

HUMAN AND ECONOMIC GEOGRAPHY

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Unit 1 WORLD AGRICULTURE AGRICULTURE

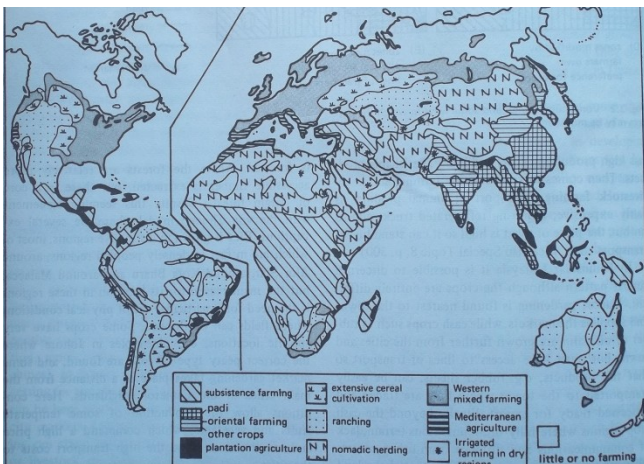


Figure 1.1 World Agricultural types

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Agriculture

It is the activity of cultivating crop and rearing animals for human needs.

It refers to arable farming and livestock farming.

Factors influencing agriculture

1. Physical factors

a. Slope of land relief

- Terraces need to be constructed in steep slopes.
- Some crops thrive best on high lands with well-drained hill slopes for example tea and coffee.
- Contours on undulating land conserve moisture and reduce run-off.

b. Edaphic Factors/Soils

- Different crops grow well in specific soils. Rubber needs slightly acidic soil, sugarcane needs deep well drained fertile soils and cotton needs soils rich in nitrates.

c. Climatic factors

- Farming depends on well distributed and reliable rainfalls, moderate temperatures, wind and sunshine.

d. Pest and Diseases

- Different areas are prone to different types of pests and diseases.

2. Economic Factors

- Enough capital is needed to meet operational costs for farm inputs, animal feeds, paying water, electricity or fuel, hiring of extension and veterinary services.
- Favourable locations for plantations or grazing land close to roads and highly populated areas for demand and supply of the products.

3. Socio-Cultural Factors

- Culture affects the type of crops grown and animals kept in an area. In West Africa, farm work is mainly done by women. The farm input or output will depend on the population of women in a society.
- Religious traditions affect the types of crops grown and animals reared by the society. Muslims and Jews never rear pigs for they are considered as unclean

animals. Beef farming is underdeveloped among the Hindus since a cow is regarded as a sacred animal.

4. Political Factors

- Land ownership influences the way in which land is used.

Types of Land ownership

- (i) Company plantations and estates that own large areas of land.
- (ii) Tenant land ownership.
- (iii) Owner or Individual occupied land ownership

5. Technological Factors

- Developing new breeds of crops and animals that will withstand harsh conditions i.e. droughts and resistant to diseases and pest attacks.
- Chemical fertilizers, pesticides, fungicides and medicine for animal diseases facilitate increased production.
- New machines for ploughing, cultivation of land, planting crops, harvesting, collecting and storing farm products and keeping farm records e.g. computers
- Use of green houses that allows crops to grow under controlled conditions.

Types of Agriculture

1. Subsistence Farming

It involves the growing of food crops for a family. A farmer owns a small piece of land on which the family works.

Types of Subsistence Farming

a. Shifting Cultivation

- It involves slashing and burning of vegetation cover in a piece of land.
- Land is cultivated and abandoned or left uncultivated for a lengthy period of time to regain soil fertility.
- It is known as Chitemene in Zambia, Roca in Brazil, Poda or Bewar in India, Visoso in Malawi, Chena in Sri Lanka, Tamrai in Thailand, Masole in DRC, Milpa in Zimbabwe, Humah in Indonesia, Caingin in Philippines, Ladang in Maylasia, Taunngya in Burma and Conuco in Venezuela.
- Crops grown are maize, millet, sorghum, groundnuts, beans, cassava and sweet potatoes.

Characteristics of Shifting Cultivation

- Small plots in forested areas are used.
- Vegetation is cleared by cutting, slashing and burning and the ash is added to the soil.
- Cultivated areas are separated by thick forests.
- Simple tools are used e.g. the axe, cutlass and a hoe.
- Manual labour is required.
- Plots are left fallow over a long period of time. Cultivators leave a patch of land (swidden) for a few years. The forest regenerates and humus is replenished.
- Few crops are raised e.g. tapioca, cassava or manioc, maize, corn, millet, beans, hill rise peas etc.

Farming Method of Shifting Cultivation

Forests or trees are cut using axes and cutlasses.

Seeds are sown by broadcasting method (scattering them about by hand)

Little or no weeding is done during the growth.

No application of artificial fertilizer but only ash which contains potash.

Harvesting is done using hands or sickles.

Root crops are dug with sticks and hoes.

Disadvantages of Shifting Cultivation

- The system leads to soil erosion or exhaustion.
- Destruction of natural vegetation.
- The system fails to provide food to a huge population.
- Loss of soil fertility i.e. nutrients are not replaced.
- Forest destruction leads to flooding.

Rotational bush fallowing

- Land is divided into permanent housing.
- Fields are cultivated in rotation

b. Intensive Crop and Animal Farming

- The land is intensively cultivated and crops are rotated to ensure maximum utilization of available land resources in order to feed a high population.
- It is predominant in Asia, China, Japan, Korea, India, Pakistan and Sri Lanka.

Characteristics of Intensive Farming dominated by Wet Padi

(It is called Wet Padi or rice because it is grown on land that is flooded from planting time to harvesting time)

- Plots are subdivided in very small areas or small holdings.
- It is monoculture in Korea, China, Japan, Malaysia, Taiwan and Java.
- Farming is aimed at sustaining individual families.
- Labour is intensive during weeding time.
- Oxen are drawn or water buffaloes are used to cultivate the field.
- Farming is so intensive that double or treble cropping is practiced in course of a year.
- Ploughing is done by draught animals.
- Manure is required to supplement soil fertility.
- Animal farming is little developed among the Hindus and Buddhists.
- Artificial fertilizers are used in Japan, India and China.
- Rice fields release quantities of methane gas into the atmosphere that is responsible for global warming.

Conditions or Requirements for Rice Growing

1. Minimum temperatures of 21°C.
2. Annual rainfall of over 2000mm with at least 120mm.
3. Flat land to allow the soil to retain the water.
4. Heavy alluvial clay soils that have the ability to retain water.

Cultivation of Wet Padi

- Rice fields are leveled and earth walls called bunds are built to retain water.
- Irrigation canals are constructed to control the flow and amount of water on the fields.
- Ploughing and manuring of fields is done.

- During wet season seeds are sown in either the nurseries or direct in the fields.
- Young seedlings are then transplanted into nursery fields.
- Occasional weeding is required to reduce food competition.
- After three months the plants are ready for harvest.
- The fields are drained and rice is allowed to ripen.

Harvesting and Processing:

- This is done using a sickle or curved knife.
- It is labour intensive as every stalk is hand-picked.
- Threshing is done to separate the grains from the stalks.
- Winnowing, thus the removal of the unwanted particles from the padi grains. The grains fall to the mat while the lighter chaff is blown away.
- Milling removes the yellowish husks from the padi in order to obtain white polished rice.
- Later rice will be packed and stored ready for sale.

The main rice producing regions of the World

a. China	36%
b. India	20%
c. Indonesia	6%
d. Bangladesh	5%
e. Japan	5%
f. Thailand	4%
g. Vietnam	3%
h. Burma	3%
i. Brazil	2%
j. S. Korea	2%
k. Philippines	2%
l. U.S.A	1%
m. Pakistan	1%

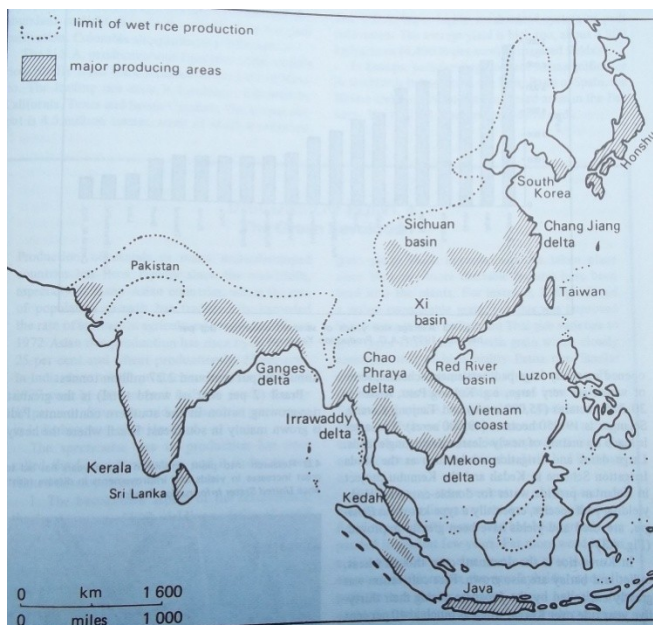


Figure 1.2 Rice growing regions in Asia
Problems associated with Intensive Subsistence Farming

- Limited resources to combat the setbacks caused by uncertainties in farming.
- Lack of technical know-how on new farming techniques.
- Chemicals, fertilizers are very expensive.
- Overpopulation results to lack of land
- Land holdings are fragmented or divided making it tedious to manage them efficiently.
- Under-utilization of animals due to religious beliefs and concentration on crop farming.

Advantages of Intensive Farming

- Higher yield of crop per unit land.
- Several harvests per year.
- Land is continuously used as manure replenishes soil fertility.

c. Nomadic Pastoralism

- It is the practice of rearing animals by moving them from place to place in search of water and pasture.
- It is a form of animal grazing that relies mainly upon natural vegetation for livestock fodder.
- The herders are forced to move their herds in search for pasture.

Transhumance: It is similar to nomadic herding since it involves the seasonal movement of animals in search for pasture.

It is different from Nomadic herding in that it is based on a permanent farm and is more intensive than nomadic pastoralism. In Europe cattle or sheep from a farm or ranch may be kept in the valleys in winter and driven on to the mountain pastures or Alps in spring when the snow melts. In winter they are stall-fed using the fodder which grew during summer. In North America animals graze on the uplands in summer but they are brought down to the valleys in winter.

Why such movements?

1. Seasonality of grass and water.
2. They escape from diseases and pests.
3. To comply with the custom of abandoning a place where an adult has died and is buried in some cultural arenas.

Examples of Nomads

Fulani of the Sahel in West Africa, Masai of East Africa, Nubians of Ethiopia and Sudan, Tuaregs of North Africa, Bedouins of Saudi Arabia, the Lapps of Scandinavia and Kirghiz, Kazaks and Kalmucks of Central Asia, the Mongolians, Tibetans, the Berbers of North Africa, the Yakuts, Chuckchees, Tunguses, Koraks, the Buryats, the Khoi Khoi, Khoisan, Tsantu and Tswana of South Africa, Botswana and Mozambique.

Characteristics of Nomadic Pastoralism

- Keeping of large herd of animals that are mixed as an insurance of drought and disease.
- Seasonal migration of the nomads and their animals in search for water and pasture.
- Poor health of animals ie. cover long distance without veterinary services.
- Nomads depend on the herds for milk, meat, wool, hides, dung for fuel and transport.
- The land is communally owned hence at the risk of overgrazing.

Problems Associated With Nomadic Pastoralism

- Climatic hazards such as drought brings about scarcity of pastures.
- Cattle rustling fuel up animosity or enmity between the communities.
- Poor quality pastures resulting from unreliable and seasonal rains.

- Local breeds are of poor quality, slow to mature and produce low quality milk and meat.
- Diminishing grazing areas because arable or crop cultivation is spreading into the grazing zones.
- Loss of political control because nomads can easily cross regional boundaries without legal documents.
- There is uncontrolled breeding.

Ways of combating these problems associated with Nomadic Pastoralism

- Cross breeding of livestock to improve the quality.
- Regular vaccination and dipping of animals to control diseases.
- Provision of piped water to or boreholes to reduce seasonal migration of animals.
- Animals should be sold for slaughter in order to give income to pastoralists.
- Planting of drought resistant fodder crops to ensure sustainability of animal feeds.
- Introduction of ranching among conservative pastoralists.

Why Pastoral Nomadists keep Large Herds?

- Herds are regarded as man's wealth or prestige.
- Nomads use the animals to pay bride price.
- Insurance against drought and famine.
- In a bad year many of them may survive.

2. Commercial farming

- It aims at the production of farm produce for sale or cash in order to generate a cash income i.e. cotton, coffee, sisal, rubber, tea and pyrethrum.
- Food crops grown i.e. maize, wheat and beans may fall under cash crops.

Plantation Agriculture

- It is the commercial cultivation of cash crops on a very large piece of land called plantation or estate.

Characteristics of Plantation Agriculture

- One crop is grown i.e. tea, coffee, sugarcane, rubber, cocoa, sisal, palm oil etc.
- Large areas are used.
- A crop takes a long period of time to mature for example, cocoa takes 5 years and rubber takes 6 years.
- Large amount of capital is required.
- Processing factories are located near the plantations.
- Multinational companies own and operate these plantations.

Advantages of Plantations

- Large profits due to high yields.
- Easier to manage especially with use of machines.
- Constant supply of produce.
- Products are exported and sold in the world.
- Generation of employment opportunities.

Disadvantages of Plantations

- Capital intensive to initiate and maintain plantations. Overseas technical expertise drains huge expenses.
- Soil exhaustion and erosion.
- Huge losses experienced if world market prices fall.
- Concentration on cash crops results to food shortages due to the neglect of food crops.
- Monoculture spreads diseases easily.
- Large quantities of manure and fertilizers have to be applied to replenish the soil fertility dwindled by leaching problem due to heavy rainfall.
- Rubber, cacao, oil palm need high temperatures and high humidity. However these drain human energy and reduce the amount of work people can do.
- During the long gestation period the plantation crops yield no income.
- Local winds such as harmattan, hurricane and typhoons cause severe damage to plantation crops. The output is reduced in return.

MIXED FARMING

- It is a combination of arable farming and animal husbandry on the same piece of land.
- Crops benefit from animals and vice versa.
- It is practiced in highly developed countries for example in North-West Europe eg. Belgium, Berlin, Denmark and USA.

Characteristics of Mixed Farming

- Involves a mixed economy of raising animals and growing of crops on a same piece of land.
- Crop rotation is practiced to maintain soil fertility e.g. legumes, potatoes, peas, beans and clover.
- Industrial crops are grown such as sugar-beet and tobacco.
- Animals are kept to enrich the soils with dung.
- Cattle are kept for beef and dairy products.
- Poultry provides eggs.

Factors influencing Mixed farming

- Mixed farming needs high capital expenditure on machinery and buildings.
- Needs high skills and expertise of the farmers.
- Good transport lines such as railways to send livestock to local markets.
- Availability of cold storage facilities and refrigerated ships to preserve the freshness of meat.
- A high and steady demand for livestock products.
-

Advantages of Mixed Farming

- Animals provide food for farmers and manure for crops.
- Crops and animals increase farm income through products.
- It takes care of risks since the farmer has an alternative source of income should one fail.
- Improved human nutrition i.e. animal proteins, cereals and root crops provide carbohydrates..

COMMERCIAL EXTENSIVE FARMING

Extensive farming is characterized by very large land holdings practiced in areas of sparse population.

Characteristics of Extensive Farming

- Farms are big such as 160 square kilometers.
- Cultivation is highly mechanized.
- Monocultural cropping is common.
- Low yields per hectare but high yields per man.
- Farms are individually owned.

Problems Associated With Extensive Farming

1. Any international price depressions can have devastating effects.
2. Droughts have devastating effects on the crop being cultivated because irrigation is not usually used.
3. Pest multiplication and loss of soil fertility due to growing same crop on the same piece of land.
4. It requires sparsely populated areas and a flat land for mechanization.

DAIRY FARMING AS AN EXAMPLE OF INTENSIVE LIVESTOCK FARMING

Dairy Farming

- Involves the rearing of livestock with the aim of producing milk.
- It is practiced in Netherlands (Holland), Denmark, Switzerland, Japan, New Zealand, France, South Africa, Germany, Poland, USA and UK.

Factors favouring Dairy Farming

- Availability of highly nutritious fodder (high grade green pastures).
- Well managed co-operatives societies.
- Availability of both domestic and international markets.
- Availability of capital to invest in dairy farming.
- Advanced technology leads to improved preservation of the dairy products. Invention of modern milking machines which simplify work.
- Low temperatures lead to the breeding of dairy cattle.
- Improved transportation system since milk is perishable.

Characteristics of Dairy Farming

- Dairy farms are small.

- Use of intensive working method.
- Main source of income is milk.

Important Dairy Breeds of Cattle

- Jersey
- Guernsey.
- Friesian(Also for beef)
- Milk(dairy) Short horn(also for beef)
- Brown Swiss
- Alderney
- Ayrshire
- Important Fodder Crops for Dairy Cattle
- Hay clover or Alfalfa Silage(A mixture of grains and seed remains)

DENMARK DAIRY FARMING

- Europeans in United Kingdom and Switzerland drink half a litre of milk everyday.
- It is highly nutritious.

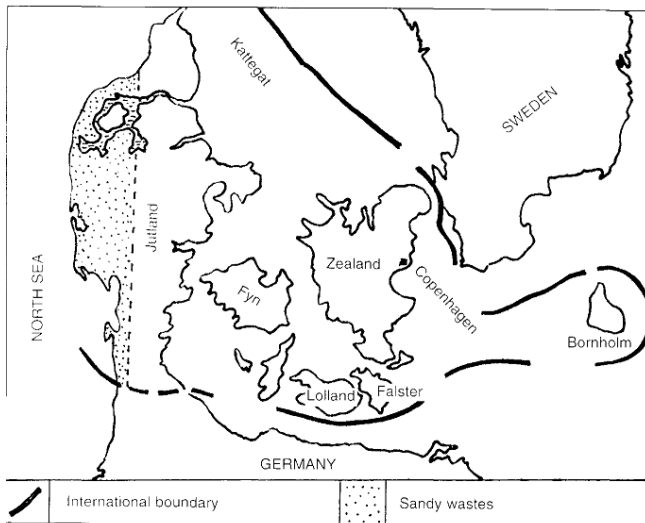


Figure 1.3 Main Islands and Jutland Peninsula

Location of Denmark and Physical & Climatic Conditions

- Located at latitude 55°N and Longitude 10°E.
- It is a small country in North-Western Europe surrounded by water.
- It is a flat and low lying area that facilitates free movement of animals.
- It has a cool climate of between -3°C to 19°C.
- Light rains enable the yearly growth of grass and other fodder crops.

Favourable Conditions for Successful Dairy Farming in Denmark

- Existence of favourable climate for instance moderate annual rainfall (500mm-1500mm).
- Moderate mean annual temperatures(12-15°C)
- Scientific methods of farming or technological advancement that improves output.
- Efficient separation methods which extract cream from milk.
- Availability of markets for milk and milk products i.e. cheese, butter milk, cream etc.
- Addition of reclaimed land.
- Development of infrastructure for example a well-developed transport network, which facilitates easy transportation of milk.
- Active co-operative societies in Denmark that assist farmers in various ways.

DAIRY CATTLE BREEDS

Ayrshire

- It is either white or brown.
- Long, sharp-pointed horns.
- Milked three to four times a day.

Guernsey

- It is smaller in size.
- Produce milk with high butterfat content.
- Milk important for cheese making.

Jersey

- The smallest breed of cattle.
- Weighs not more than 450kgs.
- Light yellow to dark brown or black in colour.
- High content of butterfat.

Friesian/Holstein

- Black to white in colour
- Heavy grazer.
- Weighs 675kg.
- A bull may weigh up to 900kgs.

Swiss Brown

- Brown in colour.
- Its milk is used for cream and chocolate making.

Cooperative Farming in Denmark

- Farmers work together for mutual profits.

- These form cooperatives.
- It is an advanced form of farm organization.
- This demands a literate population to comprehend the cooperative principles and business management.

Functions of Co-operatives

Purchasing

- Cooperatives buy farm inputs i.e. fertilizers, tools etc at cheaper rates than individual farmers.
- The production costs are reduced.

Marketing

- Cooperatives collect, grade and store the farm produce and sell later on.
- They work with the government marketing boards.
- High standards of products is therefore maintained.

Finance

Cooperatives give loans to farmers when need arises. Loans are provided to farmers to purchase land, equipment and other farm inputs.

Processing of dairy products

- Factories are owned by cooperatives i.e. creameries, bacon, egg collecting, fertilizer factories or slaughter houses.
- Farmers get profits from such factories as a group.

Advice and Research

- Agricultural research by co-operatives help farmers to curb problems faced during farming operations.

Importance of dairy industry in Denmark

- Source of employment.
- Foreign exchange earnings through the export of milk, butter, cheese, eggs and bacon.
- Development of infrastructure.
- Promotes educational development through research.

A FARM CASE STUDY IN DENMARK ASSERHOIGAARD FARM

- This farm is located on Zealand Island one of the four islands of Denmark.

