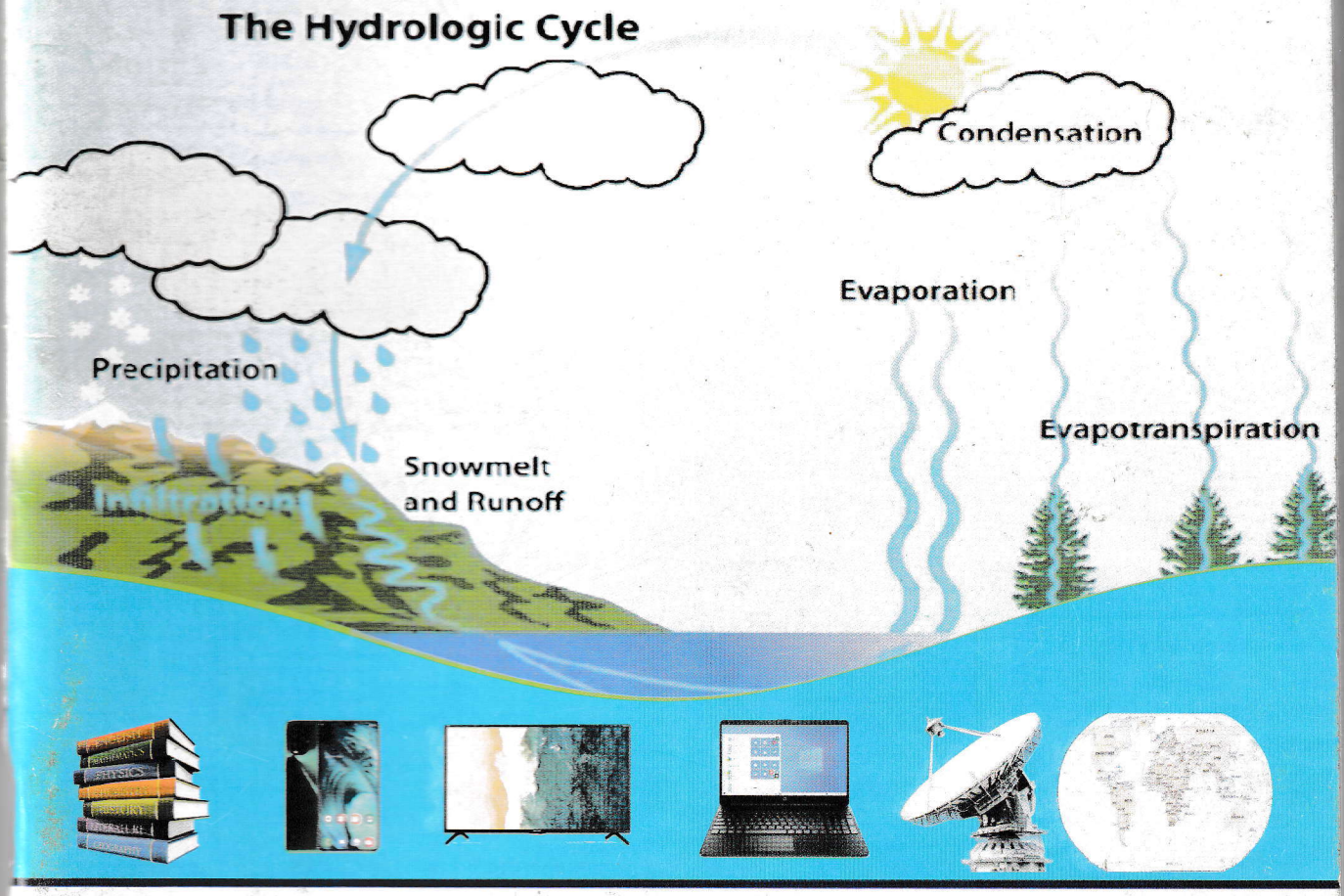
Module 4A

GEOGRAPHY

Stage I

Describing Human Activities



Institute of Adult Education
Alternative Secondary Education Pathway

GEOGRAPHY

Stage I

Describing Human Activities

Institute of Adult Education
Alternative Secondary Education Pathway

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Acknowledgement

This module is a product of the Institute of Adult Education (IAE) produced in 2021 for Alternative Education Pathway (AEP), and reflecting the current syllabi of 2010 secondary education in Tanzania, as recommended by Tanzania Institute of Education.

This module is an outcome of concerted efforts of various experts from within and outside the IAE. The IAE profoundly acknowledges the valuable inputs of all stakeholders for devoting their time and resources to ensure effective preparation of this module.

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Contents

About this module

This module has been produced by the Institute of Adult Education. All modules produced by the Institute are structured in the same way, as outlined below:

How this module is structured?

The module overview

Dear learner, the module overview gives you a general introduction to the module. Information contained in the module overview will help you determine:

- If the module is suitable for you;
- What you will need to know;
- What you can expect from the module; and
- How much time you will need to complete the module.

The overview also provides guidance on:

- Study skills;
- Where to get help;
- Unit assignments and assessments;
- Activity icons; and
- Units.

The module content

The module is broken down into units. Each unit comprises:

- An introduction to the unit content;
- Terminologies;
- Core content of the unit with a variety of learning activities;
- Unit reflection; and
- Unit assignments.

Resources

For those interested in learning more on this subject, we provide you with a list of additional resources at the end of this module these may be books, articles or web sites.
Your comments

Your Comments

Dear learner, after completing this module of Describing Human Activities, we will appreciate if you would spend time to give us your feedback on:

- Module content and structure;
- Module reading materials and resources;
- Unit assignments;
- Module assessments;
- Module duration; and
- Module support (assigned tutors, technical help, etc.)

Your constructive feedback will help us to improve and enhance this module.

Module overview

Welcome to this module

Dear learner, welcome to module 4A. The module is about Describing Human Activities. The Module is divided into 5 units namely: Unit 1: Explaining Concept of Human Activities. Unit 2: Analysing Agriculture. Unit 3: Management of Water Resource for Economic Development; Unit 4: Managing Sustainable use for Forest Resources; and Unit 5: Applying Sustainable Approaches to Mining. I hope that the module will contribute in providing you with skills and awareness on human activities for economic development.

