



EFFECTIVE WASTE MANAGEMENT IN AGRICULTURE

A Guideline for SIZA Members

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TABLE OF CONTENTS

1.	What is waste management?	4
1.1.	Types of Waste:	4
2.	The environmental impact of not managing waste	5
2.1.	Soil Contamination:	5
2.1.1	Reduced Microbial Activity:	5
2.2.	Water Contamination:	6
2.2.1	Runoff and leaching	6
2.2.2	Chemical residues in surface water	6
2.2.3	Groundwater contamination:	6
2.2.4	Surface runoff from storage areas:	7
2.3.	Air Pollution:	7
2.4.	Loss of Biodiversity	8
2.5.	Greenhouse Gas Emissions	8
2.6.	Pest and Disease Proliferation	9
2.7.	Landfill Overload	9
2.8.	Resource Inefficiency:	9
3.	SIZA environmental standard and South African legislation	10
3.1.	Disposal of General Waste to Land	10
3.2.	Recycling	11
3.3.	Chemical Filling and Mixing Points:	11
3.4.	African National Standard 10206 and Chemical Filling Points:	12
	Location:	12
	Floor construction:	12
	Bunding:	12
	Mesh or Stone Covering:	12
	French drains are not accepted:	12
3.5.	Burning Waste:	13
	Materials prohibited from burning include:	13
4.	Waste management systems best practices	14
4.1.	Disposal of Hazardous Waste:	14
4.2.	Alternative Options for French Drains:	15
	Evaporation paddock/pit:	15
	Artificial wetland:	15
	Tank system:	15
4.3.	General Recycling Good Practices	16
4.4.	Recycling on Farms:	16
4.5.	Recycling for Packhouses	16
5.	Creating a waste management plan	17

1. WHAT IS WASTE MANAGEMENT?

Waste management in the context of the agricultural sector is a comprehensive approach aimed at efficiently handling, reducing, and repurposing various types of waste generated throughout farming and processing activities. The agricultural sector produces diverse forms of waste, including crop residue, animal waste, processing by-products, and potentially hazardous waste. Efficient waste management involves implementing specific strategies to minimise the environmental impact of the waste streams while adhering to environmental standards and promoting sustainable practices. By adhering to waste management strategies, the agricultural sector contributes to environmental stewardship and aligns with the broader global agenda of promoting sustainable and responsible resource management within the industry.

1.1. Types of Waste:

Crop waste/residue comprises of non-edible parts of plants left after harvest, including stems, leaves, and agricultural residues. Examples include orchard or vineyard waste, corn stalks, potato vines, and wheat straw.

Packing waste results from activities involved in sorting, cleaning, and packaging agricultural products. Examples include packaging materials like plastic, cardboard, and foam. Other examples include damaged or unsuitable fruits and vegetables.

Animal waste refers to organic matter produced by farm animals, such as manure and bedding materials used in livestock operations. Examples include cow manure, poultry litter, and bedding straw.

Hazardous waste in agriculture includes materials that pose a threat to human health or the environment; thus, hazardous waste is associated with the use of agrochemicals. Examples include chemical containers, used pesticide containers, residues from certain agrochemicals, overflow and agro-chemical spillage at filling points or agro-chemical storage facilities.

General waste refers to waste generated that does not pose an immediate hazard or threat to the environment. This might include waste generated from construction and demolition and the majority of waste classified as non-hazardous waste.



2. THE ENVIRONMENTAL IMPACT OF NOT MANAGING WASTE

The environmental effects of not effectively managing waste in the agricultural sector can be significant and wide-ranging. Failure to implement proper waste management practices can lead to various negative consequences. These environmental consequences include:

2.1. Soil Contamination

Improper disposal of hazardous waste, such as chemical containers, pesticide residues, and industrial pollutants can lead to soil contamination. When these substances are released into soil, they may persist and negatively impact soil health, altering its chemical composition and fertility.

2.1.1 Reduced Microbial Activity

Various hazardous substances have toxic effects on soil microorganisms. Microbes are crucial in maintaining soil structure, nutrient cycling, and overall soil health. Thus, the improper disposal of hazardous waste can disrupt microbial activity, leading to a decline in soil fertility and degradation.

