
# ONE HEALTH ILLUSTRATION MANUAL

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CABI

# ONE HEALTH

## ILLUSTRATION MANUAL

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# Message from CABI

CAB International (CABI) is delighted to introduce this One Health Manual which aims to share knowledge and raise awareness amongst extension workers, smallholder farmers and consumers on good farming practices in order to prevent interrelated health problems affecting humans, livestock, crops and the environment (One Health). The manual was co-created by a multi-disciplinary team in line with a One Health approach, which requires cross-sectoral collaboration. It provides information on how to prevent health risks in five key areas:

- misuse of pesticides in crop production
- misuse of veterinary drugs in animal production
- aflatoxin contamination in human foods and livestock feed
- spread of zoonotic diseases
- environmental degradation

These risks were prioritized by communities and government officials from Baringo, Trans Nzoia and Elgeyo Marakwet counties, based on animal and crop production practices reported at joint crop–livestock and One Health advisory clinics.

The manual is an output of a project titled *Joint crop-animal services for smallholder farmers in East Africa: Exploring One Health benefits, operations, and lessons for scaling out.* The project aimed to enable smallholder farmers in Kenya and Uganda to address major interrelated health and production problems affecting crops, animals, people, and the environment (One Health issues) - in an integrated way.

We acknowledge and extend our gratitude to Biovision Foundation and Welttierschutzstiftung (WTS) for funding this project, which was implemented by CABI together with the county governments of Baringo, Elgeyo Marakwet and Trans Nzoia. We extend our sincere gratitude to Heads of Departments for Agriculture, Livestock Production, Veterinary, Public Health, Environment, subject matter specialists and field staff, whose commitment and contributions enabled the successful production of this manual.

A concerted multi-sectoral approach that is entrenched in local government mechanisms, such as, county One Health Units, animal welfare policies and standard operating procedures, will be necessary for resource allocation for, and sustainability of, a One Health approach. CABI will continue to engage and forster collaboration to strengthen these mechanisms.

CABI, as a global, intergovernmental, not-for-profit organization, whose mission is to improve people's lives worldwide by providing information and applying scientific expertise to solve problems in agriculture and the environment, is committed to continue promoting One Health approach, which we define as:

"Any added value in terms of human, animal, plant and environmental health, sustainability, financial savings, and social resilience, achievable by the cooperation of the human, veterinary, plant, environmental and social sciences when compared to the disciplines working independently."

CABI is also committed to continuing to promote its One Health Knowledge Bank https://www.cabidigitallibrary.org/product/1k/about, which brings together dispersed One Health information and transdisciplinary knowledge on the interconnections between humans, animals, plants and ecosystems, and their shared environment.

Together we can apply a One Health approach, for a healthier and safer world!

# Stakeholders' message

The One Health approach is relevant to counties in Kenya, as human, animal and ecosystem health are closely interconnected. Zoonotic diseases, antimicrobial resistance, food safety, and ecosystem health are critical concerns that require integrated solutions.

This One Health Manual is a vital tool to support promotion of the well-being of our people and animals, and the environment. It is a significant milestone in our commitment to a holistic approach to One Health, and it provides a framework for cross-sectoral collaboration, offering guidelines and best practices related to the One Health concept.

This comprehensive manual will play a critical role in guiding crop advisory workers, public health professionals, veterinarians, environmentalists, and communities in preventing and managing zoonotic diseases, improving food and feed safety for human and livestock health, and promoting sustainable environmental practices. By integrating knowledge and strategies from multiple sectors, this manual will support enhanced disease surveillance, response mechanisms, and overall public health outcomes in Kenyan counties.

As we implement the practices recommended in the One Health Manual, we call upon all relevant stakeholders to work together to ensure its effective use. Together, we can build healthier, more resilient counties for present and future generations.

# List of contributors

The following organizations were represented by the directors and One Health related subject matter specialists in the development of this manual:

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# Chapter 1

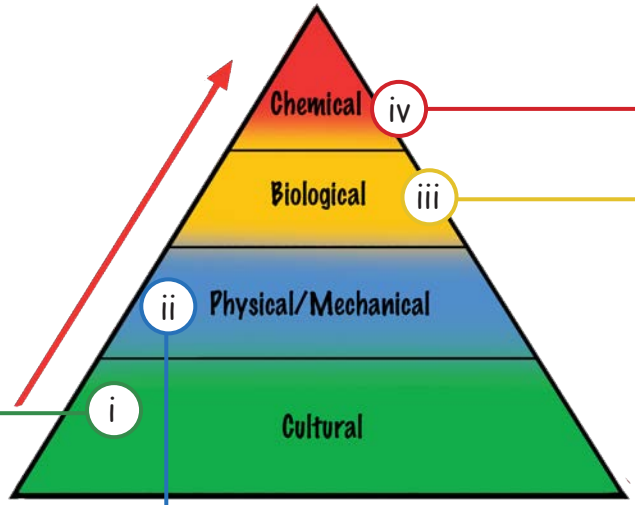
## MISUSE OF PESTICIDES IN CROP PRODUCTION

Pesticide misuse occurs in many forms including not following spraying instructions, using unregistered chemicals, not using protective clothing, not observing the required time period between spraying and harvesting produce. All of which are common practices amongst farmers. When used incorrectly, pesticides pose health risks to humans, animals and the environment, and cause economic losses. Increasing farmers' awareness and knowledge on the safe use of pesticides, and how to access lower-risk pest control products, is critical for applying a One Health approach. The following practices for reducing pesticide risks are covered in this chapter:

- Integrated pest management (IPM), including good agricultural practices such as scouting and cultural methods
- Using lower-risk products, including biological control agents and biopesticides
- Using approved pesticides
- Proper pesticides handling
- Protecting water sources
- Disposal of pesticide containers
- Pre-harvest intervals

# Integrated Pest Management (IPM)

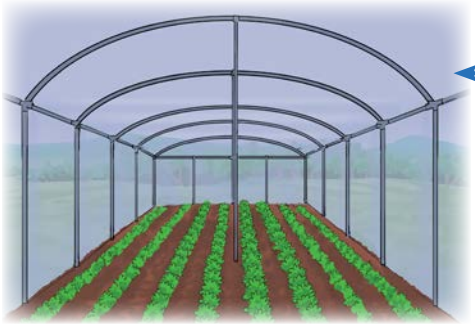
i) Cultural control, such as weeding





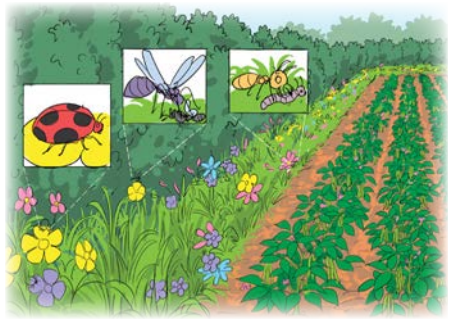
iv) Chemical control

(Use chemical control as a last resort)



ii) Physical control

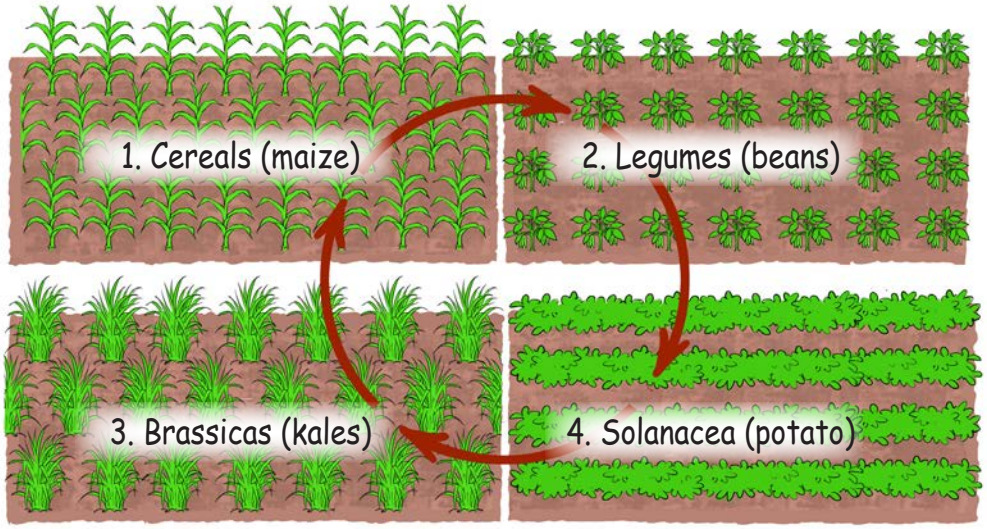
Use IPM to minimize use of pesticides. Use cultural or mechanical control, biological control, scouting (checking the crop for pests regularly so any control can take place early) and practices such as push-pull technology



iii) Biological control

## Crop pest resistance

**To enhance crop pest resistance, apply the following IPM strategies:**




i) Rotate/alternate crops of different families, which are less likely to share the same pest

ii) Plant early to ensure the crop escapes high pest population

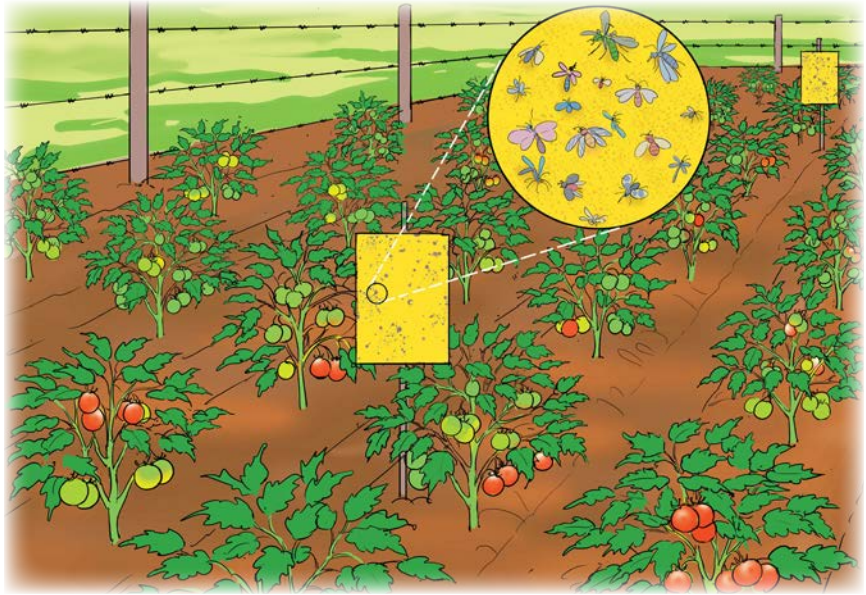
iii) Ensure timely and proper weeding

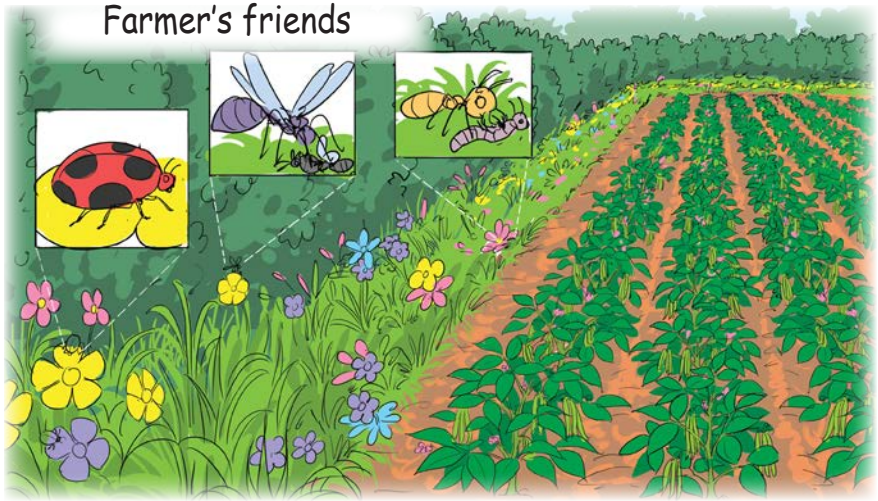
iv) Ensure proper crop nutrition by applying recommended fertilizer and manure rates

v) Regularly monitor the field for pests to ensure timely control

vi) Use certified seed and clean planting materials

# Using lower-risk products: physical control, biological agents and biopesticides






**Physical/mechanical control**

i) Use insect traps and/or physical barriers (screen nets, greenhouses)
ii) Soil solarization: wet soil, cover with translucent polythene for two to six weeks before planting (especially used for nursery/ greenhouse to control soil-borne pests)