General competence

Dear learner, upon completion of this module, you will be able to demonstrate the following competences:

- Engaging yourself in sustainable agriculture and sustainable use of water, forest, power, energy resources as well as sustainable mining.

Study skills

Dear learner, being a student learning through Alternative Secondary Education Programme, your approach to learning will be different from that of your formal school days. In this approach, you will choose what you want to study, you will have professional and/or personal motivation for doing so, and you will most likely be planning your study activities and other professional and/or domestic responsibilities.

Essentially, you will be responsible to manage your learning environment in issues such as time management, goal setting, stress management, etc. Perhaps you will also need to reacquaint yourself to areas such as essay planning, coping with examinations and using the web as a learning tool.

Your most significant considerations will be time and space i.e. the time you dedicate to your learning and the environment in which you engage in that learning.

We recommend that you take time now before starting your self-study, to familiarize yourself with these issues. There are a number of excellent materials on the web. A few suggested links are:

- http://www.how-to-study.com/

The "How to study" website is dedicated to study skills resources. You will find links to study preparation (a list of nine essentials for a good study place), taking notes, strategies for reading text books, using reference sources, test anxiety.

- http://www.ucc.vt.edu/stdysk/stdyhlp.html

This is the website of the Virginia Tech, Division of Student Affairs. You will find links to time scheduling (including a "where does time go?" link), a study skill checklist, basic concentration techniques, control of the study environment, note taking, how to read essays for analysis, memory skills ("remembering").

- http://www.howtostudy.org/resources.php

Another "How to study" website with useful links to time management, efficient reading, questioning/listening/observing skills, getting the most out of doing ("hands-on" learning), memory building, tips for staying motivated, developing a learning plan.

The above links are our suggestions to start with on your way. At the time of writing, these web links were active. If you want to look for more go to www.google.com and type "self-study basics", "self-study tips", "self-study skills" or similar.

Need help?

Dear learner, in the course of your study, you may need help in various issues such as the location and how to get support from resource centres, clarification of various issues pertaining to your study materials (modules) and so on. If this happens, you are advised to ask for help from your centre coordinator or facilitator, you can also visit the website of the Institute of Adult Education which is www.iae.ac.tz or ask for help by using phone no. +255 22 2150838.

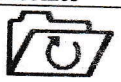
Module assessment

After each unit, you will be required to attempt one unit assignment. These are not meant for submission rather for reflection on what you have learned in the whole module. You will also be given tests and assignments for submission as you will be guided by your module facilitator. You will also sit for mock examinations to accomplish your continuous assessment.

Getting around this module

Margin icons

Dear learner while working through this module you will notice the frequent use of margin icons. These icons serve to "signpost" a particular piece of text, a new task or change in activity; they have been included to help you to find your way around this module.
A complete icon set is shown below. We suggest that you familiarize yourself with the icons and their meaning before starting your study.

 Activity	 Assessment	 Unit assignment	 Case study
 Discussion	 Group activity	 Help	 Note it!
 Outcomes	 Reading	 Reflection	 Study skills
 summary	 Terminology	 Time	 Tip
 Computer-Based Learning	 Audio	 Video	 Feedback
 Generai competence	 Basic Competence	 Answers to Assessments	

Unit 1
Explaining Concept of Human Activities

Introduction

Dear learner, welcome to unit four which is the final Geography Module for stage one. This unit will introduce you to various activities that human beings are engaged in for their survival. The unit will mainly focus on concept of human activities and their importance to the whole ecosystem.

Learning Outcomes

Dear learner, upon completion of this unit, you will be able to:

- Describe various human activities;
- Identify various human activities in the local community; and
- Explain the importance of human activities to his/her life.

Human Activities

The Meaning of Human Activities

Life is associated with a variety of activities. I hope that, you are also engaged in different activities daily. Our lives are full of activities. Some of the activities we do are very minor while others are notable and significant.

Human activities are functions or tasks or work carried out or done by human beings over time for achieving certain purposes.

Types of Human Activities

All human activities are not the same in terms of importance, energy required and time spent. Human activities are classified into mainly three categories which are:

(a) Primary Activities

These are human activities that involve extracting the raw materials directly from the Earth. Examples of primary activities include agriculture, mining, fishing and exploitation of forest resources.

(b) Secondary Activities

These are human activities that involve processing of raw materials into useful products. Examples of manufacturing industries are processing of steel and iron ore, cloth making, car assembly, etc.

(c) Tertiary activities

These are the activities that involve the provision of services that are needed in society. Examples of tertiary activities include: trade tourism, education and hospitals. Tertiary activities include the other two categories of human activities which are:

(i) Quaternary activities

These are activities that involve provision of intellectual services and information. Example of quaternary activities are scientific research, consultancy and computer based activities such as making of software.

(ii) Quinary sector activities

These are activities that are done by top executives or officials in such fields as in the governments. Name some activities which take place in your local community basing on each of their categories.

Importance of Human activities

i) They sustain human's life, from them; humans get their needs and services.
ii) Human activities such as agriculture and fishing lead to the supply of food in a country.
iii) Human activities increase individual and national income
iv) Helps in producing raw materials such as cotton for textile industries.
v) They provide employment to people in the country.
vi) They facilitate the improvement of transport and communication in a particular area.
vii) They boost the national currency.

Dear Learner, observe human activities which are carried out around you and explain their impact to the environment and human life.

Negative Impact of Human Activities

Dear learner, although human activities are important for life, they have some disadvantages too. The major negative impact of human activities is the destruction of the environment. Human activities destroy the environment in the following ways.

i. They cause environmental degradation – for example mining and agriculture destroy land and forests;
ii. They cause air, soil and water pollution – for example, smoke and wastes from manufacturing industries, fishing by using chemicals, burning forests, and the use of fertilizers and pesticides; lead to pollution.

iii. They destroy the natural environment and replace it with the artificial environment (built environment) – for example, clearing of forests and establishing mining centre or building of industries;

iv. They dead They lead to loss of natural resources - because human activities utilize or consume natural resources; without replacement.

v. Deforestation. This can take place when trees are excessively cleared during preparation for large farms, lumbering, overgrazing and settlements;

vi. Soil erosion. This takes place easily on the land that has been left bare due to excessive cutting of trees for lumbering, farming and construction.

