AGRICULTURE

FOR

STANDARD 6

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First Edition: December, 2018

UNIT 1 THE MEANING AND IMPORTANCE OF FARM RECORDS **By Zikomo Masese Banda**

MEANING OF FARM RECORDS

Farm records are written information that farmers keep on different activities carried out on a farm.

THE IMPORTANCE OF KEEPING FARM RECORDS

- making important decisions
- budgeting and planning
- calculating profit or loss
- selecting livestock
- obtaining loans from money lending institutions

UNIT 2 PHYSICAL FARM RECORDS

Physical farm records are all farm records dealing with production.

EXAMPLES OF PHYSICAL FARM RECORDS

- field operations records
- crop records
- labour records
- layers records
- milk production records
- inventory records (record of items on a farm)

FIELD OPERATION RECORDS

A field operation record is a record of daily activities done by a farmer from land preparation to harvesting. This record shows inputs used on the crops such as type and amount of seed, fertilizers, chemicals and labour used.

CROP RECORD

A crop record shows the crop, plot number, plot size, type and amount of seed used, type and amount of fertilizer or manure and amount of insecticides used.

A YIELD RECORD

A yield crop shows the amount of yield harvested for each crop grown on the farm.

The amount is recorded in kilograms.

A LABOUR RECORD
A labour record shows crop, plot number, plot size, activity and work done (man days).

Labour is work done by human beings measured in man days.

A LAYERS RECORD
A layers record shows the date, the number of hens laying, the number of eggs collected daily and the amount of feed used daily.

UNIT 3 FINANCIAL FARM RECORDS

MEANING OF FINANCIAL FARM RECORDS
Financial records are records dealing with money on a farm.

OR

Financial farm records are all records of accounts that show income and expenditure.

EXAMPLES OF FINANCIAL FARM RECORDS

- sales records
- expenditure records
- production records

In financial farm records, there are two main columns of income on one side and expenditure on the other.

The difference between the total income and total expenditures gives the profit or loss of a particular farming activity.

Any produce from the farm eaten or used at home should be valued at current market price.

This should be recorded under sales and receipts because the farmer would have sold such produce for income.

UNIT 4 SOURCES AND IMPORTANCE OF WATER

SOURCES OF WATER

- Rivers
- Dams
- Lakes
- Streams
- Boreholes
- wells

However, all these sources depend on rainfall.

THE IMPORTANCE OF WATER TO CROPS

- Seed germination
- Irrigation of crops
- Pollination of flowers
- Making plant food
- Transportation of farm inputs and produce

THE IMPORTANCE OF WATER TO LIVESTOCK

- For drinking
- Fish farming
- Washing utensils
- Dip tanks – chemicals at dip tanks are mixed with water to make dip wash or dip solution. This helps to kill external parasites in farm animals

WAYS OF IMPROVING AVAILABILITY OF WATER

- Avoiding cutting down trees carelessly around sources of water
- Construction of dams and boreholes
- Provision of piped water

WAYS OF IMPROVING THE QUALITY OF WATER

- Avoiding putting wastes in rivers
- Adding chlorine to dirty water

UNIT 5 IRRIGATION

MEANING OF THE TERM 'IRRIGATION'

Irrigation means supplying water onto a field to enable crops grow.

IMPORTANCE OF IRRIGATION

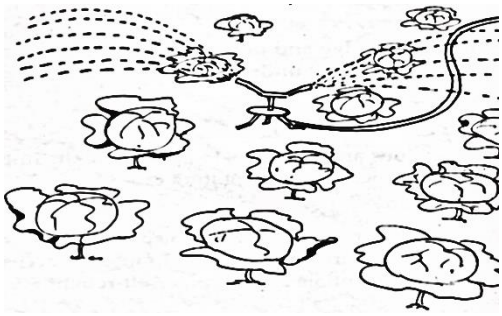
- Avoiding risks of hunger
- Helps farmers to grow crops several times a year

METHODS OF IRRIGATION

- Sprinkler irrigation
- Drip irrigation
- Basin irrigation
- Flooding irrigation

SPRINKLER IRRIGATION

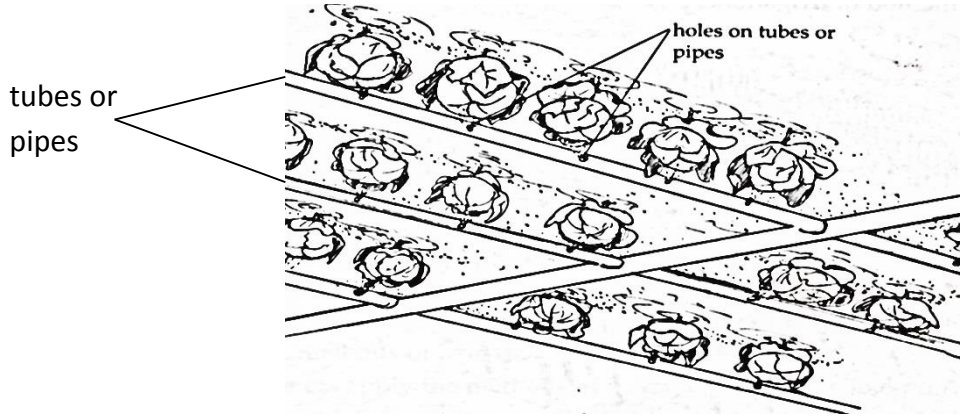
Water is supplied to crops through pipes which have nozzles at one end to spray the water.



the sprinkler irrigation method

DRIP IRRIGATION

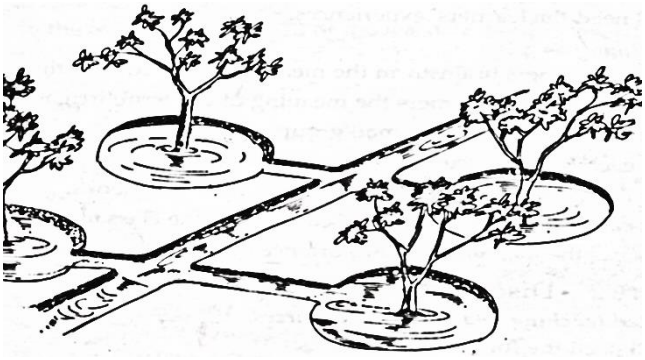
This is also known as trickle irrigation. Water is led through plastic pipes which are laid on the ground. The pipes have small holes through which water comes out. The spacing between the holes is determined by the distance between the planting stations of the crops. Water intake by the soil is controlled.



the drip irrigation method

BASIN IRRIGATION

Water is led to basins through furrows. This method is good for fruit trees.



the basin irrigation method

FLOODING IRRIGATION

Water is supplied in a plot through flooding. This method is common in rice fields. The land should be flat.



