NEW SYLLABUS BASED NOTES FOR FORM 2

AGRICULTURE

COMPILED BY

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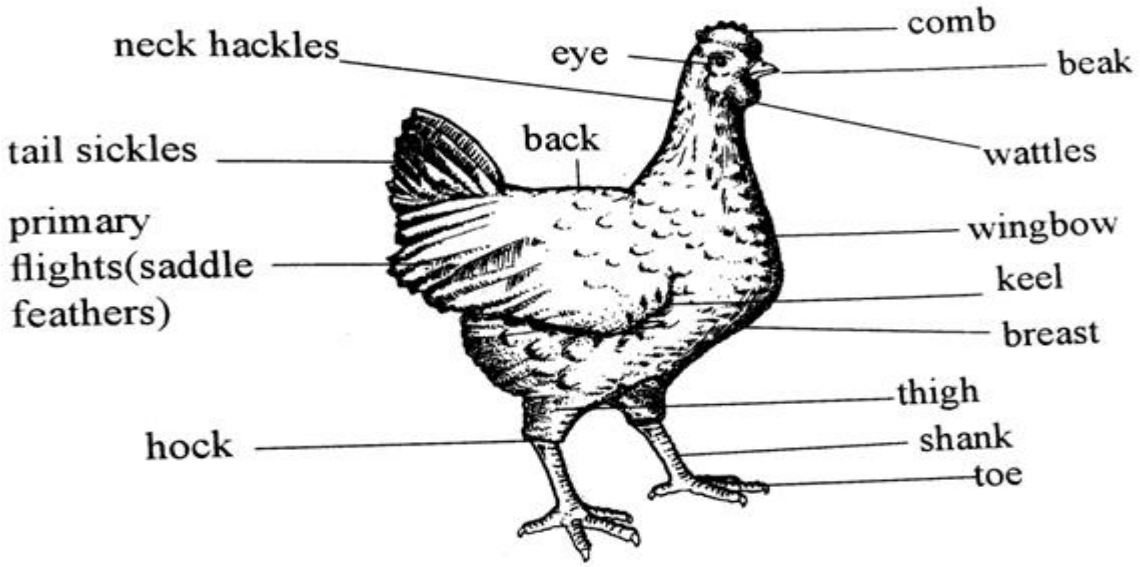

Parts of a chicken

TARGET PRIVATE SECONDARY SCHOOL-MZUZU CITY)

Passing agriculture at junior has never been easy and straight forward. This pamphlet has brought all the resources which are requisite so as to minimize lavishness of precious time probing for valuable information in different books.

ACKNOWLEDGEMENT

My profound thanks should go my spouse Chimwemwe Chakwira who persistently (tirelessly) encouraged me to work as if there is no tomorrow so that this pamphlet should be finalized despite the myriads of predicaments l encountered. I would be doing unfairness if I do not recognize the omnipresent **GOD** for the free endowment of life.

Special dedication to my children **MADALITSO (daughter) and Emmanuel chirwa (son)**

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TABLE OF CONTENTS

UNIT 1: NATURAL RESOURCES

- natural resources are things obtained from the physical environments meet need of the living organisms

List of natural resources

- water
- air/wind
- vegetation
- soil
- sunlight
- wildlife
- mineral

Importance of natural resources in agricultural production

(a) **WATER**

- germination of seeds
- dissolve and uptake of plants nutrients or elements
- cooling plants and animals through transpiration and evaporation respectively
- an agent of soil formation through physical and chemical weathering
- fish farming
- generating hydro-electric power
- providing water transport
- it is used for irrigation of crops
- it is used for processing of various farm produce in factories for example teas, coffee and sugarcane
- it is key component of any living cells since it is a medium of biochemical reactions in the cells of the living organism

PROBLEMS OF WATER

- stagnant water contributes to spread of disease likes malaria and bilharzias
- water is agent of soil erosion
- floods which destroy crops ,animals, land and people's houses
- crop lodging (falling of crop)
- hailstorm destroys crops like tobacco, fruits and flowers
- excess water leaches nutrients deep into the soil where plants roots cannot reach

Main sources of water

- rain
- surface water; rivers, streams, dams, lake, ponds and oceans
- Underground water, springs, well and bore holes.

(b) **AIR/WIND**

- Air is a mixture of gases such as oxygen, carbon dioxide, hydrogen and nitrogen. Wind is moving

Positive effects of air/wind in agriculture

- air provides oxygen for respiration in seeds during germination ; plants micro-organism and animals
- for drying of crops such as air cured tobacco (burley)
- wind brings about rainfall
- wind helps in pollination of plants
- wind helps in seed dispersal
- wind is used for driving windmills

On the negatives side, wind

- causes plant lodging
- transmits diseases and pests
- causes soil erosion
- increase in rate of evapo-transpiration (loss of water bodies, soil and plants)
- disturbs grazing animals
- damage buildings

(c) **vegetation**

➢ This is the term that is used to describe plants such as trees, shrubs, herbs and grass.

Importance of vegetation in agriculture

- protects soil from forces of raindrops impact which causes erosion
- traps runoff water so that it sinks into the soil without causing erosion
- it helps to reduce effects of climate change by maintaining the balance of gases in the air
- it provides fuel wood for cooking and tobacco curing
- medical purpose
- tree provides material for building
- provide shelter in times of intense heat
- provides food for both animals and humans example leucaena,napier grass (elephant grass), acacia, wild fruits for animals and fruits and vegetable for humans
- aesthetic value, plants provide beauty in their natural growth and around building
- plants promote conservation of organism that are essential in agriculture production like pollinators and natural enemies like predator

(d) **SOIL**

➢ means top lose materials covering of the earth's surface

Importance of soil

- it anchors plants
- it provides nutrients to plants
- it provides soil water to plants
- it keep warm for seed germination, dissolution of nutrients and microbial activities
- it is habitat for soil organisms responsible for decomposition of organic matter
- it provides raw material for construction of agricultural infrastructure

(e) **sunlight**

➢ This is the light that comes from the sun.

Importance of sunlight

- Plants use it for photosynthesis. this is food making process whereby green plants combine water with carbon dioxide using light to produce glucose and release oxygen
- it is source of heat energy used for proper drying of crops
- it provides heat necessary for controlling some pests e.g. eelworms

(f) **wildlife**

- This is the term used to describe undomesticated animals and plants.

Importance of wildlife

- source of income
- source of foreign exchange mostly though tourism
- prevents effects of climate change
- maintain the ecosystem
- a reserve for biodiversity

(g) **minerals**

- A mineral is an element or chemical compound that is normally crystalline and that has been formed as a result of geological processes.
- a rock is an aggregate of minerals which does not have a specific chemical composition

Importance of minerals in agriculture

- they are absorbed by plants for their normal growth and yielding
- dietary minerals are used by humans for their normal body functioning so that they are fit for agricultural operations
- some mineral like coal are used as source of energy needed on a farm-for example heat for curing tobacco
- they are source of income through export so that as country, Malawi can import agriculture which are not manufactured locally

Ways in which natural resources can be depleted

(a) water

- **evaporation** : water from the soil and water bodies like river, lakes and oceans changes into gaseous water and goes into the air
- **Transpiration**: loss of water by plants in form of vapour. it should be noted that water lost by plants is first absorbed from the soil
- **irrigation**: this occurs when water from reservoirs is used to grow crops
- **domestic use**

(b) AIR

How air can be polluted

- human activity contributes to the availability of harmful and unnecessary gases in the atmosphere in several ways like
  - dust which is often a bi-product of agriculture processes
  - biomass burning produces a combination of organic droplets and soot particles
  - industrial processes produce wide variety of gases depending on what is being burned in the manufacturing process

- Exhaust emissions from different transport systems like tracks, locomotives and cars. These generate a great deal of gasses which pollute the air.

(c) vegetation

- vegetation can be reduced mainly due to human activities such as
  - opening new farms
  - clearing land for construction of buildings, roads and various infrastructure
  - fuel wood
  - timber and poles
  - bush fires

(d) soil

- erosion is he major way soil is lost
- **soil erosion**: is the washing away of the top loose material either by water or wind
- in Malawi major agent of erosion is water

Types of erosion

Water erosion

- these includes:

i. Splash erosion

- Occurs due to raindrop impact
- Raindrops displace soil particles as they hit the ground

ii. Rill erosion

- Small streams due to surface runoff after rainfall dig small channels called rills on the ground.

iii. Gully erosion

- If unchecked rill erosions leads into gully erosion where large channels are made on ground
- It is the most serious type

iv. Sheet erosion

- A large body of shallow water runs down the slope carrying away with it the top soil {only 10% of water erosion is due to surface runoff (rill, gully and sheet erosion}

- **wind erosion** may be caused by whirl wind

(e) How wildlife can be depleted

- **Deforestation:** as human population increase, so does the demand for land for settlement and agriculture. As results, people may have very little option but to clear the land by felling the tree. they also cut down tree for fuel wood and construction
- **Poaching and hunting:** humans have been hunters for food since time immemorial. s a results animal became fewer
- **wildfire:** this kills vegetation and animals
- **encroachment** in protected areas: people either open garden or clear such land for settlement

(f) how mineral can be depleted

- As crops grow in the garden, these, make use of minerals. The higher the yield realized from field, the higher the amount of nutrients used up by the crops.

Soil loses mineral salts in the following ways

- plant uptake

- **soil erosion**: agents soil erosion such as water and wind do not only take soil particles , they also take mineral salts which they hold
- **leaching:** this is when dissolved mineral salts are taken deep into soil where plant roots cannot reach
- formation of compounds which are not used by plants like aluminum
- mining

Conservation of natural resources

- **Conservation of** natural resources means wise use of the earth's resources by humanity.
- it involves proper utilization of these resources to avoid depletion or destruction

Ways of conserving natural resources

(1) soil conservation

- is a set of management strategies for prevention of soil being eroded from the earth's surface

Methods of soil conservation

i. cultural methods:

a. **Crop rotation:**

- Practice of growing a series of different type of crop in same area in subsequent seasons.
- land must be demarcated into plots where the different crops are grown separately
- in the next season, the plots are allocated with different crops

How crop rotation conserve soil

- Different crops have the ability to cover the soil. when the crops that cove the soil are rotated with non-cover crops, there is significant reduction in soil loss
- Protection against soil loss is maximized with rotation with that has the greatest mass of crops residues on top of the soil. the residues which cover the soil minimizes erosion from water by reducing rain drops impacts, overland flow velocity, stream and thus the ability of the water to detach and transport soil particles

ii. correct plant population

- a plot can have correct plant population if the following are corrects
  - spacing between rows or ridges
  - spacing between plants
  - number of plants per station
- **correct plant population conserve soil in this way**
  - Ensures complete soil coverage so that soil protected well from raindrops impacts and running water. the result is that the water sinks into the soil without causing erosion

iii. application of organic mater

- Organic matter loses the soil particles so that when it rains, water sinks.
- the volume o soil also increases so that it can hold a great volume of water below it overflows

iv. controlled grazing

- this ensures that pasture is not overgrazed and land does not lose the grass which protects the soil from erosion

v. zero or minimum tillage

- is a way of planting crops from year to year without disturbing the soil through ploughing
- no till increases the amount of water and organic matter in the soil which decreases erosion

vi. correct land used

- Every land is allocated with an agricultural activity which will protect the land. For example, a hilly area needs not to be opened to arable crops but to tree or perennial crops like teas to avoid erosion.

b. **Biological method:** such as planting vegetation like trees and grass on bare land. the main aim is to ensure that soil not exposed to agents or erosion

c. **physical methods:**

- This involves building structure such as terraces, contour or graded bands, ridges across the slope, box ridges, storm drains and dam.
- the purpose is to hold rain water and allow it to sink while at the same allowing excess water to drain away from the field of crop without being erosive

(2) water conservation

- is conserved in the soil and dam

Methods of water conservation

a) cultural method of conserving water

- these may include; crop rotation, corrects plant population, controlled grazing, zero grazing and corrects land use
- *they aim at ensuring that there is always adequate soil coverage of the soil so that when it rain, most of the water is trapped and forced to infiltrate into the soil*

b) biological method of water conservation

- This depends on planting tree on bare land.
- people are also discouraged from setting bush fires and wanton cutting down of trees
- *vegetation helps to open up soil, trap running water thereby increasing rate of water infiltration in the soil*

c) physical methods water conservation

- These methods make us of physical structure such as box ridges, contour bunds, dams, storms drains and ridges across the aslope.
- *these structures trap and hold water and increase infiltration*

(3) air conservation

- Refers to the keeping of air free from pollution. it involves protecting and cleaning of the earth's air supply.

Ways of air conservation

- Restricting the use of chlorofluorocarbons. These materials are produced in industries use mainly in refrigerants and air conditioners. thy ear now regulated under the Montreal protocol due to their adverse effect on ozone layer
- Conservation of vegetation: vegetation which use up carbon dioxide for photosynthesis herby cleaning the atmosphere gases. vegetation also covers up the soil and reduces dust
- avoid bush fires which emits smoke and other gases
- avoid smoke producing vehicles and locomotives

Effects of rapid population on natural resources

- **these may include**

(a) lead to increase in demand for arable land and this results into land degradation due to over cultivation
(b) decline in land productivity and reduction in forest cover due to increase in pupation
(c) pollution of water, air and land because of the wastes from industries and urban cities
(d) deforestation as people covert it to arable land for settlement and farming
(e) encroachment of wetland and marginal land which are not originally suited for cultivation
(f) Desertification this results from human activities such as overgrazing due to overstocking, deforestation and poor agricultural practices like slash and burn system which depletes vegetative cover.

UNIT 2: AGRICULTURAL RESEARCH

- Is the scientific and systematic procedure of finding solution dot agricultural problems.
- Or is a formal work undertaken systematically to increase knowledge of garniture, solve new or existing problem, develop new theories and test the validity of instruments or procedure.

Importance of agricultural research

- coming up with high yielding varieties of crops and breeds of livestock in order to increase food production, thereby reducing hunger
- coming up with better storage facilities in order to reduce post harvest storage losses
- farmers can sell excess harvest for cash
- due to increased ion productivity, the other hand can be used for other agricultural activities e.g. livestock
- they come up with new technology to enhance the production of high yields
- develop solution to existing problem e.g. may develop variety can resist against pest and disease(maize is genetically modified to control stalk borer
- they determine suitable ecological conditions for various crops and livestock
- they carry out efficacy test on pesticides ,herbicides or fungicides to determine the most suitable for crop production

Agricultural problems requiring research

(a) low quantity of crop and livestock yields
(b) low quality of quality of crop and livestock products
(c) high susceptibility of crop and livestock to pest , disease and parasites
(d) spoilage of agricultural produce before consumption
(e) inadaptability to prevailing ecological conditions
(f) effectiveness and ineffectiveness of agrochemicals
(g) **land husbandry**—so that land continue to be fertile without losing its fertility
(h) **crops husbandry practices**-weeding, fertilizer application, pest and disease control, storage and processing
(i) **livestock breeds**-so that new breeds which can grown quickly while fed on small quantities of feed, resists various disease, pests and parasites
(j) **crop varieties** –so that new varieties which can produce high yield from small hectare are found

(k) **livestock husbandry practices:** like new feeding methods, advanced housing , new disease and pest control techniques

Links between agricultural research and agricultural technology

- **agricultural technology :** means new agricultural ideas and inventions which increase agricultural production
- ***Technology and research are related.*** *Research brings new ideas which are in them technology. for example, local varieties to new varieties of crops of crops, hand hoes to ox-drawn and tractor drawn ploughs, clay points to air tight silos*

Scientific approach to agricultural research

- stages in scientific approach to agricultural research
  - problem identification
  - hypothesis formulation
  - aim
  - experimental design
  - carrying out the experiment
  - data collection and recording
  - data analysis
  - data evaluation
  - report writing

(a) identifying problem or areas of study : for example , a problem could be faced by farmers could be , "
  - of the so many fertilisers available, what could be the beats type of fertilsers for maize production"
  - lack or failure of DSP fertilizers during planting results in slow growth rate of maize

(b) Propose a hypothesis (guessed answer). This is an answer which will be proved or disapproved. example : planting maize using DSP fertilsers promotes fast growth

(c) Clearly state aims of the experiment: this is what you want to achieve at the end of the day. example : "to determine the effects of planting maize using DSP fertilizer on root growth"

(d) Experimental designs: this means planning the layout of the experiment i.e., how the experiment will appear in the field.

