

PASTURE AGRONOMY

Pasture

Is the mixture of grasses and legume species which are used to feed livestock.

OR

Is any plant which is naturally or artificially grown and managed for the purpose of feeding livestock.

Agronomy

Is the one deals with the relationship between soil and plants.

Pasture Agronomy

Is the science and art of taking care of pasture so as to get the maximum yield as long time as possible.

TERMS USED IN PASTURE AGRONOMY

1. FORAGE CROP: Are the crops grown for the purpose of obtaining forage eg. Hay and Silage.
2. GRASS LAND/RANGE LAND: Defined as the land that carry vegetation for domestic and games.
3. STOCKING DENSITY: Is the number of animals kept in the specific area of land.
4. STOCKING RATE: Is the number of animal per unit weight of herbage.
5. CARRYING CAPACITY: Is the number of animal that the land can sustain without causing destruction of plant and soil.
6. HERB: is the soft stemmed dicot plant species used to feed livestock.
7. CLIMAX VEGETATION: Is defined as the highest stage of plant development that is possible within prevailing climate and edaphic conditions.
8. FODDER: Are the homestead grasses, legumes, herbs, shrubs which are used to feed livestock while still at green stage.
9. HAY: Are the dried grasses, legumes plant species served to feed livestock during the period of the year when the pasture is scarce.
10. SILAGE: Fermented grasses or legumes preserved in the SILO pit which are food to livestock normally mixed with molasses so as to increase appetite and palatability to livestock.
11. LEGUMES: Any small dicot plant species with high feeding value (protein) and has high ability of nitrogen fixation.
12. SHRUBS: Are growing trees which are edible/ eaten to livestock with branches which start above the soil level.
13. BROWSE: Are palatable trees, shrubs, herbs with high nutritive value which are preferred by goats and sheeps.
14. BROWSING: Is the action of goats and sheeps to feed on branches of trees, shrubs, herbs when standing upright with its hind limbs.
15. BROWSERS: Are the type of livestock that feed on high branches of trees, shrubs, herbs when standing upright.
16. GRAZING: Is the tendency of cattles to feed on the trees, shrubs, herbs which are in low level.
17. ECOLOGY: Is the study which deals with living organisms in relation with physical environment.

ECOLOGY CAN BE DIVIDED INTO TWO

- A. Ecology based on Environment
 - (i) Terrestrial ecology
 - (ii) Fresh water ecology
 - (iii) Marine water ecology
- B. Ecology based on Individual
 - (i) Autecology: Is the study of single species eg. Plant only
 - (ii) Synecology: Is the study of community

CLASSIFICATION OF PLANTS BASING ON PHYSIOLOGICAL ADAPTATION TO THE LOCAL ENVIRONMENT.

- I. Hydrophytes: Are plants which habitat is found in water.
- II. Mesophytes: Are the plants which habitat is either in water or Terrestrial
- III. Xerophytes: Are the plants which habitat is in dry and semi arid areas.

ENVIRONMENT

Environment of the organisms comprises of the following components

- 1. Climatic factor
 - Temperature
 - Rainfall (Precipitation)
 - Humidity
 - Wind
- 2. Edaphic factors
 - Soil fertility
 - Soil pH
 - Drainage
 - Aeration
 - Organic matter
- 3. Biotic factors
 - Concerned with living organisms
- 4. Anthropogenic factors
 - Factors originating from living organism for example Farming infrastructure.
- 5. Physical factors
 - Altitude
 - Shape of the land
 - Exposures to the sun

DEVELOPMENT OF VEGETATION

-The development of vegetation in an area is called PLANT SUCCESSION which implies the progressive change in vegetation within a community.

-When we talk of ecological succession we include the development of organism that is plant, animals and micro-organism. The succession lead to the CLIMAX COMMUNITY
CLIMAX COMMUNITY: The organism that wake up the final stage of ecological succession.

CLIMAX VEGETATION: This is the higher stage of development possible within the prevailing climate and edaphic conditions.

VEGETATION

-Vegetation may be developed on bare land for the first time. This is termed as PRIMARY SUCCESSION.

PRIMARY SUCCESSION: Is the development of vegetation for the first time on the area/ground.

SECONDARY SUCCESSION: Is the development of vegetation which result from modification or destruction of the original vegetation

During vegetation succession. There are stages of development. This includes

- A. **MIGRATION:** Arrival of pioneers plants to colonize an area.
 - B. **ACESIS:** Establishment of plant in a new area.
 - C. **AGREGATION:** This is multiplication or increase in vegetation after occupying new area.
 - D. **COMPETITION:** This happen as a result of population increase, the competition is for water, nutrients, space and light.
 - E. **REACTION:** Changes within the community and its environment resulting from competition.
 - F. **STABILIZATION:** This is the condition of equilibrium within the community
- All these stages which follows one another up to climax vegetation are known as SERE.

TYPES OF PLANTS LIKELY TO OCCUR IN ANY VEGETATION

1. **GRASSES**
 - Annual grasses
 - Bi annual grasses
 - Perrenial grasses
2. **HERBS**
 - Herbs are plants with no wood (soft stem)
 - Appear as weeds
 - They are many
3. **LEGUMES**
 - They are small plants with pods
 - They have high feeding value since are rich in nutrients than grasses
 - They have high protein and minerals content
 - Act as source of nitrogen for improving fertility
 - They act as cover crops
4. **SHRUBS/BUSH**
 - Many grow up to height of 6m
 - They are called low growing trees
 - They are edible to Browsers
 - Sometimes they can cause problem if they dominate in grazing area.They make the canopy which may inhibit the growth of another grasses
 - Branching may start at very low level from the ground
5. **TREES**
 - These are vegetation that may grow above the height of 6m eg miombo,Leguminous trees that is Leucaena and acacia spp

QUALITIES OF GOOD PASTURE

1. **PRODUCTIVITY:** It should have ability to maintain high yield
2. **PALATABILITY:** It should have good smell and taste.
3. **NUTRITIVE VALUE:** It should contain high nutrients for example Vitamins and minerals.
4. **ADAPTIVE:** It should have capacity/ability to adapt local soil/environments.

5. PROPAGATION: It should be easily propagated.

TYPES OF/CATEGORIES OF PASTURE

- I. NATURAL PASTURE
- II. ARTIFICIAL/CULTIVATED/ESTABLISHED PASTURE
- III. MIXED PASTURE(Grass and legume together)
- IV. PURE STAND PASTURE (Pasture composed of grass only)

NATURAL PASTURES

-Are the pastures growing naturally without being cultivated by human being

NOTE: Most natural pastures are grasses and are not stable, does not move towards the static climax

-Vegetation is constantly changing due to:

- a. Climate
- b. Natural migration

-The rate of changing is increased by Human activities such as:

- I. Grazing animals
- II. Removing trees and shrubs
- III. Burning which leads to secondary succession.

