NABBINGO COLLEGIAL SCHOOL

AGRICULTURE NOTES

AGRICLTURAL MECHANISATION

Definition: This is the use of mechanical aids or machines to do farm jobs

Reasons [merits] for mechanizing the farm

I. Eases work
II. Saves time
III. Economical for large scale production
IV. Increases the quality produce due to better uniformity
V. Increases output by bringing more land into use
VI. Makes impossible task possible
VII. Reduces human drudgery
VIII. Improves soil physical properties e.g. structure, porosity etc.
Increases output per person
IX. A more thorough job can be done than by hand
X. It solves the problems of labour shortages
XI. Allows for better combination of enterprises
XII. Releases labour to be use in farm operation that cannot be mechanized
XIII. Help in proper planning of farm

Factors against mechanization [demerits]

I. It's expensive
II. Skilled labour is required
III. Causes unemployment
IV. Some jobs cannot be mechanized
V. It cannot work well in hilly areas
VI. Exhaust smoke pollutes environment
VII. Machines may compact soil if use on wet soil
VIII. Spare parts are expensive and scarce
IX. Not economical for small scale production
X. High maintenance costs.
XI. Clearing large land can lead to soil erosion

LIMITATIONS TO AGRICULTURAL MECHANISATION

- Land fragmentation
- Hand lab our is still considered cheaper than mechanization
- It's expensive to many farmers
- Poor marketing leading to low price resulting from over production
- Operation require skill man power
- Clearing large area of land encourages soil erosion
- Some crops cannot be mechanized
- Topography does not allow use of machines in some areas

 Lack of service centers for machinery
 Lack of spare parts
 Low return from some crops
 Inadequate capital
 Conservativeness of farmers to adopt changes
 Political instability
 Inadequate extension services
 Thick vegetation may hinder mechanization

PRE-REQUISTES TO MECHANISATION

Educate farmers on the benefits of mechanization
 Improve on land tenure system
 Effort to develop simpler and less expensive machines
 Develop simpler and more adaptable machines to do different jobs on the farm
 Mechanization should start with crops economically viable
 Encourage farmers to own farms collectively
 Government should open agricultural engineering workshops in all towns.
 subsidies should be given to farmers to purchase suitable agricultural implements
 Improve on marketing and market of the products
 Train enough local artisans to operate and maintain the machines
 Encourage local fabrications of machines and their spares

SOURCES OF FARM POWER

 Power is the rate of doing work, if machines are to be use to do work it must have a source of power; In the farm there may be need for power for;
 1; tractile work i.e. work done through grip on the ground and develop motion of pulling and pushing

 2; stationary work i.e. work done when the machine is at a fixed place

SIX POSSIBLE SOURCES OF FARM POWER

HUMAN POWER

This is human labour use to accomplice various form of task on the farm

MERITS

 It's cheaper than other sources of power

 Provide employments

 Suitable for small scale production

 Its suitable where there is high topography

 Does not require specific skills

 Its readily available

 Can work without supervision

DEMERITS

 Human efficiency decline with increase in work

 Not suitable for large scale production

 Its affected by health condition of the worker

 It's expensive in the long run because its slow

ANIMAL POWER

Man has trained animals to help supply power on the farm. E.g. of animal trained includes; cattle, Donkeys, buffalos etc.

MERITS

 No skill is required

 Can transport heavy load than man power

 Operate well when land is fragmented

 Operate on large acreage of land than man power

 Initial cost to purchase and maintain is lower than engine

Demerits

 Require land for grazing

 Less powerful than engine

 Health of animal affect the power

 Some customs discourage animal work

 Animal have shorter life span

FACTORS DETERMINING THE AMOUNT OF POWER PRODUCE BY ANIMAL

 Breed of animal

 Training level of animal

 Feeding level of animal

 Age of the animal

 Type of York used. round collar York is better than straight wooden York

CONDITION NECESSARY FOR THE SUCCES OF ANIMAL POWER

 Availability of animals

 Relatively flat land

 Light soil

 Short vegetation

 Absence of parasite / diseases

 Suitable breed of animal

 Availability of pasture

ENGINE POWER

Power is supplied by motorized machines e.g. tractors, mowers, hedge trimmer etc.

MERITS

 It saves time

 Less laborious

 More efficient

 More varied products can produce

 Has longer life span

 Dose not suffer from fatigue

DEMERITS

 Require skill

 High initial cost / maintaining

 They may create unemployment

ELECTRIC POWER

Sources of electricity may be from hydro-electric power or thermal electric power.

MERITS

 Easy to construct

 They are lighter

 Easy and ready to start

 Operate quietly

 Produce uniform and smooth power

DEMERIT

 Initial cost of purchasing and installation of equipment is expensive

 Its operation requires skill labour

 There is risk of electrical shock

WIND POWER

Wind provide power to do light jobs by use of wind mill

Wind power can be used for grinding, winnowing, etc. Its performances depend largely on the size of the wheels and the strength of the wind

MERITS

 Requires little capital investments

 Its easily available

 Its free

DEMERITS

 Its unreliable

 High cost of purchasing wind mill and its accessory

 Man has no control over wind

SOLAR POWER

It’s got from the sun light; it’s a vital element for photosynthesis in green plants.

Heat from the sun is use for drying most crops prior to processing and storage

Solar energy can now be stored by use of photo voltaic cell [module] that produces electricity direct

from the sun

MERITS

 Solar energy abundant esp. .in the tropics

 Its supply is free

 It requires less labour

 Require less skill

DEMERITS

 Equipment for storage is expensive

 Its effectiveness depends on weather

 Man has no control over the sun

FARM ENGINE

An engine is a machine or a device which convert the heat energy of some combust able mechanical materials into usable power

Fuel normally has stored energy which can be utilized

So heat engine converts chemical potential energy in fuel into mechanical energy which causes the wheel for example, to run.

HEAT ENGINE

[1] EXTERNAL COMBUSTION ENGINE

In this type of engine fuel is burnt outside the cylinder. In order to convert the chemical potential energy into mechanical energy e.g. Steam engine where fuel is burnt anywhere as long as it turns water into steam which will be directed into the cylinder

[2**] INTERNAL COMBUSTION ENGINE**

In this type of engine, the conversion of potential chemical energy into mechanical energy takes places in the cylinder and the power is supplied to the piston

MERITS OF INTERNAL COMBUSTION ENGINE

 More efficient because high percentage of fuel is converted into usable energy

 The engine is lighter than external combustion type

 Its smaller than external combustion engine

 It has less time to spent on preliminary, while for external there is need for loading, lighting, etc. before the engine starts

 Operation needs less attention

 It can be made into various sizes

COMPONENTS OF AN INTERNAL COMBUSTION ENGINE

[A] CYLINDER/ ENGINE BLOCK

This is the basic supporting portion of the Engine power units

It is made of cast iron because it’s cheap and easy to manufacture

[B] CYLINDER

Is an air tight chamber with one end close by the cylinder head and the other end by the piston.

It's also called the combustion chamber. Its inside the cylinder where fuel is burnt to convert the chemical potential energy in fuel into mechanical energy. It may be one or more in an engine

[C] CYLINDER HEAD

Is a removable part which seals the top of the cylinder block. On it is found valves system. It's made of high grade cast iron in order to withstand high temperature within the cylinder as a result of combustion

[D] GASKET

It's usually filled between the cylinder head and the cylinder block

Its function is to maintain air tight seal between the cylinder block and the cylinder head.

Its either made of copper or asbestos, because asbestos can withstand high temperature and copper is a good conductor of heat

[E] PISTON

It moves up and down the cylinder i.e. makes a reciprocating motion

It's necessary in order to maintain good compression, thus preventing leakage of fuel. It's also conduct away heat from the inside the cylinder as a result of fuel combustion. It's usually made of aluminum to make it light.

