



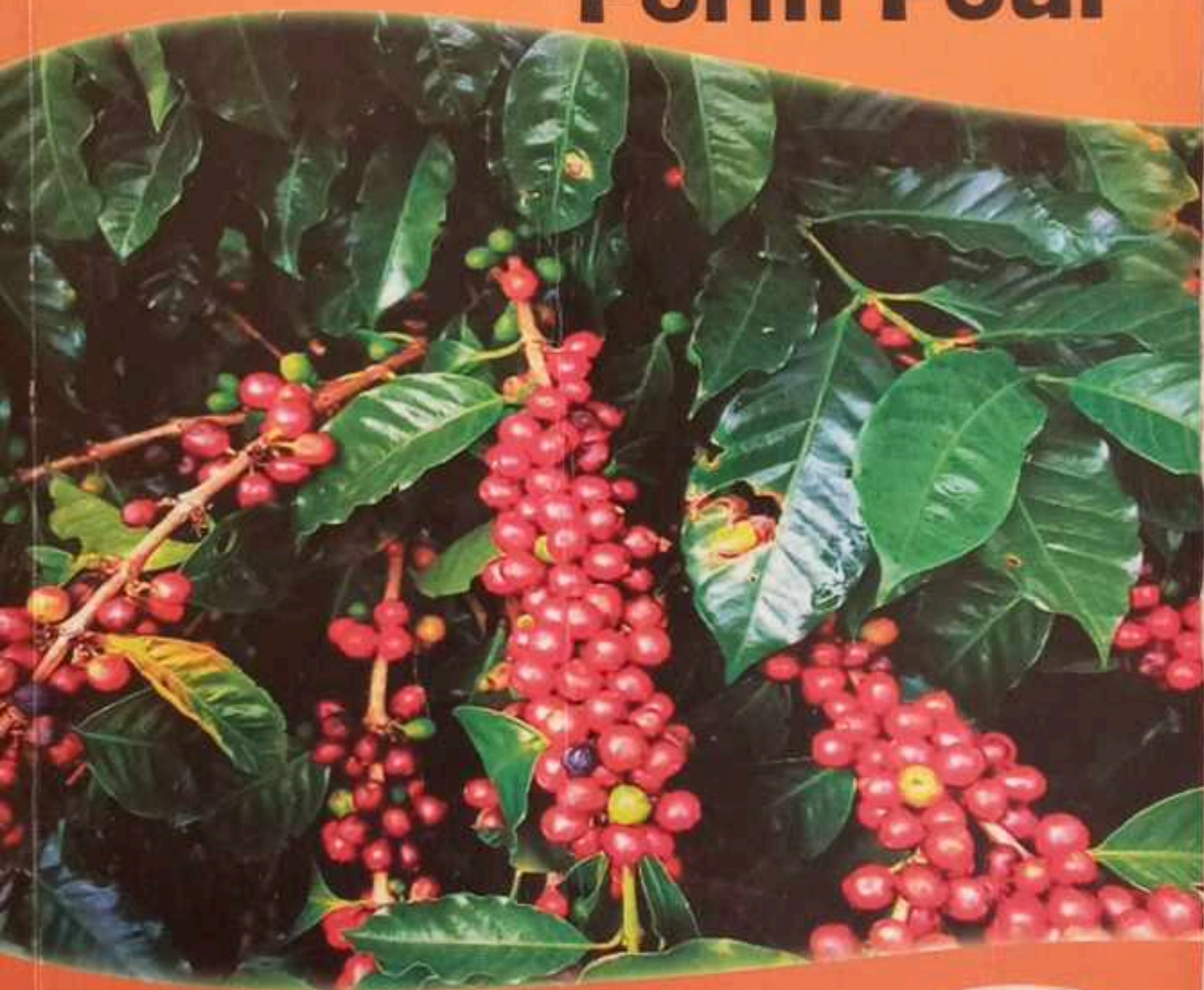
Republic of Somaliland
Ministry of Education & Higher Studies



Secondary Geography

Student book

Form Four



1st edition

HEMA
BOOKS

AGRICULTURE

1.1 Meaning of Agriculture

Farming or agriculture is the world's major primary activity and the biggest employer and use of land in rural environment and produces raw materials of **two basic needs of food and clothing for people**.

Farming is the cultivation of crops and the rearing of livestock, and farming is a system because it consists of three components of **inputs, processes and outputs**, or expenditure, storage and the income of the farm respectively.

Factors that influences agriculture

Farm inputs are favorable conditions and materials needed for the establishment of the farm, and they are as follow:

1. **Physical (natural) factors** are the main factors that determine the decision of the farmer on which crop to grow and what type of livestock to rear and they are:-

A. **Climatic factors** (rainfall, temperature, sunlight, winds, and growing season)

i) **Rainfall**

Rain is the sources of water necessary for all life processes. Lack of rain means that farmers cannot plant new crop and the growing ones may wilt and die or they may not yield as expected. **Aspect of rainfall:** -

- Rainfall reliability
- Amount of rainfall
- Rainfall distribution
- Rainfall intensity

ii) **Temperature**

is the hotness or coldness of a place measured in degrees Celsius or centigrade. Temperature affect agriculture in two ways:-

a) **Low temperature**

- Slow growth rate of crops as the process of photosynthesis is slowed.
- High incidences of disease infection of crops as **Elgon** die back.
- Quality of crops such as **tea** and **pyrethrum** improves with the lowering of temperature.

b) **High temperature**

- Increase evaporation leading to wilting crops.
- Increase rate of growth or hasten the maturity of crop.

- Improves the quality in crops such as pineapples and oranges.
- Reduce livestock production.
- Increases incidence of disease in coffee berry disease (CBD).

iii. **Sun light** it is needed for photosynthesis and without it plant will not be able to produce food. Plants grown without sunlight have elongated yellow leaves.

Aspect of light: -

- I. **Light intensity:** - this is strength with which the light is harnessed by chlorophyll for the purpose of photosynthesis.

The amount of light harnessed can be increased by: -

- Pruning
- Thinning
- Weeding or wider spacing

- II. **Light duration:** - the period during which light is available to plants in per day. Plant varieties are classified as **short day**, **long day** and **day neutral**. Depend on the hours of light required for proper growth.

- III. **Light wave length:** - these are types of light as observed in rainbow. Each type has different wavelength. Some wavelength cannot be seen with eye, e.g. X-rays and Gamma rays.

iv. **Relative humidity** is the amount of water vapor held by air at a given temperature. Relative humidity affects the rate of evaporation and transpiration. Evaporation is the loss of water from the soil surface in form of water vapor whereas transpiration is the loss of the water vapor through the leaf pores. Combination of the two processes is referred to as evapotranspiration. At high relative humidity, the rate of evapotranspiration is low.

- v. **Wind** is an air in motion and the effects of strong wind in agriculture include.

- Increasing the rate of evaporation of moisture from the soil.
- Damage to the crops.
- Acting as agent of seed dispersal.
- Acting as agent of soil erosion.
- Increasing the spread of pests and diseases.

B. **Soil (Edaphic) factor** like the type, minerals, fertility and drainage of the soil.

- Soil is a support for plants.
- It is the main medium whereby water and nutrients are absorbed by roots.
- Rich and fertile soils have higher productivity than poor soils, either chemically or in texture, both in amount and variety.

C. **Land topography** (the relief and the altitude), which affect the tillage of the farm, mainly heavy mechanization farming and the access of transportation.

- It relates to soil erosion.
- It relates to difficulty of tillage and poor transportation facilities.
- The use of agricultural machinery is impossible on rough, hilly lands.
- The slopes of mountains are terraced into small farms as in China.

2. **Biotic factors** involve all living organisms that affect the growth and the production of the crops, such as the **pests, parasites, decomposers, predators, pollinators, pathogens and nitrogen-fixing bacteria.**

Pest is any harmful organism. These are destructive organisms which

- They feed on the whole or parts of the plants.
- They transmit crop diseases.
- Some pests injure the plant parts which they feed on and as a result expose the plant to secondary infection.
- Pests increase the cost of producing crops.

1.2 Parasite

These are an invertebrate which live in or on the plants and animals. Those living on plants are called **plant parasites**. Those living inside the animal are called **Endo-parasites**. They include round worms, Tape worms and liver flukes. Endo-parasites absorb food substances from the digestive tract of animals. Those living on the animal are called **Ecto-parasites**. They suck blood from the animals and irritate by biting on their skin.



Decomposers

These are microscopic livings usually found in the soil. That breaks down organic material in the field and hence helps increasing nutrient.



Cereals crop
leguminous
herb culture

Pathogens

These are micro-organisms which transmit diseases. They are of economic importance, because they can cause death. Pathogens also reduce both quality and quantity of agricultural products. Pathogens include bacteria viruses' fungi.

Predators

A Predator is an animal that kills and feeds on another animal. Predators that feed on pests are beneficial to farmers as they reduce pest population.



Pollinators

These can be insects or bird's. they transfer pollen grains from stamens to the pistil of the flower. Causing cross pollination. They include bees and butterflies. Cross pollination helps in the production of new and improved varieties of crops for the following generation.

Nitrogen fixing bacteria

These are useful micro-organisms in leguminous plants. They are found in the nodules of the roots. They covert nitrogen from the air into nitrates When these bacteria die they release nitrates to the soil which helps other plants in the following season.

3. Human factor

- a. **Capital** investment (technology, machinery, fertilizers, insect/pesticides, seeds, livestock)
- b. **Political factors** (government grants, subsidies)
- c. Market and transport.

4. Cultural factors (land tenure, inheritance, farm size)

Importance of agriculture

Farming is the most important branch of the primary economic sector because it produces both the food and shelter materials that essentially eliminate the famine and contribute a significant proportion to the level of the economic development of countries.

Also, agriculture has the following importance to any country:

1. It provides all the food required to feed the people of any given country.
2. It provides the raw materials for the manufacturing industries.
3. It provides high income as an export earning to obtain a hard currency from abroad.
4. It provides medicines and herbal materials used for the treatment of diseases.
5. It is source of informal income to a large number of households in urban areas.
6. It provides employment to people in rural settlements in LEDCs.

1.3 Classification (Types) of Farming

Agricultural system practiced in the world varies from region to region and they are categorized into four main groups according to the four factors as the specialization, the location, the output and the input of the farm.

1. Classification based on specialization

There are three types depending on the varying processes carrying out by the farmer.

- a) **Arable or crop farming:** is the cultivation of crops only, either food or non-food crops.
- b) **Animal or pastoral farming:** this involves only in rearing livestock either for commercial or subsistence.

- c) **Mixed farming:** this involves in both the growing of crops and the rearing of animals on the same farm.

This type has significant advantages than other two, because the livestock are fed on the farm's own crop as **forage** and their **manure** is used to fertilize the field before crops are sown.



2. Classification based on the location

There **two types** of farming according to the way a farmer uses the land.

- a) **Sedentary or settled farming:** this is relatively advanced and localized farming in which crops are cultivated or animals are kept on the same piece of land for long time of period. This is characterized by:
- The uses of modern techniques and tools of farming.
 - The production is kept high by using manures and fertilizers.
- b) **Shift cultivation** is a primitive practice which involves in shifting or moving from one place to another mainly in the equatorial rainforests.

This is characterized by:

1. Clearing or cutting and burning trees in forests for a land to cultivate
2. The farmer moves from the cultivated field after the exhaustion of fertility from the soil and decrease in production.
3. The use of rudimentary techniques of farming and growing of mono-crops such as maize, millet, and hill rice.
4. The uses of simple tools for cultivating land, e.g. hoes, sharpened sticks,
5. Farmer do not use manure or fertilizer.
6. Existing in areas where population is sparse and where land is relatively abundant.

3) Classification based on the output

On the basis of how farmers use the product or the yield of the farm, there are **two types**:

- a) **Commercial farming** is the growing of crops and the rearing of livestock only for sale.

The main characteristics include: -

1. The use of modern techniques of farming
2. The use of highly mechanized farm machinery and tools.
3. Farm workers are usually hired. *→ expensive*
4. The use of fertilizers, manure and pesticides to improve the yield.
5. The use of high input of money

- b) **Subsistence farming** is the cultivation of food crops and the rearing of livestock for the consumption of the product by the farmer and his family, and its characterized by:

1. it is little advanced form of shifting cultivation,
2. farm sizes are relatively small.
3. The standard of living of the farmer and his family is usually low
4. There is no more surplus to sell or to store.
5. The use of intercropping, mainly cereals and vegetables.
6. The use of simple tools and methods is common.

4) Classification based on input of the farm

According to the farm inputs, mainly economic and human inputs of the system, farming can be either **intensive or extensive**.

- a) **Intensive farming** uses a small-sized farm with a high input to produce a high yield per unit area.

Horticulture farms, dairy farms and market gardening farms in HICs and the rice growing in LICs are good examples.

- Locates near urban areas for easy access to markets
- They give high a return or yield per hectare
- The land is cultivated annually and is not left fallow.
- They are mainly commercial farming except the rice growing in south-east Asia.
- Uses much capital, labour, fertilizers and farm machinery, e.g. greenhouse farms are plastic or glass buildings in which vegetables are grown by creating artificial climatic conditions to enable growth throughout the year

- b) **Extensive farming** uses small amount of input and relatively large areas of land from which lower yield are obtained per unit area. The vast mechanized wheat farming in HICs and the nomadic herding in LICs are examples.

- The yield per hectare is relatively small.
- It relates to pastoralism and cereal cultivation of dry-farming in semi-arid areas.

Hot + culture = fine
vegetable
flower
field crop
= some
cereal

1.4 Crop Cultivation

Arable farming and Crops

Crop or arable farming is the cultivation and the production of crops only on a cultivated piece of land and there are two systems of crop farming and they are: -

Mono-cropping which is the growing of a single crop in an area e.g. maize or wheat but not both and **intercropping** which is the growing of two or more crops in the same piece of land e.g. beans and maize. Most small-scale farmers in Somaliland traditionally grow many crops in mixture on the same farm.

Crops cultivated in arable farming is mostly categorized into two types namely **field crops** and **horticultural crops**.



Intercropping

Mono-cropping

Field crops are perennial or annual crops which are grown entirely on a large area of land.

- **Annual crops** are plants which take one year to complete their cycle e.g. cereals, pulses or leguminous crops.
- **Perennial crops** are plants that grow continually for many years e.g. tea, sugarcane, fibrous crops (sisal, cotton), oil crops (palm oil).

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Definition

Horticultural crops are the perishable crops which are mostly marketed within the countries to earn foreign exchanges and they can be subdivided into three groups: -

- **Floriculture** is the growing of flowers
- **Olericulture** is the growing of vegetables
- **Pomoculture** is the growing of fruits such as avocado, mango and citrus fruits.



Cereals.

Wheat, rice and maize are the three principal grain crops of the world they grow best under specific climatic conditions.

Rice

Wheat, Rice, and maize are the principal grain crops of the world that produce edible seeds which form an important part of the daily diet of the world's population.

Botanic names

- Rice is the seeds of a grass family plant botanically called **Oryza sativa**
- Wild rice called **Zizania** species from which the crop was developed, may have its native range in Australia
- Rice is the third-highest worldwide production in agricultural commodity after sugar cane and maize
- The rice plant can grow to 1–1.8 m (3.3–5.9 ft) tall.



There are **two** main types of rice cultivation; the dry paddy system in which rice is grown on dry land, and wet padi system in which it is grown on land that is flooded from planting time to the harvesting time.

Rice a **monocotyledon**, is normally grown as an annual plant, although in tropical areas it can survive as a perennial and can produce a ratoon crop for up to 30 years.

Growing conditions for rice

The successful cultivation of rice requires:

1. A growing season of about 5 months with minimum temperatures of 21°C and followed by a dry sunny period in which the crop ripens.
2. An annual rainfall of over 2000 mm (about 80 in) with at least 120 mm (5 in) falling in each month of the growing season.
3. Flat land to permit the soil to retain the water upland rice is grown on terraced slopes. Each terrace is like a broad step which means that the slopes are turned into a series of level steps.
4. Heavy alluvial soils with an impervious sub-soil of clay to retain the water.

The cultivation of rice

The rice fields are carefully leveled and earth walls, called **bunds** are built just before the wet monsoon begins because rice requires abundant water during the growing season.

The seeds are either sown directly in the fields or in nurseries where they are allowed to germinate and grow into young seedlings which are then transplanted into the flooded fields.

Rice reaches maturity after about **six month** with a small wind-pollinated flowers and then fields are drained to allow the seeds to ripen, after which is harvested.



The harvesting and processing of rice

Rice is harvested by hand in Asia because the small rice fields make the use of machines uneconomic, but machines are used where rice fields form large units, such as in the U.S.A, and Australia.

After it is harvested, the seeds are separated from the stalk by **threshing** and later dehusked and polished in the rice mills. Also, in rural areas the seeds are dehusked by pounding in a large wooden tub and then winnowed by tossing seeds in a bamboo tray.

Consumption of rice

Rice is the staple food of over half the world's population. It is the predominant dietary energy source for 17 countries in Asia and the Pacific, 9 countries in North and South America and 8 countries in Africa. Rice provides 20% of the world's dietary energy supply, while wheat supplies 19% and maize (corn) 5%.

The nutrient content of rice varies based on a number of factors.

1. It depends on the strain of rice that is between white, brown, red and black variety of rice.
2. It also depends on nutrient quality of the soil rice is grown in.
3. It also depends on how the rice is polished or processed.
4. It also depends on the manner it is enriched, and how it is prepared before consumption.

Main rice growing regions of the world

Over 80% of the world's supply of rice comes from Asia, mainly from:

1. The Si-kiang and Yangtze basin of **China**¹
2. The Ganges Delta of **India**² and Bangladesh
3. The Red River Delta of North Vietnam
4. The Irrawaddy Delta of Burma
5. The Chao Phraya Delta of **Thailand**⁵
6. The Mekong Delta of Cambodia
7. The alluvial coastal plains of **Japan**⁴ and **Indonesia**³.
8. The Mississippi Delta and parts of Southern California, U.S.A
9. The Po Basin in Northern Italy
10. The Nile Delta of Egypt
11. Parts of New South Wales of Australia.

Pests and diseases of rice

Rice pests include **weeds, pathogens, insects, nematode, rodents, and birds**. A variety of factors can contribute to pest outbreaks, including climatic factors, improper irrigation, the overuse of insecticides and high rates nitrogen fertilizer application.

Rice blast caused by the fungus *magnaporthe grisea* is the most significant disease affecting rice cultivation. Other major rice diseases include **sheath blight** (*Rhizoctonia sulani*) and **tungro**.

Wheat



Wheat is a cereal grain, **botanically** known as a **Caryopsis** originally from the **Levant region** of the Near East, although some archaeological records suggested that this first occurred in the regions known as the **Fertile Crescent**, (between the two rivers of Euphrates and Tigris), but now it is the third most-produced cereal after maize and rice.



The *emmer* and the *einkorn* wheat seeds are the most common species. However wheat breeding developed in the first years of the twentieth century by using the method of Mendelian genetics, in order to obtain a high grain yield, good quality, disease and insect resistance and tolerance to abiotic stresses, including mineral, moisture and heat tolerance.

Growing conditions for wheat

Wheat grows best in regions having the following conditions:

1. Growing season temperatures of between 15°C and 21°C .
2. An annual rainfall of 38 to 90 cm. most of it falling during the growing season.
3. A growing season of at least three month.
4. A rich loam soil which retains the moisture, but allows good drainage.
5. A warm, dry sunny period to enable the wheat to ripen.
6. Fairly level or gently undulating land to permit mechanized farming.

Cultivation

Wheat is widely cultivated as a cash crop because it produces a good yield per unit area, grows well in temperate climates between the latitudes of 30°N and 40°N , and 25°S and 45°S and yields versatile, high-quality flour that is widely used in baking. The popularity of foods made from wheat flour creates a large demand for the grain, even in economies with significant food surpluses.

There are **two types** of wheat based on the cultivation seasons: -

- a) **Spring wheat**, which is planted in spring and harvested in the following summer in regions which have severe winters, such as the U.S.A, Canada, C.I.S, Eastern Europe and in Northern China.
- b) **Winter wheat**, which is sown in winter and harvested in the following summer in regions which have mild winters, Australia, Argentina, central Chile and North-Western Europe.



Wheat



Sheaved and stooked wheat

In India and Pakistan, wheat is sown just after the summer monsoon rains begin and it is harvested before the hot wet season begins.

Wheat is cultivated extensively as a monoculture; on very large farms with the maximum use of heavy machinery such as threshing machines and reaping machines (the 'combine harvester') tractor-drawn cultivators and planters. Although the yield per unit area is relatively low in the growing regions of U.S.A, Canada, Australia, Argentina, C.I.S and China.

Intensive wheat cultivation involves the use of labour rather than machinery on small areas of land which produce a high yield per unit area, and usually it is grown in rotation with other crops to produce wheat crop once every 3 or 4 years. Intensive wheat farming exists in India, Pakistan, China and in European countries.

Wheat Consumption

Wheat is a major diet component because of its agronomic adaptability with the ability to grow from near arctic regions to equator, from sea level to plains of Tibet, approximately 4,000 m (13,000 ft) above sea level.

In addition to agronomic adaptability, wheat offers ease of grain storage and ease of converting grain into flour for making edible, palatable, interesting and satisfying foods such as Pasta, bread and biscuits. Wheat is the most important source of carbohydrate in a majority of countries.



Rust-affected wheat seedlings

The major diseases of wheat crop include the following:

In temperate climates

Eyespot, Glume blotch, Yellow or stripe rust, Powdery mildew, Leaf blotch, Brown or leaf rust, Head blight, Tan spot and stem rust.

In tropical areas

Spot blotch (also known as leaf blight) is most common disease.

Wheat Growing Regions

The largest exporters of wheat in 2009 were, in order of exported quantities: United States, EU Countries, Canada, Russian Federation, Australia, Ukraine and Kazakhstan.

Largest importer of wheat in the world is Italy to turn wheat into flour and then Pasta. The largest three producers are U.S.A. Canada and the C.I.S.

Maize

Also known as a corn (botanically called *Zea Mays*). This grows with a very long stalk to a height of about 1.5metres and very long leaves. When the plant is mature, the fertilized flowers arise in the axils of leaves and produce cobs at the end of the flower stalks.



Growing conditions

Maize requires the following conditions:

1. A growing season of between 150 and 210 days, according to varieties
2. A daily temperature of between 20°C and 25°C. Night temperatures should not fall below 15°C.
3. An annual rainfall of between 620 mm and 1000mm with most of it falling in the growing season.
4. A dry, sunny season to enable the cobs to ripen.
5. Well-drained deep soil, rich in phosphates, nitrates and potash.



Cultivation and land preparation

Maize is the staple food in most parts of S/Land and it is produced by small and subsistence crop especially Gabiley and Awdal regions area.

Land is prepared early to allow trash to dry and enough time to rot.

Ploughing is used in large scale farmers while hand digging is used in small scale.

It grows well in fertile soils.

Sowing should be done early in the rain season to make maximum use of available moisture. Also, early planting reduces attack by stalk borer.

Weeds in maize should be controlled, right from the early stage of growth to reduce competition for moisture and nutrients by using slashing or herbicides.

Phosphate fertilizers are applied at time of planting to encourage root developments. They should be used at recommended rate

Maize diseases

1. **Maize streak:** this disease caused by a virus by grass hoppers. **Symptoms**

- Yellow longitudinal strips of the leave.
- Running parallel to the midrib.



2. **White leaf blight:** this disease caused by fungus.

Symptoms

- It causes oval, grey and thin lesion on the leaves.
- Spots increase in size and number.

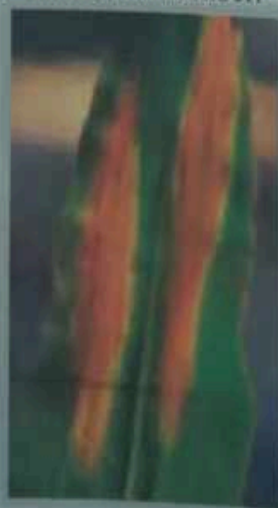


Fig: 10.14 white leaf blight

3. **Smut disease:** this disease caused by fungus.

Symptom

- It attacks the grains and tassels, causing masses of black powder.



Fig: 10.15 Smut

4. **Rust disease:** This disease is caused by the fungus

Symptom

- Red or brown pustules are formed on the leaves.



Fig: - 10.16 rust

The main growing regions

Maize growing regions locate in warm temperate latitudes, U.S.A is the greatest producer of maize and others include china, Argentina, C.I.S, and Brazil.



Growing Conditions

It grows well:-

- Altitude - 0 - 1500m above sea level
- Rainfall - 420 - 630mm
- Soils - fertile soil, well drained soils

Land preparation

- Prepare during the dry season.
- Dig or plough for primary cultivation.
- Secondary cultivation to fine tilt.

Planting

- Plant at the onset of the rains.
- Planting depth is 2.5cm – 5cm.
- Incorporate 25 – 40 kg per hectare of phosphorus fertilizer.

Field management of Sorghum

- Weeding – by uprooting.
- Hand cultivation of planted sorghum in rows.
- Fertilizer application.
- Control pests by application of appropriate pesticides.
- Control diseases like smut by crop rotation.

Pest and disease control Pests

- Birds such as Sudan dioch (*Quelea quelea*).

Effects

- Destroy the crop.
- Feed the grain



Sorghums hoot fly

- It attacks young plants in its larval stage.
- Several tillers appear which may also be attacked.

Control

- Early planting.
- Application of insecticides.



Diseases

Loose smut

It is caused by fungus

Symptom

- It contains masses of black or brown spores.

Control

- Crop rotation.
- Field sanitation.



Fig: - 10.18 loose smut

Head smut

- This caused by fungus

Symptom

- Black spots on the head.

Control

- Crop rotation.
- Field sanitation.



4. Millet

- Millet is originated in the savannah areas of west African from where it spread to the rest of the African continent and then to India. It is the staple food in the drier areas of Africa and India.
- There are two types of millet namely: -
 - Bulrush millet (tall, grows up to 3 m high)
 - Finger millet (short, grows up to 1 – 2 m)
- Finger millet is the common millet; it can be stored for many years without use of insecticides because it has small seeds that dry quickly.

Growing Conditions

It grows well:-

- Altitude - up to 2400m above sea level
- Rainfall - 900 mm per year
- Soils - fertile, free-draining soils
- Warm climate required

Land preparation

- Done during the dry season to remove all perennial weeds.
- Dig, plough and do primary cultivation.
- Secondary cultivation or harrow to produce fine tilth.

Planting

- Planting is done at the onset of rain
- Broadcast or plant in rows

Field establishment

- Weeding control
- Control pests
- Control diseases
- Fertilizer application

Common pests of millet	Control of pests
▪ Aphids ▪ Army worms ▪ Birds ▪ Rodents such as rat	▪ Use of insecticides ▪ Use of pesticides ▪ Rogueing

Common disease

- Head smut
- Common smut.

Harvesting of millet

- Cut heads with a knife or sickle when dry.
- Thresh by beating the dry head.
- Store in well ventilated, dry conditions.

Planting

- Planting is done at the onset of rain
- Broadcast or plant in rows

Field establishment

- Weeding control
- Control pests
- Control diseases
- Fertilizer application

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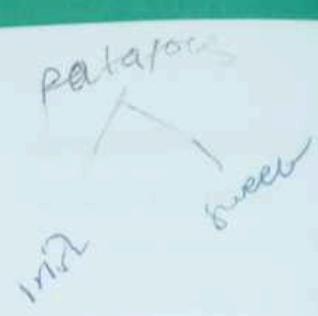
Common disease

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Harvesting of millet

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Wheat production

General conditions favoring wheat production

- Average temperatures not to exceed 20°C or fall below 6°C.
- Gently sloping landscape for proper drainage and allow use of machines.
- Warmth during early periods of growth and sunny dry conditions in later stages for harvesting.
- Rainfall of between 305-1015mm annually.
- Grows best on light clay soils because they are stiff and give plant firm support

5. Beans (*Phaseolus vulgaris*)

- The bean as a crop is the main source of protein for most people in the country.
- The crop is grown for dry seed and also for green pod, with the dry beans being consumed locally, and the green pods sold in local markets, and in the well-developed export market.
- Beans can do well in most of the cultivated parts of our country.
- As a legume it is beneficial to other crops which it is interplant such as maize, Irish potatoes and cassava.



Growing Condition

It grows well:-

- Altitude - 1000 - 2100m above sea level
- Rainfall - more than 625mm per year
- Soils - well drained soils, soil rich in organic manure and soil that are not waterlogged

Land preparation

- One primary cultivation and one secondary will be enough.

Planting

- Plant at the onset of rains
- Apply organic manure
- Incorporate phosphorus fertilizer
- Place 2 - 3 seeds per hole

Field establishment

- Weeding control
- Control pests
- Control diseases
- Fertilizer application

Common pests of bean	Damaged caused by pest	Control of pests
• American bollworm • Bean aphids • Bean bruchid	• Cause stunted growth • May transmit diseases	• Spraying pesticides • Seed dressing • Crop rotation • Early planting

Common disease

- Anthracnose.
- Bacteria (Halo) blight.

Control

- Certified seed.
- Crop rotation.
- Use of fungicides.

Harvesting of beans

- Beans are harvested when green as pods or when dry as grains.
- The green pods are harvested prematurely and are used as vegetables

Human Factors

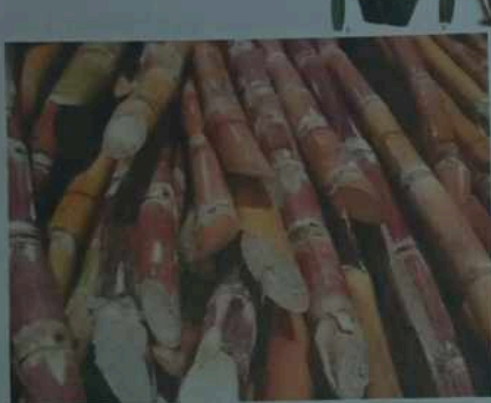
- Adequate labour for planting, weeding, application of fertilizers etc.
- Availability of transport facilities such as Lorries and tractors to transport grains from the fields to the store and then to buying centers.

Cultivation (production methods)

- Land is preparing by ploughing using tractor driven ploughs.
- It is then hallowed several times to allow weeds and stray wheat grains to be killed in the next harrowing.
- Manure and phosphate fertilizers are applied after the last harrow before sowing.
- Sowing is done using drills that are pulled by tractors or hands.
- Weeding is done by spraying or pulling using hands.

2. BEVERAGE CROPS

Sugarcane



Cut sugarcane



Sugarcane and bowl of refined sugar

Sources of sugar

80% of World's sugar production comes from sugar cane botanically known as *Saccharum Officinarum*, and most of the rest is made from sugar beet.



Sugar cane is a tall perennial grass family that forms lateral shoots at the base to produce multiple stems. It has stout fibrous segmented stalks rich in sugar. Mature cane stalk is 3-4 meters tall and 5cm in diameter and it typically takes about 12 months to reach maturity.

The Persians, followed by the Greeks discovered reeds in India between the 4th and 6th centuries BC and sugarcane plantations began in Caribbean, South America and islands in the Pacific and Indian Oceans.

