**S.3 TERM III (1ST & 2ND):**

**AGRICULTURAL FARM STRUCRUES, ENGINEERING AND MECHANIZATION:**

**FARM STRUCTURES:**

Farm structures are various forms of construction that are made on the farm to improve the management condition of the farm.

**Examples of farm structures:**

* Fences
* Animal handling structure e.g. dip tank, spray race and crush.
* Farm building farm crop stores.
* Water storage structures.

**Importance of farm structure in general:**

* Protection of animals from weather conditions e.g. wind, rain, and sun that could cause stress to animals.
* To keep animals in conditions where diseases and parasites can be effectively control e.g. ticks by use of fences and dip tank.
* To keep farm machinery protected from rain and dirt.
* To improve quality of product e.g. milk by building good milking shades.
* To help animals and crops to grow in conditions that helps them to achieve maximum yield by exercising their full genetic potential.
* Farm buildings and structures help farmers to maximize profits on the farm.
* They reduce crop losses from rodent and decay.
* They decrease labor requirements.
* They offer proper storage facilities and reliable marketing.

1. **FENCES:**

There are farm structures constructed around a piece of land to control the animal in and outside of the farm.

**Uses of fences;**

* They avoid boundary disputes among neighbors.
* They prevent intruders’ e.g. thieves and trespassers.
* They lead to improve a grazing management paddock that facilities rotational farming.
* It enables farmers to isolate sick animals or animals affected with pests and diseases.
* They enable mixed farming to be carried out easily.
* The feeding is easier since animals can easily be grouped according to their age.
* They control water points for livestock.
* Fences add beauty to the farms.
* They reduce labor requirement on the livestock farm.
* Live fences act as wind breaker or and fire wood.
* They control diseases causing organisms such as worms and ticks on the livestock double fence.
* They can be used to control breeding especially, inbreeding.
* They facilitate night paddock.

**Problems of fencing in land management:**

* Fencing requires alot of capital.
* It requires a lot of labor.
* They deny animals chance of feeding freely, finding the earliest growth and the best feed.
* Too many fences.
* Faces especially live ones take up a lot of land that would be used for growing crops.
* They damage hides that spoil their quality.
* Live faces maintenance takes years to grow.

**TYPES OF FENCES;**

There are major types of fences on farms, namely;

1. **Live fences; i**) living trees.

ii) Electric fences.

1. **Dead fences; i)** wire fences.

**ii)** Wood fences.

**iii)** Block fences

iv) Stone fences.

v) Trench fences.

1. **LIVE FENCE**

* **Living trees. (Hedge).**

These are constructed by planting trees or bushes e.g. sisal, cocoa, cypress, cactus, tick berry, kier apple, Eucalyptus etc.

**Advantages:**

* They are cheap to construct from seeds/establish.
* They may act as windbreakers.
* The thorny species-effectively discourage intruders.
* Tall varieties like kier apple can serve as fuel.
* Shelter animals against sunshine and rainfall.
* Herbs and therefore used as medicine.
* Erosion control.

**Disadvantages:**

* They take long time to establish.
* They don’t establish evenly and therefore weed gap filling.
* They can harbor snakes, rats, and thieves.
* They require regular trimming.
* Hedges compete with crops for nutrients and moisture.
* They cannot be effectively used to sub land in paddocks.
* Some of the shrubs such as **kier apple** and **lantana camara** are poisonous to animals.
* Thorn species may damage the hides/skins of the animals and injuries to the personnel.
* **Electric fence**

They are commonly used in strip grazing. They are fences made of electric wire to act as boundaries through which electric current flow. These fences are movable.

**Advantages:**

* It takes less labor in operation.
* It is effective in the control of animals and intruders.
* It is durable or long lasting.

**Disadvantages:**

* It is expensive in buying and installing electric material.
* They can cause electric shock to farm animals and farmers.
* It is conditioned or it depends on the presence/absence of electricity.

1. **DEAD FENCES:**
2. **Wire fences:** these include:

* **Plain wire fences:** here, a plain wire and posts are used. It is only used in quite animals but may be used in a combination with a barbed wire.
* **Woven wire fences:** it is used in confining small animals like goats, chicken, rabbits, pigs etc. strands (lines of wires) of plain wire or barbed wire used before putting woven wire. However, it should be buried in the ground to avoid the animals from lifting it up.
* **Barbed wire fences:** these are used in many farms. They are usually made of ordinary wires and barbs that may be spread about 8-15 inches from each other. It is the commonest type with poles that should at least is treated.

**Types of barbed wire:**

1. **High tensile wire:** these are barbed wire that has high resistance to tensile forces.

**Characteristics of high tensile barbed wire:**

* It has high resistance to tensile forces.
* It does not break easily (it is strong).
* They are shinny wires.
* They are thinner (small).
* They have sharp barbs.

**Diagram illustrating this type of wire:**

1. **Low tensile wires:** these are barbed wire that has a very low resistance to tensile forces.