UNIT 6 SOIL COMPOSITION

The term 'soil' means the loose material covering the surface of earth.

THE COMPOSITION OF SOIL

Soil is made up of different materials.

These include the following:

- Inorganic matter
- Organic matter
- Soil water
- Soil air

INORGANIC MATTER

- This is made up of sand, silt and clay particles. This forma the largest part of the soil.

ORGANIC MATTER

- This is made up of living, decaying and decayed plant and animal parts. The decayed matter is called humus.

SOIL WATER

- This is soil moisture.

SOIL AIR

- This is air trapped between the soil particles.

UNIT 7 THE IMPORTANCE OF SOIL

THE IMPORTANCE OF SOIL TO CROPS

- Holds plants
- Supplies water to plants
- Provides mineral salts to plants
- Provides air
- It is home of soil organisms

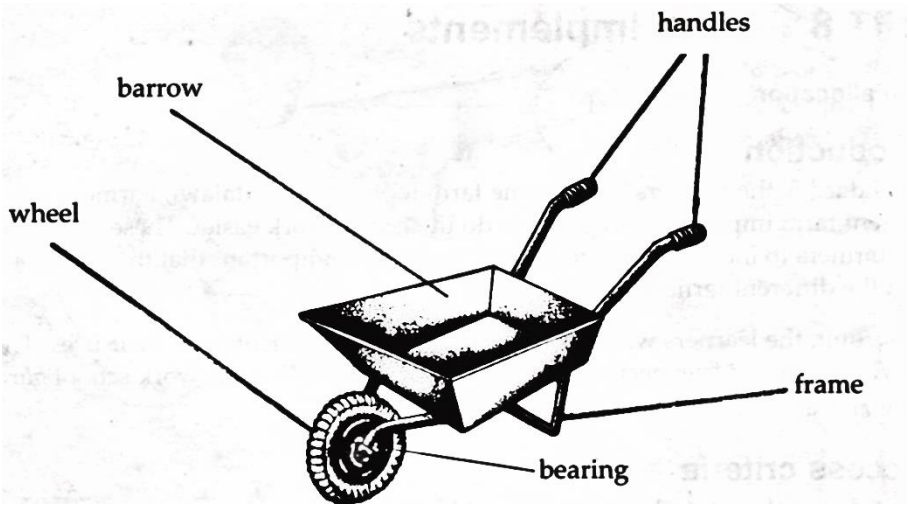
UNIT 8 FARM IMPLEMENTS

NAMES AND PARTS OF FARM IMPLEMENTS

a) The wheelbarrow

The wheelbarrow has four main parts:

- Wheel
- Handles
- Barrow
- Frame



a wheelbarrow

Wheel – it rolls over the ground to enable the barrow to be pushed more easily.

Handles – they enable the farmer to hold and push the barrow.

Barrow – this is the basin or box in which the materials being transported are placed.

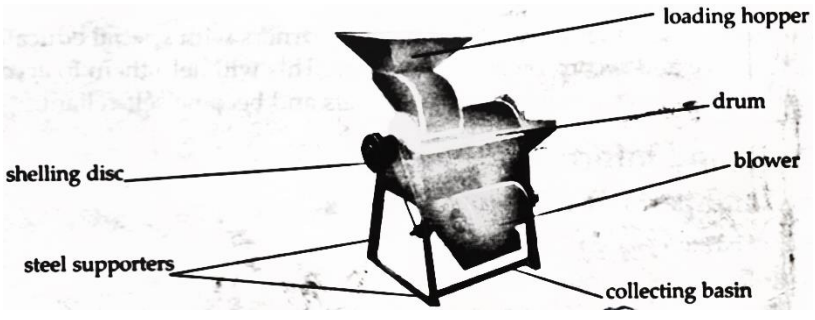
Frame – this is the structure to which all the other parts are attached.

b) THE MAIZE SHELLER

This implement is used to shell maize.

Major parts of the maize sheller are:

- Loading hopper
- Drum
- Shelling disc
- Steel supporters



a maize sheller

Loading hopper – this is where maize cobs are placed or loaded for shelling.

Drum – the cobs slide into a drum where shellers are placed.

Shelling disc – the shellers in the drum are attached to a shelling disc which spins during shelling process.

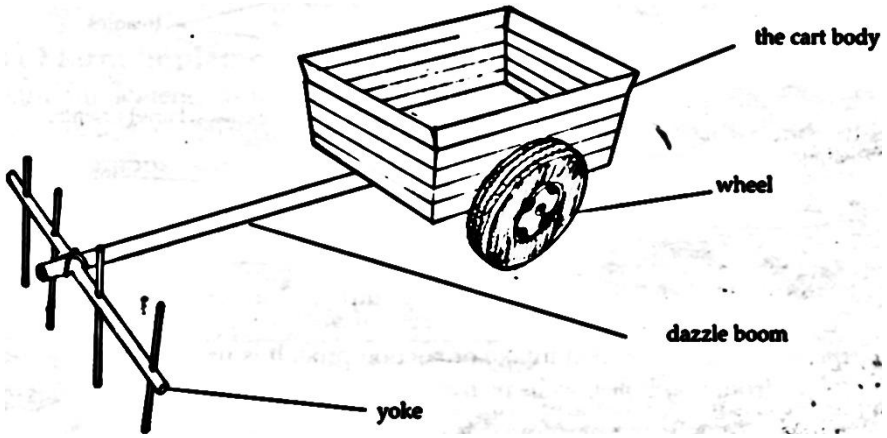
Steel supporters – the implement is held upright by strong steel bars.

c) A FARM CART

This is used for transporting farm goods.

The main parts of a farm cart are:

- Cart body
- Dazzle boom
- Wheels and tyres
- Yoke



a farm cart

Cart body – this is a box-like structure made of wooden planks bolted together. It is where goods are loaded.

Dazzle boom – this supports the cart body and joins it to a yoke.