The growing conditions of sugar cane

The plant can be grown commercially in **topical, sub-tropical or temperate regions** which have the following conditions:

- i- High monthly temperatures of between 21^o- 30^oC.
- ii- An annual rainfall of about 2000 mm (80 in) with most of it falling in the growing season, or the equivalent irrigation water.
- iii- A dry warm season to enable the canes to ripen so that high sugar content forms in the pith of the canes.
- iv- Rich, deep well-drained soils.
- v- A large labor force for digging irrigation/drainage canals and for planting, weeding and harvesting the cane, in those areas where mechanized farming is not practiced.

Most of the world's sugarcane is grown between the latitudes of 22^oN and 22^oS, and some up to 33^oN and 33^oS. In terms of altitude, sugarcane crop is found up to 1,600 m close to the equator in countries such as Colombia, Ecuador and Peru.

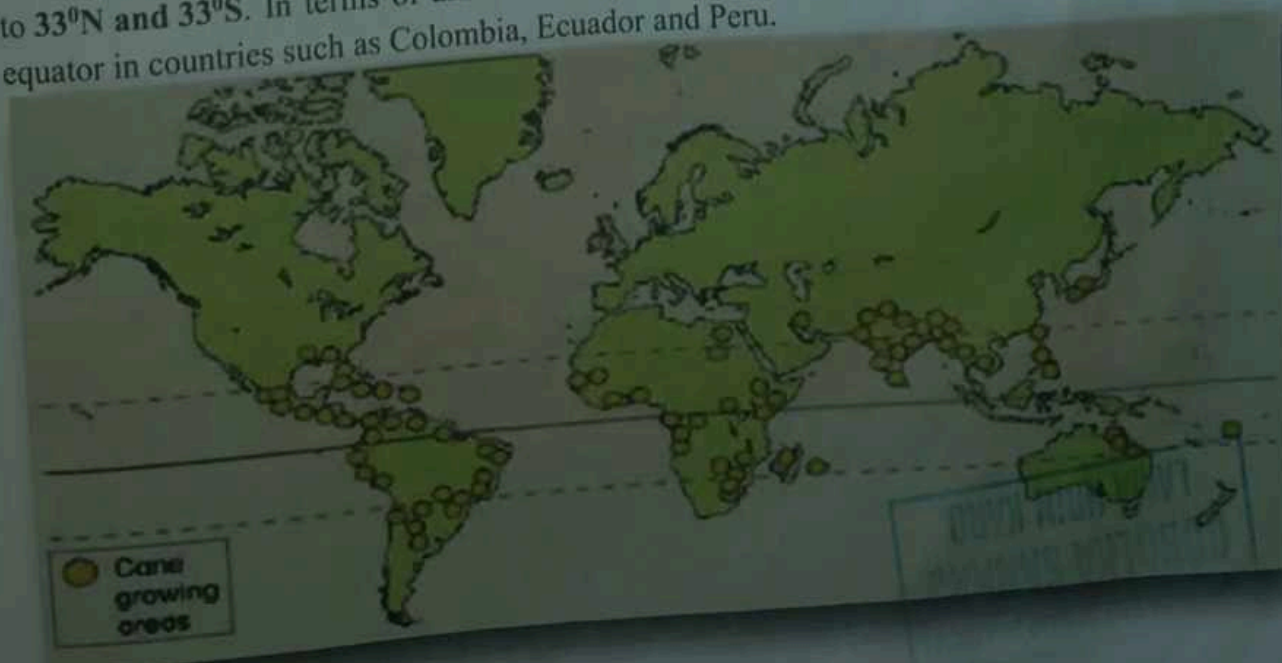
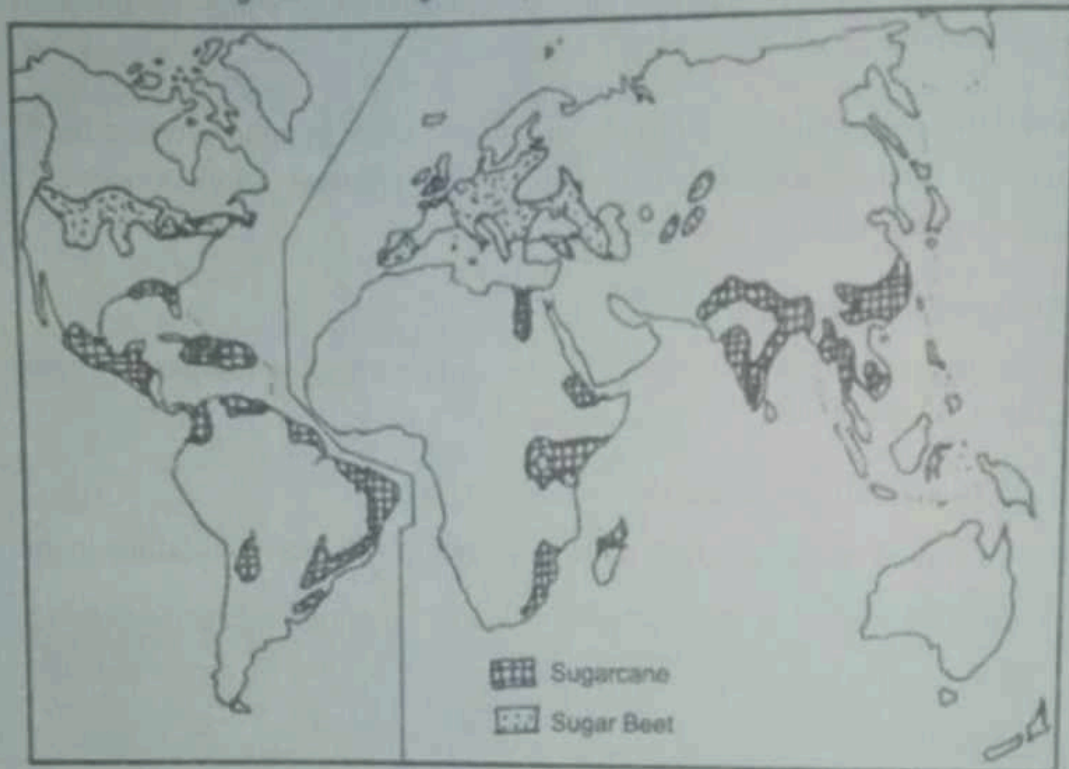


Figure 6.10
Sugarcane and sugar beet-producing areas of the world



Cultivation of sugarcane

Sugarcane is cultivated in the tropics and subtropics in areas with a plentiful supply of water, and it does not tolerate severe frosts.

Sugarcane is not sown from its seeds but it is planted from stem cuttings with one or two buds, either by hand or mechanically from long stalks called billets is directly planted by heavy machineries that open, recloses and rolls the ridges of the ground.

Harvesting of sugarcane

Sugar cane is harvested by chopping down the stems but leaving the roots that sends up new stalks called rations (the word derived from Spanish meaning sprout) for the next crop. Harvest times tend to be during the dry season.

In developing world, where sugarcane is traditionally cultivated in smaller fields, the cane is hand-harvested up to 10 years before replanting. But to avoid a decrease in yield, cane is replanted after two or three harvests in the developed world.

Once cut, cane must rapidly be taken to the factory for processing to avoid losing of its sugar content. Harvested sugarcane is transported to the factory often by truck or rail wagon but sometimes on a cart pulled by a bullock or a donkey!

PROCESSING SUGARCANE IN THE FACTORY

Sugarcane processing passes through **two** stages, namely **milling and refining**.

1. Milling the sugar cane

Milling stage takes place at sugar-extraction mills that extract a raw sugar and a mill-white sugar through such processes as: -

- **Shredding** fresh cane chops into smaller pieces by shredder.
- **Crushing and grinding** cane to extract the juice by a series of rolling crushers and grinders called the milling train and with the addition of water, a **bagasse** and an **impure juice** is produced.
- **Boiling and clarifying** the mixed juice takes place in boilers and clarifier tanks, in which **lime** is added to remove impurities and produce a **clear sugar juice** and **mud** or **solid juice** in the boiling house.
- **Evaporating and colorization** of the pure sugar juice by adding **SO₂**, (color-inducing) occurs in a number of evaporators to form a crystallized raw sugar and molasses.



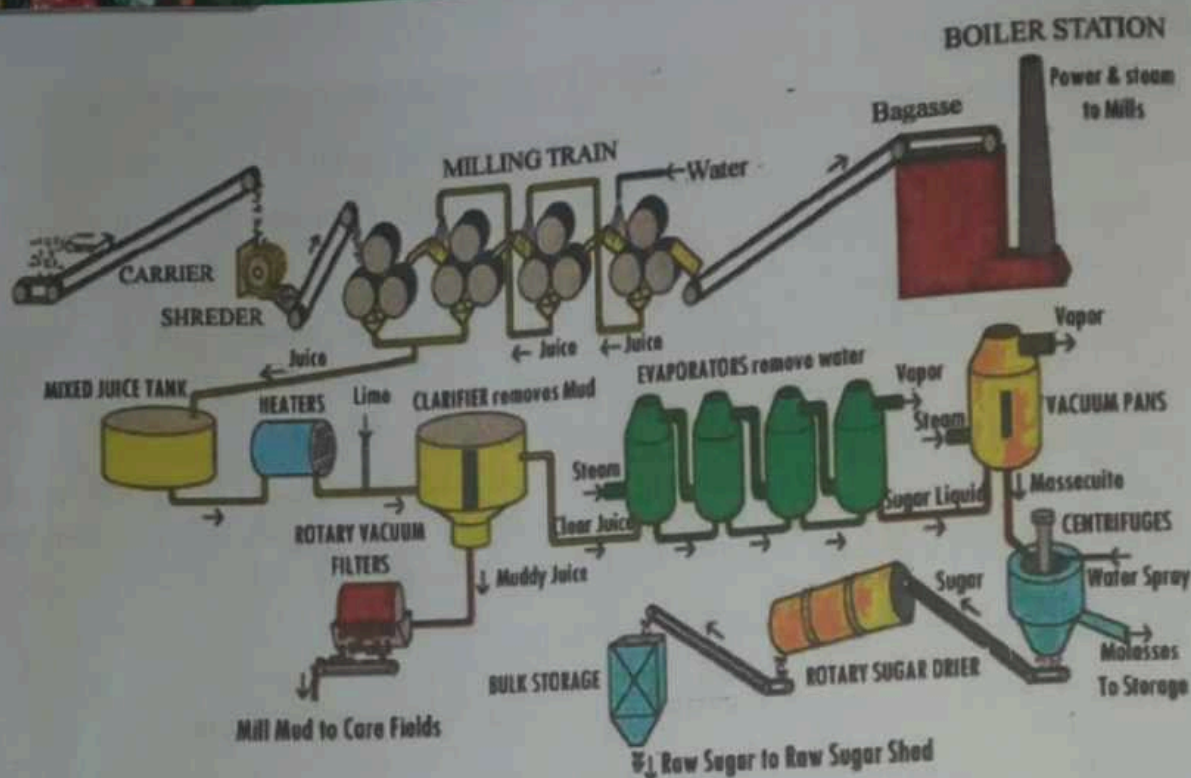


Fig.6a. Sugar formation flowchart of the sugar factory

2. Refining the raw sugar

The raw sugar is sent to the curing house for farther purification or intended for local consumption.

- **Centrifuging** to separate the mixture of the **raw sugar** and the heavy **molasses** syrup is followed by washing away the outer coating of sugar crystals in the centrifugal chambers, and this process is known as **affination**.
- **Precipitating the sugar solution** by adding both phosphoric acid and calcium hydroxide (phosphotation) or by using carbon dioxide and calcium hydroxide (carbonation) to produce calcium phosphate or calcium carbonate precipitate that entrap and absorb impurities and skimmed off as they float at the top of the tanks.
- **Filtering** any remaining solids from the clarified sugar and the final molasses in which still contains 20-30% sucrose and 15-25% glucose and fructose.
- **Concentrating** to super saturation and **crystallizing** the purified sugar solution (brown) is then **decolorized** by filtration through activated carbon to form the **white refined sugar**.
- Finally, the white sugar is heated in a rotary dryer and blown cool air through it for several days to produce granulated white sugar crystals.

Then sugar passes through inspection, bagging, packaging, loading, wholesaling and retailing.

By-products of sugarcane

Other than sugar, by-products derived from sugarcane includes

1. **Bagases** the residual dry fiber of the cane after cane juice has been extracted is used for several purposes:
 - fuel for the boilers and kilns,
 - production of paper, paperboard products, and reconstituted panel board,
 - agricultural mulch, and
 - As a raw material for production of chemicals.
2. **Molasses** is produced in two forms: Blackstrap and purer molasses syrup.

Blackstrap molasses is used as

- Food and dietary supplement,
- An ingredient in animal feed,
- To produce ethanol and rum,
- To manufacturing of citric acid.
- Sugar cane wax or glue

Purer molasses syrups are sold as molasses, and may also be blended with maple syrup, invert sugars, or corn syrup. Both forms of molasses are used in baking.

It can be used as a biofuel alternative to gasoline and is widely used in cars in Brazil. It is an alternative to gasoline

GROWING REGIONS OF SUGAR CANE

- a) Caribbean Regions
- b) Latin America
- c) Asia
- d) Australasia

Largest producers are not exporters (India and Brazil) but Cuba and Australia are the largest exporters

1. India
2. Cuba
3. Brazil
4. China
5. Mexico
6. U.S.A
7. Philippine

8. Pakistan
9. Australia
10. Colombia
11. S. Africa
12. Dominica Republic

Tea

The tea plant is an evergreen shrub which by pruning is kept to a height of about 1.5 m. The plant grows best in tropical and sub-tropical monsoon regions which have:

1. Annual rainfall between 150 and 750cm of rain or equivalent irrigation.
2. Average monthly temperature of at least 18°C during the plant's nine months growing season.
3. Well drained soil.
4. Slope hills.
5. High humidity producing morning mist or dew which enables the young leaves to grow quickly.

Origin

Tea is an aromatic beverage which is native to East Asia, and probably originated around the meeting points of the lands of north Burma and southwest China.



Cultivation of tea

The plant is grown from seed in a nursery. When it is about 0.3 m (1 ft) high, it is transplanted into sloping land. After about 3 years the plant is mature, and its leaves are ready for picking.

plants are cultivated at elevations of up to 1,500 m (4,900 ft) above sea level. Though at these heights the plants grow more slowly, they acquire a better flavor.

Two principal varieties are used: *Camellia sinensis* which is used for most Chinese and Japanese teas, and *Camellia assamica*, used in India.

Tea plants can reach up to 16 m, high, but they are pruned to waist height for ease of plucking and to bear more new shoots (called flushes) which provide new and tender leaves with higher quality.

Pests of tea

This include the mosquito bugs (genus helopeltis) that tatter leaves and they are sprayed with insecticides.

Harvesting and processing tea

Tea is harvested by picking the young leaves at the tips of its shoot. Picking tea takes place weekly, of 20 pickings per season in India and 4 pickings per season in Japan and china. Picking tea leaves needs abundant skilled and cheap labour

Tea is commonly processed in **two forms**: -

1. **Green tea:** tea leaves are dried on trays in the sun or in heated room (withering) to lost moisture and become soft and not to break when rolled.
Then leaves are crushed and sifted.
2. **Black tea:** (post-fermented) the leaves are fermented to reduce the tannic acid content and fermentation is stopped by roasting that turns leaves to black.



Non-fermented,



light-fermented,



medium-fermented



and fully-fermented



Tea growing regions and trade

Tea plant flourishes in humid tropical and sub-tropical regions in monsoon lands of east and south Asia.

- I. **India** grows extensively in
 - The Darjeeling district on the southern slopes of Himalayan foothills
 - On the slopes of Assam Hills along the Brahmaputra valley
 - On the Nilgiri and Cardmon Hills of the South
- II. **Central Sri Lanka** around Kandy
- III. **China** on the Yangtze Basin
- IV. **Japan.** In southern Honshu
- V. **The C.I.S** around the Black Sea where winters are mild

- VI. Indonesia in West Java
- VII. Bangladesh

Coffee

The coffee plant is perennial shrub which is extensively cultivated in latitudes between 30°S and 28°N . The shrub is pruned to a height of about 2 m, and after flowering the shrub produces clusters of berries along its branches. The coffee plant grows best in tropical and sub-tropical regions and it is commercially cultivated in regions which have:

1. An average monthly temperature of between 21° and 26°C with a minimum daily temperature of 15°C with high humidity.
2. An annual rainfall of about 1700 mm with a maximum in the growing season and minimum when the plant is flowering and when the berries are ripening.
3. Rich deep loamy soils which are well drained to enable the roots to spread easily.
4. Reasonable shade.
5. A cool dry season to facilitate the picking and drying of the berries.
6. A plentiful supply of cheap labor for weeding, spraying, picking, drying, sorting and bagging the berries.

Commercial cultivation of coffee

Although coffee grows within a defined area between the two tropics called **the bean belt or coffee belt**, but coffee is native to tropical Africa, Madagascar, and the Comoros, Mauritius and Reunion in the Indian Ocean.

Coffee grown from its seeds, which are sown traditionally in the field by placing 20 seeds in each hole at the beginning of the rainy season or in nurseries is which more safe and transplanted the seedlings **six months after germination** into the fields. *Diagram on page 69*



The seedlings grow under a shade of tall trees to protect them from the sun. The plant is pruned to produce more shoots and the soil is manure till it is reaching maturity in the fifth year of growing.

Pests

A large number of various pests and insects attack and mass spraying of insecticides is used to kill such insects as the beetles, bugs, mites, nematodes and snails. Also, birds and rodents eat the coffee berries but relatively less impact.

Types or varieties of coffee

Coffee beans can be distinguished by their differences in flavor, aroma (pleasant smell), body and acidity.

There are two main types of coffee and some subspecies:

1. **Arabica** coffee beans are cultivated mainly in Latin America, eastern Africa or Asia.
2. **Robusta** beans are grown in central Africa, throughout Southeast Asia, and Brazil.

Varietals (subspecies) are generally known by the region in which they are grown, such as Colombian, Java and Kona.

Harvesting and processing coffee

Once ripe, coffee berries are picked by hand in the autumn and dried on trays for about three weeks and covered at night from rain and dew.

Dried coffee berries are processed by either one of two methods:

- Dry process method: the pulp is removed by machine to release the beans, which are roasted to varying degrees, depending on the desired flavor
- Wet process method: the berries are fermented by putting into water to remove the pulp, after which beans are dried in the open.

The dried beans are packed in bags or they Roasted beans are ground and brewed with near boiling water to produce coffee as a beverage.

Coffee is slightly acidic and can have a stimulating effect on humans because of its caffeine content.

World production and trade of coffee

The largest producer and exporter is Brazil followed by Colombia, Ivory Coast, Uganda, Angola, Mexico, Indonesia, Ethiopia, India, and El Salvador. Also, other African producer countries include Zambia, Kenya and Zaire.

The International Coffee Agreement was set up in 1962, to operate controls to regulate the production and prices.

U.S.A is the major importer of coffee from Brazil and followed by W. Germany, France, Italy, Sweden and Holland.

Cocoa

The cacao plant was first given its botanical name by Swedish natural scientist Carl Linnaeus in his original classification of the plant kingdom, who called it *Theobroma*.

The cacao tree is an indigenous tree of Latin America, it is now extensively cultivated on cleared forest lands in West Africa between the latitudes 10°N and 10°S of the Equator. The tree is grown in regions which have:

1. A mean annual temperature of about 26°C with a range of temperature of less than 10°C .
2. An annual rainfall of at least **2000 mm** which is evenly distributed throughout the year.
3. No strong winds (such winds could easily damage the pods).
4. Deep well-drained soils which are rich in potash.



The cocoa bean, simply is dried and fully fermented fatty seed of from which cocoa solids and cocoa butter can be extracted. They are the basis of chocolate, as well as beverages.

Chocolate was introduced to Europe by the Spaniards, and became a popular beverage by the mid-17th century. They also introduced the cacao tree into the west India and the Philippines. It was also introduced into the rest of Asia and into West Africa by Europeans. In the gold coast, modern Ghana, cacao was introduced by an African, **Tetteh Quarshie**.

Types of cocoa

The three main varieties of cocoa plant are

- **Forastero**, comprising 95% of the world production of cocoa
- **Criollo**, plantations have lower yields than those of Forastero, and also tend to be less resistant to several diseases that attack the cocoa plant
- **Trinitario**, is a hybrid between Criollo and Forastero varieties. It is considered to be of much higher quality than Forastero, but has higher yields and is more resistant to disease than Criollo.

Cultivation of cocoa

Cocoa is grown from its seeds which are sown in a nursery and the seedlings are transplanted into the fields under tall trees to provide a shade.

Cocoa reaches maturity and bears their first pods five years after planted, though not at full production until eight years.

Unlike most fruiting trees, the cacao pod grows directly from the trunk or large branch of a tree rather than from the end of a branch, similar to jack fruit. This makes harvesting by hand easier as most of the pods will not be up in the higher branches.



Harvesting and processing of cocoa

The ripe and near-ripe pods, as judged by their color, are harvested from the trunk and branches of the cocoa tree with a curved knife on a long pole. Care must be used when cutting the stem of the pod to avoid damaging the junction of the stem with the tree, as this is where future flowers and pods will emerge. One person can harvest an estimated 650 pods per day.



Cocoa pods, beans and chocolates

The harvested cocoa pods are cleaned, roasted and cracked to remove their hard skins called hulls. Then beans are **fermented** for four to seven days and must be mixed every two days. The fermented beans are dried by spreading them out over a large surface and constantly raking them for five to 14 days, depending on the climate conditions.

Finally, the beans are trodden and shuffled about (often using bare human feet) and sometimes, during this process, red clay mixed with water is sprinkled over the beans to obtain a finer color, polish, and protection against molds during shipment to factories in the **United States, the Netherlands, the United Kingdom, and other countries.**

The beans should be dry for shipment and traditionally exported in **jute bags**, and over the last decade, beans are increasingly shipped in "**mega-bulk**" parcels of several thousand tones at a time on ships. Shipping in bulk significantly reduces handling costs.

Since cocoa beans are susceptible to pest attacks a protection techniques for shipping and storage are used such as:

- Fumigation with methyl bromides
- The application of pyrenoids
- Hermetic storage in sealed bags (airtight).

Uses of cocoa

Once the cocoa beans have been harvested, fermented, dried and transported to the factories, they are crushed and ground into a paste from which the fat containing is separated to form the **cocoa butter**. The remained paste is dried to a **powder** called **cocoa**, which is used for making **chocolate**, together with cocoa butter, milk and sugar.

Cocoa producers and exporters

The largest producers and exporters of cocoa are Ghana, Nigeria, Brazil, Ivory Coast, Cameroon, and Ecuador. The African countries produce half of the world's cocoa.



Exercise

1. Explain how to cultivate either one of the following crops:
 - a) Sugar cane, coffee, tea and cocoa
 - b) List at least four growing conditions for the first two crops in (a)
2. Name four perennial crops and two annual crops you have learned?
3. What is the difference between mean annual temperature and the annual range of temperature?

→ Effort + Wrong Logic = No Result

Fruit Crops

Mango



Mango tree is a tropical perennial, evergreen plant which bears a juicy fruits resembling apple. Mango family is known as *Magnifera* and there are two main species or types, namely:

- Indian mango (*Magnifera indica*) have brightly colored fruit
- Indo-Chinese mangoes

A mango originated in India and Southeast Asia and grows commercially best in tropical and subtropical regions which have the following growing conditions:

1. A cool, dry winters and wet, hot summers
2. Mean annual temperature of between 40°F and 50°F.
3. A frost free growing season
4. A deep, well-drained soil

Cultivation of Mango

Mango is grown from its seeds in a nursery where the young seedlings are watered every day or two for the first couple of weeks. The mango seedlings are grafted before transplanting into the field.

Mango trees are pruned to sprout more terminal branches for keeping the tree a manageable size and a nice shape and usually pruning is done after harvesting or just before flowering in every year.

Flower is triggered by cool nights at the tip of the branches and the flower panicles self-pollinate and bear the fruits.

Harvesting mangoes

Mango fruits can be harvested the beginning of the wet season as it changes color to yellow or red and even when green to ripen at room temperature of between 18°C - 22°C, because birds and bats may eat or damage the fruits.

When harvesting fruits, avoid the sap that can cause burns, allergies or dermatitis and rotten the skin of the fruits.

**Mango pests and diseases**

The most serious mango disease is **anthracnose**, a fungus that can cause the flowers to go black and fall off. It also causes black spots on stem and small fruit, leaves may go brown and It is worst in areas where it rains during flowering and fruit set. Spraying with a copper solution or a fungicide can be used to control the disease.

Also, other mango pests and diseases include **fruit spotting bugs** and **borers**.

$$C = \frac{5}{9} (32 + 40)$$

$$C = \frac{5}{9} (72) = 40$$

$$\frac{5}{9} (32 + 40)$$

Can You Grow Mangoes Indoors?

Nope. But you can grow mangoes in pots! So if it is just a little bit too cold in winter where you are, you can buy a dwarf variety and grow it in a tub and bring it inside during the coldest time of the year.

However, even a mango tree growing in a pot still needs lots and lots of heat and sun in summer. Growing mangoes indoors won't do!

How To Grow Banana Plants And Keep Them Happy.

Growing bananas does not take much effort, but it does require that you get a few things right when you first get started.

Banana plants can offer many benefits:

- They make great windbreaks or screens,
- they can keep the sun of the hot western side of your house,
- they utilize the water and nutrients in waste drains (think washing water or outdoor shower),
- the leaves can be fed to horses, cows and other grazers,
- The dried remains of the trunks can be used for weaving baskets and mats.

But when I look around friends' gardens then I see some pretty sad looking banana plants growing there. It helps to understand what bananas like and dislike if you want them to be happy!

Banana plants like:

- Rich, dark, fertile soils.
- Lots of mulch and organic matter. LOTS. Just keep piling it on.
- Lot of nitrogen and potassium. (Chicken manure!)
- Steady warmth, not too hot and not too cold. (Bananas are sissies when it comes to temperatures...)
- Steady moisture, in the ground and in the air.
- The shelter of other bananas! That's the most overlooked aspect by home growers...

Banana plants dislike:

- Strong winds.
- Extreme heat or cold.
- Being hungry or thirsty.
- Being alone and exposed.

More detail on all that below.

Banana varieties

Cavendish is the variety that you know from the shops. It's a stout variety that produces large heavy bunches.

Lady Fingers are very tall and slender plants and have sweeter fruit.

Plantains are cooking bananas. They are drier and more starchy. You use them green like you would use potatoes, and they taste similar.

(80% of all bananas grown in the world are plantain varieties! They are an important staple food in many tropical countries.)

There are other varieties, but those are the most popular and most commonly grown.

How do bananas grow?

How do bananas grow?

Bananas aren't real trees, not even palm trees, even though they are often called banana palms. Bananas are perennial herbs. (Gingers, heliconias and bird-of-paradise flowers are distant relatives of bananas. They are in the same order, *Zingiberales*.)

Banana trunks consists of all the leaf stalks wrapped around each other. New leaves start growing inside, below the ground. They push up through the middle and emerge from the centre of the crown. So does the flower, which finally turns into a bunch of bananas.

Here is a picture series showing how the flower looks at first, and how the bananas appear and curl up towards the light.



Those pictures were taken over the course of a few days. You can pretty much watch this happen. But now it will take another two months or so, depending on the temperature, for the fruit to fill out and finally ripen.

A banana plant takes about 9 months to grow up and produce a bunch of bananas. Then the mother plant dies. But around the base of it are many suckers, little baby plants.

At the base of a banana plant, under the ground, is a big rhizome, called the corm.



The corm has growing points and they turn into new suckers. These suckers can be taken off and transplanted, and one or two can be left in position to replace the mother plant.

Great, so now you know what to do once you have bananas growing in your garden, but how do you start?

How to get started growing bananas.

First you need to make sure that you can grow bananas where you are.

You need a tropical or warm subtropical climate. Bananas can handle extreme heat (if they have enough water), but they don't like it. They can handle cool weather for a short while, but they don't like that either. Below 14°C (57F) they just stop growing.

If the temperatures drop any lower the fruit suffers (the skin turns greyish) and the leaves can turn yellow. Frost kills the plant above ground, but the corm can survive and may re-shoot.

The ideal temperature range for banana growing is around 26-30°C (78-86F).

You need a lot of water to grow bananas. The huge soft leaves evaporate a lot, and you have to keep up the supply. Bananas also need high humidity to be happy. (Where I live the commercial banana growers water their plants two or three times a day with sprinklers to keep up the humidity in the banana plantation!)

You need very rich soil. If you don't have good soil to start with, make some. Incorporate lots and lots of compost and plenty of chicken manure before you plant your bananas (wood ash for extra potassium doesn't hurt either), and then mulch them very thickly. And keep mulching and feeding them!

And you need room so you can plant enough of them together. Bananas need shelter from wind. Growing many banana plants together increases the humidity in the middle, evens out temperature changes a bit, and it shades and cools the trunks. (You don't want to cook the flower that's forming in the middle...)

If you get a chance look at a commercial banana plantation somewhere. The outside rows, especially the western side, always look sad. The best bananas grow on the inside...

You should plant bananas in blocks or clumps, not single rows and definitely not single plants. If you have very little room you can grow a few banana plants together and grow something else on the outside to protect them. But you do need to give them that sheltered jungle environment if you want them to be happy.

Planting bananas

You cannot grow bananas from seeds. Banana plants don't produce seeds.

The best way is to start with the above mentioned suckers. Know someone who grows bananas? Talk to them. Every banana plant produces a lot more suckers than you need, so people usually have plenty to give away.

Only take suckers from vigorous banana plants. The suckers should have small, spear shaped leaves and ideally be about four feet high. (Smaller suckers will take longer to fruit and the first bunch will be smaller.)

Cut the sucker from the main banana plant with a sharp shovel. Cut downwards between the mature plant and the sucker. You have to cut through the corm. It's not easy...

Make sure you get a good chunk of corm and many roots with it. Chop the top off the sucker to reduce evaporation while you move it and while it settles into its new home. (Remember, the growing point is at the bottom of a banana plant. You can decapitate the sucker. It will grow back.)

You can also dig up a bit of corm and chop it into bits. Every bit that has an eye can be planted and will grow into a banana plant. But it takes longer than growing banana suckers...

Plant your bits or suckers in your well prepared banana patch, keeping two to five metres between them.

The spacing depends on your layout. My bananas grow in a block of several double rows. Within the double rows the spacing is two to three metres, but there are two plants in each position, suckers of the initial plant. And I have four to five metres between the double rows.

I also have a banana circle around an outdoor shower where I only have two metres between individual plants, and they are growing in a haphazard way. And if you have just a single clump of a few banana plants you can put them even closer together.

Keep your banana plants moist but not too wet in the early days, or they may rot. (They don't have leaves yet to evaporate water, so they don't need much.)

Maintaining your banana patch

The most common cause of death for bananas is lack of water. The most common cause for not getting fruit is starvation. Banana plants blow over in strong winds. Protect them and feed them and water them and all will be well. Other than that bananas don't need much maintenance.

Just remove any dead leaves and cut down the dead plants every now and then.