- consider three things when carrying out agricultural research
  - treatment
  - replication
  - randomization

i. treatment

- This is a variable or feature or quality which may change or differs or vary. for example of fertilizer trial it could be "**type of fertilizer under study"**

ii. replication: means repeating of the experiment in different plots of the same field or at another place

Plot 1	**Block 1**	**Block 2**	**Block 3**
1	CAN	Urea	Sulphate of Ammonia
2	Urea	Sulphate of Ammonia	No fertilsers
3	Sulphate of Ammonia	No fertilsers	CAN
4	No fertilsers	CAN	Urea

- **Plot there is control treatment** which serves as a comparison treatments against all other treatments. this treatment is familiar to the researcher
- Replication is important because it removes environmental differences which may exist e.g. soil fertility, soil structure and texture. these differences affects results of the experiment

iii. Randomization

- means allocating treatment into blocks by chance
- importance of randomization is to avoid bias or favour when allocating the treatments

Methods of randomization

- there are there are four and these are

1. **tossing a coin:** if there are two treatments since a coin has two sides
2. **throwing a dice** : if there are six treatments since a dice has six sides
3. **Use of pieces of papers:** each treatment is written on piece on separate piece paper and folded. Each paper is picked in turns and allocated to a block. the number of papers should be equal to number treatments
4. **Using random number tables**: numbers are written in tables and they are generated by computers. for details refer to book 2

(e) experimental designs

- there are two

i. **randomized block deigns**

- there are two or more blocks i.e. replicates
- each treatment appears once in each block
- treatments r randomly allocated to the block

Randomized block design

Plot 1	**Block 1**	**Block 2**	**Block 3**
1	CAN	Urea	Sulphate of Ammonia
2	Urea	Sulphate of Ammonia	No fertilsers
3	Sulphate of Ammonia	No fertilsers	CAN
4	No fertilsers	CAN	Urea

ii. **Latin square**

- number of blocks is equal to number of treatments i.e. numbers of treatments is determines number of blocks
- each treatments appear once in a block
- each treatment appears once in a block and also once in plot

Latin square design

Plot 1	**Block 1**	**Block 2**	**Block 3**
1	CAN	Urea	No fertilsers
2	Urea	No fertilsers	CAN
4	No fertilsers	CAN	Urea

(f) carrying out experiment

- while designing is done on paper, the then is taken to fried as follows
  - crops husbandry practices are going to be the same except treatments under study
  - the results from other treatments should be the results of fertilizer

(g) observing and collecting data

- Data can be collected on leaf colour, plant height, number of flowers, branching, leaf length and breadth, stem circumference, plant lodging, disease and pest incidence.
- every incidence and operation should be recorded properly

Ways of collecting data:

i. **Direct observation**: e.g. leaf colour, number of flowers, branching and, plant lodging, disease and pest incidence.
ii. **Measurements** e.g. plant height, , branching, leaf length and breadth, stem circumference,

(h) data recording

- Data is recorded in pie-charts, histogram, bar graph and line graph.
- it should be presented in the most convenient way possible

Below is a table used for recording data

Plot 1	**Block 1**	**Yields (kg)**
1	CAN	5000
2	Urea	8000
3	Sulphate of Ammonia	4500
4	No fertilsers	500

(i) data analysis

- data can undergo the following processes
  - calculation of percentage e.g. germination percentage , survival percentage
  - calculation of averages or mean
  - calculation of range
- reason for analyzing is to give true reflection of the results

(j) data evaluation

- Is summary of the findings in which the researcher discusses, concludes and recommended the findings to the farmers.

(k) report writing

- This is to inform the user about the findings i.e. the farmer of the new technology that has been identified through the research.
- it helps other researchers do not repeat the experiment but continue from where it was stopped (**for details on how to write a report refer to agriculture pamphlet book 2)**

UNIT 3: AGRICULTURAL TECHNOLOGY

- **agricultural technology**: is the use of scientific tools and techniques for carrying out tasks in agriculture or
- **agricultural technology** refer to the techniques that are applied to crops and or livestock production to enhance growth and productivity

Examples of techniques in agricultural technology

- use of herbicides
- use of resistant varieties of crops
- pruning
- cropping system
- feeding
- housing
- machine milking
- irrigation among others

Examples of tools in agricultural technology

- ploughs
- mowers
- harrows
- combined harvesters
- pumps
- tractors
- incubators
- brooders
- sprayers

Importance of agricultural technology

- It is fasts and efficient. e.g. farmers can plough more deeply and better with disc plough than using hoes
- There are situation when the use of technology is cheaper than use of human labour. e.g. hand maize Sheller is more expensive than a machine which dos the shelling
- There are task which can be done by technology only like spraying pesticides, cutting down trees, feed mixing.
- increase quantity of produce through the use of manure and inorganic fertilsers
- increase quality of produce though cultivation of indigenous crops and keeping indigenous breeds of animals which are more resistant to diseases
- reduce cost of production by encouraging improvisions of tousles rather than buying
- increase production lifespan for example, through use of quality certified seeds
- improvement on adaptability to local ecological set-ups
- Enhances food security that the food produced by farmers is enough for the nation. farmers are equipped with improved machinery to achieve this
- improve environmental conservations by encouraging farming practices such a ploughing across the slopes, soil erosion control, afforesting among others
- improve transport and communication by maintaining proper road networks

- improves bilateral, international or multilateral relationship which is important especially when loans or aids is required by a nation
- reduce crop or livestock produce loses through better post harvest storage technology

Outline of the types of farm structures

- granaries
- warehouse
- animals house
- crumb
- silos
- spray race
- milking parlor
- abattoir
- cattle crash
- cold room
- fence
- roads
- irrigation channels
- physical conservational structures like storms drains and bunds

Types of farm structures

- Farm structure refers to different type of physical constructions that are put up in a farm for the purpose of livestock and crop production.
- farm structures are categorised into five groups
    - crop storage
    - crop- processing
    - animal housing
    - farm equipments and tools
    - roads and bridges

a. crop storage structures

- They are used to preserve harvested crops produce for future use or during a time when the weather cannot allow prodcuti9n.

Conditions for good storage facilities

- grains must remain dry with no contact with dampness and rain water
- storage temperature must remain constant to avoid the grains initiating sprouting
- store must be protected against insects and rodents

Size and type of store depends of the following factors

- the amount of crop to be stored
- specific needs for the crop
- availability of materials for construction
- the cost of the materials
- the nature in which the crop is to be stored

- there are two types of storage facilities

- ❖ **traditional**
- ❖ **modern**

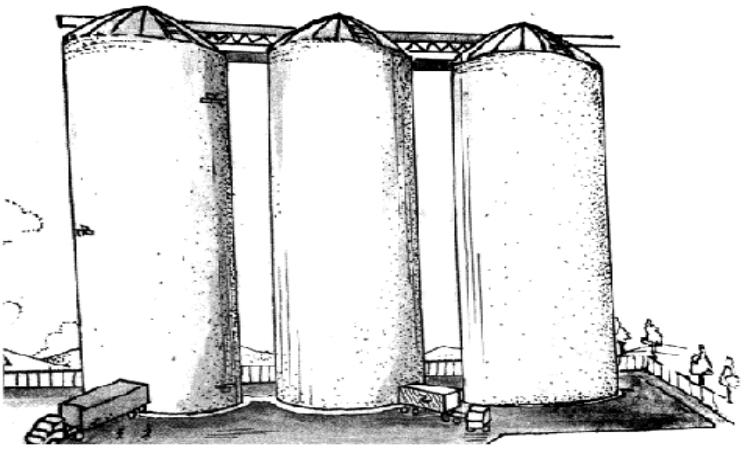
i. traditional storage facilities include

- underground pits
- clay pots
- grass baskets
- traditional made from local materials

ii. the modern storage facilities

- grain tanks and drums
- grain silos
- modern granary
- sacks
- portable metallic silos

traditonal grains store granary)



silos

b. crop processing structures

- ➢ crop processing involves changing crop from one form to a move valuable or one that can last longer
- ➢ examples of the processing facilities
  - drying maize-maize driers
  - pulping of coffee berries-pulping machines
  - milling of the maize grain-maize millers
  - drying of leaves-tobacco burn
  - silage making (en siling)-silos
  - chaff cutter
  - oil pressing machines
  - forage harvester

c. animal housing structures

- ➢ These are structures used to housing the livestock.
- ➢ they include;
  - crushes
  - dips
  - sprays race
  - calf pens

- dairy shed or parlour
- poultry house and
- structures (deep litter, coops, folds or arks, runs, battery ages)
- rabbits hutches
- piggery or pig sty
- fish ponds
- zero grazing unit and
- Beehive.

d. farm equipments and tools

- Tools are quite simple and held in the hand as one performs a particular.
- Equipment on the other hand is more complicated and specific.

Examples of equipments are

- knapsack sprayer
- stir-up pump sprayer
- chaff cutter

Examples of tools

- machete
- rake
- garden fork
- axe pick axe or mattock
- hoe
- wheelbarrow
- watering cane

Importance of using farm tools and equipment

- to increase efficiency and make farm operations easier
- to minimize injuries to livestock for example trocar and canular can be used rather than a knife to relieve cattle of bloat
- To enhance milk production. Machine milking will be more effective than hand milking where a large herd of cattle.

e. roads and bridges

- Roads allow the farmers to get inputs anytime they want and transport their farm produce as they wish.
- Goods roads which are passable throughout irrespective of the time of the year are therefore a very important.
- Bridges should be constructed over such river to allow communications and transportation throughout the year. This is important because most of the farm produce are transported by goals.
- Even those air-lifted or shipped will to use roads to and from airports and seaports respectively.

Description of farm structures

(a) granaries

- Used for storing unshelled crops like maize, groundnuts and miller. they are made up of a roof, baskets, rafters raised from the ground

(b) crib

- used for drying crops like maize and ground before shelling
- It is also built on well raised rectangular rafter like a granary. the only difference is that the materials used for the body re not tightly packed together as with the granary-they are spaced about 10to 20cm apart to allow free blowing of air to promote drying process.

(c) silos

- These are air-tight containers. Locally made silos are clay pots, tins or drums.
- They become silos if they are provided with the lid which prevents free air circulation.
- they are more highly mechanized which can hold large quantities of grains

(d) **spray race**

- Used for praying animals against exo-parasites like ticks. Animals a pass through the structure while the pesticides are being sprayed. by the time the animal leaves the structure, the whole animals will have been sprayed.

(e) **cattle crush**

- Used for handling cattle when drenching, vaccinating and branding. The animal's neck is held up so that the animal fails to pass through or they cannot be withdrawn. while with this position, it is possible to handle it without endangering the stockman

(f) **milking parlour**

- Used to handle cows during milking.
- The animals are driven into the structure in which they cannot move forward or backward while being milked.

(g) **abattoir**

- it is the structure in which animals are commercially slaughtered without being tortured, degraded or condemned before taken to storage and consumption

Safety rules when using farm structures

- Wear protective clothes such as gumboots, overalls, gloves and headgear. this is critical when spraying chemicals to crops in the field and before storage
- the farm structure need to be in good conditions all the time
- farm structures should be stored away from dwelling houses so that they cannot easily be accessed by children
- provide animals with appropriate handling structure like cattle crush used for handling cattle during branding and administering drugs
- structures such as warehouse need to have exits which are wide enough to allow free exits in times of fire
- equipment and material should be properly stacked or arranged for easy inspection and access in time of need
- switch off the engine of the farm machinery when servicing it
- do not put on loose clothing when servicing farm machinery
- store fuel and any chemicals in safe places where children cannot reach
- avoid smoking , eating or drinking when spraying agro-chemicals
- wash hand s thoroughly soap after handling chemicals
- enough light is important especially in the store room to allow visibility
- keep safe distance from others when using tools and equipments to avoid injuries

Importance of observing safety rules when using farm structures

- every efforts must be made to ensure that they are well maintained and stored so that they can last long
- people should not be harmed in course while using them
- substandard construction in the farm will be avoided and buildings stay longer
- Well tools are stored properly, they do not rust. they cannot be stolen as well
- injuries are avoided when the users of the farm tools keep safe distance when using the tools
- broken tools should be repaired to avoid accidents and increase their efficiency
- Children can be injured ignorance when they are close to the farm machinery. they should stay far from moving parts
- of machine
- expert only should be allowed to operate farm machines to avoid injuries
- agricultural containers ate normally kept away from reach of children in order to prevents the children from consuming the toxic chemicals inside them
- Some agrochemicals are inflammable. avoiding smoking will prevent onset of fires
- proper lighting in the farm house prevents accidents

UNIT 4: FARM BUSINESS MANAGEMENT

- Farm business management is the process by which resources and situations are manipulated by the farm family in trying to achieve its goals.

Basic concepts in farm business management

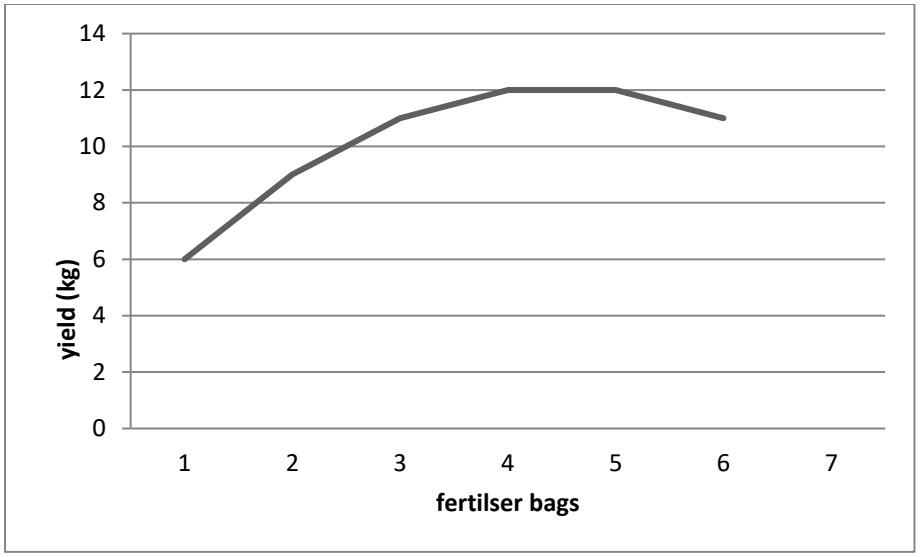
(a) production

- means changing inputs to outputs which are needed by consumers at a profits
- Farmers must use the rights amount of inputs in order to make high profits.
- Otherwise too little or too much is not good enough for high profits.

The production curve

- This is the curve that shows the relationship between inputs and production levels. usually production increases as level of inputs rises to a point when output start to decline

Fertilizer bags	Yields (bag)
1	6
2	9
3	11
4	12
5	12
6	11



- The graph shows the possibility of yield increase as inputs are increased. But hen too much is dangerous and that is why further increase in the fertilsers results in a decline yield.

  Three sections of the curves

  i. **yield increases** as the farmer increases inputs (yield is increasing at increasing rate)
  ii. **yield increases** as the farmers contuse to increase inputs (yield increasing at decreasing rate)
  iii. **yield starts** to decline if inputs continue to be increased
- The farmer should operate within the second segment. This works where there is direct relationship between input and outputs. for example, yield and fertilsers

Importance of agricultural production includes

- **provision of food for rural and urban population**
- source of direct and indirect employment
- production of raw materials for industries
- provide market for industrial goods such as farm machinery and agrochemicals
- earn foreign exchange after exporting farm produce
- source of revenue or capital obtained when a farmer sells his or her farm produce
- Improves the standard of living of the farmer's households.

(b) financing

- This means acquiring funds and making them available for production. Availability of funds gives farmer control over all the production operations. For example, farmer can buy inputs of the quantity they want, and hire labour when needed.
- **How do farmers acquire funds for agriculture?**
  - from commercial banks
  - from friends and relatives
  - personal savings
  - village banks
- farmers must apply financial management principles by;
  1) obtain credits from is institution will charge low interest rates
  2) Buying cheap inputs from suppliers. this may be done by buying them in groups or at a wholesale than retail supplier

3) ensuring that liquid capital is readily available for day to day operations
4) ensuring that they build their own capital base by investing part their profits

(c) farm budgeting

- A budget is a financial plan of income and expenditure over a given period of time.
- The farer must estimate the expected income and expenditure from crops and animals enterprise.

Importance of budgeting

- it helps the farmer to sticks to his/her plan
- the farmers allocates resources to various enterprise which are most profitable
- it shows the farer expected profits each enterprise and is able to choose wisely
- tell the farmer expenses in advance and is able to finance the farm activities adequately in advance

(d) record keeping

- Farm record refers to the systematic of various farm business activities and transactions in suitable books or on sheets of paper.
- for example planting dates, breeding dates, amount of and type of fertilsers used, amount and type of feeds given to livestock's, tools and equipments available at the farm can constitute a s entries in to the farm records.

Importance of farm records

- they tell a farmer whether the farm is making profits or loss
- they help a farmer whether he/she is making progress or not
- They help a farmer to know whether he/she is using right quantities of inputs or not by comparing with past records.
- They help to check the effectiveness of the production methods. for example, use organic or inorganic fertilsers
- the farmer identifies problems and weakness as they occur and is able to avoid then in future
- they help the farmer know whether resources are available or not
- they help the farmer know whether he/she is credit worthy or not

(e) business decision making

- Can be regarded as the metal process resulting in selection of a course of action among several alternate scenarios.

Examples of decisions farmers can make

i. **What to produce:** some may choose maize for food, cotton for ale, while others cassava for food and tobacco for sale, or produce excess maize so that some can b sold.
ii. **How much to produce:** this could b due to economic or social factors. A farmer cannot produce more than what his/her resources can allow.
iii. **when to produce :** some farmers choose to produce tomatoes during the dry season because diseases are less troublesome; while some can choose to produce even in the rainy season despite the disease because the tomatoes are less in supply so that they can minimize profits

iv. **How to produce:** the farmers decide on resources to be sued. for example; the farmers decides on whether to use manure or inorganic fertilizer

v. **when to sell the produce :** some farmers sell their produce soon after production , while some keep them until prices group in order to make profits

Factors of agricultural production

- in economics are inputs needed to the production process
- input is the starting point while output is end point of the production

Major factors of production

a. land

- Can be defined as a factor of production which comprises of all naturally occurring resources like water, soil, rocks and vegetation.
- This implies that land is where agricultural production takes place.

b. labour

- this is the amount of work done by humans measured in an days/man hours;
- The effort of people in the process of production. It does not imply the human themselves but what they do per unit period of time.
- labour can be hired or family members

c. capital

- Means a list of items or materials which can be living or non-living but use d for production. It does not imply the humans themselves like fertilsers, seeds, feeds, livestock, tress (fruits or forests) and cash.