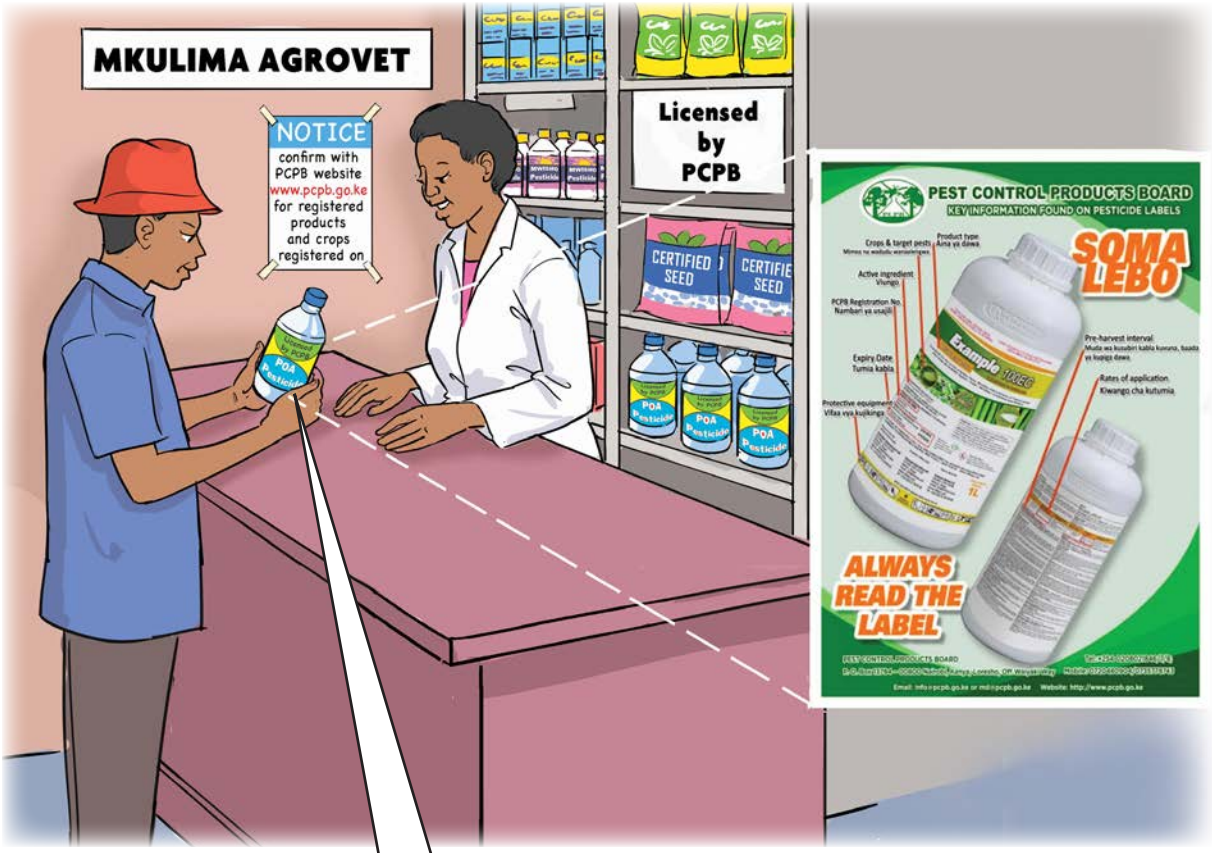
**Biological control**

i) Preserve natural enemies on the farm (such as ladybird beetles, parasitic wasps, predatory mites) by planting live fences, leaving grass strips/flower strips on the farm, like kikuyu grass, guatemala grass, napier grass, alfalfa, among others
ii) Use bio pesticides to control pest populations. Consult your extension worker on the specific product to use on a specific crop, or consult the CABI Bio-protection Portal https://www.bioprotectionportal.com

**Use of botanicals**

i) Use plant extracts like neem and plant teas to control pest populations such as African armyworm, African bollworm, Aphids, Banana weevil as instructed by your extension officer

# Approved pesticides




i) Purchase pest products from registered stockists only

ii) Use products that are registered by the Pest Control Products Board (PCPB)

iii) Report the presence of unregistered products to your nearest agricultural officer

iv) Do not use banned pesticides

v) Consult your nearest plant clinic for advice

**Confirm if products are registered for specific crops or contain banned pesticides by calling (PCPB) on 0720 480 904**

## Proper pesticide handling


i) Use personal protective equipment while handling pesticides

ii) The application of pesticides should be done by trained persons, such as Spray Service Providers (SSP)

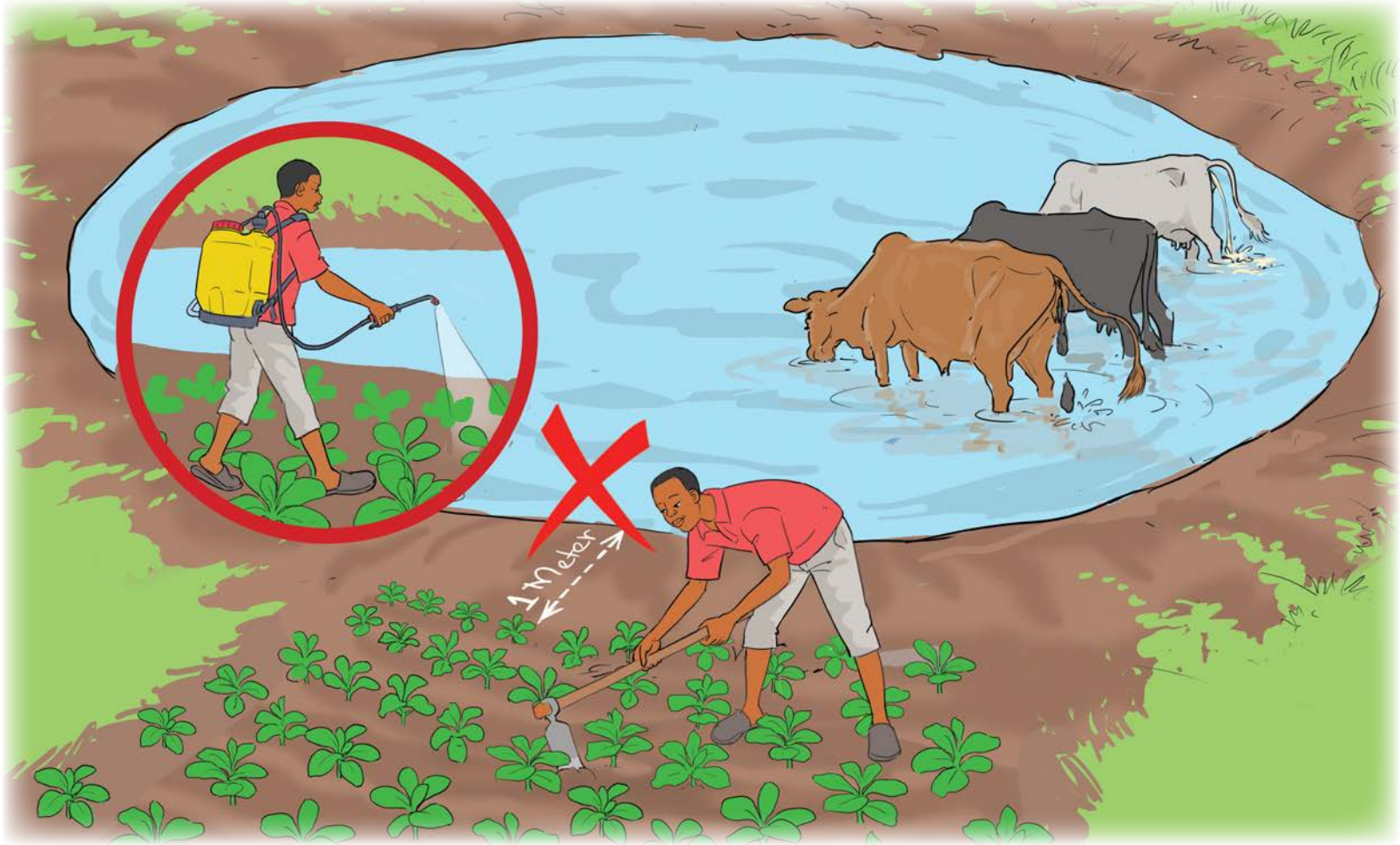
iii) Spray only when the risk of losing the crop is high, which can determined through proper scouting

iv) Poor pesticide handling can be harmful to humans, animals, plants and the environment

v) Only use products that are registered for the specific crop and pest by PCPB


vi) Make adjustments to the spray equipment (calibrate) and read the label to ensure you apply the required rates (this will ensure you use chemicals effectively and economically, avoiding wastage)

vii) Do not spray on a windy and rainy day. Wind and rain (run-off) can disperse pesticides to neighbouring places, causing a health risk to humans, animals and the environment




viii) Farm at least 30 meters from the watering point to avoid water contamination (siltation and chemicals) that will affect aquatic life and affect users downstream

## Protecting water sources

i) Wash pumps used in spraying pesticide in designated and controlled places, such as soak pits. Farmers are encouraged to make shallow soak pits on their farm, far away from water sources, which they can also empty of any pesticide remnants

ii) Always wear protective clothing when cleaning spraying tools, such as gloves and gumboots

iii) Do not clean personal protective equipments near water sources

# Disposal of pesticide containers


i) Do not use pesticide containers for other purposes (e.g. carrying milk, drinking water etc.)