- The owner of the farm grows wheat, barley, oats, sugar beet, and grass for livestock.
- Cows are also kept.
- Pigs, chicken are also kept for pork and egg production.
- Pigs and chicken are kept as scavengers on the farm.
- They feed on decayed matter in the farm to reduce occurrence of animal diseases.
- They pick up pests that make attack dairy cattle.
- The skimmed milk is used to feed pigs.
- That is why pigs are reared in the dairy farm.
- The farmer uses tractors, reapers, combine harvesters, grass cutting machines, ploughs etc for his production.
- Barley, oats and grass are used to feed cattle and pigs.
- Sugar beet is sold to cooperative societies.
- Cattle are milked using machines.
- Cattle are fed using cattle cake to supplement their diet.
- Dairy animals are grazed on rich grass i.e. Hays, silage and clover beet root and cereals.
- Cattle cake is made up of cereals like maize and vegetable oil.
- Spacious housing of animals promotes milk production.

Crops grown:

- Wheat, oats, maize and barley.
- These are used as fodder crops for animals.
- Dairy farming products: milk, butter,
- Cheese, eggs, pork, ham, bacon and sausages.

PROCESSING OF MILK

Milk processing passes through stages

The weighing of milk: Is done in order to know how much milk has been set by an individual farmer.

Testing of milk: to check the quality and quantity or certify the water content or diseases.

Pasteurization: liquid milk is heated for about 15 seconds at high temperatures to kill harmful bacteria.

Sterilization: Milk is heated to a temperature of 100°C to kill any surviving micro-organisms. Milk is heated for about 60 minutes..

Homogenization: This involves the breaking up of the fat content of the milk to prevent the formation of a top creamy layer.

Ultra-Heat treatment of milk: Is done in order to kill harmful bacteria in the milk. It is done for 20 seconds before bottling the milk.

Cream Making:

Separation or extraction of cream from milk is also done. Milk is put in bowls and is allowed to settle for 12 hours to 24 hours. Cream collects on top and is skimmed off.

The milk can be processed to make condensed or sweetened milk.

It can be dried or powdered and later on tinned or packed.

Butter making

- The cream from milk is churned or stirred in a large container and solidified to make butter.
- Cold water is added to the cream and the churn is turned until butter granules become small. A muslin cloth separates butter from the churned milk.
- The by-product of this process is the skimmed milk (an excellent feed for pigs).
- Another by-product of butter-making is **casein**: this substance is used to make drugs, plastics and other fibres.

Cheese making

- Lactic acid is added to fresh milk to coagulate milk proteins. Rennin(enzyme) is added to encourage curdling of milk. Whey(watery fluid) is left out.
- Moisture is drained of by putting the curdled milk in moulds with small holes.
- Salt is added to the drained curds.
- Salt improves the quality of cheese by withdrawing water from cheese.
- Cheese require ripening. Micro-organisms work on lactose and fats to give a good flavor and aroma.
- Cheese is then pressed into shapes.
- Milk is processed into fresh preserved milk, butter, powdered milk, ghee and cheese.
- Marketing of products to retailers is done by the cooperatives while governments monitor their quality.

Uses of Milk

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- Milk is used in making cheese and butter.
- Skimmed milk is used as pig feed.
- Casein, a by-product in the making of butter is used to make drugs, plastics and synthetic fibres.
- Milk is used in the making of cream, ice cream and yoghurt.

FOLK HIGH SCHOOLS

- The school is popularly referred to as a folk high school (the Danish term is *folkehøjskole*, or more simply *højskole*).
- These schools were initiated to serve almost exclusively the children of farmers. However, over past four decades these schools have served even children from the urban milieu or class of Copenhagen.
- A Danish *folkehøjskole*, are open to all those above eighteen years of age.
- Folk high schools specialize in ecology and biodynamic agriculture, athletic instructions, music instruction.
- Other subjects offered are: Agriculture for men (November to April)
- Home Economics for Women (May to August)
- Men are taught latest Agricultural techniques.

Problems associated with Dairy Farming in Denmark

- Scarcity of land needed for expansion of dairy farming.
- Labour scarcity as many people opt for white-collar jobs.
- Harsh winters force farmers to keep their cattle indoors for six months.

Economic Benefits of Dairy Farming

- Dairy farming creates employment opportunities.
- It is a source of income to the farmers.
- It earns foreign exchange.

DAILY FARMING IN MALAWI

- Milk production is locally done at smallholder levels in Malawi.

Most important commercial dairy centers:

These are: Blantyre, Lilongwe and Mzuzu.

An extension to the existing dairy farming programme is going on and some achievements on this production can be measured as the donor countries such as Denmark, Norway, Canada and Netherlands have projects with smallholder farmers in rural areas.

The needs of smallholder dairy farmers in central and Northern regions are met by two main projects:

One located at Choma North of Mzuzu and Likuni west of Lilongwe city (Katete).

- ✓ These centres intensify the breeding of high yield milk areas.
- ✓ Malawi-Canada dairy project has aims to improve Katete and Ndata farm in Thyolo.
- ✓ The government of Malawi is making efforts to improve the industry through research at Bunda College of Agriculture.

Problems faced by dairy farming in Malawi

- Pests and diseases may kill dairy animals.
- Mismanagement of co-operatives kills the farmers' initiative and morale.
- Poor road conditions in the rainy season delay milk delivery.

- Importation of dairy products by traders interfere with the domestic market for locally produced dairy products
- Prolonged periods of drought lead to scarcity of grass and water hence affecting the health of animals.
- Concentration on the growing of cash crops especially tobacco discourages dairy farming.
- Shortage of dairy facilities i.e. big cold rooms.

EXTENSIVE WHEAT FARMING IN PRAIRIES

Wheat is an annual cereal crop. It is also known as 'bread grain'.

Types of Wheat

a) Winter Wheat:

- Grown in autumn season in temperate lands.
- It is after winter moisture has been absorbed.
- It is grown in Australia, in Argentina, in central Chile, India and Pakistan.

b) Spring Wheat

In the Northern latitudes, the seed is planted in spring as the winters are severely cold. For example, Canada, Eastern Europe and Russia.

CONDITIONS THAT FAVOUR THE GROWTH OF WHEAT

1. Warm and moist conditions in its early growth.
2. Temperature range between 16°C and 20°C.
3. Light to moderate rainfall between 300mm to 700mm.
4. Extensive flat grassland which encourage mechanization.
5. Frost-free climatic conditions such as a dry sunny period to enable the wheat to ripen.
6. A growing season of at least three months.
7. Deep, fertile, and well-drained soils e.g. the Chernozems that are less leached

and not acidic loam soils and volcanic soils.

8. Availability of a large local and international market in U.S.A, Europe and Asian countries.
9. Well-established transport and communication facilities.
10. Dry sunny season for ripening and harvesting of crops.

Characteristics of Wheat Farming

- Large farms are required to embark on wheat growing.
- Cultivation is highly mechanized for example use of tractors, ploughs, drills and combine harvesters.
- Mechanization means that labour force is small while the yield per man is high.
- Lack of irrigation since wheat does not require heavy rainfall.
- Individual ownership of farms.

Economic importance of Wheat farming

- a) Source of food as foreign exchange is saved for importation of food.
- b) Industrialization e.g. Wheat mills, distilling and brewing industries.
- c) Initiated development of infrastructure.
- d) Foreign exchange earner when wheat is exported to foreign countries.

Processing Of Wheat

- Combine-harvesters reap and harvest the wheat.
- Harvested wheat is milled and sieved to obtain wheat flour.
- The wheat flour is packed and ready for sale.
- Wheat flour is used for baking bread, biscuits, cakes, breakfast cereals like semolina, spaghetti, macaroni and vermicelli.
- Wheat waste (wheat bran) is used as animal feeds.

THE PRAIRIES PROVINCE

A **Prairies** is an extensive, treeless grassland in North U.S.A and Canada. It is characterized by high summer temperatures and low winter temperatures. The dry continental air mass and Chinook winds have a great influence on climate in Prairies.

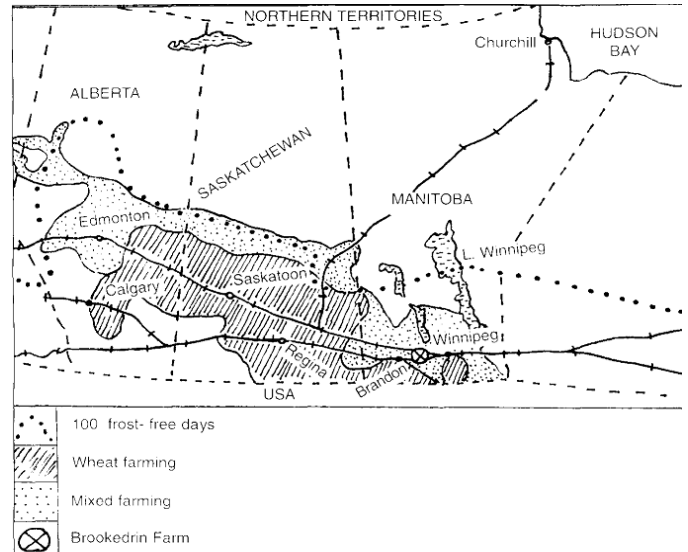


Figure 1.4 Wheatlands of Canada
Three Regions of the Prairies:

1. Albert
2. Saskatchewan
3. Manitoba

The population density of Canada is 5 people per km².

Prairies land covers about 26 million hectares.

Land use on Prairies

- Land is cleared, ploughed and harrowed (left bare)
- The harsh winters kill insects and pests in the field.
- Farmers sow by broadcasting method on a small farm.
- On a large farm, farmers sow by use of tractors or planting drills.
- Manure is done at the time of sowing.

Example of annual activities on Brookedrin farm

Month	Farm activities
April-May	Sowing wheat and growing potatoes.
June-July	Light weeding and chemical spraying
August-September	Harvesting wheat and transporting it to the elevators for storage at nearby railway stations.
September-October	Potato harvesting
October-	

November	Ploughing the field and applying fertilizer
November-March	Repairing and general maintenance of farm structures and equipment. Snow impedes work on the land.

Table 1.1 Annual Activities on Brookerdrin Farm

Favourable Conditions for Wheat Cultivation on the Canadian Prairies

- Flat land that allows easy mechanization.
- Good infrastructure extended into prairies for example, good railway lines.
- Suitable climate that allows the growth of wheat.
- Rich dark brown chernozem soils are essential for wheat growing.
- Market availability due to a well-developed transport network.

The Routes through which wheat is exported from the Canadian Prairies

- Wheat is transported by Lorries to the railway stations.
- Inspection is done at Calgary, Edmonton Winnipeg.
- Wheat is then transported to Ports Arthur and William in the great lakes region.
- Wheat is then shipped through elevators to the great lakes and St. Lawrence Seaway.
- It is taken to big ships known as Whale boats or by railways to ports Halifax, Montreal, New York and Buffalo.
- From there it goes to European countries.

Main Railway Lines in Canada

1. The Canadian National Railway line.
2. The Great Canadian (Intercontinental) Pacific railway line.

Transportation is done in summer season when there is absence of snow. Panama Canal is used.

Problems associated with Wheat growing

- Fluctuation of international market prices.

- Drought, hail, wind and frost affect wheat production.
- Mice, grasshoppers and some pests may damage the crop.
- Transport difficulties when wheat export routes are closed during winter, because both the Hudson Bay and the St. Lawrence River are frozen.
- Soil exhaustion: Soils lose their fertility and the nutrients have to be replenished.

Solutions to Problems affecting Wheat production

- Farmers turn to crop diversification in case wheat production fails.
- To curb climatic hazards, hailstorms are predicted earlier through storm warning systems so that farmers harvest the wheat quickly.
- When routes are frozen during winter, ports that are open all year-round are used such as New York and West Coast Ports.
- Frequent manuring, and application of fertilizers to improve yields is done in areas where a wheat variety has exhausted nitrogen.

Uses of Wheat

- It is used for making bread, cake, pasta and noodles.
- It is an excellent livestock feed for poultry.
- It is used for distillation of alcohol, preparation of glue and adhesives.
- Straw is used for making paper and straw boards.

CASE STUDY 2: RANCHING IN ARGENTINA

Ranching: Refers to all activities taking place in the raising of livestock on a ranch or rearing of animals on large piece of land at large scale for commercial purposes. Animals are reared in a ranch or cattle estates called **Estancias**.

- It is practiced in the cool humid temperate grassland belts of Northern and Southern Hemisphere i.e. prairies of North U.S.A, steppes of Russia, Pampas

of South America, Dawns of Australia and High Veldt of South Africa.

- Denmark and Netherlands.

Example of annual activities on Ita Caabo Estancia

MONTHS	ESTANCIA ACTIVITIES
January-February	Ranch fences are repaired and rye is sown
March-May	Cattle dipping
May-June	Sheep dipping and branding
July-August	Lambing and lamb marking
September-October	Sheep shearing
October-December	Hay making and fence repairing

Table 1.2 Annual activities on Ita Caabo Estancia

Differences between Ranching and Pastoral Nomadism

Livestock Ranching

- Animals are raised for sale
- Scientifically managed.
- There is no migration of animals.
- Vegetative cover is continuous.
- Low stocking ration.

Pastoral Nomadism

- Vegetative cover is seasonal.
- There is seasonal migration of animals.
- Land is held communally or collectively although livestock are owned on an individual basis.
- Animals kept for subsistence or prestige.
- The pastoralists have no permanent shelter.
- Large herds of animals like donkeys, goats, sheep and cattle are kept.

Characteristics of a Ranch

- Animals kept in divided plots.
- One type of animal is kept.
- Dependence on natural vegetation mainly for pasture.
- Ranches are close to good road networks.

Cattle types raised on a ranch

- Shorthorn
- Aberdeen Angus

- Hereford

Activities in a Ranch

- Receiving or buying of the animals and feeding of animals.
- At the frigorifico animals are weighed, cleaned and let into slaughtering rooms.
- Slaughtering, removal of offals and skinning of animals and meat freezing i.e. frigorificos (slaughter-houses) in Buenos Aires and Rosario.
- Hides are dried and fats are extracted and then exported.
- Washing of carcasses and processing them accordingly or freezing them ready for to be loaded onto refrigerated ships.

Parts of a cow and their uses

- Tongues, livers, heart and other offals are collected, cleaned and packed.
- Polish and fertilizers come from the blood of cows.
- Bones are used for making handles of knives, buttons and fertilizers.
- Bones can be crashed and made into fertilizers.
- The animal fur can be used for making cushions.
- The fat from the animals is used in margarine making and as cooking fats.
- Hides for making leather materials like shoes, bags and belts.
- Horns and hooves are used in glue making.
- Meat is cooked and tinned and sold to local butcheries called saladeros.

Argentina is the world's major exporter of beef. Meat is exported to U.S.A, Canada, Germany, France, Spain, and Israel.

Factors favouring beef farming

- i. The flat and gentle Pampas plains provide good natural grazing land.
- ii. Fertile soils (loess) support the growth of good pasture.

- iii. Adequate annual rainfall of 1000mm ensures constant supply of pasture for animals.
- iv. Average temperatures of 10 degrees Celsius in winter and 24 degrees Celsius in summer favour the breeding of beef animals.
- v. Temperate grasslands called Pampas encourage beef cattle rearing.
- vi. Introduction of exotic breeds from Europe e.g. the Shorthorn and Hereford improved the quality of beef products in Argentina.
- vii. Well developed transport and communication network makes transportation and exportation of products easy and fast.
- viii. Well organized and fairly mechanized cattle ranches increase beef production.
- ix. Availability of capital that has led to mechanization of beef farms.
- x. Natural grasses like alfalfa, desmodium are of high nutrient content hence increase productivity.

Features or characteristics of beef farms in Argentina

- Ranches called Estancias are large covering over 200 square kilometers.
- Mixed farming involved e.g. wheat, barley and rye growing.
- Utilization of natural grass called Pampas while Alfalfa is given to the animals in ranches.
- Farm manager's houses called 'prestos.'
- Stores for grains and cattle food.
- Water supplied to the ranches for animals.
- Cross-breeding is done to improve the quality of livestock.
- Inspections of the farms by the cowboys called gauchos.

Importance of Beef Farming to the Economy of Argentina

- Industrial growth for example the existence of frigorificos.

- Urban growth for example towns like Buenos Aires, Rosario and Bahia Blanca.
- Source of employment in the estancias has improved standard of living.
- Source of foreign exchange for example Argentina exports about 15% of its beef to Europe and other countries.
- Improvement in a network of roads and railways.

Processing and marketing

- ✓ Cattle are slaughtered on farms.
- ✓ Packed in tins or cold containers
- ✓ Later transported by train.
- ✓ About 15% of the beef products are exported to USA, Europe, Chile, Brazil and East Indies.

PROSPECT OF BEEF FARMING IN MALAWI

- In 1982 cattle in Malawi was estimated to be 1,267,000
- The year to follow there was a great increase.
- Artificial insemination centres and sub-centres are located in Blantyre, Lilongwe and Mzuzu.
- The establishment of veterinary departments has reduced diseases for example East Coast Fever.
- Cattle are moved to markets by rail in the south and motor vehicles from North to Centre even by foot.
- Cattle ranching in Malawi is mainly done in Dzalanyama range, South West of Mzimba and lower Shire between N'gabu and Nchalo.
- The most common cattle type raised is the Zebu. It is resistant to ticks, high humidity and drought. It adapts to high

temperatures. Fats are concentrated in the hump at the back.

Problems of Beef industry in Malawi

1. **Diseases:** Most common disease affecting cattle in Malawi is Trypanosomiasis (sleeping sickness) spread by tsetseflies), east coast fever, red water fever and fall sickness.
2. **Remoteness of the land:** Rearing animal's areas are where there is no good road, and railway system. This makes it uneconomical to fatten cattle in rearing areas for when they reach slaughtering plants they are either thin or underweight.
3. **Hot Climate:** Hot summer and dry winter causes shortage of pasture and death to many animals.
4. **Financial Constraints:** Lack of enough capital for running the industry; despite other NGO, involvement in the industry lead to poor management of cattle.
5. **Stealing:** Presently robbery is on the greatest increase leading to many people keeping few or none of cattle.
6. **Cultural altitudes:** In most parts of the Northern region people keep cattle for prestige and a form of marriage dowry.

Suggested Measures to be undertaken by the government of Malawi to improve beef farming

- The ministry of Agriculture must ensure that the animal disease control section is active in trying to reduce animal diseases through animal vaccination.
- The government must establish meat canning and processing factories to

enable Malawi export her beef products overseas.

- Implementation of wildlife compensation scheme whereby ranchers whose animals are destroyed by wildlife are compensated.
- Livestock farming advisory services to be provided through field extension officers.
- Roads should be improved to ease marketing of livestock.
- Research into animal diseases, breeding and better livestock management should be funded by the government.
- Heavy taxation on imported meat products protects the local farmer.

LAND RECLAMATION IN THE NETHERLANDS

Polder: It is a reclaimed land from swamps, lakes, deserts and seas. It is the land that has been drained.



Figure 1.5 Polders of Netherlands Landscape of Polders.

- The land should be flat or leveled.

- Reclaimed land is below the sea level.
- Land to be marked to maximize land use

Problems of Land reclamation

- The land dries out and Salination results.
- Costly to maintain the dykes, pumps, drainage canals e.t.c
- When a dyke breaks it causes flooding.
- Land subsides or sinks when it dries out.
- **Land reclamation:** It is the process where land is restored to its original productive state after it has lost its fertility.
It is the turning of water-logged land or areas of shallow lake into a dry land.
- In 1929, the government of Netherlands, under the Zuider Zee and Delta Plan projects reclaimed land that was below the sea level.
- Dykes and dams protect the reclaimed land.
- It is occupied by more than of the population.

Factors that facilitated land reclamation in Netherlands

- Shortage of land for settlement, farming, roads and development of towns.
- Frequent floods.
- Creation of fresh water lakes e.g. Lake Yasser.
- Poor drainage system hence improved drainage system.
- High salinity along the coastlines.

THE ZUIDER ZEE PROJECT

- Zuider Zee means the Southern Sea.

- A dyke was constructed between the province of Hollas and Friesland.
- Polders (low lying land reclaimed) from the sea enclosed by a dyke were created.
- A polder is a low lying reclaimed land below the sea level which is surrounded by dykes that protect it against high water tides.
- Removal of salts from the reclaimed polders is called desalination.
- To reclaim the land or empolder, water is pumped from the sea and channeled into channels or ditches then directed into pumping stations.
- Grass is grown in the reclaimed land to bind the soil together.
- Chemicals are used to remove salts.

Benefits of the Zuider Zee project

- Shortened the road between Northern Netherlands and Friesland.
- Availability of fresh water.
- Creation of land for settlement.
- Growing of horticultural crops i.e. flower and vegetable growing hence improved economy.
- Arable farming i.e. growing of wheat, rye, oats and barley.
- Dairy farming is now practiced in the polders.
- Employment opportunities were created.
- Dykes controlled by the dykes.
- Fresh water from Lake Yssel reduced salinity.

Possible areas for land reclamation in Malawi

Lake Chilwa, Chiuta and Kazuni: Elephant, Ndindi, Vwaza and Lake Chilwa marshes.