[F] CONNNECTING ROD

- It connect the piston to the crankshaft
- Help in transmission of power during power stroke to the crankshaft
-It has two ends i.e. small end and the big end.
- Its connected to the piston by the gurgdion pin

[G] CRANKSHAFT

-It's a twisted metal rod which provide power from engine to the belt pulley and wheels

- Its twisted ness converts the reciprocating motion of the piston into a rotary motion, thus Providing a means of doing various types of work

-Its fitted extra weight to cause a balance against vibration

-Its enclose in an air tight case called crank case

[H] FLY WHEEL

-Its fitted to one end of the crankshaft to assist in turning

- It maintain the speed of the engine at the interval power is not produce because of inertia Force

-The size of the fly wheel depends on the number of the cylinder. The more the cylinder the Smaller is the fly wheel and vise-verse

[I] CAM SHAFT

Is fitted with cam lobs which help in opening and closer of the valves

[J] CRANK CASE/ OIL SUMP

- - Support and enclose the lower part of the cylinder block

-provide reservoir for lubricating oil

-It severs as a mounting point for accessories e.g. starter mortar, oil pump, ignition coil etc.

[K] IN-LET VALVES

It allows the entry of fuel air mixture in case of petrol engine or clean air in case of diesel Engine during induction stroke

[L] EXHAUST VALVE

Allows the exits of exhaust gases produce during combustion of fuel air mixture in the Cylinder

[M] VALVE SPRING

It's found on the valve and help in closing of the valve

[N] PISTON RINGS

[a]compression ring

Its place in the upper groove at the top of the piston

FUNCTION

- Retain compression

- Reduces friction between the piston and the cylinder wall

- Transmits away heat from the piston

[b] OIL RING

Its place in the lower groove of the piston

FUNCTION

- Have slots [holes] for the return of excess oil during cylinder wall lubrication

- Transmit heat away from the piston

[O] SPARK PLUG

Produce an electrical spark that jump across its terminal to ignite compressed fuel

During the power stroke in the petrol engine

[P] PUSH ROD [ROCKER ARM]

It's along rod driven by the camshaft to open and close the valves

NB [i] Ring clearance is the space left between the piston rings and the cylinder wall

[ii] Piston clearance is the space left between the piston and the cylinder wall to enable the

Piston move up and down. It should not be too big because it will lead to loss of

- Compression
- It will lead to loss of lubrication oil
- Lead to piston slap

EVENTS THAT TAKE PLACE IN AN INTERNAL COMBUSTION ENGINE

There are four events [strokes] namely;

1 INDUCTION STROKE

This is the time fuel air mixture is taken inside the combustion chamber in case of petrol

engine and clean air in case of diesel engine

2 COMPRESSION STROKE

This is when fuel air mixture in case of petrol engine is compressed while in diesel engine

Its only air which is compressed

3 POWER STROKE

Is when fuel air mixture is compressed to maximum and it explode [ignite] by the spark

Plug. While in diesel engine, it's when air is compressed to maximum and a spray of diesel is

Made on it through the injector nozzle and it explode to produce power

4 EXHUAST STROKE

It's the events which help to eliminate burnt gases from the combustion chamber

TWO STROKE CYCLE ENGINE

This is the type of engine that complete one cycle in only two stroke of the piston

It has on valves but instead there are openings or ports located in the cylinder wall which gets covered and uncovered as the piston moves up and down the cylinder.

The events are group into two, namely induction/ compression and power/ exhaust stroke.

OPERATION OF TWO STROKE CYCLE ENGINE

1 INDUCTION STROKE / COMPRESSION STROKE

At the beginning of the cycle the piston is at bottom dead center [BDC] as it moves up wards, it uncovers the inlet port and the fuel air mixture is drawn into the carburetor Into the crank case.

As the piston continues up wards it compresses the fuel air mixture in the combustion Chamber

When the piston reaches top dead center [TDC] a spark will be produce across the Terminal of the spark plug that ignites the compressed fuel air mixture

2 POWER /EXHAUST STROKE

From TDC the piston moves down wards to BDC as it moves down wards it uncover the Exhaust port and burnt gases is eliminated out. As the piston continuous down ward it uncovers The transfer port and fuel air mixture from the crank case is transferred into the cylinder Through the transfer port and it deflected upward by the deflector piston to avoid fresh fuel air Mixture mixing with burnt gases

MERITS OF TWO STROKE ENGINE

- Cheap and easy to maintain
- Economical in fuel consumption
- Good for small scale jobs
- Can be use in a wide range of farm land

DEMERITSOF TWO STROKE ENGINE

- Produce less power therefore weak for heavy work
- Not good in fuel and oil utilization
- Are small in size because they are mainly air cooled
- Slow at work

FOUR STROKE CYCLE ENGINE

They engines which produces power after every four stroke of the piston

NB; There are two types of four stroke, viz

1 SPARK IGNITION TYPE

-It uses petrol as fuel

-fuel is mixed with air in the carburetor and supplied to the cylinder during induction

- Spark plug is use to ignite the compressed fuel air mixture

2 COMPRESSION IGNITION TYPE

-They are diesel engine

-during induction only air is taken into the cylinder

-after full compression a spray of diesel is made on heated air through the injector

NB; It does not use spark

OPERATION OF SPARK IGNITION ENGINE

[A] INDUCTION STROKE

The piston will be at TDC and starts to move down ward to BDC. The inlet valve opens and the

Exhaust valves remains closed and fuel air mixture is drawn into the cylinder

[B] COMPRESSION STROKE

From BDC the piston moves up ward to TDC. Both valves remain closed. The upward

Movement of the piston compresses the fuel air mixture

[C] POWER STROKE

When the fuel air mixture is fully compressed a spark will jump a cross the terminal of the

Spark plug and ignite the fuel air mixture, thus producing power. Power produced will force

The piston to move down wards transmitting power to the connecting rod and to the crank

Shaft, making it to begin rotating. Both valves remained close

[D EXHAUST STROKE

Exhaust valve opens while inlet remains closed. Piston will move up wards from BDC to TDC

Eliminating burnt gases

OPERATION OF COMPRESSION IGNITION ENGINE

[A] INDUCTION STROKE

Inlet valve opens while exhaust valve remains closed. Piston moves down ward from top dead center (TDC) to bottom dead center (BDC) and clean air is drawn into the cylinder from the air cleaner

NB; only air is taken in.

[B] COMPRESSION STROKE

Both valves remain closed. Piston moves from BDC to TDC and compresses air in the

Cylinder to maximum

[C] POWER STROKE

Both valves remain closed after full compression. The injector pump will make a fine

Of diesel on the compressed air through the injector nozzle and it will explode producing

Power which exert pressure on the piston forcing it to move down ward to BDC

[D] EXHAUST STROKE

Exhaust valve opens while inlet remains closed. Piston moves up ward to TDC thus

Expelling burnt gases out

MERITS OFFOUR STROKE ENGINE

- Produce a lot power
- Efficient in fuel/oil utilization
- Exhaust gases sufficiently expelled out
- Has more or heavier crank case to absorb vibration
- Can perform a wide range of farm operation

DEMERITS OF FOUR STROKE ENGINE

- They have high initial cost
- They are expensive to maintain
- Operation need skilled operator
- Their use is limited by hilly areas

SIMILARITIES BETWEEN TWO STROKE AND FOUR STROKE

- Events are still four though combine in two stroke
- Both can use spark ignition except in four stroke diesel engine

DIFFERENCES BETWEEN TWO STROKE AND FOUR STROKE ENGINE

TWO STROKE FOUR STROKE

TWO STROKE	FOUR STROKE
No valves but uses ports	uses valves
Two events combine in one	Each event done independently
- Has no fly wheel	has fly wheel
Has transfer port/deflector piston	does not have
- Has two stroke in one cycle	four stroke in one cycle
- Fuel enter via crank case	fuel does not enter crank case
- Inefficient expulsion of burnt gases	efficient expulsion
Has balance weight	no balance weight
- Uses only petrol	uses both petrol and diesel

FIRING ORDER OF AN ENGINE

This is the order in which power is produce in a multi cylinder engine

The cylinder of multi cylinder engine are arranged to have their power stroke succession

FIRING INTERVAL

IS the distance moved by the crank shaft in degree between two successive power stroke

NB; Each movement of the piston from one end to anther makes 180 degree

For a two stroke cycle engine the firing interval is 180x2 stroke = 360 degree i.e. when the engine has only one cylinder. But if it has more cylinder then the firing interval would be shorter i.e. 360 divided by the number of cylinder

For four stroke cycle engine the firing interval is 180x4stroke =720 degree i.e. if the engine has only one cylinder. But if it has more cylinders it would be 720 divided by the number of cylinder.