Measures of Solving Environmental Problems Caused by Human Activities

Dear learner, problems caused by human activities can be addressed in various ways. The following are the measures on how to overcome problems caused by human activities:

i) Planting trees where the land is bare and avoid people from cutting trees;
ii) Mass education should be provided among the people on how to conserve the environment;
iii) Government should formulate policies that guide people on how to undertake various activities;
iv) Discouraging the improper dumping of waste in the soil or water;
v) The use of modern methods in agricultural activities such as crop rotation, inter cropping, fallowing strips, contour ridging; and
vi) Discouraging excessive use of chemicals in the control of pests and diseases.

Unit Reflection

Observe human activities taking place around where you are living and list the activities you consider harmful to the environment and those useful to the environment. How will you advice community member on maintaining sustainable environment?

Unit Assignment

1. Mention any six human activities that you know.
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   .....
   .....
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2. Write short notes on the following:
   a) Human activities
   b) Primary activities
   c) Secondary activities
   d) Tertiary activities

3. Mention any four types of human activities that you know.
   .....
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   .....
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4. Explain the negative effects of any two human activities that are practicing in your local community.
5. List down measures of solving environmental problems caused by human activities.

Unit Assignment

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4. Explain the negative effects of any two human activities that are practicing in your local community.
5. List down measures of solving environmental problems caused by human activities.

Unit 2
Analysing Agricultural Activities

Dear learner, in the previous unit, you learnt about concept of human activities and major types of human activities. I hope you enjoyed it. In this unit you will study about Agriculture. Agriculture is the main activity which is the chief source of food, source of employment, source of income and industrial raw materials (secondary industries). It is therefore, important to discuss this activity and its role to individuals and national development.

Learning Outcomes

Upon completion of this unit, you should be able to:

- Describe concept of agriculture and types of agriculture;
- Describe the characteristics of small scale agriculture at subsistence level;
- Explain advantages and problems of small scale agriculture and ways of improving it;
- Identify areas where large scale agricultural farms are located; and
- Discuss the problems that face livestock keeping in Tanzania.

The Concept of Agriculture

Dear leaner, I hope you are aware of the types of human activities that are practised by the people at our community. I also believe that you have learnt on the importance of human activities in our daily life. Now, let us focus our attention on "**Agriculture**" as one of primary human activity.

Dear learner, I believe that the term agriculture is not new to you.

Can you try to define it?

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What is agriculture? **Meaning of Agriculture**

Agriculture refers to the human activity that involves the *cultivation of crops* and *keeping of animals.* It is an art that involves cultivation of crops and animals keeping. Crops cultivation is also called arable farming and animal keeping is called livestock husbandry.

As it is already said, agriculture is the main human activity which is the main source of food on earth. With other many advantages and products of agriculture, it is also the main source of employment for many people especially in the rural areas. Let us see the types of Agriculture.

Types of Agriculture

Dear learner, observe the area which you are living and list types of agriculture available. Then compare your answer with the information given, below:

Agriculture can be grouped into major two types of agriculture which are: *Small Scale Agriculture* and *Large Scale Agriculture.* The other minor kinds of agriculture will be discussed under these two types.

Small Scale Agriculture

Small-scale agriculture is the production of crops and livestock on a small-piece of land without using advanced and expensive technologies. This is a farming system that takes place on a relatively small area less than 5 hectares. This type of agriculture produces food crops, cash crops. Small scale livestock farming aimed at providing the essential needs of a family. This kind of agriculture is also known as *subsistence farming.*

Characteristics of Small Scale Farming

Small scale agriculture is characterized by the following features:

i. Simple tools are used, e.g. the hand hoes and ox-drawn ploughs.
ii. The areas cultivated are small, usually the family labour is used and production is low.
iii. Low or no use of chemicals to improve soil fertility and to control diseases and pests.
iv. The capital used is small.
v. It is characterised by the use of poor farming methods and poor transport services.

Dear learner, I hope now you are familiar with the characteristics of small scale agriculture. Can you list methods/ types of small scale crop cultivation? Compare your answer with the discussion that follows:

Dear learner, mention methods of subsistence agriculture practiced by various Tanzanian tribes such as: Masai, Sukuma, Chagga, Ikizu, Zanaki or any other tribe of your choice.

Methods / Types of Small Scale Crop Cultivation

There are four methods/ types of subsistence agriculture; namely: *Shifting cultivation, Crop rotation, Bush fallowing* and *sedentary farming.*

Shifting Cultivation

Is the system in which a peasant keeps on shifting from one area to another as a result of soil exhaustion. In this type of agriculture peasants cultivate certain pieces of land until the soil is exhausted after 2-5 years then shift to a new piece of land where they clean and cultivate. The community cultivates in nearby areas or moves to different parts. One particular thing is that at each new location, the grass and trees are cut down and burned.

For this reason, shifting cultivation is also called *slash* and *burn.*
Dear learner, shifting cultivation is the main form of agriculture found in many parts of the world's tropic climatic regions which have relatively high temperatures and plentiful rainfall. It is an ancient (old) method, mainly existing in three tropical regions: the Amazon of South America, Central and West Africa, and South East Asia including Indonesia, Indo-China and New Guinea. In Tanzania the regions practicing shifting cultivation include Morogoro, Tabora, Iringa, Mbeya, Tanga and Dodoma. For example, tobacco farming relies heavily on shifting cultivation.
Dear learner, we have seen the concept of shifting cultivation, let us see the characteristics of shifting cultivation as follows:

i) Farmers usually clear the land for planting in part by slashing vegetation and burning the debris.
ii) Farmers grow crops on a cleared field for only a few years and then leave the land to follow many years.
iii) People who practice shifting cultivation, generally live in a small village and grow food in the surrounding land.
iv) Each year, the villagers plan for planting an area surrounding the settlement. Before planting they must remove dense vegetation that typically cover it.
v) Before planting, fields are cleared by hand, with the help of simple tools such as a hand hoe and machetes.
vi) Cleared land can be used to grow crop for only a short time, usually three to five years.
vii) If a cleared area outside a village is too small to provide for the entire population of a village, then some of the people establish a new village and practice shifting cultivation there.
viii) The crops grown include maize, rice, millet, cassava, groundnuts, beans and vegetables.
ix) Most families grow for their own needs, although some may specialize in particular crops and trade with villages who specialize in other crops.
x) Traditionally, land is owned by the village as a whole rather than by each individual. Each family is allocated with some piece of land and is allowed to retain the output.