IRRIGATION FARMING IN THE WORLD

Irrigation

It is defined as the supplementation of rainfall or the artificial supply of water from a source other than rainfall, to crops in order to enhance their growth and yields.

Background Information

Archaeological investigation has identified evidence of irrigation in Mesopotamia and ancient Egypt and Ancient Persia(modern day Iran as far back as the 6th Millenium BCE where barley was grown in areas where the natural rainfall was insufficient to support such a crop. Irrigation systems existed in the Tigris-Euphrates valleys as along as 4000BC.

Major world locations on irrigation

These areas include: Indus Valley, Ganges Plain, Nile Basin, Central Valley of California and places of Multipurpose river dams, California and Nile valley

- Rice in India and China
- Wheat in USA and Israelite Kibbutzim
- Vegetables in Denmark, Netherlands and Britain
- Sugarcane in Cuba, Mexico and Japan.

Two Main types of Irrigation

1. **Perennial Irrigation:** Water is supplied to cultivated areas throughout the year. Huge dams are constructed across the rivers so that reservoirs are created to store water. Sluice gates control the flow of water into the fields. Examples are the Aswan dam project,

the Grand Coulee Scheme project and the Indus Valley project.

2. **Annual Irrigation (Basin Irrigation):**

It depends on the annual flooding of a river during the period of heavy rainfall. The flood plain is leveled and banked by mud walls to distribute the flood waters during the season. Examples are the Ganges valley flood plain and the Nile valley.

Other types of irrigation

- a) Traditional types e.g. Shaduf, Sakia and Channel irrigated methods.
- b) Modern types: e.g. Sprinkler, Furrow and Drip Irrigation.

Factors that determine the Irrigation

Methods

1. **Soil type:** Sandy soils have a low water storage capacity and a high infiltration rate. They need frequent but small irrigation applications. Clay soils with low infiltration rates are ideally suited to surface irrigation.
2. **Slope:** Sprinkler or drip irrigation are preferred above surface irrigation on steeper or unevenly sloping lands as they require little or no land leveling.
3. **Water:** Sprinkler or drip irrigation when water is in short supply.
4. **Type of Crop:** Surface irrigation can be used for all types of crops. Sprinkler and drip irrigation, because of their high capital investment per hectare, are mostly used for high value cash crops, such as vegetables and fruit trees. Drip irrigation is suited to irrigating crops such as vegetables and sugarcane.
5. **The type of technology:** The purchase of equipment requires high capital investment per hectare in case of drip and sprinkler irrigation. Regular supply of fuel and spare parts may require foreign currency.

6. Previous experience with Irrigation

- The choice of an irrigation method also depends on the irrigation tradition within the region or country.
- Introducing a previously unknown method may lead to unexpected complications.
- The servicing of the equipment may be problematic and the costs may be high compared to the benefits.

7. Required Labour inputs

- Surface irrigation often requires a much higher labour input for construction, operation and maintenance.
- Sprinkler and drip irrigation require little land leveling, system operation and maintenance are less labour-intensive.

8. Hydro-electric Power:

It is important in order to pump water.

METHODS OF IRRIGATION SYSTEMS

a) Basin irrigation

(Flooding Irrigation)-Traditional

- Water moves over and across the land by simple gravity flow in order to wet it and to infiltrate into the soil.
- It is often called flood irrigation when the irrigation results in flooding of the cultivated land.
- Banks are built across the river and across the valley. Flood water is held between when the river flows forming basins.
- Water flows back to the river after several days. It is commonly used in Egypt (Nile valley) Iran and India.



Figure 1.6 Basin Irrigation

Advantages of basin irrigation

- Maintains soil fertility by deposition and sedimentation of silt.
- After harvesting the land is left furrow until next flooding season allowing it to gain fertility.

2. Shaduf (Traditional)

- Buckets full of water are lifted from a deep well.
- A rock is tied to a rope that is lowered into the well.
- This method is common in Egypt, Iran and Iraq.

Advantages of Shaduf

- Low requirements for infrastructure and technical equipments.
- Can be used all year around.



Figure

1.7 Shaduf Irrigation method

3. Sakia (Traditional method)

- Water is lifted using a wheel or a pulley.
- Animals like donkeys, horses or even manpower is used.

4. Wells and Channels (traditional)

- Wells are sunk to enable water to be obtained from saturated rocks.
- Channels are constructed to lead water into the garden.
- Few wells can be sunk into the ground to avoid shortfall of underground water.

5. Sprinkler or Overhead Irrigation (Modern)

- In sprinkler or overhead irrigation water is piped to one or more central locations within the field.
- A system utilizing sprinklers, sprays, or guns Higher pressure sprinklers that rotate are called *rotors* and are driven by a ball drive, gear drive, or impact mechanism.
- Rotors can be designed to rotate in a full or partial circle.



Figure 1.8 A traveling sprinkler at Millets Farm Centre, [Oxfordshire](#), United Kingdom.

- Sprinklers use engine pumps to pump water, under pressure through pipes e.g. Upper Nile, Israel, Iraq, Iran and U.S.A.

6. Trickle or Drip Irrigation (Modern)



Figure 1.9 Drip Irrigation - A dripper in action

- Grapes growing in Petrolina is possible in this semi arid area due to drip irrigation. Water is distributed to the plant stations by pipes. Perforations or holes are made in the pipes. This type of irrigation saves water.

- Water is delivered at or near the root zone of plants, drop by drop through perforations.

Advantages of Trickle Irrigation

- Minimization of evaporation and runoff.
- Large area is irrigated at once.
- Operates well in low water pressure.

Disadvantages of Trickle Irrigation

- Very expensive to establish and maintain.
- Difficult to regulate pressure on steep slopes.
- Computerised set of valves need high-tech solutions.

7. Canal/Furrow Irrigation

- Canals lead irrigation water from rivers or storage lakes.
- These provide water all the year round.

Why Irrigation is an Intensive type of farming?

- Demands high labour.
- Needs high capital for maintenance of the dams.
- Heavy application of chemicals.
- High yield per unit area.
- Several harvests per year may be produced.

Problems associated with Irrigation

- Fluctuation of river water during the dry season.
- During the dry season, high evaporation rates cause soil salinization making the soil poor for farming.
- Capital shortage makes it impossible for farmers to employ a form of mechanization.
- Farm inputs are too costly for farmers.
- High costs are incurred during pumping of water.
- Constant supply of salty water from lakes or rivers increases salinity of the soil.
- It causes siltation of a dam and leaching of minerals.
- Depletion and exhaustion of the soil's fertility by maize crop.
- Monoculture has resulted to farmers abandoning other crops.

- It results to silting of a dam and leaching of plant nutrients.
- Stagnant water provides a conducive environment for breeding of mosquitoes and snails which infect farmers with diseases.

Advantages of Irrigation Farming

- It leads to urbanization and development of towns.
- Irrigation schemes improve water supply in the region.
- Controlled supply or use of water prevents soil erosion.
- It is possible to diversify crops.
- Irrigation facilitates the development of other social amenities such as schools and hospitals.
- Irrigation schemes have created settlements of thousands of people.
- Source of employment, income and livelihood for farmers.
- Increased production of food hence reducing the country's food imports.

ISRAEL IRRIGATION

The State of Israel

- The creation of the State of Israel was declared in 1948.
- Israel's relief consists of the mountain range between the river Jordan and the Mediterranean Sea.

The Southern Region

- There are no rivers in the south where Negev desert is situated.
- Annual rainfall is less than 25mm.
- The soils are the aridisols which are shallow and have low humus.
- These soils lack moisture due to rapid evaporation(2100mm)

The Central Region

- Has steppes grasslands or shrubs.
- Has semi-desert conditions.
- Soil is badly eroded.
- Receives annual rainfall between 25mm to 75mm.

Galilee Region

- Galilee Sea is in the North and the Dead Sea is in the South.
- Israel is a small arid country depending on collective farming.
- Has dry summers and wet winters.

- Has evergreen trees and shrubs.
- Receives more than 75mm of rainfall annually.
- Evaporation rate is less than 1200mm.

Climate of Israel: (Mediterranean Climate)

- Winter rainfall is experienced from (November to March)
- No rains are experienced in summer.
- Israel has mild and wet winters
- The southern part of Israel receives rainfall less than 127mm annually .

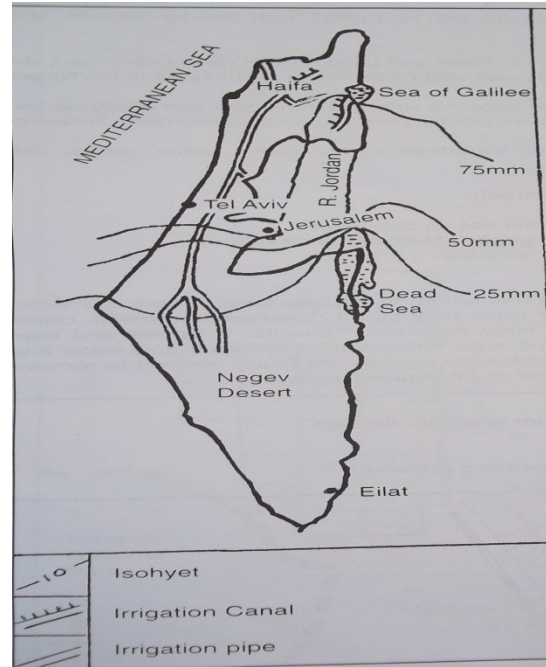


Figure 1.10 Map of Israel and irrigation works

Types of Soils

Fertile soils exist in the North. Israel
Alluvial heavy clay
Sandy areas
Desert soils

Sources Of Irrigation Water

- Jordan river boreholes
- Lakes Galilee (Tiberias) wells and sprigs.
- Artificial lakes
- Open streams and dams constructed.

Methods of Irrigation in Israel

- a. Drip irrigation
- b. Sprinkler irrigation

Reason for using Pipelines instead of Canals.

- Pipelines prevent large quantities of water from being lost through evaporation.

- The altitude of Lake Tiber is about 212m below the sea level.
- Thus water control moves into canal by gravity since altitude is very low.

Important crops grown

- Cotton
- Citrus fruits
- Grapes
- Vegetables
- Wheat

Problems facing irrigation farming in Israel

- Long distance between Jordan river and Negeb desert where water is needed.
- Rapid evaporation of water in the desert.
- Lake Tiberius is 212m below the sea level making it difficult to pump water.
- The water from the sea is salty which is not good for irrigation

Solutions to the problems

Use of electrical pumps.

- Installation of pipelines eases the problem of evaporation.
- Desalination of water.
- Use of fertilizers to restore the soil fertility.

How is water desalinized?

- Water is poured in the desalination plant or tank where it is boiled.
- The steam from the tank is led into the pipes where the salt remains in bottles to condensation tank.
- In the condensation tank the water becomes pure as it cools.
- The pure water is carried through pipes to all parts of the country.
- In Israel, the main desalination plants are found at Cilat and Itaiya.

Problems faced with desalination of water

- It is very expensive.
- Distilled water is not good to our bodies because it does not contain minerals required by our bodies even essential minerals for crop growth.
- Use of distilled water influences use of more chemicals and manure for high productivity.

Kibbutzim or Israel system of farming and settlement

Kibbutzim are successful co-operative communities in Israel.

Principles of Kibbutzim

- Its members live in a single community and share the work.
- The word kibbutz is the Hebrew name for such a community.
- Property such as land, buildings and equipment, factories and tools, is owned by the kibbutz, is owned jointly (collectively) by the community.
- The kibbutz looks after all the needs of its members and their families and usually provides communal dining, laundry and other services.
- Kibbutzim now owns and operates factories, hotels and restaurants.
- The General Assembly decides policy and allocates responsibilities (work)
- They produce something like 50 per cent of Israel's agricultural produce and about 9 per cent of its industrial goods.

NCHALO SUGAR CAN IRRIGATION SCHEME

Location of Nchalo Sugarcane Scheme

- Lies on the western terraces of the Shire river in Chikhwawa district.
- The estate is checked by Ndindi and Elephant marshes which absorb flood waters from the wetlands.

Factors influencing the establishment of the scheme

Soils

- Alluvial soils comprising of sand, silt and clay are common.
- Grey to dark brown soils are also common.

Climate

- Temperature range is between 24°C to 32°C.

- Low annual rainfall of about 800mm necessitates irrigation or sugarcane plantations.
- Sugarcane requires 1270mm of rainfall.
- Too much rainfall makes sugarcane not to be sweet enough.

Land

- The land is naturally fertile with potash and phosphate.
- The land is generally flat.
- Water flows easily from Shire river.

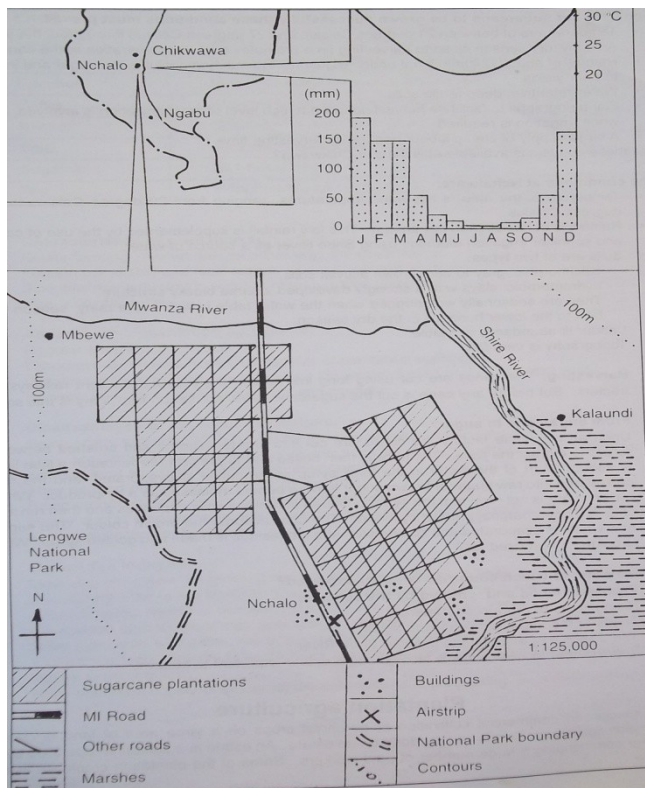


Figure 1.11 Nchalo Sugarcane plantation

Methods of irrigation

- Sprinkler irrigation system.
- Furrow irrigation system.

Growing activities of sugarcane

Land Preparation:

- Includes ploughing, harrowing (leveling and removal of soil lumps by scrappers and construction of shallow ditches)

Planting Sugarcane:

1st Method:

- The cane is cut in lengths of 60cms

- It is dipped into hot water (52°C) or fungicides to kill organism which may cause diseases.
- Stems of cane (setts) lay horizontally in loose soil on shallow ditches.
- They are buried beneath 7.5 cm of soil.
- Nitrogenous fertilizer is applied in advance.

2nd Method:

- It is called Ratoon(after cutting or harvesting, the root regenerates to produce ratoon crop)
- Generating shoots are removed and planted.
- Fertilizer is applied in advance.

Harvesting of sugarcane

- Irrigation is stopped to enable the land to dry.
- It speeds up maturity for instance sucrose and moisture content.
- It is called a dry off period.
(3weeks before harvesting)
- Sugarcane matures when it is 18-24 months old.
- The fields are set on fire a day before cutting.
- This is done in order to:
- Kill dangerous snakes and animals and
- Reduce the weight of sugarcane.
- Prevent sucrose from deteriorating because sucrose deteriorates greatly in fresh canes than burnt ones.
- Canes are cut by hand knives or pangas.
- Harvested canes are piled in heaps and transported by lorries and tractors to the factory.

Sugar processing in general

1. Preparation:

At the factory, sugarcane is weighed. Canes are cleaned by warm water to remove trash. Canes are chopped by ratting knives called shredders.

2. Juice extraction or pressing:

Canes pass through rollers to be crashed and squeezed in order to extract juice. Bagasse is left out after juice has been squeezed out.

Clarification: It is also known as defecation process (thus the removal of both insoluble and soluble impurities). Juice is poured into large

containers called clarifiers where screening takes place. Milk neutralizes the natural acidity of the juice. Lime helps in the sinking of non-sugars to the bottom. The filtered material called mud is returned to the field as farmyard manure.

4. Evaporation

Juice enters an evaporator where it is boiled to form thick concentrated syrup. In a vacuum pan, the syrup undergoes evaporation process that results to molasses and sugar crystals known as massecuite.

5. Crystallization: The massecuite are stirred in open tanks called crystallizers where sugar crystals develop.

6. Centrifugation: Massecuite is led into centrifuges (revolving machines (baskets)) which separate the white sugar crystals from the molasses..

Once the sugar is centrifuged, it is sent to a granulator for drying.

7. Drying and Packaging

- Damp sugar crystals are dried by being tumbled through heated air in a granulator.
- The raw sugar is melted and filtered in the refinery where the brown substance is removed by further use of lime to produce white sugar.
- The dry sugar crystals are then sorted by size. Sugar is weighed then sent to be packed in the familiar packaging we see in grocery stores, in bulk packaging, or in liquid form for industrial use.

Uses of sugar byproducts

- Molasses are used as animal feed.
- Molasses are distilled into ethanol and alcohol (rum, Malawi gin)
- Bagasse is used for fuel (generating steam in factories) and fertilizers.
- Bagasse can also be used as cattle fodder.
- It is used for paper making and is ploughed in the fields to enrich the soil.
- Bagasse is used for insulating boards, and hardboards.
- Sugar used for sweetening of beverages, for example, tea and coffee.
- Sugar is used for making confectionery, bread, cakes, sweets, jams etc.
- It is used in pharmaceuticals, paper, polish and plastics manufacturing.

Problems associated with sugarcane industry

- There is power failure at the factory due to unreliable rains that affect water level in the Shire river.
- This is checked by use of generators or thermal electricity
- Wild animals and snakes endanger the lives of the workers.
- This is checked by burning before harvesting.
- There is a problem of transport which is checked by letting wholesalers use their own transport for distribution.
- Diseases affect the quality of cane.
- Diseases such as Ratoon stunting, mosaic yellow with leaf spots and pests or stem borers and rats are solved by planting several varieties at the same time to reduce the impact of the diseases.
- Sugarcane plantation can also be sprayed with chemicals.
- Regular inspection of the plantation to spot the infected areas curbs the problem of pests and diseases.
 - Poor seed types and lack of varieties results to low yields.
 - A delayed payment by sugarcane millers to the farmers discourages them.
 - Fire outbreaks in sugarcane estates cause losses to farmers.

Importance of Nchalo scheme

- Source of employment as people get employed in estates and factories.
- It earns the Malawi government foreign exchange..
- Malawi sugar is exported to Zambia, Zimbabwe, Burundi, therefore brings income.
- It has improved other sectors of national economy for example Sobo Company and Distillery Industries. .
- Sugar is consumed locally thereby saving the use of foreign exchange to import sugar.
- Sugar industry has led to the development of towns like Nchalo in Chikhwawa and Dwangwa in Nkhota-kota.

- It has contributed to the development of a better transport network.

TEA PLANTATION IN MALAWI

- Tea is a non-alcoholic beverage shrub. Apart from Malawi Tea is grown in China, India, Sri-Lanka, Indonesia, Japan, South America, Uganda, Kenya, Rwanda and Tanzania.

Conditions necessary for the growth of Tea

- Uniform temperature is required ranging from 18°C to 20°C.
- Cool and humid weather stimulates leaf growth.
- Availability of shade from strong sunlight or violent winds.
- High rainfall is required of about 1150mm to 2000mm.
- Tea does best in high altitude areas between 1000mm-1700mm above the sea level.
- Well-drained fertile soils are preferred to avoid water logging with gentle slopes.
- Soil must have humus and moderately acidic with potash.
- Well established transport network.
- Availability of labour.
- Availability of both international and local market.

Seasonal activities on the tea plantation

- **Clearing the Land**
- Removal of Stump rings or barks to prevent diseases affecting tea e.g. Armillas.
- **Nursery Seed Planting** Seeds are put in wet sand where after germination are transplanted into nurseries and open fields after 1 or 2 years.
- The seedlings are transplanted on the land at the height of 20-30 cm.
- They are planted in straight rows 1.5 apart and 15cm deep holes.
- **Weeding** is done at regular intervals.

- When the plant is about 1 m high, pruning is done to stimulate growth.
- It also ensures that the branches grow thick.
- It is done during the first four years.
- Falling tree leaves keep ground moisture and provides umms for tea plants when they decay.
- Plucking or picking of tea begins after 2-3 years.
- On Makwasa Estate it is done in November to April.
- Tea is picked every 5-7 days in the rainy season and 10-14 days in the dry season.
- Tea is taken to the shades for sorting and weighing.
- The leaves are then transported to the factories for processing.

Makwasa Tea estate

- Located in the Shire highlands.
- It is in West of Luchenza in Thyolo district.
- The estate was established in 1936.
- It employs 2000 people during picking season among them the General Manager, Assistant Managers, technicians and factory engineers.
- Over 5% of the working population lives on the estate.

Tea processing

Tea factories in Malawi are located in Chombe in Nkhata Bay, Makwasa in Thyolo, Limbuli and Kasembereka in Mulanje.

