-urgent and general information

Phone: (03) 470 1200 Fax: (03) 477 0509 or email poisons@otago.ac.nz

7.1.3 Spray application precautions

Before spraying, take the following steps:

- check with your Regional Council for any rules that may relate to your proposed activity
- always check and calibrate equipment before applying pesticides. Accurate calibration will ensure safety for users, crops and the environment. Repair leaky or damaged hoses and valves
- ensure that the correct precautions have been followed and that the warnings on the label are observed
- make sure that all staff who are to use the sprays have been fully trained
- warn neighbours and anyone else who could be affected by spray drift (especially if you have neighbouring properties that are practising organic production). Consider putting a notice on the gate of your property to warn people that you are spraying
- cover pools and water supplies, and bring in pets and washing.

While spraying, the following considerations apply:

- spot spray where feasible rather than blanket spraying
- do not spray in very windy conditions. Application should preferably be done with a slight wind away from sensitive non-target areas, starting at the downwind edge, to make easier to predict likely outcomes, to ensure accurate application, eliminate waste and prevent drift to adjacent crops, pastures, livestock, dwellings, workers, or watercourses
- spray only when people and stock are not nearby
- turn the sprayer off at the end of each row or pass so that spray is not thrown high into the air. Be careful when spraying near sensitive areas. Do not rely on buffer zones, shelterbelts or low drift additives to eliminate spray drift hazards
- never apply pesticides where they could drift into waterways unless they are approved to be used near natural water and/or you have a resource consent. This is particularly relevant when using herbicides to control aquatic weeds. The Regional Council will know which pesticides can be used and the consent requirements
- ensure spray can not drift into the farm dairy premises.

7.1.3.1 Exposure to spray drift

If you are concerned that you have been exposed to spray drift, take the following steps:

- write down as much information as possible regarding who is spraying, time and place, chemical used if known, method of spraying, weather details (e.g. wind speed and direction, air temperature)
- if possible, approach or phone the person on whose property the spraying is taking place and let them know of your concerns
- disconnect the roof supply if you use tank water and are concerned that your roof may be contaminated. Leave it disconnected until there have been several hours of heavy rain
- seek medical attention if you are worried about symptoms of illness
- contact your Regional Council.

7.1.4 Agrichemical storage

Food safety regulations developed with the dairy industry state that:

- pesticides and similar high-risk substances, unless required for farm dairy management purposes, shall not be stored or mixed in farm dairies and shall not be stored with animal remedy dispensing units or in the same room as detergents or any other equipment used in the farm dairy
- a separate building should be used to store these chemicals, which has no direct entry to or from the dairy
- farm dairy equipment must not be used for mixing or storing these substances. Separate, identifiable containers must be used to measure or mix chemicals
- these chemicals should not be stored within 45 metres of the farm dairy water source (for surface waters only)
- the use of pesticides and similar substances in or near farm dairies must be controlled in a manner that will not contaminate milk either directly or indirectly
- pesticide containers must be clearly labelled and not be re-used for any other purpose in the farm dairy.

Never store agrichemicals in unlabelled containers or containers unsuitable for the purpose (e.g. beverage or food containers). Keep all agrichemicals in their original container and keep them tightly closed. It is recommended that cardboard-packaged pesticides be placed, package and all, into a clear plastic bag for storage.

All agrichemicals should be stored in a secure, separate designated area, away from people (especially children), animals, foodstuffs, crops and seed (a requirement of the Hazardous Substances and New Organisms Act (1996)). Small quantities may be stored in a secure and dry chest, cupboard or shed. For larger quantities, a separate storage area with the following features must be provided (refer to Figure 7.1-1).

- Secure locking.
- HAZCHEM signage visible from all lines of approach showing that dangerous agrichemicals are stored within. (This is available from safety suppliers).
- An impervious floor with bunding sufficient to contain any spilt agrichemical, and a floor sump to allow pumping out of agrichemical spills.
- Secure side walls constructed of fire-resistant materials (e.g. concrete, concrete block or galvanised iron) and fire extinguishers.
- Adequate ventilation and light.

The storage building should be separate from other farm buildings, and located at least 50 metres from a waterway and 20 metres from any obvious hazard (e.g. workshops, fuel pumps, heaters, welding equipment, motors). Agrichemical stores and mixing areas should be sited well away from ponds, ditches, drains, wells and bores to avoid pollution being caused by spillages and/or flooding.

Store only agrichemicals in the storage area. Some agrichemicals are reactive in the presence of oxidisers (e.g. sodium chlorate) or other agrichemicals. Examples where segregation is required include: pesticides and fertilisers, agrichemicals and swimming pool chemicals. Never store explosives with any agrichemical.

Store containers off the ground on pallets or shelves. Shelves should be rigid, secure and capable of supporting full containers. Containers should be stacked having regard for their size, design and the material from which they are made and in accordance with the advice provided by the manufacturer. Containers should be stacked so that their labels are visible and incompatible materials are stored on different shelves. A raised edge on the front of the shelf will prevent containers falling in the event of an earthquake.

Regularly check all containers for leaks, secure closure and intact and legible labels. Transfer the contents of any damaged or leaking container into a correctly labelled, suitable container.

FIGURE 7.1-1

FARM CHEMICAL STORE



Source: Total Business Training (Australasia Ltd)

7.1.4.1 Storage of detergents, bloat and teat care products

Poisonous substances such as animal treatments and detergents should be kept out of reach of children and stored in a location that minimises any likelihood of milk contamination.

Farm detergents, sanitisers, bloat control and teat care products should be stored in their correct containers or a secondary container used only for that particular product. The new container should contain the same label information as the original container. Acid detergents should not be stored in a container previously used for alkali detergent and the two must not be stored alongside each other or with chlorine in such a manner that they could possibly mix.

Follow these guidelines:

- do not use a common drip tray for different detergents
- do not use a common drum pump for different detergents
- do not dispense acids and alkali at the same time in the same area
- store these products in a bunded area with a nib wall of no less than 150 mm that has the capacity to contain the contents of the largest storage container
- secure storage areas so children cannot access them.

It is recommended that no more than 1300 litres/kilos of farm detergents and sanitisers be stored on the farm at any one time. Only MAF/NZ Food Safety Authority approved detergents and sanitisers should be used.

7.1.5 Transport of agrichemicals

For ANY vehicle used for the transport of agrichemicals, drivers shall at all times note the following:

- Load protection. The agrichemical shall be well protected from water damage
- Safe loading. All agrichemicals shall be stowed so that they remain in a fixed position despite normal vehicle movement
- Food. Food packaging material and food containers shall not be carried with any load of agrichemicals
- Security. All agrichemicals in transit shall be secured so as to prevent unauthorised access
- Loading and unloading. All care shall be taken during loading and unloading to prevent contamination of people and the environment.