You get bigger fruit if you remove all unwanted suckers, only keeping the best one (two for very healthy, vigorous plants).



$$\frac{7}{5} \cdot 28 = 39.2$$

$$\begin{array}{r} 26 \\ 5 \overline{) 130} \\ \underline{10} \\ 30 \\ \underline{25} \\ 50 \\ \underline{45} \\ 5 \end{array}$$

$$\begin{array}{r} 40.5 \\ 32 \\ \hline 72.5 \end{array}$$

The best suckers are the ones with the small, spear shaped leaves, NOT the pretty ones with the big round leaves!

Why? A sucker that is still fed by the mother plant does not need to do much photosynthesis, so it doesn't need to produce big leaves.

And a sucker that is well looked after by the mother plant will produce better fruit and be stronger than one that had to struggle on its own...

A mature plantation is pretty much self-mulching. Just throw all the leaves and old trunks etc. back under the plants. You can also grow other plants in the understory to produce more mulch. (I use cassava, sweet potato and crotalaria).

You just need to sprinkle on some fertilizer every now and then, to replace what you took out of the system when you took the bananas. Keep the fertilizer close to the trunk as bananas don't have a big root system.

Growing banana fruit

You may see your first flower emerge after about six months, depending on the weather. Leave the leaves around it, especially the one protecting the top bend of the stalk from sunburn!



As the purple flower petals curl back and drop off they reveal a "hand" of bananas under each. Each banana is a "finger".

You may get anything between four to a dozen or more full hands. Then, under the next petal, you'll see a hand of teeny weeny excuses for bananas. Those are the male fingers.

The male fingers just dry and drop off. Only the stalk remains. If you let it grow it will eventually reach the ground.

Some people break off the "bell" (the bunch of purple flower petals at the end) about 15 cm below the last female hand. That way the banana plant puts its energy and reserves into growing big bananas, and not into growing a long stalk. (Commercial banana growers also remove some of the bottom female hands, so the remaining bananas grow bigger.)

Not everyone thinks that way, though. This is a comment from one of my readers:

I never cut the flower off the bananas. The hummers (Ed: hummingbirds) love them too much. As you said, there are always enough bananas around and though I sell them I have to keep my hummers happy.



Well, and then you patiently wait for at least another two months. You may have to prop your banana bunch, because it becomes very heavy, and a bunch can snap off or pull the whole plant over.

A good prop would be a long stick with a u-shaped hook at the end. But a long enough plank or pole can do the job, too. I leave that to your ingenuity.

Bananas are ready to be picked when they look well rounded with ribs, and the little flowers at the end are dry and rub off easily.

They will eventually ripen on the bunch, and those bananas taste the best. But once they start they ripen very quickly, faster than you can eat or use them. So you may as well cut the top hands off a bit earlier and ripen them on the kitchen bench.

You can also cut the whole bunch and hang it somewhere if you need to protect it from possums or birds or other thieves. But then all bananas will ripen at once! So be prepared.

You can preserve bananas for use in cooking and baking by peeling and freezing them. Or, to preserve them for eating, peel, split in half lengthwise and dry them.

Once the bunch is picked the rest of the plant will die quickly. Cut it to the ground, throw on some chook poo, and let the next sucker grow while you process all the bananas...

Tip: commercial banana growers use bunch covers (plastic bags open at both ends that they slip over the bunch and tie at the top) to protect bananas from diseases, insects, sunburn and marauders. You can try to buy those bags at a rural supplies store, or beg some of a grower.

I used to bag my bananas (hard to get out of habits after four years of working on commercial plantations) but I don't bother any more. Even if the birds get a few, there are still more than enough left for me and the chickens and the dog and all friends and their families and freezing and drying... So why not let the wild birds partake of the bounty as well!

Citrus



Citrus is a common term and genus (*Citrus*) of flowering plants in the rue family, retinac.

The most recent research indicates an origin in Australia, New Caledonia and New Guinea. Some researchers believe that the origin is in the part of south Asia bordered by northeast India, Burma (Myanmar) and the Yunnan province of china, and it is in this region that some commercial species such as oranges, mandarins, and lemons originated. Citrus fruit has been cultivated in an ever-widening area since ancient times, with the best-known examples being the oranges, lemons, grape fruit, and limes.

At various times, citrus plants were thought to be native to Asia (where they were first domesticated), Europe, and Florida. But the European oranges (such as the **bitter orange**) were originally brought from India at around the time of **Alexander the great**, and the "native" oranges of Florida actually originated with the **Spanish conquistadors**. The lemon reached Europe during the time of **classical Rome**.

The large citrus fruit of today evolved originally from small, edible berries over millions of years. Citrus plants diverged from a common ancestor about 15 million years ago, which was about when it diverged from the closely related *severinia*, for example the Chinese box orange. About 7 million years ago, citrus plants diverged into two groups, the main citrus genus and the ancestors of the trifoliate orange (*poncirus*), which is closely enough related that it can still be hybridized with all other citrus. These estimates are made using genetic mapping of plant chloroplast, and the evolution at that time is thought to either have occurred somewhere in southeastern Asia, or Australia.

The three original species in the citrus genus that have been hybridized into most modern commercial citrus fruit are the mandarin orange, pummelo, and citron. Within the last few thousand years, all common citrus fruits (sweet oranges, lemons, grapefruit, limes, and so on) were created by crossing those original species. Something similar has occurred with the wide array of Chile peppers originating in the hybridization of a few initial species.

The taxonomy and systematics of the genus are complex and the precise number of natural species is unclear, as many of the named species are hybrids clonally propagated through seeds (by apomixes), and there is genetic evidence that even some wild, true-breeding species are of hybrid origin.

Most cultivated *Citrus* seem to be natural hybrids or of four core ancestral species^[12] — the citron pummelo, mandarine, and papeda (see image).^[13] Natural and cultivated citrus hybrids include commercially important fruit such as oranges, grape fruit, lemons limes, and some tangerines.

Apart from these four core citrus species, there are Australian limes and the recently discovered mangshyyegan kumquats and *clymenia* sp. are now generally considered to belong within the citrus genus.^[14], which is often used as commercial rootstock, is an outgroup and may or may not be categorized as a citrus.

Tree

These plants are large shrubs or small to moderate-sized trees, reaching 5–15 m (16–49 ft) tall, with spiny shoots and alternately arranged evergreen leaves with an entire margin. The flowers are solitary or in small corymbs, each flower 2–4 cm (0.79–1.57 in) diameter, with five (rarely four) white petals and numerous stamens; they are often very strongly scented.

Fruit

The fruit is a hesperidium, a specialised berry, globose to elongated, 4–30 cm (1.6–11.8 in) long and 4–20 cm (1.6–7.9 in) diameter, with a leathery rind or "peel" called a pericarp. The outermost layer of the pericarp is an "exocarp" called the flavedo, commonly referred to as the zest. The middle layer of the pericarp is the mesocarp, which in citrus fruits consists of the white, spongy "albedo", or "pith". The innermost layer of the pericarp is the endocarp.

The segments are also called "liths", and the space inside each lith is a locule filled with juice vesicles, or "pulp". From the endocarp, string-like "hairs" extend into the locules, which provide nourishment to the fruit as it develops.

Citrus fruits are notable for their fragrance, partly due to flavonoids and limonoids (which in turn are terpenes) contained in the rind, and most are juice-laden. The juice contains a high quantity of citric acid giving them their characteristic sharp flavour. The genus is commercially important as many species are cultivated for their fruit, which is eaten fresh, pressed for juice, or preserved in marmalades and pickles.

They are also good sources of vitamin c and flavonoids. The flavonoids include various flavanones and flavones.

Cultivation



Lemons are a citrus fruit native to Asia, but now common worldwide.



Persian limes in a grocery store

Citrus trees hybridize very readily – depending on the pollen source, plants grown from a Persian lime's seeds can produce fruit similar to grapefruit. Thus all commercial citrus cultivation uses trees produced by grafting the desired fruiting cultivars onto rootstocks selected for disease resistance and hardiness.

The color of citrus fruits only develops in climates with a (diurnal) cool winter. In tropical regions with no winter at all, citrus fruits remain green until maturity, hence the tropical "green oranges". The Persian lime in particular is extremely sensitive to cool conditions, thus it is not usually exposed to cool enough conditions to develop a mature color. If they are left in a cool place over winter, the fruits will change color to yellow.

The terms "ripe" and "mature" are usually used synonymously, but they mean different things. A mature fruit is one that has completed its growth phase. Ripening is the changes that occur within the fruit after it is mature to the beginning of decay. These changes usually involve starches converting to sugars, a decrease in acids and a softening and change in the fruit's color.

Citrus fruits are non-climacteric and respiration slowly declines and the production and release of ethylene is gradual. The fruits do not go through a ripening process in the sense that they become "tree ripe." Some fruits, for example cherries, physically mature and then continue to ripen on the tree. Other fruits, like pears, are picked when mature but before they ripen, then continue to ripen off the tree. Citrus fruits pass from immaturity to maturity to over-maturity while still on the tree. Once they are separated from the tree, they will not increase in sweetness or continue to ripen. The only way change may happen after being picked is that they will eventually start to decay.

With oranges, color cannot be used as an indicator of ripeness because sometimes the rinds turn orange long before the oranges are ready to eat. Tasting them is the only way to know whether or not they are ready to eat.



Citrus trees are not generally frost hardy. Mandarin oranges (*C. reticulata*) tend to be the hardiest of the common *Citrus* species and can withstand short periods down to as cold as -10°C (14°F), but realistically temperatures not falling below -2°C (28°F) are required for successful cultivation. Tangerines, tangors and yuzu can be grown outside even in regions with more marked sub-freezing temperatures in winter, although this may affect fruit quality. A few hardy hybrids can withstand temperatures well below freezing, but do not produce quality fruit. Lemons can be commercially grown in cooler-summer/moderate-winter, coastal Southern California, because sweetness is neither attained nor expected in retail lemon fruit. The related trifoliate orange (*Citrus trifoliata*) can survive below -20°C (-4°F); its fruit are astringent and inedible unless cooked but a few better-tasting cultivars and hybrids have been developed (see citranges).

Region - A
Bio - life



Leaf of Citrus tree

The trees thrive in a consistently sunny, humid environment with fertile soil and adequate rainfall or irrigation. Abandoned trees in valleys may suffer, yet survive, the dry summer of Central California's Inner Coast Ranges. At any age citrus grows well enough with infrequent irrigation in partial shade, but the fruit crop is smaller. Though broadleaved, they are evergreen and do not drop leaves except when stressed. The stems of many varieties have large sharp thorns. The trees flower in the spring, and fruit is set shortly afterward. Fruit begins to ripen in fall or early winter months, depending on cultivar, and develops increasing sweetness afterward. Some cultivars of tangerines ripen by winter. Some, such as the grapefruit, may take up to eighteen months to ripen.

Production



Major producer regions

According to UN 2007 data, Brazil, china, the United States, India, and Spain are the world's largest citrus-producing countries.

Major commercial citrus growing areas include southern China, the Mediterranean basin (including southern Spain), South Africa, and Australia, the southernmost United States, Mexico and parts of South America. In the United States, Florida, California, Arizona, and Texas are major producers, while smaller plantings are present in other Sun Belt states and in Hawaii.

Pests and diseases



brockwary
Citrus plants are very liable to infestation by aphids, whitefly and scale insects (e.g. California red scale). Also rather important are the viral infections to which some of these ectoparasites serve as vectors such as the aphid-transmitted citrus tristeza virus which when unchecked by proper methods of control is devastating to citrine plantations. The newest threat to citrus groves in the United States is the Asian citrus psyllid.

The Asian citrus psyllid is an aphid-like insect that feeds on the leaves and stems of citrus trees and other citrus-like plants – but the real danger lies in that it can carry a deadly, bacterial tree disease called huanglongbing (HLB), also known as citrus greening disease.

In eastern Australia, the bronze-orange bug (musgraveia sulciventris) can be a major pest of citrus trees, particularly grapefruit. In heavy infestations it can cause flower and fruit drop and general tree stress.

Cons
European brown snails (*cornu aspersum*) can be a problem in California, though laying female khaki campbell and other mallard-related ducks can be used for control.

Deficiency diseases

Citrus plants can also develop a deficiency condition called chlorosis, characterized by yellowing leaves highlighted by contrasting leaf veins. The shriveling leaves eventually fall, and if the plant loses too many, it will slowly die. This condition is often caused by an excessively high pH (alkaline soil), which prevents the plant from absorbing iron magnesium zinc, or other nutrients it needs to produce chlorophyll. This condition can be cured by adding an appropriate acidic fertilizer formulated for citrus, which can sometimes revive a plant to produce new leaves and even flower buds within a few weeks under optimum conditions. A soil which is too acidic can also cause problems; citrus prefers neutral soil (pH between 6 and 8). Citrus plants are also sensitive to excessive salt in the soil. soil testing may be necessary to properly diagnose nutrient deficiency diseases.

examination

Uses

Uses



Wedges of pink grape fruit, lime grape fruit lime, and lemon, and a half orange half orange (clockwise from top)



Many citrus fruits, such as oranges, tangerines, grape fruits, and Clementine's, are generally eaten fresh. They are typically peeled and can be easily split into segments. Grapefruit is more commonly halved and eaten out of the skin with a spoon. There are special spoons (grape fruit spoons) with serrated tips designed for this purpose. Orange and grapefruit juices are also very popular breakfast beverages. More acidic citrus, such as lemons and limes, are generally not eaten on their own. Meyer Meyer lemons can be eaten out of hand with the fragrant skin; they are both sweet and sour. Lemonade or limeade is popular beverages prepared by diluting the juices of these fruits and adding sugar. Lemons and limes are also used as garnishes or in cooked dishes. Their juice is used as an ingredient in a variety of dishes; it can commonly be found in salad dressings and squeezed over cooked meat or vegetables.

A variety of flavours can be derived from different parts and treatments of citrus fruits. The rind and oil of the fruit is generally very bitter, especially when cooked, and so is often combined with sugar. The fruit pulp can vary from sweet and tart to extremely sour. Marmalade, a condiment derived from cooked orange and lemon, can be especially bitter, but is usually sweetened to cut the bitterness and produce a jam-like result. Lemon or lime is commonly used as a garnish for water, soft drinks, or cocktails. Citrus juices, rinds, or slices are used in a variety of mixed drinks.

The colourful outer skin of some citrus fruits, known as zest, is used as a flavouring in cooking; the white inner portion of the peel, the pith, is usually avoided due to its bitterness. The zest of a citrus fruit, typically lemon or an orange, can also be soaked in water in a coffee filter, and drunk.

Medical

Oranges were historically used for their high content of vitamin C, which prevents scurvy. Scurvy is caused by vitamin C deficiency, and can be prevented by having 10 milligrams of vitamin C a day. An early sign of scurvy is fatigue. If ignored, later symptoms are bleeding and bruising easily. British sailors were given a ration of citrus fruits on long voyages to prevent the onset of scurvy, hence the British nickname of limey.

Pectin is a structural heteropolysaccharide contained in the primary cell walls of plants. Limes and lemons as well as oranges and grapefruits are among the highest in this level.^[25]

After consumption, the peel is sometimes used as a facial cleanser.

Before the development of fermentation -based processes, lemons were the primary commercial source of citric acid.

Citrus fruit intake is associated with a reduced risk of stomach cancer. Also, citrus fruit juices, such as orange, lime and lemon, may be useful for lowering the risk of specific types of kidney stones. Grapefruit is another fruit juice that can be used to lower blood pressure because it interferes with the metabolism of calcium channel blockers. Lemons have the highest concentration of citrate of any citrus fruit, and daily consumption of lemonade has been shown to decrease the rate of kidney stone formation.

Oil palm faming



Oil Palm originated from W. Africa.

- Grows in bunches with each carrying up to 1000 egg shaped fruits which weigh 50 kg.
- Nigeria is the 2nd leading exporter of palm oil after Malaysia.

Ecological requirement

- High temperatures throughout the year (over 21°C).
- Heavy and well distributed rainfall throughout the year.
- High relative humidity.
- Well drained porous and fertile soils.
- Undulating land which is less exposed to strong winds

Human factors

- Abundant labor for clearing land, tendering seedlings, regular weeding, etc.
- Proper transport network for harvested fruits to reach the processing factories the same day so as not to change into fatty acids.
- Location of processing factories within or near growing areas, since oil palms are perishable and must be processed the same day.
- Efficient management to ensure that the crops are inspected frequently for any disease or pest attack for spraying to be done to control their spread.
- Capital to pay labor wages, maintain feeder roads, vehicles and factories

Cultivation of oil palm Oil palm seeds are planted in a nursery where they are watered and sprayed

- They are transplanted in the field after one year.
- They are inter-planted with food crops to force the farmer to weed the fields regularly
- The plants are inspected regularly for pests and diseases and sprayed promptly.
- The palms reach maturity after 10 years by changing their color to deep orange or red.

Harvesting oil palm

- Harvested by cutting the base of the bunch using a curved knife tied on a long pole.

The fruits are immediately collected and transported to the factory in lorries

1.5 Livestock Farming



- Rearing of domestic animals including poultry.

Traditional livestock farming

- Rearing of animals on natural pasture involving seasonal migration in search of water and pasture.

Factors influence pastoralism in Somaliland

- Grazing areas are free from animal pests especially tsetse flies for being dry and hot.
- Savannah grassland and semi-desert conditions which cause grass to sprout during rains and drying during the hot dry season.
- Availability of grass most times of the year in the bush and wooded savannah.
- Gentle or relatively flat terrain of the areas which makes it easy for the movement of animals from one place to another.
- Sparse population of N and N.E region due to harsh climatic conditions which encourages nomadic pastoralism because each community is able to occupy large tracts of land.

- f) Desert and semi-desert conditions which don't favor agriculture making livestock rearing to be way of earning livelihood.
- g) Tradition of the people whereby animals are a sign of wealth and are used for paying dowry and slaughtered for festivals

Characteristics of pastoral farming

- a) They keep large numbers of animals as an insurance against natural deaths.
- b) They practice uncontrolled breeding which results into large herds.
- c) Many kinds of animals are kept e.g. cattle, sheep, goats and camels.
- d) Animals are reared for subsistence not for commercial purposes.
- e) They keep indigenous cattle which are hardy such as Zebu and Boran.
- f) They keep animals of poor quality due to lack of quality feeds and weakening by diseases making them to be of low value.
- g) Animals are a sign of wealth and are reared for the purpose of paying dowry and slaughter during cultural festivals.
- h) (h) There is seasonal movement whereby they spend the dry season in one place and wet season in another.
- a. Disease incidences of both livestock and human are common due to tropical conditions.

Boran
Sahib
Luto
Dagari

Problems facing pastoralism in Somaliland

- (a) Shortage of water and pasture due to long dry spell making animals to be of poor quality.
- (b) Pests such as ticks and fleas which weaken animals and diseases such as east coast fever, foot and mouth
- (c) and anthrax which cause heavy losses of stock.
- (d) Overstocking causing overgrazing leading to severe erosion, poor pastures and poor quality animals which fetch low prices.
- (e) Lack of extension and veterinary services due to insecurity and constant movement hindering improvement of animals reared.

- (f) Low levels of education and culture leading to keeping animals for wealth and prestige making them to overstock leading to severe erosion, poor pastures and poor quality animals.
- (g) Poor pastures resulting from poor soils with most areas consisting of tuft grasses and bare land.
- (h) Cattle rustling which causes loss of live and destruction of property.

Significance of livestock rearing

- ✓ Animals are source of food to human
- ✓ Animals are source of income
- ✓ Cultural uses
 - Medium of exchange
 - Social ceremonies
 - Recreational purpose
- ✓ Some animals are used for provision of labor for cultivator and transport.
- ✓ Livestock provide some raw materials required in the industrial such as wool and fur.
- ✓ Traditionally chicken is used to wake up people early in the morning
- ✓ when crowing.

1.6 Plant and Animal Fibers

Introduction

Man's first clothing was probably made from leaves, grasses and bark, and the skins of animals. Today, his clothing is made from natural fibers, animal and plant, and synthetic fibers, which are made in the laboratory. Before natural fibers can be made into clothing they must first be joined together by spinning to make a continuous thread, called Yarn, which is then woven into cloth. Woven materials are called Textiles.

Main types of fibers:

- ❖ Plant: cotton, jute, manila hemp, sisal hemp
- ❖ Animal: wool, silk.

COTTON

Cotton is made from the fibers of the fruits of the cotton plant. This plant, which is an annual, grows to a height of about 1.5 meters (5feet) before it flowers. The fruit is like a pod and is called a Boll. It contains black seeds which are embedded in amass of white fibers, which is often called cotton lint.

Cotton is classified according to the length of its fiber. When this is less than 3 centimeters (1.2 inches), it is called Short staple cotton. When it is over 3 centimeters it is called long staple cotton. Long staple cotton produces finer yarn which makes into finer cotton than short staple cotton. The latter is therefore used for making coarse cloth. However, most of the cotton grown is short staple.



Growing Conditions of Cotton

The commercial cultivation of cotton can only be undertaken successful in regions which have:

1. An annual rainfall of between 500mm (about 20in) and 1000mm (about 40 in), most of which falls in the growing season, or the equivalent in irrigation water.
2. A growing season of about 200 days with temperatures of about 21°C (about 70°F) and the complete absence of frost.
3. Abundant sunshine when the flowers are forming and when the fruit is ripening.
4. A dry harvest season.
5. Rich, deep soils which contain plenty of organic matter.
6. Abundant labour for tending the plants and picking the bolls.

Cultivation of cotton:

The plant is grown from cotton seeds which are planted in rows about 1 meter apart. The seed is sown in the spring in sub-tropical regions, but in tropical monsoon regions it is sown just before the wet season begins. After the seeds germinate, and throughout the growing seasons, the cotton fields must be continuously weeded and the plants sprayed to control insects pests, such as, the boll weevil. This is small insect which hatches from an egg laid in the cotton flower bud. It eats its way out of the bud which causes the bud to fall off. The amount of damage that weevils can do is tremendous because one pair of weevils can produce more than 10 million insects in one season.

Cotton makes great demands on the soil and it quickly removes the organic matter. Soils must therefore be continuously fertilized. If this is not done, the crop will probably fail and if this happens and is followed by heavy rains, soil erosion often takes place, especially on sloping land. Erosion can also be caused by growing only cotton on the same land after year. This causes the soil structure to deteriorate because of the extraction of some mineral salts by the cotton plant. One way of cotton preventing this type is to interplant cotton with other crops, especially leguminous crops such as groundnuts and soya beans, or to grow other crops in rotation with cotton. The lands cotton at one time experienced very severe soil erosion, but this has largely been prevented by mixed crop farming and the use of fertilizers.

Cotton picking:

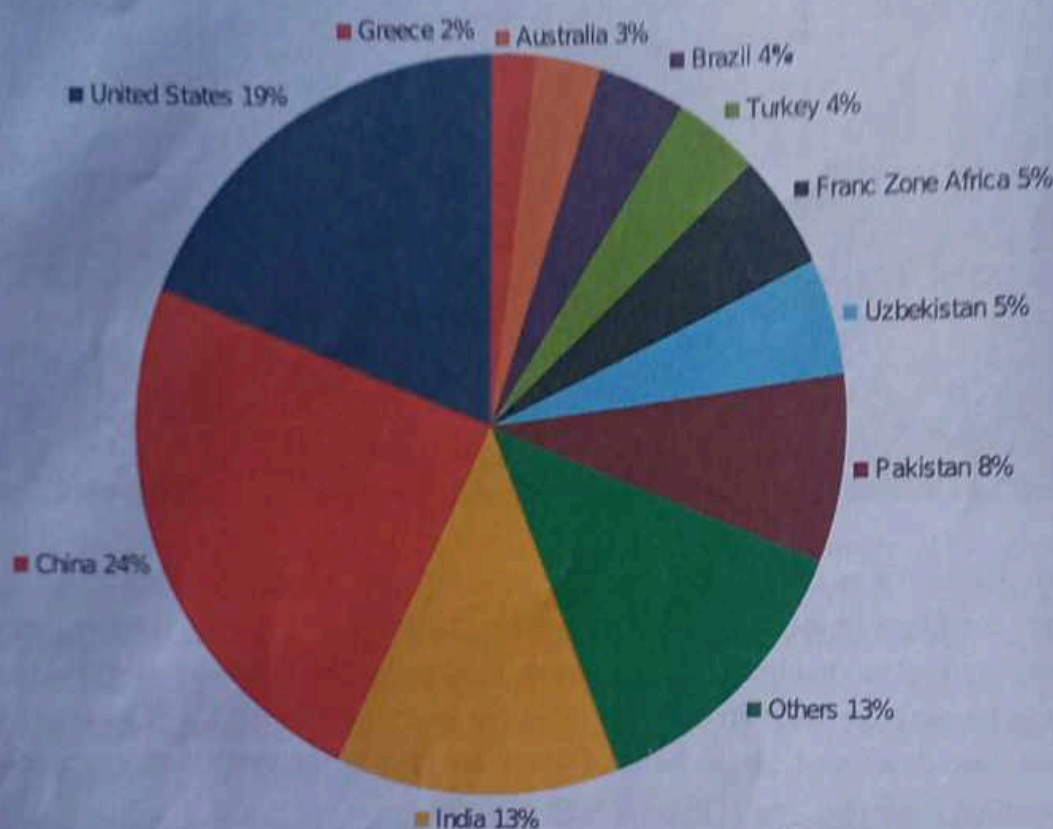
Cotton bolls are harvested as soon as they burst because any rain which falls after they have opened damages the fibers in the bolls. Although picking is still done by hand in many cotton regions, machine pickers are being increasingly used. But hand picking is more selective than machine picking because the bolls do not all open at the same time. In the USA, a variety of cotton plant has been developed, all the bolls of which are open at the same time. Harvesting the bolls by machine from this type of plant is very efficient.

Treatment of the lint

The fibers in the bolls are called Lint, and this has to be separated from the cotton seeds. The process by which this is done is known as ginning and it takes place in a machine called a Gin. This lint is then packed into bales and sent to factories where the lint is spun into a continuous thread called Yarn. The manufacture of yarn into cotton cloth is done by weaving. Although the spinning and weaving is undertaken in some cotton-producing regions, most of the main cotton textile factories are in regions far removed from the cotton-producing regions.

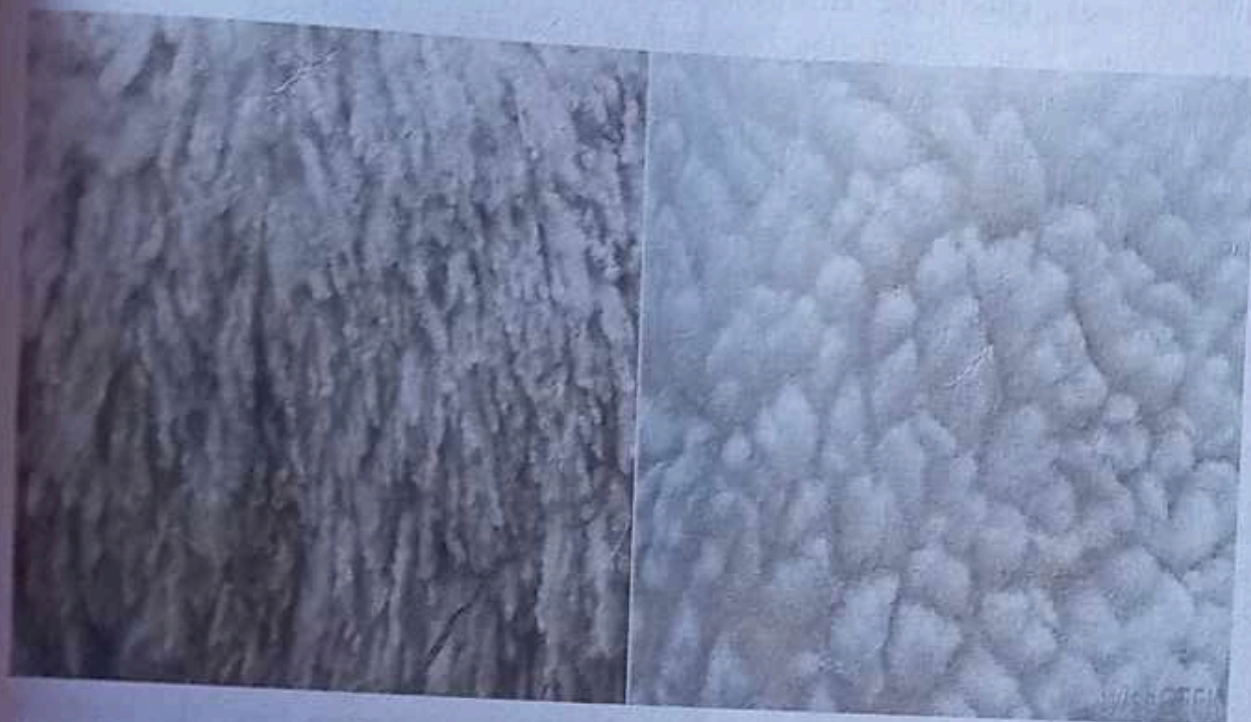
Cotton-Producing Regions

Distribution of world cotton fibre production



The USA produces more cotton than any other region, and most of this grown in the south-east. Part of the country. This cotton region is known as the cotton Belt. And it extends from Georgia and South Carolina to Texas. At one time the main areas were in the eastern part of the belt but because of soil exhaustion and period ravages of the crop by the boll weevil, cultivation steadily moved westward. Some of the most important areas are now west of the Mississippi. This western part of the belt is drier and this makes it difficult for the weevil to flourish. The use of irrigation and highly mechanized farming has enabled cotton cultivation to be extended westwards.

Wool



For a long time wool has been used in making of woollen garments for the peoples of most temperate regions. However, wool represents only about one-tenth of all the fibers used in industry the nature of wool, that is its strength, its curliness, its thickness and the length of the fibers, largely depends on the type of sheep from which it comes sheep wool can be divided into three types:

- **Merino wool:** this has a long, fine strong fiber and it is extensively used for making cloth for manufacture into clothing. This type of wool comes from merino sheep which are reared in many countries, but especially in Spain and the sheep regions of the southern continents.
- **Crossbred wool:** this type of wool has a shorter fiber and it is not good as merino wool. it comes from crossbred sheep which are reared for both meat and wool.
- **Carpet wool:** this wool is coarse and it has a short fiber. It is used mainly in the manufacture of carpets and it comes as a by-product from sheep reared for meat.

Wool-producing regions:

- I. Over one-half of the world's production of wool comes from the southern continents and Australia is by far the largest supplier. The main producing countries of these continents are as follow:
 - I. **Australia:** almost one-half of Australia's sheep population is located in the dry parts of the Murray-Darling Basin. Most of the sheep are Merinos, and sheep farms are extremely extensive. Altogether, Australia produces about one-third of the world's wool.
 - II. **New Zealand:** most of the sheep in New Zealand are reared for meat. This is because the moist climate favours crossbred and other sheep which

make good meat. However, wool is an important product of the country and it amounts to about one-tenth of the world's annual production.

III. South Africa: most of the sheep are Merinos and they are reared on the dry grasslands of the high veldt in Transvaal and the Orange Free State. The sheep farms are often large and at times the soil of the grasslands suffers from extensive erosion when conditions are exceptionally dry.