- **there are types of capital**
  - **liquid capital or circulating capital :** cash in hand or bank and can be used to perchance real assets
  - **Working capital:** these are resources used in production. These include animal's feeds, veterinary drugs, pesticides, herbicides and fuel.
  - **Durable capital or fixed capital:** these are assets used in production process, but are not consumed process. e.g. machinery, buildings, water systems and perennial crops

d. management

- refers to the process of allocation of scarce resource w to attain the desired goal
- Or the intelligence of the farmer in organizing and using land, labour and capital for production.
- It acts as a hub by bringing and weaving together all the other factors of production in a manner that that when they are put in production process, optimum levels of production can be achieved.

Ways in which factors of production influence agricultural production

1. land

- productivity of land depends on size, quality and locations

a. Size: this is the amount of land in hectares or acre. land size determines the following

i. scale of production:

- how many hectares can be allocated to an entries like maize production

ii. The number of enterprises which farmer can have:

- Small pieces of land prevent farmers from combing many different enterprises. for example, maize, beans, pastures, woodlot and others

iii. Cropping systems:

- This means are going to be arranged in the field in every growing season. If the farmer has a big farm holding each crop can be grown on its own field.
- Many smallholder farmers adopt mixed farming because of they have very small land holdings.
- However, it possible famers for farmers with land holdings to increase them through buying more land.

b. Quality

- This factors determined by fertility of soil, slope of the land, texture/structure of soil.
- A flat land is fertile loam soil would be good for agricultural purposes.
- the farmers can put sloppy land into arable crop production through **construction of terraces**
- with the use of heavy of machinery, the sloppy land can be sued made into flat steps called terraces where arable crops can grown without threat of the soil

c. location

- Land close to a market or road is more suitable for agricultural purposes than land which is very far away because consumers can easily be reached at a low cost.
- This challenge can be sorted out by government through improving road and transport network so that agricultural commodities reach market quickly enough without incurring damage.

2. labour

- A farmer may have enough land of good quality but if labour is challenge then dreams of an agricultural production can be farfetched.

Labour factors that affect agricultural production include the following

- **Number of people:** the more the people there on the farm, the quicker the operations will be done. for example weeding, fertilizing , banking, harvesting, crops processing will be completed on time
- **Capacity to work:** capacity or skills can be as a result of training, exposure and experience. workforce which has three attributes will increase production
- **willingness to work:** people's desire to work for long hours increase production
- **health of the people:** healthy people are more able to work and produce than those who are sick
- **Social activities**: these could be funerals, initiations ceremonies, wedding and others. these social activities reduce the amount of times which could be devoted to work

3. capital

- In order to start production process, there must be capital.
- Capital is different from land because it is a result of human efforts while land exists naturally.
- Different capitals are needed for different agricultural enterprises. for example, in order to produce chicken, a farmer needs feeds.

Types of capital

i. **Working capital:** this forms what is referred to as inputs. The inputs are needed for running of business. examples are animals feeds, fertilsers, pesticides and seedlings

ii. **Liquid capital:** this is cash. it is so called because it can easily be changed to other forms of capital i.e. money is used to buy all other forms of capital

iii. **Fixed capita;** this group of capital is made up of all those materials which are used over a period of more than one production season. Examples are: buildings, machinery, tools and equipments, irrigation systems, fences.

- Most farmers find it difficult to indulge in farming because capital is not readily available.

Farmers can acquire capital through

- **personal savings:** a culture of saving need to be instilled in people of Malawi s that they can have capital or their capital can grown and increase production
- **borrowing :** from financial institutions like banks., FINCA,Microloan, pride-Malawi, FINCORP and even from friends and relatives
- **Village banks** here, people form groups and bring together cash which the needy can borrow.

4. management

- in farm management, there are two aspects of management

i. **Technical aspects:** This aspect of scientific principles and practical skills of crops and animals production. The farmers need to have these skills or make an effort to learn them in order to become effective. in certain cases, the farmer can hire personnel with required skills

ii. **Business aspects:** this aspect looks into decisions making and organizational skills of the available resources. given a wide range of alternatives, the farmer should be able to decide on what to produce, when to produce and sell, how to produce an how much o produce

Management entail that the manager carries out the following

(a) planning i.e. what, when, when, how should an operation be done
(b) Budgeting resources: here, the farmer allocates various resources to the enterprise. note that a budget is a financial plan
(c) implementing the plan
(d) supervising operations in order to guide and control the plan
(e) keeping records of production and sales
(f) taking measures to bear the risks so that when misfortunes such as bad weather, disease and pests occur, the farmer should still survive
(g) Evaluating the effectiveness of the implemented plan. when necessary, make changes and improvements

Others factors that affects agricultural production

- apart from major factors , there are also other factors that play a role in agricultural processes .and these are
  - market
  - climate
  - quota
  - pests and diseases
  - risks and uncertainties

(a) market

- Market is any structure that allows buyers and sellers to exchange any type of goods , services and information.
- Market is place where goods and services are exchanged as a situation where there exist buyers and sellers of a particular produce.
- It also refers to people or customers who are willing to buy goods and serves. Through demand and supply, market influences prices market.

Market influences agricultural production in the following ways

- **it enable the farmers to obtains inputs** likes fertilsers, pesticides, seeds, pangs knives, axes, ploughs, and ridges without which production would be impossible. market which sell input are called factors markets e.g. ADMARC
- **It enables farmers to sell their produce**. Farmers are motivated by presence of market to produce more. And good prices of the farm produce also encourage farmers to produce more. Market where good and services are sold is called a product

(b) climate

- Climate refers to average weather conditions of a particular area experienced over many years (over 20 years). weather is the atmospheric conditions of the day

Climate influences agricultural production in the following way

- It affects level of production and choice of agricultural enterprise. farmers choose enterprise that which suit the existing conditions

(c) quota

- Quota is the maximum amount of a commodity to be produced and soil. Usually quota is imposed on commodities which are produced purely for sale. For example, tobacco, tea, coffee, sugar, even minerals, oil.

Quota influences agricultural production in the following ways

- To control supply of these commodities on the market so that they should only produce the amount which the customer are willing to buy. overproduction can result to losses because
  - prices go down because there is too much of the commodity on the market
  - the excess commodity may not find a market
- To control farmer's production quality

(d) pests and diseases

- During production period, there is a constant battle between the farmer on one hand and pests and disease on the other hand. The battle is financially very costly; however, if the farmers neglect them, there is always a big reduction I yield quantity and quality.

(e) risks and uncertainties

- A risk is the difference between what a farmer could predict and actual, outcome.
- uncertainty refers to a state of imperfect knowledge about future events or outcomes
- a risk can be predicted while uncertainty cannot be predicted

Examples of risks are

- theft

- fire
- accidents to employee or employer
- disease and pests outbreaks
- farmer's and his household's health
- variation in crops

Examples of uncertainties

- price fluctuations
- uncertainty of the yields
- uncertainty associated with new production
- obsolescence(irrelevant of some produce)
- ownership uncertainty
- government policy
- transport reliability
- breach of contract
- unavailability of labor
- unavailability of agricultural inputs

Challenges associated with other factors of production and their solutions

a. land

Challenges and their solutions

- **Land tenure:** Some lands are communally owned and people have no incentive to invest and improve land to increase it production. **this can be solved by**
  - ❖ institute land reforms by undertaking land adjudication, demarcation ad registration and then use it a title deeds
- **Land degradation:** land loses it value and quality and **can be solve by**
  - ❖ Rehabilitate such land by planting tree or refilling the gapping and leveling.
- **loss of fertility through water or wind erosion:** and this can be solved by
  - ❖ undertaking erosion control measures and addition of both organic and inorganic fertilsers
- **land use change from agricultural total real estate and industrial developments which reduce productivity** of the land and this can **be solved by**
  - ❖ enforcing the rules of governing the change of land use and ensure users follow accordingly

b. capital

Challenges and their solutions

- **Lack of affordable credit facilities leading to less exploitation of land and hence limited** production. can be solved by:
  - ❖ provide inputs subsidies to make inputs affordable
  - ❖ increase landing institutions
- **high interest rates on loans hence discouraging people from borrowing .**can be solved by
  - ❖ Lower the interests' rates through central bank intervention by lowering their own base lending landing rate.

- **lack of collateral for loans to young people**
    - ❖ provide grants to special groups like women and youth through special fund at interest free with no collateral
- **lack of saving culture hence low investment**
    - ❖ educate people and crating more financial facilities for saving

c. labour

Challenges and their solutions

- **Shortage of labour during peak season and surplus in off-peak season**. can be solved by
    - ❖ Re-organisation farm enterprise to ensure a combination of enterprise that utilize throughout the year. payment of competitive wages may attract labour during times of labour shortages
- **Lack of skilled labour for some questions.** can be solved by
    - ❖ invest in labour training and pay competitive salary or wages
- **Low efficiency especially in manual operations.** can be solved by
    - ❖ mechanize the operations
- **Strikes/labour unrest reducing labour productivity.** can be solved by
    - ❖ Motivate the labour through proper rewarding and
    - ❖ Improving working conditions.
    - ❖ avoid labour exploitation

d. management

Challenges and solutions

- **Little experience, low skills and knowledge or lack of managerial skills. can be solved by**
    - ❖ education and training of farmers through, farmers open days, agricultural shows, trade fairs ad exhibition
- **old age and young age:** old manages have low innovativeness and use of technology while young people though innovate but lack experience
    - ❖ mixed both youth and old in management and enhance their managerial skills and technological knowledge through continued training

e. market

Challenges

- Poses challenge through prices off both inputs and yield. When prices of input increase, farmers fail to buy adequate inputs which in turn reduce production. on the other hand , when the prices of output go down, farmers do not make high profits

Solution

- high cost of inputs can be solved when farmers form grouped and buy them in bulk and at discount
- as sellers, farmers should form associations so that they can become price makers and not price takers as usually the case

f. climate

Challenges

- little or no rains in particular season or too much of it

- bad weathers like strong winds which destroy crops

Solutions

- diversification of enterprise: this is when a farmer takes up different enterprise so tats should one fail, the other can still provide cushion
- setting up irrigation systems so that in times of dry spell, farmers can use irrigation to supply the crops with water
- Buying insurance policy: for example, hailstorms can be destructive to crops like tobacco. In event of a hailstorm, the insurance company can compensate the farmer.

g. risk and uncertainties

Challenges

- farms may not be willing to engage in enterprise with high risk for fear of big loses
- farmers may not be willing to expand high risk enterprises

Solutions

- Inputs rationing. Using less input than the recommended so that when fate strikes the fames incurs lower losses than when the recommended inputs were used.
- selecting enterprises which are more certain of producing a yield or more like to sell the yield
- diversification off enterprise so that the farmer still survive on those that have not been affected
- Buying an insurance policy so that the farmer can be compensated in case of crops or animals failure.

h. disease and pests

Challenges

- destroy crops and animals causing complete enterprise if not properly checked
- farmers are forced to spend large sums of money to control and teas disease and pest

Solutions

- raise resistant varieties of crops or breeds of animals
- diversification
- insurance

i. quota

Challenge

- it restricts the farmers who have the capacity to produce highly

Solution

- It can be solved by adding value to the products than selling it raw and this defeat the restriction which is imposed.

UNIT 5: AGRICULTURAL MARKETING AND FOOD SECURITY

- **Agricultural marketing** refers to all the process involved in transformation and flow of goods and services from the production to the consumers.
- Or the process which involves the transferring of agricultural inputs and outputs from producers to consumers.

Importance of agricultural marketing

(a) it provides inputs to the farmers which are used in production like fertilsers, seed and pesticides
(b) it is at the market where farmers sell their produce in order to find incomes to support their families and also increase their production
(c) It distributes good and services in areas area where they are not grown.
(d) It determines prices of goods. when good are a lot on the market the price go down since they are fewer buyers and low quantities but will a lot of buyers, the prices go up
(e) Though processing there is an addition of the value to these agricultural produce which increases the prices goods in turn increases income for the seller. value addition also promotes exports, which brings foreign currency for a country to earn foreign currency
(f) it encourages farmers to produce products of high quality due to competition on the market
(g) taxation of the products at various stages of marketing contributes to the gross national incomes which help fund government budget of a country
(h) creation of employment opportunities in transportation, advertising, brokerage, storage and financing services

Marketing forces

- refers to the interaction of demand and supply that shapes a market economy

The principles of demand and supply

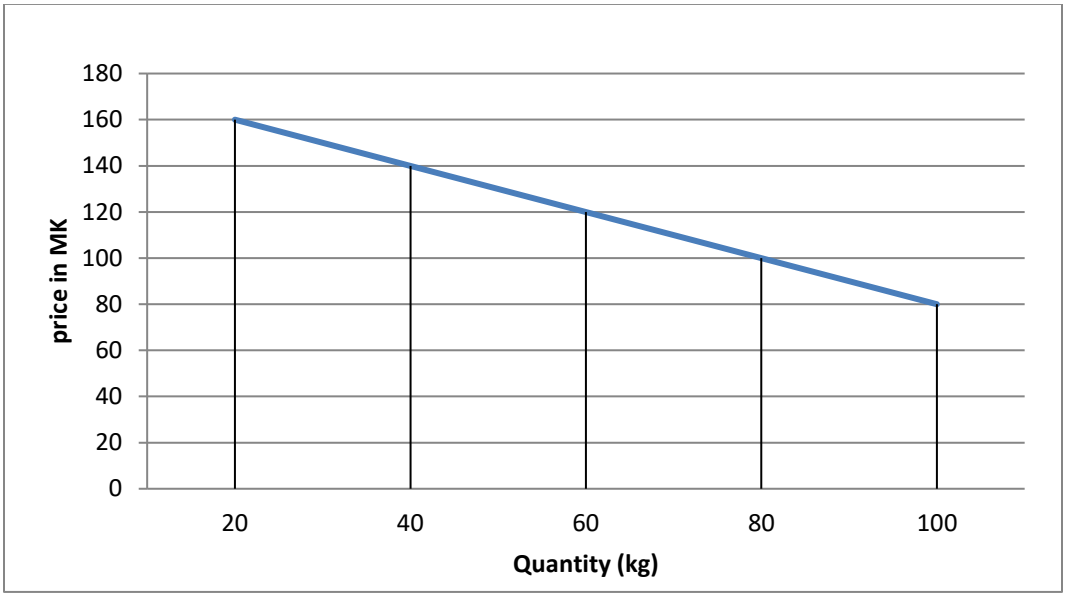
- **Demand:** means the quantity of goods and services a consumer is ready to buy at given price and time.
- **supply:** means is the quantity of goods and services a seller is willing to sell at given price and time`

Relationship between demand and price

- There exist a direct relationship between demand and the price of goods and services. When the price is high, consumers tend to buy less and when the prices are low, they are willing to buy more.
- graph below show the relationship between demand and price of a certain mzuzu nyama world Table

price per kg (mk)	quantity (kg)	
160	20	
140	40	
120	60	
100	80	
80	100	

When represented graphically, a demand curve is realized



From graph

- More meat is demanded when the price falls. For example, only 20kg of meat is bought at MK160, but at mk80, 100kg of meant is bought.
- the quantity of meat bought is maximum when the price is lowest
- when the curve cut the vertical axis, the quantity demanded is zero and nobody is willing to but at the price
- When the curve cuts the horizontal axis, the price is zero. this indicates the excess quantity that could be given free without paying
- the demanded curve rises from right to left

Factors that influence demand

(a) Price of related goods or services: When the price of substitute increase the demand for the commodity increases, for example, the demand for fish may increase if the price of beef is increased.

(b) population : when population size increases, the demand for goods and services will also increase due to increase in the number of consumers

(c) Income level of consumers: an increase in the levels of consumer's income will cause an increase in demand for normal and luxury commodities due to an increase in purchasing power.