Wheels and tyres – they roll on the ground so that the cart can move more easily when pulled by draught animals

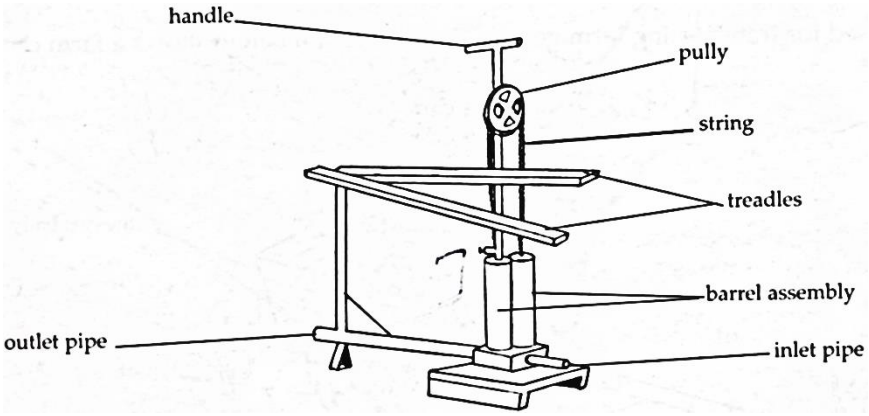
Yoke – this is a wooden structure which connects the cart to the necks of the draught animals.

d) TREADLE PUMP

This is used for pumping water from a source to a crop field.

Major parts of treadle pump are:

- Handle
- Treadles
- Barrel assembly
- Pulley
- Inlet pipe
- Outlet pipe



a treadle pump

Handle – the person operating the treadle pump holds the handle for support.

Treadles – these are the two wooden foot pedals. They are used to pump water through a walking motion.

Barrel assembly – the two pistons which help to draw the water.

Pulley – this is the metal wheel which helps in lifting the water.

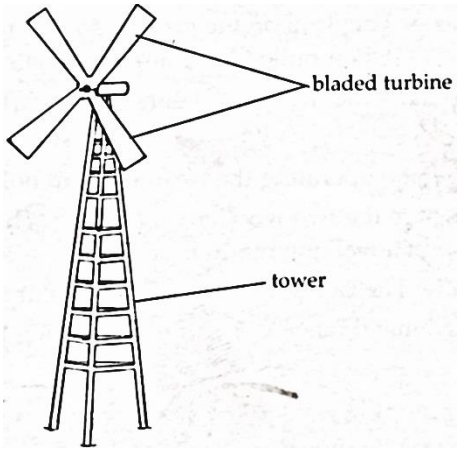
Inlet pipe – This is also called intake or suction pipe. It is used to carry water from water sources such as boreholes, wells, lakes or rivers.

Outlet pipe – this delivers water towards the garden.

e) WIND MILL

Main parts of a wind mill are:

- Bladed turbine
- tower



a wind mill

Bladed turbine – this rotates in the blowing of the wind.

Tower – this supports the wind turbine

f) A MOTORISED WATER PUMP

USES OF FARM IMPLEMENT

Farm implement	**Uses**
Wheelbarrow	• Transporting materials such as farm produce, fertilizers, manure, building materials
Maize sheller	• Shelling dry maize
Farm cart	• Transporting farm produce from the farm to the home or market • Transporting farm inputs such as fertilizer, seed, farm produce, manure, building materials
Treadle pump	• Lifting water from wells, boreholes or open sources (rivers or lakes) for irrigating crops
Motorised pump	• Drawing water
Wind mill	• Drawing water • Generating electricity

UNIT 9 SAFETY MEASURES IN USING FARM IMPLEMENTS

GENERAL FARM SAFETY RULES IN USING FARM IMPLEMENTS

- Dress suitably for the task, for example, avoiding wearing loose clothing that can be caught in a moving or rotating implement
- Using implements properly
- Ensuring that implements are in good state of repair
- Checking implements before use to ensure that bolts and nuts are securely fixed to avoid wobbling
- Following the manufacturer's instructions or procedures when using farm implements
- Greasing all moving parts
- Properly fixing the wheel axle

FARM-CART

- It should not be overloaded to avoid loss of balance
- Bolts and nuts should be tightened before use
- Tyres should be properly inflated
- Draught animals should be strong and of the same size
- The yoke should be the correct size for the oxen
- The yoke strap should be strong

- The cart should be fitted with reflectors to avoid accidents

TREADLE PUMP

- Check the pulley and rope before use
- Hold the handle firmly

WINDMILL

- Check that fasteners are tight to keep the vane in place

MOTORIZED PUMP

- Keep fuel and oil in safe place
- Tighten bolts and nuts before use
- Grease all moving parts before use
- Keep battery acid away from your skin or eyes

UNIT 10 MAINTENANCE OF FARM IMPLEMENTS

WAYS OF MAINTAINING FARM IMPLEMENTS

WHEELBARROW

- Replace worn out parts
- Load it appropriately
- Clean it well after use
- Paint it when not in use to prevent rusting
- Store it in a shed for protection against the sun and rains
- Grease the wheel axle

MAIZE SHELLER

- Replace worn out parts
- Grease moving parts to reduce friction
- Clean it properly (dust it)
- Change oil and oil filter regularly
- Set the maize sheller properly
- Paint it if not in use to prevent rusting

- Store it under the shed

FARM CART

- Replace worn out parts
- Grease bearings regularly
- Inflate tyres at the correct pressure
- Avoid overloading it
- Keep the farm cart under the shed if not in use

TREADLE PUMP

- Replace worn out parts
- Grease moving parts to reduce friction
- Paint it when not in use

WINDMILL

- Change the oil and clean the filter on the compression
- Grease the moving parts
- Replace worn out parts
- Re-paint the rotor
- Service pump
- Tighten fasteners

MOTORIZED WATER PUMP

- Change the oil regularly
- Check the wiring
- Replace worn out parts
- Overhaul the engine

UNIT 11 THE FARMING CALENDAR

MEANING OF THE TERM 'FARMING CALENDAR'

A farming calendar is a list of activities to be done in each month of the year for a given crop.

THE IMPORTANCE OF A FARMING CALENDAR

- It is a source of farm record
- It guides the farmer to carry out all farming operations or activities at the appropriate time

UNIT 12 LAND PREPARATION FOR GROUNDNUTS AND CASSAVA

Land preparation for growing field crops such as groundnuts and cassava should be done soon after harvesting the preceding crop.