The transport of dangerous goods, which includes farm dairy detergents and sanitisers is covered by land transport rules (see www.ltsa.govt.nz). These rules set out the quantity limits for dangerous goods transported for agricultural goods. Ask your farm supplies retailer for transport information.

7.1.6 Agrichemical residues in products

There is growing consumer awareness of pesticide issues and a desire for products that are seen to be free of agrichemical residues. Products have been withdrawn from markets due to detection of agrichemical residues.

To ensure continued market access, minimise the hazards of agrichemicals and develop pest and disease controls that leave no residues and pose no risk to the environment. Farmers can benefit from spending less on pesticides and sprays, and may receive premiums for organic products.

To reduce the potential for agrichemical residues, agrichemical users should do the following:

- use non-chemical methods and bio-control organisms where possible
- choose the least toxic if two agrichemicals are suitable for a specific crop or pest. Check product labels and classification
- apply the correct material and the proper dosage for the specific crop and pest
- check equipment before use, and ensure correct calibration and nozzle sizes so that the dose rate is accurate and even
- be certain that timing of the application conforms with established residue tolerances, the proper stage of growth and withholding periods before harvest or grazing
- avoid spray drift
- dispose of containers and waste product properly.

7.1.7 Chemicals for animal pest control

While controversial, poisons are widely used as a method of controlling pests such as possums. There are four commonly used poisons - 1080, cyanide (paste and capsules), phosphorus and brodifacoum (Talon). However, new products are always under development – seek advice from your Regional Council on current options.

Only registered persons who work for local government, the Department of Conservation or contractors to these organisations can use 1080. Cyanide and phosphorus can only be used by people with a controlled substances licence. (These replaced the old approved operator licenses and are administered by the Environmental Risk Management Authority). Brodifacoum can be used by the public but not on Department of Conservation land.

Rodent poisons are readily available but care must be taken if these are used around the farm dairy. Food safety regulations state that rodent baits shall not be laid in the milk storage and collection area and shall be laid in a bait station or similar in such a position as to minimise the risk of poison being spread or picked up by children, dogs or other animals.

7.1.7.1 1080

The toxin sodium monofluoroacetate (1080) occurs naturally in plants growing in South America and Australia. It was first manufactured synthetically in 1944, and has been in use in New Zealand for pest control since 1954. Although its use is under constant review, it continues to be one of the safest and most effective toxins for the control of possums and rodents.

Possums stop eating within 30 to 90 min of ingesting 1080. They become listless and drowsy and die between 6 and 40 hours after eating the toxic bait (depending on how much was eaten).

Poisoning operations are carried out by applying poisoned bait from helicopters or fixed wing aircraft, or by using bait stations on the ground. 1080 poisoning operations may kill up to 80-95% of the possums in the area of use.

Because it is biodegradable, 1080 is rapidly broken down by soil micro-organisms and does not accumulate in the food chain or pose a threat to the environment.

All toxic baits (including 1080) are coloured green to clearly identify that they are poisonous and to deter birds and other animals that are not attracted by the colour green. Before laying poison, notices are placed at all major access points to the operational area and on all properties involved. Take care to tell all neighbours, visitors and beekeepers that poison is being laid on your property.

Dogs are ten times more susceptible than possums to 1080 poison. Dogs will be poisoned if they lick or eat toxic bait and there is a strong possibility of secondary poisoning if a dog eats a poisoned carcass. The greatest danger to dogs comes from eating the guts of rabbits or possums. Carcasses poisoned by 1080 pose a danger to dogs until the fleshy parts have completely broken down. During cold weather, this can take up to 3 months.

Cats are also at risk from secondary poisoning, although not to the same degree because cats do not usually eat dead animals. There is no danger of secondary poisoning from fur, skin or bones.

Dogs should be under strict control as long as poisoned carcasses are still accessible, i.e. tied up when not working or muzzled when working in or near a baited area. Suitable muzzles are available through stock and station agents, veterinary clinics or Regional Councils.

Dogs suspected of having eaten 1080 should be given an emetic immediately to cause the dog to vomit. Zinc sulphate emetic capsules are available from Regional Councils and veterinarians. A knob of washing soda (sodium carbonate) about 1 cm in diameter is another suitable emetic. Vomiting can also be induced by giving a salt and water solution if an emetic is not available. If possible, give milk prior to vomiting. Allow 10 min after administering the emetic for the dog to vomit. Further doses may be given if the first dose is not effective.

Emetics are not an antidote and the dog must be taken to the vet for treatment immediately after vomiting. Success will depend on the time lapse between poisoning and treatment.

Farm animals must be kept out of paddocks that have been treated with poison until natural weathering has ensured that the baits are no longer toxic. About 100 mm of rain is needed to make 1080 bait non-toxic. Ensure that gates to baited paddocks are secure and that the fences are stock proof.

The dairy company must be notified immediately if it is suspected that milking animals have been poisoned.

7.1.7.2 Cyanide, phosphorus and brodifacoum

Cyanide and phosphorus can be used for possum control. Phosphorus is generally more effective, with less risk of animals becoming bait shy. With phosphorus, as possums usually die in their nests, not many carcasses will be found. As with 1080, dogs and other animals will die if they eat a possum carcass poisoned with phosphorus and carcasses can remain lethal for many weeks after poisoning.

Cyanide and phosphorus are dangerous to humans but they are effective poisons as long as baits are destroyed after they have been in place for several days. Otherwise possums can feed on sub-lethal doses and become bait shy.

In the Feratox cyanide product the potassium cyanide pellets are encapsulated, which assists with weather protection and prevents the emission of any gas. As a result there is no contact with cyanide when handling pellets. Feratox cyanide pellets are fed to possums with a quantity of ferafeed (non-toxic feed pellets or feed paste) in a special pellet feeder. A magnetic catch secures a cover over the feeding dish, protecting the pellets from wet weather and restricting access from smaller non-target species.

Brodifacoum (e.g. Talon) is an easily purchased and handled anti-coagulant poison that comes in the form of pellets. It will kill rats as well as possums. However, since death is not instantaneous, large amounts of it can be eaten by possums or carried away by rats, making it an expensive option unless numbers have already been reduced in an initial knock-down. Its use is no longer approved on Department of Conservation land due to concerns over persistence and possible contamination of game animals.

Cyanide paste and phosphorus are normally placed in small amounts in bait stations or on stones, tin lids or sticks. Brodifacoum is fed out as bait pellets through bait stations. These should not be filled continuously, as already-poisoned animals will continue to consume pellets. Instead, bait stations should be filled in pulses (refer to 7.1.7.4 Using bait stations).