(d) Taste and preferences of the consumers: a change in tastes and preferences affects demand for particular commodities. change in tastes and preferences may be influenced by the level o education, religion, sex and environment

(e) Price expectations: if the speculation of decrease in prices of certain commodities, the tendency of consumers is to stop buying until prices fall. however if the speculation is bout an increase in prices, consumers will buy large commodities before prices increase

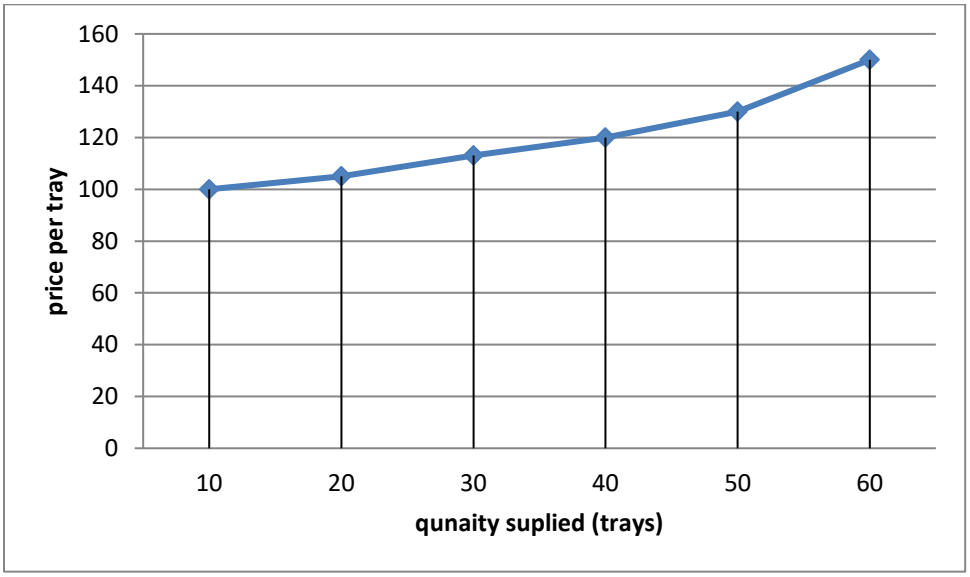
(f) Government policy: government may impose tax on certain goods good leading to an increase in prices and this is likely to decrease the demand. however government may subsidise the price of certain goods which increase demand for such products

(g) Advertisements: advertisements creates more awareness of commodity existence in market, hence, consumers will tend to demand more of that particular commodity.

Relationship between supply and price

- The law of supply states that as the price of goods or services increases, the corresponding quantity of goods or services offered for sale increases and vice versa. Table below shows supply schedules for eggs.

price per tray (MK)	quantity (trays)
100	10
105	20
113	30
120	40
130	50
150	60



From the graph

- suppliers avail to the market at higher quantity of eggs when the price is high
- as the price increases, the quantity of eggs supplied increases
- the supply curve rises from left to right

Factors which influence supply

(a) number of sellers: when the sellers dealing with the same products increases, the supply of the products will increase

(b) Price of related goods: when the prices of the substitute of the commodity increases, the supply of the commodity decreases. This is because the producers will be willing to supply more of the substitute of the commodity which fetches a higher price than the actual commodity.

(c) Change in technique of production: invention of new technology may lower the cost of production of a particular commodity and consequently increase in supply the commodity. For example, use of tissue culture in banana production or grafting in orange production may result in higher yields.

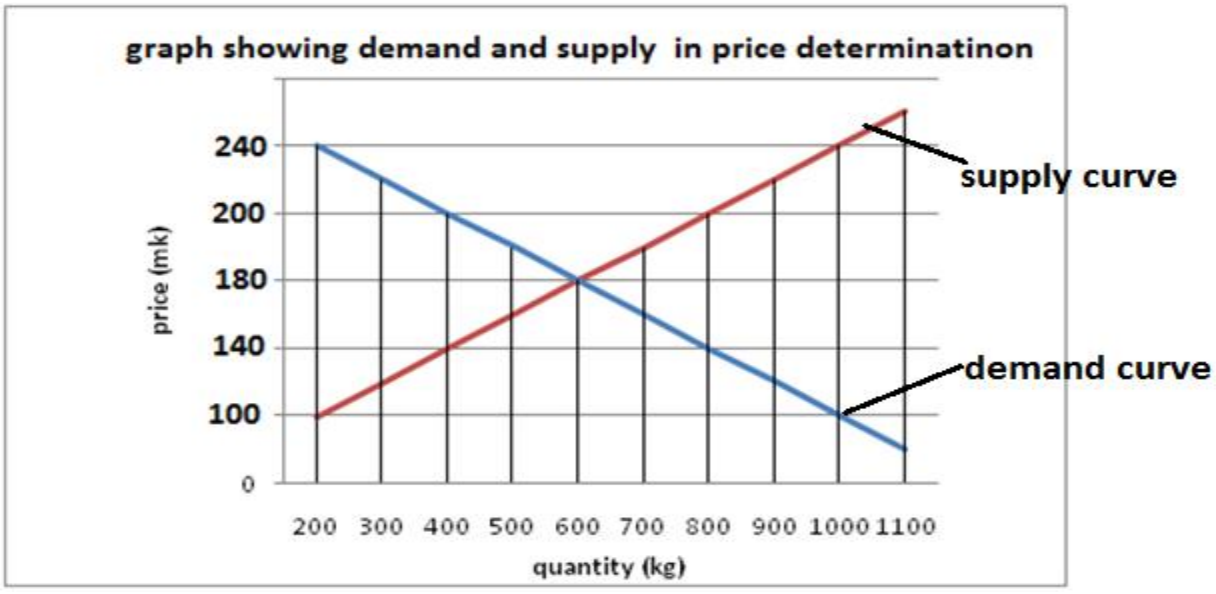
(d) **Change in weather:** A favorable condition encourages high production of certain commodities increasing their supply. Adverse weather conditions such as drought, floods and frosts usually results in low supply of the produce.

(e) **Price expectation:** when the sellers suspect that the price of a commodity will increase, they supply less awaiting the price to rise. If the price of the commodity is expected to fall, more of that commodity will, be supplied for sale before the prices falls.

(f) **Government policy:** government imposition of tax on a commodity raises its costs of production, thus fewer farmers are willing to produce it. This lowers the supply of the particular commodity. But when the government provides subsidies on the production of commodity, more farmers will be willing to produce that particular commodity hence its supply increases.

How marketing forces determine price

- When demand is high on the market and yet there is low amount of commodities supplied, the price increases.
- When the amount of supply is high and yet there is low demand, the price drops. In this situation, the seller reduces the price so that she or he can sell out all their commodities. This is true where the commodity is perishable and difficult to store. She/he would rather sell at the low price than register loses completely.
- **equilibrium price: the price at** which quantity demanded is equal to the quantity supplied ,
- **equilibrium quantity** : the quantity at equilibrium price



- from the graph, the equilibrium Price is k180 and equilibrium quantity is 600kg

Categories of marketing functions

- **marketing :** refers to all processes involved in transformation and flow of goods and services from the farm to the consumers
- **marketing functions**: are those activities which occur as a product moves from point of production to point of
- marketing functions are categorised into three groups namely

(a) exchange functions

- buying
- selling

(b) physical functions

- assembling
- grading
- processing
- packaging
- transposition and distribution
- storage
- displaying

(c) facilitating

- financing
- marketing intelligence
- advertising

Exchange functions

a. **Buying:** is the process of acquiring goods and services. this involves activities which includes
   - identifying suppliers of the goods and services
   - selecting goods based on high quality, price and quantity
   - bargaining for lesser prices so that buyers can buy more goods with the same money
b. **Selling:** this means transferring of goods and services to buyers. it involves
   - assembling the goods in large quantities
   - pa
   - packaging i.e. putting the commodities in suitable containers
   - selecting the right marketing channel i.e., how , where to sell the products
   - displaying I attractive and suitable manner
   - Advertising through radio, television. billboards etc
   - receiving payment for the products

Physical functions

a. **Transportation: this** ensures that the commodity is found at a place the consumer and suppliers find convenient.
   - farmers use bicycles, ox-carts, pick-ups, truck, rail transport or even air transport

Factors to consider when choosing transport system

- **cost:** the cost must be reasonable to avoid loses

- **Quantity of goods:** the transports used needs to be in accordance with the quantity in order to reduce cost of transport and maximize profits.
- **Distance to the market:** he longer the distance to the market the more need for efficient transport systems.
- **nature of the products:** the transport system must be appropriate depending on the whether or not the product can easily be bruised like fruits and vegetable
- **perishability of the commodity:** perishable goods needs fast transport system
- **Speed**: fast transport system is necessary for perishable goods so that they rich the market in good condition.

b. **Processing:** changes the agricultural products to a form best usable by consumes. Some products undergo more processing than others. For example, cotton requires a lot of processing in order to become a cloth.

c. **Assembling:** refers to collection or gathering of goods from different places to a place. it facilitates easier transportation, grading etc

d. Storage: this achieves time space. Since productions of some products are seasonal, it is necessary to keep access products so that they are used throughout the year. Storage also takes advantage of limited supply of the commodities so that they can be sold at higher price.

e. Packaging: this eases transportation of products and makes the products presentable to consumer. it also helps to keep products safe from contamination

f. Displaying: this involves arranging agricultural; produce in attractive patterns conspicuously to easily attract the potential consumer (buyer).

g. Grading and standardization: refers to sorting the produce according to uniform specifications for example: weight, length, colour, tenderness, diameter, texture, taste and presence impurities it makes it easy to assign a price tag to produce depending on its quality.

Importance of grading

- it give a farmer an incentive to produce commodities of high quality in order to maximize profits
- it enables farmers to compare prices of commodities of the same grade at different markets and be able to choose the best market where they sell at maximum profits
- it enables every consumer to buy according to their desired grade
- buyers and sellers can transact business electronically(through phone, e-mail) without meeting simply using conventional grades

Facilitating functions

- These make the exchange and physical functions easy and smooth.

a. **financing**
   - It involves providing money to facilitate activities. for example

- farmer need resources in form of money to buy inputs like feeds, seeds and fertilsers
- operations like planting, weeding, harvesting requires money with which to pay labour
- farmers need cash to facilitate marketing functions like storage, grading, processing, transportation and advertisements

b. **risk bearing**
   - There is need for a farmer to find a way out despite these unforeseen circumstances that accompany marketing

c. **Marketing intelligence**: farmers should know in advance about customers needs before embarking on selling o any commodity. information required can be
   - most recent information on supplies
   - demand and supply
   - forecast on prices, supply and demand
   - yield estimates in the coming season

Ways of finding the information

- friend and relatives
- newspapers
- radios
- ministry o agriculture
- internet
- ADMARC markets

Problems associated with agricultural marketing

(a) Seasonality of agricultural produce: there I high supply of the produce during harvest during harvest time and become scarce latter. As supply increases at harvest time, prices drop. As result, farmers fill to make high profit.

(b) Bulkiness: most agricultural produce occupies large volume and yet they have low value. This implies that farmers need to produce extraordinary large quantities in order to realize reasonable profits.

(c) Diversity in their nature: usually agricultural products are not the same in size, shape and colour. For example, wet potatoes may differ in sizes, shape and colour. These differences make it difficult to attract customers. The result is that farmers find it difficult to set realistic prices.

(d) Perishability of the produce. Vegetable, fruits milk is examples of perishable products because they must be used or sold soon after harvest; otherwise they go bad very quickly. Farmers find it difficult to deal with them when produced in large quantities when the market is very far away and there is poor transport system.

(e) Farmers' lack of knowledge about marketing: farmers produce without prior knowledge of demand, the supply exceeds customers demand and price automatically drops.

(f) Price fluctuation: it is difficult to maintain market prices because production is seasonal. When supply increases, prices drop and when supply drops prices go up.

(g) Poor transport and communication: agriculture is largely practice in rural areas where transport and communication system is poorly developed and hence increasing costs and making farmers unable to access market.

Solutions to the problems agricultural marketing

Problem	Possible solution
Seasonality of agricultural products	• irrigation farming can maintain supply7 of the commodities • where farmers depend on rain-fed farming, high production can be stored for future use
Bulkiness	• Processing into forms which are less bulky. for example fruits can b processed into fruit juice
Diverse nature of the products	• grading
Perishability of products	• producing them near market • produce in line with demand so that there is not much excess produce • efficient transport system so that the produce can easily be moved to places the commodity is produced e.gf tangerine
Lack of knowledge	• teaching farmers about how to supply and demand affects prices
Price fluctuation	• offering farmers guarantees minimum prices
Poor transport and communication	• Improve roads; rail sea ports so that produce reach the market on time.

UNIT 6: AGRO-BASED INDUSTRIES IN MALAWI

- the word agro comes from agriculture
- Agro-based industries are industries dealing with the supply, processing and distribution of farm products.

Examples of agro-based industries in Malawi

Table 1 : agro-based industries which process agricultural commodities

Name of the industry	Raw material	Products
Bakhresa Grain And Milling(Malawi) Limited	Wheat, Maize	Maize And Wheat Flour
Malawi Dairy Industry	Milk	Processed Milk And Chambiko, yoghurt, fresh milk
Chibuku industries Ltd	Maize, Sorghum, Millet	Chibuku Bear
Capital Oil Industries Ltd	Groundnuts, Cotton Seeds, Sunflower	Cooking Oil
Mapeto(MWSM) Ltd	Cotton	Cloth
Illovo Sugar Company	Sugarcane	Sugar
Lever Brothers	Cotton Seed, Sunflower	Cooking Oil
	Groundnuts,	Peanut Butter, Stock

		Margarine
Press Food Limited (Tambala Food Products Limited)	Tea Laves	Chombe Tea
	Groundnuts	Tambala Groundnut Superstar Oil
CORI (Capital Oil Refining Industries Limited)	Sunflower, Groundnuts	Kukoma Oil
	Meat	Sausages
Rab Processors Limited	Rice	Super Faya Rice
	Maize	Snow White Ufa Woyera
Bat (Malawi) Limited	Tobacco Leaf	Cigarettes

Table 2 agro-based industries which produce agricultural inputs

Agro-industry	**inputs**
Agrimal (Malawi) limited	Agricultural tools e.g. animal drawn Ridgers, Ploughs And Cultivators and hand operated tobacco presses, hoes, panga
OPTICHEM(2000) LTD	Manufactures of compound NPK fertilsers 23:21:0+4s, J15:5:20, super D, 10:24:20, direct importers of straight fertilsers like Urea, CAN and Ammonia phosphate
Pannar seeds(Mw)limited	Producers and suppliers of hybrid maize seed and performance tested vegetable seeds
PIPECO (pipe irrigation pump engineering company)	Manufacture of irrigation pipes, horse pipes, boreholes pumps, and spare parts
Agro-sack industries	Manufacture of polypropylene bags for seeds, fertilisers and rice
Charles Stewart day old chicks	Distributors of hyline layers and Ross broilers chicks
Rab processors ltd	Livestock feed e.g. growers mash, layers mash, broilers tarter and finisher

Roles agro-based industries in supporting the growing population

a. **Equipping farmers with inputs-**provide framers with inputs such as fertilsers, livestock feeds, improved seeds and breeds, farm machinery. All these help to increase agricultural production hence increase income for the farmers. increased yield also mean increased food supply for the population
b. **Processed raw materials:** they process raw material to a form desired by consumers. Some processed products can be exported to earn foreign reserves. This enables, Malawi to imports what it needs.
c. **Providing market for agricultural products:** indute4is buy raw material from farmers therefore provide the market that enable farmers to earn income. In addition, income from the sale of raw material motivates farmers to supply the growing population with food and other agricultural products.
d. **Feeding and clothing the nation: e.**g. grain and milling, Rab processors, press limited and CORI process food which is distributed to all parts of Malawi to feed the population textile industries use cotton lint to manufacture textiles used in clothing the population.
e. **Provide employment** –they employ many people. These receive an income that helps to support the families.

UNIT 7: FOOD DISTRIBUTION

- **Food security:** refers to the situation where there is enough food for everyone at all times. This could be at individual, household or national levels.
- **Food self-sufficiency:** means ability to produce one's own food in adequate quantities without depending on external supplies. This could be at individual, household or national levels to ensure that food is available.

How food distribution ensures foods security for the growing population

Food distributions:

This is a method of moving out or transportation food from one place to another. If there is any break in food distribution, food insecurity arises.

- ***Transportation ensures that areas which cannot produce or adequately produce food should still access the food at all times so as to avoid food insecurity***

Three main components of food distribution

- Transport infrastructure, such as roads, vehicles, rails transport, air transports and ports. transport enables food to have place and time utility
- Food handling technology and regulation such as refrigeration, storage and warehousing. this ensure that food does not spoil when in store or transit
- adequate source and supply logistic, based on demand and need

Unless agricultural marketing improves, it is difficult for food to be well distributed to all people who need it.