LIMITATIONS/PROBLEMS OF NATURAL PASTURES

- i. Used seasonally due to rain as limiting factor hence they are not available during dry season.
- ii. The grazing materials may not be enough to support livestock in large number, this leads to uncontrolled grazing (Overgrazing)
- iii. They have short growing period.
- iv. They have low proportion of legumes.
- v. They have low nutritive value

CHARACTERISTICS OF NATURAL PASTURES

- I. Not grown by man
- II. Not stable because they do not reach climax vegetation
- III. Vegetation is constant
- IV. Shows great resistance to grazing animals
- V. Shows great resistance to drought
- VI. Heavily infested with weeds
- VII. May be infested with ticks or plant diseases
- VIII. Poor nutrients because most of them are grasses.

METHODS USED TO IMPROVE NATURAL PASTURES

1. CONTROLLING WEEDS
Weed control improve the plant vigor
2. FERTILIZER APPLICATION
Fertilizer application improves plant nutrients in the soil. For example UREA and CAN
3. IRRIGATION
Application of water to the pasture during dry season.
4. PEST/INSECT/DISEASE CONTROL
Application of chemicals to control pest
Fungicides to control FUNGI
Bacteriocides to control BACTERIA

Nematocided to control NEMATODES

Use of resistant varieties of pastures.

5. ADJUSTING THE STOCKING RATE

This is done to avoid Overgrazing.

6. RE-SEEDING AND CONTROLLING BUSH FIRE

7. REHABILITATION OF DESTROYED AREA

FACTORS CONTROLLING DEVELOPMENT OF NATURAL PASTURES

I. CLIMATIC FACTOR

-For example Rainfall and Temperature, rainfall quantity and distribution determine the vegetation form and productivity.

II. EDAPHIC FACTOR

-For example fertility of the soil, High natural soil fertility increases the vegetation response to the soil surface.

III. BIOTIC FACTOR

- a. Human activities like Land clearing and continuous burning of the vegetation
- b. Overgrazing may leave the soil bare.

ARTIFICIAL/CULTIVATED/ESTABLISHED PASTURE

-Are the types of pasture grown by Human as the crops.

OBJECTIVES OF ARTIFICIAL PASTURE

- I. To solve the problem of scarcity of natural pasture during dry season.
- II. To increase productivity of animal in terms of quality and quantity
- III. Cultivated pastures are demarketed by fences so as to control the grazing

CHARACTERISTICS OF CULTIVATED PASTURE

- I. They have high yield
- II. Pasture management are practised like weeding and irrigation
- III. Involves the use of large area for cultivation for the purpose of selling or to be used for sell or to be used during scarce period.

OPERATIONS FOR ESTABLISHING ARTIFICIAL PASTURES

- I. Land clearing
- II. Seed bed preparations
- III. Sowing seeds by methods like
 - Broadcasting
 - Direct sowing
 - Drilling
 - Dibbling
- IV. Weeding
- V. Fertilizer application
 - For example UREA And CAN
- VI. Harvesting of pasture by grazing/cutting and carrying to make silage and hay.

TYPES OF ESTABLISHED PASTURE

1. ANNUAL (TEMPORALY) PASTURE.
 - Are sown and to be used within a single season/year. Then the land is ploughed and another pasture is sown.
2. SHORT ROTATIONAL PASTURE
 - It includes the perennial pasture of grasses and legumes, They are used to make Hay and Silage also their life span should not be less than 3 years.

3. LONG ROTATIONAL PASTURE

-Is the pasture produced to be used for six to ten seasonal years.

4. PERMANENT PASTURE

-Is the perennial pasture which are planted and used by grazing the animals for many years in succession. the pasture can be re sown after 10 years.

POINTS TO CONSIDER IN PASTURE ESTABLISHMENTS

1. SEED VIABILITY

Sow the seed with alive/viable embryo.

2. SEED FREE FROM CONTAMINATION

Avoid contaminated seeds from the pasture.

3. RATE OF SEED GERMINATION

Rapid seed germination ensures survival before seed drying.

4. SEED SIZE

Seedling from large seeds emerge faster than the small size

5. TIME

The best time to established seeds is during the rain season.

6. PLANT SPECIES

Select the plant which will adapts to the climatic conditions of an area.

7. PURPOSE OF ESTABLISHMENT

The type and life cycle of the species must be suitable/suited to the use to which the pasture was put.

8. NUTRITIVE QUALITY

This is greatly provided by presence of Legumes.

POINTS TO CONSIDER WHEN SELECTING PASTURE SPECIES FOR ESTABLISHMENT

1. PURPOSE: Either for grazing or conserving as Hay or Silage

2. ADAPTATION: Does the specie adapt to each local conditions.

3. COMPETIBILITY: Select pasture specie which will be able to grow well in a mixed stand.

4. NUTRITIVE VALUE: Select specie with high nutritive value to provide requirements for optimum animal production.

5. PALATABILITY: How acceptance is the forage plant to feeding animals.

6. AVAILABILITY OF PLANTING MATERIALS: Planting materials should be easily available with minimum cost.

7. PRODUCTIVITY: The ability to produce abundant forage and of good quality for livestock.

MIXED PASTURE/GRASS LEGUME MIXTURE

➤ It is composed of the mixture between a specie of pasture together with legumes.

ADVANTAGES OF GRASS-LEGUME MIXTURE

I. Grass-legume mixture have high nutritive value.

II. It gives high yield of herbage even in poor soil.

III. Legumes tends to maintain nitrogen in the soil.

IV. Maximum utilization of nutrients from the soil.

V. Reduces the use of nitrogenous fertilizer due to nitro-fixing bacteria in the legumes.

VI. Avoids total loses from pests and diseases.

VII. Increases greater chance of animal preference to pasture.

DIS ADVANTAGES OF GRASS-LEGUME MIXTURE

- I. Plant competition may occur/ take place.
- II. Difficult in collecting seeds due to/by using machines. This may result in collection of unwanted seeds

WHY LEGUMES FACE DIFFICULTY IN GRASS LEGUME MIXTURE?

- I. Tendency of the grasses to suppress the legumes.
- II. Inability of some legumes to regrow when grazed by animals and damage them.
- III. Animals preference to legumes than grasses.

FACTORS AFFECTING THE NUTRITIVE VALUE OF PASTURE

Nutritive value of pasture includes, Protein, Minerals, Vitamins and Carbohydrates.