NB. The common firing order for a four cylind1er engine are; 1,2,4,3 and 1,3,4,2 while for six cylinder engine is; 1,3,2,6,4,5 – 1,3,5,6,4,2 – 1,4,5,6,3,2 – 1,4,2,6,3,5

ENGINE TERMINOLOGY

1 BORE Is the diameter of the cylinder

2 ENGINE SIZE Is got by multiplying the Bore by stroke

3 STROKE Is the maximum length of travel of the piston from one end to another in one Direction

4 PISTON DISPLACEMENT (PD) Is volume between TDC and BDC

5 CLEARANCE VOLUME (CV) Is part of the cylinder i.e. volume between TDC and cylinder head. Its Also called combustion chamber

6 TOTAL CYLINDER VOLUME (TCV) Is sum of PD and CV

7 COMPRESSION RATIO (CR) Is the ratio of TCV to CV

ENGINE SYSTEMS

There are six different systems that make the engine to perform its work effectively viz

(a) Cooling system

(b) Lubrication system

(c) Fuel system

(d) Air supply system

(e) Electrical system

(f) Transmission system

{A} **COOLING SYSTEM**

It's the system which helps to remove excess heat produce in the engine as it runs

CAUSES OFOVER HEATING IN ENGINE

(i) Lack of water in the radiator

(ii) Non-functioning thermo start

(iii) Loose fan belt

(iv) Faulty water pump

(v) Accumulation of dirt in the radiator grill

(vi) Broken or loose horse pipe

(vii) Low oil level in the sump

(viii) Faulty radiator cup

(ix) Leaking radiator

(x) Accumulation of dirt inside the radiator tubes

EFFECT OF OVER HEATING

(i) Expanding and melting of engine components

(ii) Loss of power since some parts expands

(iii) Valves will burn

(iv) Gas leakage due to expansion of components

(v) Cracking of the cylinder head

(vi) Per-ignition

(vii) Dilution and contamination of lubricating oil.

(viii) Increase engine wear and tear due to rapid deterioration of engine oil

(ix) Enlargement of valve seals and base

DIAGRAM OF WATER COOLING SYSTEM

HOW IT WORKS

- Cool water is sucked from the bottom radiator tank by water pump
- Cool water enters the water jackets in the engine blocks and absorbs heat from the engine
- Heated water rise up and is force through the top horse to the radiator
- Water then moves from the top tank to the bottom tank through radiator tubes
- As heated water moves down through the radiator tubes heat from it will be remove by the circulating air drawn in by the fan

NB. FAN; Draws in air which cool the engine

THERMO START Regulate the temperature of the engine

DRAIN CAP Is use to remove water from the radiator when it's dirty

FILLER CUUP Is use to fill in water

TEMPERATURE GAUGE Indicates the temperature of water in the engine

MAINTAINCES OF THE COOLING SYSEM

- Check and top water level
- Any leakage in the system must be repaired
- Fan belt tension must be kept tight
- Radiator must be filled with clean and soft water
- Drain dirty water from the radiator
- Filler cup should be kept tight
- Replace won out fan belt
- Check and replace broken horse pipe
- Replace the pump if it's not working
- Lubricate water pump weekly
- Flush the system twice a year

WHY IS WATER IMPORTANT AS A COOLANT

- It's cheap and easily available
- It has high specific heat capacity
- It has low freezing point
- It has high boiling point

 It’s a solvent, so it helps to clean the engine

EFFECT OF RUNNING ENGINE WHEN IT’S TOO COOL

 Incomplete combustion leading to excess carbon deposit

 Increase cylinder wear and tear

 Poor circulation of engine oil

{B} LUBRICATION SYSTEM

Its main purpose is separate the two metal surface with a film of oil in order to reduce friction and wear between the two moving surfaces

COMPONENTS OF LUBRICATION SYSTEM

(a) **Oil sump**; It reserves lubricating oil

(b) **Oil filter**; it purifies oil as it leaves the oil sump

(c) Oil ways; are holes drilled in the cylinder head to convey oil at the required pressure

(d) Oil pump; it’s immersed in oil sump. It pumps oil round the engine

LUBRICANTS

Lubricant is something which reduces friction between two surfaces in the machinery

E.g.; (i) oil –Is thin and use in engine, gear box, air cleaner, hydraulic system, differential unit, break system etc.

(ii) Grease; is thick and use in the Steering, chain sprocket, bearing and axle

PROPERTICES OF AGOOD LUBRICANT

(i) Low viscosity i.e. ability to flow

(ii) High flash point i.e. should take long to ignite

(iii) Ability to pour i.e. ability to flow at low temperature

(iv) Good body i.e. should be thick enough

(v) Good film strength i.e. ability to resist pressure

(vi) Detergent i.e. ability to clean

(vii) Oiliness i.e. smooth and slippery

CLASSIFICATION OF LUBRICANTS

Lubricants are classified according to the thickness and allotted number by the society of Automotive engineers (SAE)

NB Thin oil has low SAE number and thick oil has high SAE number.

E.g. SAE 40&30 are thin and use in small engines

SAE 40&90 are thick and use in the transmission system

SAE 120&140 Are very thick oil and use for bearing

ADDITIVES IN OIL

These are substances added to the oil to keep oil viscosity stable as the oil temperature changes

(i) Detergent; it plays a roll of cleaning

(ii) Dispersant; keep oil suspended in the oil way without sticking to the oil way piston etc

(iii) Antioxidant; reduces the effect of oxidants which thicken oil

(iv) Anti corrosive; protect the engine from corrosive action of water and other substances

(v) Anti wear; reduces the rate of wear and tear of the moving surfaces

USES OF OIL

- Reduces friction
- Cools the engine
- Reduces wear and tear
- Removes dirt and small metal particles which usually chip off when the engine is in operation
- Prevent rusting
- Absorb noise from the engine
- Act as shock absorber
- Use as hydraulic fluid
- Act as a seal between the piston and the cylinder wall

CAUSES OF OIL CONTAMINATION

- Un burnt fuel
- Water produced when fuel is burnt and added to oi
- Dust / dirt from air cleaner
- Broken metallic particles
- Rust particles from rusty engine parts
- Carbon deposit
- Excessive heat in the engine
- Dirty oil filters

TYPES OF LUBRICATION

- **SPLASH LUBRICATION SYSTEM**

Oil is carried from the sump to the connecting rod and piston by a scooper attach on the connecting rod. Some oil goes into the reservoir above the bearing then it flows down by gravity

 OIL MIST LUBRICATION

Oil is mixed with fuel e.g. in 2 stroke engine. The oil mist is provided when the mixture of oil is burnt and used to lubricate the moving parts. 20part of petrol is mixed with 1 part of oil

 PRESSURE OR FORCE FEED LUBRICATION

-Oil driven around the engine through drill under pressure generated by an oil pump

-The oil pump is driven by the crank shaft.

Oil is driven from the sump through a strainer to the oil filter element.

- Filtered oil then passes to the main bearing, cam shaft bearing and big end bearing, Valves, gears and other parts of the engine are lubricated as oil runs back to the Sump.

- Relief is fitted into the system to protect the pump from over loading esp. at high Speed by bleeding out some pressure

- The crank case also as a vent (breather) that prevents build-up of pressure in the Sump.

FUNCTION OF THE BREATHER

 Prevent build-up of pressure in the crank case

 Prevent water vapor and exhaust gases from building up in the crank case

 Allows air to drawn into the crank case when the engine is cool

DIAGRAME OF A FORCE FEED LUBRICATION

OIL PRESSURE

Tractors have oil pressure gauge which show whether oil pressure is low or high. Oil pressure should be about 2.8 kgs/cm3

CAUSES OF HIGH OIL PRESSURE

(i) Relief valve stuck in close position

(ii) Blocked oil ways

(iii) Oil too thick

(iv) Blocked oil filters

CAUSES OF LOW OIL PRESSURE

(i) Low oil level in the sump

(ii) Blocked oil ways

(iii) Too thin oil

(iv) Worn out oil pump

(v) Worn out engine bearings

(vi) Weak relief valve stuck in open position

(vii) Blocked oil filter

MAINTAINCES OF LUBRICATION SYSTEM

(i) Use correct type of oil

(ii) Replace oil filters when you change oil

(iii) Replace used oil regularly

(iv) Do not use contaminated oil

(v) Drain oil when the its still hot to avoid sticking to the engine parts

(vi) Check the oil level regularly using a dip stick and top if necessary

(vii) Seal off any leakage in the system

(viii) Clean the crank case according to the manufactures instruction

{C} FUEL SYSTEM

Is the system that helps to supply fuel from the fuel tank up to the combustion chamber.