- Weighing:** The leaves are weighed and spread on troughs through which hot air is blown.
- Withering:** The leaves are left in withering lofts for 20 hours with hot air to extract moisture.
- Sifting:** Tea leaves are crushed into smaller pieces by machines called rollers. This promotes fermentation.
- Fermentation:** The leaves are then dried and fermented by passing still warm air and high humidity over them. The leaves turn brown and acquire a taste or aroma of tea.
- Firing:** The leaves are put on the conveyor and through a hot oven over

104.0°C. The tea leaves are dried for 16 to 24 minutes. The tea leaves turn black.

- f. **Grading:** Tea leaves pass through strainers with holes of different sizes so as to get tea of various grades. Leaves fall through air current. The poorest quality tea made up of heavier stems fall quickly through centrifugal forces.
- g. **Packaging:** Tea is packed in wooden boxes called “chests” ready for export. The chest is lined with aluminum paper to preserve tea flavour.
- h. **Blending:** It is the mixing of different grades of a product together. This mainly is done by experts in different countries where tea is exported. Some blending is done in country for home consumption eg. Chombe Tea Factory, Banja Tea leopard.
- i. **Transporting and Selling:** Trains and large Lorries carry tea to Beira and Dar Es Salaam where it is shipped to London where there is world tea market. Tea is further exported to Great Britain, Canada, U.S.A, South Africa, Netherlands, France and other countries.

Mimosa Tea research

- This has been established in order to improve the production of tea and control the amount of produce for better prices at the world markets.
- Finds better methods of controlling pests and diseases.
- Train tea growers.

Tea plantation problems in Malawi

- Competition from other crops like tobacco and maize has reduced the total area of land under tea.
- Population explosion or boom has reduced the area covered by plantations.
- Soil exhaustion due to mono-cultural farming lowers the yield hence need for a lot of fertilizer for successful growth of tea.
- Prolonged drought leads to withering of tea hence lowering the harvest.
- The production cost of tea is high yet farmers lack adequate capital.
- Fluctuation of world market prices causes losses to farmers hence affecting farm operations.
- Transportation is very costly as Malawi is a land locked country.
- Tea plantation work, demands large labour force, with low wages paid. Many

workers opt for greener pastures e.g. tobacco fields.

- Pests like the black tea thrips, weevils that damage young tea plants, and diseases like Armillaria root rot reduced the quality and quantity of the field.

Small Holder Tea authority

- This was formed in 1967 in the southern region in order to encourage Malawians to grow tea on small holder scale basis.

This was formed in order to:

- Let Malawians utilize the knowledge acquired from the estates after working for some time, by establishing their own tea gardens.
- To provide income to Malawians supplementary to bananas.
- Tea yields are high therefore a small holder does not need much land as farming land is scarce.

Assessment on Small Holder Tea Authority

- The authority provides 2,800,000 Tea plants every year to small holder farmers on long term loan basis.
- Since its establishment to 1977 there were 307 hectares in Mulanje and 338 hectares in Thyolo.
- In 1975 a modern tea processing factory was established in Mulanje by the authority.

Importance of Tea to Malawi's economy

- Tea contributes 25% of Malawi's export earning thus second from tobacco.
- It is the largest single employer with over 34,000 employees. Malawi is the second largest producer of tea in Africa.
- Tea estates are sources of tourism.
- Establishment of small holder authority, farmers have increased the production of tea hence the improvement of living in areas like Thyolo, Mulanje and Nkhata Bay.

COCOA PLANTATION IN GHANA

Historical Background

- Cocoa comes from a tropical tree called theobroma cacao. It is used as a beverage.
- Cacao tree produces pods that contain seeds called beans.

- It was an indigenous plant in the rain forests of Central and Southern America.
- It was very expensive.
- The royalty of Inca or Aztecs were permitted to eat it.
- The Swiss were interested in developing chocolate products as an expensive luxury food.
- The Swiss Missionaries who came to the Gold Coast in the early nineteenth century, and to Kwawu in 1888, wanted to convert the local people to cash cropping so as to monetize their economy.
- By that time it was grown in Sao Palme, introduced there by the Portuguese.
- Ghanaian oral history relates that Tetteh Quarshi went to Sao Palme and stole some live beans to bring back and cultivate in the Gold Coast.
- Cocoa was introduced in Nigeria in 1874.

Location:

- Cocoa is extensively grown in Nigeria, Ivory Coast, Cameroon and Ghana.
- Ghana is the largest producer of the world cocoa beans. It is seconded by Nigeria then Brazil.
- Principle cocoa regions in Ghana are: Ashanti Province around Kumasi, Agogo and Awaso, on the western part of the country.

Factors Favouring Cocoa growing in Ghana

- Well distributed annual rainfall which is at least 1500mm.
- Temperatures of about 25°C.
- Thrives best in high humid areas.
- Cocoa tree requires protection from direct sunlight and strong wind hence need for tree shades. Unripe pods may be blown off by strong winds.
- Favours lowland areas and plains.
- Requires deep well drained loamy soils rich in iron and potassium. Light clays are also a favourable condition.



Figure 1.12 Cocoa growing regions in Ghana

Cultivation of Cocoa Planting

- Seedlings are sown in nursery and are transplanted to the farms and planted in rows.
- Tall forests are left in the farms to protect the plants from the strong equatorial sun and wind.
- Cocoa plant takes five to eight years to mature.
- The first harvest takes place when pods turn yellow-orange in colour.
- The trees grow to a height of 8-10m.



Figure 1.13 Cocoa tree with yellow pods growing on it. Cocoa pods growing on trunks

Harvesting

- Harvesting is done between September and February and between May and August.

Drying of Cocoa beans

- They are dried in the hot sun till they turn browns.
- They are then packed in sacks and taken to the government agent for weighing and grading.
- Farmers are paid according to grades.

Processing of Cocoa

- **Traditional methods**
- The pods are split open using a sharp knife, panga or machete.
- Cocoa beans are scooped out using hands.
- The beans are heaped on a mat covered with a broad banana leaves.
- This allows the juicy pulp to drain away.
- It also facilitates fermentation process in order to remove the bitter taste of the fresh beans and stop beans from germinating.
- Fermentation process also improves the flavor of cocoa.
- Fermented beans are dried in the sun in order to turn brown.
- Beans are then grade, weighed and packed ready for export.



Figure

1.14 Women turning cocoa beans on a mat

Importance of Cocoa

- Beans are cleaned and roasted.
- Cleaned beans are cracked to remove the covers called husks.
- The wastes may be used in the garden as manure.
- The removed fats produce cocoa butter which is used for production of cosmetics e.g. perfumes, ointments.
- Paste is dried and into cocoa powder which can be used to make a cocoa drink (mixed with sugar and milk chocolate cakes. Etc.
- Beans are cleaned and roasted.

- The husks of the beans are crushed to form fatty cocoa butter and nutritious powder.
- The powder is used to make chocolate and other cosmetics like cocoa butter.

Problems facing cocoa production in Ghana

- Political instability: Ghana experienced coup d'états that resulted to the decline of cocoa production.
- Migration of farmers to towns like Accra, Takoradi and Sekodi caused labour shortage hence negligence of cocoa.
- Destruction of cocoa farms by drought, bush fires and strong winds
- Poor transport network.
- Cocoa is affected by pests, insects and diseases like swollen shoot and black pod which lowers the yield.
- Lack of government incentives to improve cocoa production.

Economic importance of cocoa in Ghana

- Source of employment.
- Source of foreign exchange.

•
More



farmers earn a living through cocoa growing.

UNIT 2 WETLANDS IN MALAWI

- A wetland is a place which has more water almost throughout the year for example swamps and marshes.
- It contains wild and aquatic life species.
- Examples of Wetlands in Malawi are:
- Vwaza Marsh in Rumphi
- Ndindi Marsh in Nsanje.
- Elephant Marsh in Chikhwawa
- Dedza and Bana swaps in Nkhotakota.
- Chombe swamp in Nkhata Bay

- Limbe Marsh in Zomba around Lake Chilwa.
- Lake Chilwa is about 2,000 square kilometers.
- Fishery is the most valuable asset of Lake Chilwa.
- Between 1973-1986 the Lake used to produce 8,000 tonnes of Chambo fish but now it is less than 2,000 tonnes.

Importance of wetlands

- They are habitats for wild and aquatic animals.
- They are source of attraction to tourism industry as they contain over green and beautiful plants and animals.
- Hardwood in these lands is a source of timber production.
- Cultivation of crops like rice is done around Chilwa and Chombe swamps.
- Play an essential part in the regulation of river flow.
- They filter pollutants and fertilizers
- Alluvial deposits act rather like sponges which absorb surplus water before releasing filtered water.

Figure 2.1 An example of a Wetland

Threats to Wetlands

- Cultivation around wetlands might lead to dryness or extinction of a wetland eg. Lake Kazuni.
- Aquatic animals are prone to water pollution due to flooding of industrial areas.

Management of wetlands

- Avoid cultivation of wetlands to maintain its beauty.
- Declaration of inhabited areas by the governments or legislature of wetlands to protect the species.
- Authorization from the responsible people before visiting wetlands.
- Conservation of trees to maintain the scenery of the wetlands.

UNIT 3 ENERGY FROM NATURAL RESOURCES

Energy:

Is the power of fuel, sun, wind, nuclear, water etc needed to run machines or assist humanity in production.

Types Of Energy

- Solar energy
- Fossil fuels
- Wind energy
- Hydro-Electric Power
- Geothermal Power
- Nuclear Energy
- Biogas energy

a. H.E.P

- This is power produced from water.
- It is generated from moving water using turbines.

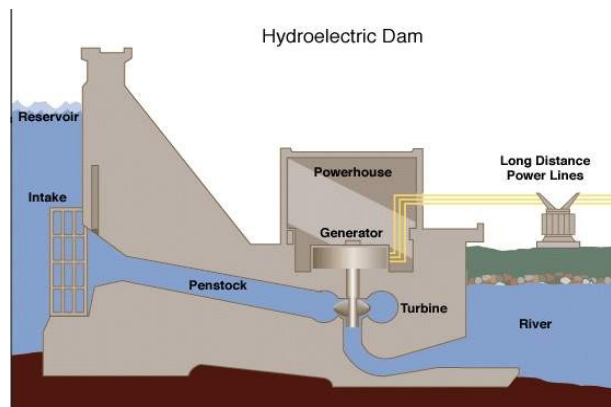


Figure 3.1 Hydroelectric Dam

H.E.P. is produced as water passes through a dam and into a river. The more water passes through a dam, the more energy is produced. Water from the reservoir enters the penstock and turns a device called turbine. Turbines contain metal coils surrounded by magnets. Turbines are connected to the generator. When the magnets rotate rapidly over metal coils, electricity is produced. Electricity is transmitted to the consumers through long distance power lines.

Advantages of H.E.P

- Cleanest form of energy.
- It is an inexhaustible source of energy as long as there is rainfall.
- Can be transmitted over a long distance to millions of consumers.
- It is relatively easy to use requiring only a switch.

- It is the most reliable and versatile form of energy.
- It can be used for several purposes.

Disadvantages of H.E.P

- Power supply fluctuates with fluctuation of water levels or during droughts.
- Silting of dams due to soil erosion reduces the water holding capacity of the reservoirs.
- Building of dams and power plants is very costly.
- It is expensive to transmit H.E.P over long distances.
- Once H.E.P. is generated, it cannot be stored.

Importance of H.E.P Projects in Malawi

- Electrical power is used for Malawi's industrial development.
- The scheme controls floods along Shire River to some extent.
- Nkula falls attract tourists that attract foreign income.
- Creation of employment in **H.E.P** stations and **ESCOM** Company.
- Provision of electric power has led to development of urban and rural centers.
- The stations attract tourist attractions hence bringing in foreign exchange.

TIDAL OR WAVE ENERGY

Oceans contain potential energy in form of tidal and wave power. Tides are caused by the gravitational pull of the moon and sun, and the rotation of the Earth.

Types of Tidal Energy

1. **Kinetic Energy:** Harnessed from the ebbing and surging tides.
2. **Potential Energy:** Harnessed from differences in the high and low tides.

Generation of Tidal Energy

- A simple generation system for tidal plants involves a dam, known as a barrage, across an inlet.
- Sluice gates (gates commonly used to control water levels and flow rates) on the barrage allow the tidal basin to fill on the incoming high tides and to empty through the turbine system on the outgoing tide.
- There are two-way systems that generate electricity on both the incoming and outgoing tides.
- A high barrier dam on the continental shelf is constructed. The sea is separated from an

estuary by a barrier dam. In the barrier dam is turbine and a passage going to the estuary that allows the movement of water. Water turns the turbines as it goes back and forth to generate electricity.

Advantages

- Cheap source of energy as tidal waves are free.
- It is a clean source of energy.
- Tidal power is more predictable than wind energy.

Disadvantages

- It is only available along the sea where tidal waves are high.
- Generating plants may be destroyed by hurricanes or strong tidal waves.
- Limited knowledge about tidal waves.
- Requires a lot of capital to install the plant.
- Tidal barrages can affect the movement of marine animals.

Geothermal Power

- It is energy derived from the heat in the earth's interior.
- The core of the earth is very hot with very high temperatures.
- Convectional heat currents heat up rocks which when in contact with water, turn it into steam and super heat water.
- Through cracks, the steam manifests itself in form of geysers.
- This steam is then transmitted to the station where it is used to turn turbines that generate electricity.
- Any left over water is pumped into the reservoir.

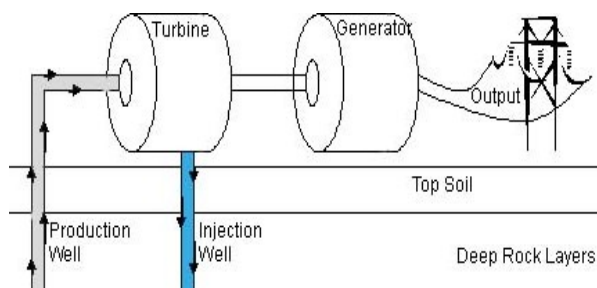


Figure 3.2 Geothermal plant
Advantages of Geothermal Power

- It is a cheap source of energy as only steam is used to drive the turbines.

- The generation of power is continuous as water can be pumped back underground to generate more steam.
- It is the clean form of energy
- Cost production is low.

Disadvantages of Geothermal Power

- Generation of geothermal power causes noise pollution.
- The geysers are confined to few areas.
- Advanced technology is expensive and technical “know how.”
- Geysers may be accompanied by harmful gases like sulphur dioxide, ammonia and methane.

Thermal Energy

- Produced using diesel steam and gases. It is energy produced from ancient microscopic plants and planktons. Microorganisms are buried in silt and sand. Sediments settle over them. The sediments build up, mud is compressed and heated. It forms petroleum.
- The oil flows and accumulates in thicker porous limestone or sandstone. Oil is burned to produce heat energy that converts water to steam.
- The steam turns a turbine and a generator and produces electricity.
- Thermal energy is not as widely developed as H.E.P power generation.

Advantages of Thermal Energy

- Affordable
- Effective
- Little emissions of carbon dioxide unlike coal.

Disadvantages of Thermal Energy

- Produces carbon dioxide which is one of the greenhouse gases causing global warming.
- Non-renewable resource.
- Rising fuel costs.
- Damages marine ecosystems in case of accidents of crude oil tanker ships.

BIOMASS ENERGY

- It is produced from organic matter from plants and human and animal wastes found on the earth’s surface.
- Burning of organic materials produce heat energy.

- Biogas is a combustible gas which is generated by fermentation of biomass (plant and animal remains)
- Biogas comprises of methane and carbon dioxide.
- The biogas plant has a digester (or fermentation tank) and a gas holder.

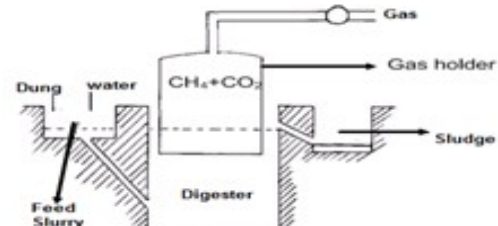


Figure 3.3 Generation of biogas energy

- The digester is a cylindrical waterproof container with an inlet into which the fermentable mixture is introduced in the form of liquid slurry.
- The gas holder is an airproof steel container that collects the gas being generated.
- It is also equipped with a gas outlet, while the digester is provided with an overflow pipe to lead the sludge out into a drainage pit.

Advantages of Biomass

- It is an inexhaustible source of energy.
- It is not pollutant.
- It is a cheap source of energy as it makes use of waste materials.
- Requires little skills to produce.

Disadvantages

- It cannot be transported over a long distance.
- It produces little energy therefore limited for commercial purposes.
- Lack of necessary technology for the exploitation of biogas in developing countries.
- It's a pollutant if the materials are burned directly.

NUCLEAR ENERGY

- It is energy produced by the alteration of atomic structures (splitting of the atomic nuclei) using uranium. Uranium U-235

undergoes fission(a free neutron bombards a U-235) nucleus. The free neutron will be absorbed by the U-235 nucleus causing the atom to be unstable and splits immediately)

- In a nuclear reactor an atom splits and releases 2 to 3 neutrons and a huge amount of energy in form of heat and gamma radiation. This energy released within the reactor is capture by water pipes. The water passes through the heat exchanger, which transfers heat from the reactor water to fresh water.
- The heat released produces steam that drives the turbines which produces electricity.
- These nuclear power stations are common in Britain, France, Germany, Canada, China, USA and Japan.

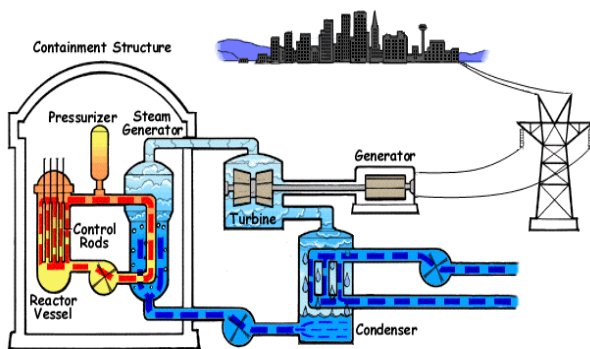


Figure 3.4 Nuclear energy plant
Advantages of Nuclear Energy

- A reliable source of energy due to its long lasting supply.
- Generates large amount of energy or electricity.
- Very little fuel or uranium needed to generate electricity.
- Power is free from pollution.

Disadvantages of Nuclear Energy

- Construction of nuclear stations and reactors is expensive.
- Wastes from power reactors are radioactive hence harmful to the environment.
- Reactors can also be used to produce dangerous weapons to mankind.
- Requires high technological and scientific know-how to install the stations.

Wind Energy

- Windmills generate energy as they are connected to the turbines.
- Wind makes the turbines rotate. In return generators which are connected to the turbines generate electricity as well.

Advantages of Wind Energy

- No air pollution.
- Operational costs are relatively low.

Disadvantages of Wind Energy

- Can only be harnessed in places of strong winds.
- Wind fluctuates with atmospheric changes.
- Large number of turbines is needed.
- Windmills cause visual and noise pollution.

Solar Energy

It is energy derived from the sun rays. Tropical countries have a high potential of generation of solar energy because they experience longer hours of sunshine. Direct production of electricity using sunlight is accomplished through photovoltaic cells or also known as solar cells.

Advantages of Solar Energy:

- Conducive for rural areas where H.E.P or tidal wave energy is not available.
- It is the cheapest form of energy.
- Does not cause pollution.

Disadvantages of Solar Energy

- Frequent energy fluctuations since the stored solar energy lasts for few hours.
- The cost of production is high.
- Lack of technology to produce the equipment for solar energy.

ENERGY AND DEVELOPMENT

Energy Crisis

- Energy crisis is a condition of demand and supply uncertainties and imbalances and the rapid depletion of fossil fuels.
- There is high demand and a low supply of energy.
- Prices tend to increase and people rush for the scarce commodity

Causes of Energy Crisis in the World

- Limited resources being depleted by other countries.
- Improvement in technology results into many machines that consume a lot of energy leading to shortage hence causing a crisis.

- Over exploitation of available energy resources that can fit in the position of oil.
- Prolonged droughts lower H.E.P. production leading to energy crisis.
- Political disagreement e.g. the Arab-Israel War, Gulf war, the current Anti-Government Revolutions in the Arab countries. The producing countries can withhold oil.

Negative impacts of energy crisis

- It leads to an increase in prices of imports and locally manufactured goods.
- Third world countries spend huge sums of money on importation of crude oil.
- Affects balance of trade since earnings from exports will be lower than imports.
- Causes inflation rates.
- Oil crisis lowers the GDP of third world countries since there will be more expenditure than investments.
- It causes recession making an economy unable to create more jobs.
- Causes a rise in the living standards of the people.

Solutions to Energy Crisis.

- Control of the importation of vehicles with heavy engine capacity
- Importing public transport vehicles to encourage more people to use them hence reducing the number of small vehicles on the road.
- Educating people through the media on energy conservation.
- Proper planning of the road network in urban centers to reduce traffic jams and to curb fuel wastage.
- Rationing of power by the distributing company.
- Encouraging people to put off electricity when not in use.
- Ensuring the development of energy saving devices e.g. jikos or mbaulas which use wood or charcoal.
- Reduction of taxes on gas and solar panels to cut down on the use of wood fuel.