Examples of improper disposal causing soil contamination include:

- Inadequate storage and disposal of pesticide containers can result in leaks or spills, leading to the direct soil contamination.
- Incomplete rinsing of containers can leave behind pesticide residues, which may contaminate the soil when improperly disposed.
- Poorly maintained fuel or oil storage tanks can leak, releasing petroleum-based products into the soil. This can result in long-term contamination and harm soil structure and microbial activity.
- Faulty irrigation systems with leaks can transport contaminated water directly into the soil, introducing pollutants and chemicals.
- Abandoned or neglected machinery and equipment can rust, deteriorate, and release heavy metals and other contaminants into the soil.



2.2. Water Contamination

The improper disposal, storage, or use of hazardous materials such as pesticides, herbicides, chemical fertilisers, and industrial pollutants can lead to water contamination in the following ways:

2.2.1 Runoff and leaching

Leaching is a process in which water, often from irrigation or rainfall, moves through the soil, carrying away dissolved nutrients, minerals, and other substances. Hazardous substances, such as pesticides, herbicides, and chemical fertilisers, are often applied to fields during agricultural activities. The mismanagement of water and waste management can lead to these substances being carried away by runoff or leach into the soil, reaching groundwater and surface water bodies. Runoff and leaching can introduce hazardous chemicals into rivers, lakes, and aquifers, contaminating water. The presence of hazardous chemicals in water can drastically affect aquatic ecosystems and organisms and potentially contaminate drinking water supplies.

For example, runoff can take place due to the following:

- A producer engages in poor waste management practices by allowing unused pesticides and chemical fertiliser to accumulate near the edge of their orchards. During heavy rain, these chemicals are carried away due to runoff into a nearby stream or water source.

For example, leaching can take place due to the following:

- A producer disposes of leftover pesticide containers by burying them in a pit. Over time, rainwater infiltrates the soil, leaching the residues from the buried containers into groundwater and contaminating the soil.

2.2.2 Chemical residues in surface water

Improper disposal or accidental spills of hazardous chemicals, such as pesticides or agricultural chemicals, can directly contaminate nearby surface water bodies. Chemical residues in surface water can drastically affect aquatic life, disrupting ecosystems and biodiversity.

For example:

- A producer employs various pesticides and fertilisers. The farm has numerous water sources such as a dam or a river. Due to the farm not implementing proper protective barriers and buffer zones, the residues from unused pesticides and spilled fertilisers accumulate near orchards or crops posing a risk during heavy rain.

2.2.3 Groundwater contamination

Improper storage or disposal of hazardous waste, including chemical containers and unused pesticides, can lead to groundwater contamination. Groundwater contamination with hazardous substances poses a significant risk to human health if used for drinking or irrigation. It can lead to long-term exposure to toxic chemicals and pose health risks to humans and livestock.

For example:

- A chemical filling point or chemical storeroom on a farm is neglected and there is inadequate maintenance, and spills or leaks occur in either of these two areas. Over time, rainwater or irrigation can move these hazardous substances into the soil. Through leaching, the contaminants reach the ground water.
- Hazardous materials such as chemical containers that aren't disposed of correctly and are thrown into landfills can also leach into the soil and later lead to groundwater contamination.

2.2.4 Surface runoff from storage areas

Storage areas for hazardous materials, such as pesticides and chemical fertilisers, may be vulnerable to runoff during rainfall events. Runoff from these storage areas can contaminate nearby water bodies if not adequately managed. The runoff from storage areas introduces concentrated amounts of hazardous substances into surface water, increasing the risk of acute water pollution and negatively impacting downstream ecosystems.

For example:

- A farm's chemical storeroom or chemical filling point is located on a slope, making it vulnerable to runoff during rainfall events. During heavy rainstorms a poorly designed storage area fails to contain the runoff effectively. The runoff can lead to surface water or ground water contamination as well as soil contamination.

2.3. Air Pollution

Burning of waste, a common practice in some areas lacking proper waste management infrastructure, releases pollutants into the air. This includes particulate matter, carbon monoxide, and volatile organic compounds. The combustion of organic matter also contributes to releasing greenhouse gases, such as carbon dioxide and methane, leading to air quality degradation and climate change.