Dear learner, let us now look on the advantages and disadvantages of shifting cultivation.

Advantages of Shifting Cultivation

i) More than one crop can be planted and harvested in a single plot.
ii) Burning involves production of ashes which assist in soil fertility.
iii) Food supply is assured since the family cultivates for self-sufficient basis.

iv) The system does not cost much since simple tools are used for production.
v) Family labour is used in the production process.

Disadvantages of Shifting Cultivation

i) The use of fire kills (destroys) the natural habitats and wild animals.
ii) The system cannot be applied on high populated areas.
iii) Low productivity because the plots are small and control of pests and diseases is poor.
iv) Clearing of forest encourage deforestation and soil erosion.
v) Destruction of ozone layer due to burning of bushes and grasses.

Dear learner, I hope now you are familiar with the characteristics, advantages as well as disadvantages of shifting cultivation let us look on another type of subsistence agriculture which is bush fallowing.

Bush Fallowing

Is the farming system in which a peasant cultivates in a certain area until it gets exhausted and leaves it for a certain period of time to regain fertility. It differs from shifting cultivation in that farmers are settled and hence are rotating rather than shifting to a new home.
Rotational bush fallowing is the simplest form of sedentary farming. This system took place after shifting cultivation failed to perform well due to increase in population.

Characteristics of Bush Fallowing

i. Simplest tools are used through more advanced compared to shifting cultivation Slashing and burning of bushes.
ii. The community can engage itself into other activities like trade,
iii. Hunting and gathering etc.
iv. Farmers are settled but the farms are the ones which are rotating.

Advantages of Bush Fallowing

i. Since people are settled, they engage fully and effectively in the production process.
ii. Slashing and burning involved in the farm preparation adds fertility to the land.
iii. Fallowing gives room for the improvement of the soil and encourages the recovery of vegetation.
iv. It takes places where there is high population unlike shifting cultivation.
v. Farmers can involve in other economic activities such as trade, lumbering and fishing.

Disadvantages of Bush Fallowing

i. There is low production due to the use of low technology and simple tools.

ii. Slashing and burning can lead to environmental degradation as well as loss of biodiversity.
iii. Poor trade among communities.

Dear learner, another method or type of crop cultivation or subsistence farming is crop rotation, can you give the meaning of crop rotation.

Crop Rotation

Crop rotation involves growing of different crops on the same land at different times for example previous year the farmers grow maize, this year beans, next year millet. The farmers continue rotating crops according to their needs.

Sedentary farming

Sedentary farming is the farming system in which a farmer does not move and establish a permanent settlement. The farmer grows crops and keeps animals.

Advantages of Small Scale Farming

Dear learner, although small scale agriculture is the inferior way of farming, it has the following advantages:

i. It is cheap because of the use of simple tools, use of locally produced manure and local seeds.
ii. It provides food required to feed the population, for example maize, millet and wheat. It also provides employment to most of the rural population.
iii. It provides raw materials for the industries like cotton, tobacco, tea and coffee, thus it brings about foreign currency after being exported.
iv. It needs a small area of land, hence encourages the environmental conservation efforts.
v. Cost of production is low labour as it involves the family members.
vi. It has encouraged the development of settlement among the farmers.

Dear leaner, you have seen advantages of small scale farming however, it has some disadvantages, let us see them:

Disadvantages of Small Scale Farming

The following are the disadvantages of small scale farming:

i. Land production is very low due to use of simple tools which lead to poor standard of living.
ii. Poor methods of farming which lead to environmental degradation like erosion and deforestation.
iii. Heritage of land leads to land fragmentation and over population in a small piece of land hence results into shortage of land.

iv. Poor quality of products due to the use of poor farming methods and failure to control diseases.
v. Poor use of fertilizers can cause soil exhaustion.
vi. This type of agriculture is highly depending on favourable weather condition. Bad weather condition result in great loses.

Ways of Improving Small Scale Agriculture

Dear learner, you have learnt on advantages and disadvantages of small scale agriculture. What are the ways of improving small scale agriculture? The following are the suggested ways that can help to improve small scale agriculture:

i) To educate farmers on good farming methods/practices and proper ways of using fertilizers and pesticides.
ii) The government should facilitate the establishment of market for selling crops.
iii) Farmers should use of better farming tools example the use of tractors.
iv) The farmers should be encouraged to establish permanent farms to avoid shifting cultivation.
v) Introducing more crops for consumption and surplus for sale.
vi) The government should provide small loans to farmers in order to increase capital.
vii) The government should facilitate good transport and communication network.
viii) To encourage people to have permanent settlements so that they can organize their farms.

Subsistence Farming and Women Empowerment

Dear Learner, women form the group which is mostly engaged in small scale farming. Yet they are faced with a lot of challenges in the activity. One of the challenges is lack of the right to own and inherit land. The other is that of unequal participation in agricultural production. Many societies perceive agriculture as the women's activity. As a result, no much investment is put in agriculture. To improve the situation, the following should be done:

i) Women should have the right to own land;
ii) Women should have the right on the products from the land;
iii) Men and women should participate in all family's activities including family planning to control human population.

Effects of Overpopulation on Small Scale Agriculture

Dear learner, I hope you have learnt more about small scale agriculture including characteristics, methods/ types, advantages disadvantages and ways of improving. Now, we are going to see the effects of overpopulation on small scale agriculture.

According to what you have learnt, list any two effects caused by overpopulation on small scale agriculture.

There are many effects of overpopulation on small scale agriculture, let us see the definition, causes and effects of overpopulation.