How proper food storage ensures food security for the growing population

Food storage: t

- This is both tradition and domestic skills. Food is stored by almost every human society and even by many animals. e.g. ants

Purpose of storing foods

(a) storage of harvested and processed plant and animals food products for distribution to consumers in areas of scarcity
(b) enabling a better balanced diet throughout the year
(c) reducing kitchen waste by preserving used or uneaten food for later use
(d) Preparedness for catastrophes like drought or floods, emergencies and periods of food scarcity or famine.
(e) protection from destruction by animals or loss through theft

Family size and food security

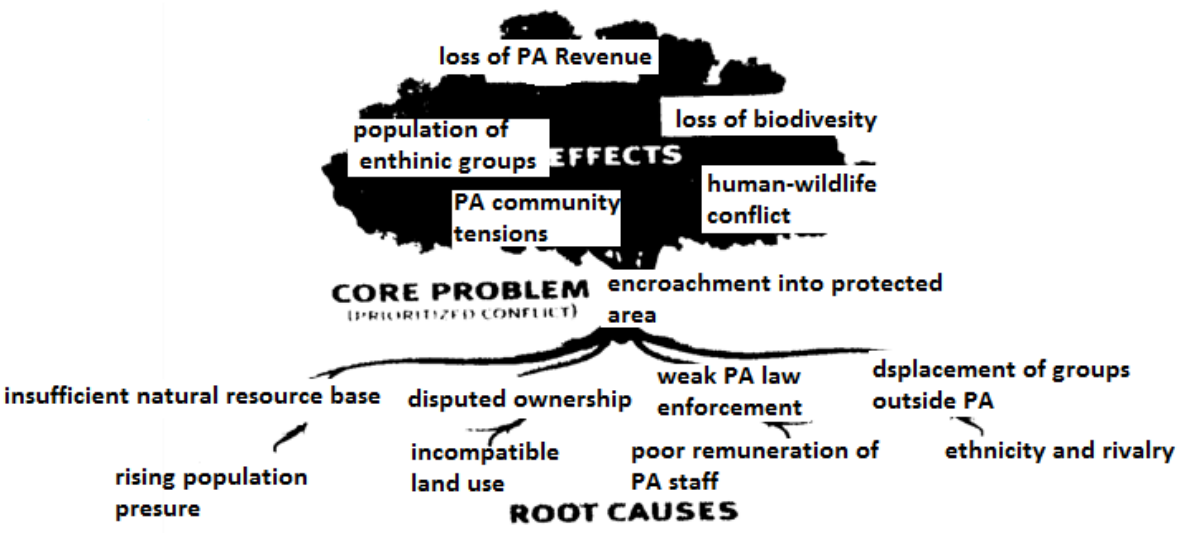
- **Family size:** is the number of children per household. This number has significant influence on the population of the country and both national and household food security.
- an adult per annum can consume 300kg per year
- children can consume 150kg of maize per year

How family size affects food security

- High population growth endangers foods security through environmental degradation as they exert pressure on the scarce production resources. this means reduced resources for food production
- Large family sizes provide enough labour where land and capital are not limited leading to food security. However, Malawi is labour intensive economy and hence large family size only lead to surplus labour which is not engaged and hence endangering food security.
- A large family size requires more foods for consumption. It spends most of its resources on food items and less is invested in farming. Hence leading to food insecurity.
- A large family size has the danger of having insufficient food for its members and may have malnourished children. an small family size is hence an ideal in ensuring food security

Cause effect problem tree

- **A problem tree:** is a tool which assists in analyzing an existing situation by indentifying the major problems and their main casual relationship.



Unit 8: essential plants nutrients

- **Essential plants nutrients**: are chemical elements required by plants for optimal growth and development. these elements are also called essential elements

A list of plants nutrients

- nitrogen
- phosphorus
- potassium
- sulphur
- calcium
- magnesium
- chlorine
- iron
- boron

- manganese
- molybdenum
- zinc
- copper
- carbon
- oxygen
- hydrogen

Essential plants nutrients are deemed necessary for plants for the following reasons

- they are important in metabolism
- in their absence, the plants have abnormal growth and development
- Each nutrient has a role it plays in plants growth and cannot be replaced by another.

Classification of essential plants nutrients

- they are classified into two
  - macro nutrients/major
  - micro nutrients/trace

a. macro nutrients

- They are also known as major plants nutrients.
- they are required in large quantities by plants
- examples include
  - phosphorous
  - calcium
  - nitrogen
  - potassium
  - sulphur
  - magnesium
  - oxygen
  - hydrogen

b. micro nutrients

- they are also known as trace/minor elements
- they are needed by plants in small quantities
- examples include the following
  - chlorine
  - iron
  - boron
  - manganese
  - molybdenum
  - zinc
  - copper

Roles of essential plants nutrients

a. nitrogen

Functions/role

- formation of chlorophyll which is deep in colour necessary for photosynthesis
- a major component of protein molecule in plants
- make plants and fruits succulent(having full water)
- increases grain size by producing excess glucose and protein which is stored in the grains cereals and legumes

Sources

- inorganic fertilsers such as straight fertilizers e.g. CAN(27%N) and Urea (46%N) and compound like 23:21:0+4s

- organic manure
- ammonification of atmospheric nitrogen through lightening
- fixation by symbiotic rhizobium and bacteria and free living bacteria liker azotobacteria through nitrification process

Depletion

- crop removal : crops absorbs nitrogen as they grow
- soil erosion carries away together with nitrogen
- leaching: soluble nitrogen especially nitrate does deep into the soil where plants roots cannot reach
- volatilization is when nitrogen is released into the atmosphere in form of nitrogen gas
- Immobilization: is when bacteria use nitrogen to build up their own bodies.
- fixation: nitrogen becomes unavailable to plants when it gets attracted to clay particles or when it forms organic matter which is difficult to decompose

Deficiency signs

- chlorosis (loss of green colour and becoming yellow) starting from the tips of the leaf
- stunted growth
- premature falling of leaves

b. phosphorous

Functions/roles

- increase s the development of secondary roots
- speed up maturity of crops by stimulating flowering and seed formation
- increase disease resistance in crops
- improves the quality of fruits, vegetables and cereals crops
- strengthens the straw of cereal crops lodging
- it is an energy carrier needed for metabolic processe

Depletion

- plants absorption and harvesting away of crops
- fixation through absorption into clay minerals
- leaching erosion

Sources

- inorganic fertilisers such as single super phosphate, double super phosphate and triple super phosphate
- organic fertilsers such farmyard manure, compost and green manure
- mineralization of phosphate rocks

Deficiency signs

- leaves become purple in colour
- reduced root development especially secondary roots
- poor branching because lateral buds become doormat

- fewer and smaller tubers
- delayed maturity
- dead spots on leaves and fruits
- poor development of seed, grain and fruits

c. potassium

Functions/roles

- promotes growth of meristematic tissues
- helps in crops resist against disease e.g. root rot
- necessary ion the formation of starch and proteins
- strengthen cellulose in cell wall to make stems strong and reduce lodging
- facilitate in translocation of sugar from leaves to other plants pars especially tubers and seeds so that they are well developed

Sources

- inorganic fertilsers such as muriate of potash, potassium sulphate, potassium nitrate
- potash rocks like mica and feldspar
- inorganic manures

Depletion

- plants absorption
- soil erosion
- leaching
- adsorption (fixation in soil particles of some clay)

Deficiency signs

- small dots appear on plants leaves
- weak stalks resulting in lodging
- scorched or burnt leaf margins from tips spreading backwards beginning with lower leaves
- small fruits seeds, seeds and tubers

d. calcium

Functions/roles

- necessary for cell division (mitosis) which promotes elongation of apical tips of the roots and shoots
- it is a component of cell wall structure
- it is useful in protein synthesis
- raise soil ph thereby increasing availability of phosphorous and multiplications of nitrifying bacteria

Sources

- inorganic fertilsers such as calcium ammonium nitrate
- weathering of calcium rocks
- organic matter

- agriculture lime such as dolomite, calcium carbonate and quick lime(CaO)

Depletion

- Absorption by plants
- leaching
- erosion

Deficiency signs

- weak stems
- premature shedding of flowers and buds
- death of terminal buds
- in maize, the funnel they fail to unfold and emerge
- terminal buds and roots tips ail to grow; as a result the plant fails to grow

e. magnesium

Functions/roles

- it is a component of the chlorophyll molecule
- activates enzymes in metabolism of carbohydrates and nitrogen compounds
- increases soil contents in groundnuts, soya beans

Sources

- inorganic fertilsers e.g. dolomitic lime
- organic manure
- weathering of magnesium rocks

Depletion

- absorption
- leaching
- soil erosion

Deficiency signs

- interveinal chlorosis on leave where veins remain green while the rest of the leaf is yellow
- in some crops like cotton, lower leaves develop a reddish-purple colour

f. sulphur

Functions/roles

- it is needed in protein synthesis and improves value of protein
- activates some proteolylic enzymes such as papain
- used for nodule formation on legumes roots for nitrogen formation
- increases oil content of crops like groundnuts, soya beans and sunflower

Sources

- inorganic fertilizer like ammonium sulphate, 23:21:0+4s
- oxidation of sulphides in soil minerals such as copper sulphate and iron sulphate

- rain water
- atmospheric sulphur from industries where coal is burnt to release sulphur dioxide

Depletions

- plants absorption and crop removal
- vitalization in form of hydrogen sulphides gas

Deficiency signs

- leaves turn light green(sometimes yellowing, starting with young leaves)
- small and short plants with thin stems
- reduced nodulation in groundnuts

g. iron

Functions/roles

- necessary for the formation of chlorophyll
- activates various respiratory enzymes

Sources

- inorganic enriched NPK fertilizers and chalates
- organic matter

Depletion

- soil erosion
- leaching, especially of acid soils, in which iron soluble

Deficiency signs

- interveinal-chlorosis of young leaves
- young leaves can turn completely white in serve cases
- twigs stop growing and die (the whole branch may die in severe cases)

h. boron

Functions/roles

- essential for cell division in meristematic tissues
- regulates carbohydrates metabolism
- Important in transfer of sugars (starch) within the plant.

Sources

- Inorganic enriched NPK fertilizers and borax.
- Organic manure

Depletion

- Soil erosion
- Leaching

Deficiency signs

- Poor growth and sometimes terminal buds
- Shortening of internodes
- Poor or necrotic spots on fruits or tubers

i. Manganese

Functions/roles

- Activates enzymes and acts as catalyst in the formation of chlorophyll

Sources

- Fertilizers like manganese sulphate are used to correct deficiencies
- Organic matter

Depletion

- Soil erosion
- Leaching in acidic soil condition
- Organic matter

Deficiency signs

- Mottled interveinal chlorosis of young leaves
- Interveinal white/brown specks in some cereals

j. Molybdenum

Functions/roles

- Promotes synthesis nitrogen fixation in legumes
- Increase nitrogen utilization

Sources

- Enriched inorganic NPK fertilizers
- Organic matter

Depletion

- Soil erosion
- Leaching in alkaline soils, in which it is very soluble
- Fixation into insoluble forms by ferrous oxides in acidic soils

Deficiency signs

- Whip tail, in brassica crops such as cauliflower and broccoli
- Failure of legumes(in severe cases)

Applying appropriate chemical fertilizers and organic manure

How to prepare compost manure

- Compost manure is basically organic waste which has decayed. It is prepared in the following ways

Procedure

- Gather plant residues
- Pile them in heap or a pit
- As the plant residues are being heaped it is important to do it in layers. The first layer should be of organic matter followed by a small layer of soil and ash. This can be repeated until the right height or depth is reached
- A source of nitrogen can be added to the material in form of nitrogen fertilizer or already decayed farmyard manure. The manure injects into the heap with bacteria necessary for decomposition.
- Very dry material such as maize stalks need to be added with water to facilitate decomposition.
- The material can be turned occasionally in order to promote decomposition by allowing air to penetrate in the pit.
- Use of pits can at times not good enough especially in wet seasons due to water logging. If the compost is done in the wet season, find a place where the soil is free drainage.
- When the pit is filled, it must be covered up with a layer of soil

How to apply compost manure

- Compost manure is applied to each planting station before planting.
- The manure is hen buried so that when planting time comes; the seed is planted on top of the manure.

How to apply inorganic fertilizers

1. **Based on time of application**

a. Basal dressing

- Fertilizers are applied during planting or soon after seedling emergence. Fertilizer is applied on each planting station and then covered with the soil. The seeds are then placed on top of fertilizers. Although the first fertilizer can also be applied soon after seedling emergence, it is still regarded as basal dressing.
- Basal dressing is meant to provide plants with necessary nutrients so that they can start their growth with vigour.
- In case where the crop is closely planted like beans, the ridge is first cut into trenches in which fertilizer is sprinkled, covered by soil before the seed is placed at the appropriate spacing. this called banding

b. Top dressing

- This is basically any subsequent application of fertilsers made after the first application. the types of fertilsers applied are usually nitrogen containing fertilsers. The aim of this is to boost the crops yielding potential.

2. **Based on fertilizer placement**

a. Dollop method

- Make two holes, one on each side of the planting station. The holes are made by use of sticks and should be about 10cm away from the planting stations and 10cm deep. It is in these holes where the fertilizer is applied and then covered.

b. Side dressing

- Fertilizer is applied on the sides of the planting stations by use of dollop or making a trench around the planting stations. This is common in fruits.

UNIT 9: VEGETABLE GROWING

- **Vegetable:** is an edible product of a herbaceous plant or an edible plant part.

Importance of vegetables

- They are excellent source of vitamins such as vitamins A, B and C
- They supply minerals like calcium, iron, phosphorous and potassium
- They are sources of food to man. Vegetables can be eaten raw instance, in salads or cooked. Examples are cabbages, kales and tomatoes.
- Vegetables gardening offers self-employment. It provides income to the case farmers
- Export or horticultural products earns the country valuable foreign exchange
- It is a source of raw materials to industries dealing with vegetables processing

Classification of vegetables

- They are broadly classified as either indigenous or exotic
  a. Indigenous
- These vegetables that are native to Malawi
- Most of them grow in the wild and are considered as weeds while some have been domesticated. Examples are

- Bononge
- Luni
- Denje
- Mpriru
- Mkhwani
- Chitambe
- Nkhwanya
- Limanda
- Chisoso/kazota(black jack)
- Mwamunaaligone
- Zumba
- Kamganje
- Chikaka/chipwete

Exotic vegetables

- Cabbage
- Rape
- Pumpkins
- Lettuce
- Beetroot
- Carrot
- Cucumber
- Egg plants
- Tomatoes
- Beans and peas
- Onions
- Cauliflower
- Pepper

Advantages of indigenous vegetables

- They have a rich diversity based on the locality
- They are readily available since most of them grow as weeds and are also easy to grow
- They are cheap to produce as seeds are readily available and require little fertilizer to produce

- Due to their diversity , they are resistant to pest and diseases and require little intervention in their control
- They are higher nutritional value than exotic vegetables
- They are more suitable to local environmental conditions than exotic vegetables as a result, they have more chances of survival during rough conditions than the exotic and they are easier to care for.
- They grow naturally without proper care as opposed to exotic vegetables which require good husbandry practices in order to grow and produce a good yield.

Factors to consider when selecting a suitable site for vegetable growing

a. Nearness to a source of water
- The site should be near a water source since vegetables require regular watering.

b. Shading
- Heavy shading should be avoided as it prevents light supply. Shading from trees should be moderate

c. Space
- The site should be large enough to accommodate the population of vegetable crop required

d. Topography
- Level ground is the most suitable. This prevents flooding or surface run off that **may destroy the crop.**

e. Type of soil
- The soil should be deep and well drained. this enhances water infiltration into the soil and prevents water lodging

f. Security
- A vegetable bed should be located in an area well protected against damage by animals and theft by human beings. This are should be properly fenced. Locating the site near the homestead can also provide security.

g. Previous crop grown
- One should avoid growing vegetables in an area where vegetables of the same family have been grown before. Crops rotation should be done to control peat and diseases as well as optimize use of plant nutrients

h. Soil fertility
- The site should be fertile to provide necessary nutrients to reduce on quantity of fertilizers used and promote faster growth.

Constructing a vegetable garden fence

- Vegetable gardens are constructed by use of grass/reeds, bamboos, strips/ropes, poles.

Steps involved when constructing garden fence

a. Marking the boundary of the field
b. Digging holes in which poles are fixed
c. Fixing the poles around the field
d. Tying cross members to the poles
e. Thatching with grass/reeds. This includes trying the grass/reeds to the cross members with strings/ropes

f. Trimming the grass

Importance of importance constructing a fence around a garden

- The vegetable are going to be protected from animals such as goats, cattle and even chicken which are usually raised free range during the dry season
- The fence protects the vegetables from strong wind.

Operations for seed bed preparation

(a) Ploughing the field

- The field should be ploughed to a depth of between 25cm and 30cm. this will ensure that water will properly infiltrate and drain while at the same time ensuring proper root penetration and development.

(b) Harrowing

- Helps to break large lumps of soil into fine tilth. Fine tilth is good because ;

- Seeds can be placed to a corrects planting depth
- When seedling is emerging from the soil, there are no big soil lumps which can prevent them from getting out of the soil.

(c) Applying manure

- Vegetables so well where large quantities of manure are applied. Apart from supplying nutrients to plants, manure keeps moisture necessary for proper growth. The manure should be thoroughly mixed with the said.

(d) Leveling the ground so that water does flow

(e) **Where a farmer prefers a raised seed bed,** it is necessary to constructing them cross the slope.

- Raised beds should have right angles or be parallelogram. In order to ensure right angles, use 3, 4 and 5 or triangulation method.
- Materials required are tape measure, pegs and number.

Procedure

- Peg points a, b and c
- Peg another from c and d so that it is 4m long
- Connect points b and d so that from b to d it is 3m along
- Construct a seed bed whose dimensions are 4 m× 1m
- This can be repeated several times depending on number of seed beds required.

Procedure for seed bed preparation

a. **Marking the bed**: the seed bed for raising the seedlings is first prepared by marking out the bed. A thin rope is used to show demarcations
b. **Measuring a bed**: the seed bed for vegetable growing is usually 1m wide with any convenient length
c. **Tilling the land:** vegetation is cleared using suitable tools and equipment for example slasher, machetes and mower. Seedbed is dug deeply to remove stumps, rooting system and all the perennials weeds

d. Leveling tilled land: the soil clods are broken to suitable tilth using a hoe. Since most vegetable seeds are small, a fine tilth should be achieved. The loose soil is then leveled using a rake to attain a uniform level surface. During leveling, stones and trash from plant materials are removed using the rake.
e. **Raising the seedbed:** after harrowing and leveling, the seed bed is raided to about 15cm above the level in order to improve drainage. However, a sunken seedbed can be made in areas with limited rainfall to conserve water.
f. **Applying manure and inorganic fertilizers:** holes or narrow paths are dug into the soil and applied with manure or inorganic fertilizers. The manure is mixed to form a uniform mixture.