The diesel fuel system is different from petrol fuel system

FUEL SYSTEM OF DIESEL ENGINE

It's made up of the following components which aid fuel to flow from the tank up to the cylinder

(a) Fuel tank - It stores fuel and its location above allows for fuel to flow under gravity to The sediment bowel.

(b) Sediment bowel - It removes large pieces of dirt from fuel

(c) Fuel lift pump - It add more pressure on the fuel so that it can flow up to the injector

(d) Fuel filter - Makes the final cleaning of fuel as it continuous to the injector

(e) Injector pump - It meter fuel and makes it jump to each atomizer at a correct time.

It also has the bleeder point to bleed out air which could have continued

In the fuel.

(f) Atomizer - Change a jet of fuel into a fine spray and introduce it into the respective

Cylinder having full compression of air

FUEL SYSTEM OF PETROL ENGINE

It's made of the following components

(a) Fuel tank - It stores fuel and fuel flow from it to the sediment bowel under gravity

(b) Sediment bowel - Help to settle larger particles from fuel

(c) Fuel lift pump - Help to maintain constant supply of fuel to the carburetor

(d) Fuel filters - makes the final cleaning of fuel

(e) Carburetor - It three major functions namely

(i) Mixes fuel and air to form fuel air mixture

(ii) Atomizes (break) fuel air mixture into a fine spray

HOW IT WORKS

- Receives fuel through needle valve operated by float
- Float maintain the level of fuel in the carburetor
- Clean air enter the carburetor from the air cleaner control by the throttle
- The choke control amount of air entering the carburetor while the float control fuel

entering into the carburetor

ILLUSTRATION OF DIESEL FUEL SYETEM

ILLUSTRATION OF PETROL FUEL SYSTEM

DIFFERENCES BETWEEN PETROL AND DIESEL ENGINE

DIESEL ENGINE	PETROL ENGINE
- Uses diesel as fuel	- uses petrol as fuel
Fuel ignited by compression	fuel ignited by spark plug
No carburetor	- has a carburetor
- Has no spark plug	uses spark plug
Has injectors	no injector
High compression ratio	low compression ratio
- Produce more smoke	less smoke
- Is more expensive	less expensive
Low fuel consumption	high fuel consumption
- Is stronger	less strong
Only air taken during induction	- fuel air mixture taken in during induction
Has few starting problems	more starting problems
- Produce a lot of noise	produce less noise

MAINTAINCES OF FUEL SYSTEM

- Check air cleaner weekly
- Use correct grade of oil in the air cleaner
- Check and clean wire mesh in the air cleaner by dipping in paraffin or petrol
- Change fuel filters regularly
- Seal off any leakage in the system and pipes tightly secured in place
- Injector pump and carburetor should be service regularly
- Clean the injector if block and replace won out once

WHY IS DIESEL ENGINE COMMONLY USE ON FARMS?

- They are economical in fuel consumption
- It produces bigger power

 Diesel is cheaper than petrol

 It has few starting problems

 Can operate without a battery

 It cheaper to maintain

{D} AIR SUPPLY SYSTEM

This system plays a role to clean and supply air to the engine. Air is clean by air cleaner which is of two types viz; Dry type and Wet type.

FEATURE OF A GOOD AIR CLEANER

 Able to supply clean air into the engine

 Durable

 Easy to clean

diagram of a dry type air cleaner

Mechanism of operation of a dry type air cleaner

 When a vehicle is on motion air current is created

 Dry type air cleaner has a container with an end open for trapping air and the other end closed

 Inside it is dry paper with perforation to clean air

 Air current inside the container is force to swirl

 Air is then filtered through the dry paper

 Dust particle and other materials is forced to fall off

 Clean air then passed to the engine

MAINTAINCES OF DRY AIR CLEANER

 Use compressed pressure to blow out dust and other materials from the paper

 Use correct amount of pressure to avoid damage of the paper

 Don’t wash since its just paper

 Don’t apply pressure when the paper is wet

WET TYPE {OIL BATH} AIR CLEANER

DIAGRAM OF A WET TYPE AIR CLEANER

HOW IT WORKS

 Air is drawn in and passes through a pre-cleaner which remove larger particle of dirt

 Fairly clean air passes through the central pipe into the oil bath

 Some particle gets trapped in the oil

 More clean air leaves via the oily wire mesh where all dirt is removed

 Clean air leaves the cleaner through the out let pipe to the engine

MAINTAINCE OF THE WET TYPE AIR CLEANER

 Check and top the oil level weekly

 Change oil when it becomes dark

 Swirl the wire mesh periodically in paraffin to remove dirt

 Clean the pre-cleaner off larger particles

 Ensure all joints are tight to prevent leakage

 Use recommended type of oil

 Clean the sediment bowel regularly

{E} ELECTRICAL SYSTEM

It gets its power from the battery

FUNCTIONS

I. Provide a spark in the petrol engine to ignite fuel air mixture

II. Provide power for lighting headlamp, indicators etc.

III. Provide power for starting devices on the engine

IV. Provide power for the operation of horn

V. Provide power for the operation of wipers

VI. Provide power for the operation of various gauges on the dash board

WHAT IS A BATTERY

It's a device for storing electricity that is generated by chemical action. It consists of two metal plate one –ve and another +ve which are kept apart by hard rubber separator immersed in an electrolyte usually dilute Sulphuric acid. All are in a casing made of hard plastic.

The +ve plate is made of lead dioxide while –ve plate is of sponge lead

NB. When external circuit is connected to the batter y it generates electricity but when DC is passed through a battery it will be charging the battery.

CARE OF A BATTERY (MAINTAINCES OF ELECTRICAL SYSTEM)

(a) Top up electrolyte level with distil water if low

(b) Replace electrolyte if its specific gravity falls to less than 1.27

(c) Recharge if power is weakening

(d) Oil or grease the terminals to avoid corrosion.

(e) Vent should be kept clean

(f) Ensure the fan belt tension is tight to keep the battery charged.

(g) Empty electrolyte if the battery is not to be use for long and place it upside down on wood

(h) Clean the battery terminals

(i) Top of the battery should be kept clean and dry.

(j) Connect the battery terminals correctly

(k) Replace cracked wires.

(l) Battery should be fixed tightly to prevent damage due to vibration.

FLOW OF CURRENT FROM THE BATTERY UPTO THE SPARK PLUG

HOW IT WORKS

a) Ignition switch is turn and the engine is turn over by the starter mortar

b) Current from the battery flows to the primary circuit and create a magnet in primary winding.

c) The cam opens the contact breaker point causing the primary circuit to break and goes back to the coil

d) The break in the primary circuit induces a high voltage of 7000 -10000 volts in the secondary circuit

e) The current then flows through heavily insulate wire via the rotor to a plug in the cylinder in which compression is taking place

f) The high voltage creates a spark across the terminal of the plug and it ignites the fuel air mixture

g) The engine will then start to run.

NB. DYNAMO (ALTERNATOR) OR GENERATOR

It has a coil in it which is run by the V-BELT to produce a magnetic field, i.e.

Electricity for recharging the battery.

When battery is fully re- charged cut out regulator will reduce power output of the dynamo.

Dynamo produces DC while Alternator produces AC. It can be maintained by ensuring good tension of the drive belt.

IGNITION COIL, step up the voltage of power from the battery.

Failure of the coil ignition system: wrong clearance gap of the plug, burnt plug

gap electrodes, low battery charge, broken wire, dirty battery terminal, dirty spark plug, faulty ignition coil.

STARTER Motor, it turns the fly wheel using the electricity it gets from the battery

{F} TRANSMISSION SYSTEM

Is the system which helps to transfer power from the engine to the rear wheels or driving shaft. It converts the reciprocating motion of the piston into the rotary motion for moving the wheels.