This is what is known by early land preparation.

REASONS FOR EARLY LAND PREPARATION

- It is easy to till the ground
- It promotes the decomposition of crop residues which improves soil fertility
- It enables the farmer to plant with the first rains

ACTIVITIES INVOLVED IN LAND PREPARATION

- Site selection
- Clearing land
- Ploughing the land
- Ridging
- Making box ridges

UNIT 13 SEED SELECTION IN GROUNDNUTS AND CASSAVA

In Malawi, most farmers buy seeds from shops.

However some farmers select seeds or planting materials from the previous crop.

FACTORS TO CONSIDER WHEN SELECTING GOOD SEEDS OR PLANTING MATERIALS

- Ability to germinate

- Large size
- Wholeness (unbroken or undamaged)
- Free from diseases
- Purity (not mixed with any other materials)
- Maturity
- Suitable variety for climate of the area

UNIT 14 PLANTING GROUNDNUTS AND CASSAVA

Like any other field crops, groundnuts and cassava must be planted at the right time, spacing, seed rate and depth.

Groundnuts

In Malawi, groundnuts are planted with the first or soaking rains of between 25mm and 30mm.

It is usually between October and November in the southern region and November and December in the central and northern regions.

The spacing between ridges and planting stations for groundnuts depends on the variety.

VARIETIES, SEED RATE AND SPACING IN GROUNDNUTS

Variety	**Seed rate (kg/ha)**	**Spacing (cm)**	**Planting depth**
Chalimbana	110	75 x 15 x 1 seed	5-7cm
Chitembana	120	75 x 15 x 1 seed	5-7cm
CG7	110	75 x 15 x 1 seed	5-7cm
Nsinjiro	100	75 x 15 x 1 seed	5-7cm
Manipintar	80	75 x 15 x 1 seed	5-7cm
Mawanga	80	75 x 15 x 1 seed	5-7cm
RG1	80	75 x 15 x 1 seed	5-7cm
Malimba	45	75 x 10 x 1 seed	5-7cm
Kakoma	60	75 x 10 x 1 seed	5-7cm
Baka	60	75 x 10 x 1 seed	5-7cm

Cassava

Cassava is also planted with the first soaking rains in all the regions in Malawi.

It is recommended to plant cassava on ridges spaced at 90 centimetres apart and 90 centimetres between planting stations where it would be processed into Kandowole.

For the tubers to be sold fresh at the market, spacing of 90 centimetres between ridges and 45 centimetres between planting stations is used.

Cassava planting materials must be obtained from a middle portion of a well matured plant.

Cassava cuttings should be 25 to 30 centimetres long with at least two nodes.

Cuttings should be planted at an angle and two thirds of the cuttings should be planted into the soil.

This prevents water from settling down on the cut edges which can cause rotting of the cutting.

The improved varieties of cassava include silira, maunjiri and mkondezi.

There are also local varieties that are grown in Malawi like Manyokola (mbundumali), Gomani and Chitembwere.

Groundnut seed and cassava planting materials that have not germinated or sprouted have to be replaced immediately so that they can almost grow together with the seeds or planting materials of the first planting.

Replanting where germination failed is called 'supplying'.

Supplying is important because it helps to maintain both the plant population and yield of a particular crop.

UNIT 15 WEEDING IN GROUNDNUTS AND CASSAVA

WEEDING GROUNDNUTS AND CASSAVA
The best time to weed is when weeds appear.

It is also recommended to weed while the crops are still young.

This does not disturb the developing roots.

METHODS OF WEEDING GROUNDNUTS AND CASSAVA

- Using hoes
- Ploughing
- Using hands

- Using chemicals

COMMON WEEDS OF GROUNDNUTS AND CASSAVA

- Chisoso (black jack)
- Msonthi
- Bonongwe (Amaranthus)
- Luba
- Namsongole (tares)
- Dawe
- Khovani
- Chilungumwamba
- Denje
- Likodza
- Kalasawene
- Volunteer crops such as maize, millet and sorghum

EFFECTS OF WEEDS IN GROUNDNUTS AND CASSAVA

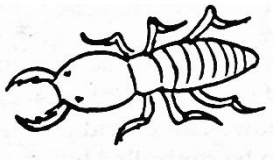
- Competition for nutrients
- Competition for water
- Competition for sunlight
- Transmission of diseases
- Harbouring pests

UNIT 16 PESTS AND DISEASES IN GROUNDNUTS AND CASSAVA

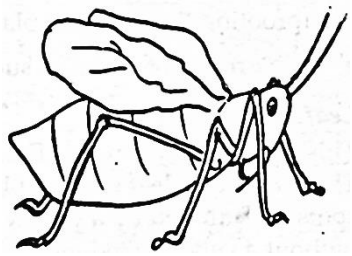
THE PESTS OF GROUNDNUTS, DAMAGE DONE AND THEIR CONTROL

Pest	**Damage done**	**Control/prevention**
Termites	• They damage the stems and eat the soft parts of groundnut pods	• Avoiding growing groundnuts in gardens that have termites mounds or a history of termites
Aphids	• They suck plant juice and transmit a virus which causes rosette disease in groundnuts	• Early planting • Planting closer together so that leaves cover the soil completely • Practicing crop rotation

		• Correct spacing of plants • Spraying chemicals
Birds	• They dig up and eat planted seeds or mature nuts	• Scaring • Trapping
Mice	• They eat up nuts in the garden and in storage	• Trapping
Monkeys	• They dig up planted seeds and mature nuts	• Scaring



a termite



an aphid

THE DISEASES OF GROUNDNUTS

Rosette

Rosette is caused by a virus and spread by aphids.

The disease restricts pod formation.

The crop has a stunted growth.

Sometimes the groundnut leaves look wrinkled with dark green or yellow colour.

Control of rosette disease

- Planting early
- Recommended spacing to prevent aphids multiplying
- Uprooting the diseased plants and burning them
- Using resistant varieties such as RG1, Nsinjiro

Leaf spot

This is caused by fungus.

There are two types of leaf spot that attack groundnuts.

These are:

- Early leaf spot
- Late leaf spot

Early leaf spot shows reddish brown spots surrounded by a yellow band.

Late leaf spot shows darker and smaller spots without a yellow band around them.