The factors are;

1. Chemical composition.
2. Stage of growth of plant.
3. Soil fertility.
4. Plant species.
5. Plant parts.

CHEMICAL COMPOSITION

➤ Nutritive value is governed by dietary components presents to make pasture either of high or low value. The chemical composition influencing nutritive value are:

- I. Lignin
 - II. Cellulose
 - III. Hemicellulose
- } Indigestible by animals

STAGE OF GROWTH OF PLANTS

➤ With increasing in age the proportion of digestible components such as soluble carbohydrates and protein decline WHILE proportion of lignin, cellulose and hemicellulose increases.

SOIL FERTILITY

➤ Fertile soil produces forage with high nutritive because nutrients needed by plants for photosynthesis are available.

PLANT SPECIES

➤ Plant species vary widely in their nutritive. Tropical grass vary from temperate in (DM) digestibility.

NOTE: Grasses differ from legumes in dietary components and digestibility.

PLANT PARTS

➤ The plant parts differ in their nutritive value. Leaves are highly digestible than stems due to less components of Indegistible tissue like lignin hence forage with high leaf to stem to ratio are very in nutritious.

ADVANTAGE OF PASTURES

1. Increase foreign currency when exported
2. Are used for thatching materials.
3. Are used as feed to livestock.
4. They are used as mulching materials.
5. Pastures are used as a cover crops hence controls soil erosion.
6. Increase soil fertility/improve due to the nitrogen fixation done by legume pastures.

7. Provide habitat for micro-organisms

8. Some pastures are used as medicine.

CLASSIFICATION OF PASTURES FOUND IN EAST AFRICA

-Pasture found East Africa are grouped in to two groups which are;

1. GRASSES

2. LEGUMES

GRASSES PATURE

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|-------------------------------|--|
| 1. COUCH GRASS | <i>Digitaria scalarum</i> |
| Life span | Perrenial |
| Growth habit | Trailing |
| Importance | Used as pasture/animal fodder |
| Propagation | Vegetative means |
| 2. STAR GRASS | <i>Cynodon dactylon</i> |
| Life span | Annual |
| Growth habit | Erect |
| Importance | Used as pasture/animal fodder and cover crop |
| Propagation | Split cutting |
| 3. KIKUYU GRASS | <i>Pennisetum clandestinum</i> |
| Life span | Bienial |
| Growth habit | Trailing |
| Importance | Used as pasture/animal fodder |
| Propagation | Cuttings |
| 4. THATCH GRASS/JARAGUA GRASS | <i>Hyparrhenia ruffa</i> |
| Life span | Perrenial |
| Growth habit | Erect |
| Importance | Used as pasture/animal fodder |
| Propagation | Seeds |
| 5. ELEPHANT GRASS | <i>Pennisetum purperium</i> |
| Life span | Perrenial |
| Growth habit | Erect |
| Importance | Used as pasture/animal fodder |
| Propagation | Stem cuttings |
| 6. SWORD GRASS | <i>Imperata cylindrica</i> |
| Life span | Bienial/Annual |
| Growth habit | Erect |
| Importance | Used as pasture/animal fodder |
| Propagation | Cutting |
| 7. SIGNAL GRASS | <i>Brachiaria bricantha</i> |
| Life span | Annual |
| Growth habit | Trailing |
| Importance | Used as pasture/animal fodder |
| Propagation | Split cutting |
| 8. GUATEMALA GRASS | <i>Tripascum laxum</i> |
| Life span | Perrenial |
| Growth habit | Erect |
| Importance | Used as pasture/animal fodder |

	Propagation	Seeds/Vegetative means
9. NUT GRASS		<i>Cyperus spp</i>
Life span		Perennial
Growth habit		Erect
Importance		Used as pasture/animal fodder
Propagation		Seeds
10. RHODES GRASS		<i>Chloris gayana</i>
Life span		Perennial
Growth habit		Erect
Importance		Used as pasture/animal fodder
Propagation		Seeds
11. GUINEA GRASS		<i>Panicum maximum</i>
Life span		Perennial/Biennial
Growth habit		Erect
Importance		Used as pasture/animal fodder
Propagation		Split cutting
12. MOLLASSES GRASS		<i>Melinis minutifolia</i>
Life span		Perennial
Growth habit		Erect
Importance		Used as pasture/animal fodder
Propagation		Cuttings
13. LOVE GRASS/SETARIA GRASS		<i>Setaria verticilata</i>
Life span		Annual
Growth habit		Trailing
Importance		Used as pasture/animal fodder
Propagation		Seed.
14. BUFFEL GRASS/AFRICAN FOXTAIL		<i>Cenchrus ciliaris</i>
Life span		Annual
Growth habit		Erect
Importance		Used as pasture/animal fodder
Propagation		Split cutting
15. MANYATA GRASS		<i>Eleusine jaeran</i>
Life span		Annual
Growth habit		Trailing
Importance		Used as pasture/animal fodder
16. SPEAR HEAD GRASS		<i>Heteropogon contortus</i>
Life span		Annual
Growth habit		Erect
Importance		Used as pasture/animal fodder
17. CROW FOOT GRASS		<i>Dactyloctenium aegyptium</i>
Life span		Annual
Growth habit		Erect
Importance		Used as pasture/animal fodder
18. GAIANT STAR GRASS		<i>Cynodon plectostanchyus</i>
19. SUDAN GRASS		<i>Sorghum sudanae</i>
20. CARPET GRASS		<i>Axonopus compressus</i>

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| 21. RED OAT GRASS | <i>Themeda triandra</i> |
| 22. GAMBA GRASS | <i>Andropogon gayanus</i> |
| 23. RED TOP GRASS | <i>Rhynchelytrum repens</i> |
| 24. SURINUM GRASS | <i>Brachiaria decumbens</i> |
| 25. PARA GRASS | <i>Brachiaria mutica</i> |
| 26. DONKEY GRASS | <i>Panicum trichocladum</i> |
| 27. MASAI LOVE GRASS | <i>Eragrostis superba</i> |

LEGUMES PASTURE

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|-----------------------------|---|
| 1. LEUCAENA/WHITE LEAD TREE | <i>Leucaena leucocephala</i> |
| Life span | Perennial |
| Growth habit | Erect |
| Importance | Used as pasture/animal fodder |
| Propagation | Seeds |
| 2. LUCERNA/ALFA ALFA | <i>Medicago sativa</i> |
| Life span | annual |
| Growth habit | Erect |
| Importance | Used as pasture/animal fodder |
| Propagation | Seed |
| 3. WHITE CLOVER | <i>Trifolium repens</i> |
| Life span | Annual |
| Growth habit | Erect |
| Importance | Used as pasture/animal fodder |
| Propagation | Seeds |
| 4. SILVER LEAF DESMODIUM | <i>Desmodium uncinatum</i> |
| Life span | Annual |
| Growth habit | Erect |
| Importance | Used as pasture/animal fodder |
| Propagation | Seed |
| 5. | |
| 6. | |
| 7. PEGEON PEA | <i>Cajanus cajan</i> |
| Life span | Annual |
| Growth habit | Erect |
| Importance | Used as pasture/animal fodder and vegetable |
| Propagation | Seed. |
| 8. RATTLE POD | <i>Clitoria polypema</i> |
| Life span | Annual |
| Growth habit | Erect |
| Importance | Used as pasture/animal fodder |
| Propagation | vegetables/pasture |
| 9. CENTRO | <i>Centrocema pubescence</i> |
| Life span | Annual |
| Growth habit | Trailing |
| Importance | Used as pasture/animal fodder |
| Propagation | Seed |