**Characteristics of Low tensile wires:**

* It has a low resistance to tensile forces.
* It breaks easily (it is weak).
* They are rough wires.
* They are thick (big).
* They have blunt barbs (has less sharp barbs).

**Diagram illustrating this type of wire:**

1. **Wooden fences:** this method of fencing is fairly cheap in areas where wood is available pentachlorophenol, old engine oil, creosote, arsenipentoxide and other preservatives against termites, weather, fungi and other insects.
2. **Concrete/Block fences:** these are fences mainly constructed from small stones (Gravels), sand and cement or Bricks/block with mortar (mixture of cement, sand and water).
3. **Trench fences:** farmers near game reserves commonly use these. Here, trenches are dug parallel to the fence to avoid the animals to cross over the land. These trenches are made in such a way that it is wide on the top and narrow at the bottom so that animals does not escape.

**TYPES OF POSTS:**

1. **Strainer (King) posts:** these are posts used at the corners and gates. They are also used at interval not more than 200m in straight lines and they should be big (10-18cm) and long (2.4m).
2. **Standard (ordinary) post:** they are place after the strainers to hold wires between corners. They are fairly small (4.5-6cm) and long (1.8m).
3. **Strut (supporters):** these are placed diagonally to the strainers to offer support near the base of the posts. They are always two at each corner post and one at each gate post.
4. **Droppers:** these are small or thin pieces of wood twisted between strands of wires and standard post to keeping the spacing between strands. They are placed in such a way that they don’t touch the ground.

**The structure of the fence:**

**Factors affecting the choice of fencing material:**

* Presence of capital.
* Availability of the materials.
* The type and purpose of farm.
* Durability of the materials since most farmers prefer long lasting things.
* Costs of the materials that should be affordable by farmers.
* Climate of the area that should be favorable not to cause losses on the farm.
* Presence of pests and diseases.
* Good/poor management.

**ESTABLISHMENT OF A FENCE:**

* Clear the land where the fence line is to pass to a width of 2m.
* Find out the position of each post using tape measure and pegs.
* Determine the number of strainers (corner and standard)required according to the number of gates and corners as planted.
* Dig the hole deep enough following the marks (pegs) made and fix out the concrete in the ration of 13:3 (cement: sand: gravels).
* Fit in the strainers and struts in their respective holes and pore there the concrete, the standards and nail the struts.
* Take strands of wire around the fence between the strainers to give a clear line for other posts.
* Stench and staple the strands on the posts using U or V shaped staples(nails) until all strands are put depending on farmers ability.

**Procedure for calculating the different quantities of materials required in barbed wire fence.**

Determine the perimeter (the distance around) of the area to be fenced, this is important for estimating the number of the fence; assuming you know the distance between one post to the other.

Find out the number of corners and gates (each corner post requires 2 struts and each gate requires one strut).

The spacing between posts should be determined. This helps in determining the total number of posts required.

Determine the number of strands of wire for the fence using the formulae:-

Number of roll= perimeter × number of strands.

Size (length) of the roll of barbed wire.

The number of staples per post will depend on average correspond to the number of strands, knowing the total number of posts to be used to fence the area, one can estimate the number of staples required.

**Example:**

A farmer has 1sq/km of land to fence. Assuming that the distance between the fencing posts is 5m and the farm needs to have 7main gates each measuring 10m in width.

1. Calculate the number of
2. Strainers
3. Struts
4. Ordinary post needed by the farmer.
5. If each posy needs 10kg of concrete to fix it, workout the amount of sand, cement and gravels needed by the farmer if his mixing ratio is 1: 3: 5.

**Solution:**

1000m

1000m

1. Number of strainers=(4 corners ×1)+(7 gates ×2)

=4+14

=18 strainers.

1. Number of struts:

= (4 corners ×2) + (7 gates ×2)

=8+14

=22 struts.

1. Number of ordinary posts:

Total length=4000m.

Meter gate length 70m: (7 gates×10m)

Length between fencing post 5m:

Therefore: 4000-70

=3930

3930

5

=786 posts (all of them).

Therefore: 786-18 (strainers)

=768 ordinary posts.

**10kg concrete:**

768 posts ×10kg each

=7680kg of concrete for all:

But: ratios are 1: 3: 5 (cement: sand: gravels)

Therefore: Sand: 1

Cement: 3

Gravels: 5

* Cement 1 ×7860

9

=873.3kgs

* Sand 3× 7860

9

=2620kgs

* Gravels 5 ×7860

9

=4366.7kgs

**MATERIALS USED IN FENCING:**

They include:

1. Concrete.
2. Metals.
3. Wood.
4. **Concrete:** this is normally used in fencing especially when its re-enforce with metal rods of steel hence called reformed created.

**Advantages:**

* Strong and durable.
* It does not rust.
* It is neat.
* Cannot be attacked by termites and fungi.
* They are resistant to decay i.e. water proof.

**Disadvantages:**

* It is heavy, so needs a lot of labor.
* It is expensive, since it needs to be re-enforced.
* It may crank with time due to changes in wealth.