It is vital to pre-feed possums before laying cyanide or phosphorus. Use a mixture of flour (80%) and icing sugar (20%) with a lure of curry powder, cloves, cinnamon or fruit essence added. Do not use oil of roses, wintergreen, banana or raspberry essences as they also attract some bird species. Lay poison once there is a good acceptance of pre-feed baits. This may take 2 to 3 days. Before laying poison, remove the pre-feed baits.

Dead possums should be collected and disposed of the following morning. Remove all baits and bury them. It is not only a dangerous practice to neglect to do this, but remaining baits lose toxicity, causing poison shyness. Provided there is no rain, the best results are obtained on the first two nights. Phosphorus poisoning can be carried out at fortnightly or monthly intervals to keep the possum population as low as possible.

7.1.7.3 Licensing and safety

To purchase cyanide or phosphorus, the user must have a controlled substances license. To obtain a licence, complete the application form available from the Environmental Risk Management Authority (ERMA) on 0800 376 234 or the website www.ermanz.govt.nz

The regulations require that permissions be gained prior to the laying of poison. Any land under poison control must have conspicuous notices erected at every place where people normally gain access, specifying the name of the person laying the poison, the fact that it is a poison, the name of the poison and the date it is intended to be laid.

Poison cannot be laid:

- on or within 60 m of a public road or place to which the public are entitled to have access
- inside or within 400 m of any community, town or city boundary, or any catchment area from which water is drawn for human consumption, without the prior consent of the appropriate authority and the Medical Officer of Health.

Safety precautions include the following:

- always comply with the instructions on the container
- always store cyanide and phosphorus paste in locked containers
- always wear protective clothing. Do not wear contaminated clothing in vehicles or at home
- do not point the base of the tube towards your face when squeezing
- do not let cyanide paste come in contact with acids

- do not smoke or eat while handling poisons
- wash hands thoroughly after using poisons
- keep children and domestic pets away from the area being poisoned
- bury all toxic baits at the finish of an operation
- once the bait station is no longer needed, remove it from the tree, bury any toxic material and scrub the bait station with hot soapy water. Allow it to dry and store it in a dry place
- always carry amyl nitrate capsules when using cyanide and learn how to use them.

7.1.7.4 Using bait stations

Bait stations keep bait dry and can be fastened to trees or fences out of reach of pets and farm animals.

Each bait station will effectively cover a range of 100 m. They should be located clear of the reach of children and stock, and ideally about 30 cm above a tree branch or on fence posts from which possums can easily feed on the bait. Concentrate bait stations around the edge of bush and crops, especially near tracks. Pine, willow and poplars are very attractive to possums and bait stations should be placed on the outer edges of plantations.

With anticoagulant poisons, possums will consume a lethal dose if they ingest up to 60 g of bait (approximately one small cupful) and may take 10-20 days to die once a lethal dose has been ingested. The time lapse between ingesting a lethal dose and death gives a possum plenty of time to eat more poison than it needs to. To avoid wasting bait, a 'pulse baiting' strategy is advised.

- Keep the bait station filled for 7 to 10 days.
- Leave the station empty for 21 days.
- Repeat the cycle as necessary.

At the conclusion of a bait programme or pulse baiting, the unused bait should be collected and any material dropped around the bait stations should be removed or buried.

7.1.8 Chemicals for plant pest control

Plant pests may occur in pasture or in retired and planted areas.

In either case, it is important to carefully assess the problem and get positive identification and advice on control options. Weed control can be time-consuming and expensive so it is important to step back and prioritise the problem.

Regional Councils have Pest Management Strategies, outlining what level of control is required over which types of weeds (e.g. total control or boundary control only). They usually provide a free identification and advice service for weed species and may have lists of common problem weeds on their websites.

Weeds in retired areas or riparian strips may be unsightly but they can do a good job filtering runoff and holding banks together. Leaving them may be an option if control is not required under Regional Council rules and they are not too invasive or likely to cross property boundaries. Similarly, ridding steeper faces of gorse can consume large amounts of time and resources when leaving it as a nitrogen-fixing shelter plant can be the first stage to regenerating a patch of native bush while preventing erosion from steep and unproductive faces. Proactively fencing weed-prone parts of the farm and planting with a timber crop or native species is a good preventive weed management strategy that allows you to focus your resources on your better land.

The use of herbicides can be minimised by:

- careful grazing management to avoid pugging and opening up bare ground
- spot spraying or grubbing target species rather than blanket spraying an area. Since clovers are sensitive to many weed sprays, avoid aerial application where other means will be effective. Spot spray with a tank on the back of the bike, use a knapsack on hills, or use weed wands or swipers. If this is not feasible, choose a chemical that will have least impact on clover and spray during winter if possible (e.g. for buttercup)
- vigilance in spotting weed problems early and responding immediately. Schedule regular weed surveillance in any retired or planted areas. Consider paying someone to control weeds during busy periods as this may be a large cost saving compared to leaving the infestation until it reaches more challenging proportions

- mulch in planted areas to stop weed seeds germinating and dense planting to get canopy closure early and exclude weeds
- ringbarking woody weeds or using the 'drill and fill' technique to inject a small amount of herbicide directly into the plant.

Seek professional advice and ask other farmers about the best chemicals to suit your situation. Be sure to use herbicides at recommended rates and take particular care around native plantings as they are sensitive to herbicides.

7.1.8.1 Aquatic weeds

Introduced aquatic weed infestations cause numerous problems including out-competing native aquatic plants, robbing the water of oxygen as dead plant material breaks down, blocking waterways and impeding drainage causing flooding. Recreational use becomes very difficult where aquatic weeds have flourished.

Examples of problem aquatic weeds include alligator weed (*Alternanthera philoxeroides*), some oxygen weeds (*Egeria densa*, *Lagarosiphon makur* and *Ceratophyllum demersum*), parrot's feather (*Myriophyllum aquaticum*) and Manchurian rice grass (*Zizania latifolia*). Take precautions to prevent them being introduced onto the property as they can be extremely difficult to eradicate.

If you think you have some of these weeds, contact your Regional Council to get positive identification and advice on best control methods.

Spraying directly into a waterway will often require a consent. Find out from your Regional Council what is permitted before spraying aquatic weeds. There are also controls under Hazardous Substances and New Organisms legislation that may require an approved handler for certain chemical applications near water.

- Most glyphosate herbicides can be applied around water bodies without the need to be an approved handler.
- Escort and similar metsulfuron based herbicides must be under the control of an approved handler when applied onto or into water.