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|---------------------|---|
| 10. STYLO | <i>Stylosanthes gracilis or Humilis spp</i> |
| Life span | Annual |
| Growth habit | Trailing |
| Importance | Used as pasture/animal fodder |
| Propagation | Seeds |
| 11. GLYRICIDIA | <i>Glyricidia sepium</i> |
| Life span | Perennial |
| Growth habit | Erect |
| Importance | Used as pasture/animal fodder |
| Propagation | Seed |
| 12. CHINESE LANTERN | <i>Nicandra physalodes</i> |
| Life span | Perennial |
| Growth habit | Erect |
| Importance | Used as pasture/animal fodder |
| Propagation | Seed |
| 13. CALOPO | <i>Calopogonium mucunoides</i> |
| Life span | Annual |
| Growth habit | Erect |
| Importance | Used as pasture/animal fodder |
| Propagation | Seed |
| 14. SIRATRO | <i>Maroptilium actopeperium</i> |
| Life span | Annual |
| Growth habit | Erect |
| Importance | Used as pasture/animal fodder |
| Propagation | Seed |
| 15. CREEPING INDIGO | <i>Indigofera spinata</i> |
| Life span | Annual |
| Growth habit | Trailing |
| Importance | Used as pasture/animal fodder |
| Propagation | Seed |
| 16. CLITORIA | <i>Clitoria tematea</i> |
| Life span | Annual |
| Growth habit | Trailing |
| Importance | Used as pasture/animal fodder |
| Propagation | Seed |
| 17. PUERO | <i>Puerania phaseolides</i> |
| Life span | Annual |
| Growth habit | Trailing |
| Importance | Used as pasture/animal fodder |
| Propagation | Seed |

PRINCIPLES OF PASTURE UTILIZATION (SYSTEM OF GRAZING)

- I. ZERO/INDOOR/SOILING GRAZING
- II. ROTATIONAL GRAZING
- III. CONTINUOUS GRAZING
- IV. TETHERING

V. STRIP GRAZING

VI. DEFERRED GRAZING

1. ZERO/INDOOR/SOILING GRAZING

- Is the system of grazing where by animals are kept indoor or stall feeding are used.
- It is practiced in areas with high population densities such as: RUNGWE in MBEYA, BUKOBA, KILIMANJARO and UKARA ISLAND in LAKE VICTORIA

ADVANTAGES

- I. Low labour cost
- II. Has good pasture utilization
- III. Minimum disease spread
- IV. Animals can be supplied with extra nutrients like concentrates
- V. Easy to collect manure and other farm product

DISADVANTAGES

- I. It is tedious job because it needs regular cutting and carry of grasses pasture every day.
- II. It is only applicable to few number of animals.

2. TETHERING SYSTEM OF GRAZING

- Is the system of grazing in which animal are tied with a rope
- In this system animals feeding depends on the length of the ropes.

ADVANTAGES

- I. It requires few labourer
- II. No animal damage to the neighbouring crops
- III. Good method of pasture utilization

DISADVANTAGES

- I. Not suitable for many animals
- II. Animals can easily be caught by thieves/predators.
- III. Animals are exposed to adverse environments condition like rainfall and sunlight.

3. ROTATIONAL GRAZING

- Is the of grazing in which the animals are allowed to graze in alternation in the given area of land per paddocks.
- It allows pastures to re grow and accumulate.

ADVANTAGES

- I. Easily to control mating of animals
- II. Good method of pest control like pest called ticks
- III. Cropping of pasture is more efficiency
- IV. Controls soil erosion

DISADVANTAGES

- I. May lead to overgrazing
- II. Higher cost of making fences
- III. It needs large area of land in which land is the factor of production is scarce

4. CONTINUOUS GRAZING

- Is the system of grazing in which animals are allowed to graze continuous in the same piece of land.
- Common where communal grazing is practiced

ADVANTAGES

- I. It is a suitable system for a herd/large group of animals
- II. Good pasture consumption of the animal are allowed to graze and select palatable plant species
- III. Highly occurrence of running mate.

DISADVANTAGE

- I. High spread of disease
- II. Easily for animal/Livestock to get parasites like Ticks
- III. Difficult to control mating and breeding

5. DEFERRED GRAZING

➤ Is the system of setting aside a certain area of the pasture to be used at the later stage as the **STANDING HAY**.

ADVANTAGE

- I. There is a pasture re seeding
- II. Good method of pasture utilization.

DISADVANTAGE

- I. Suitable only for grasses species of pasture
- II. Palatability of pasture is reduced.

6. STRIP GRAZING

➤ Is the system of grazing animals in which animals are allowed to graze in alternation within the given area of land per paddocks and controlled by electrical current fence of low voltage.

CONSERVATION OF FORAGE CROPS

➤ During wet season normally pasture grows well as the result there is plenty of herbage in the pasture. If excess herbage is not conserved it will be lost.

➤ **Conservation is done mainly by the process of making:**

1. HAY
2. SILAGE

HAY

➤ Is the herbage such as grasses which is cut and then dried and stored for feeding animal during/when there is shortage of animals feeds (dry season).

HOW TO MAKE HAY

- I. Allow the pasture to grow in the field until flowering stage because during flowering stage pasture is quite nutritious
- II. Cut the pasture by using the reciprocating mowers or sickle
- III. Allow the pasture to dry for few days BUT do not allow the pasture to dry too much (should be pr wilt).The good quality pasture remains green when dried.
- IV. Collects carefully herbage without causing much breakage to the herbage.
- V. Then you need to make the bales
- VI. Bales are stored in the shed/roof

WAYS IN WHICH NUTRIENTS ARE LOST IN HAY

- I. Respiration soon after cutting and before drying
- II. Bleaching of the green colour which contains Vitamins A and the proteins nutrients.
- III. Loose of leaves due to the breakage during Baling.
- IV. Oxidation which occurs during the storage.

SILAGE

- Is the livestock fodder which is stored in the SILO while it is still in the green moist state.