1. **Metals:** metal can be used in fencing in form of fencing wire, fencing staples (u/v shaped nails) and fencing posts.

**Advantages:**

* They are light.
* They are termite and fire poof.
* They are strong and durable.
* When in the soil, they guard against lightening.

**Disadvantages:**

* They are not easily obtained.
* They are expensive when available.
* They are susceptible to rusting if not painted.
* They need special skills in use e.g. welding, bending etc.
* Sometimes they are heavy therefore not easy to work with.

1. **Wood:** this is commonly used as post in wire fences in most of the areas in Uganda or East Africa.

**Advantages:**

* They are cheap to buy.
* They are easily obtained in most areas.
* They are easy to work with (no special skills are required).
* They have good appearance if well constructed.
* They are also durable if well treated.

**Disadvantages:**

* It is easily burnt by fire.
* Termites and fungi easily attack them.
* They are easily decayed by the elements of weather like rainfall.
* They are not durable if not treated well.

**Precautions taken when drying wet timber/wood by air (Timber seasoning/ drying by air):**

* They should be pilled in roofed house/shelter to keep off rain direct sunshine.
* The pilled timber or wood should be supported from the ground so as to allow air circulation under the pilled timber to prevent absorption of moisture from the ground.
* The wooden rods called **stickers** to allow air passage in the pile should separate pilled timber.
* All supporters and stickers should be spaced close to prevent warping or folding of the wood/timber during the process of drying.
* Pilled wood/timber should also be parallel to ground to prevent or avoid bending and falling or sliding off.

**WOOD TREATMENT:**

The following methods are used to treat or preserve the wood for long life use.

1. Chemical treatment of wood
2. Pressure /vacuum method.
3. Soaking method.
4. Hot and cold.
5. Cold method.
6. Sap displacement (End diffusion).

**Therefore, in summary:**

* Pressure method
* Hot and cold method
* Cold method
* Sap displacement.

**Explanations:**

1. **Pressure/vacuum method.**

The freshly or dried poles are peeled off their bark, then they are immersed in the preservative in a large cylinder (drum). The preservative is then forced to enter/pass in to the wood under pressure.

1. **Hot and cold treatment:**

Peeled posts are immersed in oil tank containing the preservative and then heated for about two hours until the chemicals are about to boil, this expands the wood cells.

The posts are then allowed to cool in different cold chemical and the wood cells that had expanded shrink and draw up the preservative.

1. **Cold method treatment:**

Peeled posts are immersed in the desired preservative for a few days (1-3) to allow the chemical to be drawn up slowly in to the wood. The posts are later removed and allowed to drip dry after which they are ready for use.

1. **Sap displacement (End diffusion):**

In this method, freshly cut poles are put in container with preservative in slanting position as sap comes out of the wood; it is then replaced by the preservative transpiration stream. Later their bottom parts are inverted up until enough chemicals are taken in.

**Examples of chemicals used:**

* Pentachlorophenol, Tributyl, Tin oxide, Old engine oil, Best for weevils and other insects. Dieldrin for Termites.
* Arsenic pentoxide, Sodium dichloromate, Copper sulphate for Fungi.
* Coal, Tar, Creosote Tanex and Paint for weather.

**Tools used in fencing:**

* Tape measure.
* Ground spear (hole digger).
* Wire (plain, woven and barbed).
* Staples (u/v nail).
* Craw hammer.
* Wire strainer.
* Firming stick (Ramming).
* Pair of pliers.
* Supporters.
* Droppers. Etc.

**Practical Eleven:**

1. You are provided with specimens Y1, Y2, Y3, Y4, and Y5 which are used together in farm operation.

Identify the specimens.

Y1…a pole……………………………………………..

Y2………claw hammer………………………………………………

Y3………barbed wire……………………………………………..

Y4………………………………………………………

Y5…………plier……………………………………………

1. Name the operation where the specimens are used.

…………………………………………………………………………………………….

1. Give the functions of each specimen.

Y1 …………………………………………………………………………….

Y2 ……………………………………………………………………………..

Y3. ..…………………………………………………………………………….

Y4 ………………………………………………………………………………….

Y5………………………………………………………………………………….

1. How is the design of each specimen suited to its function?

Y1………………………………………………………………………………………

Y2…………………………………………………………………………………………

Y3…………………………………………………………………………………………………

Y4……………………………………………………………………………………………………..

Y5………………………………………………………………………………………………………….

**Practical twelve:**

You are provided with specimens Y10, Y11, Y12, Y13, Y14 and Y15 which are used in erecting a farm fence.

1. Identify the specimens.

Y10………………………………………………………………………………………….

Y11………………………………………………………………………………………..

Y12……………………………………………………………………………………………

Y13……………………………………………………………………………………………

Y14……………………………………………………………………………………………

Y15…………………………………………………………………………………………..

1. Mention the use of each specimen.

Y10……………………………………………………………………………………………..

Y11…………………………………………………………………………………………….

Y12……………………………………………………………………………………………….