It has the following components: clutch, gear box, differential, wheels/tyres and axle

THE CLUTCH ASSEMBLY

It consists of some friction plates and it's operated by the clutch plates to ease gradual

connection for engagement of the gears

FUNCTION:

I. Connect or disconnect the driving shaft to and from the engine

II. Helps in changing gears

III. Helps the operator to stop the vehicle without stopping the engine

IV. Helps the operator to take off gradually and smoothly

V. Helps to provide power from the engine to the power take of **(PTO)** shaft

GEAR BOX

It has wheels with teeth around their surfaces. Every gear has different number of teeth

FUNCTION

I. Enable the driver to select forward or reverse movement to suit the operation

II. Helps to alter the speed ratio

III. Enable the driver to stop the vehicle without suddenly stopping the engine

IV. Enable power from the engine to be applied to do the work

DIFFERENTIAL

It's composed of a set of pinion gear and crown gears. They are smaller gears on the output end of the gear box and help to make power move from the output gears to the wheel sin a right angle and this convert the mechanical energy into a rotary motion

FUNCTION

I. Changes the direction of the drive to the right angle so that power is transmitted to the rear wheels

II. Adjust the speed of the drive so that the operator can work at a slower speed than the engine speed

III. Enable in the negotiation of the corners by allowing the near side wheel to turn slower than the off side wheel

WHEELS AND TYRES

It enables the vehicle to move and do work. It allows maximum possible grip (traction)

WAYS OF INCREASING GRIP IN TYRES

- By reducing pressure in the tyres
- Using larger tyres
- Ballasting i.e. adding water into the inner tube

 Use of metallic wheels but not on public road

 Increasing the number of rear wheels

 Using four-wheel drive in the vehicle

 Use of new tyres

 Use of chain wheels

PROBLEMS OF TOO MUCH PRESSURE IN THE TYRE

 Reduction in traction

 Discomfort to passages

 Tyres can burst

FACTORS AFFECTING LIFE SPAN OF TYRES

I. Level of inflation i.e. too low or too much

II. Bad opening and fitting esp. with sharp tools

III. Driving on sharp objects

IV. Poor protection from sun light

V. Over loading

VI. Exposure to oil and other petroleum products

VII. Poor and bad breaking

VIII. Use of weak quality tyres

CARE AND MAINTAINCES OF WHEEL AND TYRES

I. Inflate to recommended weight (pressure)

II. Fit wheel cup to prevent entry of dirt

III. Check tyres regularly for any damage

IV. Change tyres periodically

V. Nuts / bolts should be checked and refastened daily

VI. Keep vehicle out of sun to prevent deterioration of rubber tyres

VII. Keep tyres away from petroleum products

AXLE

It connects the rear wheels and help to transmits power from the differential to the rear wheels

POWER TAKE OFF (PTO)

It's connected to the main gear box. It uses its special gear to regulate the engine speed in order to make the tractor run stationary machines E.g.: Threshers, water pump, grinding machine, and

can also be used to operate rotary machines such as mowers, combine harvesters, sprayer, seeders etc.

HYDRUALIC PUMP

It provides oil under pressure to operate the three-point linkage and other hydraulic equipment.

MERITS

I. Help to ease lifting of implements

II. Require little force from the operator

III. It's not bulky

IV. Facilitate easy turning

DEMERITS

I. Require continuous checking of oil using a dip stick

II. If it fails then the steering and the clutch will also fail

III. Require frequent change of oil

MAINTAINANCES OF THE TRANSMISION SYSTEM

I. Oil must be kept at the correct level in the gear box

II. Change at specific interval as require by the manufacture

III. Ensure all parts are lubricated

IV. Check oil level always

V. Clean the filter regularly

TRACTOR

Tractors were introduced to farms to help in the process of mechanization

FACTORS CONSIDERED WHEN PURCHASING A TRACTOR FOR FARM WORK

a) Adaptability to work on the farm

b) Cost of the tractor

c) Horse power of the tractor

d) Size of the farm

e) Availability of spare parts

f) Fuel and oil consumption

g) Efficiency at work

h) Durability of the tractor

i) PTO and belt pulley speed

j) Guarantee given by the seller

k) Ease to mount and to dismount implements

l) Ease to use and maintain

MAINTAINCES / CARE OF THE TRACTOR (COMMON SERVICING POINTS OF A TRACTOR)

- Check the level and quality of oil
- Check fuel level
- Check level of electrolyte in the battery
- Grease the movable parts
- Check fan belt tension
- Check level of water in the radiator
- Check and clean air filters if dirty
- Check the pressure in the tyres
- Check and tighten bolts and nuts
- Open the sediment bowel and clean
- Check the breaking system
- Start the engine to check for normal functioning
- Before starting a tractor ensure that the shut off valves and tap is open

COMMON PROBLEMS IN ENGINE

(1) **ENGINE FAILING TO START**

- Weak battery
- Loose wiring
- Starter mortar won out

(2) **ENGINE SWITCHES ON BUT DOES NOT FIRE**

- No fuel in the tank
- Faulty fuel filter
- Weak battery
- Faulty spark plug
- Carburetor jets blocked
- Defective ignition coil
- Engine over chocked
- Incorrect ignition timing

(3) **ENGINE STOP SUDDENLY**

- Faulty ignition coil
- No fuel supply
- Too much load on the engine
- Defective bearing on the crank shaft

(4) **ENGINE PRODUCE TOO MUCH SMOKE**

- Black smoke means incomplete combustion of fuel
- Wrong type of fuel used
- Excess oil in the sump
- Won out oil rings
- Loose bearings
- Won out valves

(5) EXCESS OIL CONSUMPTION

- Oil level too high
- Wrong grade of oil used
- Too high engine speed or prolong idling
- Loose or won out bearing

(**6) EXCESSIVE FUEL CONSUMPTION**

- Prolong operation in low gears
- Carburetor wrongly set
- Excessive carbon deposit
- Dirty air cleaner
- Over loading

(**7) ENGINE RUN ERATICALLY**

- Spark plug dying
- Fuel getting finish
- Wrong gears applied
- Over chocking

TILLAGE EQUIPMENTS

They are tools used for inverting the soil and burying the weeds

REASONS FOR TILAGE (CULTIVATION)

1) To kill weeds

2) To loosen the soil for easy water infiltration

3) To loosen soil for easy aeration

4) To improve root penetration

5) To soften the soil for easy germination and sprouting of plant materials

6) To ease other subsequent management practices

7) To control [pest by burying and exposing their eggs, laver and adult to predators

8) To bury crop residue

MOULD BOARD PLOUGH

Diagram of an ox mould board plough

Functions of each part

- Beam - use for attachment of all other parts
- Handle - use for steering the plough
- Handle stays - to keep the handle in position
- Mould board - help to invert the furrow slice
- Hake - help to regulate the depth rod
- Frog - provide attachment for mould board, share, and land side
- Share - use for cutting the furrow slice
- Land side - stabilizes the plough
- Draft rod - is where the chain is connected
- Depth rod - use to adjust the depth and width of the plough
- Land wheel - regulate the depth and reduces resistance while ploughing
- Link (hitch) - is use for hitching the chain