Overpopulation is the demographic situation where number of people at a given area is greater than the available resources include; Land, Water, Minerals etc. Over population is sometimes called *population pressure*

Causes of Overpopulation/Population Pressure

i) Movement of people from one place to another for their own interests or by force due to different situations such as conflicts, unemployment, hunger etc.
ii) social services, where there is availability of social services such as medical care may lead to the increase in population.
iii) Economic activities such as industries or mining activities may lead to the population pressure
iv) Cultural attributes such as marriages, polygamy, naming of relations, and unplanned reproduction and sex preferences.

Dear Learner, we have seen the definition and causes of overpopulation. In this part you will learn the effects of population pressure on small scale agriculture.

Effects of Population Pressure on Small Scale Agriculture

a) Increase of crimes such as prostitution, theft and bandits.
b) Shortage of land for cultivation.
c) Results into land degradation due to cultivation, deforestation, bush burning.
d) Spread of diseases such as cholera, malaria as well as malnutrition due to shortage of food.
e) Poor arrangement of houses or improper housing.
f) Poor provision of social services like Water, Health, Education etc.
g) Overcrowding, small piece of land to be occupied by many houses.

Large Scale Agriculture

Dear learner, after having discussed on small scale agriculture let us discuss another major category of agriculture which is large scale agriculture. This part intends to explain the concept, characteristics and the way small scale agriculture differs from large scale agriculture. Welcome!

In large scale agriculture commercial farm produce crops and animals mainly for sale. It differs from small scale agriculture in which products are mainly for family consumption. Large scale agriculture is also called *commercial agriculture* as opposed to small scale agriculture which is *subsistence farming*

Concept of Large/Commercial Agriculture

Large scale agriculture refers to a type of agriculture which takes place in a large area of land approximately 100 hectares. This is also known as *commercial agriculture* or *state agriculture.* The type of farming practiced is normally monoculture means is based on single crop.

Types of Large Scale Agriculture

Dear learner, large scale agriculture can be divided into two types namely; *Plantation Agriculture* and *Extensive Cereal Cultivation*. Plantation agriculture involve cultivation of limited number of cash crops in large farm or estate, crops grown include tea, coffee, rubber, tobacco, cocoa, sisal, oil palms and sugar cane. Plantation agriculture is dominant in some regions of Africa, Asia, North and South America where there are favourable climatic conditions.

Extensive cereal cultivation deals with large scale food crops production, crops grown include beans, maize, wheat and rice. Due to large size of cultivated area, all stages of cultivation from ploughing, sowing, harvesting, packaging is done by machines.

Characteristics of Large/Commercial Agriculture

i) Heavy use of machinery, it has a high degree of reliance on technology and scientific improvements. A small number of farmers are able to feed a large number of people in relatively developed societies because commercial farmers depend on machinery rather than people or animals.

ii) Improved transport and communication system, in areas where large scale agriculture is practiced there is modern and improved transport and communication systems. This includes railways, roads, harbours and ports. This helps in the delivery of farm outputs and inputs.

iii) Use of scientific techniques, commercial farmers, also make extensive use of scientific methods to increase farm products e.g. use of research findings, fertilizers, hybrid plants and animals, etc.

iv) Large farm size, commercial agriculture involves the use of large sized farms for example wheat farms in the prairies of the United States and Canada. The average farm in the USA Midwest is nearly 100 hectares (250 acres). You can imagine how big the farms are!

v) Large sized farms are partly a result of mechanization that is, use of modern machines. As a result of the large size and the high level of mechanization, commercial agriculture is an expensive business.

Farmers must spend hundreds of thousands of dollars to buy or rent land and machinery to conduct farming operations.

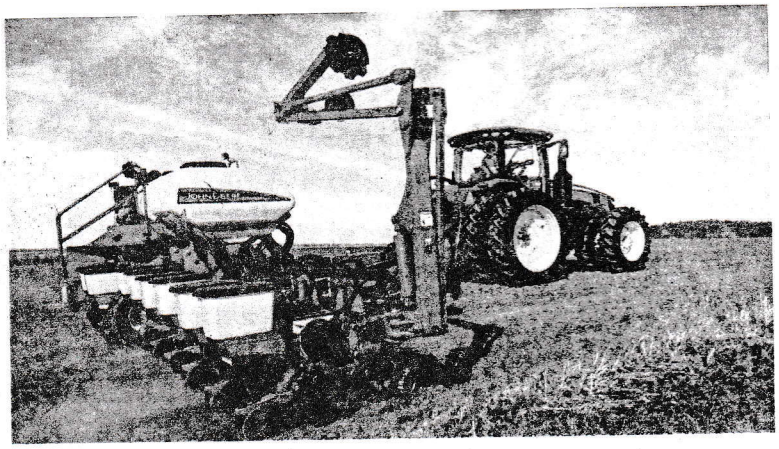

Figure 2.1: Commercial agriculture depends heavily on expensive machinery to efficiently manage large farms

vi) Output sold to processors, commercial farmers grow crops and raise animal primarily for sale rather than for their own consumption.

vii) Integration with other business is the last characteristic of commercial agriculture, that is, it has close ties with other business. The system of commercial farming in United States and other relatively developed countries has been called agro business because the family farm is not an isolated activity but is integrated into a large food production industry.

viii) Farms earn all or most of their income from sale of one kind of crop or livestock. Many of these farms use mass - production methods and require a large investment in equipment and supplies. The specialized farms are categorized into two groups such as specialised crop production and specialized livestock production

Advantages of Large Scale Agriculture

i) Productivity is very high and large amounts of capital/income is obtained.

ii) Risk of pests and diseases is highly reduced.

iii) Promotes the growth of other sectors.

iv) Promote the development of social services i.e. Housing Electricity and water supply.

v) Provides employment to the people.

vi) It is the source of foreign money exchange.

Challenges / Problems Facing Commercial Farming

i) They suffer from low income because they produce too much rather than too little.
ii) While the supply of food has increased in the relatively developed countries, demand has remained the same because the market for most products is already down.
iii) Demands almost stand still for most agricultural products in relatively developed countries because of low population growth.
iv) In fact, some countries such as USA and European Community (EC) have adopted two types of policies to attack the problem of excess supply, because soil erosion is a constant threat, the government encourages planting of fallow plants.
v) Frequently occurrence of natural hazards such as floods, earthquake
vi) They encourage consumption of excess grain by selling or donating it to foreign governments.
vii) Fluctuation of price in the world market the farmers may face loss when the price falls down.