HOW TO MAKE SILAGE

- Material used in making are;
 - I. Mainly young plant materials like Cereals (Maize, Sorghum, Wheat) and Grasses (Guatemala, Elephant, Sudan love and Kikuyu grass)

PROCEDURES

- I. Allow the plants for silage making to grow in the field.
- II. Cut the plant when they are at Flowering stage and legumes started setting pods.
- III. Chop the materials into small pieces in order to increase the surface area for the microbial reaction/activities.
- IV. Place the chopped materials into the ground pit (SILO) by rapid filling.
- V. Add molasses or Urea in each layer.
- VI. Compress the material by tramping or running tractor over the material.
NOTE: We compress the materials so as to Exclude Air so as to create Anaerobic condition in the SILO.
- VII. Cover the SILO with the soil.

NOTE: Anaerobic bacteria found in a SILO are called CHESTRIDIA who produces organic acid which are: Lactic acid, Propanoic acid and Acetic acid.

-If the Air is allowed to enter the SILO the silage becomes BITTER or DEMAGED.

NOTE: We add molasses and Urea in plant materials so as to:

- I. Promote the activities of the micro organisms to breakdown organic materials.
- li. Promote the activities of good quality silage contains aromatic smell (Aroma)

QUALITY OF SILAGE DEPENDS

1. COMPRESSION
So much oxygen should be excluded
2. WATER CONTENT OF THE PASTURE
Much water should be avoided
3. AGE OF THE CROP PASTURE
Young plant have low level of carbohydrate

NOTE: Sorghum should not be used to make silage during Flowering stage or during drought BECAUSE at this time it contains high level of PRUSSIC ACID which is poisonous.

METHODS OF PASTURE IMPROVEMENT OR MANAGEMENT

1. WEED CONTROL
Control of weed is important in the pasture since weeds compete with pasture for resources like water, minerals, salts and sunlight.
2. APPLICATION OF FERTILIZERS
Application of fertilizers like Nitrogen is important, Grasses loves nitrogenous fertilizers because it stimulate leaves and shoots growth and often boosts crude protein.
3. IRRIGATION
Application of water to the grassland is necessary especially during the dry periodis/or when there is insufficient amount of moisture in the soil.

4. FIRE CONTROL/BURNING

Grassland should be burnt so as to allow re growth,BUT this is done to grassland containing different species of pasture grasses

5. RE SEEDING

Pasture species when they become weak plants should be re established

6. DISEASE AND PARASITE CONTROL

Parasite like TICKS and TSETSE FLY should be controlled so that animals can utilize pasture very well in the field pasture.

7. FENCING/PADDOCKING

Movement of animals in the grassland should be controlled. Animals should be grazed in paddocks so that pastures can not be destructed/destroyed.

8. CONTROL OF UNDESIRABLE PLANT SPECIES IN THE PASTURE

Control of Undesirable species of plants should be done so that animals can not feed on them.

9. ADJUSTING STOCKING RATE

10. PLANTING GRASS LEGUME MIXTURE

11. PLANTING SHADING PLANTS

UNDESIRABLE PLANT SPECIES OF/IN THE PASTURE.

1. MEXICAN POPPY *Argemone mexicana*

Causes: Poisoning of nerves, Oedema

2. THORN APPLE *Datura stramonium*

Causes: Diarrhea,Paralysis,Oedema and poisoning of nerves.

3. BUFFALO BEAN *Mucuna pruriens.*

Causes: Irritation.

4. STINGING NETTLE *Urtica masaica*

Causes: Irritation

5. PUNCTURE VINE *Tribulus terrestris*

Causes: Indigestibility and sometimes Death.

6. CASTOR OIL (SEEDS) *Ricinus comunis*

Causes:Death

7. LANTANA(SEEDS *Lanatana camara*

Causes: Death

8. DOUBLE THORN *Oxygonium sinuatum*

Causes: Death.

9. EUPHOBIA *Euphobia spp.*

Causes: Irritation and Cynogenic glucocides

10. LEUCAENA *Leucaena leucecephala*

Contain Mimosin which causes Overutilization

11. CASSAVA *Manihot esculenta*

Causes: Cynogenic glucocides and they contain phenolic acids

12. SOLANACEAE FAMILY (solanin chemical)

Commonly found in crops like Tomato,Black night shade,Sodom apple.

Causes: Paralysis,Temperature fall,Increases pulse rate and

Nervousness.

13. WILD PG WEED *Amaranthus spp*

14. SAW THISTLE *Sonchus spp*

15. CREEPING INDIGO *Indigofea spicata*

16. GROUNDNUT MEALS *Arachis hypogea*

Causes: reduce growth, Anorexia nervosa, This is due to the content of Aflatoxicosis causes by fungus ASPERGILLUS FLAVUS

17. LOVE GRASS

SEED DORMANCY

- Is the physiological process in which the embryo becomes inactive due to inactive enzymes systems.
- Dormancy associate with the coat which inhibit seed expansion.

WAYS OF BREAKING SEED DORMANCY

1. STORAGE

Proper storage of seeds helps to overcome the permanent seed dormancy.

2. DRY HEAT TREATMENT

This helps to improve seed germination, the process is mainly done in the laboratory.

3. TREATMENT WITH CONCENTRATED SULPHURIC ACID

Concentrated sulphuric acid acts on the outer coat of the seeds so as to breakdown the seed coat.

4. TREATMENT WITH HOT WATER

Soak the seed for two minutes at a temperature of about 75°C and then dry, then after drying sow the seed immediately.

5. MECHANICAL SCARIFICATION

They are designed to create small cracks so as to reduce dormancy. This is done by the process known as NICKLATION.

NICKLATION: Refers to the removal or cutting the parts of seeds coat for easier emergence. It is mainly done in COCONUT seeds.

CALCULATIONS ON PASTURE UTILIZATION

WORKED EXAMPLES

1. RUVU RANCH posses 40000 hectares of land on which 14,000 of cattle are kept of the entire ranch. 10,000 hectares are not utilized for grazing

Use the following information to answer the question that follows:

- ✓ 1m² of the land produces 500kg. Dry matter per year (DM/Year)
- ✓ 1 livestock unit is equivalent to 350kg live weight.
- ✓ 1 livestock unit consumes pasture equivalent to 30% of its body weight.
- ✓ Pasture utilization in the ranch is 50% and the rest is left for regrowth and reseeded

CALCULATE

- I. The stocking rate during the year
- II. The stocking density during the year
- III. Is the ranch operating overcapacity or under capacity? And explain why?

SOLUTIONS

$$\begin{aligned} \text{I. Stocking rate} &= \frac{\text{Number of animal (cattles)}}{\text{Area of the land utilized}} \\ &= \frac{14,000 \text{ herds}}{30,000 \text{ hectares}} \\ &= 0.47 \text{ herds /hectares} \end{aligned}$$

Therefore the stocking rate is 0.47 herds/hectare.