UNIT 4 MINERALS AND MINING

Definition of Minerals:

These are inorganic substances made up of the chemical elements and physical properties.

Characteristics of Minerals

- They have chemical properties, for example carbon, iron oxide, potassium and aluminium.
- Minerals are hard.e.g. Diamond is the hardest.
- Crystal shape-crystalline minerals have distinct shapes e.g. quart is 6 sided.
- Variation of colours.
- Differences in degree of transparency.
- Differences in soil texture.
- Tenacity-the ability to withstand breaking, crushing or tearing hence brittle, elastic, ductile or flexible
- Variations in taste-some minerals have salty taste eg. Halite while others are tasteless.
- Attraction to magnets: some minerals are attracted to magnets like magnetite (iron oxide) while others not.

TYPES OF MINERALS

Metallic Minerals

- These may contain iron and are called ferrous or they may not. Examples are silver, iron, copper, aluminium, uranium and gold.

Non-metallic minerals

- Like sulphur, potash and diamond.

Mineral fuels or fossil fuels

- Petroleum, coal, and natural gas.
- They are derived from organic materials.

Rock minerals

- Include granite, limestone, sandstone and marble.
- Used for construction.

MINING

Definition: It is the extraction of valuable minerals from the ground or earth's crust.

Factors influencing the occurrence and exploitation of minerals

Value of the mineral

Minerals of high economic value e.g. uranium, gold and diamond are mined at high cost as they fetch high profits.

Size of the Mineral deposits

1. Large mineral reserves require installation of expensive equipment.

Quality of the ore

- High grade ores yield a large amount of good quality minerals unlike poor ores.

Mining Method

- Open-cast mining is cheaper than shaft mining.
- The method depends on the occurrence of the minerals.

Level of Technology

- Technical skills and modern skills speed up the mining process.

Capital

- Inadequate capital retards mining exploitation.

Transport Cost

- Coal, Petroleum is bulky and costly to transport.

Market

- If the demand for a particular mineral is low, then its deposits may remain unexploited.

Political factors

- Political hostility and wars influence the mining of deposits located at the border of two countries.

Methods of Mining

Surface Mining: Mineral deposits lie at or near the surface of the earth.

Examples of Surface Mining

Open-Cast Mining: It involves stripping or removal of overlying unwanted material e.g. limestone mining, extraction of clay for bricks, excavating coal.

Hill slope Boring: It is used to extract minerals that outcrop or appear on the side of a hill like coal.

Effects of Surface Mining

- Causes land dereliction.
- Voids and holes on the ground may be filled with stagnant water hence encourage the breeding of mosquitoes which cause malaria.
- It results to ugly landscape that causes visual pollution.

Underground mining

- Minerals occur at great depths of the earth crust.

Examples of Underground Mining

Shaft Method

- Vertical shafts and galleries are dug deep in the earth's crust to the mineral deposits.

Drift/Adit Method

- Horizontal or nearly horizontal tunnels(adits/drifts) are used to extract minerals in gently sloping areas e.g. copper mining in Uganda and Zambia.

Solution Method

- A network of pipes are sunk at great depths below the earth's surface to the mineral deposits.
- Superheated water is passed through the pipes to dissolve the minerals.
- High pressure is introduced into the pipes to pull the dissolved minerals to the surface.
- This method is applied when extracting potash, Sulphur and salt.

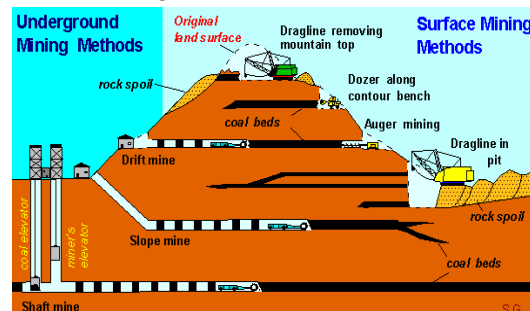
Drilling Method

A drilling bit is used to drill a passage through the earth and rocks.

- Minerals are pushed out due to pressure.
- Oil and natural gas are extracted in this manner.

Figure 4.1 Methods of Mining Effects of underground mining

- Blasting leads to rock falls and collapse



of tunnels which may result to death.

- Mining sites are susceptible to flooding.
- Poisonous gases may be released.
- Miners are exposed to health hazards as they inhale poisonous dust.

Problems facing mining industry in developing countries

- Competition from developed countries.
- Insufficient capital.
- Control of mining operations by foreign countries.
- Some minerals occur in small quantities and are uneconomical to exploit.

- Poor transport networks makes the mineral sites inaccessible.
- Collapse of mines causing death of miners.
- Environmental impact of mining.

Effects of mining to the environment

- Pollution of air, water, soil and noise due to blasting and excavation process.
- Collapse of the ground due to mining activities result in loss of life and property.
- Mines lower the local water table as ground water is pumped out of the mines.
- Land dereliction.
- Disturbs life in the ecosystem.
- Degradation of the soil.
- Blasting triggers landslides.
- Mining pits when filled with water become breeding grounds for mosquitoes that cause malaria.
- Other waterborne diseases may emerge.

Significance of minerals in developing countries

- Minerals are a base for industrial development e.g. limestone deposits promote cement industry.
- Minerals are used to make rails, electric cables and pipes hence promoting infrastructure development.
- Creation of employment opportunities.
- Generation of foreign exchange earnings from minerals export.
- Establishment of urban centres.
- Social amenities like hospitals, schools, housing, water, churches and mosques have been established in mining regions.
- Enhancement of trade as items of trade like jewelry and money (coins) are made from minerals.
- Aluminium is useful in making electronic appliances like electric belts, kitchenware like cooking pans and also parts of automobile.

PETROLEUM

- It is a mixture of various hydrocarbons (chemical composition of hydrogen and carbon)
- It is mineral oil found in the sedimentary rocks called oil reservoir rocks.

Formation of Petroleum

- It is derived from organic materials of animals, plants, fish.
- When the above-mentioned living things die and decompose. Their remains sink to the ocean floor.
- They mix with the sediments brought down by the rivers.
- They accumulate over millions of years.
- Under increasing pressure from the crust and temperature, the organic compounds decompose chemically.
- Clays and mud deposited in a chemically reducing environment where oxygen is lacking matter is buried, it is converted into Hydrocarbon compounds of type related to those found in petroleum.
- Heating at great depth plays an important role in this chemical conversion.
- A second phase involves the maturation and migration of petroleum from the source rock to a reservoir rock.
- Petroleum moves both upwards and laterally/horizontally out of the compacting sediment layers and eventually becomes concentrated in porous rock mass.
- The hydrogen and Carbon compounds change into oil and natural gas.
- Some oil and gas may be trapped in the pores and cracks of rocks.
- Earth movements squeeze the oil and gases out of the original sediments and drive them in porous rocks i.e. sandstone and limestone.
- Well **A** will draw gas, Well **B** will draw oil and Well C will draw water. The cap rock is shale, the reservoir rock sand stone.

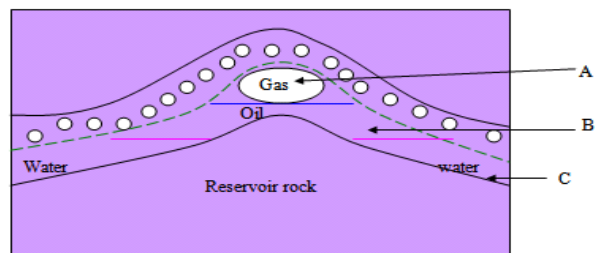
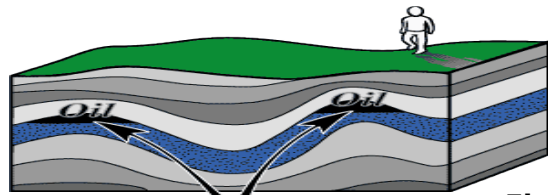


Figure 4.2 Oil reservoir rock
Types of Oil traps

- Oil is located in oil traps.
- These are named after the shapes and characteristics they have.

3. Anticline Trap

- Located along long dome of land.
- Layers, or strata, of rock have been pushed up into an arch.
- Anticline traps hold most of the world's oil



4.3 Anticline Traps **Figure Anticline Traps**

4. Fault Trap

- A fault is a place in the earth's crust where layers of rock slide up against each other.
- These layers can contain permeable and impermeable rock.
- If oil is migrating through the impermeable rock and the layers begin sliding up or down against each other, then the migrating oil can be cut off by an impermeable layer and trapped against the fault.

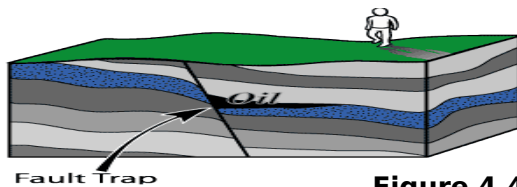
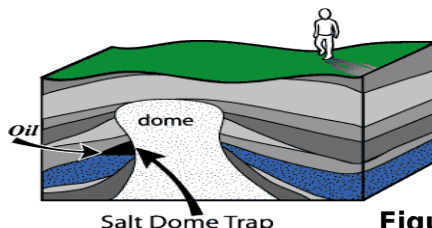


Figure 4.4

Fault Trap

5. Salt Trap

- Masses of salt form underground and are pushed up by pressure inside the earth to form a salt dome.
- The salt dome breaks through and pushes layers of rock aside as it rises to the surface.
- When it crosses layers of permeable rock, it blocks the path of the migrating oil much like a fault would, and causes the oil to accumulate up against the pillar of salt.



4.5 Salt Trap **Figure**

6. Stratigraphic Trap or Pinch-Out Traps.

- It accumulates oil due to changes of rock character rather than faulting or folding of the rock.
- The term "stratigraphy" basically means "the study of the rocks and their variations".
- Sandstones make a good reservoir because of the many pore spaces contained within.
- On the other hand, shale, made up of clay is a poor reservoir, because of its low porosity.
- If oil migrates into the sandstone, it will flow along this rock layer until it hits the low-porosity shale.
- A stratigraphic trap is born.

Oil refining or Hydrocracking process

- Oil is extracted using drilling method.
- A derrick machine is used for the extraction process.
- Soil, muds, rocks are sent out before reaching level of gas which is found on top of oil.

Oil refineries are located

- Near the oil fields (small refineries)
- Near a port
(Cheaper for the importers such as Beira and Durban for Malawi)

- Oil is refined by the use of Fractional Distillation method.
- Oil that comes from the underground is thick and black called crude oil.
- Crude oil is heated in a furnace and is turned into vapour.
- As the vapourised oils enter the fractioning tower, vapour rises, cools and condenses.
- The lighter fractions such as Petrol, Paraffin or Kerosene and Benzene will be evaporated and condensed first at lower temperatures below 38°C.
- Heavier fractions like diesel, lubricants and heavy fuels will condense later between 40°C-430°C.
- At the end of the line is the residue comprising of the heaviest fuel oil as well as wax, Vaseline and asphalt.

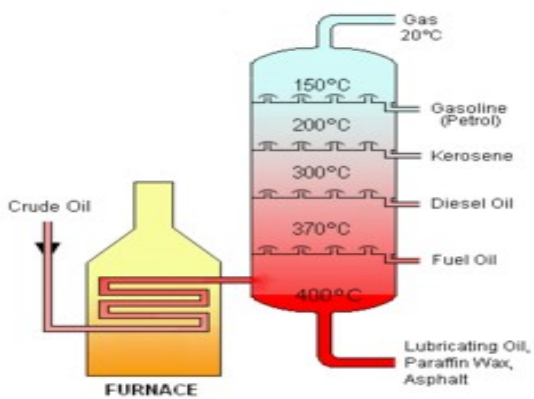


Figure 4.5 Fractional Distillation Column
Oil transportation

It is done through:

Oil Pipelines

- These are constructed from the oil field to either the sea ports or refineries. Pipelines may pass from town to town.
- For example, Baghdad to Damascus or from Saudi Arabia, Iran to Tel Aviv.

Sea Tanker Vessels

- They transport oil from port to port.

Electric Train Tankers

- Commonly found in the developed countries. e.g. U.S.A and South Africa.

Uses of oil

- Used to fuel automobiles in the form of petrol, diesel, oil and aviation fuel.
- A source power for industries.
- For lighting, heating and cooking.
- Used as a lubricant.
- Making candles and polishes.
- Road surfacing and water proofing.
- Manufacturing of petrochemicals. e.g. fertilizers, insecticides, medicine, dyes, paints, printing ink, carbon paper, perfumes, plastics and synthetic textiles.

Oil production in Middle East

- World's major producers of Oil are Saudi Arabia, Iran, Kuwait and United Arab Emirates.
- It is mainly exploited by foreign companies from America, Britain, Canada, Brazil, China, South Korea and Japan.
- Most of the oil comes from the Persian Gulf fields.
- These countries are members of OPEC

- (Organization of Oil Producing and Exporting Countries)
- Algeria, Gabon, Libya, Nigeria, Indonesia, Iran, Iraq, Kuwait, Qatar, Bahrain (located between Qatar Peninsula and Saudi Arabia), Saudi Arabia, United Arab Emirates, Ecuador and Venezuela.

Saudi Arabia

- It is the world's largest producer of oil.
- Oil was first tapped in 1938 at Damman oil field.
- Other productive oilfields are situated at Ghawar, Abagaig, Dar and Safaniya.
- It is piped to the Persian Gulf and refined at Bahrein and Ras Tanura.
- The bulk of the petroleum is exported to Western Europe, Japan and USA.
- She produces 22% of the world's oil.

Iraq

- The first oil field was discovered in 1927.
- The main oil fields are around Kirkuk and Mosul.
- Has new oil fields at the Gulf Coast around Basra, Zubair and Rumilia.
- The oil is piped to the Mediterranean ports of Baniyas, Syria, Tripoli and Lebanon for refining and export.
- She produces 4% of the world's oil.

Iran

- The first oil field was discovered in 1908.
- Oil was first drilled in 1923.
- The Iranian government nationalized the oil industry in 1951.
- Oil fields are located in Bahnegan, Lali, Naft-I-Shah, Maijidi-Sulaiman and Agha Jari.
- Oil is refined at the Persian Guld.
- Iran produces 8.5% of the world's oil.

World main producers of minerals

Coal:

- USA, China, Germany, Russia, Poland and Great Britain.

Oil:

- Saudi Arabia, USA, Russia, Iraq, Iran, Kuwait, Nigeria, Libya, Venezuela, Indonesia, China.

Copper:

- USA, Russia, Chile, Canada, Zambia, Peru, DRC.

Iron Ore:

- Russia, Australia, USA, Brazil, Canada, China, India.

Bauxite:

- Australia, Guinea, Jamaica, Surinam, Guyana, Serbia and Monte Negro(Yugoslavia), Hungary, Greece, France, India.

Diamond:

- Democratic Republic of Congo, South Africa, Botswana, Ghana, Namibia, Sierra Leone, Venezuela.

Uranium:

- USA, Canada, South Africa, France, Niger, Gabon

BAUXITE

- It is the ore or metallic rock from which Aluminium is obtained.
- It is the main ore from which aluminium is obtained.
- It contains hydrate oxide of Aluminium. It also contains impurities of silica and iron.
- Large amounts of bauxite are found in the tropical and subtropical latitudes e.g. Jamaica, Guyana, Surinam, Brazil and USA.
- Bauxite is formed by the decomposition of a variety of rocks rich in alumina, silicates and limona.
- Under heavy rainfall and deep weathering, silica is drained away leaving alumina and iron hydroxide in the tropical reddish regoliths.

Processing of Bauxite Concentration

- It is first crushed.
- Then put into hot caustic soda solution.
- The ore dissolves on being heated.
- The undissolved iron is filtered out.
- Silica and aluminium oxide is left out.
- Aluminium precipitates to produce alumina.
- The alumina is dissolved in molten cryolite and electrolysed to produce aluminium.

Smelting

- In the smelter, Aluminium is separated electronically from the oxygen in the alumina by a hall.

- To produce one tonne of Aluminium by electrolysis needs two tones of alumina and half tonne carbon, 18000kwh of electricity, certain quantities of cryolite and fluorspar and involves sixteen man hours of labour using H.E.P in full.
- Once smelted, the Aluminium is made into inputs cuts of sheets for its lightness.

Properties of Aluminium

- It is malleable(can be made into sheets)
- It has a high melting point of 659°C.
- It is light in weight.
- It is a good heat and electric conductor.
- It is non-corrosive.

Uses of Aluminium

- Being strong and light it is used for aircraft making.
- Aluminium paint.
- Overhead electrical cables.
- Utensils such as kettles and saucepans.
- Aluminium foils for packaging food and other products.
- Highly pure Aluminium is the best material for making headlight reflectors and mirrors and is used in telescopes.

Bauxite in Malawi

- There are about 28,000,000 deposits of bauxite on Mulanje Mountain.
- The mountain is characterized by igneous intrusions.

Problems facing mining of Bauxite

- Our Hydro-Electric Power is inadequate to allow the exploitation of bauxite.
- Transporting of ore is costly from the mountain.
- The mining process will result in the pollution of the environment and air. Wild animals will run away from the place.
- This will lower down the number of tourists visiting Mulanje Mountain.

GOLD IN SOUTH AFRICA**Appearance**

- It is a brilliant/shiny, yellow-reddish mineral.

Location

- The main mines are concentrated in Witwatersland area, Odendaalsburg, Lydenburg and Welkom.

- South Africa is the largest gold producer worldwide.

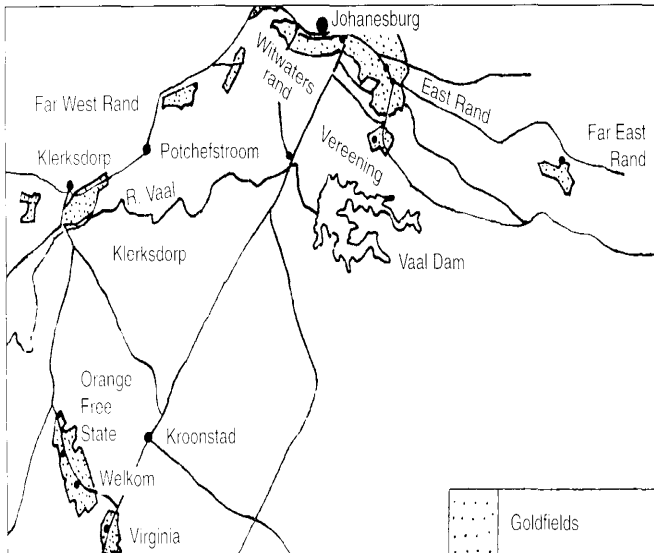


Figure 4.6 Main goldfields of South Africa Occurrence

- Gold occurs in quartz veins (metamorphic rocks) and in reefs.
- The sediments were deposited millions of years ago and metamorphosed, then folded and uplifted.
- The reefs were later exposed through erosion. The rock reef is the one that is mined.
- Gold is found in the alluvial deposits.

Extraction of Gold

- It is extracted using underground mining.
- Vertical shafts and horizontal tunnels are sunk to the gold bearing rock.
- The rock is drilled and blasted.
- The ore is hauled to the surface by the shaft.

Processing of Gold

Crushing

- The ore is ground into powder in crushing mills.

Stirring

- With a solution of cyanide to dissolve finer gold particles.

Mixing

- With Zinc dust to precipitate gold and put in
- Sulphuric tanks to separate it from Uranium.

Melting

- To remove impurities.

Moulding

- Into bars of gold

Characteristics of Gold

- Very shiny.
- Scarce and does not lose its brightness.
- Very ductile, for example 340g of gold can be drawn into a wire 2km long.
- Very malleable, for example 340g of gold can be beaten into a sheet of gold leaf over half a square metre in area.

Uses of Gold

- It is the basis of the world's currencies as a medium of exchange.
- Making jewelry and ornaments.
- For making gold tooth fillings.
- In the chemical industry it is used for making of photographic materials.
- Making gold paints for crockery.

Contribution of Gold to South Africa

- Earns foreign exchange.
- Creates employment opportunities.
- Improved the living standards of over half a million people in South Africa and her neighbouring countries.
- Small amount of Uranium is obtained together with gold.
- Uranium is a source of atomic energy.
- Other secondary industries have been set up e.g. footwear and engineering.
- Stimulated the growth of conurbation such as Witwatersrand.
- Provision of social amenities e.g. schools and hospitals.
- Establishment of a good transport network of roads and railways.

Problems facing Gold mining

- High mining costs due to deepening of mines.
- Depletion of mines as gold is a non-renewable resource.
- High labour costs.
- Insufficient water supply used for gold processing.
- Death of workers due to the collapse of mines as they grow deeper.
- Workers suffer from respiratory problems.
- Low quality gold as mines get deeper.

- Expensive to cool mines which are very deep.

UNIT 5 INDUSTRIES

Definition

- It is an activity or business enterprise that is involved in the productions of goods and services which satisfy human needs.

Manufacturing

- It is the process by which raw materials are processed to better forms of products for consumption.

An industry is an open system because:

- It receives inputs or energy.
- Converts these inputs into outputs.
- Discharges its outputs into the environment.