Control of leaf spot

- Spraying the plants with recommended fungicides
- Growing resistant varieties
- Practicing crop rotation

THE PESTS OF CASSAVA, DAMAGE DONE AND CONTROL OR PREVENTION

Pest	**Damage done**	**Control/prevention**
Green spider mites	• They attack fresh leaves and shoots especially during the dry season • The tips of the shoots shrivel and die	• Early planting • Planting stem cuttings that are not attacked by green spider mites
White flies	• They suck juice from the plant • They cause lumps and knots in the tubers • They spread cassava mosaic disease	• Planting stem cuttings which are free from white flies • Early planting
Mice Hares Wild pigs Monkeys Porcupines	• They dig up mature tubers	• Scaring • Trapping

The diseases of cassava

- Cassava mosaic. It is caused by virus and transmitted by white flies.
- Bacterial blight. It is caused by bacteria.

THE DISEASES OF CASSAVA, EFFECTS AND CONTROL

Disease	**Effects (damage)**	**Control/prevention**
Cassava mosaic	• Change shape of the leaves and become yellow	• Using healthy cuttings • Early planting • Uprooting and burning diseased plants
Bacterial blight	• Shoot tips turn brown • Leaves develop brown patches, wilt and fall off	• Using healthy cuttings • Early planting

		• Uprooting and burning diseased plants • Practicing crop rotation

UNIT 17 HARVESTING GROUNDNUTS AND CASSAVA

The success of harvesting depends on the timing of both groundnuts and cassava.

Before harvesting both groundnuts and cassava, it is important to check if they are mature.

Groundnuts

Groundnuts are mature and ready to harvest if the inside of the pod is spotted pale brown.

This is usually after three to five months from the time of planting depending on the variety.

STEPS TO FOLLOW WHEN HARVESTING GROUNDNUTS

- Dig up the plants with a hoe carefully to avoid nuts breaking off and remaining on the ground and pull them down
- Stack groundnuts and leave the plants in the sun with pods up for few days to dry
- Pull off the nuts from the plants, that is, strip off the nuts (kuthothola)
- Spread groundnuts on the mats to dry again for a week

Cassava

Cassava is usually mature and ready to harvest when it has been growing for one year.

Cassava is usually mature when the soil on which it grows starts to crack.

It can be harvested by cutting off the stems with a panga, removing the soil around the roots with a hoe and then pull them out

UNIT 18 PROCESSING AND STORAGE OF GROUNDNUTS AND CASSAVA

Cassava and groundnuts need to be processed and stored properly.

Processing of cassava helps it to stay for a longer period of time and attracts high prices on the market.

Groundnuts

Groundnuts' inside shells take 3 to 6 weeks to dry.

Sometimes groundnuts are dried in stooks for quick drying.

It is not recommended to dry groundnuts on iron sheet roofs.

Pods are then removed by hand or machine from the plant when they start to rattle.

Groundnuts are then winnowed to remove soil debris or trash.

After drying, shelling is done by hand or machine.

After shelling, groundnuts are graded to remove mouldy and broken nuts from good ones.

Take note that oil nuts such as mawanga and manipintar are usually sold in pods.

Shelled nuts may be roasted, pounded into flour and made into sauce.

Sometimes farmers roast, salt groundnuts and put them in small plastic packets.

These are sold as an income generating activity at local markets.

CASSAVA

Cassava is best stored in processed form because it does not take long to rot after harvesting.

There are two methods of processing cassava.

These are:

- Heap fermentation
- Soaking fermentation

HEAP FERMENTATION

This involves:

- ★ peeling the outer covers
- ★ Slicing
- ★ Heap to ferment
- ★ Drying

SOAKING FERMENTATION

This involves:

- ★ Peeling
- ★ Soaking in containers
- ★ Cleaning
- ★ Pounding
- ★ Drying

Fermentation helps to remove the toxic substances from the bitter varieties of cassava and improve taste

When slicing cassava, chips or slices are prepared about 2.5 to 7.5 centimetres for easy drying.

Large chips develop moulds especially when harvesting is done in rainy season.

Sweet varieties of cassava are prepared by peeling, cutting the tubers into small pieces and boiling.

STORAGE OF GROUNDNUTS AND CASSAVA

Groundnuts

Dried groundnuts can be stored either in shelled or unshelled form.

Unshelled groundnuts are stored in sacks, granary (nkhokwe) or in clay pots.

Shelled groundnuts are stored in sacks.

The sacks are stacked on planks or logs to allow free movement of air to prevent moisture which attracts the growth of moulds on the groundnuts

Groundnuts store better in pods because it is difficult for moulds to attack.

Before storage, groundnuts need to be winnowed to clean them.

Cassava

Farmers are encouraged to store cassava in processed form such as dried pieces (makaka) or flour.

Processed cassava stay longer in storage without getting rotten.

Apply 25 grammes of actellic dust to 50kg of makaka to avoid weevil damage.

Cassava chips should be kept dry and away from wet conditions to prevent them from developing moulds.

Mouldy cassava chips are not good for consumption and cannot sell well on the market.

UNIT 19 TYPES AND IMPORTANCE OF POULTRY

Poultry means all domesticated birds.

TYPES OF POULTRY

- Chickens
- Pigeons
- Ducks
- Geese
- Turkeys
- Guinea fowls

IMPORTANCE OF POULTRY

- Source of food to people
- Beautification
- Source of manure
- Employment
- Source of raw materials
- Source of income

TYPES OF CHICKENS

- Layers
- Broilers

Layers are kept mainly for egg production

Broilers are kept mainly for meat production

In Malawi farmers also keep the Black Australorp locally known as Mikolongwe.

These are kept for both meat and eggs.

BROILERS

Broilers are big, heavy and grow very fast.

They are usually ready for use at the age of 6 to 8 weeks.

The improved breeds of broilers kept for meat in Malawi include Stabro, Indian River and Ross.

LAYERS
Layers are small, light and grow slowly.

They take about 18 to 20 weeks before they start laying eggs.

There are several improved breeds of layers kept and these include Hyline, White leghorn and Shavers.

UNIT 20 SYSTEMS OF KEEPING CHICKENS 1

Chickens need proper housing to protect them from bad weather, predators and thieves.

It is important to provide enough space.

A clean chicken house will help to control diseases and parasites.

There are three main systems of keeping chickens.

These are:

- Free range system
- Semi-intensive system
- Intensive system

FREE RANGE SYSTEM
Chickens are left free all day, getting their own feed in form of green grass, insects and any leftover food.