For example a business cannot burn:

- Chemical cans or any plastics
- Old tyres or rubber
- Pressure treated woods
- Paint cans or materials containing paint



2.4. Loss of Biodiversity

Improper waste management practices can introduce chemical residues and pollutants into ecosystems, negatively impacting biodiversity. Soil-dwelling organisms, insects, and other wildlife can be harmed by these contaminants, disrupting the delicate balance of ecosystems. This can lead to a decline in species diversity, affecting ecosystems' overall health and reliance.

Examples include:

- Rainwater washes away improperly disposed pesticide containers and residue from fields into nearby streams or ponds, introducing chemical contaminants into an aquatic ecosystem.
- Farm waste, including plastic packaging, discarded machinery, and other non-biodegradable materials, is dumped in nearby ecosystems.
- Empty chemical drums are discarded on the farm without proper cleaning or disposal procedures. Residual chemicals leach into the soil, affecting soil-dwelling organisms.



Impact on aquatic ecosystem

2.5. Greenhouse Gas Emissions

Inefficient waste management practices, such as open dumping or improper landfilling of organic waste, contribute to the release of methane. Methane is significantly more effective at trapping heat in the atmosphere than carbon dioxide, significantly contributing to climate change and global warming.

Examples of improper waste disposal causing greenhouse gas emissions include:

- Inefficient landfilling practices involving livestock waste such as manure and bedding materials, can generate methane as well as improper waste management systems for livestock facilities.
- Failure to implement proper composting practices or organic waste generated on the farm can result in the production of methane.
- Burning waste releases carbon dioxide into the atmosphere.



Carbon dioxide release when burning waste

2.6. Pest and Disease Proliferation/Increase

Failure to manage crop residues and waste can create favourable conditions for pests and diseases. Crop residues left in fields can become breeding grounds for harmful organisms, leading to increased pest infestations and disease outbreaks. This can result in a higher reliance on chemical pesticides, further impacting the environment and potentially harming non-target species.

Examples include:

- Leaving crop residues such as stalks and leaves untreated in fields after harvest provides a conducive environment for pests and diseases.
- Failure to properly clean farming equipment such as plows and harvesters, can result in the transportation of pests and pathogens from one field to another.
- Inefficient irrigation practices, such as allowing standing water or not properly maintain irrigation equipment, can create breeding sites for pests.
- Neglecting weed management allows weeds to thrive and create a sheltered environment for pests.

2.7. Landfill Overload

If agricultural waste is disposed of in landfills without proper sorting or recycling, it contributes to landfill overload. Landfills require significant space, and the accumulation of organic waste in landfills produces methane during decomposition. This poses environmental risks and necessitates additional land and waste disposal, leading to increased pressure on available resources.

2.8. Resource Inefficiency

Failing to repurpose or recycle agricultural waste represents a missed opportunity for resource efficiency. Valuable organic matter, such as crop residues and animal manure, can enhance soil fertility through composting. Neglecting these opportunities means losing potential benefits for soil and nutrient cycling, requiring additional inputs to maintain agricultural productivity.

For example:

- Manure from livestock, such as cows, chickens, or pigs, is a valuable source of organic matter. Rather than letting it accumulate in concentrated areas, it can be collected and composted.
- Fruits that are deemed unsuitable for sale due to cosmetic imperfections or over ripeness can be repurposed. Composting these fruits prevents them from going to waste and adds valuable organic matter back to the farm.
- Cover crops, such as legumes, can be planted between fruit tree rows to fix nitrogen in the soil. These cover crops can later be incorporated into the soil as green manure, enhancing soil fertility.



3. SIZA ENVIRONMENTAL STANDARD AND SOUTH AFRICAN LEGISLATION

The SIZA Environmental Standard is built on a foundation of South African legislation – SIZA members are therefore expected to comply with the National Environmental Management: Waste Act (No. 59 of 2008), SANS 10206(2020), Air Quality Act (No. 39 of 2004), NEM:BA – the National Environmental Management: Biodiversity Act 10 of 2004 and the National Water Act (1998). The following segment will provide an overview on the legal requirements of waste management systems according to the mentioned acts and South African legislation.

3.1. Disposal of General Waste to Land

The following actions are defined as listed activities in terms of Government Notice No. 921 that requires a BA process as part of a Waste Management License Application as indicated by NEMA:

- The treatment of general waste using any form of treatment at a facility that has the capacity to process > 10 tonnes but < 100 tonnes of waste.
- The disposal of general waste to land covering an area > 50 m², but < 200 m² and with a total capacity not exceeding 25 000 tonnes.