Classification Of Industries

An industry can be classified under the following criteria

Size

- Small scale industries or light industries e.g. Dakeries
- Large Scale Industries or heavy industries i.e. Motor Vehicle

Types of Products

- Processing Industries.
- Service Industries.

Level of Production

a. Primary or Extracting industries

- They convert natural resources into primary products that are mainly raw materials for other industries eg. Farming, fishing, forestry, mining and quarrying industries.

b. Secondary or Manufacturing industries

- They use output of primary products as raw materials to manufacture finished goods eg. automobile, iron and steel, engineering and metal work, tobacco and brewing industries.

c. Tertiary or Service Industries.

- Provide services to other businesses and final consumers.
- Do not manufacture goods.
- Examples are transport, marketing, education, postal services, banking, tourism, health etc.

Factors influencing the location and development of Industries

Capital: Capital will facilitate the acquisition of premises and salaries for workers.

Proximity or nearness to the industry: Constant supply of raw materials will keep the industry running.

Market availability: Produced goods will be sold to earn some profits.

Availability of Power: In order to run machines H.E.P is needed.

Suitable transport and Communication system: Facilitates constant flow of raw materials to the industry or finished products to the market.

Labour force: Sufficient skills are needed for an improved productivity.

Type of Land: Big land is needed for further expansion.

Water supply: Constant water supply is needed for processing.

Government policy:

- Some policies motivate private ownership.
- It lets market forces to control pricing and wages.
- In the state owned policies the government owns and controls all industries ie. China and Russia.

Major Industrial areas of the world

Western Europe: Has high level of technological advancement in engineering, chemicals textiles and electronics etc.

North America: Has a rich mineral resource.

Japan: Is highly industrialized.

Other areas: South Africa, South Korea, Brazil and Argentina.

Negative impacts of Industries

- Industries lead to urbanization that has introduced western values. The traditional cultures have been eroded.
- Industrialization leads to displacement of people to other settlements.
- Pollution of the air and noise pollution.
- Formation of acid rains.
- Industrialization leads to unemployment as human labour is replaced with machines or robots.

- Food shortage in the country as strong emphasis on industrialization leads to neglect of agriculture.
- High influx of population in urban areas (Rural-Urban migration)

Importance of Industries

- Source of socio-economic development in a country.
- It provides import substitution to a country hence export of products.
- Leads to development of an area.
- Leads to pollution, hence enhances people to find ways of preventing pollution itself.

CEMENT INDUSTRY IN MALAWI

Cement is made from limestone and shale.

Areas where it is mined:

Changalume in South West Zomba.
Balaka.

Types of Cement

- Rapid hardening cement.
- Low Heating cement.
- Sulphate Resisting Cement.
- White Cement.
- Portland Blast Furnance Cement.
- Masonry Cement

Factors influencing the Cement Industry in Blantyre

- Easy access to transportation by railway and roads e.g. Chiradzulu(Njuti) Mwanza, Chikhwawa and Zomba(Changalume)
- Presence of large and easy supply of power.
- Presence of skilled and unskilled labour force.
- Access to advertisement medias e.g. newspaper prints, Malawi Broadcasting Cooperation, Television Malawi etc.
- Market availability (High demand) of cement by Blantyre as a commercial city.

Cement Making Blasting of rocks

- Sedimentary rocks are the recommended rocks for cement making.
- They are quarried by blasting after drilling and exploding.

- Large rocks are loaded into the trucks to the cement plants e.g. Changalume plant or Blantyre Portland Cement

Crushing and Grinding

- The quarried limestone is dumped into **Primary crusher**.
- This smashes the large rocks into pieces.
- The secondary crusher or hammer mills or breaks the rocks into smaller particles about 2cm wide.
- Silica, iron oxide, sand, alumina and chalk are mixed with the crushed rocks to make Portland cement.
- The mixture is ground in the rotating ball into fine particles.
- Water is added during grinding until soupy mixture called slurry is formed.
- Burning (Heating)
- The slurry is fed into a kiln (a huge cylindrical furnance) made of steel and lined with fire bricks.
- A cement kiln rotates about one turn in a minute. It takes about four hours for the materials to travel through the kiln.
- Oil or powdered coal is burned at the lower end.
- This produces a flame that heats the material at more than 100°C.
- The heat changes the materials into a substance called clinker in pieces about the size of marbles.
- **Finisher**; Large fan cools the clinker after leaving the kiln.
- A small amount of gypsum is added to the clinker before grinding.
- The final grinding produces Portland cement that is stored in silos or bagged.

MOTOR VEHICLE INDUSTRY IN USA

Car-making industry is well developed in USA. It requires iron and steel and aluminium as its raw materials.

These are available in :

Youngtown, Pittsburg
Detroit, Cleveland, Buffalo, Gary and Chicago, Sparrow's Point and Bethlehem.

THE THREE MAIN MOTOR VEHICLE INDUSTRY IN USA

General Motors Corporation
Ford Motor Company
Chrysler Motor Company

Factors influencing the growth of Car Industry in Detroit

- Presence of iron and steel industries which provide different car parts.
- Presence of technicians who provide enough labour for the industry.
- Presence of markets provided by USA's large population with a high purchasing power and demand from consumers all over the world.

Availability of hydroelectric power which has led to the growth of the industry.

Government support through provision of loans and carrying out research.

The Great Lakes provide cheap transportation of cars parts and the assembled cars.

Problems associated with Motor Vehicle Industry in USA

- High competitions with other countries like Japan, China, Germany.
- Most countries designs are much more improved and preferred by other countries away from USA.
- There is high exhaustion of raw materials because of over production hence depends on imported raw materials from overseas.
- This results to high production costs.
- Presence of more motor vehicle producing plants has led to shortage of labour force.

FISHING INDUSTRY

Fishing is the exploitation and management of aquatic animals undertaken for both commercial and subsistence purposes. Fish may be caught in the sea or fresh waters in only part of the world. The total weight of fish catch yearly is about 70% of the world's annual production of meat.

Fishing is a major activity and economy in some countries e.g. Finland and Japan.

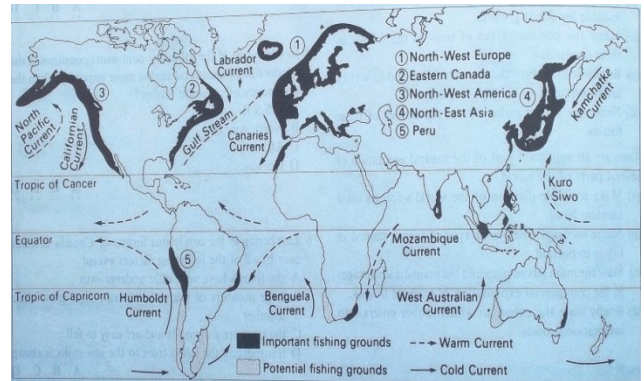


Figure 5.1 Major fishing grounds of the world

Reasons for More Fishing Grounds in the Northern Hemisphere

Nature of Coastline: bays or indented coastlines provide sheltered waters used as habitats for fish.

Cool Climate: Marine life like fish species like salmon, mackerel, cod or herring, planktons thrive best in areas with cool temperatures less than 20°C.

Supply of planktons: Oceans and seas rich in plankton have plenty of fish.

Depth of Water: The water should be of a considerable depth which will allow light to penetrate to the seabed hence encouraging of planktons.

Nature of Ocean currents: The meeting of warm and cold currents encourage the growth of planktons.

Presence of land-derived minerals: Brought in by inflowing rivers nourish the planktons.

Salinity of the water: Highly saline water encourages the growth of planktons.

Labour: Needs for high labour at the sea and the processing industries.

Market availability: availability of a large population with a fish-eating culture and vibrant fish market also affects fishing e.g. Japan, China, Europe and North America.

Capital: Highly mechanized fishing fleets are capital intensive.

Temperate forests: Provide both soft and hardwood for construction of fishing boats barrels and pitch.

Poor development of animal farming: Which can supply protein to feed on large population.

TYPES OF FISH

i) Freshwater fish:

Found in streams, rivers, ponds and paddy fields.

Fished for domestic purposes.

Fish caught include herring, trout, sturgeon, carp and eels.

ii) Salt Water fish:

found in oceans and seas.

Pelagic fish

They live and breed near the surface of the sea or ocean. For example, herring, mackerel, tuna, pilchard and sardine species.

Demersal fish

They live in cool waters at the bottom of shallow seas with depths of about 40 metres.

Found in shoals e.g. cod, sole, halibut and haddock.

Anadromous fish

Live deep in the oceans and seas but come back to freshwater rivers to spawn or lay eggs e.g. the salmon.

Major Fishing Grounds of the World

1. North-East Atlantic e.g. Norwegian fisheries, German, French and British fisheries and North-East Coast of North America
2. North-West Atlantic e.g. around Newfoundland, Britain, France, Spain, and Portugal.
3. North-East Pacific e.g. USA and Canada fishing grounds.
4. North-West Pacific e.g. China, South and North Korea, USSR and Japan fishing grounds.
5. South Africa near Agulhas bank with shallow waters. Fishing ports include Cape town, Port Nolloth, Durban, Saldana bay and Port Elizabeth.
6. Peru: Upwelling waters of the Humbolt current create good conditions for the growth of planktons. Most fish are used for making fertilizers.

Factors favouring fishing in the North-West Atlantic Fishing Grounds

- A vast continental shelf with an abundant supply of planktons.
- The cold Labrador Current meets the warm Gulf Stream (**North Atlantic Drift**) resulting in the growth of planktons.
- Icebergs brought by the cold currents contain minerals for the nourishment of planktons.
- The area is suitable for agriculture and has few minerals.
- Temperate forest provide timber for making fishing vessels, corks for

floating nets and boxes for packaging.

- The cool temperature favours commercial fishing and preservation.
- The region has an indented coastline, with good natural harbours.

METHODS OF FISHING

a. Drifting:

Nets hung vertically in the water.

Pulled by drifters.

Weights are attached on the lower side and floats on the upper side of the net.

Gills become entangled in the mesh of the nets.

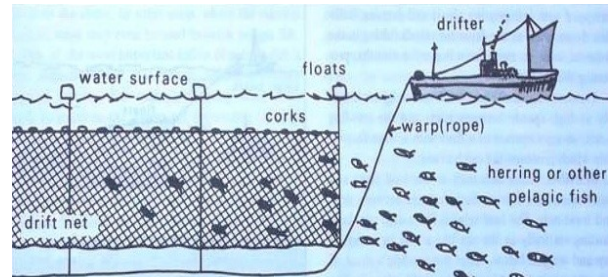


Figure 5.2 Drift Net

b. Trawling

Fish are caught using a trawl net (a large bag-like net which is conical in shape)

The mouth is open and has weights at the bottom and floats at the top.

The net is dragged along the sea bottom by a trawler vessel at 8km/hour.

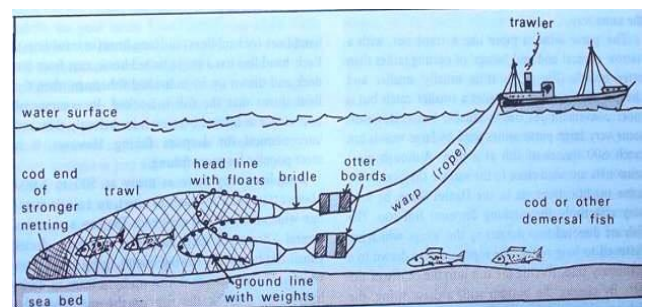


Figure 5.3 Trawl Net

c. Seining

It involves using a seine net. It resembles trawl net.

It is categorized in two:

Purse Seining: It has weights below and corks on top to keep it afloat.

When a shoal of fish is detected, the net encircles it. The net is drawn tight like a purse, catching fish such as sardines inside.

Haul Seining: The net is stretched between two fishing boats.

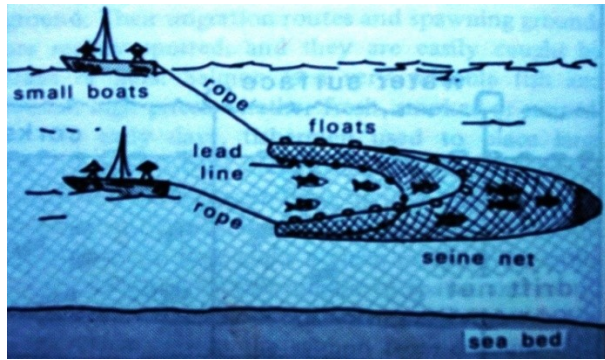


Figure 5.4 Seine Net

Significance of Fishing Industry

- Source of food rich in oils, animal proteins and minerals(iron, iodine, phosphorous, magnesium and calcium) for human growth.
- Creation of employment opportunities in the fishing industry.
- Fishing industry stimulates the growth of other industries like ship building, net making, canning industry and making of fertilizers, glues, lubricants, medicines, cosmetics, soaps and margarine
- Foreign exchange earner if exported.
- Sport fishing promotes tourism and generation of foreign exchange for governments.

Problems and Possible Solutions facing Fishing Industry.

Overfishing and indiscriminate fishing-depletion of fish in coastal areas.

Solution

Strict rules should be imposed on the size of nets and limits of the fishing season.

Restocking of over-fished waters by transferring small fish from areas well populated with new fish species.

Pollution: Sewage, industrial wastes and chemicals and domestic litter in rivers, seas and oceans, affect both the fresh and salt water fisheries.

Solution

Monitoring and controlling of the inflow of such materials.

Offenders must be fined once found.

Inadequate capital: fishing is capital intensive and funds are required to purchase fishing equipments.

Civic education on effects of pollution.

Solution

Fishermen's loan schemes to be introduced.

Lack of adequate market

Many inland communities apart from the coast do not consider fish as an acceptable form of food.

Solution

People should be sensitized on the value of fish.

They should diversify their eating habits.

Lack of advanced fishing technology:

Many developing countries suffer from acute shortage of manpower trained in fishing technology.

Solution

Manpower should be trained on fishing technology.

Transport problems: difficulty in transporting fish from fishing areas to the markets.

Solution:

Road upgrading is needed to ease the distribution of fish.

Lack of preservation facilities: Fish are perishable and need proper preservation.

Solution:

Cold storage facilities for both fresh water and marine fisheries are needed.

Other Resources from the Sea

Salt, prawns and shells, oil, natural gas and metals (tins, diamonds, iron, aragonite, gold, phosphorites, sulphur etc)

Seaweeds used for making of ice cream, malted milk, cheese, chocolate milk, puddings, mayonnaise, salad dressing, jellies are also found in the seas.

FISHING IN MALAWI

Malawi has lakes and other water bodies.

The area covered by these water bodies is 20%

Although Malawi is a landlocked country it produces meat more than Mozambique.

This is because meat in Malawi is short supply.

The Main Fishing Grounds in Malawi

Lake Malawi: South West and South East arms. Nkhotakota, Nkhata Bay, Likoma Islands.

The lake has 225 fish species.

Tilapia fish is the most important one.

Lake Chilwa has 12 fish species.

The other fishing grounds include

Lake Chiuta, Malombe, river Shire, river Lilongwe, Ruw, Elephant Marsh, Vwaza Marsh, Lake Kazuni.

The most important riverine fish is the cat-fish.

Methods of Catching Fish in Malawi

Ring-netting, trawling, long lines, fishing baskets, engine-powered boats and dugout canoes and nylon nets.

Problems facing Fishing Industry in Malawi

- Water hyacinth locally known as namasupuni, makes fishing difficult.
- Over-fishing.
- Lack of cold storage facilities.
- Lack of capital to purchase the fishing equipments.
- Lack of innovation in Fishing industry.
- **Attempts made to curb the problems facing Fishing Industry**
- Removal of water hyacinth from the fishing grounds.
- Fishing is closed during breeding season.
- Fishermen are encouraged to use large gill nets.
- Beach Village Committees have been established to monitor and sensitize the community on problems associated with fishing.

UNIT 6 SETTLEMENT AND URBANISATION

A settlement is a place where people live and have built homes.

It is a created unit of space where group of people live together either temporarily or permanently.

In this definition there are four elements involved in Settlements

- . People
- . What the people do
- . Buildings and their functions
- . Transport linkages

Types of Settlements

- a. Rural Settlement:
People are engaged in primary agricultural production.
- b. Urban Settlement
People are engaged in secondary and tertiary activities i.e. trade and industry.

Settlement is described using site and situation. Site refers to the point or actual place where the town is located influenced by water supply, relief and soils.

Situation describes the location of a settlement in relation to its surroundings features.

Factors influencing Settlements

- Availability of Water supply e.g. rivers, lakes and springs for domestic use, industrial, irrigation, farming etc.
- Relief features: Mountain peaks and steep rugged slopes are sparsely populated while gently sloping lands and low lands attract settlements.
- Diseases and Pests: the infested areas discourage human settlement.
- Political factors: People tend to settle close to hills, mountains and islands to avoid attacks from other communities. Introduction of Ujamaa policy in Tanzania and Kibbutzim in Israel influenced human settlement.

Religious factor: People tend to settle near worshipping centres.

Soil conditions: infertile soils are thinly populated than fertile soils.

SETTLEMENT PATTERNS

1. Nucleated/Clustered settlement pattern

Houses are closely packed to one another, compact and concentrated on the land are to form a cluster.

Farmers own very small pieces of land.

Population density is high.

i.e. in villages, around oases or irrigation schemes

2. Dispersed or Scattered settlement pattern

Few family residences are scattered in isolated places. Farmers own very big pieces of land.

Population density is low.

3. Linear settlement pattern

Homesteads are built along lines of communication e.g. road, railway or transport facilities such as river banks.

Factors influencing Patterns of Settlement

Topography: valleys encourage linear settlement, islands result to nucleated settlement.

Climate: low and unreliable rainfall, low temperatures lead to disperse settlement.

Lines of Communication and transport:

Roads, railways and rivers form linear settlement.

Soils: Poor infertile soils give rise to disperse settlement.

Pests and Diseases: Areas prone to pests and diseases have dispersed settlements.

Presence of minerals: areas with minerals attract nuclear settlements.

Functions of Rural Settlements

- Engaged in agricultural activities.
- Housing the rural population
- Having minor shopping centres with one or two shops.
- Provision of fishing activities.
- Provision of religious activities, schools, recreation and other minor social services
- Provision of local industries like art and craft, sculpture, weaving and pottery.

Functions of Urban Settlements

- Towns and cities form the chief trading centres.
- Administration or public control i.e. districts, states or cities.
- Defence of the country is centralized in towns.
- Collection centres for raw materials to be processed or refined.
- Cultural centres: Such as provision of education arts, galleries or religious buildings e.g. Museum in Karonga and Blantyre.
- Production centres: Manufacturing industries are based in cities i.e. Kanengo Industrial centre and Ndirande Industrial centre.

URBANISATION

It is the process whereby an increasing proportion of the total population becomes concentrated in towns.

Important Terms to note under United Nations Definitions

Town: a densely populated area with many buildings but smaller than a city.

It has above twenty thousand people but less than a hundred thousand.

City: an extensive build-up area where large numbers of people live and work. It has high population density. It means Regional, national administration of activities.

International airports and sea ports are available.

Conurbation: A large urban area created when neighboring towns aggregate into one large continuous towns

Metropolis: A very large city often the capital or chief centre of a country, state or region. E.g. Mumbai, New York, Tokyo,

Shanghai, Los Angeles, Seoul, Mexico city and Sao Paulo.

Megalopolis: An extremely large, spreading thickly populated area comprising many cities joined together to form a continuous urban region e.g.

Factors responsible for Urbanisation

- Presence of employment opportunities.
- Availability of better housing facilities and accommodation.
- Growing population results in the struggle for land in rural areas. Hence people migrate to towns and cities.
- Cultural factors: Allurement of city life, bright lights, education, stadiums, recreation halls, good pubs, and community grounds.

Factors for the growth of Blantyre city

- Founded in 1876 as a base for missionary expansion.
- It was a centre of trade and tea planters in Mulanje and Thyolo.
- It is a commercial and industrial centre of Malawi.

Lilongwe City

- Declared a capital city in 1975
- It has rich agricultural land.
- The growth of the city is due to:
- Extension of residential areas due to immigration of people from other countries as well as from rural areas.
- Extension of trade facilities such as market stores and vending.
- Extension and introduction of factories.
- Settlement of some refugees in some areas.
- Transfer of capital city from Zomba to Lilongwe.

Mzuzu City

- It is the largest commercial and health centre in Northern region.
- The growth of the city is due to:
- The migration of traders from Tanzania, refugees from Rwanda and Burundi.
- Growth of industries i.e. Timber production.
- Growth of administrative offices and residential areas.

URBAN LAND USE

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Urban centres are zoned on the basis of land use and functions into:

Central Business District (CBD)

- Centralized in the urban centre.
- Easily accessible.
- Contains offices of both local and international organizations, commercial and financial premises.
- Absence of residential activities.
- Absence of manufacturing activities.
- High land values

Transitional Zone:

- Land value is moderate.
- Contains small scale industries like jua kali industries, hotels, and shopping malls.

Low income residential area Zone:

- Poor living conditions characterized by slums.
- Low class and middle class residents occupy such residents.
- Slums are common.
- High Income Residential Zone:
- Land has high value.
- High class and some middle class people occupy this land.