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ii. Stocking density

$$\text{Stocking density} = \frac{\text{Allowable forage}}{\text{Usable forage}}$$

BUT,

Allowable forage = No,of animals × Weight of animals × No,of days in years × Weight of pasture consumed

Allowable forage = 14000herds × 350kg × 365days × 0.3

Allowable forage = 536,550,000herds/kg DM days

Therefore: The allowable forage is 536,550,000 herds kg DM days.

BUT,

Usable forage = No, of animals × % of the pasture utilized × Total land utilized × Dry matter/year

INTRODUCTION TO WEED SCIENCE

Weed

- Is any plant which grows to a place where it is not required and whose disadvantages outweigh the advantages.
- A plant is termed as weed when it interfere peoples soil and water resources.
- Useful plant growing under undesirable area are called **Volunteer plants**

ECONOMIC IMPORTANCE OF WEEDS

1. Some weeds are edible to both man and livestock, for example Pig weed (*Amaranthus spp*) and Black night shade (*Solanum nigrum*)
2. Some weeds have medicinal effects. Weeds have been known to provide herbal medicine to both human being and livestock. for example Sodom apple (*Solanum incanum*)
3. Weeds act as soil cover, preventing the soil from erosion due to the impacts of rain drops and winds.
4. Weeds add organic matter to the soil when they decompose.
5. Leguminous weeds fix nitrogen in the soil
6. Some weeds decorate our environments
7. Some weeds act as the habitats for organisms
8. Weeds provide employments usually during their control

HARMFUL EFFECTS OF WEEDS

1. Weeds compete with crops for nutrients, space, light and soil moisture and therefore reduce crop yields.
2. Some weeds such as Witch weeds (*Striga spp*) are parasitic to cultivated crops such as maize.
3. Some weeds lower quality of agricultural produce. when weed seed get mixed up with produce the quality is reduced.
4. Some weeds are poisonous to man and livestock, such weeds include Thorn apple (*Datura stramonium*), Sodom apple (*Solanum incanum*).
5. Some weeds act as alternative hosts for pest and other diseases. for example Wild oats (*Avena fatua*) is an alternative host for RUSTS.
6. Some weeds are allelopathic, that is they produce poisonous substances that may suppress the growth or germination of cultivated plants with which they come into contact.
7. Some weeds block irrigation channels making it difficult for water to flow in the irrigated land.
8. Aquatic weeds like **Salvinia** (*Salvinia molesta*) in lake Naivasha and **water hyacinth** (*Eichhornia crassipens*) in lake Victoria affect fishing because they block navigation and they deprive fish and other water animals of Oxygen dissolved in water.
9. Weed lower quality of pastures. when pastures are invaded by weeds such as Tick berry (*Lantana camara*) and other bushy weeds.
10. Some weeds are difficult to handle and control because they irritate the workers thus reducing the efficiency in which they are controlled. These includes weeds such as Double thorn (*Oxygonum sinuatum*), Stinging nettle (*Urtica massaica*) and Devils horse whip (*Achyranthes aspera*).

CHARACTERISTICS OF WEEDS

1. Have a tendency to grow in the undesirable locations.
2. Have competitive and aggressive habits.
3. Have wild growth habits
4. They are persistence and resistant to control and eradicate
5. They have high reproductive capacity
6. They are large in populations
7. They are mostly useless and undesirable
8. They might be harmful to human, animals and crops

COMPETITIVE ABILITY OF WEEDS

1. Ability to produce large quantities of seeds. for example Pig weed and Black jack.
2. Weeds seeds remain viable in the soil for a long time waiting for conducive germination conditions.
3. Most weed seeds are easily and successful dispersed. for example Fleabane
4. Some weed have ability to propagate vegetatively. for example Couch grass and Wondering jew.
5. Most weeds have extensive root system useful in supporting the plant and absorption of water and nutrients.
6. Weed have ability to survive even in the soil with limited nutrients supply.

FARM PLANNING

Introduction

Farming is a business. For this reason a farmer must formulate plans which will lead to better farming and therefore more profits. The farmer usually has scarce resources which he can use in different ways for producing different items.

The major aim of farm planning is to allocate the scarce resources in a way that gives the farmer the best satisfaction as well as optimum returns. After a farmer has formulated a farm plan he implements it. That is, he puts it into action. When conditions on the farm change, the plan may have to be changed or modified in one way or another. When such changes are made, there are two possibilities;

1. The whole farm plan may be changed.
2. Alternatively, farming may be done in a better way using the present farm plan with minor adjustment.

In this chapter we shall look at three important ways of making improvements in the farm business which are called tools of farm planning. They include;

- a) The use of Gross Margins i.e Gross Margin Analysis
- b) Budgeting, especially Partial Budgeting and
- c) Programme planning.

USE OF GROSS MARGIN

-Before discussing what gross margin are and how they can be used in improving the farm business, we need to remind ourselves on two types of costs that are incurred on the farm. These are Fixed costs and Variable costs.

-**Fixed costs:** These are the costs which include all costs that have to be incurred on the farm on common basis, such costs are also called common costs. They include machinery cost, permanent labour, rent and insurance or bills. Such costs have to be incurred on the farm continuously regardless of whether the resources are used or not. Their magnitude does not depend on how much is produced on the farm. For example, once a tractor is bought, it continues to depreciate regardless of how much work it does. Permanent labourers have to be paid their wages regardless of how much work is done on the farm, Insurance premiums have to be paid even if no accidents occurs on the farm.

-**Variable costs:** It includes items such as animal feeds, sprays, veterinary fees, fertilizers and casual labourers. The magnitude of such cost is directly proportional to the area of land put under cultivation or the number of livestock kept.

-In other words, if one hectare of maize requires 2 metric tonnes of fertilizer, four need eight metric tonnes, ten hectares need twenty tonnes and so on. Variable costs are therefore incurred only when production is done. For example, if the farmer in this case decided not to plant maize, he would not need fertilizer.

-A small change in the farm plan will certainly involve change in variable costs as well. Usually, Fixed costs do not change when the farm plan is altered (except when complete change in the organisation of the farm is done)

Remember that **Variable cost** and **Fixed costs**=**Total costs**.

MEANING OF GROSS MARGIN

Gross margin: Is the difference between output and Variable costs

Gross margin = Output - Variable costs

-Gross margin therefore includes the element of Fixed costs and shows the gain that is obtained or loss that can be incurred if the size of a particular enterprise is increased or decreased.