7.1.9 Petroleum products

All petroleum product storage facilities should be sited as follows:

- away from waterways or field drains in case of spillage or leakage
- where accidentally spilled fuel cannot come into contact with any heated surface
- in a position where the delivery driver can see the filling gauge
- away from main traffic passage to avoid accidental collisions by vehicles
- on an impervious base.

Above-ground tanks are normally fabricated from welded mild steel plate and supported by either masonry walls or steelwork. Such tanks may become unstable during strong winds when empty and should be connected to secure foundations to prevent overturning.

It is recommended that fuel drums and above-ground tanks greater than 1000 litre capacity should be surrounded by a bund constructed from durable and impervious materials. This bund should be large enough to hold the volume of the tank(s) plus 10%. The bund should be positioned so that all parts of the tank and all taps empty vertically downwards inside the bund. There should not a direct outlet from the bund. Instead a small sump that can be emptied easily (e.g. with a hand pump) should be provided. Large amounts of oil can be taken out of the bund water using a blanket specially designed to absorb oil.

Ensure that all hose connections for fuel tanks are sound and are replaced or repaired, if leaks occur, as soon as possible. Tank valves and taps should be locked shut when not in use. If a flexible pipe is used for filling vehicles, it should be fitted with a tap that closes automatically.

Below ground tanks should be positioned in a masonry or concrete chamber. Storage tanks should not be buried directly in the ground where:

- the occurrence of a leak might contaminate groundwater
- the water table is likely to rise above the bottom of the tank
- soil is acidic and corrosive to the tank material.

Mobile tanks should be built to withstand accidental damage. They should be stable enough to travel on roads and have suitable brakes. Mobile tanks should not be overfilled. All valves should be kept locked when the tanks are not being used. The fuel systems and tanks of all tractors and diesel engine machinery used in a fixed position should be checked regularly.

Before installation, all tanks should be cleaned internally and externally and protected with a rust-inhibiting, priming paint. Tanks should be provided with a fuel level indicator (e.g. dip stick, float gauge, sight tube). Sight tubes should not be made of glass.

Anti siphon devices should be used where any inlet is below the highest fuel level in the tank. Outlets should be marked to clearly show whether they are open or closed.

Tanks should be closed at all times to prevent entry of foreign matter (e.g. dust). Inspect all tanks regularly and repaint them on the outside to prevent corrosion. Check for leaks at all times and repair them as soon as they appear.

If at all possible a member of staff should be present when fuel is delivered. Provide sand or another absorbent material next to the storage area to soak up any spillages. Take precautions to minimise the risk of fire.

A Location Test Certificate may be needed (previously a Dangerous Goods Licence) and/ or a Tank Certificate for bulk tanks. Information on this and the legal requirements for fuel storage can be found at the ERMA website www.ermanz.govt.nz

For information on disposal, refer to 7.2.2.5 Disposal of waste oil.

7.1.10 Top tips for chemical use

- **Have all farm staff do a GROWSAFE® course on safe chemical handling.**
- **Investigate alternatives to chemicals and only use where necessary – choose the least toxic and least persistent chemical available.**
- **Always read the label before opening an agrichemical container and follow the mixing and use instructions. Do not store agrichemicals in containers without the correct label.**
- **The best way to dispose of any agrichemical is to use it for its intended purpose.**
- **Chemicals must be disposed of safely - do not pour them into drains or waterways, into the ground or into offal pits and farm landfills.**
- **If transporting agrichemicals, make sure that they are separate from passengers and food, and well protected from the elements.**
- **Work with neighbours to avoid issues with chemical use.**
- **Discuss with the Regional Council the most effective control method for animal and plant pests in your area.**

7.2 WASTE DISPOSAL

Waste disposal on the farm includes plastic wastes such as silage wrap, hazardous and toxic wastes such as chemical products, and organic waste such as milk, dead cows and offal.

Waste disposal facilities and rules differ from one region to another, so it is important to check with your Regional Council and local transfer station or waste collection facility for the relevant information in your locality.

There are moves to encourage greater levels of product stewardship recovery in New Zealand (e.g. through the AgRecovery project) – where producers or brand owners take responsibility for the packaging they put into the marketplace. This could create new avenues for reducing and managing waste in the future.

7.2.1 Plastic silage wrap

Plastic silage wrap is a convenient method of storing and feeding out silage. Its use has also reduced the volume of potent leachate that exudes from traditional silage pits and stacks. Plastic silage wrap is commonly used in all major dairying areas, resulting in the generation of many thousands of kilometres of used wrap each season.

Although convenient for farmers, the use of plastic silage wrap presents a problem because of the necessity to dispose of the wrap after the bale is fed out. Because the wrap tends to be contaminated with organic matter, it is difficult to recycle and there are currently no recycling options within New Zealand. Some export of the wrap has occurred but there are biosecurity risks associated with export of this waste if it carries organic matter.

There may be some local recycling centres that are prepared to accept silage wrap and store it until future options become available – check with your local recycling facility. Farmers could also choose to store wrap on-farm until recycling becomes possible. If so, keep the wrap as clean as possible by following these steps:

- while the bale is on the tractor forks, strip off the outer layer of plastic, shake it and put it away where it will not be soiled by trampling or being driven over on the ground
- secondly remove the inner webbing layer – if clean enough it can also be recycled
- if storing the wrap, keep it out of the sun.

Burning and burial are not recommended practices for silage wrap. Burning silage wrap gives off dense black smoke and toxic gases such as formaldehyde and acrolein, and in some regions is specifically prohibited by rules to protect air quality. Burial on-farm is not recommended because, unless the plastic is tightly packed and buried deep, it has a tendency to work its way to the surface within a year or two. This creates problems of unsightly plastic blowing loose around the farm and the possibility of stock ingesting it. Veterinarians have reported cattle dying after eating silage wrap.

Where there is no storage or recycling option, wrap should be tightly packed into bales and transported to an approved public landfill site (refer to Figure 7.2-1).

To package the wrap, drive four fence standards into the ground to make a 1-2 m square. Stretch layers of wrap around the standards to form a box. Cram the rest of the wrap into the box and remove the standards. The wrap will shrink in on itself and compact into a tight bundle. Alternatively, bale up the plastic in a wool fadge using a wool press.

Better options for silage wrap are being actively investigated nationally so farmers should watch for new information.

Research into the use of edible protein based sprays (eg. soya bean and casein) is also being undertaken to devise a waste-free means of waterproofing hay and silage bales and reducing losses from bales left out in the weather.



7.2.2 Chemical containers, hazardous substances and waste oil

The disposal of these materials is complicated because of the hazard created by toxic and/or inflammable substances.

All of these substances and the empty containers should be kept in a secure store to await disposal. Do not use empty containers to make water troughs or feed containers as residues may remain even after rinsing.