IV. South America Argentina and Uruguay are the two main wool-producing countries of this continent. Most of the sheep are reared on large farms and most of them are crossbred. The sheep region of these two countries extends from northern Uruguay southwards through eastern Argentina into Tierra del Fuego.

2. Most of the wool produced by countries of the northern hemisphere comes from sheep which are reared for meat. The main wool-producing countries are as follows:

- a. The USA the bulk of the USA's sheep are reared in the dry, semi-arid regions of the western states. Very little mutton is eaten in the USA and most of the sheep are reared for wool. However, insufficient amounts are produced for home use and wool must be imported from the southern continents.
- b. The C.I.S as in the USA the chief wool-producing regions coincide with the drier regions, especially those parts of the steppes. The C.I.S comes next after Australia as a world producer of wool.
- c. The UK. The UK as still important as a world-producer of wool, though this importance is now very much reduced. These are important sheep regions on the limestone soils of the Pennines and south-east England. In the hills of Wales and the Lake District, and in the southern Uplands of the Scotland. Sheep are also important on the Wicklow mountains of the eastern Ireland and on the limestone plateaus of the Galway in western Ireland.

Sisal Hemp



- d. This is the tropical plants whose fibers are used for making string, rope and a coarse cloth used for matting. The plant is a low shrub from whose short thick stem arise a mass of long, sword-shaped leaves whose thorned edges are very sharp. The plant is grown from suckers in a nursery until it is about 30centimetres (12 in) high. It is then transplanted into plantation.

The plant grows well in regions where:

- ✓ The average monthly temperatures are over 24°C (about 75°F).
- ✓ The annual rainfall is about 890mm (35 in).

Like abaca, it requires an abundant supply of cheap labour if it is to be grown commercially.

Cutting and processing



Unlike flax and abaca, the fibers of sisal hemp are contained in the leaves. This means that the plant, which is a perennial, does not have to be cut down. The plant is evergreen, and a few leaves can be cut from it, two or three times a year, for as long as twenty years. The first leaves are cut about four years after the

Sisal regions and trade:

The most extensive sisal hemp regions are in the east Africa where there are sisal plantations in Tanzania, Kenya, Uganda, Angola, and Mozambique. Sisal hemp originated in Yucatan, which is part of Mexico. It is still grown there commercially as it is in parts of Central America and the West Indies. The bulk of sisal hemp fibers is exported to great Britain, western Europe and the USA.

Silk



Silk is a fiber which is made by a caterpillar often referred to as a silkworm. During the chrysalis stage of its life cycle, the caterpillar extrudes a fine thread in which it encases itself to form a cocoon. The filament may be as long as one mil. It is this filament which is spun into silk thread.

Silkworms are fed on the leaves of the mulberry tree and silkworms farming, which is called Sericulture, is confined to regions where mulberry trees grow well. This tree requires a Mediterranean or Mediterranean-type climate where winters are short and mild and summers are hot, with an annual rainfall of about 500mm (200 inches)

Sericulture:

The moth lays about 500 eggs in autumn. These hatch out into small grubs in the following spring. The grubs are kept on trays on which regular supplies of fresh mulberry leaves are placed. The grubs grow rapidly and after a few months they grow into silk worms about 7.5cm (3 inches) long. They now enter the chrysalis stage and each silkworm spins a cocoon around itself. The chrysalises, except for a few which are allowed to turn into moths for egg-laying in the next autumn, are put into heated ovens to kill the pupae inside them.

During the few months of a silkworm's life, it eats large quantities of mulberry leaves, and it is essential that the silkworm farmer has easy access to unlimited quantities of this foodstuff.

Sisal regions and trade:

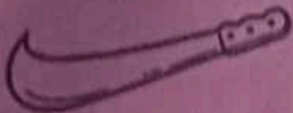
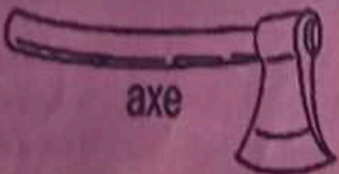
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The preparation of silk:

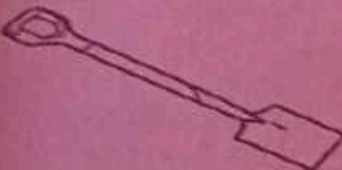
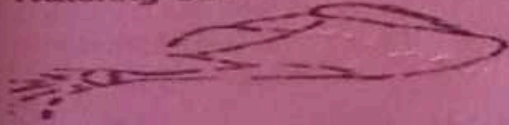
The first task is to unwind each cocoon. This is sometimes done by hand and sometimes by machine in factories. As the cocoons are unwound, the threads of perhaps ten or more are twisted together to give a strong single silk thread. Each cocoon yields about 450m (1450 Ft) of good quality thread which comes off first and from 450 to 1350 meters (1450 to 4400 Feet) of poorer quality thread which comes off last. The latter is spun into a weaker thread which is called Spun silk.

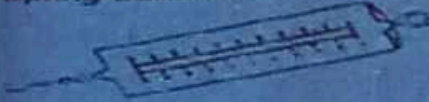
1.7 Farm tools and Equipment

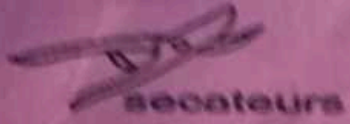
Farm tools and equipment improve efficiency of work leading to better results. Tools also enable us to perform tasks faster. For example, tractors in ploughing and milki Machines in dairy farming

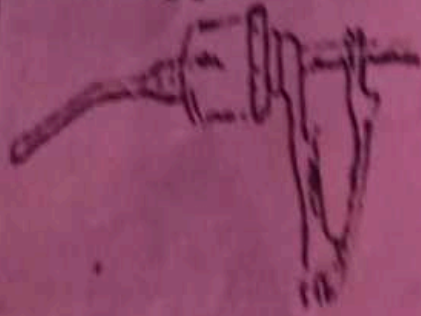
Tool or equipment	Use	Care and maintenance
Panga 	• Clearing land with small trees and shrubs • Planting by the dibbling method • Shallow cultivation • Making trenches for sowing seeds	• Sharpen the cutting edges • Repair or replace broken handles • Use panga for right job • Clean after use and keep it dry to avoid rusting
Axe 	• Splitting logs for firewood • Felling big trees • Uprooting tree stumps	• Sharpen the cutting edge • Replace broken handles • Oil the cutting edge to improve penetration when in use
Mattock 	• Digging pits • Uprooting tree stumps and removing stones in land preparation	• Ensure handles are firmly fixed • Replace broken handles • Sharpen the cutting edge • Oil the cutting edge to improve penetration
Jembe 	• Seedbed preparation • Digging planting holes • Weeding • Harvesting root crops	• Sharpen the cutting edge • Clean blades after use • Replace broken handles • Oil the blades

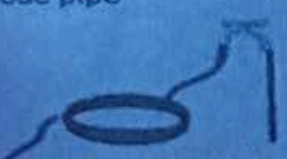
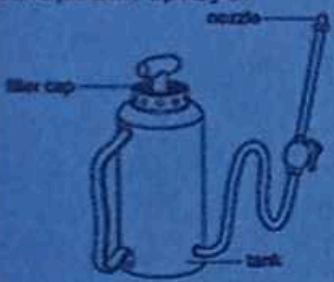
Garden fork 	• Digging and collecting manure and trash on a farm	• Sharpen blunt prongs • Straighten bent prongs • Repair and replace broken handles • Ensure handles are tightly fixed • Store the fork in a rack
Garden trowel 	• Digging up of seedlings during transplanting • Making holes for transplanting	• The blade should be firmly fixed to the handle • It should be cleaned and kept dry

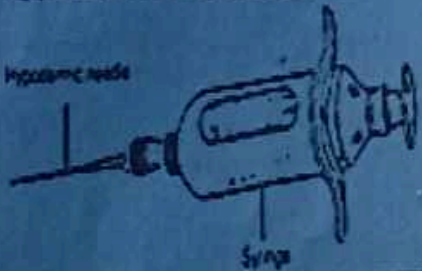
Fork jembe 	• Weeding rhizomatous weeds • Opening virgin land • Cultivating areas with stones	• Straighten the bent prongs • Replace the broken handles • Ensure the handle is firmly fixed
Spade 	• Removal of soil when constructing farm • Mixing sand, cement and gravel in farm building construction • Turning manure in compost pits	• Sharpen the cutting edge • Replace broken handles • Ensure handles are firmly fixed
Wheelbarrow 	• Transporting small loads of inputs and farm products on the farm	• Grease moving parts • Replace and repair broken parts • Clean after use • Store when empty
Watering can 	• Watering seedlings • Watering vegetables and flowers	• Clean the hose when blocked • Replace any broken parts • All leakages should be welded

Spring balance 	• Weighing products of small masses	• Keep it clean and dry to avoid rusting • Avoid weighing heavy products beyond recommended weight
Rake 	• Uprooting weeds • Removing small stones and big lumps from nursery beds • Levelling the soil	• Replace broken handle • Keep the handles firmly fixed • Remove grasses or leaves that stick on the teeth • Keep teeth facing downwards when in the field • Replace teeth which

Garden shears 	• Trimming hedges • Cutting grass near fences	• Grease the moving parts • Sharpen the cutting edges • Replace the broken handles • Oil the blades
Pruning saw	• Cutting woody stems	• Replace broken handles • Sharpen cutting edge
Secateurs 	• Pruning or cutting small branches of tree crops	• Sharpen the cutting edges • Grease the moving parts • Replace the worn out blades • Keep the secateurs clean and dry before storage
Pruning knife 	• Cutting small unwanted branches off fruit trees	• Sharpen the cutting edge • Replace broken handle • Ensure the blades are firmly fixed • Oil the blades to prevent rusting
Pruning hook 	• Cutting small branches off tree crops and leaves, for example bananas • Harvesting fruits	• Sharpen cutting blades • Replace broken handles • Clean and dry after use before storage • Store in racks

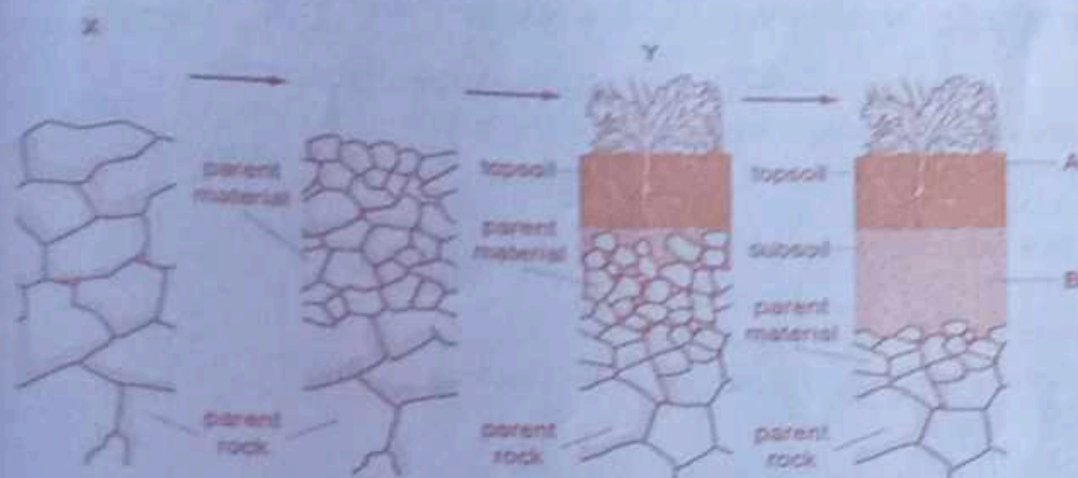
Drenching gun 	• To administer liquid drugs, especially for the control of internal parasite, for example roundworms	• Oil and grease the moving parts • Tighten loose moving parts • Repair broken or damaged parts • Unblock the nozzle
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Hose pipe 	Conveying water from the storage place to where it is to be used for crop, livestock or domestic use	- Seal leakages - Use clean water to avoid foreign materials that can block the pipe
Sprinkler 	Irrigating crops	- Oil and grease moving parts - Unblock the nozzles - Clean and dry before storage - Replace and repair damaged parts
Knapsack sprayer 	Spraying agricultural chemicals on crops and animals	- Wash and clean after spraying - Unblock the filter and nozzles - Replace faulty valves - Oil and grease moving parts
Levelling boards	Levelling the ground prior to planting	- Clean after use - Store horizontally to avoid bending
Sickle 	- Harvesting grains for example rice, wheat and millet - Cutting back pyrethrum and pruning - Cutting grass - Slashing bushes and weeds	- Sharpen cutting edges - Replace broken handles - Clean and dry before storage - Store in a tool rack to avoid injuries

Bolus gun 	• Administering solid drugs to animals through the mouth	• Clean after use • Store in a cool dry place
Hypodermic needle 	• Administering drugs by injection • It can also be used to extract blood samples from an animal for analysis	• Use the appropriate needle for a given animal • Sterilize after use by boiling in water • Store separately in a dry place
Stir-up pump 	• Spraying animals with chemicals to control external parasites	• Wash thoroughly after use • Use clean water to avoid blockage of nozzles • Repair and replace damaged parts • Clean dirty nozzles
Halter 	• A string or rope used in tying an animal around the neck and mouth, helping to restrain and lead the animal	• Keep it dry, especially if made of sisal

Work to do

- Shows rocks being replaced by soil over millions of years.



- List four agents of weathering that are acting at X.
- State two ways plants are helping form soil at Y.

1

2

- List four characteristics of top soil?

3 Table 11.1 compares a clay soil with a sandy soil.

	clay soil	sandy soil
cultivation	difficult	easy
drainage		
temperature	warms and cools slowly	warms and cools quickly
water holding		

- Complete the table using the words good or poor.
 - State how clay soil can be treated to make cultivation easier.
 - Explain why a sandy soil warms and cools quickly.
- Describe two methods of draining soil.

1.
2.

4. Name three aspects of light that effect crop growth.

17. Discuss how the following factors may affect agricultural production?

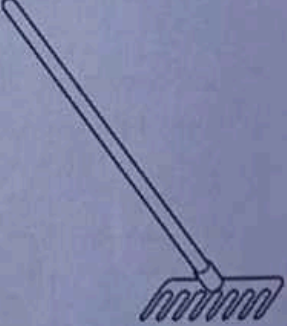
- (a) Cultural and religious believes
- (b) Governmental policies

18. List thee characteristics of clay soil?

Tools 1.

- (a) What are garden tools and equipment?
- (b) Which tool or set of tools is required for the following operations?
 - (i) Bloodless castration.
 - (ii) Digging.
 - (iii) Pruning.
 - (iv) Trimming hooves.
 - (v) Administration of drugs.
 - (vi) Dehorning.

2. Table 2.1 shows three hand tools.

 spade	 fork	 rake
function of the spade 	function of the fork 	function of the rake

- In Table 2.1, state the function of each tool.
- Outline the way in which these tools should be maintained to keep them in good condition.

The diagrams below show a set of equipment used in livestock management. Study them and answer the questions that follow.

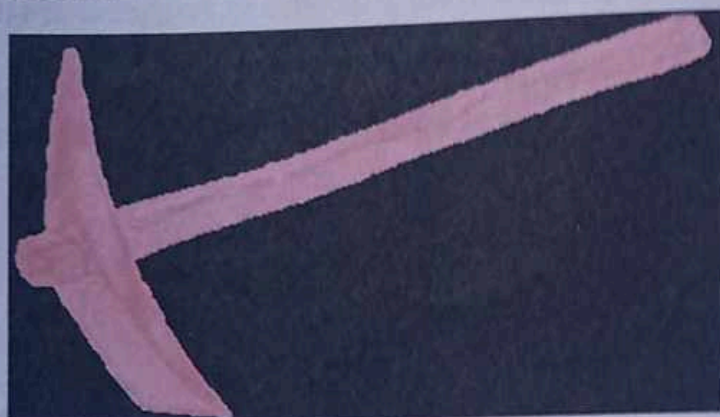


- Identify the equipment labeled E and F.
- State the appropriate use of the set of equipment illustrated above.
- Describe the appropriate procedure followed when using the equipment.
- Name six tools that used for the animal production?
- differentiate between tool and equipment?
- The diagram below shows a tool being used by a farmer.



- Identify the equipment.
 - State the function of the tool.
 - Describe care and maintenance of the tool.
7. Name seven tools and equipment that used for the agricultural production

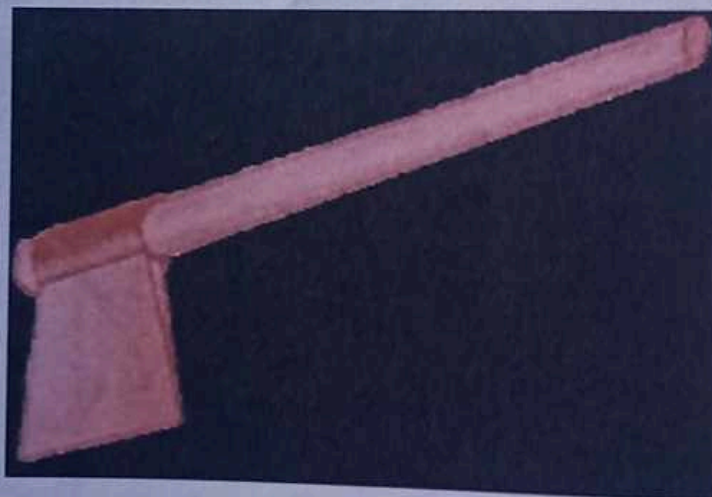
5. The diagrams below illustrate some farm tools and equipment. Give the name and the function of each in the farm.



(a)

(i) Name

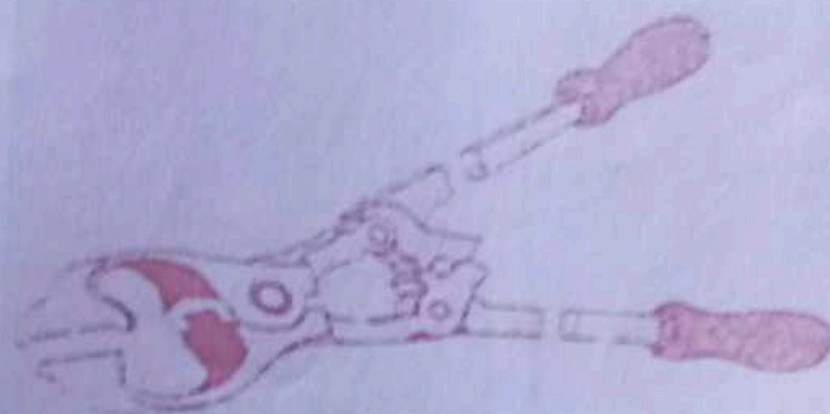
(ii) Function



(b)

(i) Name

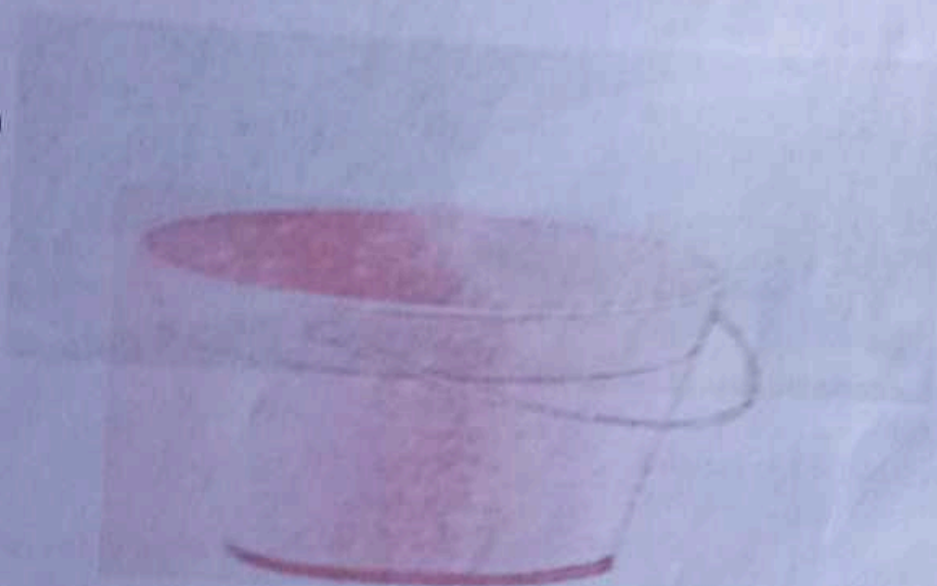
(ii) Function



(c)

(i) Name

(ii) Function



(d)



(e)

(i) Name (ii) function



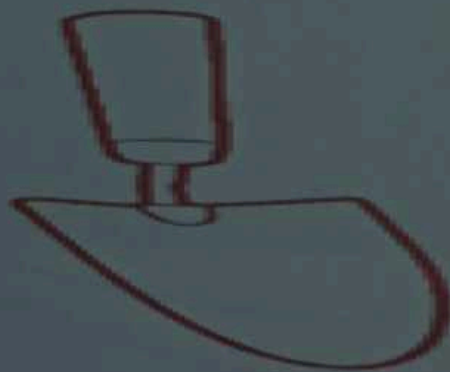
(f)

(i) Name (ii) function



(g)

(i) Name (ii) function



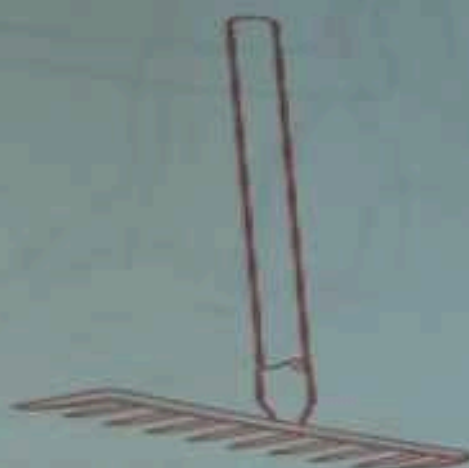
(i)

(i) Name (ii) function



(i)

(i) Name (ii) function



(k)

(i) Name (ii) function



(l)

(i) Name (ii) function



(m)

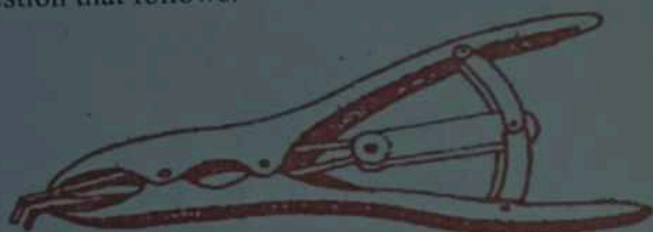
(i) Name (ii) function



(n)

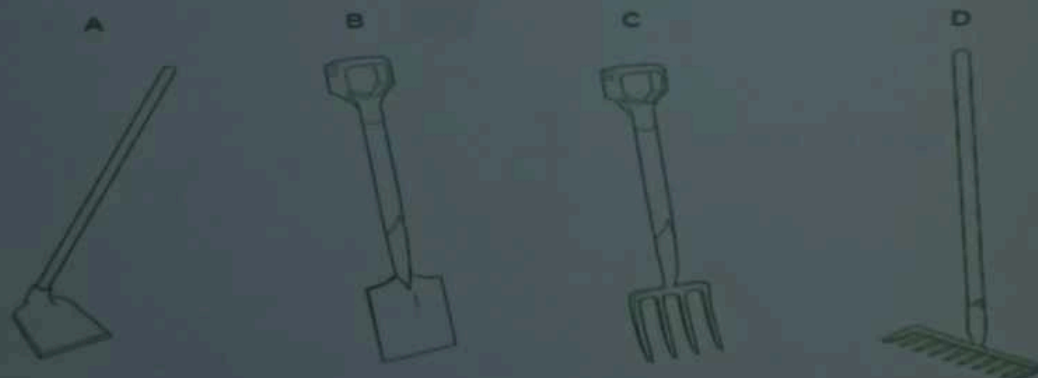
(i) Name (ii) function

8. Below is an illustration of a livestock management equipment. Study the diagram and answer the question that follows.



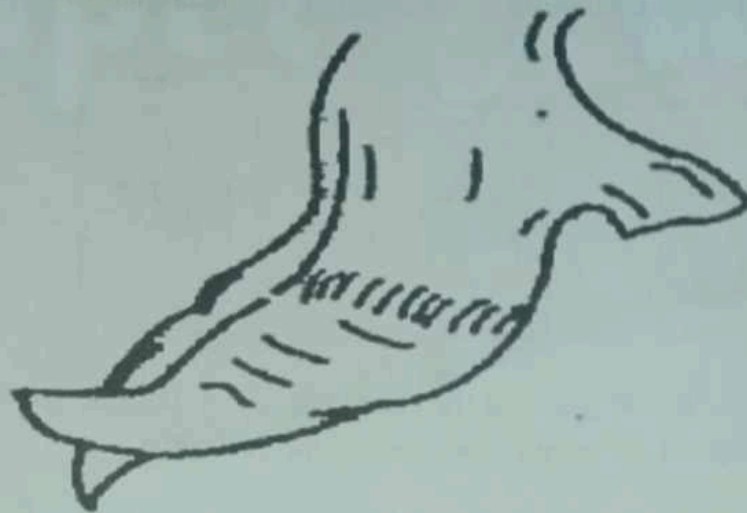
(a) Identify the equipment. (b) State the use of the equipment.

9. Fig. 9.1 shows four hand tools that can be used when preparing a seed bed.



Choose one of the tools shown in Fig. 7.1. (a) State which tool, A, B, C or D, you have chosen. Explain the purpose of this tool in preparing a seed bed. (b) (i) Describe how rust could be prevented on the metal part of the tool. (ii) State one way in which the wooden part of the tool might deteriorate over time. (iii) Describe action that could be taken to prevent this damage.

10. The diagram below illustrates a hoof of a sheep. Study it carefully and answer the questions that follow.



(a) Name the routine management practise that should be carried out on the hoof illustrated above. (b) State two reasons for carrying out the management practise in (a) above.

11. (a) (i) Name a weed that grows in a named local crop.

crop weed

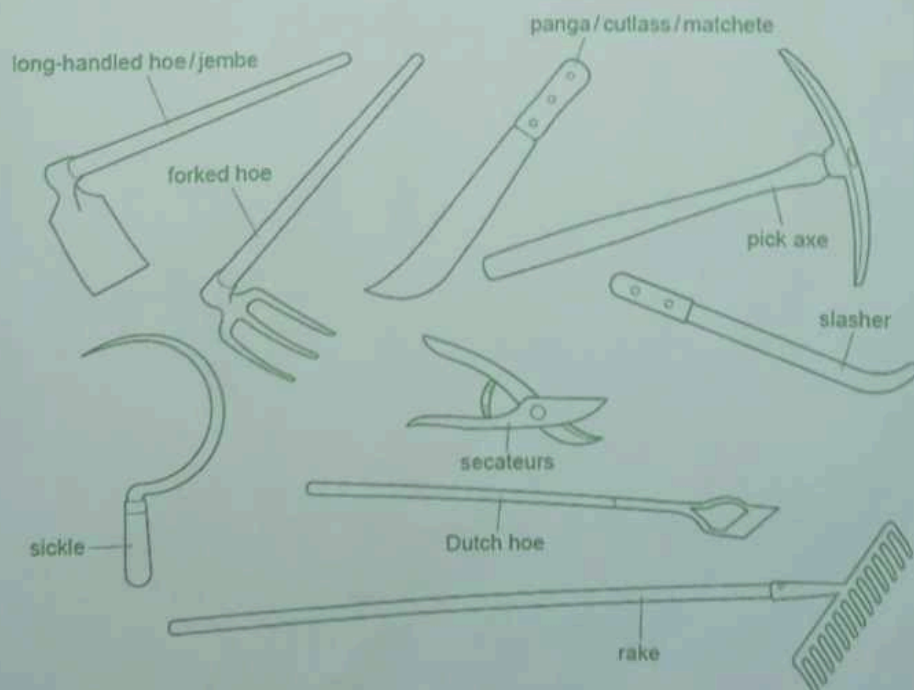
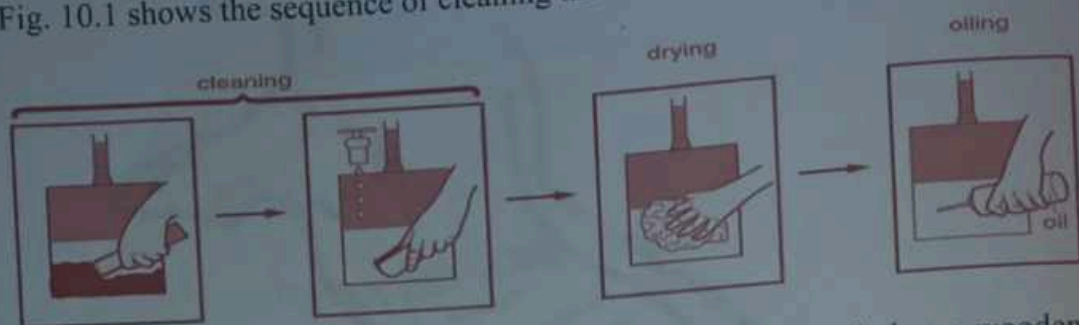


Fig. 9.1 shows hand tools used in agriculture.

(ii) Which tool would be most suitable for controlling this weed?

(iii) Describe how the tool is used for weed control.

12. (a) Fig. 10.1 shows the sequence of cleaning the metal part of a spade.



State the reasons for the stages in the cleaning process. (ii) The spade has a wooden handle. Describe and explain the maintenance needed for the handle.

13. The diagram shows three tools used to cultivate a small area of land used for growing vegetables.

Chapter Two

Energy Resource

Chapter Two



ENERGY RESOURCE

At the end of this chapter the learners should be able to:

- Identify the different sources of energy.
- Explain significance of energy to human.
- Understand existing crisis of energy in the world.
- Describe exhausted/ non exhausted energies

2.1 Resource of Energy

Energy is the power required to carry out an activity e.g. to run a machine. In other words, energy is defined as the capacity to do work. For a person or machine to do work, energy must be used. The machines used in various industries such as transportation, agriculture and manufacturing use energy to perform various tasks.

For example: a tractor uses diesel to plough, a truck uses petrol to transport goods while a printer uses electricity to print books

Resources: resources have been defined as features that are needed and used by people. Although the term is often taken to be synonymous with natural resources geographers and others often broaden this definition to include human resource

Natural resources can include raw materials climate and soils human resource may be divided into people and capital Most of the energy that we use comes from fuels which are burned in power stations, factories, homes and vehicles.

Nearly all of the world's energy originally came from the sun.