There are three types of beds

1. **Raised beds:** the ground is raised up the already prepared soil to a height depending on the types of the soil. The bed is constructed during the rainy season to drain excess water.
2. **Sunken beds:** the ground is first dug in order to make a basin and then creates a bridge around the bed. A lot of manure is put in the bed. These beds are made for dry season gardening so that they should keep water.
3. **Nursery beds:** these are beds where seedlings are raised before they are transplanted in the field. They are constructed like raised beds. Their size should be based on quantity of seedlings needed for the field. The soil should be of fine tilth so that seedling can emerge out of the soil without being hindered.

Sowing indigenous and exotic vegetables

- Vegetables can be sown directly or indirectly

Direct sowing:

- Does not require a nursery bed. Instead they are sown on the main field where they will grow and mature ready for planting.

Indirect sowing:

- Is when seeds are first sown on the nursery on the nursery bed and later the seedling is transferred to the main field.

Importance of indirect sowing

- Seedlings are easier to start on the nursery bed than directly in the field.
- You get a jump on the growing season when you sow indoors. Where the weather is too cold to sow seeds in the seeds in the field, the seedlings can be raised in doors while waiting for the weather to become ideal. This is called seed starting

Procedure for sowing seeds

a. The farmer must first select suitable vegetable types to grow. This may be determined by the following factors.
    - Farmers taste and preference
    - Market demand
    - Ecological conditions

- Preference of diseases and pests

b. The farmer should assemble the planting materials, equipments and tools. These include;
   - Selected vegetable seeds
   - Organic manure
   - Phosphatic fertilizers such as double super phosphate (DSP) , single super or triple super phosphate (TSP)
   - Mulch materials such as dry grass and dry banana leaves
   - Tools as a rake and drilling stick
   - Equipment such as watering can or hose pipe and sprinkler
c. Organic manure is spread on tilled seedbed and mixed thoroughly with the soil using a rake
d. Shallow drills of 10-20cm apart are made using a stick or finger. The drilled should be 2cm deep.
e. Apply Phosphatic fertilizer in the drills and mix with the soil
f. Seeds are sown thinly in the furrows
g. Cover the seeds shallow with soil
h. Immediately apply light organic mulch to cover the seedbed. **This has the following advantages**
   - Protects the seed from pests
   - Conserves soil moisture
   - Raises soil temperature to enhance germination
   - Protects the seeds from eroded by heavy rains
i. Water the seedbed immediately if it is dry

Caring for seedlings

a. Watering: regular watering is necessary and too much water should be avoided as it leads to water logging. Avoid intensive watering; this may also lead to soil capping, soil erosion and washing away of the seedlings.
b. Mulching: seedbed should be mulched soon after sowing the seeds
c. Shading: create the shade over the nursery bed. This protects the seedlings from direct sun. Provide a light shading so as to allow seedlings receive sunlight. Heavy shading results in seedling etiolating.
d. Pricking out: this is the removal of excess seedlings from nursery bed and transferring to a new nursery to overcome overcrowding.
e. Weed control: weeds are controlled by uprooting practices.
f. Pest control: carry out appropriate pest control practices. Spray against pests using appropriate using appropriate pesticides.
g. **Disease control:** control seedling disease like dumping off by regulating watering accordingly. This involves using disease-free seeds and maintaining clean nursery bed or spraying with appropriate fungicides foe example copper and Dithane M45
h. Thinning: Excess seedlings are uprooted to reduce seedlings competition for nutrients and sunlight.
i. Hardening off: hardening off is done two weeks to transplanting. Hardening off involves the gradual removal of shading material to expose the seedlings to sunlight and reducing the frequency of watering till it is finally stopped. This helps the seedlings to get used to the harsh conditions they will experience once transplanted from the seedbed and this cause them to establish with little setbacks.

Harding off: means to prepare seedlings to new growing conditions by reducing amount of water applied to the nursery two weeks before transplanting.

Timing of transplanting

- Vegetables can be sown directly or indirectly
- Transplanting should be done at the beginning of rainfall season and in the afternoon or evening weather conditions are cooler. At this, the seedlings have less hours of sunlight and will have cooler hours of night to get used to their new environment.

Procedure and precautions during transplanting

(a) Marking the planting stations:

- Before transplanting, holes are prepared to a depth of 10-15cm at appropriate spacing.
- Spacing is determined by the type of the vegetable for examples kales and cabbages should be $90cm \times 60cm \times 60cm$ depending on the variety for example , onions are planted at planted at spacing of $30cm \times 8cm$

(b) Watering the seedbed

- A day before transplanting, the seedbed is thoroughly watered. Watering of the seedbed is repeated on the day of transplanting before uprooting the seedling.
- Watering ensures that the seedlings have a ball of the soil intact around the roots system.

(c) Lifting the seedlings

- Uproot the seedlings from the nursery with use of a garden trowel. Ensure the seedlings come out with a lamp of the soil without cutting tender roots

(d) Transplanting

- The uprooted seedlings are placed on a shallow basin or a wheelbarrow and taken to the field
- Before transplanting , irrigate the field of water the holes if there are no rains
- Apply a teaspoonful of Phosphatic fertilizer per planting holes and thoroughly mix with the soils.
- Also apply an insecticides such a aldrin dust in the hole to protect the transplant from soil borne peats e.g. cutworms
- Place one seedling with a ball of the soil still intact in the transplanting hole. Ensure the roots are straight and not damaged.
- Refill the hole with soil and ensure the seedling retains the same depth as it was in the nursery. Deeper covering of the seedlings results in rotting of covered crown hence lowering the degree of establishment. Shallow covering exposes some roots hence poor seedling support.
- Press or firm the soil around the seedling or transplant to enhance anchorage

(e) Mulching

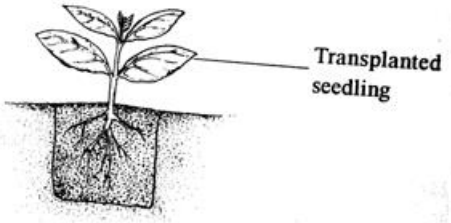
- Immediately after planting, organic such as dry grass is applied around the transplant to conserve moisture.

(f) Watering the transplant

- After mulching, the transplants are watered if there are no rains.

uprooting of seedlings

a seedling with a lump of soil around the roots



proper root placement

Caring for the transplant

- After transplanting the following management practices should be carried out to ensure proper establishments and growth of the transplants.

a. **Watering**

- If there are no rains, watering should be carried out as a routine practice. On small scale, watering canes can be used. However, on large scale, drip or overhead irrigation can be used to apply the water.

b. **Light tillage**

- The soil should be lightly cultivated to loosen it for easy penetration of water and expansion of roots

c. **Weeding the beds**

- This is achieved through light cultivation or through application of post-emergence herbicides. This is carried out early as soon as the weeds emerge to reduce competition for nutrients and help control pests and disease as weeds are alternate hosts.

d. **Fertilizers application**

- When the plants are about 20-25 cm tall, topdressing with nitrogenous fertilizers is carried out. This is done to encourage vegetative growth. The rate of fertilizer applications varies with the vegetable type. After 2-3 weeks the second split application of nitrogenous fertilizers is done. Foliar fertilizers can also be sprayed directly on the vegetable foliage.

e. **Pest and disease control**

- Immediately the symptoms of the pests or disease attack are observed, control measures should be taken. This may involve application

f. **Staking**

- This is the practice of providing support to weak stems. This is usually done for tall climbing varieties.
- Sisal strings or other natural fibre can be used.

Importance of staking

- Staking helps produce clean fruits and reduce plant infection by soil borne diseases and pests

- It also enhances maximum absorption of sunlight and facilitates spraying of chemicals and harvesting.

Pest of pests and diseases in vegetable growing

- **Pest:** can be defined as any living organisms that destroy crops either directly or indirectly by introducing pathogenic effects.
- The word pest is derived from a Latin word ***pestis*** which means plague or a contagious infection.

Economic importance of pests to vegetable crops

- Pests may cause physical destruction to vegetables by eating, stems, roots, flowers or fruits.
- If not controlled , pests can cause considerable reduction in crop yields
- Some pests lowers the quality of the crop produced for example through piercing of holes in fruits and leaves
- Some of the pests are disease vectors for example, piercing and sucking, pests such as aphids, mites, leaf hoppers and thrips transmit
- viruses and bacteria cause disease infection in vegetables
- It increases productions cost in purchase of pesticides to control pests resulting to environmental pollution, contamination of soil, water and air endangering life of two other living organisms

TYPES OF PESTS

a. **Piercing and sucking pests**
   - They suck sup from plant tissues
   - Cause distortion of leaves or shoots
   - **Examples:** aphids, thrips and mites
b. **Biting and chewing**
   - Damage plant leaves, stems, roots and flowers, fruits and seeds. They include mammals (rodents, insects(army worms, locust) and birds

Pests control measures

- **Cultural control methods:** agricultural practices for example use of resistant varieties
- **Physical control methods:** hand picking and killing
- **Biological control methods:** use of other living organisms to predate on pests.
- **Intergrated pest management (IPMS) :** A strategy of combing various pest control methods
- **Legislative pest control method:** creating laws and regulations and enforcing them. For example, control cross border transfer of agricultural materials to prevent entry of pests

Plant diseases

- May be defined as an alteration in the physical state of a plant on its parts which interrupts normal functioning

Examples of disease that attack vegetables

- Fungal diseases: attack roots, leaves, stems and fruits e.g. leaf blight
- Viral diseases: e.g. tomato mosaic, chilly mosaic, chilly leaf curl, pea seed borne mosaic, cucumber mosaic, green mottle and yellow vein mosaic of okra
- Bacterial disease: they attack stems and leaves, e.g. bacterial wilt in tomatoes

Control diseases

- Disease control mechanisms can be grouped into five categories namely;

a. **Cultural methods**

- This involves agricultural practices carried out in crop production. The following methods can be used
  - Selecting disease free fields. The fields or crop propagation media must be free from disease pathogen
  - Early planting for the crop to avoid attacks by the diseases
  - Early harvesting to avoid attack by diseases
  - Planting of early maturing varieties to escape disease attack
  - Wide spacing of crop to reduce or avoid disease spread and control vector movement.
  - Planting of disease free planting materials. The planting material must be certified.
  - Practice field hygiene (field sanitation). This involves burning of diseased plants to reduce the spread of disease and kill the pathogens.
  - Rogueing. This involves uprooting and destructing diseased plants to reduce the spread of disease and kill the pathogens.
  - destruction of alternate hosts of the disease pathogens and the vectors
  - practicing crop rotation
  - Nutrition. Apply fertilizers and manures to enhance robust growth of the plants to resists.
  - Growing resistant varieties.
  - Intercropping. This helps to create physical barrier to pathogens and vector spread.

b. **physical(mechanical) method**

The following techniques can be used

- **Heat treatment**. This involves exposing the pathogens to lethal (very high) temperatures that kill them. For example hot water treatment is very done to the seeds (planting materials) to kill seed-borne fungi, bacteria, viruses and nematodes.
- planting materials are treated with electromagnetic radiation such as x-rays to kill the pathogens
- flooding of the fields to reduce or eliminate the soil pathogens and nematodes

c. **biological methods**

Involves the use of other organism called natural enemies to kill the pathogens

- use of bacillus bacteria as control agent of other soil borne pathogens
- development of resistant verities through plant breeding
- planting traps crops attract the vectors and the pathogens hence reducing attack

d. **legislative method**

- This methods involves creation of laws regulation) and enforcing the same, controlling movement of plants material within the country and cross the country, border.
- The method includes quarantine, which prevents introduction of diseased plants material into diseases free area.

e. **chemical control**
   - This involves use of a variety of chemicals that kills the pathogens or prevents the pathogens from attacking the plants. The chemicals used are.
     - fungicides-used to control fungal diseases
     - antibiotics(anti-bacterial)-used to contro9l bacterial diseases
     - nematicides-used to control nematodes
     - acaricides-used to control mites that re vectors of viral diseases

Harvesting vegetables

- Vegetables should be harvested on time. This helps to reduce field losses through destruction by rains, pests and disease. Harvesting the crops in the wrong stage may lower the quality of the produce or even render the product unusable.

Factors determining time of vegetable harvesting

- **Intended us of the crop:** tomatoes for processing are harvested when purely ripe whereas peas can be harvested for their pods as vegetables or processed stage.
- **Taste and preference of the consumer:** some people prefer immature carrot (baby carrot) while some prefer the mature hardened carrots.
- **Market demand:** crops can be harvested earlier when the market demand is high. this allows the farmer to benefits from the high market prices
- **Pest and disease outbreak:** to avoid spread of pests or diseases, crop can be harvested earlier to prevent damages.
- **Prevailing weather conditions:** carrots need wet weather for harvesting while onions dry weather.

Method of harvesting

- Vegetable harvesting can either be manual or mechanical. However most vegetables are manually harvested manually.
- the following are some of the methods

a. **Picking**: this method applies to most fruits and vegetables. Leafy part of the vegetables is nipped for examples kales and spinach. Fruits of tomatoes, peppers, egg, squach, cucumber and okra are harvested picking.
b. **Uprooting**: used for harvesting root crop vegetables for example carrots and beetroots. The roots tubers are pulled out of the soil. Soil should be wet at the harvesting time. The tubers are then washed before packing in bags.
c. **Cutting:** some vegetable are harvested by cutting the stem using a sharp knife. For example cabbage is cut at the base of the head where the stem is attached.

Handling of vegetable produce

- Onions are dried under the shade for a week. Graded based on size and then stored in nets. They are stored in a cool dry place.

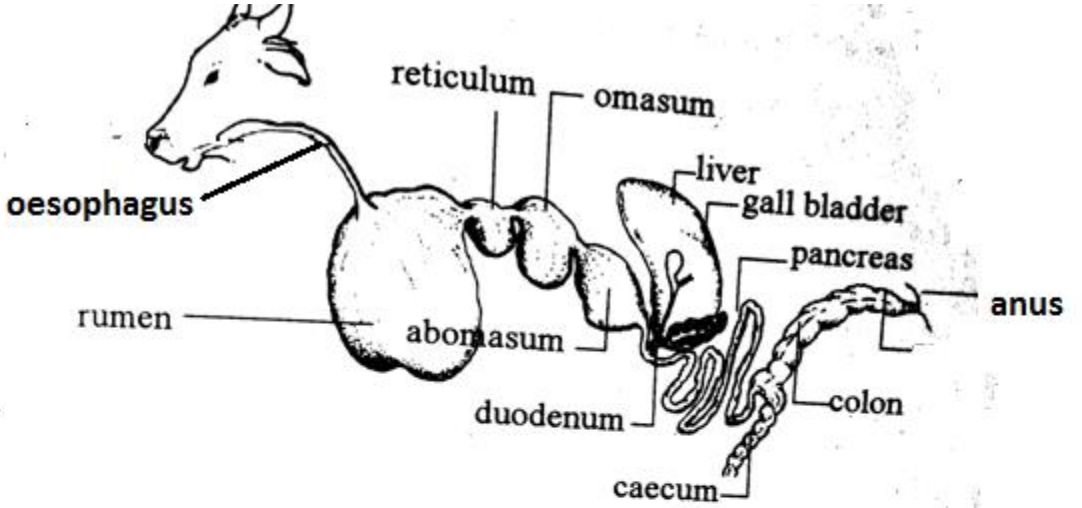
- Roots tubers for example beetroots and carrots should be washed before packing in bags to reduce loss. They are graded and stored at low temperatures
- French bean and snow peas should be sorted out graded and then packed in plastic containers or aerated crates. They are then dispatched to market where they are stored at low temperature until they are sold.
- Tomato fruits are handled depending on the intended market. Fresh tomatoes is graded based on size, they are then packed in wooden or plastic crates and dispatched for market. Tomatoes for processing are not graded according to sizes but packed immediately for dispatch to the factory. Tomato is usually stored at low temperatures.