7.2.2.1 Disposal of chemical containers

The plastic in chemical containers is of recyclable quality, but potential tainting from residues creates a hazard risk for handlers at recycling facilities and potentially could contaminate the recycled products that are produced from these plastics.

Check with your local recycling centre to find out their policy on accepting these containers.

Wherever possible, return the container to the retailer or manufacturer. Some drums may be able to be sold to a company equipped to neutralise any adhering agrichemicals.

A national recycling system is also likely in the future for agrichemical containers.

If there is no current recycling option for the containers in your locality, transport them to a facility to go into an approved landfill. Contact your local landfill or Regional Council if you are unsure which containers they accept.

Whether the containers are to be recycled or landfilled, it is essential to:

- empty the container thoroughly at the time of use (e.g. into the spray-tank or other receiving container). This minimises the risk and saves money
- triple rinse, using the washings to dilute the chemical where dilution is to be achieved prior to use
- where the chemical is not being diluted before use, rinsings should be spread on waste ground, never down stormwater drains or into septic systems or the effluent treatment system. Do not rinse containers near a waterway, drain, well or bore head
- puncture and/or crush the container to render it unusable
- do not destroy or remove container labels.

Burying agrichemical containers on the farm is not recommended and may be prohibited by your Regional Council. No container should be buried where there is any risk of polluting surface water or groundwater or within 0.8 m of the land surface or land drains. Records should be kept of any waste buried on the farm.

Burning agrichemical containers is not recommended and is prohibited by many Regional Councils as fumes and smoke under rules designed to protect air quality.

7.2.2.2 Disposal of unwanted chemicals

Chemicals should be purchased in small quantities to avoid being caught with excess as farm practices or legal frameworks change. Chemicals must be disposed of safely to protect the environment from contamination.

Do not pour left over agrichemicals into drains or waterways or toxic substances may enter rivers, lakes or the sea and kill fish and aquatic life. Water supplies may be contaminated.

Do not pour concentrated agrichemicals on to the ground or into offal pits and farm landfills as chemicals may kill pasture, seep into the soil and contaminate underground water supplies.

Very persistent chemicals such as DDT and Dieldrin must now be stored in a safe manner and should be disposed of through a drop off or collection programme.

Agrichemical drop-off or collection for safe transfer to a secure facility is now available in most regions. Contact your Regional Council to find out how the agrichemical collection and disposal scheme in your region operates.

If an agrichemical container is leaking, place it in two strong plastic bags, one inside the other and secure it firmly. Label the bag clearly.

It is important that labels remain intact so that agrichemicals can be readily identified.

Note the precautions for transporting agrichemicals – refer to 7.1.5 Transport of agrichemicals.

7.2.2.3 PCBs

PCB (polychlorinated biphenyl) in its most common form in the electrical industry, is an oily liquid first used as an electrical insulator during the 1950s, 1960s and 1970s inside transformers and capacitors of electrical appliances such as fluorescent lights and electrical motors. Fluorescent lights have inside their body a ballast component. Inside the ballast or alongside it is a capacitor that contains the PCB liquid. In some cases the ballast may also contain PCB resin.

Because PCBs are chemically stable at high temperatures they take a long time to break down into less harmful substances. This means PCBs persist for a long time in the environment and accumulate in the food chain. PCBs are fat-soluble and tend to accumulate in the fatty tissue of humans and animals where they can have health effects. PCBs can also threaten export markets.

It may be difficult to identify whether PCBs are present in farm equipment but any electrical equipment more than 30 years old and fluorescent light fittings from the same period may contain PCBs.

If you suspect you have a PCB-containing item:

- do not remove the capacitor from the ballast
- seal the ballast in a heavy plastic bag and take it to an approved drop-off point. Contact your Regional Council to locate such a point, in some areas councils fund the disposal of PCB's
- if the capacitor is leaking, wear heavy PVC gloves. If any liquid spills, mop it up with either kitty litter, sand or rags and put these inside the plastic bag along with your gloves and the ballast/capacitor
- clean the area with a kerosene-moistened rag followed by a clean, dry rag. Place everything inside the plastic bag.

PCBs can not be buried in a regular rubbish tip or landfill. They must be isolated and dealt with separately.

7.2.2.4 Tanalised timber

Timber that has been tanalised to increase its durability contains toxic chemicals. This is becoming an increasing concern, and kiwifruit orchardists are now moving away from the use of tanalised timber to allay market concerns about these chemicals.

There is no recycling option for treated timber. The only option currently is to landfill treated timber unless on-farm uses can be found. Using alternatives such as concrete or steel posts should be considered.

7.2.2.5 Disposal of waste oil

Waste oil is generated during the servicing of agricultural machinery. The main types of waste oil are used lubrication oil from engines and hydraulic oil from hydraulic systems.

Waste oil is best disposed of by taking it to a recycling centre, waste oil dealer or motor service station for re-refining and re-use.

Collect used oil drained from machinery during routine servicing and store it in suitable leak-proof containers. Different grades of oil should be kept separate.

Never dispose of waste fossil fuel into soak holes, waterways, drains or sewers as it can cause serious environmental damage.

Waste oil should not be burned or buried on farm.

Waste oil should not be used on roads for dust suppression.

Do not leave empty oil containers lying around the farm - store all empty containers in a safe, dry area and dispose of them in an appropriate way.

7.2.2.6 Other hazardous waste

Hazardous wastes can be flammable, corrosive or poisonous and should not be buried in a landfill but separated out and dealt with by an approved refuse centre.

These include solvent-based products, petroleum products, explosives, cleaning chemicals, paints and batteries.

7.2.3 Farm and household waste

Food safety regulations require that litter not accumulate or be scattered inside or surrounding the farm dairy as it is unsightly, unhygienic, can emit odour and encourages flies and rodents.

Rubbish should be placed in a lidded drum that is emptied and cleaned regularly.

7.2.3.1 Waste reduction

Using materials and equipment carefully can extend their useful life and reduce the amount of waste produced. Regular maintenance will reduce wear and prolong the useful life of farm machinery.

Take waste disposal into account when choosing products for the farm. Choose less toxic alternatives when purchasing potentially hazardous substances and only buy the amount you need for a particular job. Aim for minimal packaging when purchasing products. Wherever practical, choose those methods, equipment and practices that give extended life and produce low amounts of waste for disposal.

7.2.3.2 Recycle and reuse

Separate out general rubbish into waste types and recycle it where possible. Food scraps and other organic matter can be composted. Timber, bricks and wire can be reused on the farm.

Other recyclable materials such as metals, plastics and glass can be washed where necessary and taken to a recycle centre or sold to a local scrap merchant. Sort different types of waste materials and stockpile them in good condition.