The disposal of general waste to land is < 50 m², the following requirements must be adhered to ensure good environmental management practices at the waste disposal or storage facility:

- The site should be situated outside a watercourse and above the 1:50 year flood line.
- It should be adequately fenced, locked, and marked with relevant warning signs.
- It should not overlie an area with shallow or emergent water tables.
- The waste should not cause any nuisance conditions.
- It should be located in previously disturbed areas (i.e., virgin soil should not be disturbed to make way for a waste disposal or storage facility).



3.2. Recycling

Recycling is a process of converting waste materials into new products or materials, thereby preventing the disposal of items as waste and reducing the consumption of fresh materials. This environmentally conscious practice involves collecting, sorting, processing, and transporting used materials – such as paper glass, plastic, and metals into secondary raw materials that can be used to manufacture new products. Thus, the primary goals of recycling are to conserve resources, reduce energy consumption, minimise environmental impact, and promote sustainability by extending the life cycle of materials. According to the SIZA Environmental Standard principle code 3.4 and NEM:WA Waste Act 59 of 2008, waste streams should be monitored and be in line with the reduce, reuse, recycle best practices. In accordance with this, the following is also required:

- There is recordkeeping in place to identify and measure all waste streams (including what is recycled).
- There is a document or visual evidence of recycling in place (e.g., bins for the collection of paper/cartons, plastic, glass, metal, oil, and organic waste). Where applicable, organic waste is composted and processed for further use.
- Storage facilities for waste are in line with legal requirements.
- Where service providers are used for the management and/or removal of waste (e.g., used oil, plastic, empty chemical containers, and sewage), management should ensure that waste is disposed of in a safe manner that does not pose a risk to the environment.
- The site is kept clean and free of waste accumulation outside of designated storage and disposal sites.
- There is evidence of a reuse and recycling system in place that is annually reviewed and improved upon.
- In terms of waste disposal and management, make sure to contact your local municipality, consultants and service providers.



3.3. Chemical Filling and Mixing Points

Chemical filling points on farms are locations where agricultural chemicals, such as fertilisers, pesticides, and herbicides, are stored and transferred into application equipment for use on crops. Chemical filling points on farms have a crucial role in the agricultural workflow. Still, it is essential that they comply with environmental standards and regulations to minimise the potential impact on the environment and human health. South African National Standards (SANS) 10206:2020 sets out the guidelines for constructing filling points at the farm level. It is stated that filling points should be well away from any water sources and that the run-off or spillage of pesticides is not allowed to come in contact with surrounding soil and water resources. As many businesses might have a French Drain system in place, or used to have such a system, one should move towards adopting an alternative to ensure less chemical exposure to the natural environment. Alternatives to French Drains are discussed under section 4.2. of this guideline.

3.4. African National Standard 10206 and Chemical Filling Points African National Standard 10206 and Chemical Filling Points

Adherence to the guidelines as detailed in SANS 10206:2010 is a minimum requirement:

Location:

Filling points should be situated at least 32 meters away from any water sources, and not overlie any shallow underground water reservoirs to prevent contamination. This helps to minimise the risk of pesticides entering water bodies.

Floor construction:

Filling points must have a floor made of non-porous material, such as waterproof cement or concrete; the surface of the filling point should be free from cracks. This design helps prevent the penetration of pesticides into the ground and minimises the risk of soil contamination.

Bunding:

The floor should be banded by a retaining wall. Bunding is a containment measure that helps capture and contain spills or runoff, preventing them from reaching and polluting the surrounding environment.

Mesh or Stone Covering:

The retaining wall should be covered by wire mesh or filled with stones. This additional layer of protection prevents animals and birds from accessing the water in the banded area, the risk of contamination. The mesh or stone covering is applicable when an evaporation paddock/pit is used.

French drains are not accepted:

French drain systems (also sometimes referred to as soakaway systems) consist of underground perforated pipes surrounded by gravel, which assist in the distribution and percolation of liquids into soil across a chosen area. The use of French drain systems according to SANS 10206 is not permitted as French drains in the context of chemical filling points causes hazardous substances to leach into soil and water bodies having contamination effects on soil and water which damages and contaminates the environment.