Y13……………………………………………………………………………………………………

Y14………………………………………………………………………………………………………..

Y15………………………………………………………………………………………………………..

1. Closely examine specimen Y14 and Y15 and determine the tensile of each specimen.
2. Name the specimen with:

High tensile……………………………………………………..

Low tensile………………………………………………………

1. Which of these specimens would you recommend for the fencing for diary/beef paddocks and give reasons.

…………………………………………………………………………………………………..

……………………………………………………………………………………………………

…………………………………………………………………………………………………………

………………………………………………………………………………………………………………

**3RD-4TH WEEK:**

1. **ANIMAL HANDLING STRUCTURES (Animal dandling layout):**

There are 3 mainly used handling structures and their uses depend on the size of the land.

**They include:**

1. Crushes.
2. Spray race.
3. Dip tank.
4. **THE CRUSH:**

A crush is a farm structure used for close operation on farm animals. It has a handling yard and opened narrow passage in which animals are restrained from.

**Uses of a crush:**

* It helps farmers in hand spraying and dressing to control ticks.
* It is used to direct animals in to the dip.
* It is used when giving injections and anti-biotic to sick and drenching.
* Help farmers to make identification marks.
* It helps farmers to take temperature of the animals.
* It is used for examination of sick animals.
* It enables farmers to carryout pregnancy diagnosis.
* It enables farmers to carryout artificial insemination.
* It enables farmers to take blood samples from animals.

**Advantages of using a crush:**

* It is constructed from locally available materials.
* It is cheap to construct so small farmers can afford.
* It is used for several purposes.
* It does not require maximum skills of construction.

**Disadvantages:**

* It is not very durable i.e. it can break during operation.
* May not be able to handle calves.
* It is not economical when spraying.

**THE SPRAY RACE:**

These are farm structures constructed in a confined space and work under pressure to deliver the chemicals through a series of pipes.

It consists of a reservoir which is driven by pump powered by an electric motor or engine connected to pipes with nozzles pointing in all directions to ensure coverage of the animals.

**Advantage of spray race:**

* It is quick than a crush and a dip tank.
* There is less wastage of acaricides since just enough is used a day.
* It requires less labor when operating.
* Small animals like goats, sheep, sick and pregnant animals can be sprayed faster than dip.
* The animals receive proper coverage of the acaricides.

**Disadvantages of spray race:**

* Spray races are expensive to construct.
* It requires technical skills in maintaining the engine and the pump.
* The nozzles may be blocked with dirt.
* It is only economical with large held management rules at the spray race.
* Arrange in single file.
* Young ones sprayed with less pressure to make them used.

**Precautions after spraying (management rules at the spray race):**

* The remaining dirt spray wash should be pumped out.
* The whole unit should thoroughly be cleaned and the nozzles.
* Keep their clean water to reduce cracking and keep valve moist.
* The returning pipes should be closed to prevent rain water from entering I to the reservoir.
* Let cattle pass through with their heads down to spray all parts.
* Young animals should be sprayed with less pressure.
* Arrange the animals in a single file.

**THE DIP TANK (PLUNGE): AJUNA**

A dip tank is a farm structure where the animals are totally immersed in a wash to control the external parasites e.g. tick, flies, and lice.

**Factors considered before constructing a dip:**

* There must be a lot/abundant supply of water.
* It should be on near the grazing ground.
* It should be on the firm ground to keep it intact.
* The ground should be able to resist water and wind erosion i.e. well drained

**The structure of dip tank:**

**FUNCTION OF THE PARTS:**

1. **Roof:**

* Avoid rainfall from diluting the dip tank.
* Presents excessive loss of water through evaporation.
* Avoid splashing out the dip wash during dipping.

1. **Collecting yard:** is the fenced area before the entrance.

* It confines animals in one place and therefore allowed to move one by one.

1. **Entrance:**  pass through for the animals to the dip.
2. **Foot bath:** is abrasion like depression at the entrance race for cleaning animals’ feet before entering in to the dip wash.
3. **Jump off point:** it direct and facilitates the animals to enter in to the wash easily.
4. **Swim bath:** it contains or holds the dip wash.
5. **Sloping ramp:** this guides the animal to climb out of the swim bath.
6. **Return pipe:** this brings back the drained wash from the animal’s body to the dip tank.
7. **Exit race:** this allows the animal out of the dip tank.
8. **Draining yard:** it avoids the wash from contaminating the pasture as it drains from the hides after dipping.
9. **Drain race:** it transfers the drained wash to the dip wash through the return pipe.

**DIPPING OPERATION: TALEMWA MARGRET**

* Animals are gathered in a collecting yard.
* They are given water to cool down.
* They are then led in a single file through the entrance race when feet are washed clean in the foot bath.
* They are introduced to jump off point, from here in to the dip wash.
* It swims across to the slopping ramp and climbs up and exit dip through the drainage race.
* It stops in the drain race for acaricides dripping off their bodies to flow back in to the tank via return pipe.
* They are held in to the draining yard at the end of the exit race to dry and later led out back to the pasture.