Diagram of tractor mould board plough

MERITS OF MOULD BOARD PLOUGH

a) Give good inversion of the furrow slice

b) Require less skill

c) Require less power

d) Operate at uniform depth

e) Produce relatively clean seed bed

f) Can be used for inter row weeding

g) Has better penetration into the soil

DEMERITS OF MOULD BOARD PLOUG

a) Cannot work in stony and stumpy areas

b) Its rigid and can easily break down

c) Cannot manage dry hard sol

d) Because of uniform depth penetration, it can form hard soil pan

e) Its more expensive to maintain

MAINTAINCES OF MOULD BOARD PLOUGH

I. Check the condition of the share (tighten or straighten if necessary)

II. Ensure the share is sharp

III. lubricate all moveable parts

IV. Remove soil / vegetation from the plough after work

V. Grease the mould board and other parts touching the ground if the plough is not on use

VI. Repair and replace won out parts

WHY OX CULTIVATION SUCEEDED IN EASTERN AND NORTHERN UGANDA

I. Large herd of cattle

II. Light soil

III. Short grasses

IV. Relatively flat land

V. Few livestock parasite and diseases

VI. Presents of adversary services

LIMITATION OF OX CULTIVATION

I. Cattle rustling and raiding

II. Oxen can also get tired

III. Animal can also fall sick

IV. Animal are slow at work

V. Its only limited to land preparation, seeding, weeding and transportation

DISC PLOUGH

PARTS AND FUNCTION OF THE DISC PLOUGH

 CROSS SHAFT / TOP LINK - Is use for connecting the plough to the tractor

 MAIN BEAM - Is use the attachment of other parts of the plough

 DISC - Is use for cutting and inverting the furrow slice

 SCRAPER - Is use for removing soil from the disc

 SHANK - Is use for suspending the scraper

 FURROW WHEEL - Is use to control the depth of the plough

MERITS OF THE DISC PLOUGH

a) Can easily slide over obstructions

b) Can be use in hard dry soil

c) Work well in all type of soil

d) Cheap to maintain

e) Its quick in operation

f) The blade can be sharped when worn out

g) It control soil erosion by burying the weeds poorly

DEMERITS OF ADISC PLOUGH

a) Require skill to operate and maintain

b) It cannot bury rubbish well

c) Leave the field in a very rough state

d) Expensive to purchase

e) It is heavier than mould board plough

f) Cannot be used for secondary cultivation

MAINTAINCES OF A DISC PLOUGH

a) Tighten bolts and nuts

b) Sharpen the blade by grinding or rolling

c) Regular greasing

d) If not on use coat the blade with oil

e) Repair broken parts

f) Do not leave the plough outside

MOUNTING APLOUGH ON THE TRACTOR / HITCHING APLOUGH ON ATRACTOR

 Reverse the tractor with lower link raised above the level of the cross shaft towards the plough until the hand lower link is correctly placed for attachment.

 Lower the linkage until the left hand lower link is at the correct height

 Brake the tractor and dismount (get down of the tractor)

 Attach the left hand lower link and secure the link pin

 Using the leveling box fitted to the right hand lower link and necessary the cross shaft and adjustment screw, align the right hand link, fit and screw it with the link pin

 Fit the top link between the head stock and the tractor adjusting as necessary.

 Remove the tractor and rise the implements using the tractor hydraulic system

 Avoid excessive swing of the implements that may force the tractor

PLANTING IMPLEMENT

Planting refers to the placement of planting materials at a particular depth in the soil. The common planting equipment is the row crop planter

Diagram of row crop planter

ROLES OF ROW CROP PLANTER

I. Open up soil for placement of seeds

II. It meter seeds

III. Placing seeds in the furrow

IV. Covering the seeds

V. Firming the soil around the seed

QUALITY OF A GOOD ROW PLANTER

I. Able to plant seeds at uniform depth

II. Able to place seeds at uniform interval

III. Able to plant seeds of different sizes accurately

IV. Able to work at a reasonable speed

V. Able to maintain its accuracy even when seeds are few

MERITS

I. Quick and save time

II. Plant seeds at uniform depth

III. Cover and firm the seed uniformly

IV. Good spacing for easy weeding

V. Seed placement is accurate

VI. No wastage of seed

VII. May also be used to apply fertilizer at the same time

VIII. Less labour is required

FARM STRUCTURES

These are physical constructions that are put on a farm to aid in the production process.

They include: fences, cattle dip, farm building, cattle crush, spray race, milking parlous, water tanks etc.

CONSTRUCTION MATERIALS

TERMS USE IN RELATION TO MATERIALS

HARDNESS - Is the ability of materials to resist cutting, abrasion and indentation

MALLEABILITY - Is the ability of material to remain extended in all direction when

Subjected to compression force

DUCTILITY - Is the ability of a material to be drawn into a thin wire by a tensile stress

TOUGHNESS - Is the ability of a material to withstand shock load with deformation

BRITLENESS - Is the ability of material to break other than bending

NB: When a material transmits a force it resists deformation by internal forces called stress which may be in form of,

a) COMPRESSIVE STRESS - It a force that tend to shorten materials

b) TENSILE STRESS - It a force that tend to stretch material and increase it in

Length

c) SHEARING STRESS - Is a force that tend to make adjacent part slides in relation

To one another

ABILITY OF MATERIAL TO RESIST STRESS IS CALLED STRENGTH AND THEY ARE IN THREE FORMS, VIZ

Compressive strength - is the ability of material to resist forces that tend

Shorten it

Tensile strength - is the ability of materials to resist forces that tend

To increase in its length.

Shearing strength - is ability of the material to resist forces that tend

To make it adjacent part slide in relation to one

Another

METALS AS BUILDING MATERIAL

MERITS

- Its durable
- Its strong
- Does not decay
- May be recycled
- Not eaten by termite
- Resistant to fire
- Resistant to wear and abrasion

DEMERITS

- They are expensive
- Increases risk of lightening accident

 Not easy to work on and mould

 Its heavy

 Not readily available

 May be subjected to rust

WOOD AS A BUILDING MATERIAL

SOURCES

 Natural forest

 Planted forest

 Local wood

 Individual trees on the farm

 Imported wood

 Industrial wood companies

MERITS

 Easy to obtain

 Relatively cheap

 Easy to work with

 With good treatment, its durable

 Have good appearance

 Its lighter compared to steel

 It has good insulating ability

 It's a traditional material

DEMERITS

 It can be eaten by termite

 It can easily rot

 It can easily catch fire

 It has short life span

 It can develop cracks

WOOD TREATMENT

Wood must be treated and protected against termites and rotting before they are used by: creosote, old engine oil, dieldrin, tanex etc.

METHODS USED

(1) PAINTING / VANISING

Paint is thin pigment that provides an opaque colored finish. They are of two kinds

E.g. oil paint and latex paints. While vanishes are transparent gum use for coating wood as a finish

(2) HOT AND COLD SOAKING

- The Burt of the wooden pole is immersed in a preservative in the tank
- The tank is heated for two hours to nearly boiling point
- Moisture in the wood cell will expand and evaporate
- Wood then cool while still in the preservative
- The cell moisture contract and draws in the preservative

(3) SAP DISPLACMENT

- Peel off the back of freshly cut poles
- Place poles in the preservative in the dram
- Keep poles in the preservative for at list 5-6 days
- As the sap in the wood evaporates its replace by the preservative

(4) VACUUM / PRESSURE TREATMENT

- Wood is place in the container of preservative
- Vacuum is induced in the wood by pressure and the preservative is

drawn into the wood.

SEASIONING (DRYING) TREATED POST

There two ways of seasoning timber viz: Air seasoning and solar seasoning

SOLAR SEASONING

Is when fresh and treated timber is dried directly under the sun. But it's not a good system

AIR SEASONING

Is where treated timber is pilled and dried under the shade. Timber is piled in such a way

that it gives space in between for free air circulation. Circulating air removes evaporating moisture from the timber

PRECAUTION TAKEN WHEN DRYING TIMBER BY AIR

1) Provide a roof to protect the timber from sun shine
2) Pile timber on the ground above the ground
3) Separate timber pile using wooden rod to allow passage of air through
4) All support and stickers should be place close to withstand weight to avoid whapping

5) The pile should be parallel to the ground to avoid sliding and bending of timber.

FENCES

Fences are farm structures that form a barrier to livestock and human movement or wild animals

MERITS OF FENCING

- Control breeding of animal
- Control diseases and parasite
- Facilitate pad docking
- Add beauty to the farm
- Add value of the farm
- Reduces labour requirement on the farm
- Help in animal isolation
- Help to ensure efficiency use of land
- Mixed farming can be practice
- Prevent land dispute
- Reduces interference from intruders
- Seal off dangerous part of the farm, hence reducing accident
- Some life fence can be used as forage by livestock
- Life fence is a source of fire wood
- Some provide shade on the farm
- They may act as wind breaker

DEMERITS OF FENCEIN

- Deny animal from feeding freely
- Life fence may harbor pest
- Occupy land that could be used for crop or livestock
- May promote weed growth
- Makes mechanization difficult
- Expensive to construct

TYPES OF FENCES

(A) LIVE FENCES

Is made of planted plant like: kier apple, Cyprus, sisal, tick berry, bougainvillea, euphorbia, cassia,

wait a bit thorn

MERITS

- Act as wind breaker
- Easy to establish
- Beautiful when maintain
-- Require less capital
- Source of fuel

DEMERITS

- Harbors pest and diseases
- Take long to establish
- Transporting planting material is laborious
- Some are dangerous E.g. sisal
- Needs pruning all the time
- Not reliable in continuity
- Some are prisoner to livestock

(B) ELECTRIC FENCE

It's a fence use in strip grazing, where plain live wire is use with low voltage of electricity to restrict animal movement in the pasture land.