3.5. Burning Waste

Improper waste disposal practices on farms can have far-reaching implications, posing risks to both the environment and agricultural operations. In particular, the improper burning of waste not only contributes to air pollution but can also result in hazardous consequences if not managed appropriately. Regarding the burning of waste, this must be conducted with a designated incinerator. Before the incineration of construction of the incinerator, a preliminary assessment must be conducted. In addition, the incineration of general waste exceeding 10 kg per diem qualifies as a designated activity under the National Environmental Management: Air Quality Act 39 of 2004 (NEM: AQA).

Consequently, formal authorisation is needed from DWS in accordance with stipulations of the aforementioned legislative framework. The process and application form is available on the following link ([Process and application form](#)).

Materials prohibited from burning include:

- | | |
|------------------------|---|
| Hazardous Waste: | Materials containing toxic substances, chemicals, heavy metals, or hazardous materials are prohibited from being burnt due to the potential for air and soil pollution. |
| Plastics: | Burning plastics releases harmful chemicals and pollutants into the air, and it is generally discouraged. Many plastics also include toxic fumes when burnt. |
| Rubber: | Burning rubber, such as tires, can release toxic compounds into the air, posing environmental and health risks. |
| Paints and Solvents: | Materials containing paints, solvents, and other volatile organic compounds can release harmful emissions when burnt. |
| Pressure-treated wood: | Wood that has been treated with preservatives, especially those containing arsenic or chromium, should not be burnt due to the release of toxic substances. |



4. WASTE MANAGEMENT SYSTEMS BEST PRACTICES

4.1. Disposal of Hazardous Waste

Effective management and disposal of hazardous waste on farms are critical for environmental protection and human health. Producers should follow best practices and comply with relevant regulations to ensure the safe handling and disposal of hazardous waste. Handling waste includes applying the following:

Identification of Hazardous Waste:

Identify and categorise materials as hazardous waste based on national regulations.

Inventory and recordkeeping:

Maintain an inventory of hazardous materials used on the farm. Keep detailed records of the types and quantities of hazardous substances.

Separation and storage:

Empty chemical containers must be triple-rinsed with water and then shattered, punctured, or rendered as unserviceable to prevent reuse before being disposed of. Hazardous waste must be stored in a designated area away from water sources, livestock, and crops, access must be restricted, and signage should be visible at all times.

Use alternatives:

Explore and implement alternative products or practices that are non-hazardous. Integrated pest management (IPM) techniques, for example, can help reliance on chemical pesticides.

Recycling and reuses:

Investigate options for recycling or reusing hazardous materials. Some agricultural chemicals can be recycled or returned to manufacturers through take-back programmes.

Contract with certified disposal service providers:

Establish contracts with certified hazardous waste disposal services. These service providers have the expertise and equipment to handle and dispose of hazardous materials in compliance with legal regulations. Producers can contact service providers in the area or contact their local municipality to set up a formal arrangement and contract for the disposal of hazardous waste.

Education and outreach:

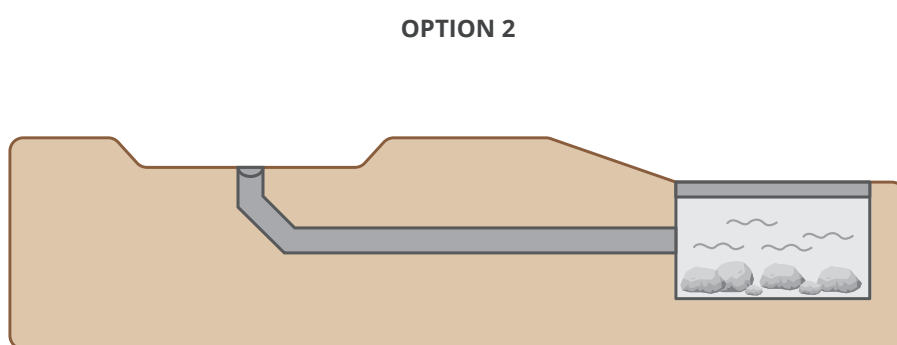
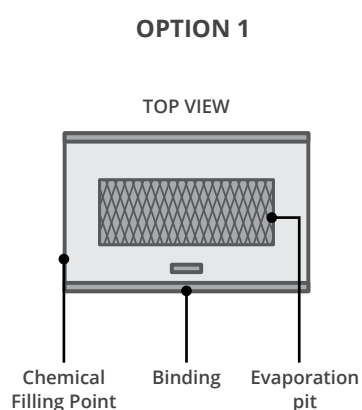
Educate farm workers and the local community about the importance of responsible management of waste. Producers can liaise with local organisations, NGO's, municipalities on collaborative efforts such as Green Earth day, awareness campaigns on safe disposal of hazardous waste.