The energy resources we use on earth can be renewable or non- renewable

2.2 Significance of Energy

Renewable Energy sources

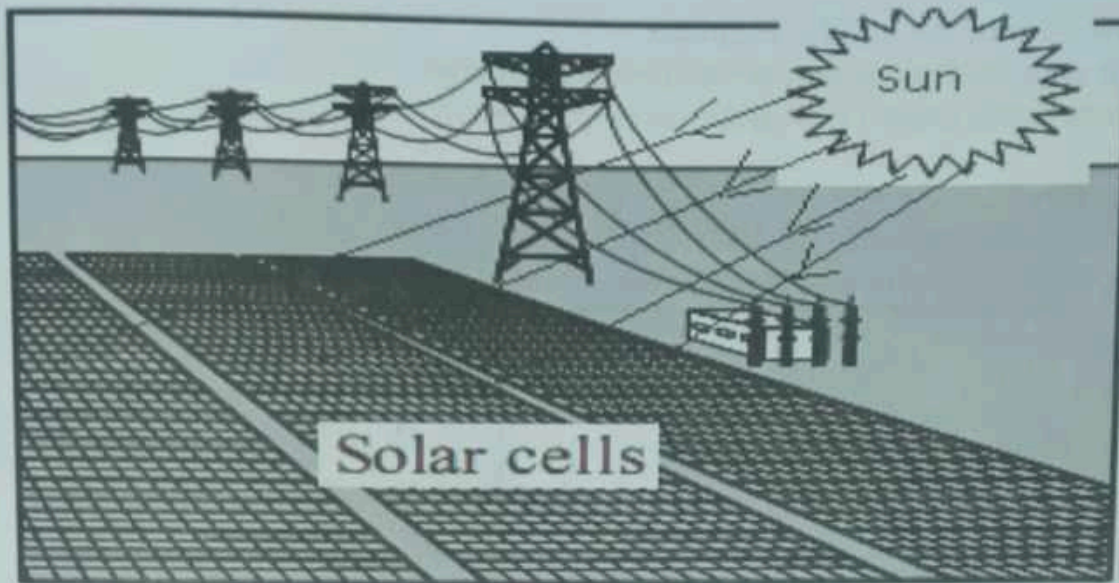
Non- renewable Energy sources

Renewable resources of energy are those sources that can be regenerated and used of long period of time, or those sources of energy which can be consumed not only once, but again and again are called **renewable energy sources**.

Example : include the sun wind and water same renewable resources of energy can be tapped at any time without affecting the amount available in the future, but careful management of others is required if they have to be sustained. It is impossible to change the wind systems for the supply of sunlight. However the supply of water and wood can be altered through with mismanagement

For example the sun

Energy from the sun is called solar energy. Sun is the primary source of most other types of energies. Heat and light energies received from the sun are available non- stop.



advantages

It is a cheap source of energy

It can be trapped

♣ It is available in all parts of the world. However, what differs is the duration and intensity of light.

♣ It is clean and environmentally friendly form of energy.

♣ It is an inexhaustible source of energy

Disadvantages

Solar energy has limited use.

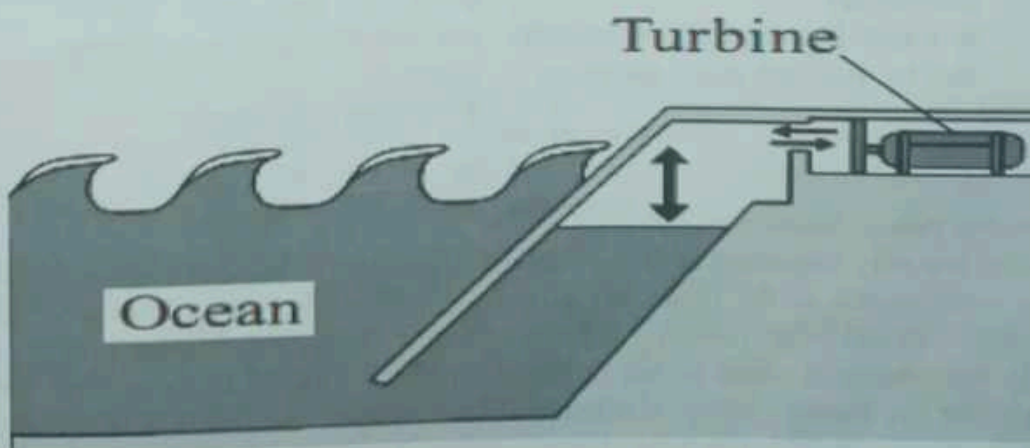
The storage batteries are cumbersome and must be replaced often.

♣ The solar panels are expensive to manufacture

♣ Solar technology is relatively new

♣ Low energy production. Large numbers of solar panels are required to produce useful amount of energy.

Oceans contain potential energy in form of tidal and wave power. By setting up mills (turbine) Electricity can be generated by both incoming and outgoing tides



Advantage of waves and tides

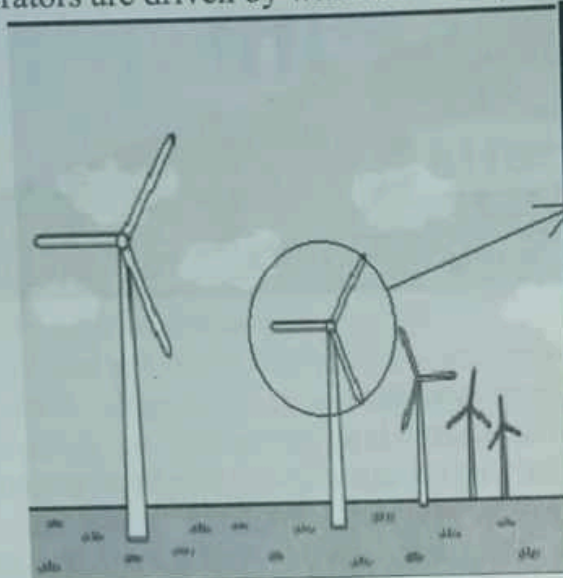
- ✓ This is a cheap source of energy as tides and waves are free
- ✓ Expensive to build
- ✓ Few devices have been successful.

Problems of waves and tides

- ✓ Few areas of the world are suitable
- ✓ The generated plants may be destroyed by tsunamis
- ✓ There is still limited knowledge about wave and tidal energy sources.

1) Wind energy

- ✓ Is the energy from the wind?
- ✓ Generators are driven by wind turbines (windmills)



Advantages

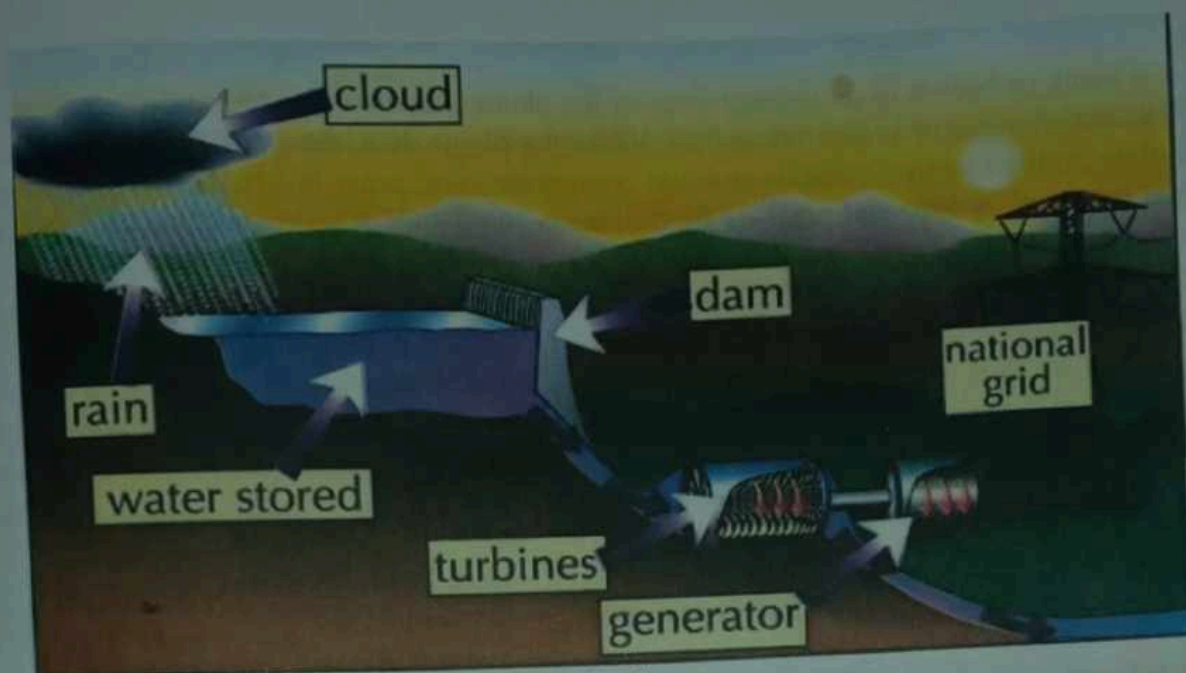
- ♣ It is a cheap source of energy
- ♣ It is clean which does not pollute the environment.
- ♣ It is an inexhaustible source of energy
- ♣ It can be produced on a small- scale basis for local consumers
- ♣ Land between the windmills can be used for other purpose.

Disadvantages

- ♣ Relatively expensive to maintain
- ♣ Low energy production: large numbers windmills are required to produce useful amount of energy.
- ♣ Large space is needed
- ♣ It is not fully reliable because the wind may change direction
- ♣ Windmill are noisy

2) Hydroelectric power (water power)

Flowing water is a very important source of energy. These days' big dams are constructed on the rivers. The water stored in the dams has potentials. When the stored water is made to flow through special channels, the potential energy of water changes to kinetic energy, the kinetic energy of flowing water is made to run turbines, which is coupled to an electric power. In the electric generator the kinetic energy of rotating shaft of turbine is converted into electric energy. The electric energy is carried over long distance through copper wires mounted on transmission towers.



Advantages

- ♣ HEP is one of the cleanest and environmentally friendly sources of energy
- ♣ HEP can be transmitted over long distance using cables
- ♣ It is an inexhaustible source of energy so long as there is sufficient

Disadvantages

- ♣ A major problem with water power is the fluctuation of the water levels in the reservoirs
- ♣ The construction of dams for HEP generation has some negative environmental impacts
- ♣ The generation of electricity is

rainfall and proper management of the water resource

- ♣ It is easy to use as one only needs to operate simple switches.

dependent of the water levels

- ♣ The initial cost of construction of power plant is high.
- ♣ Few areas of the world are suitable

Non-renewable energy sources

Those sources of energy which can be used only once are called non-renewable sources of energy. Coal, petrol, cooking gas, wood, etc. are many sources of energy which can be utilized only once. Coal burns into ashes and produce heat. The ashes cannot be burnt again to produce heat. Similarly, petrol cannot be used again as sources of energy.

Fuels and other things from oil

- Anything that can be burn to produce energy is called a fuel.
- Fossil fuels are formed from the remains of plants and tiny sea creatures which lived millions of years ago. They are a very concentrated source of energy

There are three main types of fuels these are:

- a) Solid fuels e.g. Coal and firewood
- b) Liquid fuels e.g. Petroleum or crude oil (oil is especially useful because petrol, diesel, and jet fuel can be extracted from it)
- c) Gaseous fuels. E. g natural gas (methane) and ethane

a) Coal

Coal is a black or brown of an impure form of the element carbon, formed millions of years ago from the compression of vegetative matter. When the plants died, the vegetative matter began to accumulate on the swampy grounds and was compressed into peaty layers. The vegetative matter changed into coal by heat and pressure by the increasing weight of sediments and also from earth movements and contortions.

There are four major types of coal that vary in composition, characteristics and stages of development:

Type of coal and their color	Approximate amount of carbon	Description
1) Anthracite	90%	Hard, black coal. Formed at great depth Formed at lower pressure than anthracite.
2) Bituminous	60%	
3) Lignite	40%	Softer coals, sometimes brown in colour
4) Peat	30%	Brownish, fibrous substance which is in the early stages of coal formation

b) Petroleum fuels

Petroleum or Crude oil is a mixture of different hydrocarbons. These can be separated by using fractional distillation these liquids have different boiling points. Most of the world's energy depends on petroleum products. We use fuels in our homes, cars, planes, and enormously in factories. When petroleum is refined, several products such as petrol, diesel, aviation fuel, bitumen, liquefied gases and lubricants are obtained

Significance of Energy

- For domestic use e.g. wood and charcoal for cooking and heating, etc.
- For use in industries e.g. electricity, petroleum, etc.
- Used in transportation e.g. electric cars, diesel and petrol used in motor vehicles, etc.
- Used in agriculture e.g. diesel for tractors which draw ploughs, electricity for milking machines, etc.
- Used in water supply where diesel engines wind mills and solar power is used to pump water.
- Used for medical purposes where electricity is used to run equipment for diagnosis

e.g. X-Ray and scanning machines and in refrigeration to preserve specimens on medicine research.

The Energy crisis

Oil Crisis

Situation whereby the demand for oil is higher than the amount that is being supplied leading to high oil prices.

Causes

- Over-reliance on petroleum and its products.
- High oil prices due to sharp rise in oil demand.
- Economic and political sanctions
- Uncertainties in oil supplies to consumers.
- Rapid depletion of oil reserves.
- Conflict in the Middle East especially between Israel and Palestine.
- Exhaustion of wood fuel
- Mismanagement of energy
- Oil production limits set by OPEC
- Artificial shortages by countries like Russia and USA relying on oil from other

Countries and conserving their own.

Examples of Energy Crisis in the Past

- 1973 and 1974 when there was war between Israel and Arab countries. The Arab countries which are OPEC members withheld oil supply to Israeli supporting countries e.g. USA and the result was sharp increase in oil prices.
- 1991 first Persian Gulf War caused by triggered by Iraq invasion of Kuwait

Caused by:

- (a) Iraq's claim that Kuwait was its territory.
 - (b) Kuwait was taking oil from Iraq "soil from Rumania fields which lay beneath both countries.
 - (c) Kuwait was exceeding the oil production limits set by OPEC.
- Many Kuwait's oil fields were set on fire and Iraq dumped about 465 m gallons of Kuwait's crude oil to the Persian Gulf. There resulted a major oil crisis which was worsened by the trade embargo.
- 2003 second Persian Gulf War. Iraq had failed to destroy weapons of mass destruction which she had agreed to do for the 1991 war to end. The war led to a rapid increase in oil prices from US\$35 at the start of war to US \$50 by 2004. It forced OPEC members to increase daily crude oil outputs by 8% to stabilize prices.

Impact of Energy Crisis

- (a) Increase in the prices of many commodities as a result of increase in the cost of

Production and transportation where oil is used to provide power and as a raw material in some industries.

- (b) Increase in the prices of imports due to high crude oil prices which affect the balance of trade by causing earnings from exports to be lower than the cost of imports.
- (c) High rates of inflation or devaluation of currency as a result of commodity prices

Rising high due to the cost of imports being passed to the consumers.

- (d) Industries are forced to lay off workers because of the high cost of production Which can cause losses.

- (e) It causes the price of other forms of energy e.g. charcoal and gas also to become expensive.
- (f) Developing countries running into heavy dept. as a result of borrowing heavily to pay for oil loans which are paid at high interest rates making the country unable to invest in development projects.
- (g) Decrease in agricultural production as a result of decrease in the use of agricultural

Inputs such as fertilizers due to their high cost brought about by increase in oil prices.

- (h) Decline in the number of tourists as a result of escalation of oil fares making it very expensive to travel.
- (i) Environmental degradation as a result of environmental degradation brought about by the high demand for charcoal and firewood which leads to soil erosion and low rainfall amounts.

Solutions

- (a) Developing alternative sources of energy e.g. solar, biomass, Geothermal and HEP.
- (b) Management and conservation of energy.
- (c) Developing nuclear energy to enhance self-sufficiency in energy provision.
- (d) Encouraging industries to use coal which is slightly cheaper than petroleum.

Management and Conservation of Energy

Management of energy is effective planning and control of energy resources.

Management Measures

- (a) Control of importation of vehicles with large engine capacity which consumes a lot of fuel.
- (b) Encouraging many people to use public transport in order to reduce the number of vehicles on roads and thus fuel consumption.
- (c) Educating people through mass media to create awareness on the importance of conserving energy.
- (d) Improvement and proper planning of road network to reduce traffic jams in which a lot of fuel is wasted.
- (e) Agroforestry, afforestation and reforestation programmes to reduce overexploitation of natural forests.
- (f) Banning logging, selective felling of trees and resettling people who have settled into forests.

Conservation of Energy

Conservation of energy is using available energy resources in the most effective manner to ensure there isn't wastage.

Conservation Measures

- (a) Putting off electricity gadgets when they are not in use.
- (b) Proper motor vehicle maintenance in order for them to use fuel efficiently.
- (c) Encouraging use of public transport which carries many people at a go e.g. buses.
- (d) Encouraging use of renewable sources of energy e.g. solar, wind and biogas to save on oil and wood. Encouraging use of energy saving stoves which use little charcoal and produce a

S/N	Source of energy	Type of energy	Use of the energy
1	Sun	Solar energy: mechanical, electrical	Heating, powering TV, radio, motor car, calculators
2	Waves and tides	Electrical	Possible for lighting, heating
3	Wind	Mechanical Electrical	Moving aircraft, sailing boats, kites. Lighting, heating.
4	Geothermal steam	Geothermal electricity	Lighting, heating, powering machines.
5	Biomass	Mechanical (biogas)	Heating, lighting.
6	water	Mechanical, electrical	Drive water mills and canoes. HEP, lighting, heating powering machines
7	Wood	Mechanical	Heating, lighting
8	Animals	Mechanical	Transport, carrying luggage, ploughing
9	Petroleum	Mechanical electrical	Powering engines and machines by combustion. Thermal electricity, heating lighting as for HEP.
10	Natural gas	Mechanical electrical	Heating, thermal electricity, lighting, powering machines.
11	Coal	Mechanical electrical	Heating, thermal electricity, lighting, powering machines.
12	Uranium	Nuclear/atomic energy: mechanical, electrical	Weapons, e.g. nuclear warheads and bombs. Heating, lighting and powering machines.

WORK TO DO

- 1) Two renewable sources of energy (non - conventional)
- 2) Two non-renewable or conventional sources of energy
- 3) Two forms of energy usually used at homes
- 4) The radiation emitted from a hot source
- 5) The component of sunlight that is absorbed by the ozone layer of the atmosphere.
- 6) Two activities in our daily life in which solar energy is used
- 7) The kind of surface that absorbs maximum heat
- 8) The device that directly converts solar energy into electrical energy

Chapter Three

Transport, Communication and Trade

Chapter Three

TRANSPORT, COMMUNICATION AND TRADE

3.1 Factors Influence Transport and Communication

At the end of this chapter the learners should be able:

- Describe the different types of transport and communication
- Explain the main problems facing transport
- Differentiate between transport and communication.
- Explain the types of trade.



Transport

Communication

Transport

Transport is the act of moving items and people from one place to another or it is the carrying of goods and people from one point to another over a given time and under specified costs. Transport is important in the migration of people, e.g. workers, tourists etc.

Communication

Communication is the whole process of transmitting or exchanging information between persons or it is the process of transferring information between individuals, groups and places or it is the exchange of messages between peoples.

Transport

Deals with the movement of physical items and people

Involves only the physical carriage of goods using such units of carriage as vehicles, airplanes and shipping vessels

Time is essential as the distance to be covered may be long

Communication

Deals with the movement of information

Physical carriage of information is used. Message can also be sent through computers, telephones, satellites and another media

In most cases, the transmission of the information is immediate, especially where modern technology is being applied

The Role of Transport and Communication Transport facilitates trade and commerce by carrying goods from the areas of Production to that of consumption. Goods from the areas that have surplus are shifted to those areas which are deficient in those items. Movement of people from one place to another place in search of job, education and emergency through transport facility. Communication keeps us informed about the world's events and trends. It brings in positive changes in the life of the people and thereby enhancing their economic conditions

Factors influencing Transport and Communication

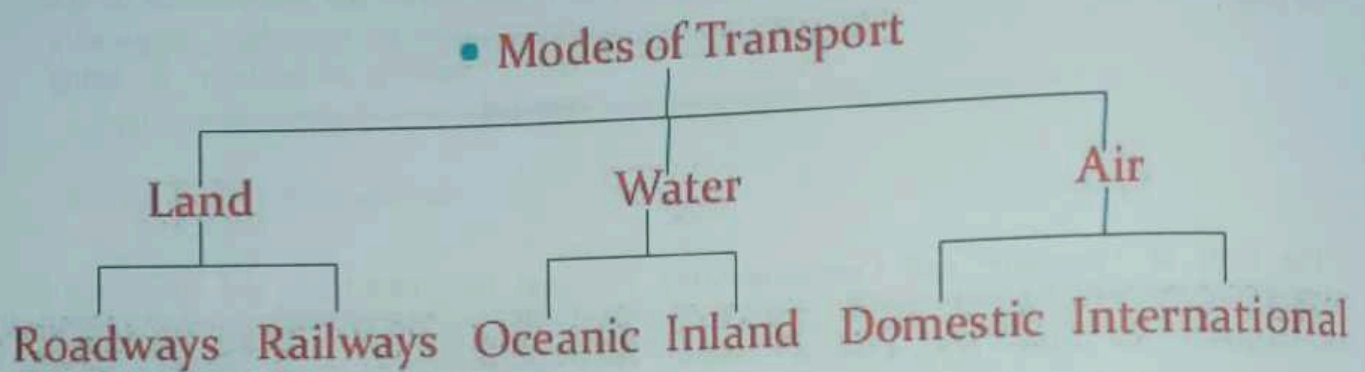
1. Existence of sets of corresponding places with surplus (supply) and deficits (demand) for goods, services and information.
2. Alternative sources may hinder transport and communication e.g. a nearby source of market of a required commodity or source of information or means of communication.
3. Infrastructure depending on how it is can lead to establishment of efficient or inefficient transport and communication network.
4. Politics where by the government may ban use of certain means of communication as was the case with Google in China or where the government may decide to be the leading provider of transport and communication facilities.

3.2 Mode of Transport

Modes of transport refer to the way or manner in which goods or people move. The common modes of transport are

1. *Land transport*
2. *Water transport*
3. *Air transport*

THE MODES OF TRANSPORT



Human form three
 three streamers
 Exercise

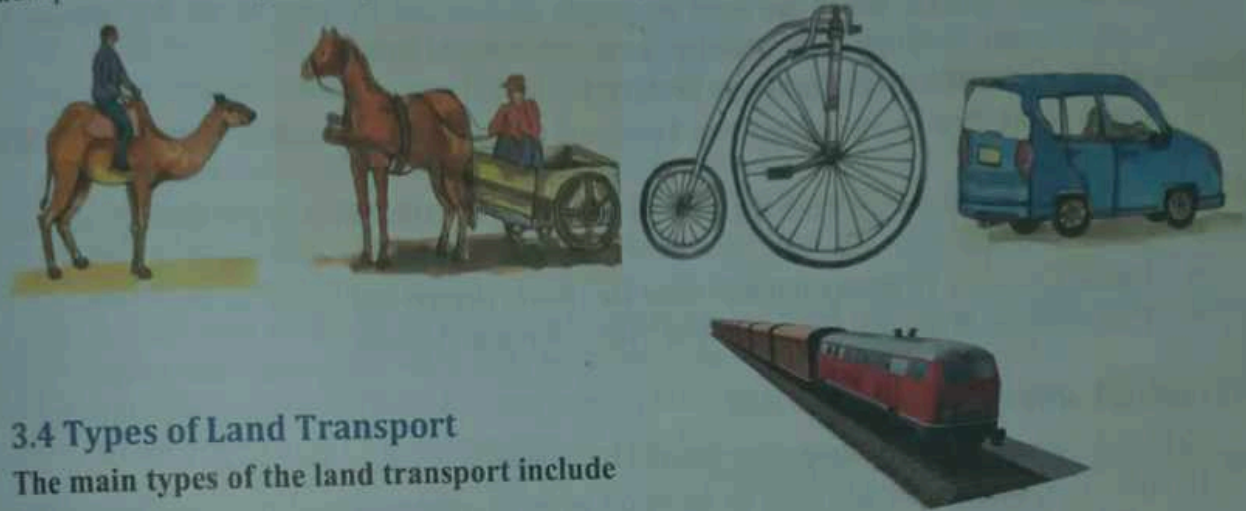
There are 3 common modes of transport namely land, water and air

Transport

3.3 Transport

1. Land Transport

This includes all movement of people and goods on dry land, or one type of transport that involves movement of people and goods on land. The most commonly used means on land transport are human porter age and use of animals, roads railways and pipelines



3.4 Types of Land Transport

The main types of the land transport include

3.4.1 Human and animal transport

Movement of people from one place to another carrying light goods on their back, hands or shoulders or by using hand carts, trolleys, bicycles or motorcycles.

Use of domesticated animals to carry goods and people on their back or pull loaded carts (drought animals).

Advantages of Human and Animal Transport

It is the cheapest and can be used by all classes of people since no fuel is used. Animals require very low maintenance costs as they feed on vegetation.

- Relatively safe because few accidents occur during transportation.
- Doesn't pollute the environment as it doesn't use fossil fuels.
- They are flexible in that they can be used to transport goods in areas without good road network.
- It's convenient in that it's readily available whenever required.

Disadvantages

- Goods can be stolen or destroyed by wild animals and extreme weather conditions because they are exposed.
- They are a very slow means of transport hence time consuming, tedious and boring.
- They can't transport large quantities of goods because human and animal energy get exhausted with time.
- They can cause congestion on busy urban roads which may delay other forms of transport.

3.4.1 Road Transport

This is the most widespread means of land transport. It means of transportation of people and goods by motor vehicles on roads

Types of Roads

- a) All weather roads- which are used all year around i.e. tarmac and murrum roads.
- b) Dry weather roads- which are used reliably during dry seasons.
- c) Motor able tracks- which are used by people on foot and by vehicles on dry season. At ruck is a path or rough road made by people, vehicles or animals.

Principal Trans-Continental Highways in Africa

- Great North Road connecting Cape Town and Cairo through Tanzania, Kenya, Sudan and Ethiopia.
- Trans-Africa Highway from the Port of Mombasa to Dakar in Senegal through east and Central Africa.
- Dakar-Djamena Highway through Core De Ivoire, Nigeria and Chad.
- Trans-Sahara Highway from Lagos to Tripoli through Algeria.

Advantages of Road Transport

- (a) It's a faster means of transport compared too human and animal transport.
- (b) It's cheaper compared to railway transport because construction of roads is cheaper than that of railways.
- (c) It's available at one's convenient time.
- (d) Roads can be constructed in stages improved and even repaired while they are being used.
- (e) It's flexible in those road connections are available all over the country.

Disadvantages

- (a) Traffic congestion and jams when there are many vehicles on roads which leads to delays and fuel wastage.
- (b) It's expensive over long distances and when transporting bulky goods.
- (c) Vehicles can carry a limited number of people and amount of goods at a time making them expensive and uneconomical.
- (d) It's adversely affected by weather e.g. during heavy rains, roads become impassable and foggy conditions hinder visibility making it easier for accidents to occur.
- (e) Vehicles pollute the environment by their exhaust fumes and noise which they Produce.

3.4.1 Railway Transport

Railway transport refers to the means of transportation of people and goods using trains or rails. Railway lines were developed at the beginning of the 19th century during the industrial revolution.

Advantages of Railway Transport

- Less expensive compared to road transport because it can carry a large number of people and heavy and bulky goods in one trip.
- There is no congestion or jam because there is only one train on a given track at any particular time.
- Passenger trains are comfortable for passengers travelling over long distances in that they have facilities such as accommodation, dining and toilets accommodation.
- Safer than motor vehicles because they are less prone to accidents.
- Have less maintenance costs because they don't require frequent repairs like roads.

Disadvantages

- Very slow means of movement especially of perishable and urgently required goods.
- Expensive to construct as much iron and steel is used to construct railway lines and trains.
- Inflexible in that railway lines aren't available all over the country and their direction cannot be changed.
- Are affected adversely by terrain as where there are steep gradients, tunnels and winding tracks have to be used which adds to the cost of setting up railway system.
- Specific gauge of railway line can only be used by a specific design of train unlike roads which can be used by many varieties of vehicles.
- Trains can't use rails while they are being constructed unlike roads which can be used while they are being constructed, improved or even repaired.

Examples of Railway Links in Africa

- Tazara railway- connects Zambia Copper Belt with the sea port of Dar-es-salaam.
- Benguela Railway- runs from Zambia Copper Belt to Angola.
- Kenya Uganda Railway- runs from Mombasa to Kisumu. It has an extension from Nakuru through Eldoret to Malaba then through Tororo to Kampala.
- Kenya's other railway branches are Voi to Taveta, Konza to Magadi, Nairobi to Nanyuki, Gilgil to Nyahururu, Nakuru to Eldoret and Kisumu to Butere.

Why There Are Few Railway Links among African Countries

- Administration by different colonial governments who constructed railway links only within areas of their jurisdiction.
- Political differences which led to mistrust and hostility which works against effort to construct railway jointly.
- Countries have railways of different gauges making connection to be difficult.
- Little interstate trade which doesn't warrant construction of railways to transport bulky goods.
- Countries lack sufficient capital to establish railways.
- Mountainous landscape and swampy terrain which hinder the development of rails to link the countries.

Problems Which Kenya Experiences in the Rail Transport

- Competition from other modes of transport which are cheaper and flexible.
- Frequent accidents from derailments due to inadequate servicing which has led to high maintenance costs and losses when goods are looted.
- High maintenance and expansion costs causing little expansion of rail lines.
- Mismanagement of rail services leading to deterioration at lower income.
- Vandalism during political unrests and by people dealing in scrap metal.

3.4.1 Pipelines

Pipeline transport means of movement of mainly fluid or gas products such as water, gas and oil through pipes from one place to another. Pumping stations are constructed along the pipelines to keep the product flowing steadily. In Kenya the main oil pipeline extends from Mombasa through Nairobi to Kisumu and Eldoret where there are main oil depots. The pipeline is managed by Kenya Pipeline Corporation.

Advantages of Pipelines

- a) No delay as there is a constant supply of commodity.
- b) Convenient in that amounts of commodity can be transported within a short period.
- c) There are low operating costs in that minimal labour is required in operating pipelines and also the cost of maintenance of pipelines is lower than for other means.
- d) They aren't affected by bad weather like other means of transport.
- e) It doesn't pollute the environment like other means of transport except in cases of leakages which are rare.

Disadvantages

- a) Selective in that they can be used to transport fluids and gasses and can transport only one type of commodity at a time.
- b) Insecure in that they may be sabotaged if they run across a number of countries when there are political differences or when one country decides to withhold the product.
- c) Pipelines may cause pollution if they burst spilling oil, gas or sewage and the problem would be grave if it occurred under water.
- d) Inflexible in that they remain permanently in one position and rerouting becomes impossible and further distribution of the substance from depots has to be done by roads and railways.

3.5 Important Canales

Several important canals have been built across narrow strips of land separating adjacent seas and oceans to shorten the transit time between trading countries. The most important of these are the Suez and Panama canals which were built in 1869 and 1914 respectively. These canals enormously reduced sailing distance between the east coast of the U.S.A. and Japan (via the Panama Canal), and between north-west Europe and Asia (via the Suez Canal).

- 1- **The Suez Canal:** this canal is 160 kilometers long and it connects the Mediterranean and red seas. It has no locks and the movement of ships through it is therefore very easy. An important cargo transported through this canal was oil from the Persian gulf region to North-west Europe.



- 2- **The Panama Canal:** this Canal joins the Caribbean sea (and hence the Atlantic) with the Pacific ocean. It is 80 kilometers long and it has three sets of locks, which makes the movement of ships through it slower than through the Suez Canal.



- 3- **The St. Lawrence seaway:** the construction of a series of deep water Canals and locks on the St. Lawrence was completed in 1960 to enable ships of up to 10,000 tons to reach the great lakes from the Atlantic ocean.