Industrial zone: (Suburb Zone)

- Most heavy and light manufacturing and processing industries are found in this zone
- Warehouses and company stores are located in this zone.
- Land value is low.

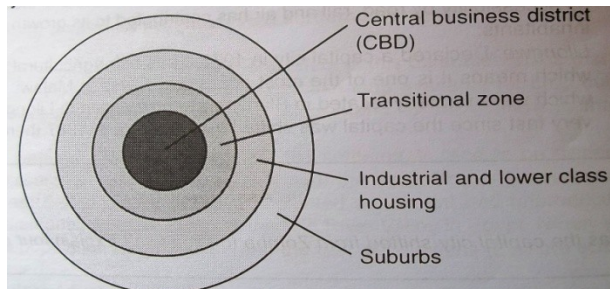


Figure 6.1 Urban Concentric Zones

Positive Effects of Urbanisation

- Enhances social cohesiveness through interaction of various ethnic groups.
- Eases provision of social and infrastructural facilities.
- Creates employment opportunities in upcoming towns.
- Formation of large market centres.

- It encourages industrial development.
- Creation of residential areas.
- Tourist attraction which earns foreign exchange for the country.

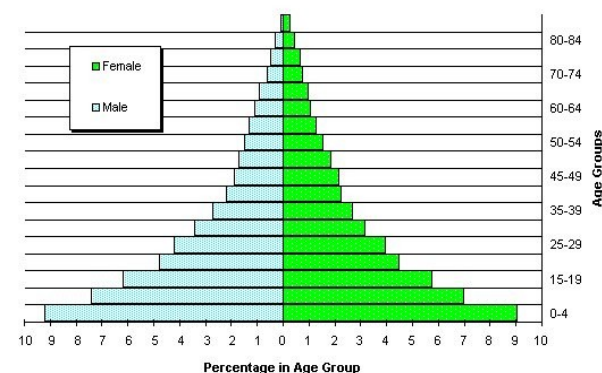
Negative Effects of Urbanisation

- Imbalance between population growth and industrial development leaves people unemployed.
- Inadequate housing facilities due to over-population which leads to development of slums and shanties.
- Urban centres suffer from traffic related problems like jams and inadequate parking in CBD.
- Air and land pollution.
- Urban sprawl: Expansion of towns reduces land for agriculture.
- Overpopulation results in the overexploitation of social, educational, health facilities and water supply.
- High unemployment rates, result in high crime rates.

Solutions to Urban Problems

- Encourage the growth of informal sector of the economy to ensure self-employment in rural areas.
- Repatriation to rural areas of urbanities through decentralization of

Population Pyramid for a Developing country



industries and establishment of multi-purpose schemes.

- The government can construct low cost houses to cater for the low income population.
- Instead of using private transport, public transport or construction of underground trains will reduce traffic jams.

- Social amenities like schools and hospitals need to be increased and improved.
- Building of skyscrapers to create space and reduce congestion of buildings in a limited space.
- The Green belt policy restricts new buildings in an area around the main towns in an attempt to restrict the rapid expansion of urban sprawl.

UNIT 7 WORLD HUMAN POPULATION

Human Population: It is the total number of people living in a given geographical area at a specific time.

Population Density: It is the average number of people living in a unit area.

Population Distribution: The manner in which people living in an area are spread out across the land.

Population Change: It is the decrease or increase of population in an area due to migration of people.

Population explosion: is a sudden large increase of population within a short period of time due to different circumstances.

Population Structure: It refers to the composition of the population in a given area at a particular time, in terms of age, sex and number.

- The population structure of a given population is represented by a population pyramid.
- A high population has a high proportion of young people. A low population growth rate is mainly composed of adults or old people.
- A youthful population has a wider base than of ageing one.

Figure 7.1 Population pyramid of a developing country

Analysis of the Population Pyramid

It groups the total population into cohorts of five-year age group, with the youngest age group at the base and oldest age group at the top.

The length of the groups represent the number of people of a particular age group. Women are shown on the right side of the pyramid while men to the left.

X-axis shows the population in percentage or numbers in millions.

Y-axis shows the ages.

The higher the growth rate, the broader the base of the pyramid will be and the vice versa.

Increased death rates will make the top of the pyramid to be narrower.

Most of the developing countries have a population structure like that of Malawi.

The reasons are:

- Low education levels of women.
- Low employment opportunities for women as a result they tend to specialize in child-bearing.
- High mortality rates forces couples to continue bearing children in the hope that others may survive.

Population Pyramid for a Developed country

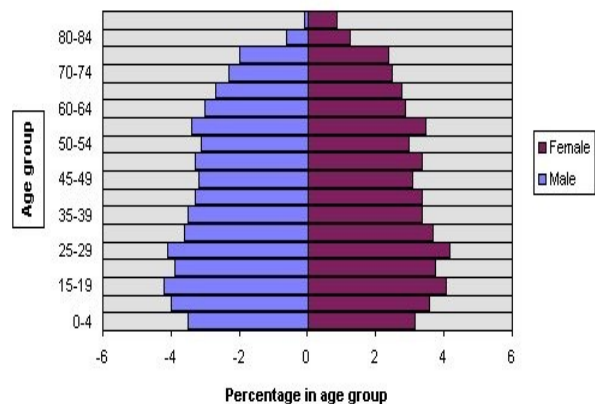


Figure 7.2 Population pyramid for a developed country

- Lack of family planning services.
- Lack of old age and other social security systems force couples to have more children as security in their old age.
- Children are source of labour.

Infant Mortality rate: This refers to the number of deaths among babies below the age of one year, per a thousand people of the population.

Life expectancy: It is the average number of years that a new born child is expected to live.

Birth rate: Refers to the number of live births per year per a thousand people of the population.

Death rate: The number of deaths per year per a thousand people of a population.

Life expectancy: It is the average age of which people die in an area or country.

Dependency ratio: Is the ratio of unresourceful people (too young or too old to work) to resourceful people who support them.

Dependency ratio = Non-economically active population / Economically active population

Developing countries have a high dependency ratio compared to the developed countries.

Developed countries have high life expectancy than developing countries.

Causes of Rapid Population Growth

- High fertility rate: the ability of a woman to give birth to live children
- Desire for a large family sizes
- Better nutrition and increase in food supply.
- High living standards.
- Expanded access to health services.
- Traditional beliefs e.g. children are regarded as a sign of virility or wealth.
- Or the belief that male children are superior to female children.
- Religious beliefs e.g. the Catholics and Muslims do not advocate for the use of artificial family planning and control methods.
- Polygamous practices.
- Migration of people due to political instability or economic and social constraints.

Positive Consequences of Rapid Population Growth

- A large population constitutes a large manpower.
- It necessitates innovations in an attempt to cater for the large population.
- Agricultural and industrial developments are stimulated.
- It facilitates urbanization and modernization.

Negative Consequences of Rapid Population Growth

- High dependency ratio which lowers the income per capital.
- A heavy financial burden results to poor living standards.
- Over-utilisation of resources.

- Rampant unemployment.
- Leads to stunted economic growth.
- Leads to poor housing like slums.
- Exploitation of medical and educational facilities.

STRATEGIES OF CONTROLLING POPULATION GROWTH

- Establishment of family planning methods.
- Imposing financial penalties for having children beyond a set limit.
- Establishing minimum age child labour laws.
- Eliminating maternity leaves and benefits.
- Persuading people to have smaller families through sensitization via mass communication media i.e. radios, TV and newspapers.

POPULATION AND DEVELOPMENT

Development is a process which involves holistic changes in structures, attitudes and institutions.

In development there is an acceleration of economic growth, reduction of inequality and eradication of poverty.

WORLD POPULATION POLICIES

India:

- Has family planning campaigns.
- Contraceptives are used in families.
- Gifts and money are given to the people who volunteer to be sterilized.

Great Britain:

- Family planning campaigns.
- Limiting marriageable age for girls.
- Provision of old age social securities.

Egypt:

- Family planning schemes.

China:

- Widespread and active family planning campaigns.
- Encouraging late marriages.
- Legally 2 to 3 children are allowed per couple.
- Contraception, sterilization and abortion are used in rural China.

Nigeria:

- Government-backed family planning clinics which provide contraceptives and encourage smaller families.

Kenya:

- Strengthening family planning clinics.

- Mass media support for family planning inter-personal communication through local campaigns to publicize opening of new services delivery points and dispel misconceptions on family planning.
- Kenya Catholic Secretariat (KCS). The council promotes better understanding of the Christian marriage, the dignity of married persons, the natural methods of family planning and the meaning and protection of human life.

Malawi

- Advocacy of late marriages.
- Discouraging child labour.
- Encouraging education for the girl-child.
- Family planning methods through Banja Lamtsogolo, Non-Governmental Organisations (NGOs) and Print and Electronic Media.

UNIT 8 STATISTICAL METHODS IN GEOGRAPHY

Statistics: can be defined as a collection of numerical facts summarizing information that has been collected from several observations.

Uses of Statistics

- Statistical data is used in Government planning.
- Statistical data is used to show and compare the relationship between rainfall and productivity for instance.
- Statistical data is used in predictions.

Methods of Collecting Data

1. Observations:

- This is a method of data collection whereby one goes to the field and observes using the eyes the geographical phenomena.

2. Questionnaire:

- A questionnaire is a written document comprising a list of questions used to instruct a listener or reader to answer one or more questions.

- The person who answers the questions is called the respondent.

Types of Questionnaires:

- Closed questionnaire
- And Open questionnaire.

3. Interviews:

- This is the collecting of information by asking questions directly and recording the answers given.
- It is a face-to-face interview.

4. Measurements:

- It is the collecting of data by use of measuring instruments such as tape measures, thermometers, rain gauges and barometres.

5. Experiment:

- The data can be collected by use of experiments, for example in soil or rocks.
- One can collect the data on the sizes of particles by experiments in a laboratory or by carrying samples and analyzing them in a class.

Analysis of Data

Data can be organized and analyzed through the following ways:

1. By calculation for example; measures of central tendency, the mean, mode, median, percentage and range.
2. Discussion of data collected from the field.
3. By classifying the data into different groups.
4. By groups reporting their findings through their group leaders.

Methods of Data Presentation

Data presentation gives the data more meaning.

These are:

1. Drawing graphs like bar graphs, line graphs, and polygraphs.
2. Drawing of pie charts and age-sex pyramids.
3. Drawing of maps such as density maps and dot maps.
4. Drawing of flow diagrams.
5. Writing of reports.
6. Drawing of the photographs taken from the field and samples.

Statistical Presentation

Data can be analysed and be presented for easy understanding and interpretation. Data can be analysed by: (i) Simple Line Graphs (ii) Simple Bar graphs (iii) Polygraph(combined bar and line graph) (iv) Pie Charts

Measures of Dispersion

Range: It is got by finding the difference between the lowest and highest observations. It tells one how the values in a set of data are scattered around the mean.

Table 2.1 Example quantities of Soya Beans export in the year 1999 to 2002

Year	1999	2000	2001	2002
Tea	71,581	86,982	63,608	49,479

The range is the highest value which is 86,982 subtracted the lowest value which is 49,479. In this case the range is: $86,982 - 49,479 = 37,503$

Y-axis

Dependent variable-Temperature

X-axis

Independent variable-months of the year

Figure 8.1 Temperature graph

1. **Simple Line Graph:** It is the most common method used to represent statistical data. It consists of a series of straight lines which represent the

	J	F	M	A	M	J	J	A	S	O	N	D
Rainfall (mm)	65	85	150	250	225	125	75	75	75	112	125	125

values. Values are plotted and later joined with a series of straight lines.

Steps to Follow:

- Draw the x and y axis on graph paper.
- Choose a suitable scale for the vertical axis and horizontal axis. In this case the scale is got by looking at the lowest export which is 45,618 and the highest export is 103,994. Plot the values for each year using very small dots starting with the year 1998 and end with the year 2002.
- Join the dots with straight lines using a ruler as shown in the graph below.
- Label the vertical axis and the horizontal axis.

- Complete the graph with a title as shown below.

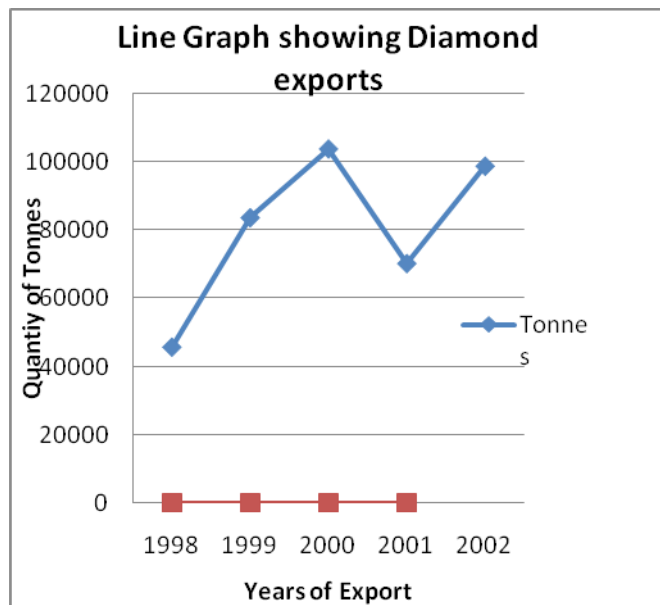
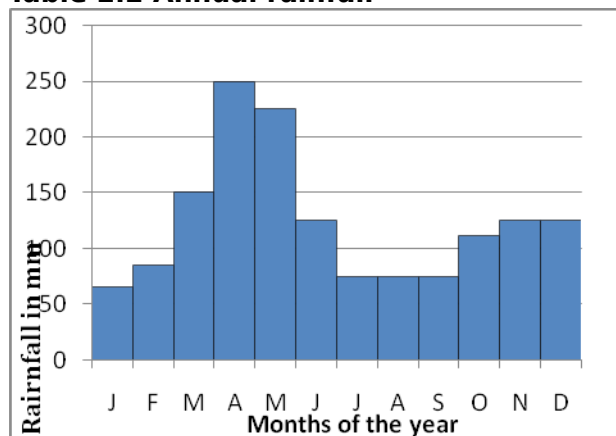


Figure 8.2 Line graph

2. **Simple Bar Graphs:** Consists of bars drawn proportional to the values. The bars are drawn either vertically or horizontally. Bar graphs can be drawn to show exports, imports, production of crops, volume of trade, production of minerals and annual rainfall.

A Bar Graph showing rainfall of an Equatorial Climate

Table 2.2 Annual rainfall



Vertical Scale: 1cm rep: 50mm
Horizontal Scale: 1cm rep: 1 month

Figure 8.3 Rainfall graph

Steps to follow:

- Choose suitable horizontal and vertical scales. The vertical scale is reached by looking at the highest rainfall which is 250mm and the lowest rainfall which is 65mm. Therefore the vertical scale is 1 cm represents 50mm. Decide on the horizontal scale. In this case it is 1cm represents 1 month.
- Bars showing rainfall should touch each other.
- Draw the vertical and horizontal axis.
- Draw the outlines of all bars as indicated above.
- Complete the graph with a title and scale.
- Label the vertical axis and the horizontal axis and shade the bars.

Pie Charts (Divided Circles)

A pie chart is a circle drawn and divided into sectors representing a given proportion of the data. Each sector is a portion of the part of the whole. It can be expressed as percentage of the whole. The raw data can be converted to degrees.

Table 2.3 Areas covered by some of the National Parks in Malawi

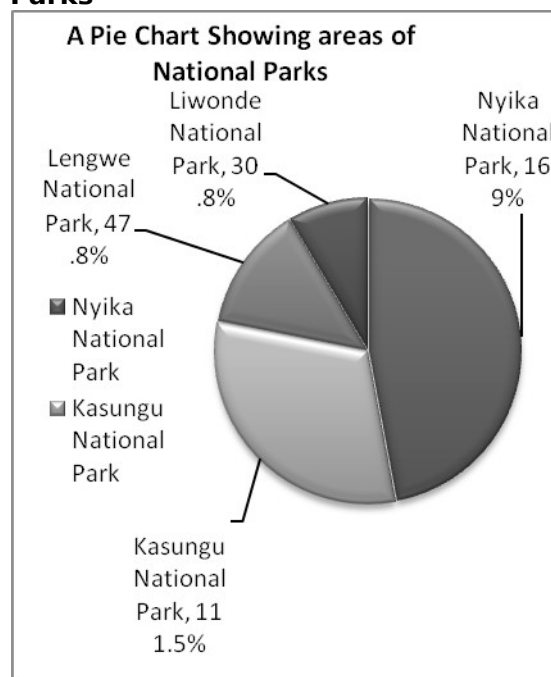
Name of National Park	Area Covered(km ²)
Nyika National Park	3200km ²
Kasungu National Park	2100km ²
Lengwe National Park	900km ²
Liwonde National Park	580km ²
Total area	6780km²

Steps to draw a Pie Chart

- Get the total area of National parks in Malawi in this case**
- Convert each of the components into degrees. (Divide each of the components by the total and multiply by 360 as shown below)
- Nyika National Park
- $3200 \div 6780 \times 360^\circ = 169.9^\circ$
- Kasungu National Park
- $2100 \div 6780 \times 360^\circ = 111.5^\circ$
- Lengwe National Park
- $900 \div 6780 \times 360^\circ = 47.8^\circ$

- Liwonde National Park
- $580 \div 6780 \times 360^\circ = 30.8^\circ$
- Draw a reasonable circle on a plain paper. Use a pair of compasses to draw the circle.
- From the centre of the circle, measure the angles which have been calculated and draw each of the sectors as shown below.
- Always start with the lowest value. In this case start with 30.8° .

Figure 8.4 Pie Chart of National Parks



UNIT 9 THE ENVIRONMENT

- It is defined as the sum total of the conditions within which non-living and living things exist.
- Abiotic things** are non-living things while **biotic things** are living things.
- Environmental management:** A process of enhancing the relationship between the environment and human beings to improve the quality of both.
- Environmental Conservation:** The wise use, without wastage, of our natural environment and resources.

Objectives of Environmental Management

- To promote agricultural production.
- To enhance scenery and habitats.
- To protect wildlife by setting up national parks and game reserves.
- To check and control desertification.
- To protect water resources.
- To protect and conserve the atmosphere.
- To raise the standards of living of human beings.
- To encourage proper utilization of resources while ensuring their availability for the future generations.

Human Activities that endanger the Environment

- Poor agricultural practices like overstocking of animals leading to overgrazing, shifting cultivation (the slash and burn method), making ridges along slopes etc.
- Careless cutting down of trees which encourage soil erosion at a larger scale.
- Overuse and misuse of insecticides, herbicides, and fertilizers.
- Pollution and poor waste disposal.
- Disruption of food chain.

Forestry

A group of trees growing together and covering a large tract of land. Trees are grown for commercial value. Forests can be natural or planted.

Importance of Forests and Forests products to Malawi

Industrial use: Pulpwood is used for production of paper, gums and resins for use in the chemical industry.

Local and domestic consumption: Forests provide fuel wood and charcoal for cooking, house construction etc.

Protection of Catchment areas: Trees intercept and retain moisture on their leaves or absorb it into their roots and stems. Trees reduce soil erosion by acting as windbreaks and shelter belts.

Wildlife conservation: Forests are a home to many wild animals, making excellent parks and promote tourism.

Balance the amount of gases in the atmosphere: Vegetation absorbs carbon dioxide and releases oxygen in turn.

Influence on Climate: Trees have a great influence on climate through the process of transpiration that releases water vapour into the atmosphere that fall as rain at a later stage.

Forests promote **educational and research** visits.

Problems facing Forestry in Malawi

- Most of the forests have intermixed species, most of which are of no commercial value.
- The cost of production is very high.
- Lack of capital to maximize exploitation of these forests.
- Lack of machinery needed to cut logs and hardwoods.
- Forest fires started by human beings destroy thousands of hectares of forests. This hinders forest regeneration for example, Chikangawa forests.
- Increased demand for fuel wood, land for settlement, agriculture depletes forests.
- Wood poaching and charcoal burning depletes forests.
- Endemic corruption in the forestry department leads to heavy losses of forests.
- Lack of emphasis on the importance of trees in education programmes and in the public awareness campaigns.

Forest Management and Conservation in Malawi

- Afforestation: It involves the replacement of every tree cut by a new tree.
- Forests must be protected from pests and diseases to reduce wastage at industrial plants.
- Agroforestry must be encouraged. This involves close association of trees or shrubs with crops, animals or pasture.
- Preservation of natural forests including establishment of National Parks.
- Providing alternative fuels such as solar and wind energy instead of fuel wood.
- Involvement of local communities in forest conservation. This enhances sense of ownership and responsibility of forests.
- Educational and awareness promotion campaign on the need for forest conservation and proper management.
- Training in Forestry Conservation and Management.
- Creation of Forest Conservation Trusts by local communities and other

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interested groups to improve forest management in Malawi.

Desertification

It is the encroachment of desert-like conditions onto marginal and more productive regions. It is a process that creates desert conditions by downgrading the land surface. It is a steady process that turns good and fertile land into a barren one.

Causes of Desertification

The underlying cause of desertification is human interference with nature.