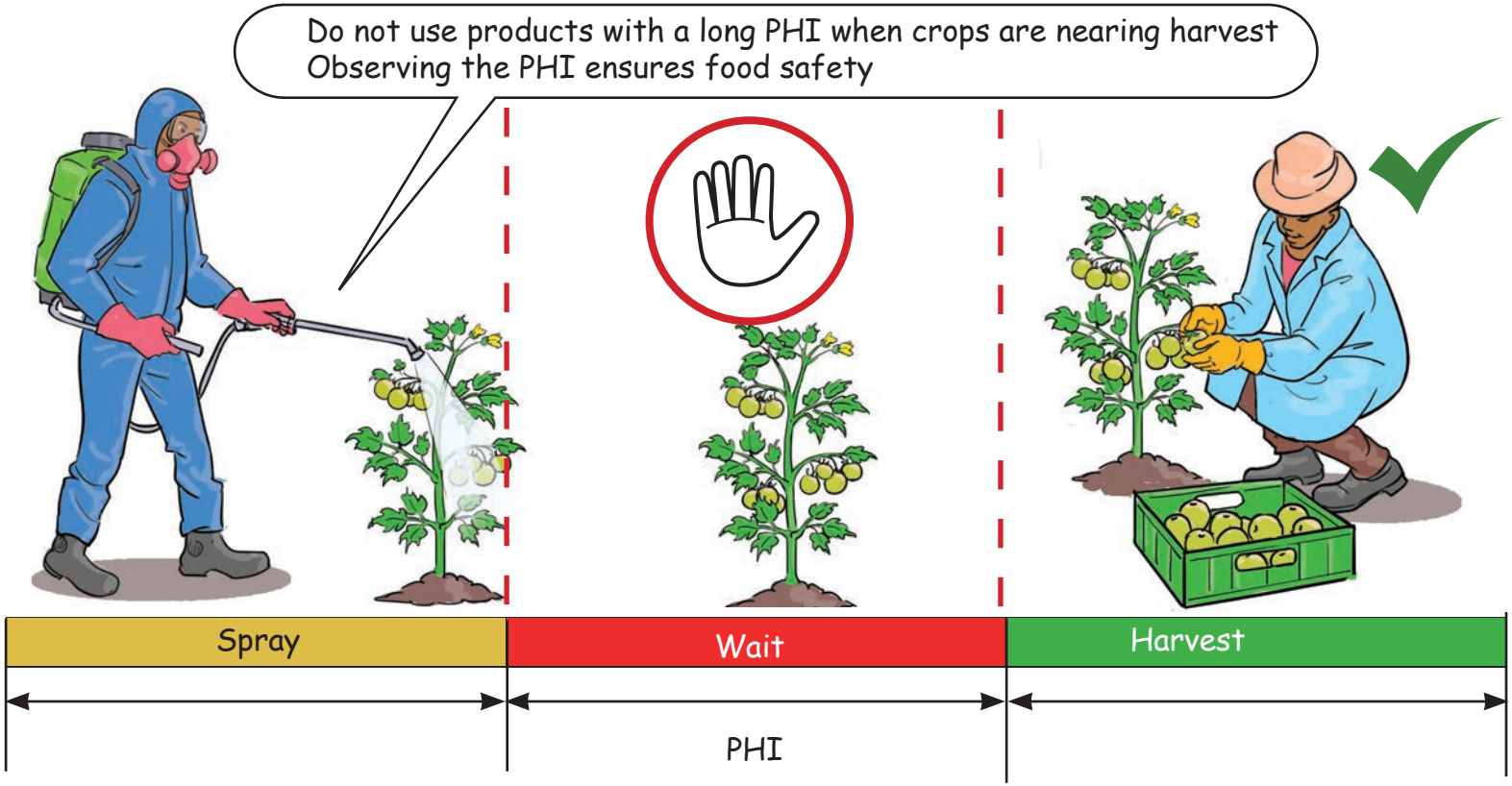
- Triple rinse
- Puncture
- Dispose


ii) Triple rinse the empty pesticide container and empty the water into the spraying mixture

iii) Puncture the container and dispose of it in a designated place for collection and recycling as instructed by the product label or use the disposal services provided by SSPs

iv) Do not burn or bury empty chemical containers or throw them in a pit latrine

# Pre-harvest interval (PHI) in crops




(i) Always read the label instructions to know the PHI

(ii) Do not harvest crops before the PHI lapses to ensure safe food

(iii) The time indicated on the label has been tested to minimize pesticide residue

# Chapter 2

## MISUSE OF VETERINARY DRUGS IN LIVESTOCK PRODUCTION

The misuse of veterinary drugs, particularly antibiotics, is a common problem in livestock production. This misuse may take the form of using drugs such as antibiotics as a preventive measure (prophylactic use), using the wrong drugs to treat an ailment, applying an incorrect quantity of a drug, and not observing the waiting period between treatment and consumption of livestock products. These practices lead to disease-causing germs and micro-organisms, such as fungi and bacteria, becoming used to drugs and at times evolving so that they are resistant to them. This is referred to as antimicrobial resistance (AMR). When disease causing micro-organisms become resistant to drugs, it makes it harder to treat illnesses in both livestock and humans. This not only increases the cost of treatment but at worst may lead to loss of life.

Following recommended practices in the following areas can reduce the risks associated with the misuse of veterinary drugs and ensure good animal welfare:

- Emerging pests and livestock diseases
- Animal husbandry practices
- Milk handling/hygiene
- Proper treatment and use of veterinary drugs
- Antimicrobial resistance
- Withdrawal periods in animal treatment

## Emerging pests and livestock diseases

**Disease spread can be curbed through early detection and intervention by the vet department, by doing the following:**


i) Consult a veterinary officer to attend to any sick animal

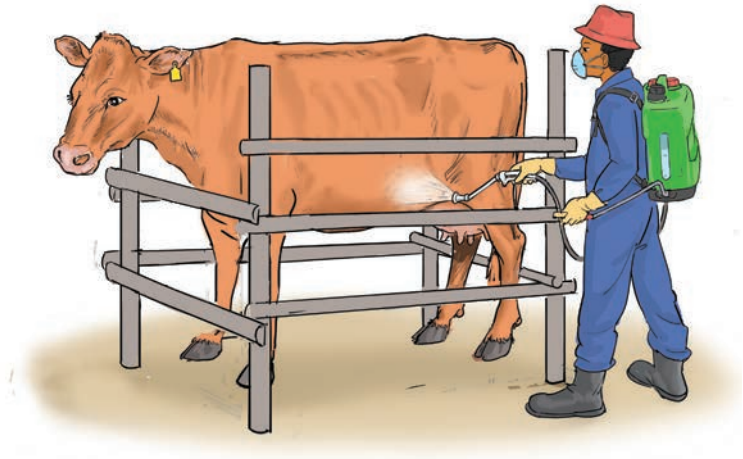
ii) Notify the authorities of any unusual animal diseases

## Animal husbandry practices

**Do the following to improve animal welfare ensuring your animals are healthy and not stressed (stress reduces their immunity, making them prone to diseases):**


i) Seek technical advice from extension staff on proper and effective livestock management

ii) Adhere to the recommended feeding programme to keep animals healthy reducing disease incidence and the need for antibiotics

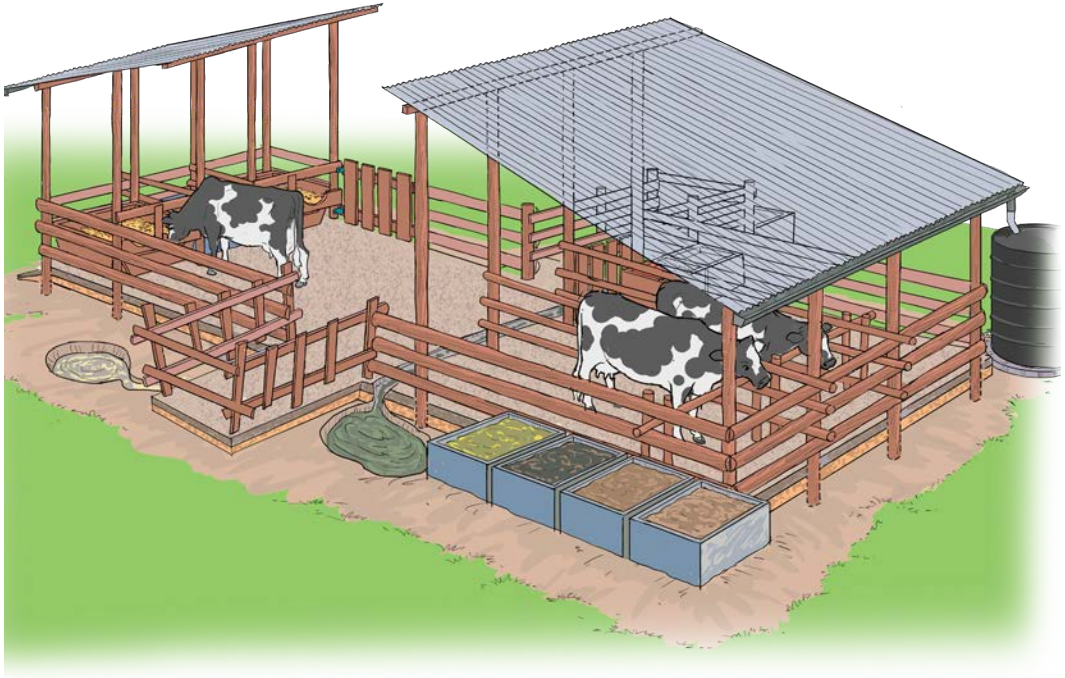


iii) Do not use the same pump you use for pesticide application to spray your animal as pesticide residue can harm your animals

iv) Control parasites as recommended by an extension officer to minimise disease incidence and hence reduce use of veterinary drugs, such as antibiotics and acaricides (drugs that kill ticks)

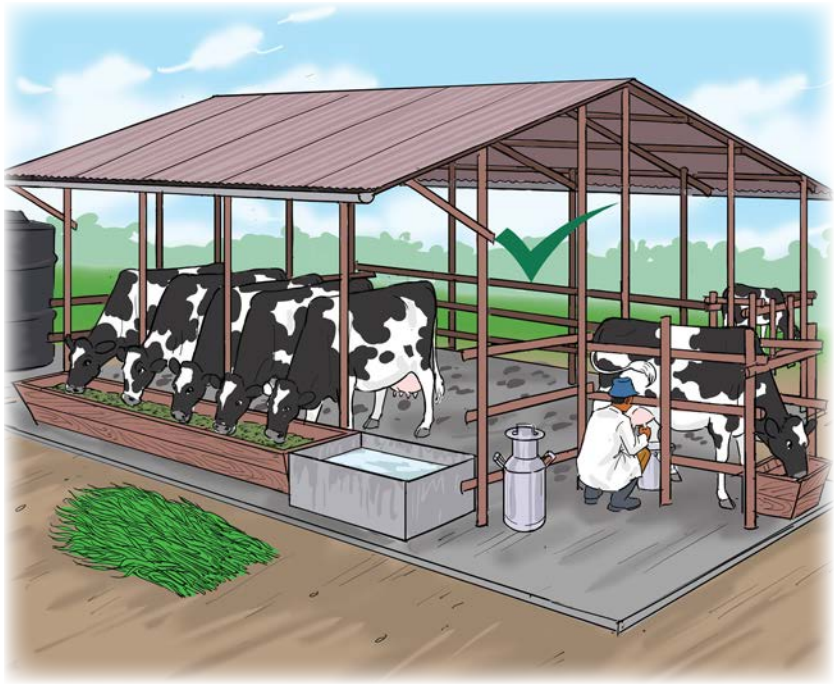
v) Avoid overuse of veterinary drugs, which increases the chances of the parasite, bacteria, fungus etc. becoming resistant to the drugs making infections more difficult and expensive to treat

vi) Carry out routine vaccinations to minimise disease incidence thereby reducing antibiotics use



vii) Ensure clean and proper housing is in place to protect animals from harsh environmental conditions and minimize exposure to infections, thereby reducing the cost of treatment and the use of antibiotics

viii) Clean zero grazing units and direct the waste to a collection pit for biodegradation before on-farm utilization to prevent buildup of disease-causing bacteria and parasites, therefore minimizing diseases. This prevents overuse of antibiotics that could lead antimicrobial resistance



ix) Construct a well-designed milking shed, with a well drained floor, which is well lit and ventilated, easy to clean, and free from dust, flies, rodents and vermins

x) Use suitable milking cans, and wash them with hot water and soap after use. Sun-dry cans on raised dish racks