The chickens are not restricted by a fence.

This system is adopted where there is enough land.

ADVANTAGES OF FREE RANGE SYSTEM

- Chickens can find feed for themselves
- Chickens are able to get sunshine
- Manure is well spread all over the field
- The children house does not need expensive materials to construct

DISADVANTAGES OF FREE RANGE SYSTEM

- Predators can catch the chickens

- It is difficult to collect eggs at they may be laid in the bush
- Chickens can easily catch diseases
- Difficult to control breeding

SEMI-INTENSIVE SYSTEM

The chickens are allowed to move freely during the day to eat insects, grass, worms and grit in a fenced area.

They are provided with a house to sleep at night.

Feed and water are provided within the fence.

Laying nets are provided.

The house provided can either be traditional or deep litter.

ADVANTAGES OF SEMI-INTENSIVE SYSTEM

- Chickens do not go far away
- Easy to collect manure
- It is easy to control diseases
- It is easy to collect eggs
- Chickens can be fed on locally made feed

DISADVANTAGE OF FREE RANGE SYSTEM

- Feed must be provided as chickens cannot find enough feed for themselves

UNIT 21 SYSTEMS OF KEEPING CHICKENS 2

INTENSIVE SYSTEM OF KEEPING CHICKENS

The chickens are confined all the time.

This system requires high levels of management and totally depends on commercial feeds.

There are two main houses used to keep chickens under this system.

These are

- Deep litter houses
- Battery cages

DEEP LITTER HOUSE

Chickens are confined (kept) throughout their life in a house.

Part of the wall is built with wire mesh to allow ventilation.

The house is built on a raised ground.

The floor is well filled with litter up to 10 to 15 centimetres high.

The litter can be made of sawdust, wood shavings, crashed maize cobs or chopped straws.

The litter is turned constantly using a rake.

The old litter is removed when new birds are put into the house.

The house has a floor space of 2 to 3 birds per square metre.

The farmer provides laying nests, roosting perches, feed and water troughs.

ADVANTAGES OF DEEP LITTER HOUSE

- Many chickens can be kept in a small area
- More eggs and meat are produced in this system than in the semi-intensive system
- Chickens are well protected from disease and predator attacks

DISADVANTAGES OF DEEP LITTER HOUSE

- There is problem of cannibalism and egg eating
- Chickens can easily catch diseases if litter has a lot of moisture
- Litter may not be available when needed
- It is difficult to identify non-laying chickens

THE BATTERY CAGE SYSTEM

This is the most intensive of all the systems.

The chickens are put in cages.

The number of chickens per cage varies from 1 to 4.

The cages are made of wire and placed in tiers, generally one above the other.

They stretch the whole length of the house.

Each cage has a sloping floor to allow for easy flow of eggs.

Since the droppings fall onto the floor, the lowest tier of cages should be 0.6 to 0.9 metres above the floor for easy cleaning.

Watering and feeding are continuous throughout the length of the cages.

Battery house should have adequate light and air should move freely.

The floor is made of concrete.

This system is recommended for layers.

ADVANTAGES OF BATTERY CAGE SYSTEM

- The farmer can keep many chickens on a small piece of land
- Individual record of the chickens can be kept
- Chickens cannot practise egg eating and cannibalism
- No contamination of food and water with droppings
- Clean eggs are collected
- High egg, meat and manure production

DISADVANTAGES OF BATTERY CAGE SYSTEM

- It needs a lot of money to buy the cages
- High level of management needed for maximum profits

UNIT 22 CHICKEN FEED AND FEEDING

TYPES OF FEEDS FOR CHICKENS

Chickens need feed every day. The type of feed depends on the type and the age of chicken. The feed given to the chickens must always be balanced. A balanced food has all the needed nutrients in correct amounts for the chickens to be healthy and provide meat or eggs. These feeds can be brought from the shops or prepared locally on the farm.

The locally prepared feed is made by mixing 1 part maize meal, 1 part maize bran and 1 part bean meal. Instead of bean meal a farmer can use any other protein source such as cotton seed meal, groundnuts meal, fish meal, meat and bone meal. However the beans must be roasted before grinding to make a bean meal. If

the chicken are feed on locally prepared feed, they must be given plenty of green vegetable as the source of vitamins.

Layers, on locally prepared feeds, must be prepared with lime, burnt and crushed bones or eggshells so that they produce eggs with strong shells.

The commercial feed is already balanced. The farmer will buy according to the needs of the chickens whether layers or broilers and their age.

The feeding is done as shown in the tables below:

Feeding of layers

Types of chicken	**Ages**	**Types of feed**
Layers	Day old to 8 weeks	Chick starter marsh
	9 weeks to 16 weeks	Growers marsh or pellet
	17 weeks on wards	Layers marsh or pellet

Feeding of broilers

Types of chicken	**Stage of development**	**Types of feed**
Broilers	Day old to 3 weeks	Broiler starter marsh
	4 weeks to 5 weeks	Broiler grower marsh or pellet
	6 weeks to 8 weeks	Broiler finisher marsh or pellet

Or

Types of chicken	**Stage of development**	**Types of feed**
Broilers	Day old to 4 weeks	Broiler starter marsh
	5 weeks to 8 weeks	Broiler finisher marsh

FEEDING CHICKENS

Chicken feed and water must be available all the time. The feed is placed in feed troughs (feeders) and water is put in water troughs (waterers). Clean water must be provided every day. Always wash the water troughs before putting fresh water.

UNIT 23 BREEDING PRINCIPLES FOR CHICKENS

SELECTION OF CHICKENS FOR BREEDING

It is the aim of every farmer to produce more eggs and chicken meat. To get this, a farmer must start with strong and healthy chicks. Such chicks will be produced if the cock and the hen have the required

characteristics of high eggs and meat production. This required good selection of a hen and a cock to be parents for the wanted chicks. It is recommended to mate cocks of black austrolop (mikolongwe) with a local hen in order to improve meat and egg production. The offspring will have the better resistance to diseases and survive under hard conditions.