3.6 Types of Communication

1. Verbal communication-communication by word of mouth e.g. telephone, face to face and radio.
2. Written communication-communication by writing e.g. letters. Magazines, newspapers and journals.
3. Audio-visual communication-communication by using a combination of sounds, signs and pictures e.g. gestures, beating drums, smoke, shouting in a special way, television, etc.

Telecommunication Services

- Communication over a distance using cables or wireless communication e.g.
 1. Telephone-converts sound into electronic signals and back to sound waves at the receiving end.
 2. Facsimile (fax)- send information through telephone lines by converting written information into electronic signals and back to written at the receiving end.
 3. Internet-global network of computers linked via telephone and enables individuals to send e-mail. It is the fastest, cheapest and connected all over the world.

Role of Transport and Communication in the Economic Development of Africa

1. development of trade because buyers are able to move to markets, traders are able to move to market centres where products are in high demand and order goods for sale without necessarily going to the suppliers which reduces transport costs and hence increases profits.
2. Development of infrastructure by making tourist attractions accessible.
3. Promotion of industrial development/establishment of more industries since areas with good transport and communication networks are likely to attract investors to set up industries and finished goods are able to reach consumers easily. Communication enables industrialists to know where raw materials are available without having to move a lot.
4. Promotes international understanding because it enables citizens of different countries to be in close contact enabling them to learn about and appreciate each other's culture resulting in good relationship.
5. Many people are employed in the transport and communication sectors e.g. drivers, mechanics, engineers, journalists, broadcasters, computer programmers etc.
6. Settlements develop where transport routes converge e.g. Khartoum at the confluence of blue and white Nile and Mombasa.
7. Transport opens up remote areas for exploitation of natural resources such as minerals, fish, tourists' attractions because labour can be easily ferried to such areas and resources can be taken easily to processing sites.
8. Transport and communication are sources of revenue to the government e.g. tax levied on air time, license fees charged when one wants to start T.V. or radio station, etc.

Problems Facing transport and Communication in Africa and their Possible Solutions

1. Some countries are landlocked i.e. located far inland away from oceans e.g. Uganda, Rwanda, Burundi, etc. the solution is to develop good relations among the nations in the continent so that countries which have access to the sea permit their landlocked neighbors to have direct access to the sea routes.
2. Regions having rugged relief due to presence of features like mountains e.g. Mountains Kenya and Kilimanjaro which makes construction of roads and railways difficult and expensive. Presence of rapids and waterfalls which causes swift movement of water makes development of river transport difficult. The solution is constructing passes and tunnels through ridges and slopes and building of bridges across rivers and valleys to allow construction of roads and railways.
3. Shortage of navigable rivers because rivers have navigable stretches presence of obstacles and fluctuations of water volumes, narrowness and shallowness all of which makes navigation difficult. Solution is widening and deepening of river channels through dredging and construction of dams across rivers to improve navigation.
4. Vandalism of communication facilities such as telephones and their cables which hinders communication. The solution would be prosecution of people caught in possession of communication materials.
5. Lack of adequate capital for establishment and maintenance of transport and communication infrastructure e.g. vehicles, locomotives, aircraft, satellites, computers, etc. The solution is joint partnership between African countries with donors in order to finance establishment of communication infrastructure and also.
6. Political instability in countries such as Somalia which have affected transport and communication. The solution would be to set peace mission in the affected countries in order to restore stability.
7. Communication experiences language barriers due to many ethnic groups with majority who only communicates through vernacular making international communication difficult. Solution is adoption of major international languages like French and English to help Africa engage in international communication.
8. High cost of travelling due to high cost of fuel causing the low and middle class persons to travel less which reduces profits realized in the transport sector. The solution is management and conservation of energy to save on the available resources and alternative sources of energy.
9. Deep rooted colonial heritage where colonialists constructed railways of different gauges which makes extension of railways into neighboring countries difficult. Efforts are being made by several African countries to change the pattern of roads and railways and joint construction of roads and railways.

3.7 Trade

Trade is buying and selling or exchange of goods and services.

Types of Trade

A. Domestic/Internal/Home/Local trade

-Buying and selling of goods within a country's borders. It's classified into:

1. Wholesale Trade-purchasing of goods in bulk from producers and selling them to retailers.
2. Retail Trade-buying goods from wholesalers and selling them to individual consumers.

B. Regional Trade

-Trade between countries found in the same geographical region.

C. International Trade

-Exchange of goods and services at the global level. It's classified into:

1. Export Trade-selling of goods and services to foreign countries. Examples of major exports from Kenya are coffee, tea, cut flowers, tourism, fluorspar, Mira, vegetables, etc.
2. Import Trade-buying of goods and services from other countries. Examples of

Imports to Kenya are crude oil, vehicles, electronics, sugar, skilled labour, fertilizers, rice, vehicle parts etc.

3. Bilateral Trade-exchange of goods and services between two countries.
4. Multilateral Trade-exchange of goods and services between many countries.
5. Visible Trade-trading in tangible goods.
6. Invisible trade-trading in services.

Balance of Trade

-Difference in value of countries visible exports and imports. It's of 2 types:

1. **Adverse Balance of Payments**-in which value of visible imports exceeds that of visible exports.
2. **Favorable Balance of Trade**-in which value of visible exports exceeds that of visible imports.

Balance of Payment

Difference in value between visible and invisible exports and imports.

Factors Influencing Trade

1. Difference in natural resources which makes it necessary to trade with other countries or areas in order to obtain goods and resources which are not found in their area.
2. population whereby large population or one with high purchasing power provides a large and ready market for goods and services encouraging trade.
3. Trade occurs when there is demand and supply of goods and services.
 - i. If the supply is low and the demand is high, prices go up stimulating Trade.
 - ii. When the supply is more and the demand is low, prices go down Discouraging trade.
4. Adequate and efficient means of transport and communication encourage trade because bulky goods can be transported quickly and over long distances from producers to consumers. Poor transport discourages trade due to the difficulty in getting goods to the market in time. Goods can be supplied faster when traders communicate with suppliers without having to travel a lot which reduces travelling cost and hence increasing profits.
5. Trade restrictions can encourage or discourage trade. They are of two types:

Tariffs- taxes or duties levied by a country on a particular type of commodity imported in order to protect its domestic industries.

- Quotas-specified quantities of goods which must not be exceeded during importation or exportation.
- Trade Agreements-agreements made between countries regarding which commodities are exported or imported from specific countries.
- Total Ban-complete restriction of importation of a particular commodity in Order for a country to protect its domestic industries or due to political hostility.

6. Trading Blocks or economic Unions/Associations among countries aimed at promoting regional trade among members states can encourage trade between members and discourage trade with nonmembers.

- Free Trade Associations-liberalize trade among member countries by lowering and abolishing tariffs.

- Common Market Associations-liberalize trade among members and raise tariffs for nonmembers.

7. Trade can only take place between countries only when they are in good terms.

Hostility leads to total ban as was the case with South Africa during apartheid and Iraq when it attacked Kuwait and failed to destroy weapons of mass destruction.

8. Existence of aids to trade e.g.

- Banking facilitates storage and transfer of money used in trade transactions
- Insurance protects businesses against theft and destruction from fire which instils confidence among investors.
- Warehouses are essential for storage of large quantities of goods for sale.

3.8 Significance

1. Many countries are employed in domestic trade such as in wholesale and retail shops and in sectors dealing with foreign trade such as customs and clearing and forwarding firms.
2. it's a source of revenue for the government by charging sales tax on Manufactured goods sold locally and tariffs at the point of entry into the country.
3. Foreign trade enables a country to earn foreign exchange which is used to import goods that a country needs, setting up of industries, developing transport and communication, providing social services etc.
4. Leads to development of settlements e.g. many towns started as a small market and more people moved there when trading activities increased.
5. International trade ensures availability of a wide range of goods for consumers to select
6. It leads to development and improvement of transport infrastructure such as roads and railways in order to enhance transportation of goods and people.
7. Leads to development of industries because as the goods are bought demand for goods increases hence more industries are set or existing ones increase their activities in order to satisfy the increased demand.

Problems Facing Trade

1. Trade is largely depends on agricultural exports which are sometimes affected by climatic variations and diseases and pests leading to low production, and hence low foreign currency.
2. Exports are of low value as they consist of raw materials or semi processed commodities which fetch low prices because they have to be processed further and also due to being bulky a lot of money is required for their exportation making returns accruing from exportation to be low.
3. Local manufactures suffer unfair competition from foreign firms e.g. from COMESA some of which don't attract tariffs, diversion of goods intended for neighboring countries to the local market and counterfeit goods which compete with genuine ones.

4. There is ignorance about Kenyan goods where by some Kenyans believe that goods from overseas are of superior quality so they prefer imported goods instead of local ones.
5. Unexpected trade restrictions are sometimes imposed on Kenyan exports e.g. in 2000 E.U. banned fish importation from Kenya.
6. Inadequate transport and communication as most roads are poor and impassable during rainy season meaning goods can't reach the market and hence increased costs for such goods.

The Future of International Trade

The future of it is bright because of the following:

1. Kenya has signed trade agreements with various countries of Europe, Asia, America and Africa.
2. It's a member of COMESA which has increased the volume of regional trade.
3. There is revival of E.A.C. which has also increased the volume of regional trade.
4. Peace agreement between Sudanese government and S.P.L.A. has also led to increase in regional trade.
5. Kenya is exploring markets in the Far East countries.
6. Kenya has trade attaches abroad who help promote Kenyan goods there.
7. She has trade organizations such as Kenya External Trade Authority (K.E.T.A.) which carries research on factors which have limited access to top markets in U.S.A. and Japan and Kenya Bureau of standards which ensures quality of goods is maintained by the manufacturers.

The Role of Regional Trading Blocks

The Common Market for Eastern and Southern Africa (COMESA)

- It was established in 1994 to replace Preferential Trade Area (P.T.A.).
- It has 22 member states e.g. Kenya, Uganda, Ethiopia, Zambia, Zimbabwe, Namibia, etc.

Objectives of COMESA

- (a) To reduce and eliminate trade barriers on selected commodities to be traded with member states.
- (b) Abolish restrictions in administration of trade among member countries.
- (c) Fostering relations, peace and political stability for member states.
- (d) Raise the standard of living within member states.
- (e) Promote goods being produced in the member states.
- (f) Establish and foster co-operation in all fields of economic activity.

Achievements

- (a) Increased volume of trade.
- (b) Increased accessibility to markets in member countries.
- (c) Free movement of goods among member countries due to elimination of trade barriers.
- (d) Increased efficiency in production as each member is allowed to specialize in what she produces.
- (e) Improvement of transport and communication facilities.
- (f) Increased political and economic cooperation among member states.

The Southern African Development Community (SADC)

- It started as Southern African Development coordination in 1980 in Lusaka Zambia and transformed into SADC after collapse of apartheid.
- It has 14 member states e.g. Tanzania, DRC, S. Africa, Zambia, Zimbabwe,

Mozambique, etc.

Objectives

- (a) Encourage self-reliance among member states in the face of instability posed by apartheid regime of S. Africa.
- (b) Promote and defend peace and security.
- (c) Promote regional integration.
- (d) Eradicate poverty.
- (e) Facilitate trade and economic liberalization.
- (f) Promote self-sustaining development on the basis of interdependence on member states.
- (g) Promote and maximize utilization of natural resources and effective protection of

Environment.

Achievements

- (a) Promotion of regional industries based on domestic and regional raw materials.
- (b) Reliability and development of regional transport and communication

Infrastructure.

The Economic Community of West African States (ECOWAS)

- Was established in 1976 by the treaty of Lagos. —
 - □ It has headquarters in Lagos Nigeria.
- It has 15 member states e.g. Nigeria, Liberia, Ghana, Benin, Guinea, Sierra Leone, etc.

Objectives

- (a) Promote mutual trade by eliminating trade restrictions among members.
- (b) Create a monetary union.
- (c) Impose uniform tariffs for imports from non-member countries.
- (d) Give special treatment to goods imported from member states.
- (e) Promote free movement of people to and from member countries by eliminating visas.

Achievements

- (a) Brought peace to troubled countries like Liberia and Sierra Leone.
- (b) Promotion of trade in the region through the peace achieved.
- (c) Development of schools to train people on peace keeping e.g. The National War College.
- (d) Free movement of goods among member states.

The European Union (EU)

- An organization of European countries dedicated to increasing economic integration and cooperation among members.
- It was formerly inaugurated in 1993 and has headquarters in Brussels in Belgium.

Objectives

- (a) Promote cooperation in economic, trade, social, security and judicial matters.
- (b) Implementation of economic and monetary union.

Achievements

- (a) Signing of many trade agreements between EC and other countries.
- (b) Free trade among members as a result of abolishing trade barriers.
- (c) High agricultural production as farmers receive guaranteed prices which have enabled them to increase efficiency.
- (d) Free movement of factors of production which include capital and labour.

Problems Facing Regional Trading Blocks

- (a) Civil wars taking place in some countries which has caused insecurity in turn affecting trade between countries.
- (b) Political differences among leaders of member states may affect cooperation among member states.
- (c) Some countries produce similar goods making the volume of trade to be low and less rewarding.
- (d) Free trade affects local industries as the imported goods without taxes are usually cheaper than locally produced goods.
- (e) Free trade denies countries revenue they would have earned from taxing imported goods.
- (f) Poor transport and communication limits inflow of goods and services.
- (g) Some member states don't remit their annual subscriptions which affects the operations of the organizations.

WORK TO DO

1. Why is transport a necessity?
2. Name five means of transport.
3. Why is communication a necessity of life?
4. Name four means of communication.
5. What are the means of mass communication?
6. What are the international highways? Name one such highway

Chaper Four

Political Geography

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Political Geography

Political geography is a branch of human geography (the branch of geography concerned with understanding the world's culture and how it relates to geographic space) that studies the spatial distribution of political processes and how these processes are impacted by one's geographic location. It often studies local and national elections, international relationships and the political structure of different areas based on geography.

4.1 Types of Government

1 Governments can be classified into several types. Some of the more common types of governments are:

1. Democracy

The word "democracy" literally means "rule by the people." In a democracy, the people govern.

2. Republic

A literal democracy is impossible in a political system containing more than a few people. All "democracies" are really republics. In a republic, the people elect representatives to make and enforce laws.

3. Monarchy

A monarchy consists of rule by a king or queen. Sometimes a king is called an "emperor," especially if there is a large empire, such as China before 1911. There are no large monarchies today. The United Kingdom, which has a queen, is really a republic because the queen has virtually no political power.

4. Aristocracy

An aristocracy is rule by the aristocrats. Aristocrats are typically wealthy, educated people. Many monarchies have really been ruled by aristocrats. Today, typically, the term "aristocracy" is used negatively to accuse a republic of being dominated by rich people, such as saying, "The United States has become an aristocracy."

5. Dictatorship

A dictatorship consists of rule by one person or a group of people. Very few dictators admit they are dictators; they almost always claim to be leaders of democracies. The dictator may be one person, such as Castro in Cuba or Hitler in Germany, or a group of people, such as the Communist Party in China.

6. Democratic Republic

Usually, a "democratic republic" is not democratic and is not a republic. A government that officially calls itself a "democratic republic" is usually a dictatorship. Communist dictatorships have been especially prone to use this term. For example, the official name of North Vietnam was "The Democratic Republic of Vietnam." China uses a variant, "The People's Republic of China."

Structure of Government

The structure of government

The Executive - *fulintan*

The Judiciary *gawoor*

The Legislature *shanci degin*

The Executive

The executive consists of the President, the Deputy President and the Cabinet ministers at national level, and the Premier and Members of the Executive Councils (MECs) at provincial level. It also includes government departments and civil servants.

The responsibility of the Executive is to run the country and to make policy in the best interests of its citizens and in terms of the Constitution. They are empowered to implement legislation, develop and implement policy, direct and co-ordinate the work of the government departments, prepare and initiate legislation and perform other functions as called for by the Constitution or legislation. The Executives cannot pass laws, however, but may propose to the Legislature new laws and changes to existing laws.

The Structure of the National Executive:

The President

The President is Head of State and head of the national Executive or Cabinet. S/he is entrusted with maintaining the supremacy of the Constitution as the guiding law of the country, and is also required to promote the unity and interests of the nation. As head of the national Executive, the President is also the Commander-in-Chief of the defense force. **Election of the President**

The National Assembly elects one of its Members to be President during the first sitting of the National Assembly. Once elected as President, the President ceases to be a Member of Parliament and must be sworn into office within five days. The President of the Constitutional Court presides over the President's election or designates another judge to do so. If the Presidency is empty, then the Constitutional Court President must set a date within 30 days in which the position will be filled.

Duration of the Presidency

A person may serve as President for no more than two terms. Appointments as acting President are not included in this period.

Removal of the President

If the President is found to have seriously violated the Constitution or the law, or has been engaged in serious misconduct or is unable to perform his/her duties, the National Assembly may remove him/her from the position of President. Such a resolution would have to be adopted with a two thirds majority - that is two thirds of all of the Members of Parliament would have to agree to this.

On the other hand, a motion of no confidence in the President (that is, a proposal that s/he is not governing the country satisfactorily) requires only a majority vote (over 50% of all Members) by the National Assembly. If this was successful, the President, Deputy President and the entire Cabinet, as well as the Deputy Ministers, would have to resign. Once a President has been removed from office, the National Assembly must elect a new President within thirty days of the vacancy occurring. If this does not happen, the Acting President must dissolve the National Assembly and elections must take place.

Acting President

If the President is out of the country or unable to perform his/her duties, the following people, in order of priority, are required to serve as acting President:

1. The Deputy President
2. A Minister designated by the President
3. A Minister designated by the Cabinet
4. The Speaker of the National Assembly until it elects one of its Members of Parliament.

Powers and functions of the President

The President is responsible for

- appointing the Cabinet;
- appointing judges after consulting with the Judicial Services Commission;
- appointing the Public Protector, the Auditor-General and members of the various Commissions on the recommendation of Parliament;
- appointing the Military Command of the Defense Force;
- appointing commissions of inquiry;
- assenting to and signing Bills passed by Parliament so that they can become laws, or referring Bills back to the National Assembly or to the Constitutional Court if there are concerns over their constitutionality;
- calling special sittings of the Houses of Parliament;
- calling a national referendum;
- receiving foreign diplomats;
- designating South Africa's representatives abroad;
- conferring honors;
- pardoning or reprieving offenders; and
- declaring a "state of national defense" with the approval of Parliament.

The Deputy President

The President appoints the Deputy President from amongst the Members of the National Assembly and may also dismiss her/him. The President assigns particular powers and functions to the Deputy President who must assist the President in the running of government (section 91 of the Constitution).

The Cabinet

The Cabinet comprises the President (as its Head), the Deputy President and Ministers who are appointed by the President from the National Assembly. (Two Ministers may be appointed from outside the National Assembly.) The President assigns powers and functions to the Minister and may dismiss them.



Responsibilities of Ministers

The President allocates specific responsibilities known as a "portfolios" to each Minister to supervise. Currently there are 26 portfolios.

Each Minister has a Ministry which consists of a small team of advisors. The Ministry and a Department, headed by a Director-General, assist the Minister in developing and implementing policy and laws.

Accountability

Ministers are accountable to the National Assembly for their actions and for those of their departments and they must act according to government policy. They must also provide Parliament with regular and full reports about matters for which they are responsible. Members of the Cabinet must act according to a code of ethics, created by the president pursuant to the principles and framework established by the Executive Members' Ethics Act of 1998. This Act says that they may not do any other paid work, have conflicts of interests between their official and private capacities, must not act in any way that is inconsistent with their offices, or use their position or any information entrusted to them for the improper enrichment of anybody.

Term

After the dissolution of Parliament, the Cabinet continues to function until the next National Assembly elects a new President and a new Cabinet is appointed.

If the majority of Members of the National Assembly passes a motion of no confidence in the Cabinet then the President must establish a new one. If the majority of the National Assembly Members passes a motion of no confidence in the President, not only the President but his Cabinet and the Deputy Ministers must also resign.

Deputy Ministers

While Deputy Ministers are not Members of the Cabinet, they are required to assist the relevant Ministers in the execution of their duties. The President, in consultation with the Deputy President, is responsible for the appointment of Deputy Ministers from amongst the Members of the National Assembly. Despite not being Members of the Cabinet, Deputy Ministers would have to resign along with the entire Cabinet if a motion of no confidence in the President was successful.

Faysal Bank

The Structure of a Provincial Executive

The Executive in each province is called the Executive Council and is headed by the Premier. Members of Executive Councils (MECs) are accountable to their Legislatures in the same way as the Cabinet is accountable to Parliament.

The Premier

The Premier is elected by the Members of that Provincial Legislature (MPLs) from amongst themselves at the first sitting of that legislature after the election.

The Executive Council

The Premier appoints the Members of the Executive Council (MECs) from among the MPLs. There may be up to ten MECs in each province. (The exception is the Western Cape whose provincial Constitution allows for the additional appointment of up to two non-voting MECs from outside the Legislature.)

Responsibilities of MECs

MECs are accountable to their Premiers. Like Ministers, MECs are responsible for departments. These provincial departments deal only with those matters that provinces are allowed to control or those over which they share control with national government. *(These are described in Section 1.3 above.)*

There is still no formal structure to facilitate intergovernmental relations between the national and provincial executive. Ministers and MECs do meet informally, however, in what is known as MINMEC. This is a meeting between the Minister and the nine provincial MECs who deal with the same portfolio. MINMEC plays a meaningful role in the process of co-operative government.

Non-compliance

It is the responsibility of national government to build the administrative capacity of the provinces. If a province is not performing properly, national government can take over a province's responsibilities to maintain established service standards, economic unity or national security or to prevent a province from acting in ways which harm the interests of another province or the country as a whole. If Cabinet intervenes in a province, it must table notice of this in the National Council of Provinces (NCOP) within 14 days of having intervened. There are a number of provisions (outlined in section 100 of the Constitution) that ensure that national supervision of a provincial administration is strictly monitored by the NCOP. In the same way, provincial governments are allowed to administer the affairs of local governments that are not performing properly. Here, too, the NCOP is responsible for monitoring such an intervention.

(See section 139 of the Constitution.)

The Judiciary

Judicial authority is vested in the courts, which are independent and subject to the laws of the Constitution. The courts are:

- The Constitutional Court
- The Supreme Court of Appeal
- The High Courts
- The Magistrates Courts and
- Various other Courts.

DEO



The Constitutional Court

The Constitutional Court is the highest court for constitutional matters. It is located in Johannesburg and presided over by a maximum of eleven judges. The Court guarantees the basic rights and freedoms of all persons. Its judgments are binding on all organs of government, including Parliament, the Presidency, the police force, the army, the public service and all other courts.

It is also the only court that may decide upon disputes between organs of state in the national and provincial spheres. The disputes may concern

- The constitutional status, power or functions of any of those organs of state;
- The constitutionality of any national or provincial Bill or Act;
- The constitutionality of any amendment to the Constitution;
- The possible failure of the Parliament or the President to fulfil a constitutional obligation; or
- certifying a provincial constitution.

Supreme Court of Appeal

The Supreme Court of Appeal is the highest court of appeal except in constitutional matters, and may hear only

- Appeals;
- Issues connected with appeals; and
- Other matters that may be referred to it in circumstances defined by an Act of Parliament.

When people are not satisfied with the decision of a High Court, they may take the matter further to the Supreme Court of Appeal. The Supreme Court of Appeal is located in Bloemfontein. It is presided over by five judges.

High Court

High Courts used to be called Supreme Courts and are primarily intended for more serious criminal and civil cases. They may hear some constitutional matters - with the exception of those matters that only the Constitutional Court may decide. Each province has a High Court which is usually situated in the capital.

Magistrates' Courts

Magistrates' Courts are the usual entry point for the majority of people who go to court. There are two kinds of magistrate courts: regional courts and district courts. Regional courts are higher in rank which means that they hear more serious cases than the District Magistrate Courts and may impose heavier sentences. Magistrates' courts and other courts may decide on any matter determined by an Act of Parliament, but may not enquire into or decide about the constitutionality of any legislation or any conduct of the President.

Other Courts

There are various other courts which are located at varying levels in the court hierarchy:

- The **Small Claims Courts** which look at minor cases involving sums of R3000 or less;
- The **Electoral Court** which deals with electoral issues, for example when there is a dispute among political parties concerning the elections;
- The **Labour Court** which deals with issues pertaining to labour relations; and
- The **Land Claims Courts** which deal with matters of land redistribution.

The Legislature

The term "legislature" means a body of elected representatives that makes laws. The prime function of legislatures, therefore, is to formulate debate and pass legislation which is needed for the government and the country to function. The legislature also provides a forum in which the public can participate in issues and watch over the executive arm of government.

Parliament

Parliament has two Houses: the National Assembly and the National Council of Provinces (NCOP).

The National Assembly

The National Assembly is elected to represent the people and to ensure government by the people under the Constitution. It does this by:

- choosing the President,
- providing a national forum for public consideration of issues,
- passing legislation and
- Scrutinizing and overseeing executive action.

Members of the National Assembly can change the government by passing a vote of no confidence in the President and/or the Cabinet. *Membership* The National Assembly must have a maximum of 400 Members and a minimum of 350 Members of Parliament (MPs). Members are elected to the National Assembly through an electoral system based on proportional representation. The Constitution makes it clear that the current electoral system can be changed by a new law, provided that the new electoral system results, in general, in proportional representation. This means that candidates are appointed from party lists in proportion to the number of votes the party wins in the elections. So, if a party wins half the votes it will hold half the seats in the National Assembly.

The National Council of Provinces (NCOP)

The National Council of Provinces (NCOP) ensures that the nine provinces and local government have a direct voice in Parliament when laws are made. The National Council of Provinces represents the provinces to ensure that provincial interests are taken into account in the national sphere of government. It does this mainly by:

- participating in the national legislative process and
- Providing a national forum for public consideration of issues affecting the provinces.

The NCOP also has an important role to play in promoting national unity and good working relations between national, provincial and local government. While the delegates in the NCOP represent their political parties, they also have the important duty of representing their provinces as a whole.

4.2 Membership

Each province has ten delegates, no matter how big or small the province, thus guaranteeing a balance of interests among the provinces. There are six permanent and four "special" nonpermanent delegates in each delegation. Each is headed by the Premier (as one of the special delegates) or a substitute for him/her when the Premier is not available. The delegation must reflect the proportional strength of the various parties in the province. In addition to the nine provincial delegations, the NCOP includes a delegation of the South African Local Government

Association (SALGA) whose ten non-voting representatives are chosen from a group of representatives from the nine Provincial local government associations.

Provincial Legislatures

Each province has a legislature, the size of which varies depending on the population levels in the province. According to the Constitution the minimum size of a Legislature is 30 members and the maximum size is 80 members. Members are elected from provincial lists on the basis of the number of votes received by a political party. A provincial legislature is responsible for passing the laws for its province as defined in the Constitution. These laws are only effective for that particular province. Parliament may intervene and change these laws if they undermine national security, economic unity, national standards or the interests of another province. Like Parliament, provincial legislatures have the responsibility of calling their Members of their Executive to account for their actions.

Office bearers of legislative institutions

Parliament: National Assembly

- **The Speaker and Deputy Speaker** are the **Presiding Officers** and they manage the National Assembly's affairs.

The **Leader of Government Business** is appointed by the President from the Cabinet, s/he is responsible for organizing and synchronizing the legislative work programme with government business.

- **Chief Whips** (representing the majority party and largest minority party)

The Presiding Officers together with the Chief Whips and Leader of Government Business decide on the programme for Parliament.

Other office bearers are:

- **The Whips;**

- the **Chairperson of Committees** who presides at the sittings of a House when the Speaker and Deputy Speaker are not available and approves the budget and expenditure of Committees, in consultation with the Chief Whip of the majority party; and

- The leader of the largest opposition party who is recognized as being the official **Leader of the Opposition**.

Parliament: NCOP

The NCOP elects a **Chairperson** and a **permanent Deputy Chairperson** to run its affairs (in similar roles to the Speaker and Deputy Speaker). In addition, a second rotating Deputy Chairperson is elected for a year, enabling each province to have one of its Members elected as the **second Deputy Chairperson**.

Other office bearers in the NCOP comprise:

- The Chairperson of Committees and his/ her Deputy.
- Two sets of Whips:
- Province Whips to organize the work of its delegation and
- Party Whips to organize its party business within the NCOP

Provincial Legislatures

Like Parliament, office bearers in the provincial legislatures comprise the Speaker

- The Deputy Speaker,
- The Leader of the House,
- Chief Whips (representing the majority party and largest minority party)
- The Whips,
- The Chairperson and the Deputy Chairperson of Committees, and
- The Leader of the Official Opposition.

Functions and responsibilities of office bearers

Presiding officers

The **Speaker** in the National Assembly and in the provincial legislatures is the person who presides over the proceedings of the House and is responsible for running the legislature subject to the policy laid down by the Joint Rules Committee of Parliament. In the NCOP s/he is called the **Chairperson** and has the same powers as a Speaker. In the NCOP there are two deputies, one permanent and one rotating. The position of the second chairperson rotates amongst the provinces on an annual basis. These presiding officers and their deputies are elected from amongst the Members of each legislature and are expected to be fair and impartial in the execution of their duties. They are responsible for:

- presiding over meetings in the House and taking charge of debates, making sure that Members can participate freely while keeping to the rules;
- interpreting the rules. S/he may also give a ruling or make a rule on a matter for which there is no provision in the current parliamentary rules;
- regulating public access to meetings and ordering members of the public to leave the House, where necessary;
- censuring Members, ordering them to leave the House and even ordering the offending Member to leave the precincts of Parliament until they have decided what action to take against the Member. In the event of serious disorder at a sitting, they may suspend the proceedings or adjourn the sitting.

The National Assembly may remove the Speaker or Deputy Speaker from office by resolution. A majority of the Members of the Assembly must be present when the resolution is adopted.

Chairperson of Committees

The Chairperson of Committees is appointed by the Members of a legislature. His/her primary functions are

- To preside at meetings of the Committee of Chairpersons;
- To approve the budget and expenditure of Committees, in consultation with the Chief Whip of the majority party; and
- To preside at the sittings of a House when the Speaker and Deputy Speaker are not available.

Leader of Government Business (Leader of the House)

The Leader of Government Business is chosen by the President (with the consent of the Cabinet) from amongst the Members of the Cabinet and represents Cabinet in Parliament. The Leader of Government Business, in consultation with the Chief Whip of the majority party, plays a crucial role in deciding on the programme of the legislature and ensuring that government business is dealt with and properly synchronized. In provincial Legislatures, the Leader of Government Business is referred to as the Leader of the House and is appointed by the Premier.

The Leader of the House serves as a link between the Executive Council and its Legislature and s/he performs the same functions as the Leader of Government Business. **Chief Whips and Party Whips**

Whips contribute to the smooth running of a legislature. At the same time whips represent their party's interests and ensure the discipline of their members and the effective functioning of their party, both within the legislature as well as within the organization. There are two Chief Whips who are the official office bearers. One represents the majority party and the other is from the largest minority party. The other parties have Senior Whips assisted by a number of other whips. The Chief Whips are formally appointed by the Speaker, based on the recommendations of the respective political parties.