## Milk handling/hygiene

**To avoid milk contamination and reduce disease incidence:**

i) Feed animals with good quality feed to maintain good health: quality feed contains nutrients and is free of mold and poisonous ingredients such as pesticides; seek further advice from your livestock officer

ii) Test for mastitis regularly before milking using California Mastitis Test (CMT) or with a strip cup (consult a veterinary officer)

iii) Ensure the milking environment is clean

iv) Ensure those who carry out milking are clean and healthy

v) Use clean and recommended stainless steel or aluminium milking utensils

vi) Store and transport milk in a hygienic manner using recommended containers and within the shortest time possible

## Proper treatment and use of veterinary drugs

**To avoid using the wrong drugs and to safeguard livestock and human health:**

i) Do not treat your livestock on your own

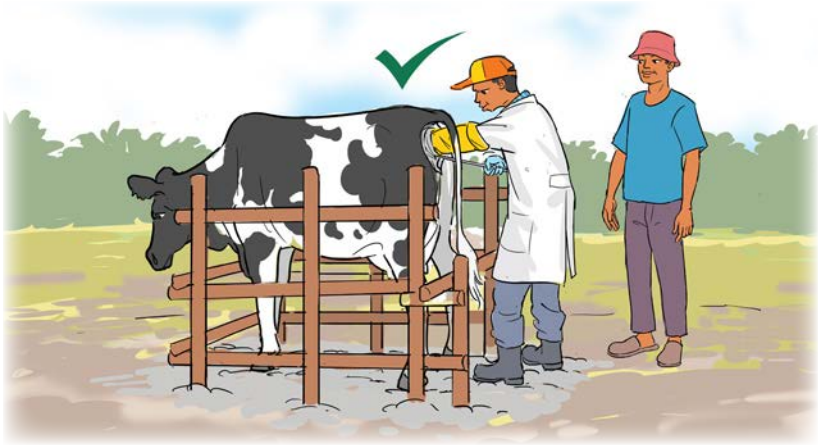
ii) Consult a vet on all issues to do with treatments

iii) Remember that the incorrect use of antibiotics can lead to antimicrobial resistance

## Antimicrobial resistance

Antimicrobial resistance refers to the resistance of bacteria in the bodies of human and animals to antibiotics. It makes infections more difficult and expensive to treat.

**To safeguard human health and prevent antimicrobial resistance:**



i) Consult an animal health expert if an animal becomes sick

ii) Make sure the recommended antibiotic type, dosage and duration of treatment is applied

iii) Observe the withdrawal period, which is the time between the treatment of an animal and when you consume its products, as recommended by the veterinary officer


iv) Do not treat sick livestock on your own

# Withdrawal periods in animal treatment

Day 1 → Day 2-4 → Use or Sell after Day 5

Observe the correct withdrawal period (the time between the treatment of an animal and when both humans and calves can consume its products) recommended by the veterinary officer, to ensure animal products do not contain residues of medicines at levels that could negatively affect both human and calf health

# Chapter 3

## AFLATOXIN CONTAMINATION

Aflatoxins are poisons produced by a specific mold (fungus) that are toxic to humans and animals. The fungus can be found in some soils and can also grow on food like maize, groundnuts and other grain products used as food and livestock feed. These can be contaminated at the production or post-harvest stage if they are not dried or stored properly. When consumed in large amounts or in small quantities over time, aflatoxins can cause cancer, decrease the body's immunity, retard growth and cause liver damage or even death. Aflatoxins in livestock feed can accumulate in products such as meat, milk, and eggs, which can then be passed on to the humans who consume them.

This chapter provides information on practices farmers and consumers can apply to reduce the risks of aflatoxins:

- Soil treatment with Aflasafe
- Good post-harvest practices
- Quality and safety of feed

## Soil treatment with Aflasafe


i) If your field has a history of aflatoxin contaminated harvests, consult your extension officer on whether you need to get your soil tested to check for the presence of fungi that produce aflatoxins

ii) When required and in consultation with your extension officer, apply Aflasafe (a natural product for controlling fungus that produces aflatoxin) to your soil two to three weeks before flowering or at the seventh leaf stage by broadcasting at a rate of 4kg per acre

iii) Consult your extension officer on how to manage crop residues and improve field hygiene in order to reduce the risk of aflatoxin contamination in your farm

iv) Manage insect pests in the field to avoid predisposing crops in the field to aflatoxins: damage through holes drilled by pests allow fungi to invade seeds in the field

v) Seek advice from your extension officer or the Kenya Agriculture and Livestock Research Organization (KALRO) on where to buy Aflasafe

## Good pre and post-harvest practices

Improper field and post-harvest handling of maize, sorghum and groundnuts, predisposes the harvest to aflatoxins

**Do the following to avoid aflatoxin contamination:**

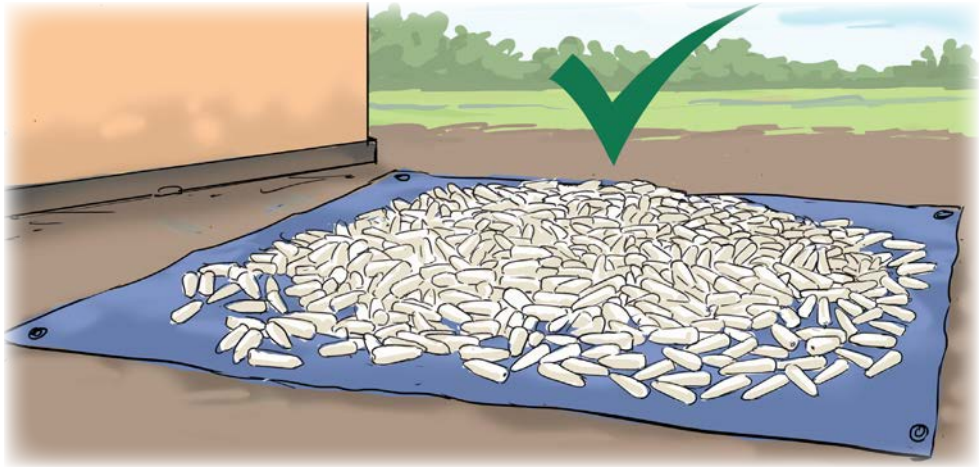
i) Harvest the crop as soon as it is ready to avoid shattering pods and husks, insect damage and being rained on all of which predispose the harvest to contamination with the fungus that produces aflatoxin

ii) During harvesting, separate damaged maize from clean maize (this also applies to any other harvested grain)

iii) At harvest, do not place the produce on the ground: the fungi that cause aflatoxin reside in the soil and the soil can be a source of contamination

iv) Avoid methods that split grains during harvesting/shelling, such as threshing, as they predispose the grain to aflatoxin contamination

v) Avoid wetting/soaking of harvested produce with water before and after shelling as storing moist grains can increase the likelihood of aflatoxin contamination

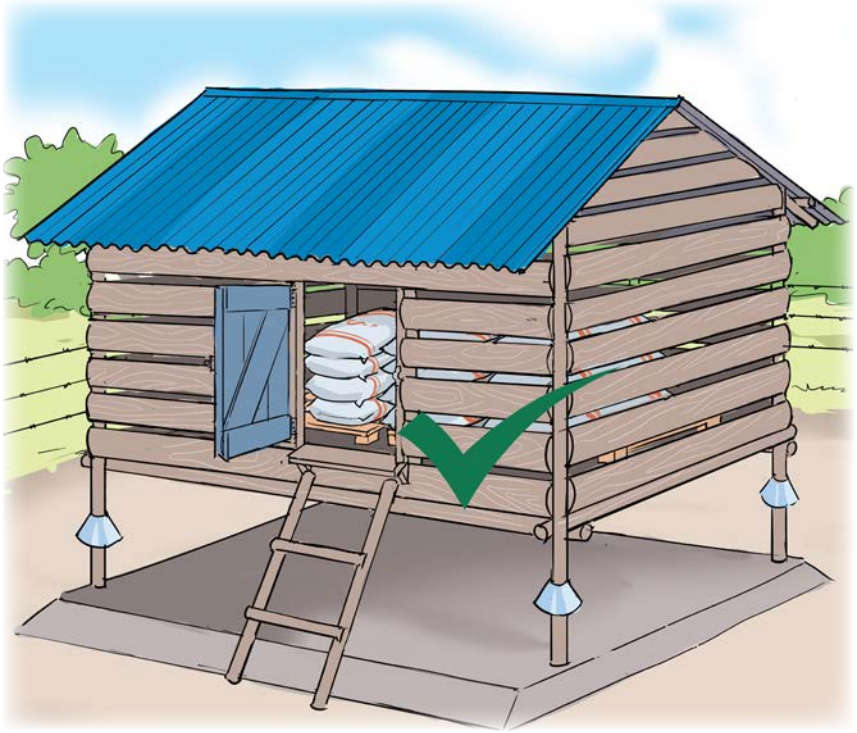


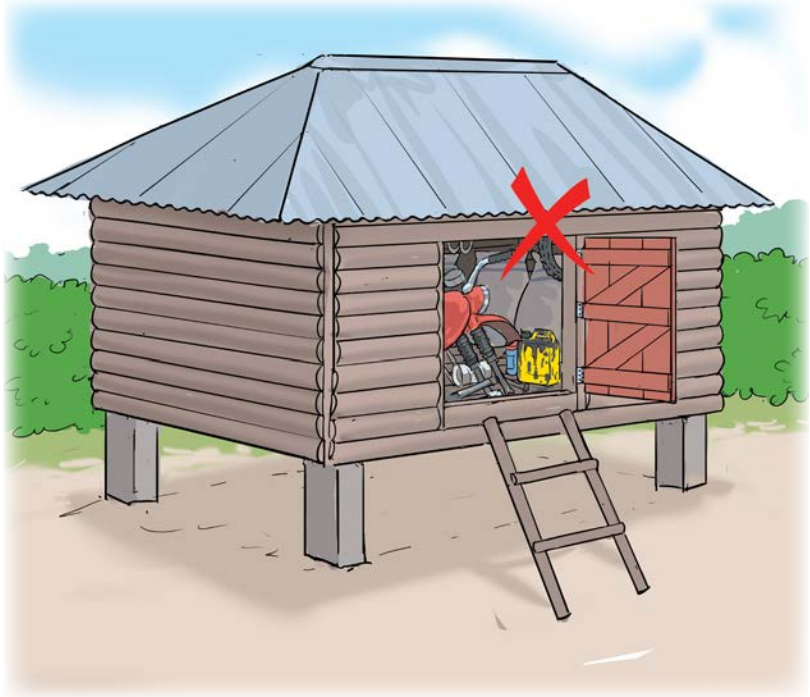
vi) Dry your grains on clean tarpaulins/surfaces and ensure the moisture content is below 13.5% before storage.