CHARACTERISTICS OF A GOOD HEN

- Broad heat and blunt, short beak
- Bright eyes
- Large smooth comb
- Well-built and roomy body
- Strong legs
- A wide, moist vent

CHARACTERISTICS OF A GOOD COCK

- A large smooth comb
- Bright eyes
- Strong and healthy legs
- Strong body

UNIT 24 THE DISEASES AND THE PARASITES OF CHICKENS

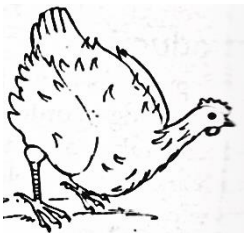
THE DISEASES OF CHICKENS



newcastle



fowl pox



coccidiosis

COMMON DISEASES OF CHICKEN

Name	Causes	Signs and symptoms	Prevention	Treatment
Newcastle	virus	• walking backward • loss of balance	• vaccination	none

		• failing on one side • head shaking • twisting of neck • paralysis • coughing • sneezing • difficulty in breathing and grasping for air	• kill all the infected birds • burn or bury all dead birds • disinfection	
Fowl pox	virus	• sores or spots or patches on face, wattles, comb, around eyes and beak	• vaccination • isolation of infected birds	none but antibiotic can be used for the sores. Iodine can also be applied on sores
Coughs Sneezing	virus	• sneezing • coughing • watery discharges from eyes and nose	• vaccination • cleanliness • Isolation of infected birds	no specific treatment
Coccidiosis	protozoa	• blood in droppings • rough feathers • weak birds	• Drugs added to drinking water and feed • Disinfection • Clean house and equipment	Use suitable drugs. For example, sulphamerazine, sulphamethizine, amprolium
Fowl cholera	bacteria	• Greyish dropping • Blue wattles, combs and face	• vaccination	Antibiotics, for example, tetracycline sulfer drugs

THE PARASITES OF CHICKENS

Two groups of parasites attack chicken.

These are:

- internal parasites
- external parasites

The internal parasites live inside the chickens, in the intestines. They feed on the food that is the chickens eat. They can block the chicken's digestive system.

The external parasite live on the surface of the chicken, infesting the skin feathers and legs. They suck blood and cause irritation.

SOME OF THE COMMON PARASITES OF CHICKENS

Parasite	Signs of infestation or damage	Prevention	Treatment
Tapeworms	• Suck digested feed • Chicks fails to gain weight	• Cleanliness in houses • Keep feeding and drinking places dry	• Use piperazine (de-worming)
Roundworms	• Suck digested feed • Chicks fail to gain weight • Older birds lose weight • Reduce eggs production	• Clean the khola • Keeping litter dry • Raising the young birds away from the older birds	• Use piperazine (de-worming)
Scaly legs mites	• Scales on legs	• Cleanliness in the khola	• Wash legs with paraffin or gamatox solution • Apply petroleum jelly or grease on legs
Fleas and lice	• Irritating skin • Birds sand-bathe	• Cleanliness in the khola	• Dust pesticides into feathers

UNIT 25 MARKETING OF CHICKEN PRODUCTS

MARKETING OF CHICKEN PRODUCTS

Chicken products that a farmer can sell include eggs, chicken meat (or live chickens), and manure.

MARKETING OF EGGS, CHICKENS AND CHICKEN PRODUCTS

Where farmers sell eggs and chickens

Poultry farmers sell chickens and eggs at local market, district council markets, town markets, hotels, restaurants, super markets and other institutions.

Procedures for marketing chickens and chicken products

Marketing of chickens and chicken products involve the following:

- Cleaning
- Grading
- Packaging
- Setting a market price
- Storing while awaiting selling
- Transporting

Cleaning

Eggs covered with chicken droppings or remains of broken eggs or litter cannot be easily sold. They should be cleaned by wiping them with a moist cloth. However, only very dirty eggs need to be cleaned. Washing eggs should be avoided because it removes the productive coat on the outside surface of the egg.

Dirty eggs become infected easily and lose their quality and become poisonous. It is therefore to ensure that eggs are laid in clean conditions in order to avoid the need for cleaning them.

Chickens must be washed with clean water after plucking the feathers to remove dirt.

Grading

The external qualities of commercial eggs are measured by:

- Shell quality – smooth, even and not cracked
- Cleanliness – dirty eggs may be rejected as they may be contaminated
- Shape – a normal egg is oval: very round or very long eggs do not fit well into the egg trays and as a result are easily broken.
- Colour – local preferences may be for brown or white eggs.
- Size or weight – eggs size must be uniform. Very small eggs are rejected. Extra-large eggs or double yolk may not be suitable for packing for transportation as they might break

CLASSES OF MARKET CHICKENS

The poultry farmer can sell chickens as:

- Broilers – young chickens under 12 weeks, which give tender meat (also called friers)
- Roasters – young chickens under 8 months. They are tender but less than broilers.
- Hens – mature female chicken, usually an old layer, more than 10 months old, less tender than a roaster, suitable for stewing.
- Cocks (old roasters) – mature male chicken with course skin, toughened and darkened meat. It is suitable for stewing.

Storage
Eggs break easily. It is therefore important that they are handled carefully in order to reach the consumer without losing much of their original quality. They must be stored at a cool place as they easily rot.

Eggs absorb strong smells and lose their taste. They should therefore be stored away from strong smelling substances such as paraffin, onions and fish. Chicken meat is stored in refrigerators or cold rooms as it can easily rot.

Transporting chickens and chicken products
Eggs break easily. They must therefore be transported carefully while packed in trays. Egg trays can be transported in wheelbarrows, cars, bicycles. Live chickens can be carried in baskets or boxes.

Setting market prices
The market price for chickens and chicken products must include the cost of production, cost of marketing activities such as the cost of plastic paper for packaging, transport, storage and profit.

Selling chicken manure
Chicken manure can be sold locally to farmers who grow crops and keep fish. Chicken manure can also be sold to the industries for making organic fertilizers.

UNIT 26 TREE NURSERY ESTABLISHMENT

SEED SELECTION
It is important to select good seed for planting to ensure high germination percentage and healthy strong seedlings. Seed can be collected from already existing trees. Ensure that the seed is disease free, plump and from mature fruits. The seed must be whole and able to germinate. Avoid seed which has overstayed by checking the expiry date when using seed which has been bought.

SEED TREATMENT
Some seeds have very hard seed coats which prevent water from entering the seed for germination. They can either be nicked, socked or rubbed with sand paper.