4.2. Alternative Options for French Drains

Evaporation paddock/pit:

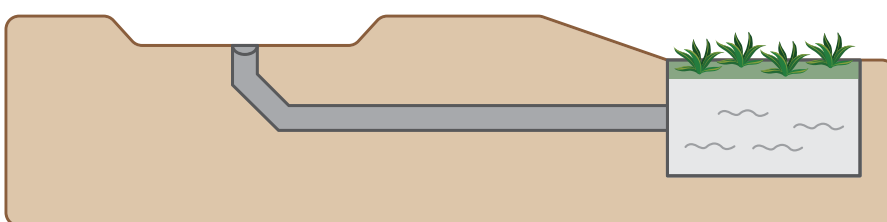
The construction of an evaporation paddock includes that the filling points must have a floor of non-porous material (waterproof cement or concrete) that is bunded. The sole purpose of this is to ensure that potentially contaminated run-off water does not contaminate the surrounding environment and evaporates as a means of disposal. The evaporation paddock/pit can either be filled with stones or covered by a metal grid to prevent animals or birds from drinking the contaminated water.



Artificial wetland:

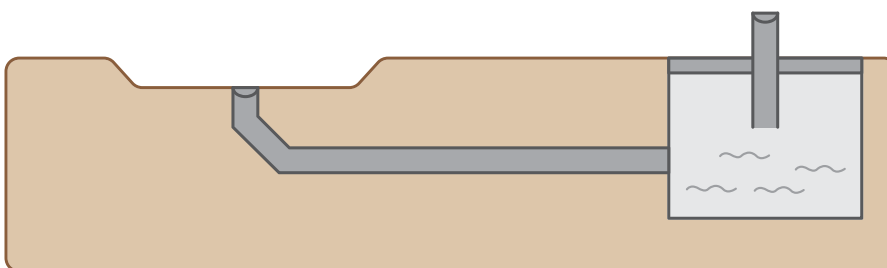
An artificial wetland is a human-engineered or constructed ecosystem that replicates the hydrological, ecological, and biological characteristics of natural wetlands. An artificial wetland can be used for water treatment, habitat restoration, or environmental conservation. An artificial wetland typically consists of carefully selected vegetation, substrate, and water flow management systems.

A constructed artificial wetland aims to mimic the functions of natural wetlands by providing a habitat for pollutants, nutrients, and sediments from water through natural processes. The implementation of an artificial wetland can assist with sustainable water management and wastewater treatment.



Tank system:

The French drain system can be redesigned, and a tank system can be installed to contain hazardous water from filling points; however, an accredited hazardous waste disposal company should remove the contents of the tank for proper disposal.



4.3. General Recycling Good Practices

General recycling practices include the following per material:

Paper and cardboard:	Flatten cardboard boxes, remove any plastic or non-paper materials, and avoid soiled or contaminated paper.
Plastics:	Rinse containers to remove any residues and remove all caps and lids.
Glass:	Rinse glass containers, remove caps and lids, and separate colours (clear, green, and brown).
Metal:	Rinse to remove any residue and remove labels and lids.
Cartons:	Flatten seed bags and fertiliser containers to save space. Remove any additional packaging materials before recycling.
Electronics and E-waste:	Do not dispose of electronics as general waste. Check for recycling programmes or service providers.
Batteries:	Do not discard batteries as general waste.

4.4. Recycling on Farms

Organic waste: Farms generate organic waste, such as crop residues, spoiled produce, and manure. Recycling on farm level would mean composting these materials to create nutrient-rich compost, which can be used as a natural fertiliser to enhance soil quality and fertility.

Water recycling: Water is a precious resource on farms. Recycling water through systems like drip irrigation, rainwater harvesting, and water treatment can help optimise water usage and reduce the environmental impact of irrigation practices.

General recycling: Farms often use products that come in plastic containers; implementing plastic recycling programmes helps reduce the accumulation of plastic waste on farms. Plastic materials can be collected, sorted, and sent to recycling facilities for processing. This applies for all other materials used on farm level such as paper, glass, and metals as well.