Polythene materials recycled by some specialist companies include:

- inners from fertiliser bags
- fertiliser sacks
- pallet covers.

Carefully reclaim and reuse items such as silage stack covers.

Hay and crop residues can be used for animal bedding, mulch or composted for garden or cropping land use.

7.2.3.3 Landfill

All rubbish that cannot be reused or recycled should be disposed of to an approved landfill operation.

7.2.3.4 On-farm burying

Check with your Regional Council as to rules regarding burying rubbish on farms.

Under Food Safety regulations, rubbish pits must be 45 m away from a surface water take for the farm dairy.

Never bury hazardous materials on-farm. They may contaminate soil and groundwater. For example, used batteries contain heavy metals such as lead and cadmium that can be harmful to the environment.

7.2.3.5 On-farm burning

Check with your Regional Council about rules regarding burning of rubbish. Avoid burning if it will cause a nuisance to nearby residential areas.

Do not burn:

- plastics, rubber, tyres or other materials that can produce dark smoke
- aerosol containers that can cause explosions
- treated timber that can release poisonous gases.

7.2.4 Carcass and offal disposal

Dead animals and offal must be disposed of in such a way that they will not produce odour, cause health problems, or result in groundwater and waterway contamination. If a surface waterway becomes contaminated, dead animal material can cause disease and impact on fish and other aquatic species through oxygen depletion of the water. Groundwater drinking supplies can become contaminated with disease-causing organisms or high levels of nitrate. Poorly constructed and managed offal pits can also create adverse effects from odours, insects and vermin infestation, and risks to domestic animals.

It is illegal to:

- dump dead animals and offal into rivers and streams or the sea
- feed animal carcasses or offal to pigs
- leave dead animals lying around the farm.

Where possible, carcasses should be picked up by a licensed dead stock carrier. Alternatively, they should be composted on-farm. Where this is not possible, carcasses may be buried in a covered offal pit.

Food safety regulations state that:

- rubbish pits and offal holes must be at least 45 m away from the surface water take for the farm dairy
- care should be taken on the location of offal holes so that leaching does not contaminate the underground water supply
- an offal hole containing decaying matter must not be within 45 m of the dairy or tanker loop
- offal holes must be adequately covered to reduce odour and insect infestation and to prevent scavenging
- dead animals must not be held beside the tanker roadway within 45 m of the farm dairy
- dead animals held beside the tanker track must not impede tanker access, and must be collected within 12 hours. The collection point should be screened from the roadside.

General recommendations include:

- dispose of dead stock as soon as possible
- move or cover dead carcasses to ensure they are not visible from the roadside
- do not leave animal carcasses in the open where dogs can gain access
- never dispose of carcasses in farm dairy effluent ponds
- keep dead stock out of waterways.

7.2.4.1 Pick up by licensed dead stock carrier

Many areas are served by a dead animal collection service. Operators skin the dead animal and render the carcass to produce protein meals, tallow and fertiliser.

Dead calves and cows should be carefully handled to avoid damaging their skins and hides as their value is greatly diminished if they are dragged or ripped. Much of the potential damage can be avoided if the carcass is carried to the collection point by a front-end loader.

A number of companies now require collection to occur within a specified period to avoid odour during trucking and processing.

To avoid negative perceptions of the industry by the public and tourists, the collection point should not be observable from the road.

7.2.4.2 Composting

Composting is an increasingly common stock disposal option that creates a useful product, reuses other farm resources such as calf-shed sawdust, and can be used in areas of high groundwater with minimal risk of contamination (where carried out correctly).

Composting is a biological process by which organic wastes are converted into safe, stable humus by micro-organisms. Carcasses are completely broken down within months, including bones. The high temperatures (around 70°) generated by the composting process destroys pathogens and prevents fly incubation. However, it is important that finished compost not be spread on pasture grazed by stock. Suitable end uses include domestic gardens, shelter belts, woodlots or gate sales.

FIGURE 7.2-2

COW COMPOSTING HEAP



Requirements

There are four requirements for efficient composting:

1. The material to be composted must be organic (e.g. animal carcasses, sawdust).
2. The carbon to nitrogen (C:N) ratio of the material should be at least 5:1. Since animal carcasses are high in nitrogen, a carbon supplement such as hay, straw or sawdust is needed. Sawdust is recommended because of its small particle size and high absorbency that minimises leachate production.
3. The process must be aerobic if odour is to be minimised, so air penetration through the compost heap is essential. The bulking agent used to adjust the C:N ratio (e.g. sawdust) will also increase aeration of the compost mixture.
4. The compost must be moist, but not wet to the point that anaerobic conditions occur.

Untreated sawdust is by far the most successful carbon-rich material, however other materials such as ground cornstalks may also work. Materials must be able to settle around and be in contact with the carcass. Straw can be used but there are problems in using it such as longer breakdown times, and leachate production. Generally a straw stack will need to be roofed and built on a concrete surface so that leachate can be collected.

Location

Siting of the piles should be considered carefully:

- locate compost piles well away from sensitive water areas such as streams, lakes, ponds and drainage ditches
- choose high points in the landscape rather than depressions to avoid water flowing through the bottom of the pile
- if on sloping land, create a diversion bank on the upper side to keep stormwater out
- think about neighbouring residences. While odour is not normally a problem, neighbours may not wish to watch dead stock being handled
- consider ease of access
- locate compost stacks well away from the farm dairy (at least 100 m).

Bin design

Bin design is not critical, but the bin should be easily accessible with a front-end loader. Two bins are needed for primary composting with a third for secondary composting. A fourth bin for storing the sawdust material is also useful. The sawdust to be added to the heaps should be kept as dry as possible to aid in faster breakdown of the carcass. The bins should be located together for ease of movement between them.

The compost bins must be fenced from stock.

Large round bales of low quality hay can be used to form the bins. Place bales end to end to create walls for a three-sided enclosure.

An alternative is to use concrete for the bin floor and walls. Although more costly, the concrete is durable, requires less room than round bales, and can be used to capture any leachate.

Excessively large bins should be avoided. Bins 12-15 m² work well (2 bales deep by 3 bales wide). Use Table 7.2-1 to calculate the total area of bins required.