vii) Use a moisture meter to measure the moisture content of maize. Where no moisture meter is available, put a few grains mixed with salt in a dry glass/soda bottle. Shake the mixture for 5-10 minutes. Leave for 5-10 minutes. If the salt sticks to the glass, the grain is still wet and needs more time for drying. Another method is to bite a few grains gently: if the grain is soft and chewy, it still has a high moisture content and requires further drying

viii)Do not dry your produce on tarmac or wet surfaces, to avoid contaminating it with aflatoxin contaminating fungi, dirt and insects

ix) Transport produce in a waterproof vehicle to avoid wetting, which creates an environment that is ripe for fungal contamination



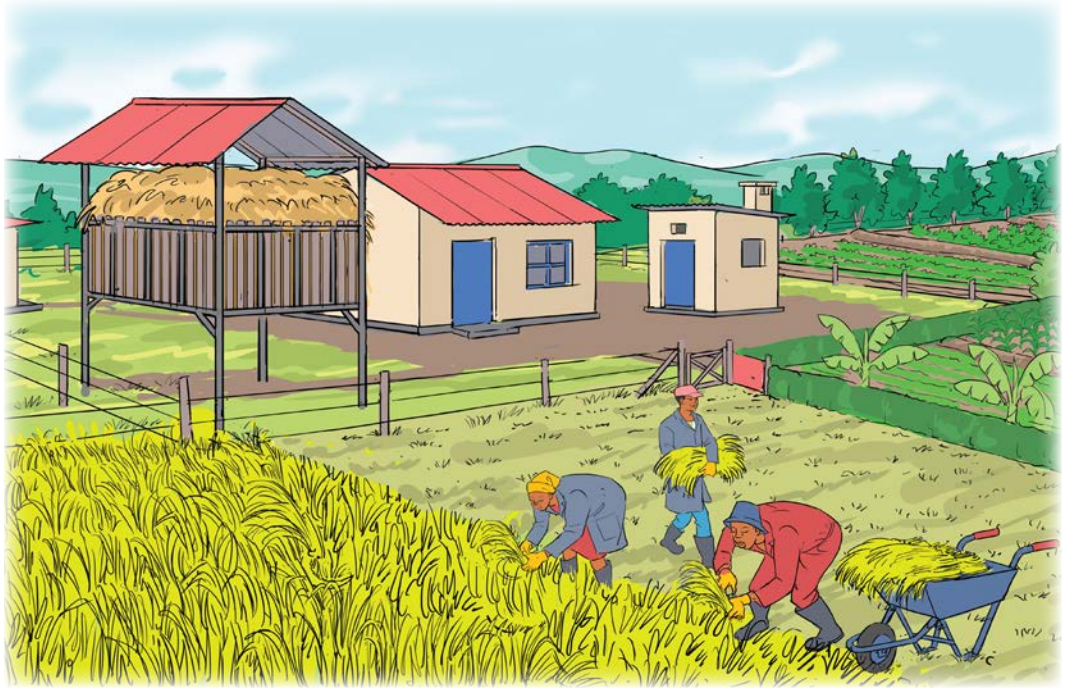


x) The grain store should have walls with spaces to allow for free air circulation and the bags should be placed on pallets above the ground to protect them from moisture

xi) Store well dried produce (especially maize) in hermetic bags or silos to prevent infestation by pests, contaminants and splashes of rainwater

xii) New crops should not be stored with or alongside grain from the previous season, as this may promote the transfer of aflatoxin-causing fungi, pests or contaminants from the old grain to the new

## Quality and safety of feed



i) Seek technical advice and guidance from extension staff on feed requirements and sourcing for feed formulation that is free from fungal mold, and on storage to ensure the preservation of high-quality feed

ii) Farmers should maximize their farm feed formulation to maintain quality and save on costs

iii) Store feed in a clean, dry and well-ventilated store to avoid rotting and contamination

iv) Do not use rotten grains for feed as this harms animals and can cause aflatoxins to be transmitted to humans through milk, eggs and meat

v) Do not sell or use rotten maize

vi) Burn rotten maize to destroy the fungi and prevent the spread of contamination on the farm: if maize is buried and, germinates, the fungi will be maintained within the buried produce and flooding can carry the fungi to other places within the farm

# Chapter 4

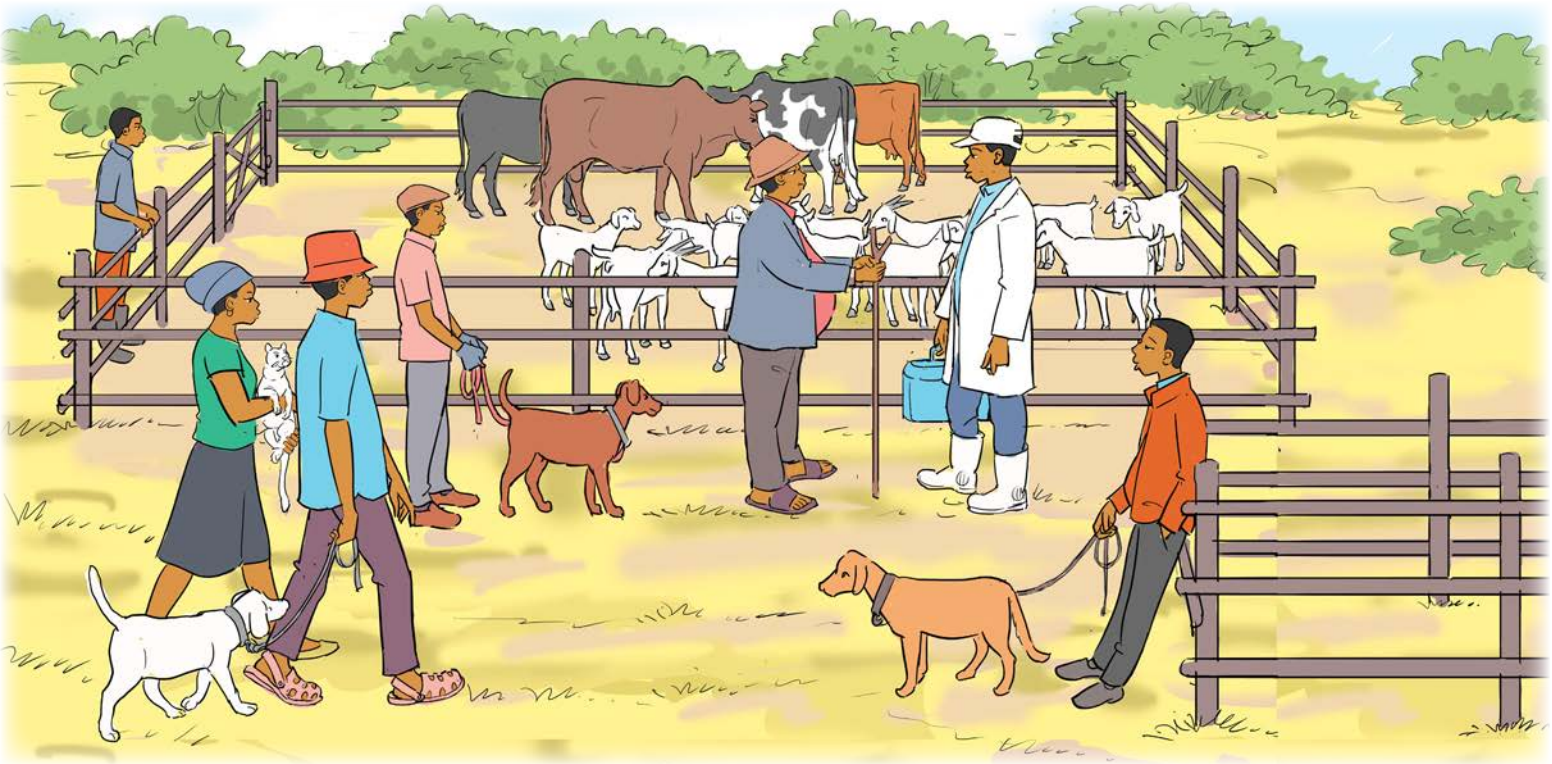
## ZOONOTIC DISEASES

Zoonotic diseases are illnesses that are passed between animals and human beings. They are transmitted in several ways, including through handling and eating infected animal products; being bitten by animals, mosquitoes, and ticks; and by consuming food and water that have been contaminated. Many of these diseases (such as brucellosis, salmonellosis, rabies, anthrax, hydatidosis, Tuberculosis and Rift Valley Fever) have serious health implications including loss of human and animal life if they are not treated in good time.