The Chief Whip of the majority party, in consultation with the Chief Whip of the largest minority party, is responsible for the detailed arrangement of the legislative business, that is, the programme of the Legislature. S/he is also responsible for approving the budget of Committees in consultation with the Chairperson of Committees.

Committees

Much of the work of legislatures is delegated to Committees. This means that

- Issues can be debated in more detail than is possible in a full sittings of the House;
- Public hearings can be held on specific matters;
- Members assigned to a Committee can develop expertise and in-depth knowledge of the field covered by that Committee; and
- Internal arrangements, proceedings and procedures for the legislature can be devised and monitored.

The responsibilities of Committees include:

- initiating legislation (rules for which have recently been established);
- debating and amending legislation and policy documents;
- monitoring the departments they oversee;
- investigating and making recommendations on the budgets of these departments;
- holding public hearings or asking for submissions on important bills; and
- investigating any function of the executive and its department, which includes summoning ministers and any department official to appear before them to supply information;

Committees do not take decisions but make recommendations to the legislature. Usually these recommendations are expressed in the form of reports to the House. Each Committee elects its own chairperson. Each Committee is supported administratively by a Committee secretary/clerk.

Portfolio and Select Committees

In the National Assembly there are "Portfolio" Committees which shadow government departments - for each government department/portfolio there is a portfolio committee. For example there is a Portfolio Committee on Housing which addresses issues which relate to the Department of Housing. The National Council of Provinces (NCOP) has equivalent Committees, known as "Select" Committees. But unlike the National Assembly committees, there is not always one committee per government department/portfolio but a cluster. For example the Security and Justice Select Committee deals with the portfolios of Justice, Safety and Security as well as Defense.

Committees in the provincial legislatures

Provincial legislatures also have committees. Like the national portfolio committees, they shadow the area of responsibilities of Member of Executive Council (MECs) - but unlike the national committees, there is not always one committee per MEC or government department/issue.

Ad hoc committees

Both Parliament and provincial legislatures have temporary Committees, known as "Ad Hoc" Committees, which are formed to consider specific issues. They cease to exist once they have completed their mandates.

Standing Committees

Some committees are permanent structures and are known as "standing committees" such as the Public Accounts Standing Committee. Some permanent committees have members from both the National Assembly and the NCOP, which are called "joint" standing Committees such as the Joint Standing Committee on Defense. However the term "standing committee" is slowly being phased out. For example the Joint Standing Committee on Defense will shortly be renamed the Joint Committee on Security Matters.

Legislative Authority

Legislative authority is vested nationally in Parliament (section 44 of the Constitution). Provincial legislative authority is vested in the provincial legislatures (section 104 of the Constitution).

National

The national legislative authority, as vested in Parliament, gives the National Assembly the power to amend the Constitution;

- To pass legislation with regard to any issue, subject to certain provisions; and
- To pass on any of its legislative powers to any legislature in the other spheres of government (except the power to amend the Constitution).

It gives the NCOP the power

- To participate in amending the Constitution (section 74);
- To pass legislation affecting provinces (section 76); and
- To consider any legislation passed by the National Assembly (section 75).

Parliament may intervene in provincial legislation and make or change laws dealing with exclusive provincial matters (listed in Schedule 5 of the Constitution) only in the following cases (section 44 (2)):

- To maintain national security,
- To maintain economic unity,
- To maintain essential national standards,
- To establish minimum standards for rendering of services; or
- To prevent unreasonable action by a province that might be detrimental to the other provinces.

Provincial

Provincial legislatures are bound only by the national Constitution and by their own Constitution, if they have one. The legislative authority of provinces as vested in provincial Legislatures gives them the power

- To pass a constitution for the province, or amend any constitution passed by it (sections 142 and 143 of the Constitution);



The Supreme Court is the highest organ of the Judiciary and is also at the same time the Constitutional Court. In addition to the Chairman, the number of judges in the court shall not be less than four. A special law shall govern the court. The Procures of the state consists of the Attorney General and his deputies Centrifugal, centripetal.

- To pass legislation for the province with regard to any matters
- Within a functional area listed in Schedule 4 and Schedule 5 of the Constitution;

Outside those functional areas that are expressly assigned to the province by national legislation; and

- For which a provision of the Constitution envisages the enactment of provincial legislation; and
- To assign any of its legislative powers to a Municipal Council in that province.

A provincial legislature can, with a two-thirds majority, request Parliament to change the name of that province. A provincial legislature may recommend to the National Assembly legislation concerning

- Any matter outside the authority of that legislature; and
- Where an Act of Parliament prevails over a provincial law

4.3 Somaliland Government

The country has a republican form of government.

The government consists of three branches which are: the Legislative, the Executive and the Judiciary. The separations of the powers of these branches are as set out in the Constitution. Each branch exercises independently the exclusive powers accorded to it under the Constitution. Sometimes referred to as "the Government" The state has an Executive Branch, which is separate and independent of the legislative and the judicial branches. The Executive Branch (sometimes referred to as "the Government"), is headed by the elected President and consist of the President, The vice-President, and the Council of Ministers appointed by the President. The power to legislate cannot be transferred to anyone outside the Parliament the legislative powers of the Republic of Somaliland are vested exclusively in the Parliament which consists of two Houses – the House of Representatives and the House of the Elders. The power to legislate cannot be transferred to anyone outside the Parliament. All bills passed by the Parliament only come into force when the President publishes them in accordance with the Constitution. The Parliament fulfils its duties in accordance with the Constitution and its Rules. The Judiciary consists of the courts and the Procuracy. The judges and the members of the Procures are independent when exercising their judicial functions and are guided only by the law. The courts of the Republic of Somaliland consist of: The Supreme Court, the Appeal Courts of the Regions, the Regional Courts, the District Courts and the Courts of the National Armed Forces.

Work to Do

- 1- Define what does mean by political geography?
- 2- Discuss the type of Somaliland government and explain the main branches of the Somaliland government?
- 3- State the roles and responsibilities of parliament?
- 4- Describe the functions of the courts?
- 5- Explain in general the types of government?
- 6- State the composition of cabinet and explain the responsibilities of each?

Chapter *five*

Population

Chapter *five*

Population

At the end of this chapter the learners should be able:

- Explain population growth rate,
- Fertility rate.
- Explain problem facing over/under populated countries
- Analyze demographic trend in SL
- Differentiate the age-sex pyramids of an developed and underdeveloped countries

Define population

In general terms, the term population refers to the total number of objects or organisms occupying a given area. In the human context however, **Population** is the total number of people occupying or inhabiting a given unit area.

Population distribution

This refers to the way people are spread out on the land. People don't inhabit all the land because of some unfavorable factors. For example some places have inhibiting features like swamps and steep slopes on which people cannot settle. This is why some areas are densely settled while others are not.

Population Density

This describes the concentration of people in a specific area or it is expresses the number of people living per unit area (kilometer squares). There are some places where people are concentrated in one area while the land in the neighborhood may be un occupied. There are two methods of calculating density.

1. Crude Population density: It is obtained by taking the number of people in a given area and dividing that number of people by the total area of the place

Crude Population density (CPD) = Total population divided by Total area.

2. Agricultural population density (APD) = Total population divided by total arable area.

Example Assume the total area of the world is 149,450,000sq km and its arable area is only 11%. And the world's population in 1990 was 5292million. Calculate

a) Crude population density

x b) Agricultural population density

Given: total pop=5292m World total area =149.45 million Arable land =11% of 149.45 =16.4 million sq km.

Therefore

a) CPD= total population/ total area = 5292 million/149.45million = 36 persons per sq km. ✓

b) APD = total population/ total arable land 5292 million/ 16.4 million sq km =322.7 persons per sq km x

Describing of population density:

- Unpopulated area if CPD is less than 1 person/ sq km
- Sparsely populated if CPD is between 1-20 persons/km
- Moderately populated if CPD is between 21-100 persons/km
- Densely populated if CPD is over 100 persons/km



Table 4-1 Population Densities for Selected Countries, 2001

Country	2001 Population in millions	Area thousands sq mi/km	Arithmetic Density sq mi/km	Physiologic Density sq mi/km	% Arable Land
Argentina	37.5	1056.6 mi-2736.6 km	35/mi 15/km	394/mi 152/km	9
Bangladesh	133.5	51.7 mi-133.9 km	2582/mi 997/km	3541/mi 1362/km	73
China	1273.3	3600.9 mi-9326.4 km	354/mi 137/km	3521/mi 1365/km	10
Colombia	43.1	401 mi-1038.7 km	107/mi 41/km	2694/mi 1036/km	4
Egypt	69.8	384.3 mi-995.4 km	182/mi 70/km	9064/mi 3508/km	2
India	1033	1147.9 mi-2973.1 km	900/mi 347/km	1607/mi 620/km	56
Japan	127.1	144.6 mi-374.7 km	879/mi 339/km	7944/mi 3085/km	11
Netherlands	16	13.1 mi-33.9 km	1221/mi 472/km	4849/mi 1882/km	25
Nigeria	126.6	351.7 mi-910.8 km	360/mi 139/km	1090/mi 421/km	33
Puerto Rico	3.9	3.5 mi-9.0 km	1114/mi 433/km	3900/mi 975/km	4
Switzerland	7.2	15.4 mi-40.0 km	468/mi 180/km	4800/mi 1800/km	10
Ukraine	49.1	233.0 mi-603.7 km	211/mi 81/km	363/mi 140/km	58
United States	284.5	3536.3 mi-9139.0 km	80/mi 31/km	423/mi 163/km	19

Demography This is the study of the statistical data of human population. Population data can be obtained from both **primary** and **secondary** sources. Primary sources include registration of persons, e.g. births and deaths, censuses and sample survey. Secondary sources include reports on population compiled and published as censuses reports, textbooks and magazines.

5.1 Factor Influencing Population Distribution

The distribution of population on the surface of the earth is not uniform due to many factors, these factors can be classified four main groups.

- Physical factors
- Historical factors
- Economic factors
- Political factors

5.1.1 Physical Factor

Climate:- Temperature and rainfall are the two main influential climatic elements. People have tendency to adapt to moderate variations in temperature. Very high temperature discouraged human settlements.

Relief:- Areas of very high altitude have low population because of the extremely low temperatures experienced there.

Vegetation: Dense forests are sparsely populated as it is difficult to develop communication lines in such areas, they are also habitats for wild animals which may be dangerous to human habitation, livestock and crops.

Soils: Areas with fertile soils and reliable rainfall have high population because they are agriculturally productive while those with poor soils e.g. savannah with leached soils have low population since they are agriculturally unproductive.

Drainage:- Well drained areas attract settlements and therefore have high populations. Swampy places and areas with seasonal swamps are normally uninhabited. Such places do not support settlement or farming.

Pests and diseases: Some parts of east Africa are still infested with pests. These pests cause diseases in people and animals. Areas infested with mosquitoes and tsetse flies have very few people living in them.

5.1.2 Historical Factors

Historical Factors Historical factor events may also be responsible for low population densities in some areas. In the 18th century, many parts of east west and central Africa were affected by slave trade. Strong young men and women were captured and sold as slaves to go and work on the farms in America. Some were taken as slaves to the Arab world. Meanwhile, others people ran away from the same areas to avoid being captured and never returned. This reduced in the population in these areas.

5.1.3 Economic Factors

Economic Factors Economic development, resulting from activities, such as exploitation of natural resources, attracts a large population of job-seekers and service providers. Mining centers, no matter how remote they may be in a country, usually attract a large population. Some of the peoples are workers in the mines, others are job-seekers, while there are those who provide services such as catering and accommodation.

5.1.4 Political factors and government Policies

Political factors and government policies Political unrest in many parts of the world has caused migration from certain areas. For example, many people from Somalia and other countries in Africa have sought refuge in many parts of the world in recent years because of political instability.

5.2 Population Growth

Population growth Population growth: refers to the increase (positive growth) or decrease (negative growth) in the number of people. This growth may be calculated in two ways:

a) Natural population growth

This is described as the natural increase or decrease in population, it is determined by:

i) The crude birth rate (CBR)

ii) The crude death rate (CDR)

Crude birth rate is the estimated rate of births in a year. It is not a precise figure because the figure for the total population that is used in the calculations is estimated by the middle of the year. The crude birthrate is calculated by dividing the total number of births recorded in the year by the total population in that year and multiplying the fraction by 1000.

$$CBR = \frac{\text{Total number of birth in the year}}{\text{total population}} \times 1000$$

CBR is expressed as the number of children born per 1000 people. The crude death rate is the estimated death rate against an estimated total population by the middle of the year in question. It is calculated in the same way as CBR, thus

$$CDR = \frac{\text{Total number of deaths in a year}}{\text{Total population (estimated by midyear)}} \times 100$$

The CDR result is expressed as the number of deaths per 1000 people. The natural population growth can be obtained by subtracting the CDR from the CBR. It can be expressed in percentage.

$$CBR - CDR / 1000 \times 100 = \text{Natural population growth.}$$

b) Numerical population increase

This is the actual i.e absolute increase in the number of people in an area within a given period of time. It is calculated every ten years by getting the difference between.

The two census, it can also be expressed as a percentage, for example, the numerical population increase in Kenya between 1989 and 1999 is

Population in 1999 = 28,686, 607

Population in 1989 = 21, 443, 636

Inter-censal increase = 7 242 971

Percentage population increase = $7\,242\,971 / 21\,443\,636 \times 100$

The numerical population growth figure is advantageous because it gives the real increase in population. The increase is due to the births and migration. On the other hand, natural population growth does not put into consideration migration. It only focuses on births and deaths.

5.3 Factors Influencing Population

Factors influencing population growth Population growth is influenced by several factors. These include:

- a) Mortality
- b) Fertility
- c) Migration

Mortality (death rate)

Mortality:- This is the number of deaths within a given population. The death rate is the number of deaths per one thousand of the total population per year or it is the number of deaths for every 1000 people in a particular year. Death rates have negative influence on a population growth.

Child mortality rate: refers to the number of deaths of children aged between 1 and 5 years per one thousand live births.

Infant mortality rate: refers to the number of deaths in the first years of life per one thousand live births.

Adult mortality rate: refers to the number of Adults dying per one thousand of the total population. Mortality may be caused by:

- ✓ Wars
- ✓ Famine
- ✓ Accidents

Fertility

Fertility is the ability to conceive or to produce or it is the ability of woman to give birth to a life child while fertility rate refers to an average number of children that women may have during her bearing age. Fertility rate are best observed through the study of factors leading to high births rate. High fertility rate has been due to improved nutrition, improved health services. This leads to growth in population. Fertility rate is influenced by:

- ✓ Early marriage
- ✓ Medical care
- ✓ Cultural beliefs
- ✓ Education
- ✓ Family planning

5.4 Migration

Migration is the movement of people from one place or region to another resulting in a change of residence.

Immigration where people come in to a country from other countries, such people are referred to as immigrants. It may also involve emigration where people leave their native land for another country such people are referred to as emigrants. Migration across the country's borders is called international migration, such migration influences population growth in the two countries affected.

Emigrants: It is the people who move out of a place.

Immigrants: it is the people who move in of a place.

Causes of Migration

There are many reasons why people migrate the reasons may be economic, social or political the following are some of the causes of the migration.

- 1) **Pressure on Land:** Agriculturalists with can't make a living in their own country because there is shortage of land to cultivate or the land has become too poor to support crops or livestock may migrate to countries or regions better than their countries.
- 2) **Availability of Employment opportunities:** This is more common for rural people who move to towns in search of jobs. Some people also move from one town to another in search of better paying jobs.
- 3) **Creation of wealth:** Some migrate to other countries with the hope of improving their income and living standards. While others want to get rich quickly.
- 4) **Religious Conflicts:** persecution of specific religious or sect groups, forces the members to migrate to safer places where they can practice their religion with out interference.
- 5) **Warfare:** wars cause large numbers of people to migrate of other countries. People may flee before an advancing army gets to them to avoid being subjected to a new regime or to avoid being caught up in the fighting, it can also be due to their homes and farms being destroyed.
- 6) **Natural Calamities:-** Occurrence of natural disasters such as diseases, floods and severe droughts may force people to move to areas where they are move comfortable. E.g. foods and draught that are common in monsoon Area have caused regular. Migration of thousands of people.
- 7) **Government Policy:-** A government may move people from areas they have settled in order to set up development projects.

Such people one compensated and resettled elsewhere. projects that may cause people to be relocated include irrigation schemes, hydroelectric power plants and mining projects.

- 8) **Forced migration:-** Most types of migration are voluntary. Though the push factors may not be favorable, people just choose to migrate. There are now ever situations where migration is forced.

5.5 Types of Migration

There are two basic types of migration namely:

- a) Internal migration
- b) External migration

Types of Internal Migration

Migration within a country

Rural to urban Migration

-Movement of people from rural areas to urban areas. It involves:

- Youth who have completed various levels of education moving to urban areas to seek employment in white collar jobs.
- People moving to urban areas in search of alternative ways of earning a living due to shortage of land in rural areas, unemployment and low prices for agricultural produce.
- Traders relocating to urban areas where there is a larger market as the people in rural areas have low purchasing power.
- People moving to urban areas where there is adequate social amenities such as hospitals, entertainment, electricity and generally exciting life.
- Youth seeking for further education who join universities and colleges many of which are located in urban areas.
- Transfer of people employed in rural areas to urban areas.

Rural to Rural Migration

-Movement of people from one rural area to another. It involves:

- People moving to plantations and other large farms seeking employment
- Movement of nomadic pastoralists from one place to another in search of water and pasture.
- People moving to other parts of the country to buy land and settle there.
- Movement of public and private employees on transfer from one rural area to another.

Urban to Rural Migration

This is the movement of people from urban areas to rural areas. It involves:

- Transfer of people employed in urban areas to rural areas.
- Movement of people from urban areas to search for jobs in rural areas.
- People moving from urban areas to rural areas to settle permanently after retirement.
- People moving away from stressful urban life to suburbs to be commuting daily to work.

Urban to Urban Migration

This is the movement of people from one urban area to another or from one part of urban area to another. It involves:

- Employed persons who are transferred from one town to another.
- People moving from one part of town to another due to:

transfer

- In search of affordable housing
- In search of better employment
- In search of better business opportunity



External Migration

This is the movement of people from one country to another. It involves:

- People who seek employment abroad for a short period who end up settling permanently.
- Refugees who are forced out of their country by factors such as war.
- People seeking political asylum due to political persecution in their country.
- Government employees such as ambassadors who are in assignment abroad.

Consequences of Population Growth

Problems of Population growth

Overpopulation: when the people are more than the resource can support problems of population growth in developed countries:

Positive Effects

- A large population provides cheap labour due to a large number of people competing for jobs.
- Increased exploitation of natural resources and industrial development due to

increased demand for goods and services causing those activities to be increased to meet the demand.

- Technological innovation due to pressing needs associated with a high population (necessity is the mother of invention).

Negative Effects

- Pressure on land leading to land fragmentation.
- Environmental degradation when people clear forests to make room for settlement and agriculture.
- Low investment and slow growth of industry as the government spends a lot of money on education and medical facilities leaving less for investment.
- Lowering GDP (aggregate value of goods and services that a country can produce) due to inability to save any money for investment
- High rate of unemployment due to employment sector growing at a slower rate than population growth.
- Towns face problems of water shortage, pressure on social amenities and high cost of housing leading to development of informal settlements such as slums which expand covering agricultural land surrounding the towns.
- shortage of food
- outbreak of disease
- Conflict and civil wars

Solution of over population In Rural: introducing new farming techniques to increase crop yield which can support many likes: Urban: introducing new cities this decrease the crowding and congestion.

Under population (Negative/Slow Population Growth)

This is the case in developed countries.

- High government spending on health and social welfare as the population consists of a high proportion of old people due to low birth rates and low death rates.
- High cost of production since there is a small work force consisting of skilled people whose wages are high.
- Underutilization of resources such as agriculture and mineral resources since there is shortage of labour due to sparse population and most of it being concentrated in urban areas.

- Inadequate market for goods and services due to a small population.

□ □ Underdevelopment and low living standards in rural areas since a large percentage of people live in urban areas.

- Traffic congestion and atmospheric and noise pollution in urban areas due to continuous expansion of towns.
- Reduced food production as towns expand and engulf surrounding agricultural land.

Demographic/Population Trends

- Various positive or negative changes (transition) which take place in the population of

a given society, country or the world and their impact on social economic environment.

- Demographic transition refers to the historical change in birth and death rates from high to low which causes population increase.

Demographic Transition Theory

- A theory compounded to explain this phenomenon. There are 4 demographic transition phases namely:

Stage/phase 1

- High birth rate and high death rate due to inadequate food supply, wars, diseases and insufficient medical facilities.
- Little or no increase in population
- Was experienced in Europe before 19th Century.

Stage 2

- High birth rate and a decline in death rate due to improved food supplies and medical facilities.
- High population growth rate
- Was experienced by European countries in the 19th Century during industrial

Revolution.

- Kenya is in this stage.

Stage 3

Relatively low death rates and declining birth rate due family realization of the need to have small families due to pressure exerted on economic resources and social facilities, level of education attainment leading to use of birth control measures. Moderate population growth rate.

Stage 4

- Low birth and death rates.
- Low population growth rate.
- The population becomes static and can only reproduce to replace the dying ones

(Population replacement level).

- It's experienced in industrialized countries like Germany and Sweden where birth rate is falling below death rate.

Demographic cycles of population growth

Stage 1 High Stationary Growth

with high birth rates 40/1000 or higher and high death rates.

Stage 2 Early Expanding

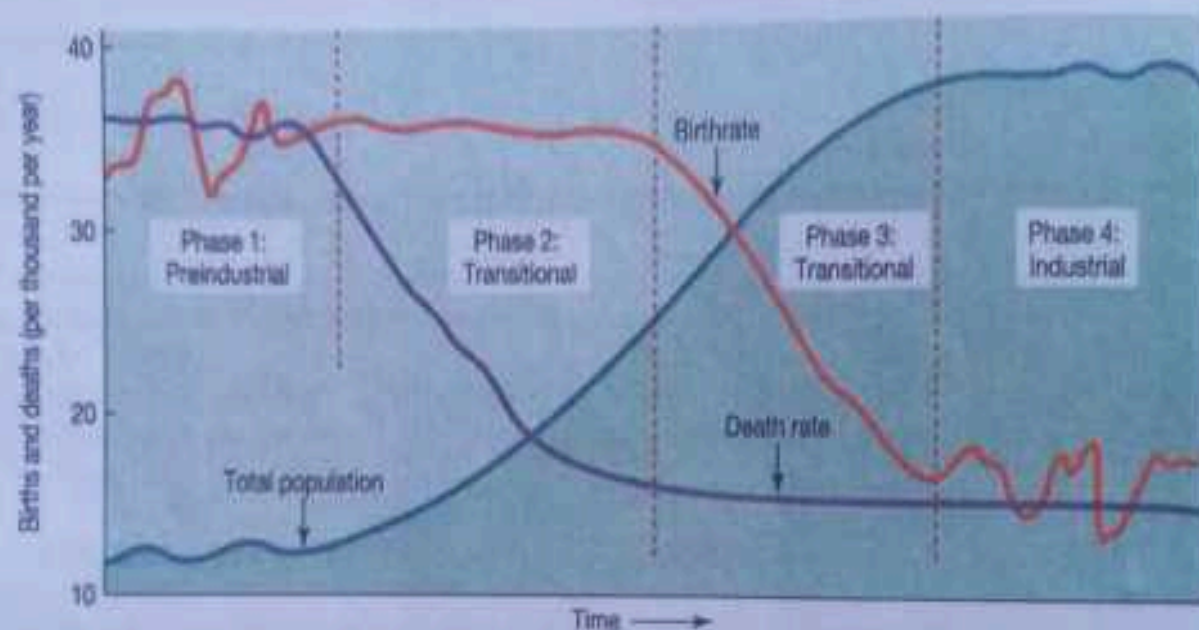
with high birth rates and declining death rates (birth 40s/death 20/1000) = rapid growth in pop.

Stage 3 Late Expanding

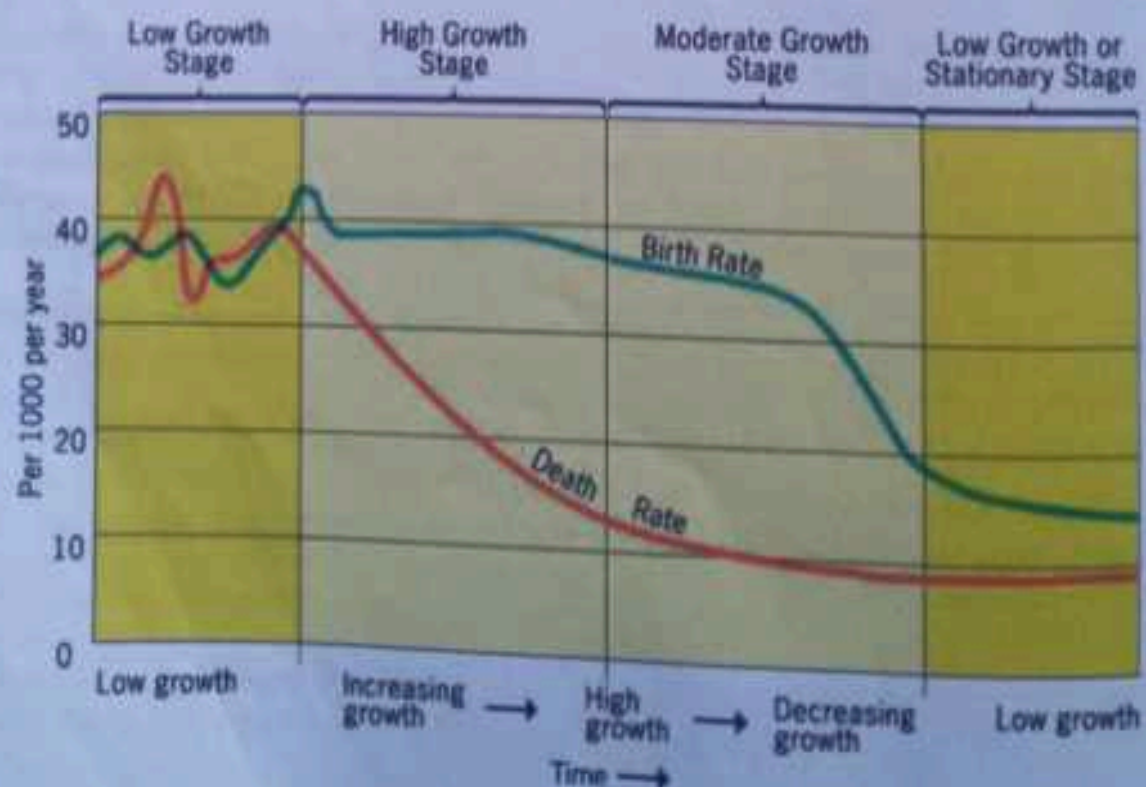
With declining birth rates (30s) and low death rates (10) = still significant growth

Stage 4 Low Stationary

has low birth rates and low death rates (birth 15 and death 10 or lower) SPL. Stationary Population Level

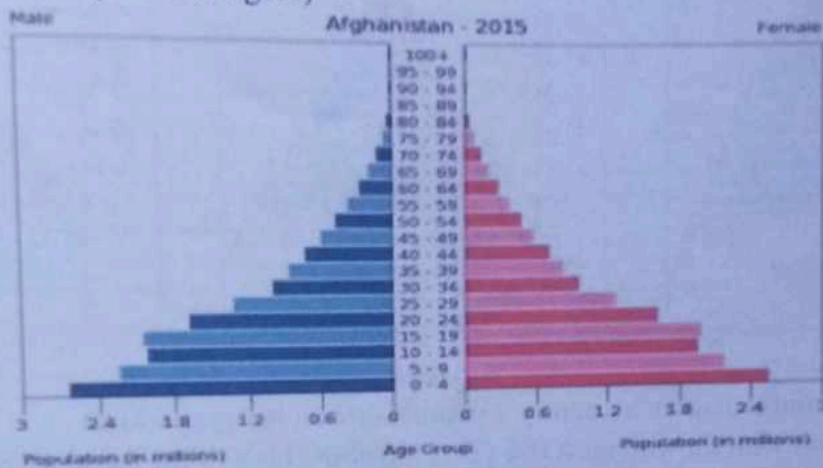


The Demographic Transition



5.6 Population Structure

Population structure refers to the composition of a given population in terms of age and sex at particular time. This information is obtained during a census. During a census, information regarding sex and age of each person is obtained the data is then compiled and the number of women and men of every age is obtained. This information is commonly presented using an age-sex population pyramid (see this figure)



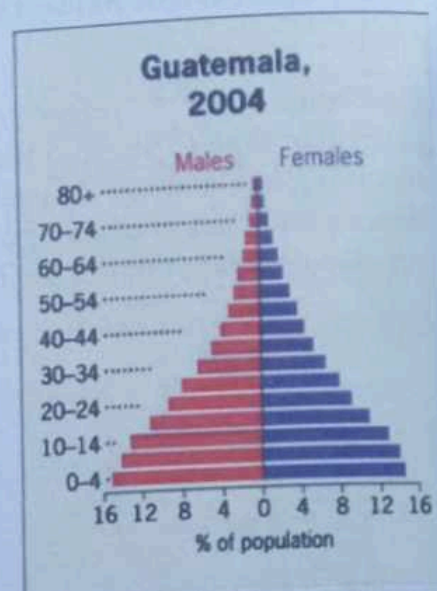
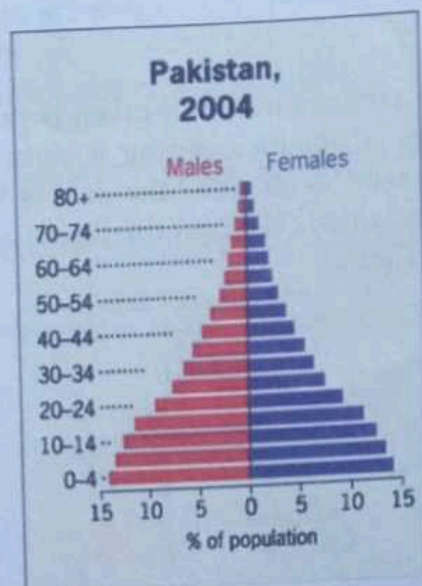
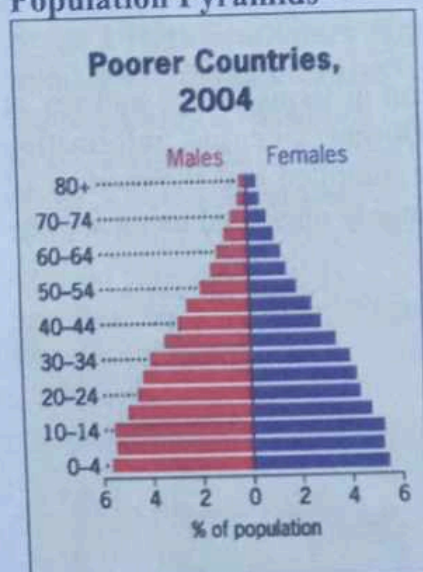
Population pyramids may have different shapes depending on the structure of the population being represented. Pyramids for developing countries like Somaliland, Kenya, Mexico and Malaysia have a similar shape unlike those of industrialized countries like UK, Japan and Sweden

Constructing and Interpreting an Age Structure Diagram

With age and sex distribution data from a certain population, it is easy to construct an age structure diagram. Once the diagram is constructed, one can clearly see if the population will grow, decline, or experience no noticeable change in its population numbers; for example, if the diagram shows a pyramidal shape, then one can expect a rapid rise in population. If the diagram shows a generally straight up and down shape except for the older age groups, a stable population is thus revealed. If the diagram shows a top-heavy shape, then a decline is forecast for that population. This shows the age structure diagrams for Mexico, Iceland, and Japan. The different shapes seen in the diagrams reflect different population characteristics. The diagram for Mexico shows the

Unmistakable pyramidal shape caused by ever-increasing number of births. Japan's diagram has the classic shape of a shrinking population. In it, you should note how pre-reproductive age groups (0 - 14 years) have smaller populations than the reproductive age groups (15 - 44 years). Iceland shows a more stable population. Except for the post-reproductive groups (45+ years), the populations for the age groups extend generally the same lengths.