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PROCEDURES OF CALCULATING GROSS MARGIN

-The calculation of the Gross margin of an enterprise involves three main steps;

1. Estimating the outputs and its value.
2. Listing all variable inputs and estimating costs of each variable inputs and
3. Subtracting the total variable costs from the the value of output to derive the Gross margin.

-Gross margin is normally expressed per production unit or per unit of area or per animal.eg.GM/bird,GM/cow or GM/hectare.

WORKED EXAMPLES ON GROSS MARGIN

1. A farmer was keeping 200 layers.In the month of January she sold 120 trays of eggs per day,each tray for 110/=,she culled 10 layers and sold them for 120/= each.during the same month,she spent 6,000/- on layers marsh and 1,200/- on veterinary medicines. Calculate the GM (Gross margin) of the poultry enterprise in January.Express your answer on the basis of GM/bird.

SOLUTION

Number of layers=200

Output=120 trays sold 110 per day

Eggs=120×110×31

=409,200/-

Culls=10×120

= 1200/-

Total output= 409,200 + 1200

=410,400/=

Total variable costs

Layers marsh=6000/-

Veterinary medicine=1200

Total variable costs= 6000 + 1200

=7200/-

Therefore;

Gross margin =Total outputs - Total variable costs

=410,400 - 7200

= 403,200/-

Thus,

The GM/bird = 403,200 ÷ 200

= 2016

Therefore, Gross margin per bird = 2016.

2. A farmer has 50 dairy cows.During the past year,he faced a lot of problems.There was serious drought,concentrates were difficult to obtain and water was not easily available.He spent a total of 30,000/- on animal feed and 1,200/- on veterinary services.In addition he bought four calves to replace 4 cows which he had culled. The culls were sold for 2,000/- each whereas the calves were bought for 2,300/- each. Total milk output was 10,000 gallons and each gallon was sold for 250/- .The farmer paid 140/- a month as insurance premiums for his farm.Calculate the Gross margin per cow.

3. In one year ,Karatu Agricultural secondary school raised 20 hectares of paddy.The school administration bought paddy seeds for 2,000/- and fertilizers for 8,000/-,planting,weeding and harvesting were done by students.The total labour contribution by students was valued at 20,000/- . All of the paddy produced was consumed by students.A total of 400 bags,each valued 500/- were produced.Calculate the Gross margin per hectare.

4. A farmer in Sengerema district had a piggery unit with 400 porkers. In one month he sold 46 porkers each for 1,200/-. He then bought five piglets from a neighbour for 100/- each. During that month, he spent 4,400/- on animal feeds of various types and 1,300/- on medicines. He has four permanent labourers whom he pays 750/- a month each. Calculate the Gross margin per porker.

5. A farmer planted two hectares of maize. In raising the maize the farmer bought seeds worth 200/-, fertilizers worth 600/- and Didimac worth 30/-, weeding costed him 400/- and harvesting costs were 600/-. The total yield was 20 bags at 100 kg each. The maize was bought by the local co-operative society at 3/50 a kg. Calculate the Gross margin per hectare.

6. A farmer planted four hectares of maize. In raising the maize, the farmer bought seeds worth 15,000/-, fertilizers worth 100,000/- and the insecticides worth 5000/-, weeding costs 50,000/-, harvesting costs worth 50,000/-. The total yield was 100 bags/100kg. The maize was bought by January enterprise at 150/- per kg. Calculate the Gross margin per hectares.

RAISING PROFITS

When using Gross margin planning, *Profits on the farm may be raised in four ways;*

- I. By reducing the level of fixed costs.
- II. By expanding or introducing some enterprises on the farm without reducing other enterprises.
- III. By substituting one enterprise or two for another or two.
- IV. By improving the Gross margin of enterprises that are already present on the farm through better husbandry.

The main objective of Gross margin is to allocate the resources to the various enterprises on the farm in such a way that the highest total Gross margins are archived for the whole farm business. In this way, the farmer gets the best returns to his fixed inputs.

BUDGETING

- Is a method of estimating the effect of a change in the farm business. Eg, A reduction or an increase of the area under cultivation or a change in the situation such as a change in the price of inputs or price of farm produce.

-The purpose of estimating the effect of a change in the farm business is to see whether the change will be profitable (and if so, how much capital will be required in making that change) OR whether there will be a loss.

-There are two main types of farm budgets:

- i. Complete Budget
- ii. Incomplete Budget OR Partial Budgets

-A complete budgets is used to estimate the effect of an extensive change in the farm business. If the change is a simple one, however a partial budget is used.

PARTIAL BUDGETS

-Is used for estimating the effect of a partial change in the existing farm plan on costs and revenue.

-In writing a partial budget, changes in costs and revenue are calculated.

❖ Partial budgets are used for two situations which commonly occur on the farm

- i. Replacement of one enterprise by another enterprise.
- ii. Expansion or Introduction of supplementary enterprise.

REPLACEMENT OF ONE ENTERPRISE BY ANOTHER

-When a farmer wants to expand one enterprise, he always finds that he has to reduce or sacrifice another enterprise. A poultry farmer may observe that market trends have changed so that the customers are now willing to pay more for poultry meat than for eggs. Suppose in doing this he decides to get rid of the laying flock so that he is able to keep broilers in his two poultry houses. What will be the effect on his revenue and costs? This can be solved by using a Partial budget.

❖ In setting out a Partial budget so as to see the effect of substituting one enterprise by another, **Four Questions has to be Answered:**

- I. What amount of revenue will be lost by reducing the size or getting rid of one enterprise?
- II. What extra costs will be incurred in substituting one enterprise by another?
- III. What extra revenue will be obtained from the new enterprise? And
- IV. What amount of costs will be saved by making the change?

❖ Such a partial budget consist of two sides; Revenue lost and Extra costs(losses) are entered on one side while Costs saved and Extra Revenue(Gains) are entered on the other side.

SAMPLE TABLE FOR PARTIAL BUDGET

Losses	Shs.	Cts	Gains	Shs	Cts
Revenue Lost			Cost saved		
Extra Cost			Extra Revenue		

❖ After entering all relevant items, Items on each side are totaled and the two totals are then compared. If “Losses” side is greater than the “Gains” side, The difference is entered on the “Gains” side as **Loss**. If “Gains” are greater then the “Losses”, the difference is entered on the “Losses” side as **Profits**. A change in the business set-up is only **Worthwhile** if the Gains side is greater than the Losses side, That is Profit gained.

EXPANSION OR INTRODUCTION OF SUPPLEMENTARY ENTERPRISES

-Another situation that occurs on the farm involves the introduction of a new enterprise or expansion of one enterprise. In such a case the Partial budget is set out as follows;

PARTIAL BUDGET

LOSSES	GAINS
Extra cost	Extra revenue
Profits (If any)	Loss (If any)

- ❖ **Note that**, in writing a Partial budget the most relevant costs are the variable costs
- ❖ When expanding or introducing a supplementary enterprise, **Two** questions have to be answered in the Partial budget;
 - 1) What extra costs will be incurred as a result of the expansion or introduction?
 - 2) What extra revenue will be obtained as a result of the expansion or introduction?