In this chapter several measures are recommended to reduce the incidences and severity of zoonotic disease transmission to humans either from livestock or pets:

- Vaccination by a trained person
- Prompt treatment
- Protecting water sources
- Not selling terminally ill animals ("Okoa" in Kiswahili)
- Consuming inspected meat
- Proper disposal of carcasses
- Proper tick treatment
- Consumption of boiled and safe milk

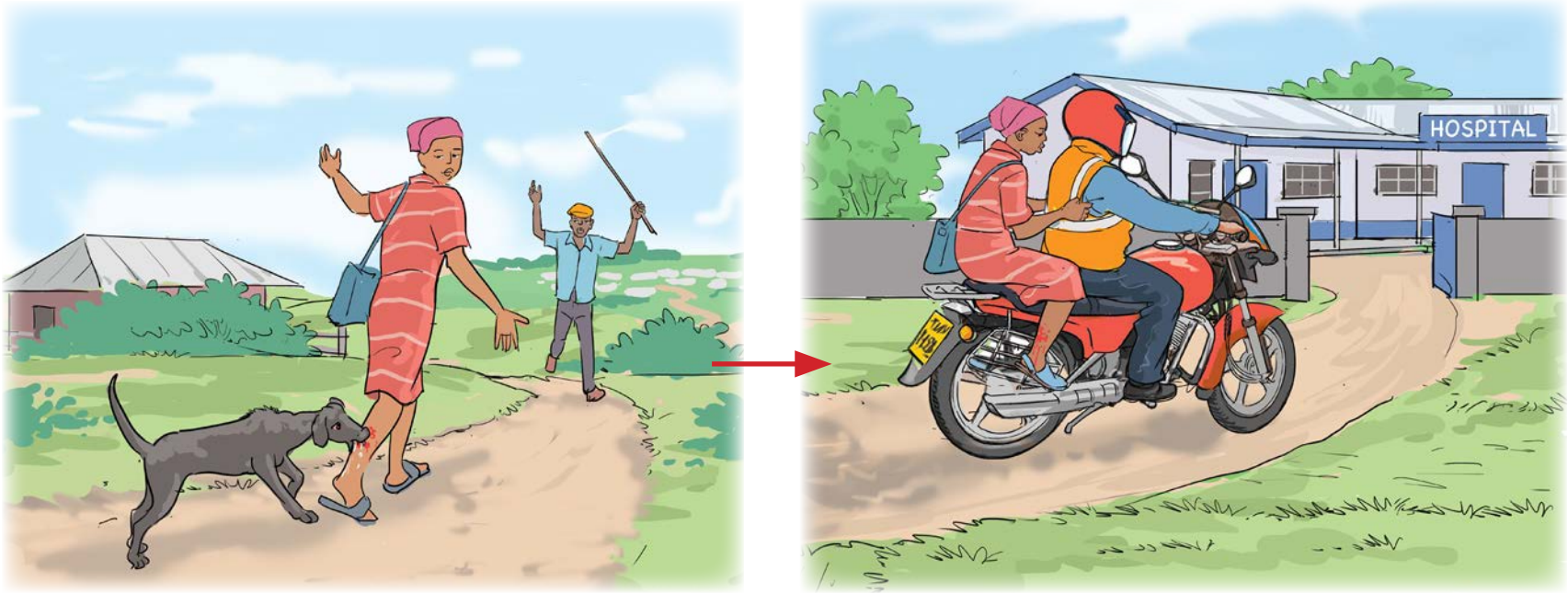
## Vaccination by a trained person



Present your animals for vaccination and treatment as recommended by the veterinary officer and adhere to the recommended vaccination schedule

## Prompt treatment

**In the case of rabies:**




i) Periodically vaccinate pets as recommended by a veterinary officer, to prevent them being infected by rabies and passing the disease to humans

ii) Consult a veterinary officer for prompt treatment of sick pets. If pets are suspected of having rabies they should be euthanized (humanely end their life to eliminate pain)

iii) Seek medical attention immediately if you are bitten/scratched by an animal as a precautionary measure incase the animal is infected with rabies (which is fatal to humans if not treated in good time)

## Protecting water sources

i) To avoid the spread of waterborne zoonotic diseases, protect water points so that they cannot be contaminated with urine, faeces or dead animals

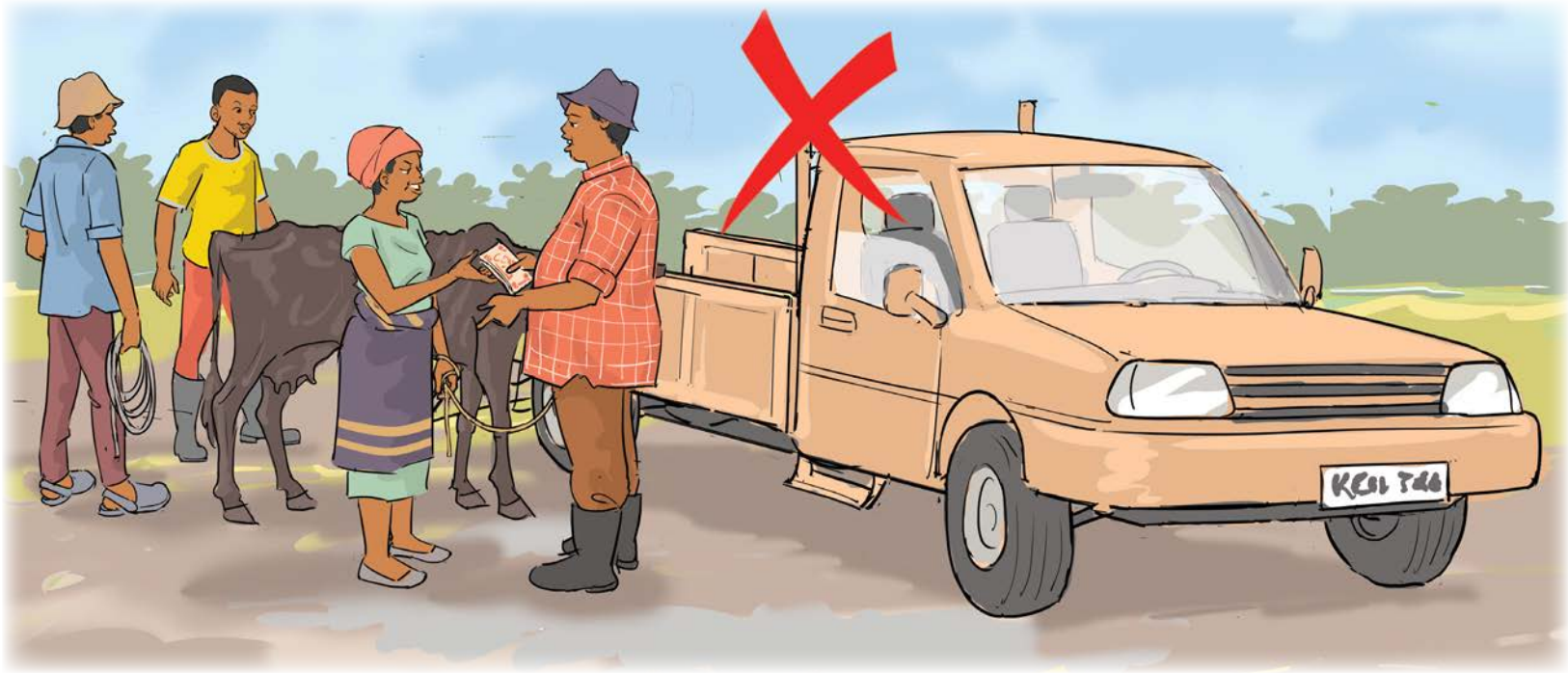
ii) Water points can be protected by fencing water pans, shallow wells, dams, and boreholes and by only accessing water at the designated exit points

iii) Construct water troughs for livestock use to provide clean and safe water to the animals. This will reduce the risk of contamination and the risk of acquiring waterborne diseases (for both humans and livestock)

## Not selling terminally ill animals ("Okoa" in swahili)

Farmers often sell terminally ill animals after a long period of unsuccessful treatment, as well as selling carcasses to minimize economic loss

**To safeguard human health:**



i) Do not sell treated livestock which are terminally ill for slaughter because their products could transfer zoonotic diseases to humans if they are consumed

ii) Seek advice from a veterinary officer on what should be done with terminally sick animals

iii) Safely dispose of dead animals/carcasses as recommended by a veterinary professional

## Consuming inspected meat

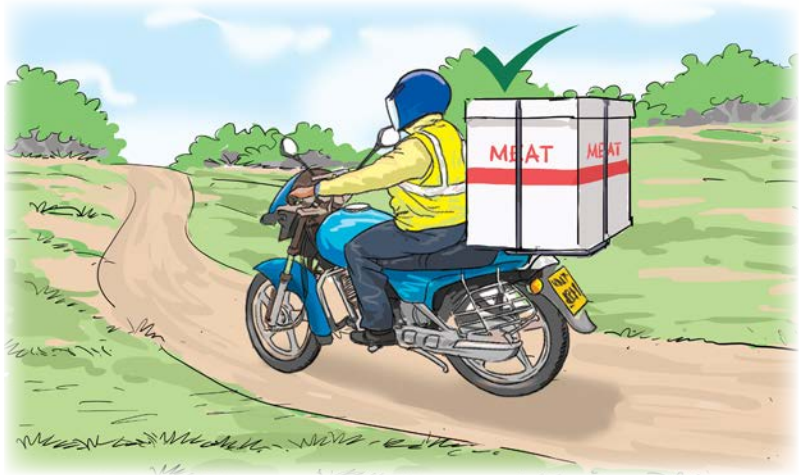
**Do the following to prevent the spread of zoonotic diseases through meat consumption:**

i) Do not eat/consume uninspected meat

ii) Verify that meat has been inspected by looking for the inspection stamp

iii) Do not slaughter animals at home

iv) All animals should be taken to the slaughter house for slaughter




v) Transport meat in licensed meat containers

vi) Do not eat meat from animals that have died due to diseases or unknown causes. They could spread diseases to humans


vii) Report all suspected cases of home slaughter to the local authorities

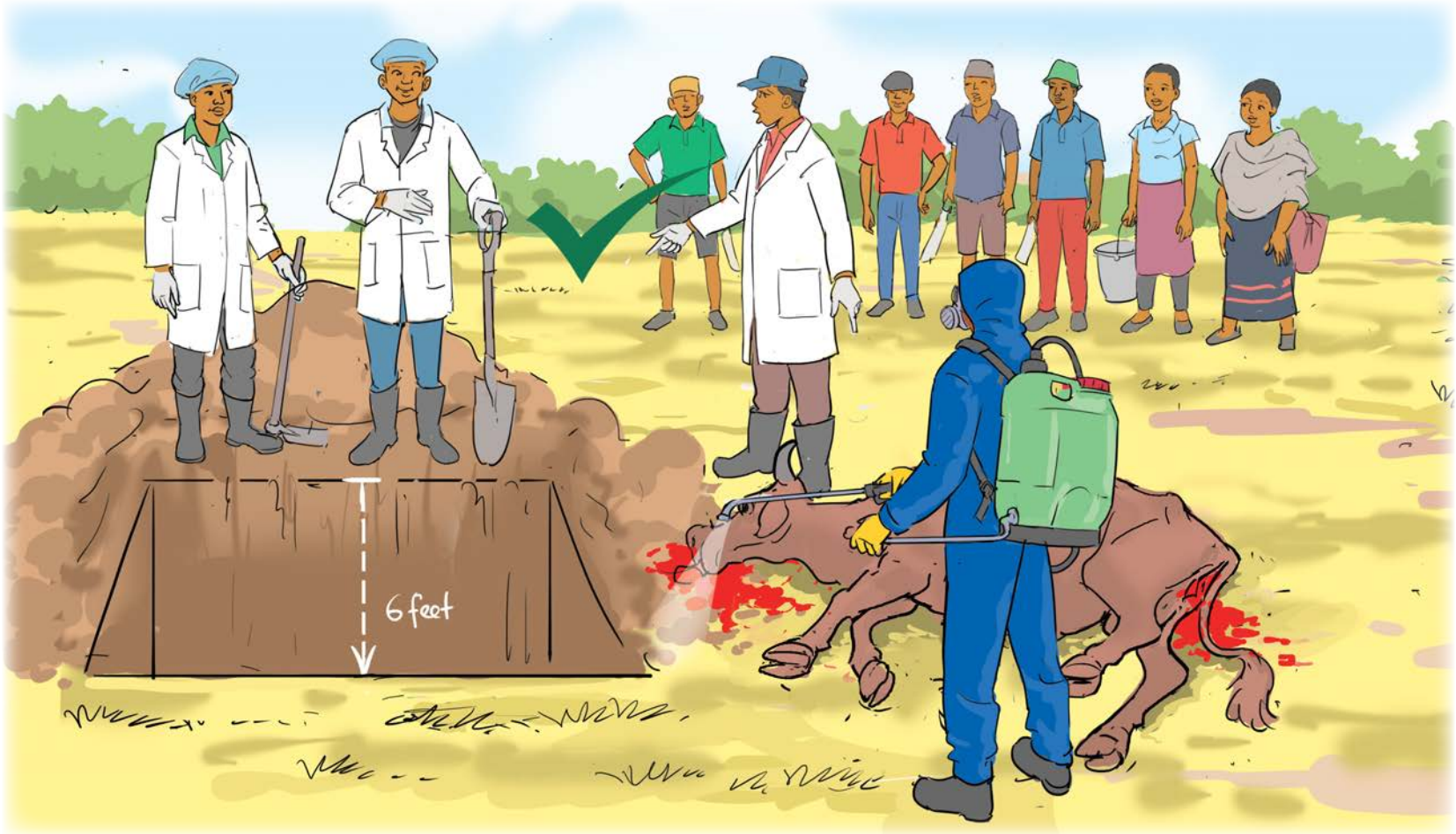
# Proper disposal of carcasses


i) Do not skin animals that have died due to unknown causes or diseases

ii) Keep the dead animal secure so that it cannot be accessed by members of the public, dogs and wild animals
They can be dangerous if their death was caused by infection with a contagious diseases. Such a disease can be transmitted to humans and other animals if consumed

iii) Dispose of condemned carcasses as per a veterinary's instructions

iv) Report all cases of dead animals that have died due to unknown causes or diseases to local authorities