Seed treatment

Tree species	**Seed treatment**
Leucaena	nick (small cut or notch)

Kachere	remove fleshy pulp
Chamwamba	remove from pod or shell
Chitimbe	nick
Acacia	nick
Msangu	nick
gliricidia	nick

SEED BED PREPARATION

After selecting the site for a nursery establishment, it must be fenced. The land must be tilled to a depth of more than 30 centimetres to loosen the soil and improve drainage. The beds should 90 centimetres wide and 15 centimetres high. Well rotten manure should be mixed in the ratio of two parts soil, one part manure and one part sand. The seeds can be sown on flat beds to avoid run off. They can also be sown in pots, plastic tubes of opaque beer packets.

SOWING

Make furrows 10 centimetres apart along the width of the seedbed in straight lines for easy cultivation and extraction. Large seeds like gliricidia and acacia must be planted at a depth of 1.5 centimetres. Medium seeds like msangu must be planted at a depth of 1 centimetre. Small seeds like sensibania and Cinderella should be planted at a depth of 0.5 centimetre. The seeds should be sown 5 centimetres apart and covered lightly with the soil.

Tiny seeds may be mixed with sand and spread evenly along the furrow. When sowing seeds in packets, lay the seeds flat in the middle of the container. Push seeds to the required depth with a finger or stick. Mulch the seeds with leaves or grass to reduce evaporation.

UNIT 27 TREE NURSERY MANAGEMENT

Tree nursery management involves a number of activities.

These activities include watering, weeding, thinning, pest and disease control and hardening off seedlings.

Watering

Water seedbeds in the morning and late in the afternoon every day until the seedlings are 4 weeks old. Avoid watering at midday when evaporation is at its highest. Avoid under-watering because it will result into wilting. Start hardening off in the fourth week by watering once in the morning only.

Weeding

Weeding is necessary to reduce competition for nutrients, water, light and space. It also reduces the incidence of pests and diseases. Hand weeding is recommended to avoid damaging the roots. It is necessary to make the soil loose using a small sharp stick.

Thinning

This can be done when there are too many seedlings in the furrow (drills). Seedlings which are very overcrowded grow thin, and tall and heavily compete for space, sunlight and water.

Controlling pests and diseases

Seedlings have to be protected from diseases and pests. Some pests of tree seedlings are ants, termites, cutworms, beetles and caterpillars.

PESTS

PESTS AND THEIR CONTROL MEASURES

Pest	**Control**
Ants and termites	• Apply wood ash from bitter trees. • Keep the seedbed free from sticks and weeds
Cutworms	• Dig up and destroy them
Beetles	• Pick and kill them
Caterpillars	• Spray with tephrosia liquid (sock 2 kg of crushed tephrosia in pail overnight and spray the filtered solution the following day. Repeat the application 2 to 3 times per week)

DISEASES

Damping off

This is the common nursery disease caused by fungi.

PREVENTION OF DAMPING OFF DISEASE

- Following recommended spacing
- Using clean farm tools and gentle handling
- Frequent weeding

Hardening off

This is done to prepare seedlings for the hot and dry conditions in the woodlot. It can be done by reducing the frequency of watering from twice to once a day 4 weeks after germination. Reduce the shading materials to half at the 4th week and remove them completely after the seventh week from date of sowing.

UNIT 28 WOODLOT ESTABLISHMENT

LAND PREPARATION
Seedlings are planted in holes.

Holes should be made in the dry season.

They must be 60 cm in diameter and 60 cm in depth.

When digging the holes, separate top soil from sub soil.

Mix the top soil with manure.

When replacing the soil into the pit, put in top soil mixed with manure first and then subsoil.

A stick can be inserted in the middle to indicate where the tree seedlings would be transplanted. The distances between the planting stations vary according to tree species and the intended use of the trees.

TRANSPLANTING
It is important to transplant seedlings at the beginning of the rain season to encourage root growth before the end of rain season.

Seedlings should be transplanted on a wet day either early in the morning or late in the afternoon.

They should be watered before uprooting for transplanting.

Place seedlings together with soil around the roots in the planting holes.

Cover the seedlings up to the collar mark. Firmly press the soil around the transplanted seedlings to prevent lodging.

UNIT 29 WOODLOT MANAGEMENT 1

WOODLOT MANAGEMENT
To ensure that trees reach maturity, the following management practices need to be done:

- mulching
- watering
- weeding
- manure and fertilizer application
- pest control

MULCHING

Mulching is the process of covering the soil around a crop to conserve moisture.



mulching a woodlot

Materials used in mulching are cut grass, leaves and crop remains.

Mulching is important because It helps in controlling weed growth.

After decomposition it improves the soil fertility.

Avoid putting the mulch close to the seedlings because it invites termites.

WATERING

When there is a short break of rainfall and trees show signs of wilting they should be given water.

Make a basin of water around the seedling to retain water.

The area around the basin should be 1 square metre.

WEEDING

Use hoes to weed a woodlot during the first 2 growing seasons. Thereafter use slashes to weed a woodlot.

MANURE AND FERTILIZER APPLICATION

DAP fertilizer can be applied at 50 grammes per tree using the banding method.



the banding method of fertilizer application

Apply two handfuls of manure around tree seedlings.

PEST CONTROL

The major pests of trees are termites and farm animals like goats and cattle.

Termites can be controlled by applying chemicals like Marshal Suscon at the base of the tree.

Branches from trees with thorns can be placed around trees to keep livestock away.

A fence can also be erected around the woodlot or around individual trees.

UNIT 30 WOODLOT MANAGEMENT 2

PRUNING

Pruning is the process of removing unwanted tree branches.

These include dead, diseased and excess branches.

It is important to start pruning trees while they are young.

When pruning, branches are cut from the bottom upwards to avoid tearing the bark.

The cutting must be at an angle.

Always cut using a sharp panga knife or saw.

Pruning helps to have straight poles and think trees.

The removal of the diseased branches helps to control the spread of diseases.

Trees must be pruned during the dry season so that the cut wounds should heal.

CLEARING FIRE BREAKS

A fire break is clearing around the woodlot to prevent fires.

It measures 3 to 5 metres in the width all around the woodlot.

The fire break must be cleared every year at the end of the rain season.

Fire breaks help to protect trees from being burnt by fire.

HARVESTING

Harvesting of trees is done according to the intended purposes.

For timber, the trees are harvested when the trunks are thick.

For poles and fuel wood, they can be harvested at any time.

Thin or poorly developing trees can be harvested earlier to enable healthier trees to have more space.

The value of the trees can be improved by processing the trees into products such as timber, mortars, pestles, hoe handles, boats and furniture.

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