Plantation Farming

What is plantation? Refers to the large farm or large area of land designed for agricultural growth. Often includes housing for the owner and workers. The crops are planted for commercial purposes.

The plantation is a form of commercial agriculture found in the tropics and subtropics, especially in Latin America and Asia. Although generally situated in developing countries, plantations are often owned or operated by Europeans or North Americans and grow crops for sale primarily in relatively developed countries. Crops produced for sale are called cash crops. Many commercial farms produce only one cash crop. These farms are known as one - crop or single crop farms. Much of the world's wheat is grown of large single crop farms in Great Plains of North America and Ukraine. Large single crop farms in tropical and sub-tropical areas are often called plantations.

Plantations raise such crops as coffee, sugarcane, and tea. Examples of such plantations in Tanzania are sisal plantations which are in Morogoro and Tanga regions, sugar cane plantations in Mtibwa and Kilombero in Morogoro region; tea plantations in Mufindi in Iringa region. We also had at one time wheat plantations in Hanang Manyara region.
Latin American plantations are more likely to grow coffee, sugarcane and bananas, while Asian plantations may provide rubber and palm oil. Since these plantations are usually situated in sparsely settled locations, they must import workers and provide them with food, housing and social services. Crops are normally processed at the plantations before shipping.

Requirements for Establishing Plantation Agriculture

Dear learner, there are basic requirements for establishing plantation agriculture which include: enough capital and reliable supply of skilled and unskilled labour, presence of market, presence of large area for cultivation, good conducive climate, Presence of reliable storage facilities, good transport and communication and Presence of good policy to the farmers.

Coffee

Coffee is a crop which produces coffee beans that are processed to make a beverage. There are several types of coffee but the famous ones are three including; Arabica, Robusta and Liberia. The chief producers of coffee in the world are; Brazil, Columbia, Ivory Coast, Mexico, Uganda, Indonesia, Ethiopia, India. In Tanzania coffee is produced in Mbeya, Arusha, Kilimanjaro and Kagera.

Condition Favorable for Growing Coffee:

The following are conditions favorable for growth of coffee

Climate

Coffee is a tropical plant which is also grown in sub-tropical climate. It requires heat humidity and abundant rainfall. The plant grows in warm to high temperature between 16^0c - 21^0c. It also need abundant rainfall between 1100 mm to 1780 mm annually and relative dry season for picking.

Topography

Coffee grows well in areas which lie between 600m to 1800m above the sea level with well-drained soil. Water stagnation is very harmful for coffee plants, therefore, hill, slopes are best suitable for growing coffee.

Soil

Soil is guiding factor for coffee plantation. The best soils are well drained, volcanic fertile soils which are rich in humus, mineral nutrients and texture to allow free air circulation.

Shade

Direct sunlight is harmful for coffee plants, therefore trees of different varieties are needed to protect the coffee from strong winds and sun light e.g. bananas, grevilleas and eucalyptus.

Labour

Extensive labour needed to work in the farms, especially during harvesting which is done by picking red ripe berries for processing.

Cotton

Cotton is a flowering plant which is grown for making cotton fabric and threads. It is the second largest export crop after coffee and the fourth largest produced cash crop in Africa. It is an annual crop which is divided into three varieties basing on the size of the fibrous and the lint. The plant is native tropical and sub-tropical in the world including Africa and America. The major cotton producers are China, USA, India, Pakistan, Brazil, Egypt, Benin, Mali, Vietnam, Cameroon, Australia, Turkey, Sudan and Russia. In Tanzania, cotton is mainly grown in Mwanza, Tabora, Mara, Shinyaga, Geita and Simiyu regions.

Dear earner, there are different types of cotton. These are long staple cotton which is grown in Egypt and Persia, Medium staple cotton which is grown in Brazil and Russia and Short staple cotton (Asiatic cotton) which is grown in Brazil and Russia.

Requirements for Growing Cotton

The following are the requirements for the growth of cotton;

Climate

Cotton grows well in warm temperatures of about 25°C. It needs well distributed rainfall of about 1000mm per year. When rainfall is low irrigation is applied example of areas where cotton is produced through irrigation is Gezira scheme in Sudan. Cottont requires dryness towards the end of the growing season for ripening and picking. Excessive water during picking leads to lint discoloration and high incidence of bacterial and fungal ball rot.

Soil

Cotton growing requires dark brown soils which are well drained fertile soils.

Relief

It grows well on a flat land or undulating relief of up to 1500m above sea level.

Uses of Cotton

There are many uses of cotton. For example textile fibers are used for cotton clothing, seeds are used to produce cotton oil, the cotton husks are used to manufacture cotton cakes (molasses) which is used to feed animals and dead cotton trees are used totally as fire woods.

Extensive Cereal Cultivation

Dear learner extensive cereal cultivation deals with large scale food crops production. Crops grown include beans, maize, wheat and rice. Due to large size of cultivated area, all stages are of cultivation from ploughing, sowing, harvesting, packaging is done by machines. Also, in extensive cereal cultivation there is commercial grain agriculture and commercial gardening and fruit farming.

Commercial Grain Farming

Commercial grain agriculture deals with the production of grain crops such as wheat, maize, corn, etc.

Commercial grain farms sell the output to food production manufactures. Large scale commercial production is found in only five countries, the United States, Canada, The Soviet Union, Argentina and Australia. Commercial grain farms are generally located in regions that are too dry for mixed crops and livestock agriculture.

The most important crop grown is hard wheat, used to make bread flour. Wheat generally can be sold for higher price than other grains, such as rye, oats and barley; and has more use as food for humans.

Commercial Gardening and Fruit Farming

Commercial gardening and fruit farming is common in the US South East. The region has a long growing season and is assessable to the large markets of New York, Philadelphia and Washington. The type of farming in this region is frequently called truck farming because trucks are used to transport the fruits and vegetables from the farms to buyers.

Truck farms grow many of the fruits and vegetables that consumers need in relatively developed societies such as apples, cherries, lettuces, mushrooms and tomatoes. Some of those fruits and vegetables are sold fresh to consumers, but most are sold to large processors for canning or freezing.