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WORKED EXAMPLES ON CALCULATIONS INVOLVING PARTIAL BUDGETS

1. A farmer wants to change over from growing his normal 20 hectares of maize to growing harricot beans (20 hectares also). Both crops are grown in the same season in that particular area. Use the data below to find out whether the change over would be Worthwhile. Set out the calculations in the form of a Partial budget.

YIELD	Selling Price
Maize 4000 kg per ha	25 cts per kg
Harricot beans 1800 kg per ha	40 cts per kg

Variable costs of growing maize(per hectare)

- 10 kg seed at 50 cts each kg
- 4 tonnes fertilizer at shs 30/= per tonne
- Harvesting and picking costs are shs 63/= per hectare
- 5 tractor-hours at shs 10/=per hour

Variable costs of growing harricot beans (per hectare)

- 4 kg seeds at shs 1/= per kg
- 3 tonnes fertilizer at shs 20/= a tonne
- Harvesting costs at shs 56/= per hectare
- 4 tractor hours at shs 10/= per hour.

Solutions

LOSSES	Shs.	Cts	GAINS	Shs	Cts
(a) Extra costs:			(c) Cost Saved:		
80 kg harricot beans seed each shs 1	80	00	200 kg maize seed each 50 cts	100	00
60 tonnes fertilizer each shs 20	1,200	00	80 tonnes fertilizer each shs 30	2,400	00
Harvesting costs 20 hectares each shs 56	1,120	00	Harvesting and picking costs shs 63	1,260	00
80 tractor hours each shs 10	800	00	100 tractor hours each shs 10	1,000	00
(b) Revenue Lost:			(d) Extra revenue:		
80,000 kg maize each cts 25	20,000	00	36,000 kg harricot beans each cts 40	14,400	00
				19,160	00
	23,200	00	Net loss.....	4,040	00
	23,200	00		23,200	00

✧ The change-over is not worthwhile because there is a loss of Shs. 4,040/=.

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2. A farmer wants to increase the size of his maize (shamba) by 10 hectares by reducing the size of his cotton (shamba).in order to grow extra maize he will require;
 10 bags of fertilizer shs 120/- per bag
 100 kg seed shs 1/50 per kg
 Ploughing shs 50/- per hectare and the yield are 10 bags per hectare at 100/- per bag.
 The work is done by a permanent labour force.
 10 hectares of cotton yield 5000 kgs of cotton shs 2/- per kg.
 Inputs required to produce 10 hectares of cotton are :
 Permanent labour force plus 4 men hired for 25 days each shs 10/- per day
 Spraying costs at 50/- per hectare
 Seed is obtained free of charge and no fertilizer is applied.
 Using a Partial Budget,Find out whether a change is Profitable or not.
3. A farmer wants to change over from keeping **four dairy cattle** to keeping a **Flock of 400 layers**. Use the data below to find out whether the change over would be economically worthwhile.Set out the calculation in the form of a Partial budget.

OUTPUT	SELLING PRICE
60 litres milk a day	Shs. 7 a litre
300 eggs a day	Shs. 3 an egg

Variable costs of keeping four dairy cattle:

Concentrates/Feeds 20/- a day

Vet.services/Medicines 4/- a day

Variable costs of keeping 400 layers:

Layer marsh 40/- a day

Medicine 3/- a day

4. Mr. ANNEY feels that his income is too little.For this reason,he wants to add a simsim field to his business.He is planning to plant 20 hectares of simsim.average yields of simsim in the area are about 450 kg per hectare and selling price is 14/- per kg.He will hire a tractor for land preparation and planting at a price of 250/- per hectare.Hired labourers for weeding cost 100/- per hectare and labour for harvesting cost 150/- per hectare.
 He will not need any fertilizer because the land is fertile.Use these data to find out whether the addition of a simsim field is economically worthwhile for Mr. ANNEY. Set your calculations in the form of a partial budget.
5. Mr.David Mandevu gets his income by selling fish which he harvests from his fish pond.The pond yeilds about 3000kg fish per annum which he sells for 30/- per kg.He is thinking of exchanging the pond for a poultry unit with 2000 layers which produce an average of 1000 trays of eggs per month.The price of eggs is 100/- per tray.Use these data given below to determine whether the exchange is worthwhile for Mr.David Mandevu.Set out the calculation in the form of a Partial budget.
Variable costs of producing fish per month
 Feeds shs 1500/-
 Fertilizer shs 200/-
 General maintainance shs 300/-
Variable costs of producing eggs per month
 Feedstuffs shs 3100/-
 Vet.services etc shs 300/-

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6. A farmer with 10 hectares of a maize farm wants to replace hired labour with a team of hired oxen and plough. Use the data below to find whether the change would be economically worthwhile. Set out the calculations in the form of a Partial budget

	OUTPUT	SELLING PRICE
Hired oxen	960 kg per Ha	Shs 5 per kg
Hired labour	600 kg per ha	Shs. 5 per kg

Variable cost of growing cotton using oxen

- Hired oxen (2) and a plough cost 200/- per Ha.
- Supplementary feeds for oxen in each farming season costs 320/- per oxen
- Picking costs using hired labour 4/- per 30 kg

Costs of growing cotton using hired labour

- Land preparation 30 Mondays per hectare at 14/- per Monday.

PROGRAMME PLANNING

-Is a process of selecting enterprises in the order of their returns (profitability) to scarce resources, that is in the order of the amount of profits obtained in using the scarce resources. Resources are preferably allocated to enterprises that generates higher profits.

PROCEDURES OF PROGRAMME PLANNING

- Programme planning is normally done in stages which are outlined below:
 1. The first stage involves making a detailed list of all the available farm resources such as Land available, Labour available, Buildings, Machinery, Feeds etc.
 2. The second stage is to list all enterprises that can be undertaken with the resources available bearing in mind the likes and dislikes of the farmer, risks etc.
 3. The gross output of each enterprise is then worked out.
 4. Work out the variable costs for each enterprise
 5. Calculate the Gross margin for each enterprise.
 6. List the Gross margins in order of magnitude, from the highest to the lowest.
 7. Set up a table showing the resources available and resources required by each enterprise.
 8. Make a list of limiting factors (or constraints)
 9. Select the enterprise with the highest Gross margins and expand it by allocating resources to it until at least one factor becomes limiting.
 10. Expand the enterprise with the next highest Gross margin until another factor becomes limiting.
 11. Repeat (10) until most resources are used up.