UNIT 10: CLASSES OF LIVESTOCK

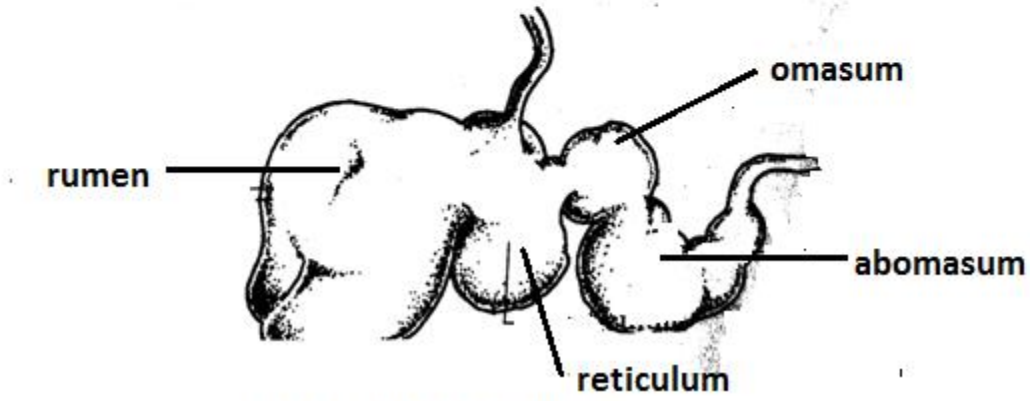
- Livestock production involves raising different types of domestic animals on the farm, for different purposes.
- livestock are classified into two based on their digestion and digestive systems, namely;
    - **ruminants(polygastric) animals**
    - **no-ruminants (monogastric)animals**

Digestive system of a ruminant

- Ruminants are animals that chew the cuds that, is they push back feed from the stomach to the mount for further cheweing-regurtate. Their stomach is divided into four chambers that is.
    - **1st stomach or rumen (paunch)**
    - **2nd stomach or reticulum (honeycomb)**
    - **3rd stomach or omasum (manyplies, books or bible)**
    - **4th stomach or abomasums(true stomach)**
- examples or ruminants include
    - cattle
    - sheep
    - goats
    - horse
    - birds
- The relative size of the four stomachs varies with age and animals species. The first there stomachs are small in young ruminants. After weaning, the rumen of the young ruminants develops and by the time the animals' reaches maturity, it accounts for about 80% of the total stomach.
- **ruminating:** the process of rechewing the cud to further break down plant matter and stimulate digestion



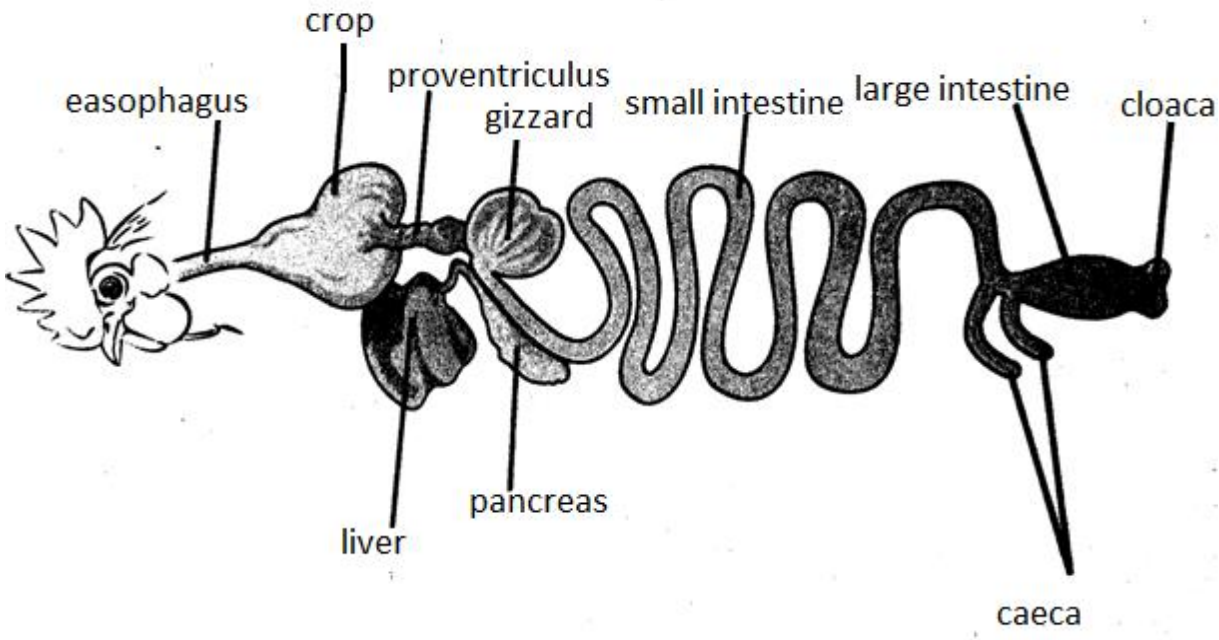
Digestive system of a cow



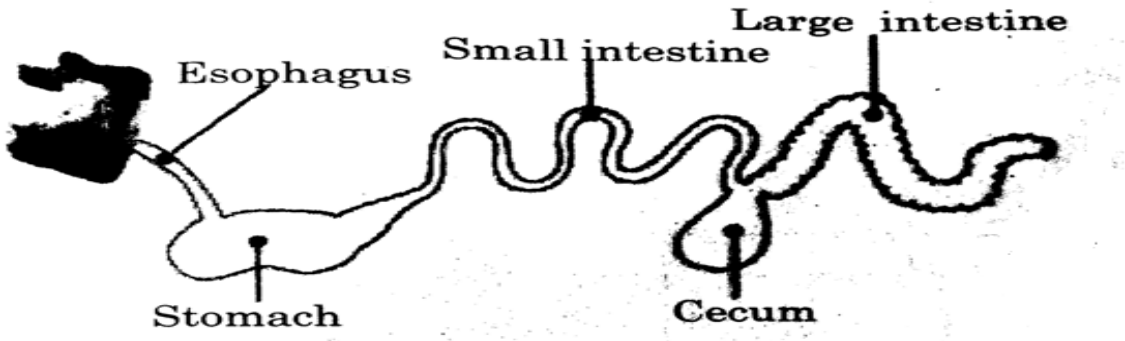
stomach of a ruminant

Digestive system of non-ruminant animals

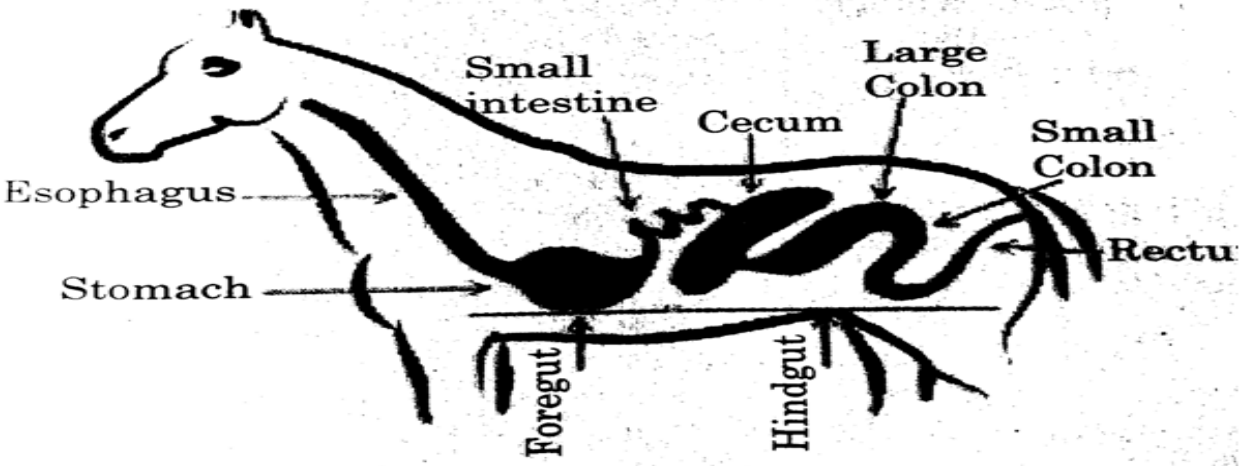
- **Non-ruminants** are animals which do not chew cud and have one simple stomach. The digestive system of non-ruminant is similar apart from a few minor differences. A chicken ha a second chamber after the true stomach, it has a gizzard which is absent in other non-ruminants animals. The large intestine is coiled unlike in other non-ruminants where the intestine has no noticeable pattern. The liver has five lobes whereas in other ruminants it has four.



digestive system of a chicken



The digestive system of a pig



the digestive system of a horse

- pigs
- poultry
- rabbits
- camels
- donkeys
- horse

- Classification of animals into whether ruminants or non-ruminants help to decide on the types of the feeds they should be given.
- Unless the animal is able to digest the feed, the feed becomes useless because the animal cannot derive any nutrient from such a fee.

Functions of different parts of the ruminants

(a) Mouth: chew in the mouth with the help of the teeth. There is no digestion in the mouth as these animals do not have ptyalin enzymes in the saliva. ruminants produce a lot of saliva which acts as a lubricant

(b) Rumen: it serves as temporally store of food ingested by animal. During storage, the food is churned, mixed and softened with water.

(c) Reticulum: sieves and separate fine materials from coarse particles in the food. Fine particles pass through while coarse one is retained.
(d) Omasum: absorbs water5 from the food so it passes to abomasums. It is also used to grind and sieve food particle by means of its folds. Food is temporary stored in the omasum.
(e) Abomasum: this is a true stomach in which most of the digestion takes place.
(f) ceacum: has microorganisms that assist in further digestion of undigested cellulose

Functions of different parts of the non-ruminants

1. in pigs

a. Mouth: teeth ingest and masticate the food. produces enzymes ptyalin which is contain in the saliva
b. Stomach: compartment for temporary food storage. There is slight digestion of food by ptyalin brought in with food from mouth. There is also secretion of gastric juice which contains hydrochloric acid and two enzymes; pepsin and rennin. Hydrochloric acid provide an acidic medium which an optimum condition for pepsin to work well. Pepsin break down proteins into smaller molecules called peptides. rennin causes the curdling of milk protein in new born
c. Small intestine: in the duodenum, there is secretion of pancreatic juice which contains three enzymes, trysin, lipase and amylase that acts on proteins, fats and carbohydrates respectively.
d. Large intestines: ceacum and colon are large and contain microorganism which help in breaking down cellulose into fatty acids. Microorganisms also produce various products which include am9inoacids and gases such as hydrogen sulphide, indole and skatole. indole and skatole are responsible for the smell of feaces

2. in poultry

Digestion in chicken

part	Description	Functions
beak	This is a bone-like structure capable of regrowing if it is cut	• it picks up the food form ground • it breaks up food into small sizes. in case of groundnuts, the beak can break the pod to release the nuts
Mouth	There are no teeth, but a pointed tongue which has taste buds. unlike other animals, the saliva does not have salivary amylase	• the taste buds on the tongue helps the chicken in selecting feeds • toughie helps in swallowing feed
Upper oesophagus	It is a tube	• it is a passage of feed from the mouth to the crop
crop	It is an enlargement of the oesophagus	• it store feed during which it gets moistened in readiness for physical digestion
Lower oesophagus	It connects tube between the crop and the proventriculus. it is more swollen then the upper oesophagus	• it is a passage of the feed from the crop to the proventriculus

Proventriculus	It is the true stomach	• It produces gastric juice (water, hydrolochloric acid and enzymes) which digest protein.
Ventriculus (gizzard)	It has thick and muscular walls. Its lining is rough. it contains sand called grit	• with the help of the grit and rough lining, the gizzard grind feed into small particles
Small intestines	It is made of duodenum and ileum	• it is only chemical digestion that takes place ,releasing feed nutrients which are also absorbed here
Ceacum	Made up of branched blind sacs	• they contain microorganism which digest cellulose
colon	Large intestine	• absorption of water from the indigested feed
Cloaca(vent)	It is common opening for urinary, digestive and reproductive system	• it is a passage through which faeces

Similarities between ruminants and non-ruminants

- digestion in young ruminants is similar to that in non-ruminants since they have not developed the rumen-rectum complex
- the last stage of protein digestion occurs in the small intestines in both cases
- absorption of water occurs in the colon in both ruminants and non-ruminants

Difference between ruminants and non-ruminants

Ruminants	**Non-ruminants**
Chew cuds	Do not chew cud
Have four stomach chambers (polygastric)	Have one stomach(monogastric)
Regurgitate food	Cannot regurgitate food once swallowed
Have micro-organism in the rumen that digests cellulose	Have no micro-organisms in the stomach hence cannot digest cellulose except those animals with micro-organism in the ceacum
Have no ptyalin (amylase) in saliva hence no enzymatic digestion in the mouth	Have ptyalin in the saliva hence enzymatic digestion start in the mouth
Digestion and absorption takes place in the rumen , abdomen and in the intestine	Most digestion and absorption occurs in the stomach and small intestines
Have alkaline saliva due to presence of Ammonia	The saliva is neutral in pH

UNIT 11: CHICKEN PRODUCTION

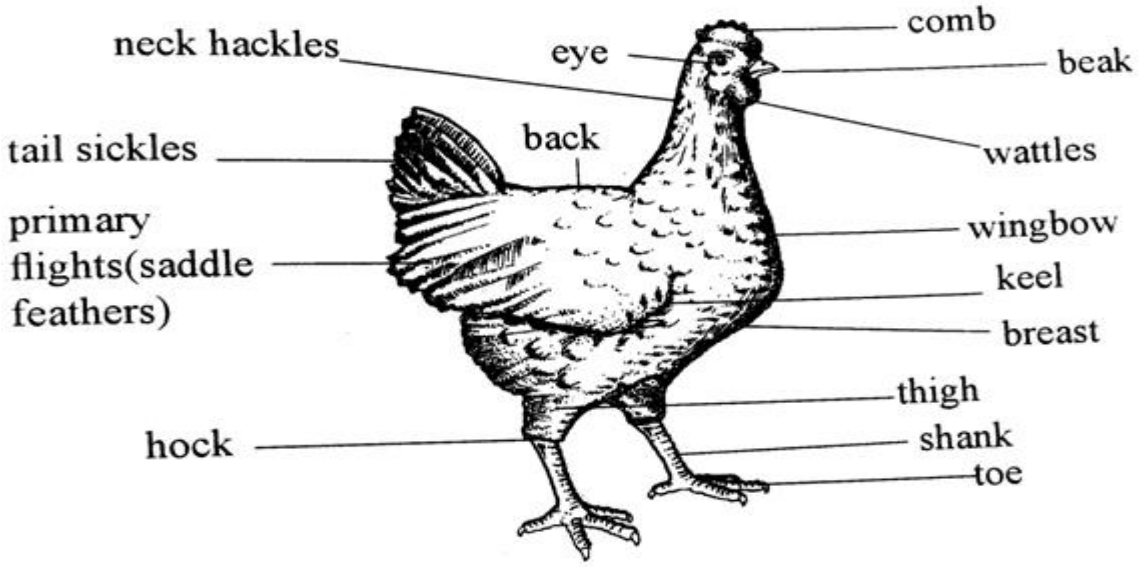
- **Poultry:** refers to all domesticated birds. these include
  - ducks
  - turkey

- geese
- guinea fowl
- ostrich
- chicken among others

- **chicken** is the most popular one and widely reared poultry
- chickens are kept for
  - meat
  - eggs
  - feathers
  - sporting for example cock-fighting

The main practices in chicken production

a. breeding
b. housing
c. feeding
d. disease and parasite control



Parts of a chicken

Breeds of chickens

- Two main breed are available in Malawi. these are
  - **local breeds**
  - **exotic breeds**
- these breeds differ in
  - growth rate (fed conversion ratio)
  - disease resistance
  - mature size weight
  - wide variation in plumage, colour and size

a. local breeds of chicken

- are indigenous breeds of the chicken normally kept for both meat and egss
- examples include:
    - chipazgaa(north)
    - chalida(central)
    - yakuda
    - yoyera
    - yankhanga

Characteristics of local chickens

- slow growth rate
- more disease resistance
- small mature weight size
- wide variation in plumage (rough and smooth), colour
- some have naked necks
- size, colour, shape of wattle
- height (zimbwatha)

b. exotic breeds of chickens

- These are breeds which originate from temperate regions for example Europe. some are kept for meat while others are kept for eggs
- they are four categories of exotic breeds of chicken which include
    - light breeds
    - heavy breeds
    - dual breeds
    - hybrid

(a) light breeds

- This is the breed for chicken kept purposely for egg production. These include; leghorn, brown leghorn, black leghorn, anocona, minorcas and exchequer.
- they are also referred as layers

Characteristics

- They are medium in size. cock weighs 3kg while hens weighs 2kg
- they never go broody, hence they are poor eggs sitters
- they are excellent layers, they can lay up to 220 eggs per year
- they poor producers of meat
- female's comb is large and flops over one eye
- male 's comb is large, firm and upright
- they are light in body, very active and exhibit a high degree of cannibalism
- combs are full, red and waxy

(b) heavy breeds

- Kept for meat production and are known are broilers. They have high a high conversion rate of feed into meat. Examples: light Sussex, Cornish dark and Jersey Giant.

Characteristics

- they provide high quality meat
- they go broody

- they are heavier and bigger in size
- they grow fast
- hens lay few eggs

(c) dual purpose breeds

- Kept for both meat and egg production. Examples include; Rhodes Island and red, black australops and New Hampshire red. They are highly recommended for upcoming poultry farmers.

Characteristics

- they have tendency to go broody
- they have a carcass o good quality
- they rarely exhibit cannibalism
- they are disease resistant

(d) hybrids

- Is bird produced by crossing two different pure bird breeds to suit a particular management condition.
- They can attain 2kg in 56kg days and can lay over 220 eggs per year.

Characteristics

- they lay many and large eggs
- they gain weight fast
- they have a better resistance to disease and can easily adapt
- They have a better feed conversion.