Maize

Maize is a crop which originated in South America, It is one of the most widely cultivated of all crops and it is grown in both tropical and warm temperature latitude. The crop is an annual grass which usually grow to a height of 1 to 4m. There are varieties of maize such as **Dent;** these are soft maize and have a high commercial value in the market, **Flint**; Which are hard maize and takes a short time being harvested, **Popcorn**; which are hard grains and are

small in size, **Sweet corn**; Contains starch and sugar which tastes sweet for human consumption, **Flour corn**; Shrinks when ripen and contains soft starch, **Wax and popcorn**; These are not grown for commercial purposes.

Conditions for Growing Maize

Dear learner there are favorable condition for growing of maize including climate. Maize grows well in temperatures of about 18^0c to 27^0c and moderate summer rains of about 635mm to1145mm especially during growing period. Maize grows 2900m above the see level. Time taken to maturity period vary from 60 to 300 days. Harvesting of maize involve the cutting of maize plant and the cobs are then removed by hand, the grains are then removed from the cobs by shelling. Before the grains are stored they should be dried.

Uses of Maize

Dear learner, maize is a staple food in Africa and Asia. Also is used to feed domestic animals such as cattle, pigs and chicken. Also maize is used to make industrial products such as vegetable oil, starch, alcohol and manufacture papers.

Rice

Rice is an edible seed from one of the grass species. As a cereal crop, it is the most widely consumed staple food for large part of the world's human population, especially in Asia. In Tanzania rice is grown in Morogoro, coast, Shinyanga, Mwanza, Tabora and Simiyu. Globally it is grown in China, Indonesia, Bangladesh, Brazil, Thailand, Kenya and Japan.

Conditions Favourable for Growing Rice

Temperature

Rice requires temperature between 20^0c and 27^0c, abundant sunshine during 4 months of growth, the minimum temperature should not go below 15^0c.

Rainfall

Rice grows in an area with plenty of water at an area with the minimum amount of rainfall 1,150mm. Paddy needs waterlogged condition with depth of water varying over 25 mm at a time of transplanting to as much as 150mm for 10 weeks of the growing periods.

Farming Practice

Dear learner, farm preparation and care of rice involve preparation land and nursery bed for obtaining seedlings. Seedlings are planted by removing them from the nursery to paddy fields 20 days after sowing. Good rice planting involve spacing at the distance of 20cm

x 20cm with one seed in plant hole. Farmers are required to maintain water and water discharge on paddy fields. Weed control can be done by herbicides before or after planting or after planting by hand removal of weeds. Fertilisation also is applied for adding nutrients needed by plants in the soil.

Dear leaner, apart from farm preparation and care of rice there are processes of harvesting, processing and transportation of rice which include; removal of the hard protective husk, packaging of rice grain as brown rice, removal of the germ and brown layers by using gentle milling. The polished white starch centre is what we know as white rice. Large scale farmers use large conventional grain harvesters where as small scale farmers use sharp sickles for harvesting. Tractors, power tillers and lorries are used to transport paddy from farm to the storage facilities.

Rice is mostly sold to consumers as polished milled rice, from the farmers it is sold directly to the millers or middlemen.

Uses of Rice

Dear learner, rice is used in many ways for food and other purposes. Bran is used to make oil, straws are used to make roof tops, baskets, hats, bedding and feeding animals, husks are used as a source of energy in bricks making.

Contribution of Crop Production to the Economy of Tanzania

The majority of Tanzanian heavily depend on agriculture; it is estimated that 75% of population is engaged in Agriculture.

There are many contributions of cash crop production to the economy of Tanzania, like:

a. It influences the development of livestock keeping. Since some of crops remains are used as animal food.
b. Cash crops is a source of income.
c. Cash crops lead to the growth of industries.
d. Promote employment opportunity to both skilled and unskilled labour.
e. Source of foreign exchange.
f. It leads to the improvement of infrastructures such as water supply.

Dear learner, there are several challenges facing large scale crop cultivation in Tanzania including high cost of production, relying on seasonal rainfall, population increase which resulted into shortage of land, poor government support, loss of soil fertility due to the act of practicing monoculture, poor management of pest and disease which leads to low production.

Contribution of Crop Production to the Economy of USA

Dear learner, in the previous section we have learnt on agriculture in general. let us see agriculture in America. In America agriculture is highly mechanized due to the use of advanced technology. Main crops produced are cotton, maize, soya beans and wheat.

Factors which lead to agriculture development in USA include; good soil which encourage the growth of crops, availability of market, abundant power supply, enough capital and use of advanced technology.

The following are the contributions of produced crops to the economy of USA:

a. It has stimulated the development of industries. Cash crops provide raw materials for processing and manufacturing industries.
b. It has led to the creation of employment opportunities in the country.
c. It has contributed to the generation of government revenue in the country and capital development.
d. It has stimulated external trade and international relations.
e. It has contributed to the development of transport and communication systems.
f. Encourages the improvement of living standard of the people in the country.
g. It has stimulated the development and growth of towns and cities such as Chicago and St. Louis.

Challenges Facing Large Scale Agriculture in USA

There are several challenges facing large scale agriculture in USA, some of them are:

a) High cost of production as agriculture in USA is highly mechanised.
b) Shortage of water as irrigation require a lot of water
c) Loss of soil fertility as the soil is eroded faster due to over cultivation and over irrigation.
d) Natural disasters affect transportation network which hinder transportation of products from field to store or market centres.

Livestock Keeping

Dear learner, you have already learnt more about agriculture. Now you know that agriculture simply means the cultivation of the field for the purpose of producing crops. However, this definition is too narrow as agriculture deals with many things and not only the cultivation of crops. Thus, in addition to the raising of crops, agriculture involves the keeping of livestock too. Examples of

animals that are kept are cattle, sheep and poultry. Fish keeping is also part of agriculture. It also involves storage, processing and marketing of the agricultural products.

In the first part of this unit you studied about the small scale agriculture and the large scale agriculture. This was meant to show you that there are various ways of growing food. The first step in the growing of food is the cultivation process. One needs land, equipment and labour in order to produce food or commercial crops. How big or small a farm is, the labour force applied and equipment used will determine whether it is a small-scale farming or large-scale farming.