NOTE: MORE RESEARCH BY TEACHER

**How to ensure effectiveness of acaricides: AIDAH**

* Following proper acaricides mixing ratios.
* Controlling acaricides dilution through leak proof roofs and blocking pipes when dip is not in use.
* Following a regular dipping routine.
* Buying reliable acaricides.
* Using additional hand dressing of animals on hidden parts.
* Maintaining acaricides strength dip testing and reconstitution.
* Dipping in dry season to avoid rains wash off.

**Advantages of a dip tank:**

* It saves time since it allows large numbers of animals to be dipped.
* There is no wastage of acaricides since it can be used again and again.
* It is cheap when is it owned by a community.
* There is proper coverage of the animal’s body.

**Disadvantages:**

* The initial costs of constructing are high.
* Sick or heavily pregnant animals cannot be dipped.
* Empting and refilling the tank is tiresome and time consuming.
* Various diseases such as foots mouth may be caused.
* High risks of diluting the wash therefore less effective.

**Mixing the dip wash: SAMUEL**

* You should measure the level of the tank.
* Fill the tank to the correct level with water.
* Immediately before dipping, add the correct level of acaricide.
* Study the ratios of acaricides and water to be used in the mixing.

**Example:**

1. The level of dip wash at start of dipping was 16000 liters. The level after dipping was 14500 liters.

**Question**: find out the amount of water that was added.

**Solution:**

Before dipping 16000

After dipping 14500

**Therefore:** 16000-14500

=16000-14500

**=15000 l (ant of water):**

1. The level at start of dipping was 22000L and 18000L after dipping. The acaricides was to be added in the ratio of 1: 1500L.

**Question:**

1. **Find the amount of water added.**
2. **Find the amount of acaricides added.**

**Solution:**

Before 22000L

After 18000L

Ratio 1: 1500L

Amount of water =22000L-18000L

=4000.

Amount of acaricides; = 1/15000×4000

=2.67L.

**Exercise 1**: a farmer started dipping and the dip wash level was 18000L and it was reduced to 16000L at the end of dipping.

**Question:**

Calculate the amount of water and acaricides he used to keep the dip wash concentration.

**Exercise 2;**

The level at starting of treatment was 30000L and 20000L after the treatment.

1. Find the amount of water added.
2. Find the amount of chemical used at the ratio of 1: 1300L.

**Solution:**

**Exercise 3:**

An acaricides × is to be used in dip tank whose capacity is 18600L. The recommended mixing ratio is 1:500. How much acaricides should be added to the water?

**Solution:**

**5TH -6TH WEEK:**

1. **FARM BUILDING:**

These are essential facilities on the farm for improvement of quantity and quality of the farm that determines the farm profits.

**Advantages of farm building:**

**(How do farm buildings improve the economic returns of the farm)?**

* They increase production by decreasing crop and animal’s losses.
* They increase the quality of farm produce.
* They decrease labor requirements e.g. drying crop products under shade or in a house.
* They protect production tools and machinery from weather elements.
* They increase profit margins i.e. store farm produce when market prices are low and sell when high.
* They increase efficiency and ease in management on a farm.
* They guard against bad weather on store crop.
* They can be used for general farm services like workshop, research, and repair machinery.
* They increase value of the farm land.

**Factors considered in site selection for farm building:**

1. **Accessibility:** there farm buildings should be near roads and market center for easy supervision and transportation.
2. **The gradient:** for purposes of free flow of rain water and natural drainage, the houses should be better located on raised ground or gently sloping.
3. **Type of soil:** they should be sited on the least productive part of the farm and the fertile part reserved for growing of crops.
4. **Water source:** the place selected should be near water source.
5. **The direction of wind:** the farm buildings should be located on the lee ward side of farm or windbreaks should be planted around the farm.
6. **Security:** for easy supervision, crop stores, workshops, as well as animals sheds e.g. poultry, pigs, rabbits or vegetable farms should be near the homestead.
7. **Power supply:** this is an important factor especially where different machines are to be installed e.g. milking machines, pumps, grain mills etc.
8. **Sun position:** hot sun rays due to high temperature affect animal’s appetite that consequently lower production. Their doors & windows for farm building should face the sun rays and set respectively.
9. **Function/purpose of the building:**

**TYPES OF BUILDING MATERIALS:**

1. **Metal:** these are commonly used industrial construction are steal, iron, aluminum, and copper. They are used for trusses, roofs and pillars they are long lasting if well protected against weather by coating by zinc or painting but expensive.
2. **Timber:** it is the most suitable material for construction on farms that is worked on wind local labor using ordinary hand tools, easy to construct, dismantle and reconstruct but less duration.
3. **Mud and wattle:** this is the most common building material in E. Africa to most peasants as it is cheap (poles, reads, mud, & grass).
4. **Mortar:** this is the mixture of sand and cement in the ratio of 4:1 with some water added it is mainly used to bind bricks, plastering walls and finishing off floors.
5. **Plastics:** these are not commonly used; they are being developed and sometimes replace metals parts. And used for internal fittings such as water pipes.
6. **Stones (stones masonry):** these are useful in areas where they are in plenty that should be cut or well place i.e. cutting increases its costs (stones are shaped as required and cleaned) especially used to build walls, join them with plaster, clay etc.
7. **Blocks:** these are common and made of various sizes from different types of soils.