1. Soil degradation leads to flooding of an area.
2. Cutting trees without replacement.
3. Poor agricultural activities like shifting cultivation, overstocking, excessive irrigation, ploughing down the slope and the excessive use of fertilizers.
4. A great need for more land for agriculture and settlement due to population explosion.
5. Global warming due to air pollution. The CFCs depletes the ozone layer leading to global warming.

Characteristics of Hot Deserts

- a) Some lie on the rain shadow of mountains.
- b) Most of them lie along coasts washed by cold currents where dry onshore winds blow, picking up moisture from the land.
- c) Hot deserts lie in the trade wind belts where the winds blow towards the equator. These winds take up moisture from an area.
- d) Most of them lie on the western side of the continents where we have cold current occurring.

Effects of Desertification

1. Soil degradation due to persistent aridity.
2. Water shortages makes people and animals move in search for water.
3. Strong winds and sand storms bury roads and human settlements.
4. Uncontrolled emigration of people in search for food and shelter.
5. Food shortages created by crop failure.

Suggested Solutions to control Desertification

- (a) Application of irrigation method in infertile desert lands.
- (b) Afforestation and re-afforestation to keep the desert away from productive land and stop advancing aridity or dryness.
- (c) Introduction of drought resistant crops to alleviate poverty and hunger in marginal lands.
- (d) Education awareness or civic education of the masses on the dangers of forest depletion and desertification.
- (e) Provision of alternative sources of energy like solar, wind, geothermal or nuclear energy.
- (f) Controlling rapid population growth that may put more pressure on forests and land resources.
- (g) Controlling the industrial emissions or fumes into the atmosphere that increase global atmospheric temperatures.

POLLUTION

It is unfavourable alteration and contamination of the natural conditions of our environment.

Classes of Pollution

1. Air pollution
2. Water Pollution
3. Land Pollution
4. Noise Pollution

Air Pollution: It is caused by the emission of harmful gases into the atmospheric air e.g. sulphur dioxide, carbon dioxide, smoke etc.

Causes of air pollution

- Sprays, farm chemicals and other cosmetic products.
- Burst sewages.
- Automobile exhaust fumes.
- Rotting garbage and domestic wastes.
- Smoke from burning garbage and rubber wastes.
- Volcanic eruptions(gases and dust particles)
- Problems caused by air pollution
- Reduction in soil moisture.
- Acid rains destroy vegetation, crops and corrode buildings
- Causes gum inflammation, internal bleeding , pneumonia and lung cancer.
- Depletion of the ozone layer hence rising the temperatures.

Controlling Air Pollution

- Carrying out campaigns and creating awareness on the dangers of air pollution.
- Installing devices in factories to control the level of air pollution.
- Use of alternative means of transport e.g. using solar powered cars and not fossil fuel powered cars.
- Installing filters in vehicle exhaust pipes to reduce the degree of air pollution by exhaust fumes.
- Legislation: Thus coming up with strict regulations and rules where anyone causing air pollution is heavily punished.

Water Pollution

It is the contamination of water sources and water bodies with toxic soluble chemicals, industrial wastes, dust and salts, sewage and garbage.

Problems caused by Water Pollution

- Spread of epidemics like cholera, typhoid and diarrhea.
- Death of aquatic organisms (both plants and animals).
- Reduction in agricultural production due to polluted water.
- Death of micro-organisms such as nitrogen fixing bacteria due to polluted water.
- Polluted water with sediment loads interferes with irrigation.
- Water contaminated with salts increases alkalinity of the soils.
- Water pollution in form of oil leaks causes massive deaths of marine organisms.
- Water pollution from the discharge of radio-active materials from nuclear plants.
- Water polluted with heavy metals such as mercury and lead cause diseases such as Minamata disease and madness.

Ways of Controlling Water Pollution

- Educating and creating awareness on the dangers of water pollution.
- Avoid throwing human, animal and other solid wastes into water bodies.

- Treating sewerage and industrial effluents before discharging them into water bodies.
- Use of appropriate agricultural practices e.g. preventing run-off of fertilizers and biocides into water bodies.
- Controlling soil erosion.

Land Pollution

This is the alteration of the natural state of occurrence of the land or soil.

Causes of Land Pollution

- Excessive use of chemical fertilizers, insecticides, herbicides and fungicides.
- Careless dumping of urban and industrial solid wastes.
- Extreme cases of soil erosion due to poor agricultural practices.

Problems caused by Land Pollution

- Reduction in agricultural productivity due to death of plants or crops.
- Diseases in human beings and animals.
- It causes land dereliction (non-biodegradable solid wastes make the landscape look ugly hence destroying the aesthetic appeal of the environment).

Measures for Combating Land Pollution

- Wise use of chemical fertilizers, pesticides, insecticides and herbicides.
- Controlling soil erosion.
- Practicing proper land use and crop management practices.
- Recycling of solid wastes.
- Open fire burning of solid wastes.
- Imposing a ban on the use of inorganic materials like plastic paper bags and containers.
- Burying of the wastes through mechanical or open window composting methods to produce useful manures.

Climate Change

Is defined as a process by which a new climate is established in a place. It refers to the slow variations of climatic characteristics over time at a given place.

Causes of Climate Change

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1. **Orbital position of the earth:** The earth during the year is closest to the sun, a position known as perihelion (147 million km^s) on 3rd January. The amount of solar radiation received into the earth's atmosphere is greatest. When the earth is farthest from the sun, the position is known as aphelion, it receives the lowest amount of solar radiation. It happens on 4th July.
2. **Amount of Carbon dioxide in the air:** A cloud of carbon dioxide in the air raises the global temperatures. It absorbs and holds heat in the atmosphere. This results to the warming up of the atmospheric air.
3. **Volcanic Eruptions:** Large volumes of ash, dust and gases released during volcanic eruptions has an influence on the atmospheric temperature. Sulphur dioxide lowers the atmospheric temperatures by reflecting back the sun's rays, preventing them from reaching the earth. The accumulation of Carbon dioxide and other chlorofluorocarbons contribute to global warming. These gases allow sunlight to reach the earth and heat it. Once heated, the earth loses the heat in long waves, which are readily absorbed by these gases. CFCs (Chlorofluorocarbons) damage the ozone layer, allowing the harmful ultraviolet rays of the sun to reach the earth. These rays increase the earth's atmospheric temperatures and are harmful to human and animal life on the earth.

Consequences of Climate Change

- Increase evaporation of oceans and sea water, hence heavy rainfall. Other places would become dry due to longer drought periods.
- Extensive melting of glaciers or icebergs would result to a rise in sea level.
- A rise in temperatures would increase the prevalence of agricultural pests hence the prevalence of food shortages.
- A drier climate would lead to a shortage of water resources such as rivers and lakes.

- Climate change would lead to extinction of some animals seeking for a better environment.
- Higher levels of ultraviolet rays damage the phytoplanktons on which the fish feed.
- The ultraviolet rays cause skin cancer, accelerate ageing and wrinkling of the skin and also reduces the body's immunity.
- Increase in diseases such as malaria as the parasite develops faster in higher temperatures.
- High temperatures melt glaciers of Kilimanjaro mountains.
- Coral reefs are damaged making tourism industry be affected.

UNIT 10 TOURISM IN AFRICA

Tourism: It is defined as the visiting of places of interest for recreational purposes.

Types of Tourism

Domestic Tourism: Involves the local people visiting tourist attractions that are within their own country.

Ecotourism: It involves the traveling to destinations where the fauna, flora and cultural heritage are the primary attractions.

Importance of Ecotourism

- It promotes environmental conservation and sustains the ecology.
- It has discouraged poaching
- It has equipped local people with education and skills.
- Offers employment opportunities to the local people hence increasing incomes and alleviating poverty.
- Ecotourism focuses on local culture and wilderness adventure.
- International tourism: It is the traveling of people to places outside the country of residence for leisure to see wildlife in the national parks and game reserves.

Factors that attract tourism in Africa

1. **Wildlife:** It is the main source of income in Africa. Examples of common animals are lions, elephants, rhinos, leopards and buffaloes.
2. **Beautiful scenery:** Spectacular landscape that influences tourism e.g. the Great Rift Valley of East

Africa, the snow-capped volcanic mountains, hot springs and geysers. Beautiful sandy and coral beaches, mangrove trees and swamps attract tourists.

3. Climate:
The warm sunny climate of Africa favours tourism as the tourists come from Europe when it is winter in their countries.
4. Historical sites:
Africa has many historic and pre-historic and archaeological sites that attract tourists.
5. Infrastructure:
The high-class international hotels provide accommodation for tourists.

Positive impacts of tourism to Malawi

1. Creation of employment opportunities
For tour guides, and other workers in hotels, lodges and camp sites.
2. Source of foreign exchange
Tourists pay for the services using foreign currency which is essential for international trade.
3. Source of revenue for the government
through entry charges
To the national parks and game reserves etc.
3. Development of infrastructure for
example roads and other transport networks leading to the areas of attraction.
4. Creation of markets
Tourism has promoted markets for industrial and agricultural goods i.e. demand for goods such as local handicrafts, clothings, souvenirs and postcards.
There is a high demand for food in lodges and hotels.
5. Cultural exchange: People learn cultural values of different countries reflected in music, dance, fashion, decorations and craft.

Problems associated with Tourism Industry

1. Poaching of wild animals.
The wild species become extinct and causes a decline in the influx of tourists.
2. Insecurity:
Ethnic clashes in African countries may reduce the number of tourists in the Africa.

3. Breakdown of infrastructure
Poor road networks and railway lines, irregular supply of electricity and telecommunication networks affect tourism.
4. Degradation of the environment
Tourists exert pressure in the conservation areas. There is overcrowding of minibuses, fuel wood collection, problem of waste disposal, water pollution, the sewerage dumped (i.e. dry cell batteries) may threaten wildlife.

NOTE: Malawi also may encounter similar problems.

UNIT 11 TRANSPORTATION AND TRADE

Transportation: This is the movement of people and goods from one place to another.

TYPES OF TRANSPORT

- a) Land Transport
- b) Water Transport
- c) Air Transport
 - i) Land Transport: This involves movement of people or goods on the surface of the earth or land.
 - ii) Air Transport: The movement of goods and people by use of the aircrafts like aeroplanes, helicopters and hot-air balloons.
 - iii) Water Transport: This is the movement of goods and passengers over waterways.

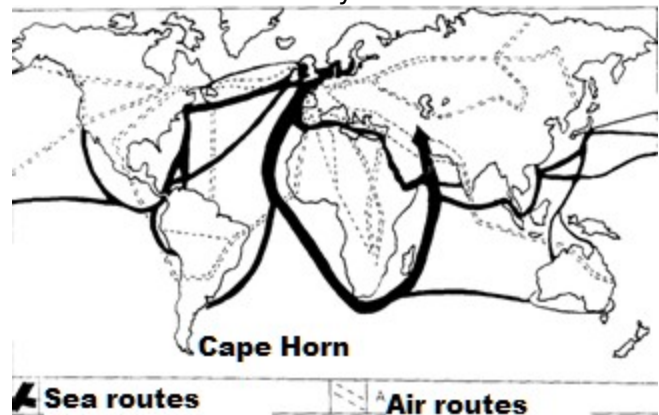


Figure 9.1 Major Sea and Air routes of the world
Demerits and Merits of Different types of Transports

Advantages of Land Transport

- Readily available even in remote parts of the country.
- Very convenient means of transport for it can be used any time e.g. bicycle cyclists e.g. zobandukas, sacramentos, kabaza etc.
- Roads are a faster means of movement compared to railway, human and water transport.
- It is cheap to construct a road than a railway construction.
- Availability of a wide variety of automobiles e.g. lorries, trucks, buses, cars.

Disadvantages of Land Transport

- Roads are more prone to accidents.
- Roads are prone to traffic congestions or jam in urban centres.
- Road transport is expensive when transporting bulky goods over long distances.
- Fog and heavy rainfall interfere with transportation.

Advantages of Railway Transport

- Trains can carry bulky goods over a long distance.
- Trains travel on a fixed time schedules hence travelers can plan their journeys.
- It experiences no congestion.
- Accidents are minimal.
- Cheaper mode of transportation.
- Disadvantages of Railway Transport
- It is slow hence not suitable for perishable goods except electric trains.
- Rail lines are expensive to construct.
- Rail lines cannot provide door-to-door services.

Advantages of Air Transport

- It is efficient and fast means of transport.
- It is comfortable.
- It is highly secure.
- It moves according to time schedule.
- Does not suffer from congestion and jams.
- Suitable for transportation of highly perishable goods, glassware and other fragile goods.

Disadvantages of Air Transport

- Air freight charges are high.
- High capital is required.

- Highly trained personnel to manage the stations and operate the planes.
- A major target for terrorists' attacks.
- It is sensitive to weather conditions like pressure, wind, precipitation and temperature.
- There are high risks and losses involved if accidents occur.
- Offers limited carrying capacity.
- Airports are expensive to construct.

Advantages of Water Transport

- The routes are naturally established e.g. rivers, seas, lakes and oceans.
- Water transport is a cheap means of transporting bulky commodities.
- Water transport has no traffic congestion.
- It offers maximum security to the cargo being transported.
- Loading and unloading is easy due to availability of machines, roll-roll and roll-off facilities or cranes at the ports.

Disadvantages of Water Transport

- Freezing of waters during cold seasons may affect navigation.
- Obstacles in the rivers may obstruct transportation i.e. rock outcrops, floating vegetation, water hyacinth, vegetation and rapids.
- Water vessels are slow and time consuming.
- Heavy initial capital for purchasing of ships, construction of ports etc.
- There are high risks and losses involved if accidents occur.

CANALS

- These are channels constructed to join rivers, oceans or lakes.
- Examples of canals include Jonglee Canal in Sudan that (connects Bor and Malakal), Suez Canal that(connects the Red Sea and the Mediterranean Sea) and the Panama Canal that(connects the Caribbean Sea to the Pacific Ocean)

Importance of Canals

- Provide water for irrigation.
- Used in draining swamps.
- Used to divert a river's course.

- Provides a waterway.

THE GREAT LAKES AND ST.LAWRENCE SEAWAY

- This waterway penetrates into the interior of North America and serves the North America and serves the Northern part of U.S.A and Southern Canada.
- It covers 3800km.
- It stretches from the mouth of St.Lawrence rier on Atlantic coast to Port Duluth on Lake Superior.
- The seaway is served by Lake Superior, Lake Michigan (has Chicago and Gary), Lake Huron(has Detroit), Lake Erie and Lake Ontario(have Toronto and Prescott).

Economic Benefits of St.Lawrence Seaway

Source of employment.

Production of electricity for example, Niagara Falls and Sault St. Marie dams for the generation of electricity.

Development of the town e.g. Chicago, Gary, Cleveland and Buffallo towns.

Ease in transportation of goods.

Increased traded between the coast and the interior of America.

Tourism attraction e.g. Niagara Falls.

Water supply for domestic and industrial use.

OTHER IMPORTANT SEA ROUTES

North Atlantic sea route-Serves North America

North America produces

Wheat, cotton, paper, woodpulp, timber etc

Europe produces

Textiles, chemicals, wine, steel, fertilizers etc

Mediterranean Asiatic sea route Europe produces:

- Textiles, chemicals, wine, steel, paper, fertilizers
- Africa and Far East produces
- Petroleum, cotton, tea, coffee, sugar, hides, etc)

Panama Canal-West Indies-Central America Route

- Far East and Pacific Estates produces:

- Oil, copper, tin, gold, sugar, timber, dairy products e.t.c.
- Europe and Atlantic Estates produces:
- Machinery, mining, equipment, cars, drugs, textiles, newsprint, chemicals

- South America-Europe Route
- South America produces
- Cocoa, coffee, wheat, flax and meat.
- Europe produces manufactured and semi-finished goods.

Factors influencing Oceanic Trade Routes

- Supply and demand.
- Availability of oceanic terminals.
- Absence of physical barriers such as icebergs and strong winds.
- Nature of cargo.

Problems facing Transport and Communication in Africa

- Hostile environments that discourage construction of roads or railway lines eg. Sahara, Kalahari, and Namib deserts which experience arid conditions and mobile sand dunes.
- Most of the rivers in Africa do not support commercial navigation.
- Lack of skilled labour and technical support.
- Political instability due to long wars in some African countries.
- Inadequate capital for infrastructure etc.
- Physical barriers like mountains, rapids and the rugged terrain hampers the construction of transport and communication infrastructure.
- Fluctuation of water levels.

Possible Solutions to the Problems above

- The construction of Trans-African highways across the continent. eg The Great North Road(from Gaborone to Cairo), Trans-African highway(from Mombasa to Dakar), Trans-Sahara road from Lagos to Tripoli.
- Taking serious action against poor road uses.
- Use of grants and loans from large International financial bodies in order to establish transport routes.

- Establishment of other types of transport like air to reduce the pressure on land transport.
- Construction of international railway networks to land locked countries in Africa for transporting bulky raw materials to coastal seaports e.g. the TAZARA railway.
- Encouraging regional economic development through establishment of regional trading blocs.

TRADE AND TRADING BLOCS

Trade: It is the buying and selling of goods and services.

Types of Trade

International Trade;

It is the trade that is carried between a country and the rest of the world.

Forms of Trade

- Bilateral Trade: It involves the exchanging of goods and services between two countries.
- Multilateral Trade: It involves the exchange of goods and services between many countries.

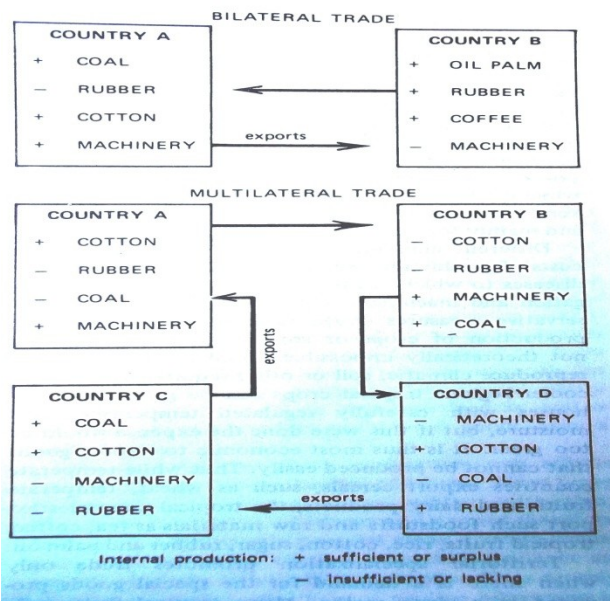


Figure 9.2 Bilateral and Multilateral Trade Factors influencing Trade

a. Difference in natural resources:

the need to satisfy the demand for goods and services that are not available.

- Population factor**-the size of a population relates to the size of the market of a given commodity.
- Stage of economic development**- Industrialised countries export manufactured goods while less developed countries export agricultural products and raw materials.
- Government policies**- a government can determine who to trade with, what to trade in and the volume to trade in through imposing trade restrictions like tariffs and quotas, taxation system and banning of trade in some commodities.
- Creation of trading blocs or common markets**

This encourages trade between the various member countries.

REGIONAL TRADING BLOCS

A regional trading bloc is an organization of various countries within a given geographical region which is aimed at achieving similar economic goals for each member state. It is also an inter-governmental association that manages and promotes trade activities for a specific region of the world.

Examples of the Regional Trading Blocs

a) Common Market for Eastern and Southern Africa (COMESA)

Established on 8th December, 1994.

COMESA Objectives

- To create a conducive environment for both domestic and foreign investment.
- To enhance peace, security and stability for economic growth.
- To promote agricultural production and ensured food security in the member states.

b) Southern African Development Community (SADC)

It was established in 1992 in Windhoek, Namibia.

It consists of Malawi, DRC, Lesotho, Tanzania, Zambia, Swaziland, South Africa, Namibia, Zimbabwe, Angola, Mozambique, Seychelles and Mauritius.

SADC Objectives

- To set up common political values, systems and institutions.

- To achieve sustainable utilization of natural resources.
- To alleviate poverty.
- To promote and defend peace and security.
- To establish a common market for the member states.

c) Economic Community of West African States(ECOWAS)

It was established on May 28, 1975 by the treaty of Lagos.

It consists of Chad, Nigeria, Ghana, Burkina Faso, Senegal, Sierra Leone, Mali and Ivory Coast

Objectives of ECOWAS

- To enhance economic co-operation.
- To improve the living standards of the member states.
- To promote free movement of member states within the region.
- To achieve and maintain economic stability of member states.

d) The European Union(EU)

EU was formed in 1993 from the former European Economic Community (EEC)
It is an economic cum political bloc.

Objectives of EU

- To lessen the negative aspects of globalization by making sure that developing countries benefit from free trade.
- To eliminate all duties and quotas for products originating from the Least Developed Countries.

Importance of Regional Trade Groupings or Blocs

- Improved quality of production due to increased competition.
- Improvement of living standards in member countries.
- Unrestricted flow of goods, services and people.
- High and increased demand increases the volume of trade among member states.
- Attainment of political co-operation and international relations within member states hence promoting peace within the region.

- Improvement of transport and communication networks within the region.
- Elimination of trade barriers hence increased opportunities for trade.
- Establishment of a common currency which is acceptable to all member states. This makes the trading easier.

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