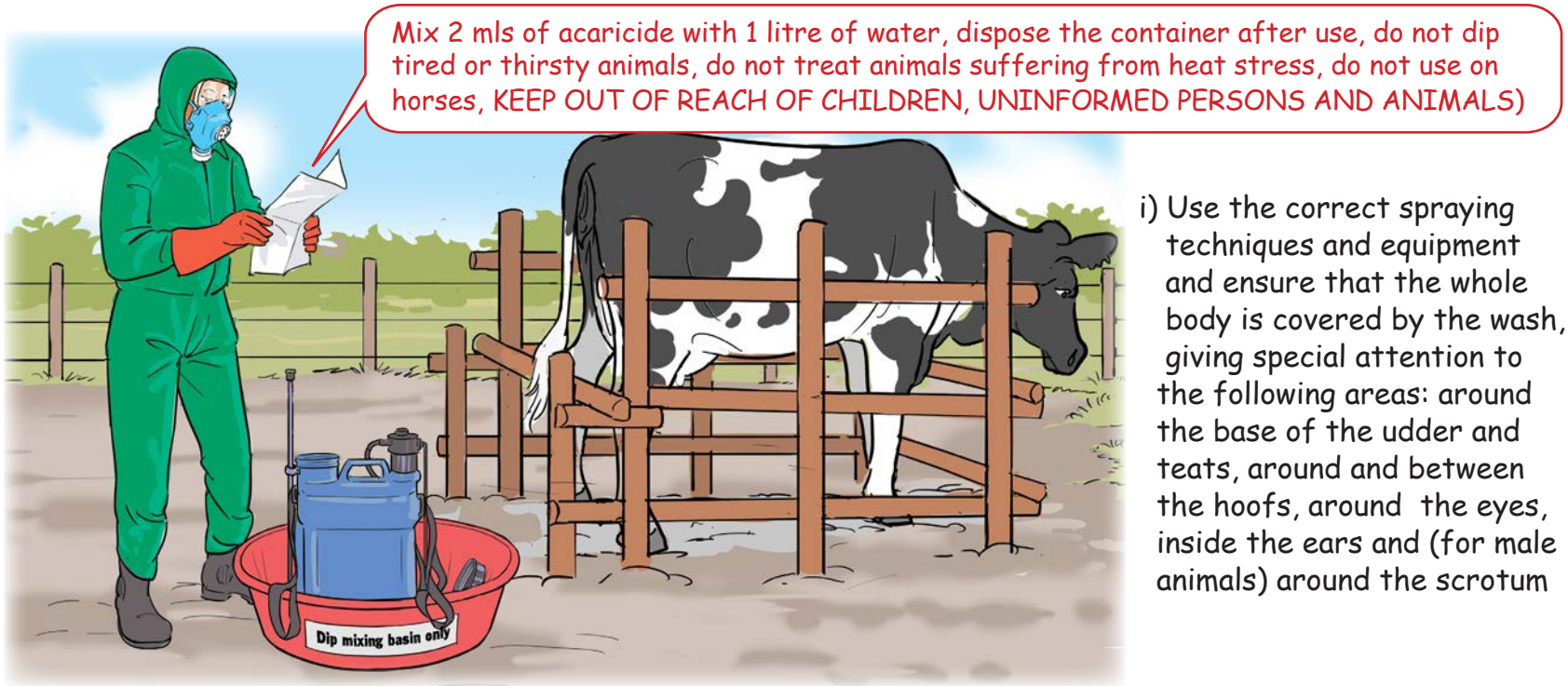

v) Handle sick and dead animals using the right personal protective gear (gum boots, aprons, goggles, gloves, mask)

vi) Disinfect contaminated ground using the correct gear and disinfectants as recommended by a veterinary officer

## Proper tick treatment

Improper tick treatment causes resistance, which is the ability of ticks to survive and reproduce despite being sprayed with chemicals (acaricides) used to kill them. This means humans remain exposed to tick-borne diseases

**To prevent tick resistance to acaricides:**




i) Use the correct spraying techniques and equipment and ensure that the whole body is covered by the wash, giving special attention to the following areas: around the base of the udder and teats, around and between the hoofs, around the eyes, inside the ears and (for male animals) around the scrotum

ii) Seek advice from a veterinary officer on the choice of acaricides to be used as per the tick species

iii) Do not mix different brands of acaricides

iv) Use the right concentration as recommended by the manufacturer

## Safe milk consumption

i) Boil milk or get it pasteurized at the local pasteurizing facility before consumption, to increase the shelf life and to remove disease-causing germs


ii) Do not include additives in milk, such as hydrogen peroxide, antibiotics or formalin. Additives may increase the milk shelf life and reduce the risk of zoonotic disease but can have other ill effects on human health

iii) Do not consume milk that is neither pasteurised or boiled: it may be contaminated with bacterial or viral zoonotic diseases

# Chapter 5

## ENVIRONMENTAL DEGRADATION AND CLIMATE CHANGE

The deterioration of nature, including water, air, soil, plants, and ecological systems have undesirable consequences for human and livestock health and for biological diversity. Human activities that lead to pollution, and overuse and destruction of habitats such as forests, water sources and pastures are the main causes of environmental degradation and climate change. Climate change affects how pests, diseases, and weeds spread, making food production unpredictable and expensive for farmers. The spread and emergence of new livestock and crop pests and diseases has led to increased use of drugs and pesticides, which in turn have negative consequences, such as antimicrobial resistance and the toxic effects of pesticides that are not used properly.

This chapter covers practices that can help farmers to better cope with the impacts of climate change, as well as contributing to reducing global warming:

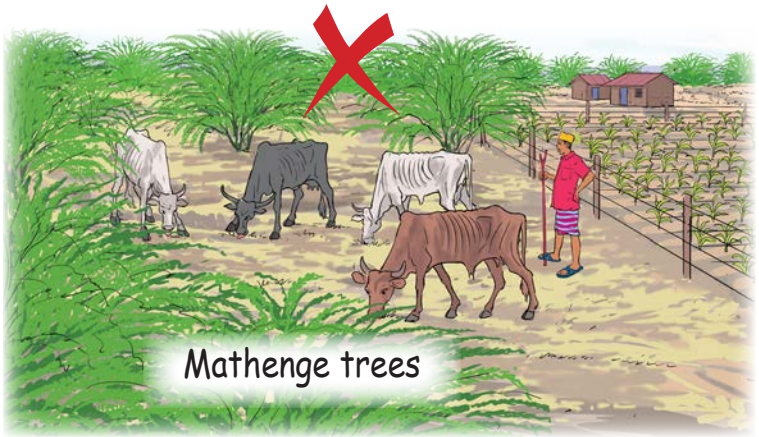
- Prevent land degradation
- Prevent contamination of water sources and farm produce
- Climate change adaptation and mitigation

## Prevent land degradation

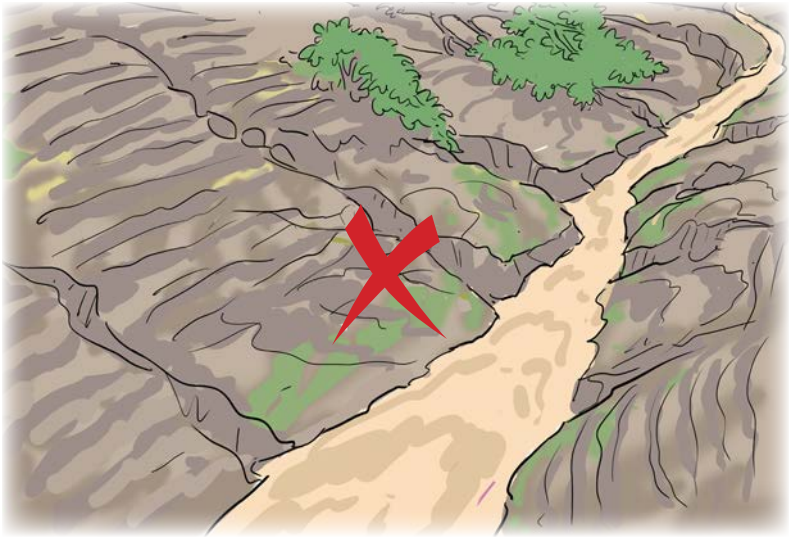
i) Practice soil conservation by planting grass strips, engaging in agroforestry, planting cover crops and retaining crop residue to ensure the soil is not left bare, which could lead to soil erosion

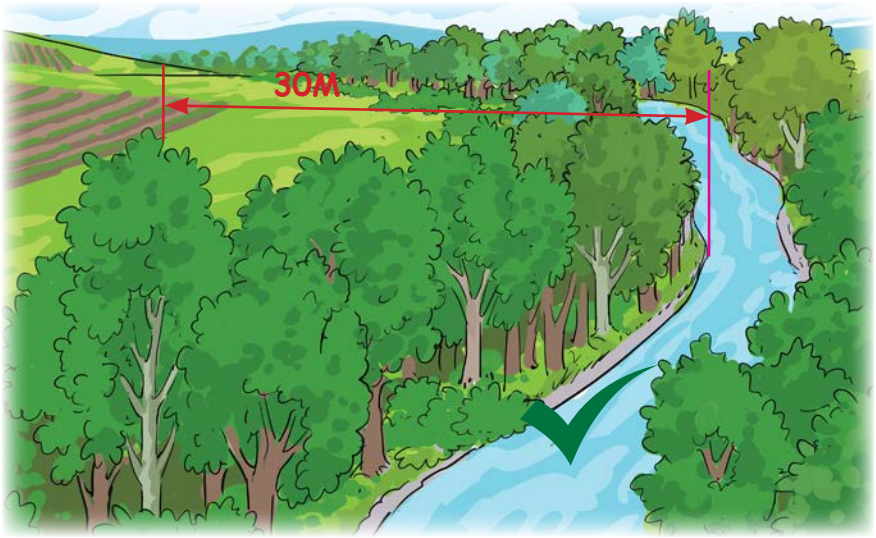
ii) Do not overstock/overgraze, to avoid soil erosion

iii) Consult with your extension officer on how to implement these farming practices




iv) Control or eradicate foreign plants that contribute to land degradation, like mathenge *(Prosopis juliflora)*, using physical, mechanical, chemical or biological methods, as advised by your environment officer