4.5. Recycling for Packhouses

Packaging materials: Packhouses deal with various packing materials, including cardboard, plastic, and paper. Recycling initiatives involve proper sorting and disposal of packaging waste.

Efficient sorting systems: Implementing efficient sorting systems within packhouses helps segregate different types of waste, making it easier to identify recyclable materials. This streamlines the recycling process and reduces contamination of recyclables.

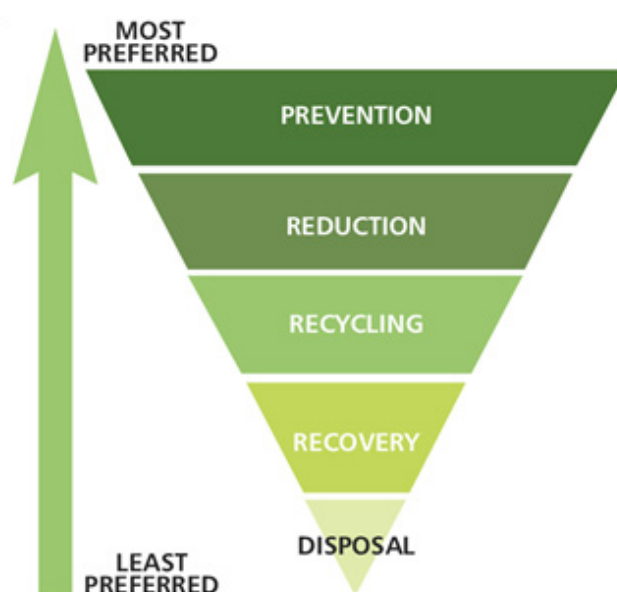
Reducing single use packaging: Packhouses can explore alternatives to single use packaging, such as reusable containers or biodegradable materials. This approach minimises the overall environmental impact and encourages a shift towards more sustainable packaging solutions.



5. CREATING A WASTE MANAGEMENT PLAN

The irresponsible disposal and management of waste can have severe impacts on the environment. As a minimum requirement, management should draft a waste management plan that includes the identification of all waste streams and types on the property (e.g., reusable, recyclable, general, and hazardous waste), as well as how each waste type is managed. All activities as set out in the waste management plan must comply with the regulations as set out in part 2 – part 6 of the National Environmental Management: Waste Act 59 of 2008 (NEM: WA) and address all associated risks as per the site's integrated risk assessments. SIZA has created a Waste Management Plan template which is available to all SIZA members by clicking on the "Member Resources" heading in the main menu of their MySIZA profile.

As waste production and the management thereof form part of a business's key performance indicators (KPIs), it is essential that its waste footprint is monitored using metric data. Management should implement a recordkeeping system, such as the SIZA Digital Recordkeeping Programme or similar, to quantify the business's waste production and the effectiveness of current reduce, reuse, and recycling practices. Not only will this provide management with a better understanding of the site's waste footprint, but it will also positively contribute to reducing its carbon emissions. Realistic waste reduction targets should be incorporated as part of the waste management plan and reviewed on an annual basis to monitor progress and to drive improvement. Waste produced should be measured in kg or tonne where possible. If not feasible, another practical unit of measurement can be used for monitoring purposes.



As a general principle, solid waste should be managed in accordance with the waste management hierarchy (Figure 1), where the reduction and reuse of waste is the most favoured option, followed by recycling and with the disposal of waste being the least favoured option.

Where feasible, used oil should be responsibly recycled using ROSE Foundation ([Recycling Oil Saves the Environment](#)) accredited collector and processors. Waste disposal should feed into a Circular Economy approach which assesses the potential value of waste sourced from one process that can be used as an input into another industry/activity. This ensures better waste quality and potential value as an input to another industry. The Circular Economy approach encourages a lifecycle perspective for resource use. In order to provide proof of recordkeeping and to monitor the site's waste, it is recommended that management make use of the SIZA Digital Recordkeeping Programme or any other tool that allows management to monitor their waste production monthly and compare it on an annual basis. In addition, the data should be used to interpret the effectiveness of current waste management practices and progress made towards reducing waste going to landfill.

For further guidance on the development of a waste management plan, see the developed waste management plan under member resources on your MySIZA homepage.