TABLE 7.2-1

CALCULATION GUIDELINES FOR SIZE OF COMPOSTING BINS		
1. Weight of carcasses to be disposed	Example	Your farm
(A) Enter number of dead animals per year	12.5	
(B) Enter average weight of a dead animal	400 kg*	
(C) Calculate the total weight of carcasses for disposal. C (weight in kg) = (A) x (B)	5000 kg	
2. Size of compost facility		
(D) Calculate the volume of primary (Bin 1 and 2) bins needed. D (volume in m ³) = (C) / 600	8.33 m ³	
(E) Calculate the volume of secondary (Bin 3) bins needed. E (volume in m ³) = (C) / 900	5.55 m ³	
(G) Calculate the area of primary (Bin 1 and 2) needed. G (area in m ²) = D / 1.5	5.55 m ²	
(H) Calculate the area of secondary (Bin 3) bins needed. H (area in m ²) = E / 1.5	3.7 m ²	

* Use 400 kg Jersey, 500 kg Friesian

Process

Start Bin 1 by placing sawdust on the ground to a depth of 60 cm. Carcasses placed directly on the ground or on concrete will NOT compost properly. Place the carcass on the sawdust and split the stomach to avoid it bloating and opening up the sawdust to expose the carcass. (Note, if the carcass is chopped up into smaller pieces it will compost faster). All body parts should be at least 30 cm from the sides of the bin and completely covered with at least 60 cm of sawdust. Covering carcasses adequately avoids any problems with odours and rodents. NEVER leave legs, hooves, ears or any body part out of the sawdust pile. Carcasses may need extra sawdust covering after the pile has settled for a day or two. Continue placing and covering carcasses until the bin is full.

In a typical situation, Bin 1 is filled with dead stock after about three months. Bin 1 is then allowed to compost for three months once the last carcass has been added. During this time any new carcasses are added to Bin 2. After Bin 2 is full, the contents of Bin 1 are moved into Bin 3 and left to compost for a further three months, while new carcasses are once again collected and covered in Bin 1.

After the collection period followed by 3 months in primary composting (in either Bin 1 or Bin 2), and then three months of secondary composting (in Bin 3), the compost should resemble black humus or soil. Some body parts (skull, teeth) may still be identifiable but will be soft and crumbly. At this point the compost can be carted away. The hay bale surrounds can be replaced over time as required.

A probe thermometer can be used to monitor the temperature of the compost. When operating properly temperatures should reach 60-70°C. The compost should heat up shortly after being assembled. If it does not, it may be too dry and need additional water.

The moisture level of the pile should be damp to touch but not overly wet. Initially the animal will provide enough moisture to keep the composting pile moist so a tarp should be placed over the pile in Bin 1 or 2 as it is built up and during the first three-month composting period. The pile should be uncovered during the final three-month composting period in Bin 3, as animal liquids will have been used up by then.

Too much moisture is the most common reason a stack will fail, produce odour or leachate. The use of dry sawdust is the best way to eliminate excessive moisture. If a composting pile becomes too wet it can usually be recovered by moving it to another bin and mixing in some additional dry sawdust. A recording system can be kept either on the side of the bin or in a book, to note when carcasses were put in, bins filled, and piles moved.

Compost with the correct content of carbon materials and moisture should not produce any leachate and therefore should not pose a threat to groundwater or surface waterways. However some Regional Councils have rules for larger composting operations – check with your Regional Council before constructing bins.

The finished compost has no noxious odours and can be used as an effective fertiliser and soil conditioner. It must not be applied to grazed pasture.

7.2.4.3 Burying

Shallow burial is a convenient method of carcass disposal where water tables are not high enough to risk contamination of groundwater. Controlling vermin and scavengers can be difficult. Make sure that the hole is backfilled immediately and that the buried carcass is well covered, so dogs and other scavengers cannot dig it up.

Select an area with clay or impervious soil below and site the hole at least 100 m from domestic bores or surface waterways to avoid contamination. Do not bury the animal in the floodplain of a waterway.

7.2.4.4 Offal pits

Farmers commonly resort to offal pits for disposal of dead stock and offal. However, it is recommended that only small and infrequent amounts of animal offal are disposed of in offal pits (e.g. after an animal has been slaughtered for home use). Some quantities of other organic matter (e.g. food scraps) can also be placed in offal pits.

Offal pits may be narrow deep trenches dug by an excavator or vertical shafts dug using a large-diameter auger.

To keep an offal pit safe for children and inaccessible for dogs and vermin, the top of the pit should be covered with a heavy duty concrete slab at least 125 mm thick with access from at least one airtight cover-plate (refer to Figure 7.2-3).

When carcasses and offal are disposed of in a deep covered pit, the animal material breaks down anaerobically. As the material breaks down, there is a potential risk of groundwater contamination.

Nitrate levels may become elevated as nitrate is released from the material in the offal pit. Depending on the number of carcasses and other organic material, and the background nitrate levels in the groundwater, nitrate concentrations in the groundwater may become elevated for some distance down-gradient from the pit.

Offal also contains potentially pathogenic organisms, such as Salmonella. The heat produced by the putrefaction process may destroy some of these, but others may survive and enter the groundwater.

Therefore, the following minimum guidelines should be used when siting an offal pit:

- offal pits should be at least 100 m from a domestic bore in any direction and 200 m in an up gradient direction
- do not dig the offal pit any closer than 1 m above the maximum expected groundwater level beneath the site. Where there is a high water table, consider composting as an alternative disposal option
- offal pits should be sited at least 100 m from any surface waterway, open drain, wetland or neighbouring boundary and away from the floodplain of a waterway
- offal pits should be sited well away from any other offal pit that has been used within the previous five years.

Some Regional Councils have rules regarding siting of offal holes so check with them before making a new pit. Do not light fires near offal holes since explosive gases may be present.

To aid decomposition of dead animals disposed in an offal pit:

- slit the stomach to allow the intestines out
- puncture the rumen on its left side to prevent toxic gas build-up
- add a spadeful of a bacterial starter such as oxidation pond sludge.

FIGURE 7.2-3

A WELL COVERED OFFAL PIT



Once an offal pit is filled to within a metre of the surface, backfill it with compacted earth, and regrass or plant a tree over it. Identify the site so that future owners can be informed.

Offal pits are not a replacement for an approved landfill or other recommended disposal options. The following material must not be tipped into an offal pit:

- chemicals and chemical containers
- human sewage and other household wastewater
- commercial quantities of any animal, chicken or fish carcasses.

7.2.4.5 Burning

As a last resort, animal carcasses and offal may be burned but this is the least acceptable option and may not be permitted by some Regional Councils.

If animal carcasses are burnt on the farm this should be done in an incinerator wherever possible. The incinerator used is best fitted with a secondary combustion chamber so that high temperatures are achieved. This will ensure complete combustion of all products. Do not exceed the design loading rate of the incinerator at any time.

If open burning is to be carried out, dig a shallow pit with cross trenches to provide a good air supply to the base of the fire. Use only dry fuels that will burn easily with minimal smoke. An accelerant may be required to reach the necessary temperatures. Ensure the fire is hot and smoke does not create a nuisance to neighbours or other parties. Do not use tyres as a fuel and do not use the fire to dispose of other wastes not recommended for burning (i.e. rubbish or plastics).