MERITS

- Control the movement of livestock and wild animal
- Fence animal handling areas
- Increase crop production by protecting it from animals
- Optimum stocking rate can be achieved

DEMERITS

- Its costly for small scale farmers
- Less effective in dry season

(C) DEAD FENCES

They are fences made of non-living material. E.g. post and wire fence, wooden rail fence, trench fence and stone fence.

- Stone / concrete fence is made of stone or brick joined by mortar to form a fence
- Woven wire fence is use to confine small animals

- Barbed wire fence is use to confine larger animals
- Trench fence is dug trenches dug along other fences to prevent the straying animals. Its Common around the game parks

MERITS

- If properly maintain can last longer
- Easy to construct
- Not affected by season of the year

DEMERITS:

- Need continuous care and mainteince
- It might be dangerous to livestock

COMPONENTS OF BARBED WIRE FENCE

a. BARBED WIRE: they can be of low or high tensile, high tensile is made of thin shiny wire but very strong while low tensile is made of thick wire but can easily break.

b. KING (STRAINER) POST: Is big and strong post always put at the corners or gate

c. STANDARD POST: Are ordinary post use between the corner posts to hold wire

d. DROPPER: are small post fitted between the wires to prevent it from sagging

e. STRUTS: Are support put on the kingpost and standard post

PROCEDURE OF ERRECTING BARBED WIRE FENCE

a. Clear the area

b. Locate the corners

c. Make a straight line using a string from corner to corner

d. Fix standard post 5-6 meter a part

e. Fix wire starting with the lower one

f. Number of the strands depends on the number and docility of the animal

TOOLS USE IN INSTALLATION OF WIRE FENCE

a. Earth auger: is use for boring the hold for the post

b. Pliers (cutter): is use for cutting or bending wire

c. Wire strainer: is use for stretching the wire

d. Rammer: is use to ram soil under the post firmly

e. Staples (U-nail): is use for fixing wire on the post

f. Tap measure: is use for spacing the post

g. Others are: an axe, cross cut saw, crow bar, panga, slashes and wheel barrow

CALCULATION:

Mr. Nseko has a rectangular piece of land measuring 1500m x 600m around which a four strand perimeter barbed wire fence is to be constructed given that the length of the barbed wire roll is 600mand the space between the fence posts is 5m and no gate should be provided.

Calculate,

i. Number of fence post required

ii. Number of rolls of barb wire required

iii. Number of staple required

iv. If the cost of one roll of barb wire is 60,000= calculate the total cost of barbed wire required

Solution

Establish the perimeter of the land

P = 2(L +W)

= 2(1500+600)

= 3000+1200

= 4200M

The spacing between fence posts is 5m therefore

Number of post = perimeter divided by space of 5m +one post covering

= 4200/5 +1 =841 post required

(i) Number of rolls = perimeter x number of strands divided by length of roll

= 4200 x 4 divided by 600m

= 28 rolls

(ii) number of staple = number of post x number of strand

= 841 x 4

= 3364 staples

(iii) cost of the rolls required = number of rolls x cost of a roll

= 28 rolls x 60,000=

= 1,680,000=

ANIMAL HANDLING STRUCTURES

CATTLE CRUSH:

Is a farm structure use to restrain animal so that certain operation can be done on them.

USES OF A CRUSH.

I. Use when caring out hand spraying

II. Use when treating animal

III. Use when caring out artificial insemination

IV. Use when dehorning

V. Use when checking animal temperature

VI. Use when examining sick animal

VII. Use when milking stubborn anima

MERITS.

I. Can be used for a varieties of operation

II. Economical for small scale farmers

III. No long distance movement is required

IV. Sick animal can also be sprayed

V. Cheap to construct

VI. Farmers can control the strength of the accaricide

VII. No risk of spread of diseases

VIII. It can be constructed using local available material

DEMERITS

I. Not durable

II. Very slow

III. Accaricide may not cover animal body fully

IV. Waste accaricide

V. Calves may not be handle

STRUCTURE OF A CATTLE CRUSH:

SPRAY RACE

Is a farm structure specifically designed for tick control. Animal walk through a confine (race) where pipes with nozzles at certain interval and angle are fitted. Animal are showered with a spray of accaricide through the nozzles

STRUCTURE OF A SPRAY RACE

MERITS:

I. Many animals can be handle within a short time

II. Less laborious

III. Better coverage of animal body with accaricide

IV. Less risk of accident

V. Easy to control the concentration of the accaricide solution

VI. Sick and pregnant animals can also be sprayed

VII. No wastage of accaricide

VIII. Small animal can also be sprayed

IX. Easy to change accaricide

LIMITATION

I. Its operation need power

II. Operation need skilled man power

III. Not economical for small scale farmers

IV. In wet weather nozzles tend to be blocked

CATTLE DIP

A dip is a farm structure which use to subject animal to the accaricide solution to control ticks

TYPES OF DIPS

MACHAKOS DIP

Is a shallow dip having about 3 steps only? Animals walk through it and it's only the legs and belly of the animal that shall be in the solution. The back shall be out and somebody must be there to scoop the solution and pour on the back and other part not covered with the solution.

This type is mainly found in Kenya but not commonly in use

PLUNGH DIP

Is of a bigger capacity and deeper than a machakos dip. Its capacity varies from 130000 – 14000 liters of dip wash. Animal walk through it in single file and jump into the dip wash one after another where they are completely submerged into the dip wash and they swim across and walk out

DIAGRAM OF APUNGH DIP

PARTS OF THE DIP:

- Collecting yard: is the space where animal gather before the actual dipping
- Entrance race: is a narrow corridor or crush that lead animals into the dip tank
- Foot bath: is found along the entrance race filled with clean water for cleaning the hooves of animals as they walk along

Dip tank: it contains accaricide solution

- Dip splash wall: It return the accracide that splashes when animal plunges in the solution
- Cat walk side: it about 0.5m wide, it helps the attendance to walk and guide animals that fail to Swim
- Dip roof: it keeps off rain water from the solution
- Exit ramp: it made of concrete gentle steps which animal use for climbing out of the tank
- Exit race: Animal walk out through it as accaricide drip down from their body and return Back to the tank. It has one hole open only during dipping to return the dripping Accaricide into the tank and another which is open only when not dipping to divert Running water away from the dip tank

PRECAUTIONS TAKEN BEFORE DIPPING ANIMALS

 Sick, pregnant, and small animals should not be dipped

 Do not dip animal when they are tired

 Give animal drinking water before dipping

 Move animal slowly into the dip to avoid stress and injury

 Do not dip animal when it's about to rain

 Dip wash should be at a right concentration

 Do not use the dip wash for too long

 Foot bath should be fill with clean water

 During dipping open the hole leading into the dip tank

 Have a rope to rescuer animals that would fail to swim across

 Dip animals in the morning hours to avoid the effect of sun heat

 Dip animal every two weeks

 Dip all cattle on the farm

 Cattle should enter into the dip in a single file

ESSENTIAL OF AN EFFECTIVE DIP

 It should be on a well-drained land

 Present of permanent water supply source

 Cement the collecting and drainage yard

 Foot bath should be filled with clean water

 The flow of entrance race / exit race should be made of concretes and slop backwards to the tank

 The dip should be in the center of the grazing land

 Dip should not be in the depression

 The flow and the wall should be leak proof

 The wall should be smooth to return the splashing accaricide

 There should be soak pit for empting the solution

 The flow of the dip should not be too slippery

 Jump off step should be gentle to enable animal gently slide into the dip tank

 Exit ramp should have gentle steps to enable animal easily come out

 Exit race should be long enough to allow animal dry before going to the pasture

 Dip tank should be big enough to contain required capacity of accaricide solution

 It should have a cat walk side

MAINTAINANCES OF A DIP

 Keep dip wash at correct level

 Fill foot bath with clean water

 Close hole returning the dip wash if not dipping

 Make sure dip tank has no crack

FACTORS THAT MAY REDUCE THE EFFECTIVENSSOF DIPPING

 Failure to follow the dipping routine

 Mixing weak accaricide

 Improper mixing of accaricide

 Leaking roof

 Dipping in the rainy day

MERITS OF DIPPING

 Effective tick control

 Many animals can be handle

 Less laborious

 The solution can be used for a long time

 No wastage of the solution

 No source of power is needed

 Cheap to run communally

DEMERITS OF DIPPING

 Sick and pregnant animal cannot be dipped

 Expensive to construct

 Not economical for small scale farmers

 Can transmit livestock diseases

 Leakage of dip wash may take place

 Empting the dip tank is laborious

 Accident may occur during dipping

EXAMPLES OF ACCARICIDES USE

Gammertox, coopertox, toxaphane, supona, delnav, supamix, bacdip, decatic, pfizertox, supona-extra, Stella done, spoton etc.