**TYPES OF BLOCKS:**

**They include:**

* Sand blocks.
* Clay block.
* Murram blocks.
* Concrete block.

1. **Sand blocks:** these are made of sand; cement and water (mortar) put in moulds then passed firmly either manually or by machines and then removed.
2. **Murram block:** these are cheapest to make since the raw materials, soil, & water are available on the farm and it can be strengthened by adding little cement.
3. **Clay block:** these are made of pure clay or antis hills, mixed water and are set out to dry. They are strengthened by burning (baking).
4. **Concrete block:** they are mixture of crushed small stones, cement and sand placed in moulds. They are mechanically made mainly.

**THE FOUNDATION AND WALL:**

* This is the base of the house that starts from the ground which should be put or constructed on a firm ground (sub soil) by removing all the loose soils and vegetation.
* If the side has a heavy rain, adequate drains must be installed around the foundation to prevent them from being weakened. Or else, standard concrete is poured on to the floor.
* Trenches are dug according to the measurements done, big stores/hard core are added followed by concrete mortar known as concrete footing.
* Few steps (2-3) of blocks are put (laid) on the concrete footing that ends slightly above the ground level.
* The damp proof course (DPC) is also placed to prevent water from penetrating in to the wall. It is made up of polyvinyl chloride (PUC).
* Therefore the wall also begins here using brick and mortar where the ring beam is immediately placed after the window level and it prevents/ provides resistance against earth movement.
* Lastly after the ring beam, few courses of bricks are laid from where the roof is placed of put.

**Types of foundation:**

* Store foundation (strong, durable, economical & cheap).
* Concrete foundation (poured in trench/ground, guided by timber) to prevent soil from mixing with the concrete.
* Pole/post foundation.

**Qualities of a good wall:**

* It should offer a great resistance against agents of weather.
* Provide fire resistance.
* Provide sound resistance.
* It should regulate roof temperature.
* Be strong and provide stability to the whole building.

**ROOFING:**

There many types of roofing materials available for farm building and should have the following qualities,

* Long lasting.
* Offer resistance against rain and snow.
* Withstand the effect of rain.
* Withstand the effect of wind.
* Higher in weight but able to support loads place over it.
* Fire resistance.
* Good appearance.
* Has ability to insulate sound and heat.
* Should be worth its cost over the lifetime.

**Types of roofing materials:**

* Thatching roofing material.
* Asbestos.
* Tiles.
* Plastics.
* Grass.
* Galvanized corrugated iron sheets.
* Fastener**.**

**Factors affecting the type of roof to be established:**

1. The size of the building.
2. Use of the building.
3. Availability of the material.
4. Knowledge/skills used in construction.
5. Costs of the materials.

**THE ROOF:**

The angle of the roof is known as pitch and it varies with the type of material land.

The roof should have a pitch of at least 400 to help the rain drop rapidly down without penetrating the roof.

The ends of **trusses** are supported on the wall plate. The wall plate is a horizontal piece of timber running from ridges to the wall plate and extends out wards so that the wall is kept dry are known as **Rafters.**

The timbers which are fixed horizontally along them out side of the roof to carry the thatching materials are known as **purlins** and run parallel to the ridge.

The timber joining both rafters to the wall plates is known as a **collar** or crosstie.

**CROP STORAGE BUILDINGS:**

Both large and small-scale farmers need to store their produce perishable farm produce need cold storage; however they need a lot of capital for construction therefore expensive to farmers.

**How to minimize crop losses during storage (desirable features of a crop store)**

* The floor should be raised above the ground level.
* All posts and pillars should have smooth surface.
* It should be vermin proof, through during metal deflectors on posts.
* It should be properly ventilated.
* It should be rain proof.
* It should have good security (near the main house).
* All parts should be easily cleaned.
* The walls should have no cracks (crevices).
* The floor should be kept dry and dust free.
* The cracks should regularly be dusted with chemicals or smear with cow dung to prevent insect.

**Common storage problems:**

* Lack of proper facilities such as storage bags.
* Lack of technical skills about seed dressing.
* Lack of cash to buy seed dressing chemicals.
* Insets and rodents damage in the fields & store.
* Deterioration, rotting and fungus attack because weather and insufficient dry (sun).

**Solutions:**

* Suitable, sensible and properly constructed stores.
* Proper cleaning of stores.
* Disinfecting stores.
* Adequate/proper drying and protection of the produce.
* Avoid introducing new stock to the old.

**Importance of drying crops before storage:**

* To prevent on insect damage.
* To reduce rotting or decay by fungi.
* To maintain good quality seeds,
* To prevent seed germination in the store.
* To increase their viability strength
* To preserve viability of seeds.