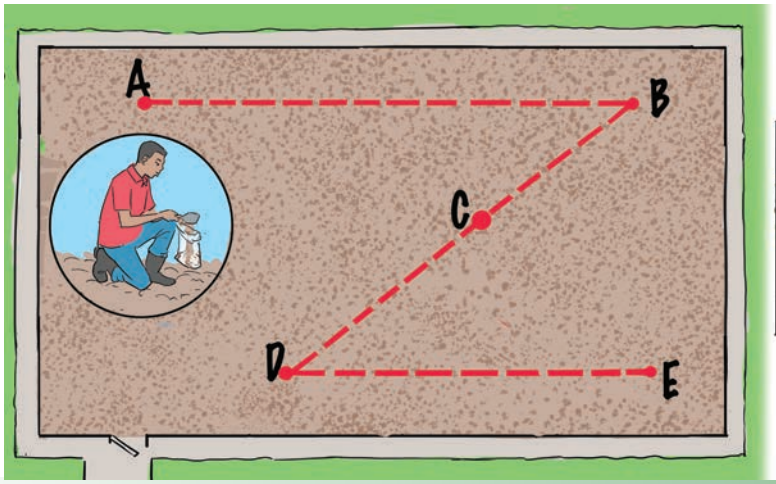





v) Cultivate 30 metres from a river bank (riverbank protection): this maintains the river course, avoids diversion and maintains water purity for safe human and animal consumption

vi) Continuously seek information from extension officers in order to gain knowledge of the most appropriate soil and land use practices for environmental conservation and sustainable land productivity

vii) Carry out regular soil testing to help determine the right inputs to use on your farm (e.g fertilizers/manure) This will enhance nutrient balance, prevent soil degradation and reduce the overuse of inputs, thereby minimizing the risk of contaminating crops and water that may be consumed by animals and humans

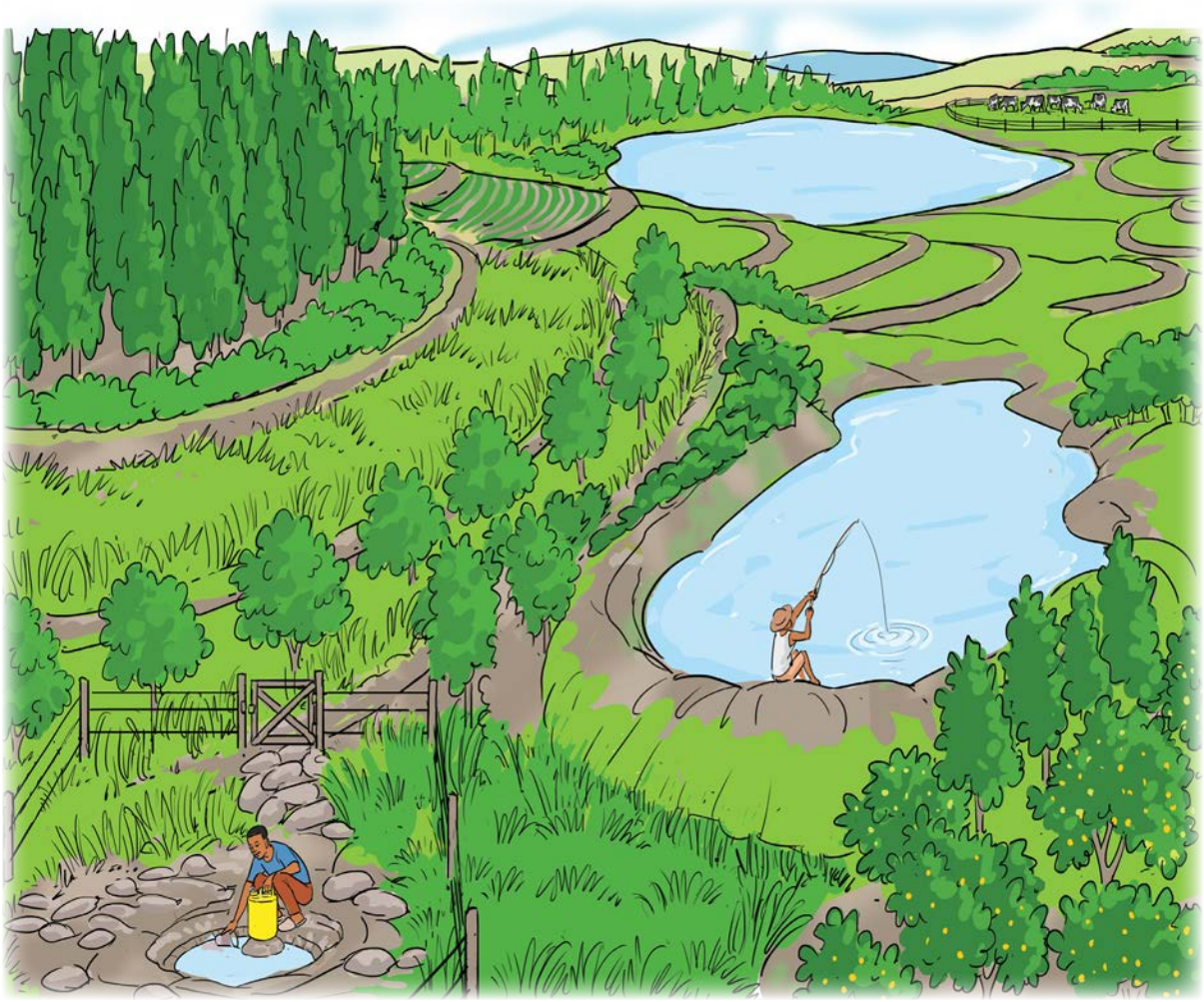




viii) Collect soil samples from different points in your farm as shown in the diagram, with guidance from a trained person and then take them to an accredited laboratory for testing

## Prevent contamination of water sources and farm produce

**Practice water catchment protection and conservation:**



i) Practice agroforestry which is the planting of trees together with crops

ii) Prevent soil erosion on sloping land by terracing, building gabions and planting cover crops, such napier grass and sweet potatoes

iii) Collect harvest run-off water by building water pans, to be used during dry seasons for irrigation

iv) Protect water sources, such as springs, where people collect water for consumption

**Do the following to prevent diseases:**

i) Do not dispose garbage near water sources to avoid water contamination, which poses health risks to downstream users

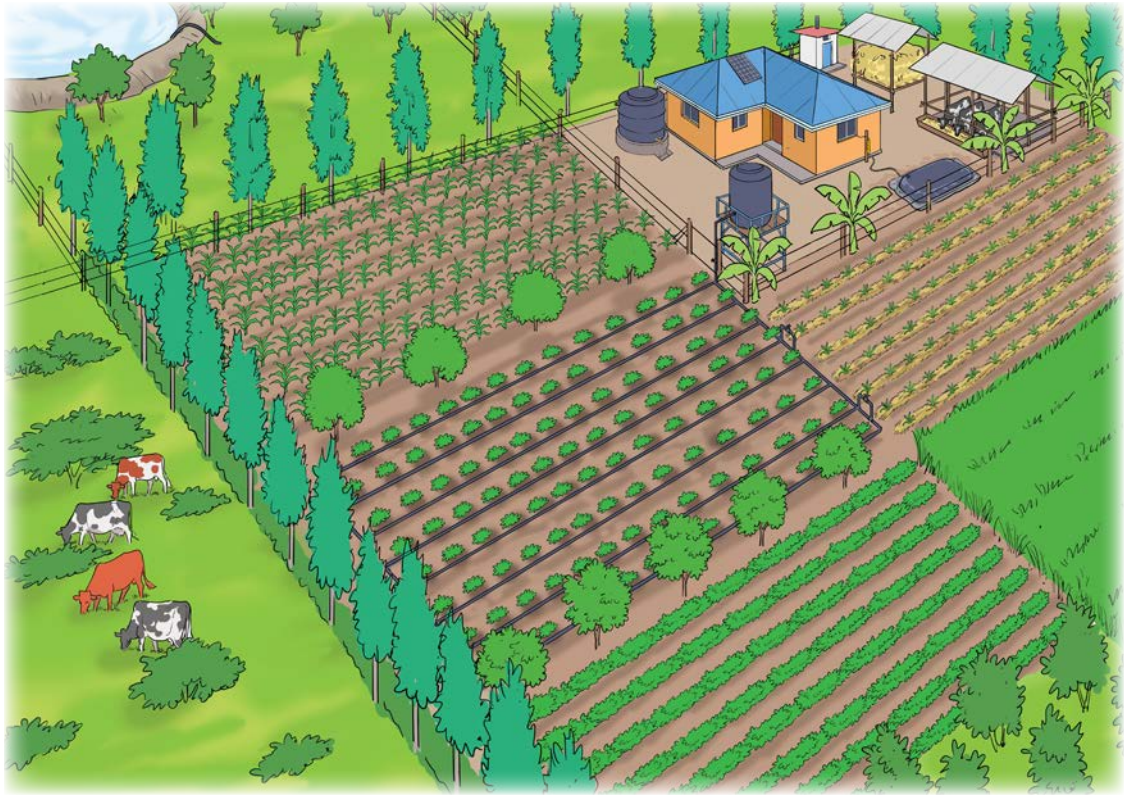
ii) Do not clean farm produce with contaminated water

iii) Use safe-to-drink water to clean food for consumption and dry and then package in food-grade containers to avoid contamination

## Climate change adaptation and mitigation

Climate change increases the risk to human, animal, plant and environmental health by creating a more favourable environment for harmful organisms, such as ticks, which can lead to an increase in zoonotic diseases

**Do the following to prevent and cope with changes in climate:**



i) Use energy-saving and renewable technologies, such as energy-saving cook stoves, solar and biogas

ii) Practice climate smart agriculture such as minimum tillage, agroforestry, cover crops, residue retention, crop rotation
Avoid burning of crop residues, in order to reduce greenhouse gas emissions that lead to climate change

iii) Recycle farm waste such as farm yard manure, to improve soil nutrients

iv) Use drought-tolerant seed varieties

v) Carry out water management through water-saving technologies like drip irrigation


vi) Share knowledge and learn about climate change through peer-to-peer learning, exchange visits, farmer climate change platforms

vii) Enrol in mobile phone farmer advisory services provided by organizations such as the Kenya Agriculture and Livestock Research Organization (KALRO)

viii) Contact your local County Climate Change Office to find out about relevant initiatives

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