FARM BUILDING

It comprises of different kinds of buildings found on the farm such as: home stead, calf pen, rabbit hatch, pigsty, maize crib, milking parlous, stores etc.

IMPORTANCE OF A FARM BUILDING

I. Provide comfort to human and animal by acting as a place of abode

II. Increases production by reducing crop and animal loss

III. Increases efficiency and ease in the management on the farm

IV. Guard against bad weather on stored crop, machines and tools

V. Reduces labour requirement on the farm

VI. Hel to buffer stock the products

VII. Reduces losses on the farm

VIII. Increases the real estate value of the farm

IX. Help to improve the quality of produce through processing

FACTORS CONSIDERED WHEN SITTING FARM BUILDING

I. Accessibility

II. Water supply

III. Elevation i.e. should be on a raise ground

IV. Should be on less productive land

V. Nearness to the source of power

VI. Should be in the Centre of the farm

VII. Should be near the home stead

VIII. Land for expansion

IX. Fuel stores should be isolated

X. It should have a beautiful scenaries

XI. Avoid wind direction

CONSIDERATIONS IN DESIGINING BUILDING FOR FARM ANIMALS

I. Construct a slanting flow to allow fluid to drain away quickly

II. The flow should be made of concrete not too smooth nor too rough

III. It should have a roof and a wall

IV. It should be well ventilated

V. Provide bedding i.e. litters on the flow

VI. The wall should be strong and smooth

VII. Light should be provided

MERITS

I. Protect animals from bad weather

II. Security against theft, wild animals etc.

III. Easy management

IV. Reduce spread of diseases

V. Encourages close supervision

VI. Reduces feed wastage

CONSIDERATION WHEN PUTTING STORAGE BUILDING

I. Should be in an open space to avoid vermin and fire

II. Should be rodent/ termite proof

III. The wall should be free from crack

IV. It should allow for easy ventilation

V. The wall should be water proof

VI. Easy to clean

VII. Should be in a secure place

VIII. Should be on a strong foundation

MERITS OF STORAGE BUILDING

I. Serve as a buffer stock

II. Allows for easy harvesting

III. Reduces labour requirement

IV. Protect produce from bad weather

V. Sorting and grading of produce is facilitated

VI. Enable keeping of crop with moisture content easy in the shade

VII. Provide security for produce against theft

BUIDING MATERIALS

MORTAR

It’s a plastic mixture of water, sand and cement

USES OF MORTAR

 Use for bonding brick

 Use for plastering the wall

 Use for flow finishing

 Use for rough casting the wall

CONCRETE

Is a mixture of sand, cement, aggregate and water

USES OF CONCRETE

 Use for making fence post

 Use for making flow and wall

 Use for making gabions and water channels to prevent soil erosion

 Use for making water and feed troughs

MERITS

 Durable

 Resistance to weather and termite

 Easy to clean

 Fire resistant

 Cheaper than steel

 Superior in strength to wood

DEMERITS

 It's expensive

 Its bulky

 Not traditional i.e. needs skilled labour

 Low in tensile strength

 Not easy to repair

 Not salvageable

Other materials are: plastic, brick, thatching grass, tiles etc.

FUNDATION OF A BUILDING

It's the seat of the house it should be strong enough on the ground

PROCEEDURE OF MAKING A FOUNDATION

 Measure the site

 Dig the site to the required depth

Remove all the organic matter or loose soil

 Mark the foundation with pegs

 Use spirit level to check horizontal level

 Throw broken stone/bricks into the excavated site

 Pour concrete on top into the site

 Ram gently the site

 Lay final layer of concrete footing

 Allow it to set

 Damp proof course (DPC) is put 15cm above the ground level to prevent water soaking the wall

DIAGRAM OF THE FOUNDATION

THE WALL STRUCTURE

This should be constructed in such a way that it supports only the vertical load since they are not able to support side loads. Spirit level is use to check the horizontal level while plum bob is use to check the vertical levels

THE ROOF

The roof covering is commonly supported by Trusses; Tie beam runs from wall to wall, Rafters makes a triangular structure above the tie beam and supported by the strut. After the trusses (kacolia) are made and in the position of purlins are nail horizontal on the rafters and the roofing materials thatch

DIAGRAM OF THE ROOF

WATER SUPPLY

USES OF WATER ON THE FARM

a) For domestic use e.g. cooking, bathing, washing etc.

b) For irrigation

c) For livestock to drink

d) For mixing agro chemicals

e) For mixing building materials

f) For recreation e.g. swimming

g) For cooling heat engines

h) For cleaning animal hooves

i) To generate power (electricity)

j) For processing farm produce

k) For aquaculture e.g. fish farming

CAUSES OF WATER SHORTAGES

I. Inadequate rainfall

II. Deforestation

III. Drainage of water bodies

SOLUTION TO WATER SHORTAGES

I. A forestation to fight desertification

II. Diversification of agriculture

III. Growing of short term maturing crop

IV. Keeping draught resistant livestock

V. Construction of dams

VI. Establishment of food reserves

VII. Insure ring farming activities

VIII. Use sunken seed bed

IX. Pollution control and treatment of polluted water

X. Mulching of gardens to preserve soil moisture

SOURCES OF WATER USE IN THE FARM

Bore hole, rivers, lakes, swamps, dams, springs, wells, streams, rain water, and ponds.

WATER STORAGE

Water is stored in several structures e.g.

 House hold containers e.g. drums, jerry cans, tins, pots, gourds etc.

 Dams like: water troughs, ponds, valley dams

 Storage tanks like: overhead tank, underground tank and house tank

OVER HEAD TANK

Is usually made of galvanized steel to it from rusting and its raised above the ground to ease water flow out of the tank by gravity. It has over flow pipe to allow excess water flow out

PARTS OF THE OVER HEAD TANK

 Tank body; is made of galvanized iron. It holds water

 Support/ stands: holds the tank body up

 Inlet pipe: deliver water from the water source to the tank

 Outlet pipe: supply water to other parts of the farm where water is needed

 Drainage pipe: to allow dirt out of the tank during tank cleaning

 Over flow pipe: to allow excess water flow out

 Safety pipe: to release excessive pressure from the tank

 Air vent: to release air in the water so as to avoid air overflowing out in the outlet pipe which would otherwise cause air bubbles and blockage of the pipe

WATER TREATMENT

(1) HEAT TREATMENT

Water is boiled at very high temperature and allowed to cool and kept in containers

FILTERING USING SAND

Water is filtered through sand and is capable of killing germs and removal of other

Foreign materials

CHEMICAL TREATMENT

Steps:

- Water is sieved at the point of intake. This remove large impurities
- Softening of water is made in the small tank where its mixed with sodium bicarbonate

- Coagulation/ sedimentation: alum is added to facilitate coagulation and sedimentation. Water stays in this tank for 36 hours to kill bilharzias. The tank is then open to remove bad smell/ colure and aeration
- Filtration: water passes into the filtration tank where all remaining solid particle are removed
- Chlorination: filtered water enter into the chlorination tank where small amount of chlorine is added to kill germs
- Storage: treated water is then stored in large tank before distribution for use

DIAGRAMM OF OVER HEAD WATER TANK

CARE / MAINTAINCE OF FARM TOOLS

- Proper handling of the tools during use on the farm
- Each tool should be use for the right purpose its meant for
- Clean the tools after using it
- Grease tools if they are not to be use to avoid rusting
- Keep tools away from children
- Carry out regular servicing of the tools
- Keep all tools in the store.

End