Housing requirement of chicken

a. Well lighted to enable proper feeding and carrying out other management practices by the farmer. dimming of light is necessary to discourage vices such as cannibalism and egg eating
b. big enough to accommodate all the chickens so as to avoid overcrowding which may lead to fasts spread of diseases
c. Strong and secure to protect the birds from predators. it should also have lockable doors
d. Well ventilated so as to reduce dampness which favours development of disease.
e. Ease of cleaning. It should be easy to clean to maintain healthy birds. the floor should be solid made of concrete, slated floor or made of mesh to allow dropping to fall
f. well thatched roof to protect birds from rain
g. clean and dry to prevent multiplication of diseases
h. warm especially during cold season and cool during dry season
i. location: it should be located in a well drained area to prevent damp
j. Fitting: it should have adequate nests or boxes for laying, feeders, waters or patches and brooders (where applicable).

Housing systems of chicken

- housing of chicken may be intensive, semi-intensive and extensive

1. **Intensive system:** this is the system of keeping large number of birds totally enclosed in a house. Examples are deep liter system and battery cage system.

i. deep litter

- Birds are confined within a big house. This house has partition and the floor is coved with absorbent litter.

Requirements

a. Site: land should be well drained. a trench should be dug around the house to drain away excess around the poultry house.

b. house:

- wall should be of solid materials at last 60cm above the ground
- wall height should be 2.5m high
- well ventilated, preferably with adjustable windows near the top
- leak proof, use corrugated iron sheets is recommended

c. litter

- Litter of good absorbent ability. The following are recommend litter materials.
  - combination of 50% sawdust and 50% wood shavings
  - combination of 25% cut straw and 75% saw dust
  - coffee husks, 100%
  - crushed maize cobs,100%

d. perches/roosts

- Roosts are wooden frame on which birds sit on to rest. it should be movable to allow even spread removal of dropping outside the building for regular cleaning

e. dropping pit

- Make trench within the poultry house along the walls. They should not more than 60cm deep and should be covered by wire netting.

f. laying nests:

- Provide laying nests in the poultry house. Individual birds or communal nest may be used. communal ones are popular because they are cheap and quick to construct

Requirements for laying nests

- they should be dimly lit to discourage egg eating
- they should be large enough to accommodate the birds
- should have dry and clean bedding
- they should have lockable doors to prevents birds from spending their rights in the nests
- they should have slanting roofs to prevent birds from perching on their tops
- they should be kept in secluded parts of the house, especially at the corners

g. feeder and waters (drinkers)

- Provide feeders and waters in the poultry house. They should be easy to refill and always clean. The water should not leak.
- Where possible, use automatic feeders that allow fed flow by gravity. The feeders and waters should have pointed tops to discourage bird from perching on them.

Advantages of deep litter system

- there is high stocking rate hence high returns per unit area of land
- there is low labour requirement

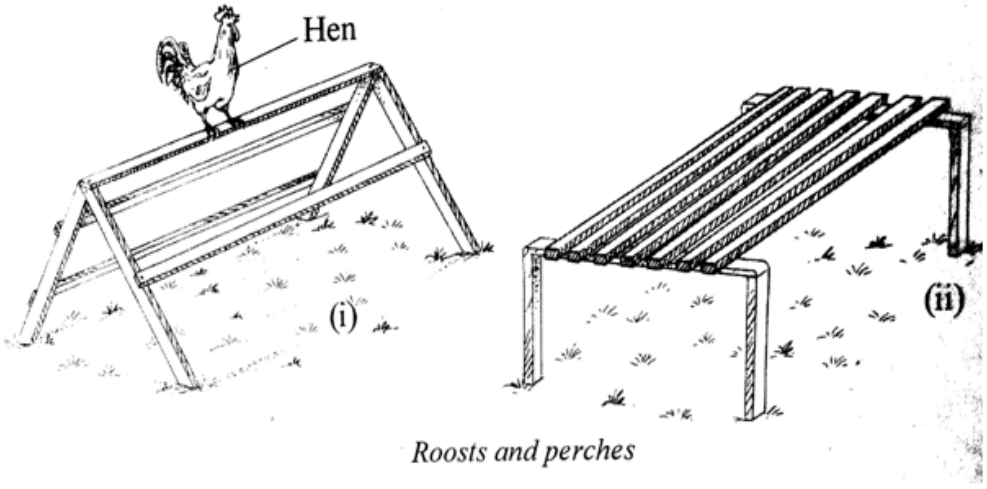
- there is fast accumulation of manure
- the system is appropriate for rearing breeding stock

Disadvantages

- provision of individual attention to birds is difficult
- vices such as cannibalisms and egg eating are very common
- the system provides conditions which encourage broodiness in birds
- high incidences of coccidiosis and parasite infestation particularly when standard are compromised

ii. battery cage system

- This is the most intensive rearing system. It involves confining of birds in wire cages. the number of birds per cage varies from 1-4 depending on the size of the cage, size of birds, environment and a farmer's presence
- The cage are normally arranged in rows called tiers that is, a row built over another usually 2-3 in number. the cages are arranged back to back and are raised 60-90cm above the ground for ease of cleaning the floor



Roosts and perches

Advantages

- this system has highest stocking rate because one is able to utilize the whole space in the house
- records per individual bird can easily be kept
- the performance of the birds is highest under this system since there is reduced movement of the birds
- vices such as egg eating and cannibalism are rare
- clean eggs are produced since they enroll of immediately after laying into collection trays
- it minimizes broodiness among the birds as they do not reach their eggs

Disadvantages

- it requires very high initial cost which is out of reach to many farmers
- it requires very high level of management

- the system is not suitable for breeders and broilers
- the cages is uncomfortable to the birds and may lead to bruiser on combs, toes and breast, as they try to contact the birds in the neighboring cages

2. **Semi-intensive:** this is the system of housing birds in movable houses that enable them to feed on grassland. examples are folds or ark system and sun system

a. sun-system

- Consist of a house in the partitioned area (run). Laying nest is also placed in the house. If the house should be movable so as to facilitate easy re-location from one runs to another. It may also be constructed at the centers of several runs for ease of sharing the poultry house. The land should to allow rotation. this reduces build up of diseases and parasites

b. fold system

- This is a system where birds free eat vegetation but are confined in small movable house known as folds or arks.
- The unroofed parts allow in sunlight and are used for exercise and feeding on grass. The roofed part contains waterers, laying nests and feeders.
- The folds should be moved to new ground daily. This helps to reduce build up of disease, provide fresh grass to the birds, and avoid accumulations of dropping.

c. Advantages of fold system

- manure is uniformly spread in the filed
- less feeding costs since the birds supplements the feed with insects and grass
- Worms's infestation and incidence of coccidiosis are reduced. this is because folds are moved regularly and hence birds do not come into contact their droppings
- there is no fencing

d. Disadvantages of fold system

- fold last for a short period because of too much handling
- few birds are kept per fold
- Labour requirements are fairly high because one has no to work on may folds. for example collecting eggs, cleaning folds and dairy movement of fold
- egg production records per bird are difficult to keep
- the returns per unit land are relatively low

3. a **Extensive system:** this is the system of where birds are reared in an open field where they move about and feed on grasses, insects and grit to supplement normal feeding. the system is called **free range system**

a. free-range system

- Also known as the traditional system. Chicken are allowed to move about looking for food.
- Most people in Malawi use this system to keep chickens.
- In the evening, the chickens are allowed to get into their house. The house is equipped with laying nests and brooding. waterers are located within and outside the home

Advantages of free range system

- It is chap to, maintain. the farmer does not spend a lot of money buying feeds for chickens
- chicken obtain balance diet by eating different type of food from surrounding

- Some habits like cannibalism, feather picking and egg-eating are controlled.

Disadvantages of free range system

- it is difficult to control parasite and disease

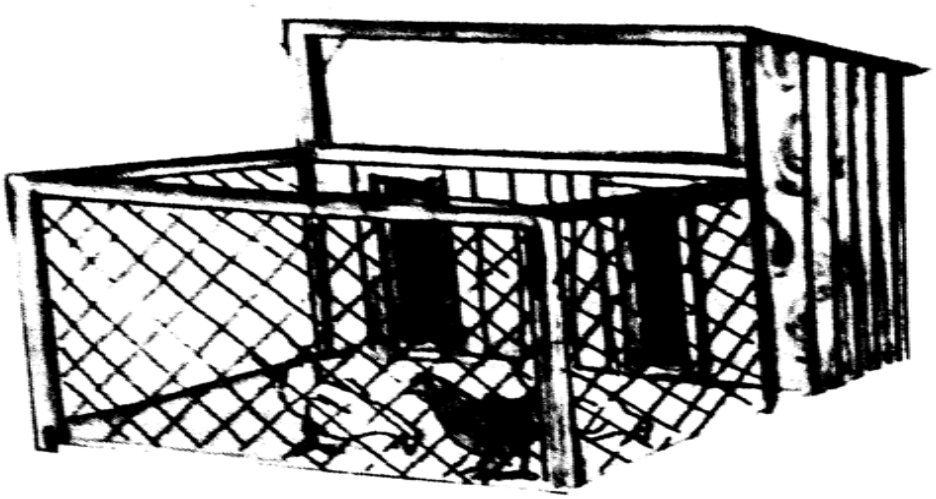
Constructing a chicken house

Materials:

- **Walls:** the wall can be made of earth (soil), iron sheets, wire mesh, bricks or timber.
- **Roof**: the is grass thatched or made of corrugated iron sheet or polythene sheet.
- **Floor**: the floor is made of earth (soil) or slated using timbers. Some are made of concrete.

When construction a chickens house not the following

- insulation
- lighting
- nesting
- litter collection
- ventilation
- positioning
- perches
- protecting of chicken from rain, sun, wind and predators



Chicken house

Feeding chicken

1. **Feeding broilers**

- Broilers are referred to as a table birds. They are kept for meat production. Broilers exhibits high growth rates and have a high feed conversion ratio. They usually achieve a weight of 2kg in 49-56 days.
- for profitable broiler production, a farmer must carry out the following practices

(a) Chicks kept for broiler production are fed on broiler starter mash or pellets. The feed has 20-24 % crude protein content which is high in energy and is highly digestible. provide the *feed adlibitum*
(b) provide adequate clean water at all times
(c) Provide 4-5, gradually introduce broiler finisher meal. Broiler finisher meal contains 18-20% crude protein. The broiler finisher meal encourages development of lean meat, i.e. discourage over-fattening. provide the *feed adlibitum*

2. feeding layers

Feeding of layers start with one day old chick (0-8 weeks), then growers/pellets (9-20week) and finally the adult layers (20weeks).

Feeding the chicks (0-8 weeks)

- One day one, chicks are fed on chick mash spread on newspaper or trays.
- Remove the newspaper cover after chicks have learn to eat from the feed troughs
- Provide chick mash till the eighth week. Chick mash contains 20-22% crude protein and highly digestible, hence suitable for chicks. Ensure that chicks are given adequate amount of the feeds at all times.
- in the sixth week, introduce grit or sand to help in digestion
- In the seventh week, introduce growers mash. Start with $\frac{1}{4}$ growers mash mixed with $\frac{3}{4}$ growers chick mash. Gradually reduce the amount of chick mash as the amount of grower mash is increased.
- At the ninth week, chicks are fed on fed growers mash only and are now ready to be taken to the main poultry house.
- clean the feed troughs and waters daily
- provide adequate clean water all the time

Feeding growers (9^{th} week to 20^{th} week, that is, point of lays)

- from the 9^{th} week, the birds are referred to as growers or pullets
  - Feed the growers on 115 grams of growers mash per day. Growers mash contains 16-17% crude protein, vitamins and trace elements.
  - Supplements the grower mash with grains and greens. Hang the greens to provide excise for the birds.
  - At the 20^{th} week, soluble grit (oyster shells) should be introduced to the diet. This provides enough calcium which is necessary for the hard egg shell formation.
  - Provide clean water ad libitum.

Feeding of layers (20 weeks)

- Layers are fed on layer mash. The layer mash has 14-165 crude protein and is high is energy value. Feed medium sized layers on about 120-140 grams of layer mash per day per day.
- Provide clean water. about 100 layers can consume 22-25 liters of water per day
- Provide grains up to 15% of the daily ration and green leafy vegetables to supplements the normal diet. Include oyster shells in the feeding programme.
- Supply grit or sand to help indigestion.

Diseases of chickens

Diseases o chickens, their causes, symptoms, methods of transmission and control methods

Disease	cause	Transmission	Signs and symptoms	Control
New castle	virus	contact	• paralysis of one side • loss of balance • twisting of the neck • difficulty in breathing • green diarrhea • shaking	• vaccinate the chickens at 3weeks old • kill and burn or burry all infected chickens • sanitation and hygiene of the chickens house and utensils • never mix old with newly bought chickens • adequate ventilation
Fowl pox	virus	Contact with infected chickens	Sores on the comb, wattles and around the beak	• vaccinate them at 3 weeks old • treat the sore with the use iodine solution • isolation of the chicks from health
gumboro	virus	contact	• dullness • sleepy • swollen cloaca • restlessness • earth of the week old chicks	• vaccination • prophylactic treatments by using antibiotics
coccidiosis	Protozoa called coccidian	Picking from the ground	• blood tinged faces • rough plumage • deaths of chicks	• vaccination • keeping the chickens house dry to reduce multiplication of coccidian • giving chickens amprolium in water or feed
Fowl typhoid	Bacteria	Trans-ovariary It is dangerous to humans if eggs are eaten raw.	• white yellowish or green yellowish diarrhea • difficulties in breathing • dullness • drooping wings • sleepy eyes	• amprolium in water or fee • there is poor response to treatment • testing and killing infected birds • regular vaccination • keep poultry house

			• Anaemia-comb and wattle get shrunken and pale yellow. • sudden death is usual	cleans, dry and well ventilated
Fowl cholera	Bacteria	• contact with carries • contaminated feds and water • contaminated soil or litter • infested carcasses when not properly disposed off	• in appearance • loss of body weight • gasping, coughing and sneezing • difficulties in breathing • diarrhea in breathing • diarrhea with yellow/green colour • lameness and swelling of joints (wings and legs) • oedema around the eye region	• keep new birds in isolation for one month before mix them with the rest • never mix the old with the young ones • slaughter all sick birds • disinfect the house before new ones are introduced • vaccinate the chicken when they are 8-12 weeks old • use of drugs like sulphadimidine can effective although there is no economic treatment

Parasites of chickens

- Parasites are organism which derives part or all their nourishment from other organism referred as the host.
- Parasites are grouped into two whether they live in/on the host.
  a. **External parasites (ectoparasites):** they feed on the host externally, which is outside the body. Examples are; leg mites, tampans, fleas and lice.
  b. **Internal parasites (endoparasites):** they live inside the body of the host. Examples such as tapeworms ,round worms and hook worms

Effects of parasites on chicken

- Some parasites compete with their host for food nutrients, for example tapeworms and roundworms.
- Some parasites piece through and lay eggs in the skin. Of the host causing damage s to the skin and predisposing the host the host to other infections for example mites.
- Some parasites such tapeworms cause mechanical obstruction of the internal digestive passage such as small intestine.
- some parasites feed on the body tissue of the host for example, blood-sucking worms and cause anaemia
- some parasites cause acts as vectors o some diseases

- Some parasites cause inflammatory reactions in their host causing irritation, and in extreme cases, death for example mites.

Effects and control of chicken parasites

Parasites	Effects	Control
Mites	• suck blood causing anaemia leading to general body weakness • cause irritation and discomfort	• Litter should be burnt in cases of infection and nesting boxes should be cleaned. • cracks should be filled because that where they hide during the day • clean the house , feed and water troughs • disinfect the house and all the equipments by use of nicotine or malathion
Tapeworms	• suck food nutrients from the small intestines causing retarded growth in chicks and loss of production in layers • increased susceptibility to other diseases • diarrhea • increase thirst • birds become unthrifty	• sanitation and hygiene • give chickens clean water • confine the bids so that they do not ingest intermediate host like ants or grasshoppers • pasture dressing with benzene hexachloride • Treatment is not economical. however use of di-n-btyl tin dilaurate or di-n-btyl tin oxide is effective
Round worms	• suck food nutrients from the intestines • retarded growth • reduced egg production • diarrhea • hemorrhages and anaemia	• keeping the house clean • always keep the fed and water troughs clean • Avoid keeping old and young chickens together. Usually the older ones re more resist than the young ones. • give the chickens drugs such as piperazine, phenothiazine or hygromycine B
Fleas, tampans and lice	• body irritation • suck blood and cause anaemia and loss of production • Heavy infection of the head causes welling and ulcers.	• Apply lard and paraffin on infected areas. the lard causes the fleas to suffocate; as a result they fall off • infected litter should be removed and burnt • apply malathion or creosote to

		the infected house
Hook worm	• attach themselves to the intestinal lining and suck blood • cause anaemia leading to weight loss, weakness and weight loss	• Disinfect chicken house. • foot bath at entrance to chicken house with disinfectant • proper disposal of sweepings chickens house

Chicken predators

- common chicken predators in Malawi include: wild cats, hawks, eagles, ravens, alligators, nyenga, snakes

Ways of controlling predators

a. keep the chickens in complete confinement so that they are not exposed to any of these predators
b. where chickens are reared in a house with a run (open space) wire mesh, they should be put above the open space so that no predator enter the open space through top
c. keep the house well illuminated so that the farmer can see the inside Cleary
d. Vents should be fitted with wire mesh to void snake s, wild cats from using them to enter the house.