**Practical thirteen:**

1. You are provided with the specimens Y6, Y7, Y8, Y9 and Y10 which are materials used in construction.
2. Identify the specimens.

Y6……………………………………………………………………………………

Y7…………………………………………………………………………………….

Y8……………………………………………………………………………………..

Y9……………………………………………………………………………………….

Y10……………………………………………………………………………………..

1. State the difference between Y6 and Y7.

|  |  |
| --- | --- |
| Y6 | Y7 |
|  |  |
|  |  |
|  |  |
|  |  |

1. Describe how the strength of Y6 and Y7 can be increased respectively.

Y6…………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………….

Y7…………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………….

1. State the advantages and disadvantages of using specimens Y8 and Y9 in construction.

Advantages of using Y8

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

Disadvantages

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

Advantages of using Y9

……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………...

Disadvantages

……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………….

1. Mention 4 ways of making specimen Y8 more long lasting.

…………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

**Practical fourteen:**

You are provided with specimens Y16, Y17, Y18, Y19, Y20, Y21 and Y22 which are construction materials.

1. Identify the specimens and in each case mention its use in construction.

|  |  |  |
| --- | --- | --- |
| Specimens | Identity | Use in construction. |
| Y16 |  |  |
| Y17 |  |  |
| Y18 |  |  |
| Y19 |  |  |
| Y20 |  |  |
| Y21 |  |  |
| Y22 |  |  |

1. i) What is the recommended ratio for mixing specimen Y17 and Y18 plus 16 and 17 water when making a foundation slab for a building? Ratio

……………………………………………………………………………………………………………………………….

1. What technical term is given to the mixture in b (i) above?

……………………………………………………………………………………………………………………………….

1. i. what is the recommended ratio for mixing specimen Y17 and Y18 for plastering walls for a building? Ratio ……………………………………………………………
2. What technical term is given to the mixture mentioned in c (i) above.

……………………………………………………………………………………………………………………………….

**7TH WEEK:**

**FARM WATER SUPPLY:**

The water supply system ensures the conveyance of water from the source to the place of consumption or use. This is because all farming practices need supplies of available water of good quality & in large quantities.

**Importance of water on a farm:**

* Use for human consumption to ease food transportation and other metabolic reactions.
* It is necessary for irrigation during dry period.
* It is used for agricultural chemicals e.g. herbicides, insecticides etc.
* It is used for cleaning the farm materials and stools.
* It is used to cool the farm engine.
* It is used as source of power production.
* It is used in making and mixing building materials.
* It is used for food synthesis during photosynthesis in plants.
* It is used to transport farm produce where rivers are available and read/ air.
* It enables fish farming.

**Disadvantages**

* Cause death due to drowning.
* Lowers the soil fertility through leading & erosion.
* It increases the costs of farm production e.g. washing off the fertilize rand acaricides.
* Excessive amount of water leads to poor drainage and water logged soils.
* It promotes & speeds water bone diseases and pests e.g. bilharzias, mosquitoes and liver fluke.

**SOURCES OF WATER:**

1. **Surface water**: this water is obtained/exists in natural basins (dams), streams, rivers lakes, ponds etc. however their flow fluctuates depending on weather condition.
2. **Precipitation:** this is presently the only practical source of obtaining water for agricultural, industrial and domestic use. This population is in form of rain fall, snow (ice), hails form. However it is not often available at the time and place of need.
3. **The ground water:** this water is developed for use through wells, springs and dug reservoir that mechanically constructed to direct its course.

**Source of water to animals:**

* By direct drinking the pond, river, lakes etc.
* By eating the solid food/succulents has 90% of water.
* Metabolic water source, it involves the breakdown of organic food substance e.g.

C6H12O6+O2 CO2+H2O+Energy

**Factors that influence the quality of farm water:**

* Source of water: this should be protected and clean.
* Location (site): it should be from an area that is not subjected to pollution.
* Distance: it should be far from the source of pollution.
* Flow: it should have provision of free flow drainage.
* Fitters: these should be available of filtering facilities.
* Fence: there is need to fence the catchments area for water collection.

**WATER STORAGE:**

Water can be stored on the farm in the following ways:

1. Common containers e.g. drums, jerry cans, barrels, pots and buckets.
2. Ponds and earth reservoirs: This tank may be made from concrete and others made of galvanized steel or iron as shown below.
3. Pump storage tanks or header tanks: these are large tanks suspended on metal supporters.

**Diagram showing the water harvesting mechanism:**

**Maintenance of water tanks:**

* The area around the tank must be well drained.
* Any crack that develops should be repaired immediately.
* Inlet to the tank should be fitted or covered.
* Segments of dirt that collects in the tank.
* It should be cleaned before the following rains.
* Flash out the first water from the first rain to avoid dust from draining in to the tank.
* Ensure proper fixed cover and not damaged of the tank.