Population Pyramids –



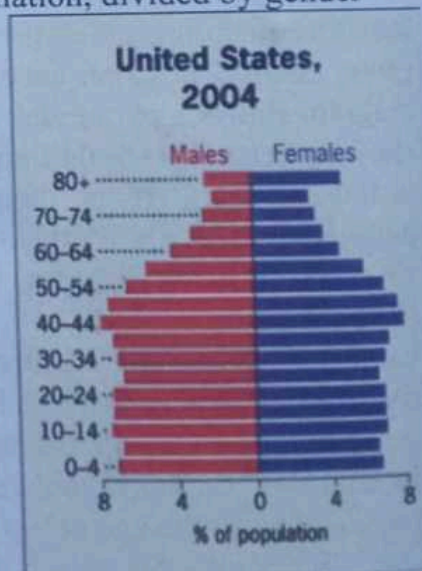
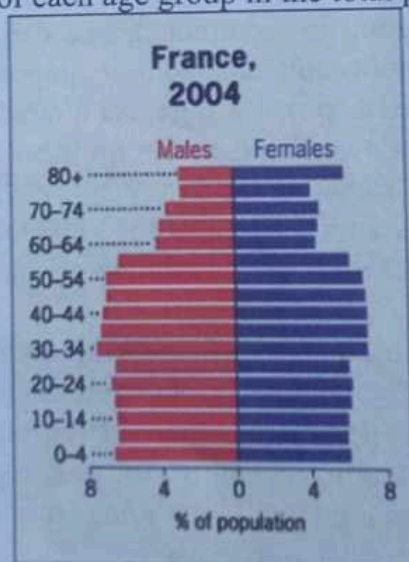
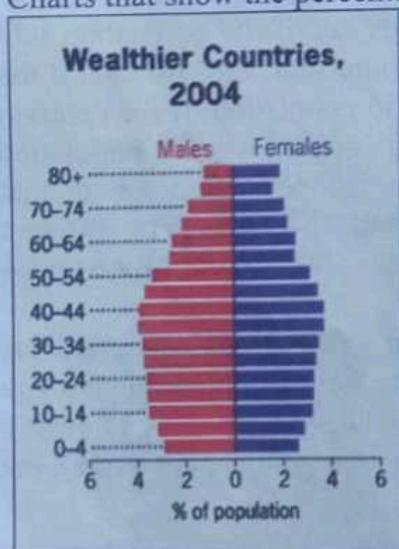
For poorer countries, the chart is shaped like a pyramid. Infant mortality rates are high, life expectancy is shorter

- Population Pyramids- display a country's population in a bar graph form
- Each 5 year group with the youngest 0-4 years old at the base of the pyramid are called cohorts
- Males are shown on the left side and females are shown on the right

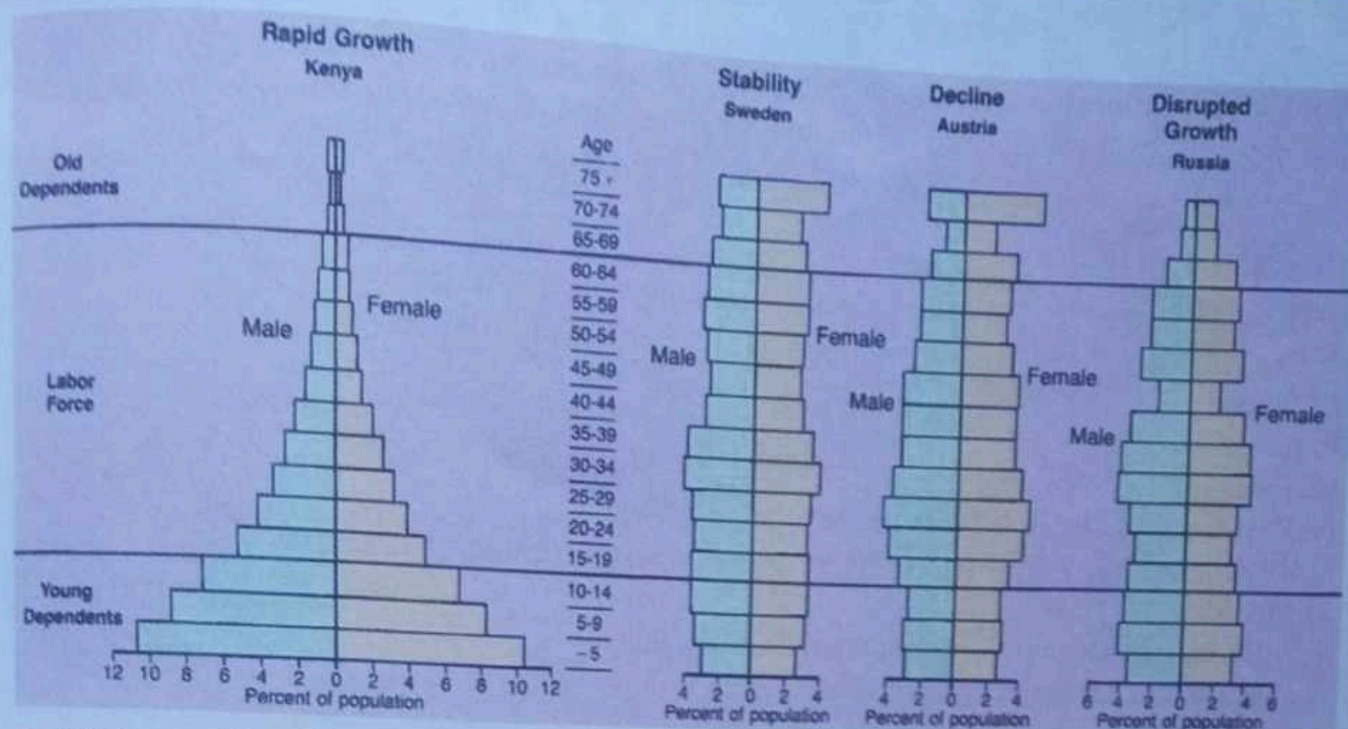
A wide-based pyramid indicates a country in Stage 2 of the Demographic transition

Population Pyramids

Charts that show the percentages of each age group in the total population, divided by gender



For wealthier countries, the chart is shaped like a lopsided vase. Population is aging, TFRs are declining



Four Patterns of Population Structure Each nation faces different problems due to a large base with many young or negative growths

There are three main age groups of a population. They are

1. Young age group population between 0-15 years
2. Adult age group or active or productive age 16-64 years
3. Old age group or too old age over 65 years

Significance of population structure

The structure of a given population is significant in many ways. Some of them are discussed below:

- Planning:** the needs of population differ with age and sex. The breakdown of population by age and sex helps a government to formulate policies for socio-economic development.
- Calculation of dependency ratio:** Data on population by age becomes useful in calculating the dependency ratio, especially when the actual size of working population is unknown. Dependency ratio is the proportion of the population that is not involved in productive activities to the one that is. It is the ratio of the population that is dependent on the population that is working.

Dependency ratio = children (<15) + old people (>65)

Working population (15-64)

When the dependency ratio is high, the population is said to be strained

- Calculation of sex ratio:** data on population by sex is important in calculating the sex ratio

Optimum, over and under population

Optimum population: this is the state achieved when the population in equilibrium with the available resources or the size of the population, when by using resources available, will produce highest per capital e.g. standard of living and quality of life

Over population: this occurs when there are too many people relative to the resources and technology locally available to maintain an adequate standard of living. Since the resources are inadequate people suffer from natural disasters (drought, famine) and have low incomes, poverty, poor living conditions high emigration



Under population : this occurs when there are far more resources in an area e.g., of food energy and minerals, than can be used by the number of people living there or this is where the number of people is so low as not to be able to exploit the resources and develop an area

WORK TO DO

1. Distinguish between population distribution and population density.
2. Explain how the following factors influence the distribution of population.
 - i. Climate
 - ii. Relief
 - iii. Drainage
 - iv. Pest and diseases.
3. What is the population growth?
 - a) Explain how the following factors influence population growth: 1) Fertility
 - 2) Mortality
4. Differentiate between immigration and emigration.
5. Discuss four causes of human.

Chapter Six

Maning and Minerals

Chapter Six

MINING AND MINERALS

Mining types

Factors that influence mining occurrence

- Effects of mining types on the ground

Minerals these are inorganic substances composed of chemical elements. They occur naturally in the crust of the earth. Minerals are formed from elements such as magnesium, potassium, calcium, iron, aluminum, and silicon. Some minerals such as gold diamond and silver have only one element while others such as bauxite, have more than one element. Mining: it refers to all attempts to extract valuable minerals both solid and liquid from the earth's crust or this is the process of extracting minerals from the ground or it is the Process of extracting valuable minerals from the earth's surface. During the Stone Age the only minerals which were extracted by people were rocks which were sharpened to make tools and weapons; modern technology has evolved highly sophisticated methods of mining minerals from the earth's crust Rocks; rocks are stony solid parts of the earth's crust or they are a hard solid and compact mass made of particles of one or more minerals, they form the earth's crust

• Types of minerals:

Minerals can be grouped in to four main types

- 1) Rocks such as those used for building houses, roads making and cement making
- 2) Non-metallic minerals: these include minerals such as potash, sulphur and diamond
- 3) Metals: which include iron, aluminum, nickel, uranium and gold
- 4) Fuels: ex, coal, oil, and natural gas which owe their origin to organic remains (fossil fuels)

• Characters of minerals

In order to be called a mineral a substance must satisfy these conditions

It must be a crystalline solid

It must occur naturally

It must be inorganic and

It must have a definite chemical composition

6.3 Factors Effecting Occurrence of Mineral

The occurrence of minerals varies from place to place; some minerals occur in seams or layers while others may be found in veins or mixed with other materials in the earth's crust. In general, minerals may occur in several formations which are discussed below.

a) **Reefs- Veins and lodes:** which are exposed on the surface?

Which are cracks or joints in rocks when minerals occur in small quantities, they are said to occur in veins while those in large quantities are said to be in lodes.

b) **Beds, Layers and seams:** Occurrence of minerals as sedimentary or as a result of compression of accumulated organic or inorganic material which are layers formed by deposition e.g. coal.

c) **Weathering:** this is disintegrates rocks which in turn are leached by the ground water. Minerals formed by deep weathering of rocks then leaching carried minerals from the top to lower layers where they accumulated e.g. aluminum, nickel, iron and manganese.

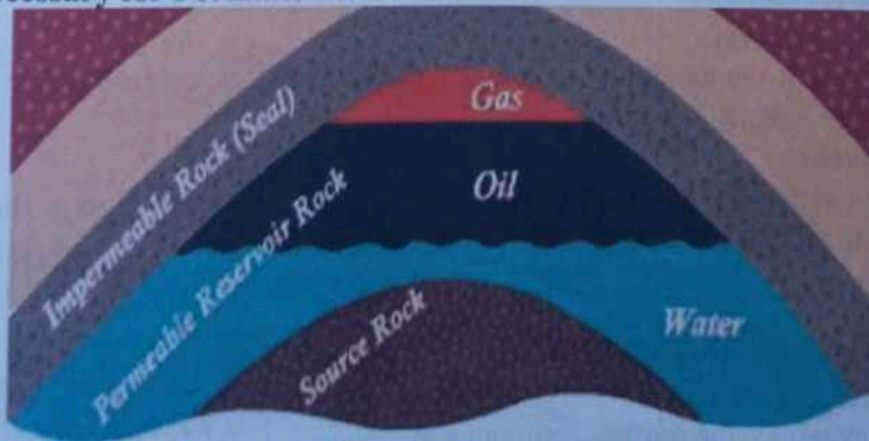
d) **Alluvial deposits:** which is weathered material washed by running water. Occurrence of minerals in crevices, cracks or faults in igneous rocks.

- They are said to occur in **veins** if they occur there in small quantities.

- Said to occur in **lodes** if they occur there in large quantities e.g. zinc, copper and silver.

E) **Oil pools/Wells** This is the occurrence of minerals in pools or wells in sedimentary rocks e.g. petroleum and natural gas.

Conditions Necessary for Formation of Petroleum



- a) Presence of fossils or organic remains
- b) Presence of sedimentary rocks for burying organic remains.
- c) Presence of pressure to compress organic remains to cook the oil and natural gas out of organic matter.
- d) Presence of a porous reservoir rock to store and transmit petroleum to the oil pools e.g. limestone and sandstone.
- e) Presence of a trap like a syncline to hold petroleum in a reservoir to prevent its escape.
- f) Presence of impermeable rocks below the trap or syncline to prevent petroleum from percolating further underground.



Factors affecting the exploration of minerals:

Before a mineral is mined it must be confirmed that the value of the mineral is greater than the cost of mining and transportation. Mining operations depended on a number of factors such as the following

a) Value of Mineral

Minerals of high value will be mined even if they occur in small quantities because one sold it will be possible to offset mining costs and make a profit and vice versa.

b) Quality of Ore

Mining can be done if the mineral deposits have high mineral content because they are economical to work on but deposits with low mineral content are rarely worked on except if the mineral in them is rare e.g. uranium.

c) Size of Deposit

Minerals which aren't of high value have to occur in large quantities for them to be mined so that it will be a possible to recover mining costs and make a profit.

d) Capital

Lack of capital causes developing countries not to exploit minerals and leave it to International companies because a lot of money is needed for exploration, infrastructure, salaries, energy.

e) Method of Mining

A mineral requiring open cast mining will be mined even if the mineral deposit is large but one requiring underground mining will be extracted if its in large deposit or if its of high value or rare.

f) Transport costs

Minerals occurring in remote areas far from the markets are not likely to be exploited if the transport system is poorly developed since mineral ore is heavy and bulky and transporting it by road and railway is expensive.

g) Market for the Mineral

Mining can be done if the mineral is in demand and if the prices are reasonable so That mining costs are offset and a profit is realized.

h) Political Influence

Mineral deposits at the borders of two countries may not be exploited as a dispute may arise concerning whom mine it e.g. dispute between Iraq and Kuwait over Rumaila should oil field.

i) Labour

Exploitation of some minerals require skilled workers and if they lack it may not be done as is the case in developing countries because expatriates have to be engaged and are very expensive to pay which may reduce the profits accruing from mining

6.4 Mining Methods

There are three main methods of mining

1) **Open-coast mining**; this is the cheapest method of extracting minerals which occur near the earth's surface. This method simply involves removing the top layers of the earth and other materials lying above the mineral using bulldozers or other earth moving machinery, once the deposit has been reached electric shovels can be employed to dig up the mineral deposit and load it into trucks or lorries, in open-coast mining the output is large and rapid,

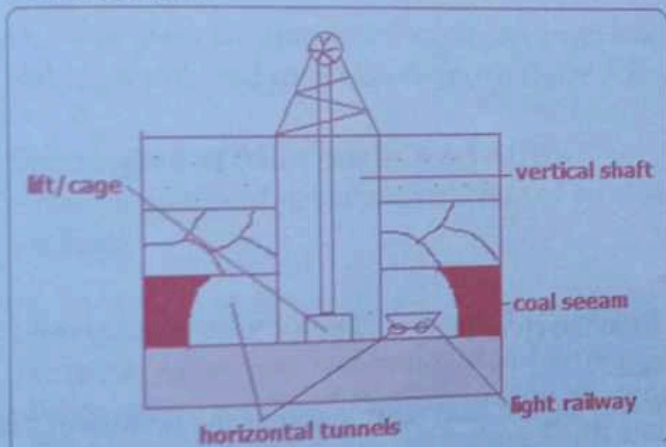
2) **Underground mining**: this is a rather expensive method for the mineral ore has to be fetched deep below the surface. It involves sinking tunnels underground to reach the mineral deposits. There are three types of underground mining namely

i) Drift or adit Mining

This method where horizontal or gently inclined tunnels are dug in to the hillsides or it is method employed when the mineral deposit can be reached from the valley sides.

- Horizontal tunnels (adits) are constructed from the side of the hill.
- Railway line is constructed into the mine to bring out the mineral e.g. mining of copper at Kilembe in Uganda.

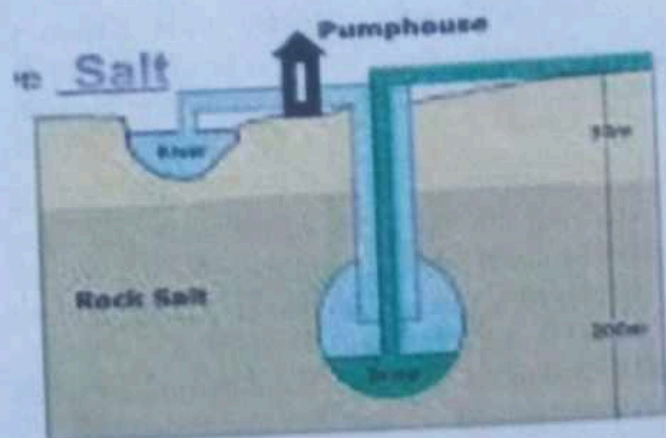
ii) **Shaft method**: where vertical shafts are sunk when the mineral bearing rocks occur in steeply inclined seams



How it's carried Out

- Vertical shafts are sunk into the earth's crust to reach the layer with the mineral.
- Horizontal tunnels are dug from the vertical shaft to reach the mineral.
- Props are erected to support the roof to prevent it from collapsing.
- The mineral bearing rock is blasted loose by explosives.
- The deposit is transported on light rail or conveyor belt to the bottom of the shaft.
- It is then brought to the surface in a crane or a lift called cage.

iii) **Solution method**: where superheated water or steam is pumped underground to dissolve minerals that are later pumped to the surface. Method used in mining soluble minerals such as sulphur, salt, potash, etc.



- □ Superheated water is ejected into salt deposits.
- The mineral dissolves or melts.
- The solution is then pumped into the surface

✓ **3. Alluvial mining;** this is where the minerals ore is found along the beds of rivers mixed with sand it is done through panning, dredging and hydraulic mining. Method used to extract minerals occurring in alluvial deposits e.g. gold, tin, diamonds and platinum

6.5 Types of Alluvial Mining

a) Panning

It involves

- Digging a mixture of sand, gravel and mineral from the river bed.
- Putting it in a pan and rotating the pan while tilted.
- The lighter sand or gravel is washed on the side leaving the heavier mineral at the bottom of the pan e.g. gold mining in Migori

b) Dredging

- A dredger scoops water logged alluvium from the bed of a lake.
- The alluvium is passed over sloping channels with series of traps.
- Wastes are washed away and denser materials are left at the bottom of the trap e.g. mining of soda ash at L. Magadi.

c) Hydraulic Mining

Method used when alluvial deposit occurs on a valley side.

- A powerful jet of water is directed at the deposit.
- Gravel and mineral collect at the valley because of the great pressure.
- The mineral grains are recovered and washed out.

d) Sub-marine Mining

Method employed in extracting minerals in alluvial deposits lying deep down the ocean floor.

- A sub-marine dredger goes down the ocean floor.

- It scoops mineral deposit and rises to the surface.
- The alluvium is passed over sloping channels with series of traps.
- Wastes are washed away and denser materials are left at the bottom of the trap.

6.6 Effect of Mining on the Environment

Mining activities may affect our environment adversely in several ways. Where it is carried out it has caused

- Renders land useless for other economic activities such as agriculture (dereliction) due to open pits left on land and heaps of rock waste litter dumped on land.
- Pollutes the environment e.g. atmospheric pollution from dust and smoke from tractors and trucks, water pollution from spilling of oil from offshore oil drilling and soil pollution from chemicals and explosives used in mining.
- Leads to loss of bio-diversity due to destruction vegetation which also destroys habitats of various animals leading to their destruction also.
- Causes soil degradation e.g. by loosening the soil which makes it vulnerable to agents of erosion like wind and water, tractors and trucks compact the soil making water infiltration difficult and chemicals used interfering with soil chemical composition making it unsuitable for agriculture.
- Causes mass wasting when explosives and heavy equipment used in mining shake the ground making weathered materials to move faster down slope under the influence of gravity.

Distribution of Minerals in East Africa

- **Phosphates** used in the manufacture of fertilizer Torero in Uganda and Majingu Hill in Tanzania.

Limestone used in cement manufacturing-Hima in N.W Uganda, Tanga in Tanzania, Athi River and Bamburi in Kenya.

- **Fluorspar** a source of fluorine used in chemical industries-Kerio Valley in Kenya.
- **Common salt** used for consumption-Kilifi and Magadi in Kenya and L. Kitwe in Uganda.
- **Diatomite** used in making insulators -Kariandusi near Gilgil and Gicheru in Nyandarua.
- **Stones** in Machakos, Mutonga and Mbeere.
- **Carbon dioxide** used in making dry ice and in beer and soft drinks industry-

Esagari in Baringo and Kagwe in Kiambu.

- **Diamond** used to make ornaments, glass cutters and drills-Mwadui in Tanzania.
- **Titanium** used in the manufacture of insulators for aircraft- Kwale district.
- **Gemstones** near Voi and Mwatate.
- **Soapstone** used for sculpture-Tabaka in Kisii.
- **Copper** used to make electrical wires and coins-Kilembe in Uganda.
- **Gold** used to make medals and jewellery and as a basis of world currency-Musoma in Tanzania, Kakamega and Migori in Kenya.
- **coal** used in smelting of iron and generation of thermal electricity-in Ruvuma River Basin and Kivira Songwe in Tanzania.



Effect of mining on the Environment

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 3. Causes mass wasting when explosives and heavy equipment used in mining shake the ground making weathered materials to move faster down slope under the influence of gravity.

Gold in S. Africa

Gold occurs as small grains in a hard rock. It's mined by shaft mining since its bearing rocks are deep below the surface.

The main mining area is the Witwatersrand and others are Ougandaalrus and lydenburg.

Processing

- Ore is crushed to a fine powdery dust.
- Mixed with water until it is fluid mud.
- Cyanide is added to dissolve gold.
- The fluid is runoff with gold dissolved leaving behind waste salts.
- Zinc dust is added to filter gold for solidification.
- Gold sinks as it is denser.
- Gold is smelted and cast into ingots.

Significance to the Economy of S. Africa

1. Earns the country foreign exchange used for paying foreign debts.
2. Offers employment to many people raising their living standards.
3. Has led to widespread urbanization contributing to formation of Witwatersrand conurbation.
4. Has formed a broad market for other industries e.g. engineering, foot wear, electrical and construction industries.
5. Has led to improvement of infrastructure and social amenities e.g. roads, schools, hospitals, etc.
6. Led to development of agriculture.

Problems Facing Gold mining

1. Expensive to mine for lying deeply.
2. Large capital is required to start mines.
3. Complication of mining by folds and faults in the crust.
4. Low gold content in the ore.
5. Problem of removal of underground water.
6. Lack of adequate supply of fresh water on the surface in mining areas.
7. Accidents resulting from collapsing of mine roofs.

Diamond Mining in S. Africa

Diamond is the hardest known substance. -Mined in Kimberly, Bloemfontein and Alexander Bay. -Mined by underground mining or alluvial mining.

Processing

- Diamond bearing kimberlite is crushed
- Crushed rock is mixed with water
- Diamond sinks to the bottom as it's denser
- Water and less dense residue are drained off
- Remaining material is put on heavily greased trays and washed
- Diamond repels water so it sticks to grease while remnants are drained off
- Diamonds are then sorted out and graded into gem diamonds and industrial type (for cutting purposes).

Contribution to the Economy

1. Provides employment to thousands of people
2. Earns the country substantial foreign exchange
3. Has led to growth of urban centers e.g. Pretoria and Kimberly.
4. Has contributed to development of infrastructure

Problems Facing Diamond Mining

1. Fluctuation in the world market prices
2. High cost of mining and processing diamond
3. Depletion of mines
4. Low mineral in the ore making mining expensive
5. Labour competition with other sectors e.g. manufacturing and gold mining

Petroleum in the Middle East

Oil is a thick black sticky liquid called crude oil

- It was formed from small creatures that lived in shallow lagoons about 100- 200m ago.
- Decaying remains of those creatures mixed with mud at the bottom as sediments
- The sediments piled on each other and slowly transformed into sedimentary rocks
- Gradually the remains were converted into oil and gas.

Major oil producers in the Middle East are Saudi Arabia with the largest reserves, Iraq, Kuwait and United Arab Emirates. Middle East accounts for 64% of world oil reserves. There are several giant oil fields in Ghawar in Saudi Arabia and Kirkuk in Iraq.

Processing

Crude oil is processed by refining using a technique called fractional distillation. The process takes place near as possible to the market as it's cheaper to transport crude oil than the different refined products. It's processed into secondary products such as petrol, paraffin, lubricating oils, dyes, fertilizers and plastics.

- Impurities are removed from the crude oil
- Crude oil is heated before entering fractionating column
- It's turned into vapor or gas
- Different ingredients turn back to liquid at different temperatures.
- Ingredients gradually cool, condense and collect in various trays and allowed to overflow until they reach an outlet.

Contribution to the Economies

1. Arab's investments overseas have increased due to oil reserves.
2. High income per capita due to oil profits.
3. Has led to development of cities e.g. Tripoli in Libya.
4. Investment of oil money in other sectors e.g. power stations, cement factories and exploitation of other minerals.
5. Earns the countries substantial foreign exchange
6. Increased political and military power.
7. Artesian water is made available for domestic and irrigation purposes e.g. in Libya.
8. Oil companies help in fixing down the sand dunes and planting trees in the deserts.

Significance of minerals to a country

Mining in a country has resulted into:

- ❖ Creation of employment opportunities
- ❖ The development of settlement and urban centers
- ❖ The provision of social amenities e.g. schools electricity water etc
- ❖ Earning of foreign exchange
- ❖ The development of transportation and communication links, like roads and railways
- ❖ Creation of industries
- ❖ The improvement of the people's living standards
- ❖ General development of that country

WORK TO DO

1. What is a mineral?
2. Describe the following characteristics of minerals: a. luster;
b. color;
c. Density.
3. State the main methods of mining
4. Differentiate between open mining and underground mining



Appendix A: A SAMPLE OF FIELDWORK AND RESEARCH PROCEDURES

A. DESCRIPTIONS ABOUT THE CASE STUDY:

1. Identify the topic of the research or fieldwork: _____

2. Identify the area of the study: _____

3. Identify the importance of the fieldwork: _____

4. Statements of the main aims and purposes of the case study: _____

5. Identify the number and the structure of the researchers: _____

B. ORGANISATION OF THE STEPS OF THE FIELDWORK STUDY.

1. Reconnaissance on the area to be visited: (to obtain more information about the area).

2. Receiving and delivering the permission and notification letters and related documents. (depends on locality, in or outside the Local area):

3. Visiting the important places, things, persons, stations and institutions for your research beforehand. (Air or Sea ports, Public or Private Agencies, river or streams, and rural or urban settlement affected by a hazard)

C. Preparing preliminary Hypothesis.

- Set out the plan of your research or fieldwork procedure.
- List the names of places to be researched in sequence and time allocations.
- Write down the rules to be taken during and after the fieldwork trip, i.e. Do and Don't.
- Assign the responsibilities for the individuals or groups that may involve in the research.
- Calculate the expected budget to be spent for the whole trip.
- Imagine the suitability of the weather and climatic conditions with activities of the fieldwork. So, postpone if not appropriate, until later time.

- Decide the best way of data collections and prepare their facilities, such as, questionnaires, camera, tape, true maps and sketch maps of the area to be visited.

D. Preparing preliminary Hypothesis.

- Set out the plan of your research or fieldwork procedure.
Decide the best way of data collections and prepare their facilities, such as, questionnaires, camera,

E. Preparing the actual visit

- The required budget must be in hand or in place.
- Make sure that everybody is well informed about activities, responsibilities, precautions and the schedule.
- Make sure the well-being of the transportation mode.
- Prepare all the equipments and facilities to be used for writing, recording, measuring and communicating.
- Prepare your Emergency Aid kit or box of medicines and bandages, in case of minor injuries and illnesses.

F. During the fieldwork or the research period.

1. Interviewing individuals. Respect Gender balance and social classes, ethnic, religious and economic variations.
2. Questionnaires filling. Avoid rude and personally sensitive questions that provoke or irritate the respondents.
3. Taking measurements of areas. Seek for allowance from the authorities and inhabitants.
4. Taking videos and photographs. Ask permissions beforehand.
5. Referring previous reports, news or scripts relating to the topic of your investigation available in museums, internet, textbooks, journals, booklets, magazines or newspapers of both nationwide and worldwide.

During the research involvement period:- All researchers must be confidently transparent, courteous, obedient, generous, smiley, attentive, reasonable, collaborative, communicative, conservative and protective to the environment of the area, as a whole.

G. After the fieldwork accomplishment.

1. Summon the data and the information collected from the field by sharing findings and experiences of all the researchers.
2. Interpret all statistical information by making graphs, tables, charts, maps, scientific notations and mathematical expressions of means, modes, and percentages.

3. Compile your first draft of the research findings.
4. Make the first presentation of the first draft in front of the researchers and few selected intellectuals for evaluation.
5. Make corrections and amendments of the first draft to produce your final draft.
6. Then, add your conclusions, suggestions, solutions and recommendations for the topic under the research.
7. Finally, before printing and publishing your report:-
 - Give a concise title to your publication.
 - Give a brief introduction to the field work with clear objectives and obstacles encountered during the research.
 - Give acknowledgements and thanksgivings of the participants, facilitators, authorities and to everybody who played a role for the successful accomplishment of your fieldwork. (Be sure the accuracy of the titles, occupations and names of the people and institutions mentioned in your document)

H. GENERAL PROBLEMS THAT CAN BE FACED DURING FIELDWORK STUDIES.

These problems depends on the nature of the topic or the area and some of the most common ones include:

1. Researchers may get sick, injured or lost.
2. Transport problems: run out of fuel, stuck, break etc.
3. Attack from wild animal or insane people.
4. Steep slopes may be difficult to climb
5. Tick and dense vegetation may cause difficult to penetrate.
6. Financial constraints: lack of many or shortage may bring the field study to stand still.
7. DATA may not be available or may be incomplete.
8. Sometimes respondents are unwilling to respond to the questions asked.
9. Respondents may give false answers.
10. Access to the area may become difficult due to bad weather conditions, such as storms, floods or dustbowls.
11. Instability or insecurity is the major problem.(this is the first factor)
 - tape, true maps and sketch maps of the area to be visited.