Place the dry fuel at the base of the fire and place the carcasses on top. Use enough fuel to ensure the carcasses are completely burned. Do not overload the fire with carcasses. Burning should begin as early in the day as possible.

Remember that many rural districts are subject to fire restrictions during the summer months and burning may not be an option. When a District Council fire ban or restricted fire season is in force contact your local District Council for information before you light a fire of any sort outdoors.

Air pollution nuisances may result. Most Regional Councils have regulations relating to on-farm burning.

7.2.5 Milk disposal

At certain times of the year, it is possible that milk will have to be disposed of (e.g. if it cannot be sold or collected due to poor weather, industrial action or milk contamination).

Milk spillage and emergency milk disposal is a serious concern as milk has an extremely high BOD₅ and so there is a very high risk of it causing problems if it reaches surface waterways. Milk is approximately 400 times the strength of domestic sewage and 1000 times the strength of treated farm dairy effluent. It can cause oxygen depletion in the waterway, killing aquatic life, and can affect downstream users of the water.

Any person or party responsible for a discharge of milk to a waterway (directly or indirectly) may be liable to prosecution by the Regional Council.

If you need help, contact your Dairy Company, the Regional Council or the Ministry of Agriculture for advice.

The choices of milk disposal include:

- feeding milk to livestock
- land application of diluted milk
- adding the milk to the effluent treatment facility.

Farmers should ensure they have a plan in place and resources available to dispose of milk by the chosen option should the need arise (e.g. pipes or hoses that can connect to the vat outlet and allow drainage to the farm dairy yard or to holding tanks or drums).

7.2.5.1 Feeding milk to livestock

If at all possible, feed the surplus milk to livestock. Nutritionally, milk is low in dry matter content (i.e. approximately 13%), and is high in energy (i.e. 20 to 23 MJME per kg of DM), protein and fat.

Calves can consume between 8 and 12 litres of whole milk per day before weaning. After weaning, up to 4 litres per day can replace 1 kg of concentrate feed. However, the use of milk should be limited to minimise the risk of digestive disorders. It should be introduced to the calves slowly, and be supplemented with digestible fibre-based feed to encourage proper rumen function. Ad-lib access to hay is advisable while milk is being fed.

Dairy cows can be fed up to 10 litres in a day. The milk could be fed via water troughs or spread on silage if it is suitably contained. The milk must be fit for purpose (i.e. must not contain antibiotics).

Milk may also be transported to neighbours with piggeries or commercial calf rearers.

Milk is best fed consistently fresh or consistently sour to dairying stock. Souring in a storage facility can be prevented for up to one week by adding 1 litre of 40% formaldehyde solution (i.e. commercial formalin) to 1000 litres of milk. At this concentration it is safe to feed the milk over the week. Citric acid or acetic acid may also be added to milk to prevent souring. Commercial yoghurt starters can also be used to make a coagulated yoghurt from the milk, and the yoghurt fed to stock. If in any doubt about the feeding of milk to stock, consult a veterinarian.

7.2.5.2 Land application

Milk can be applied directly to land. The following guidelines should be followed when applying milk to land (similar guidelines apply to the disposing of whey or any other liquid dairy products):

- dilute the milk with at least the same volume of water (i.e. 1 : 1 dilution) before applying it directly to land
- dilutions up to 10 : 1 water to milk should be considered to reduce the possibility of odour problems and pasture damage
- do not apply more than 50,000 litres of the diluted milk per hectare to pasture (i.e. 5 litres per square metre of land). Use as much land area as practically possible. If possible use land that can be worked following application
- irrigate onto recently grazed pasture and following irrigation, flush with fresh water to rinse milk residues from foliage.

Do not apply milk to:

- land within 20 m of a drain or waterway
- land close to public areas or neighbours where odour problems may arise
- paddocks which are likely to flood, have steep slopes, are pipe drained or mole ploughed or are frozen hard.

7.2.5.3 Discharge to effluent ponds

Milk can be control-fed into a pond system, though land application is preferable to discharging to a waterway. Properly designed 2-pond systems (adequate size and correct construction) can cope with milk from four consecutive milkings. After this, another option should be used, as additional milk will cause rapid deterioration in the quality of the discharge.

Odour problems may occur 5 days after milk has entered the system. Be aware that a mixture of milk and effluent can give off lethal or explosive gases. Do not mix them in confined spaces or buildings, or enter any enclosed effluent storage facility.

Ideally the treated effluent from the ponds should be spread onto land as soon as possible, (e.g. using a contractor) to reduce any impact on the receiving waterway.

7.2.6 Sewage

Care must be taken when disposing of sewage as it contains heavy metals which can be poisonous to humans, animals, plants and soil micro-organisms if they are present in large concentrations. Sewage can also contain a wide variety of pathogens including bacteria, viruses, fungi and eggs of parasites.

Most houses in rural areas rely on a septic tank system to dispose of household sewage and wastewater.

Food safety regulations require that:

- no discharge from any toilet shall enter the farm dairy effluent system
- no discharge from any toilet shall be spread onto pasture to be grazed by dairy animals or harvested for feed for dairy animals
- there should be no direct access to a toilet from the milking area, milk receiving area, or milk storage area – the toilet should be in a separate room with a ceiling and adequate ventilation
- any toilet with no septic tank should not be within 45 m of the farm dairy or tanker loop or 45 m of the dairy water source, unless it complies with local authority requirements for toilets in a dwelling and/or food premises
- septic tanks should not be sited within 10 m of the milking area, milk receiving area, or milk storage area or within 45 m of the dairy water source

Septic tanks must be properly installed and maintained. Problems can occur with systems which have not been maintained and where drainage fields have become blocked or clogged. Septic tanks must be emptied regularly (at least every 3 years) to remove the build up of solids in the tank. For more information, contact your District Council.

7.2.7 Top tips for waste disposal

- **Wherever possible, minimise waste and reuse resources on the farm.**
- **Do not use empty chemical containers for other purposes.**
- **Where recycling is an option, triple rinse chemical containers into the spray tank first.**
- **Shake the outer plastic wrap from silage bales to remove organic matter before storing to avoid soiling the wrap by trampling or driving over it.**
- **Avoid burning or burying waste on the farm.**
- **Store calf shed sawdust with a cover so it can be used to compost dead stock and offal.**
- **Dispose of milk by feeding to stock where possible. Ensure calves have access to hay or a similar fibrous supplement to avoid scouring.**
- **Take unwanted chemicals to an approved collection facility for disposal.**

7.3 FURTHER READING

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