**WATER REATMENT:**

* **Proper water storage:** water should at least be stored for some time to allow deposition of sediment.
* **Boiling:** this generally destroys the diseases causing organisms.
* **Filtering:** water is slowly filtered to remove various sediments and bacterial from the water.
* **Chlorination:** here, adequate amount of chlorine in form of sodium hypo chloride or chlorinated lime is added and properly mixed with water.

**FARM POWER: SAMUEL**

**Power** is the ratio of doingwork or the rate of expenditure of energy. It is currently measure in watts and joules. A watt is the rate of work equivalent to one Newton meter (Nm).

**SOURCE OF FARM POWER:**

There are different sources of farm power namely;

1. Human power.
2. Wind power.
3. Animal power.
4. Electric power.
5. Engine power.
6. **HUMAN POWER:** this is when man does most of the work on the farm using his energy either with the use of tools or not. **ASABA JB**

**Advantages:**

* No skilled labor required.
* Can be used in many areas (topography).
* It is less expensive.

**Disadvantages**

* It is inefficient as his work per day increases.
* It does not copy up with land coverage.
* The health conditions of the worker influence word done.
* It is expensive in long run.

1. **WIND POWER:**

This is used to do some light jobs on the farm e.g. pumping water and this depends on the speed and wheel side on windmill.

**Advantages**

* It is free.
* Can assist to generate electricity.

**Disadvantages**

* It may lead to failure if wind does not blow.
* It is unreliable because of wind direction and availability.

1. **ANIMAL POWER: ELIAH**

This majorly evolves use of animals called oxen that are common in E. Africa. For better work, the animal must be kept healthy, fed well, trained properly and not handled harshly. (Animal drown in implement in front).

**Advantages**

* It does not require skilled labor.
* They can be used in various kinds and areas.
* How lower initial costs of maintenance and investment on their implements.
* Large of land can be cultivated than in man.

**Disadvantages**

* Animals cannot cope with large acreages of land.
* Large area of land is required for grazing.
* The health of the animal may affect the work done by the animal.

1. **ELECTRIC POWER:**

If it’s available, various electric medium and implements can be installed e.g. incubators, brooders, milling machines etc.

1. **ENGINE POWER: ROBINAH**

This is especially from the internal combustion engine and it is obtained from engines of machines like tractors.

**Advantages**

* It is less tiresome (little labor is required).
* Less time is used.
* Much work can be covered.

**Disadvantages**

* It requires skilled labor to operate.
* Initial costs (buying) are high.
* It requires high maintenance costs.
* They create unemployment. **END**

**THE FARM ENGINES:**

An engine is the origin of power production in tractors and other machines after buying fuel. The principle use by the engine is a conversion of the chemical energy of the fuel in to heat energy and finally chemical energy to heat energy by burning the fuel of air fuel mixture in the cylinder of the engine.

**TYPES OF ENGINES:**

1. External combustion engine.
2. Internal combustion engine.
3. Petrol engines (spark ignition).
4. Diesel engines.

**ENGINE PARTS AND THEIR USES:**

1. **Cylinder (block)**

* It is a hollow tube in which piston works.
* The fuel air mixture burns inside the cylinder to produce energy.
* (The higher the number of cylinders an engine has the more power it produces).

1. **Cylinder head:** made of castion to which stand high pressure and temperatures.

* It is where inlet and outlet valves are mounted.
* It covers or seals off the top of the cylinders.

1. **Cylinder gasket:** placed between the cylinder head and cylinder block.

* Has a passage that allows coolants to circulate thus providing adequate cooling to the engine.
* It helps to complete compression in the petrol engine (it provides space or the piston).
* It covers the top of the engine block.
* It makes the engine gaslight and does not allow heat to move from one place to another.

1. **Piston:** it is housed on the cylinder to a number of pistons equal to the number of cylinders and connected to the crack shaft.

**Functions:**

* It transmits power to the crankshaft.
* It is necessary for compression of air.
* It disports excess heat away.
* It prevents leakage of fuel.
* It compresses fuel air mixture.
* It opens and closes the ports in 2 stroke cycle.
* It forms a point of attachment to the connecting rod.

**PARTS OF THE CYLINDER:**

1. **Piston head:** majorly for compression of fuel air mixture.
2. **Gudgeon pin:** to connect the piston head to the connecting rod.
3. **Connecting rod:** for connecting the piston to the crankshaft. Transmit power from the chamber to the crank shaft after fuel ignition.
4. **Piston rings:**
5. **Oil ring:** found at the lower part and large in size with holes.

* It allows oil to pass for lubrication between the piston head and cylinder this space is called piston clearance.

1. **Pressure ring:** found at the upper part, smooth normally two and small in size.

* It seals off the gap between the cylinder wall and the piston.
* It influences (accelerate compression of the fuel air mixture.)

**The structure of piston:**

1. **Crank shaft:**

* It rotates and helps the piston to move up & down.
* It transmits the power from the engine to flywheel.
* It also changes linear motion in to rotary motive.
* It is used in air tight parts of the engine called crank case.