In this section we shall deal with the management of livestock. We shall look at how livestock are kept at pastoral level, sedentary level and at commercial level. Livestock farming like crop production is also practiced either as a subsistence or commercial industry.

Livestock refers to the animals and birds kept or raised in a farm. They include cattle, goats, sheep, pigs, camel, horse and birds such as chickens and ducks. Much more, **livestock keeping** refers to the rearing of animals and birds.

The Subsistence Method of Livestock Keeping

Dear learner, under this method, livestock keeping is a way of life through which animals are kept to meet the basic needs of food clothing and shelter. Management practices are aimed at the survival of the animal and thus the survival of the families depends on those animals. There are two types of subsistence producers, the *pastoralist* and *agriculturist* (sedentary).

Pastoralism

Previously in this part we had a discussion about nomadic pastoralism as one kind of subsistence agriculture based on the herding of animals. They depend primarily on animals rather than crops for survival. Their lives depend entirely on livestock. They keep large herds of cattle, sheep and goats, which are grazed, on communally owned grazing land. Occasionally they migrate with their stock in search of water and pasture.

In Africa, pastoralists who in many areas still practice traditional methods of animal keeping, mainly keep cattle. The Maasai and Turkana are examples of pastoralists who are also nomadic and semi-nomadic. These people move from place to place in search of

areas with adequate water and pastures and where there are fewer pests and insects harmful to livestock.

Nomadic Pastoralism

Dear learner, nomadic pastoralism is a form of subsistence agriculture based on the herding of domesticated animals from one place to another searching for pasture and water. It is adapted to dry climate where intensive subsistence agriculture is difficult or impossible.

Pastoral nomads live primarily in the large belt of arid and semi-arid land that include North Africa, the Middle East and parts of Central Asia. The Bedouins of Saudi Arabia and North Africa and the Maasai of East Africa are examples of nomadic groups.

Unlike other subsistence farmers, pastoral nomads depend primarily on animals rather than crops for survival. They obtain milk, blood and meat for food, skins for tents (shelter) and bedding, and skins and hairs for clothing. However, most pastoral nomads like other subsistence farmers consume mostly grains rather that meat.

Characteristics of Nomadic Pastoralism:

i. Nomadic pastoralists usually move from one place to another in search of pastures and water.
ii. They keep large amount of animals.
iii. Animals kept are of poor quality, that is they produce small amount of meat, milk, etc.
iv. Animals are regarded as symbol of status and wealth.
v. Nomadic pastoralism is practiced in areas with either low rain or poor soils.

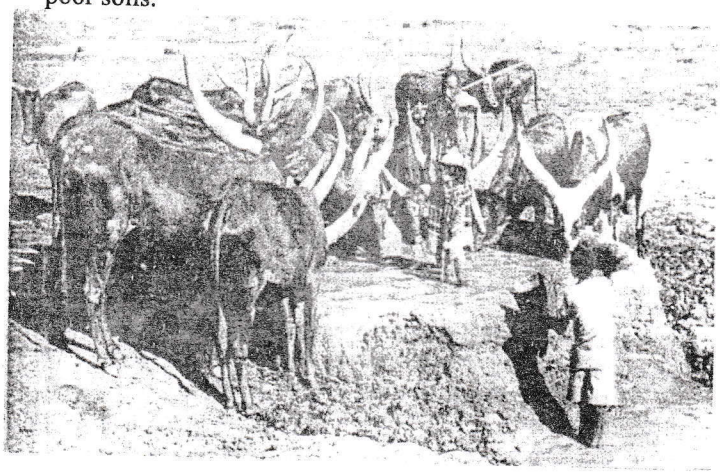

Figure 2.2: Bahima pastoralists in south-west Uganda watering their long-horn Ankole cattle

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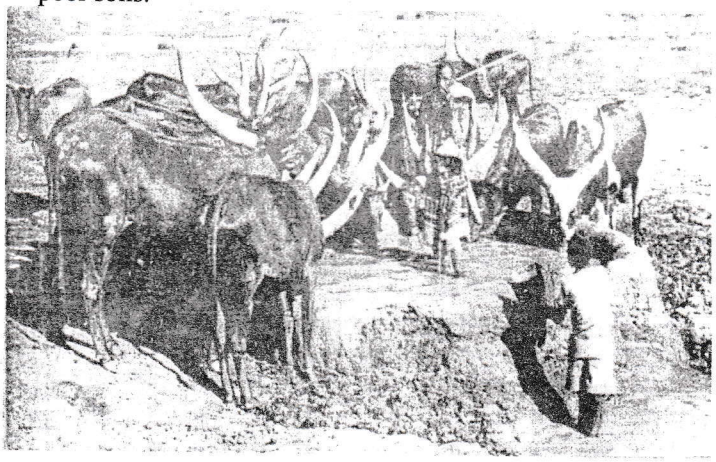

Figure 2.2: Bahima pastoralists in south-west Uganda watering their long-horn Ankole cattle

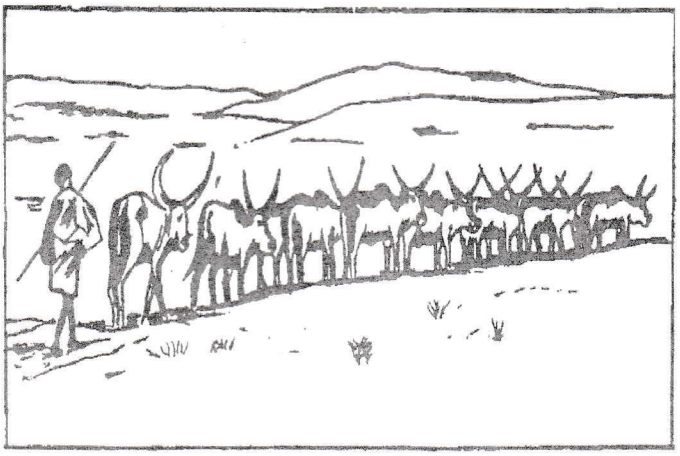

Figure 2.3: Ankole type of cattle with herdsman

Problems Facing Pastoralism

i) **Increase of Human Population**
Despite the size of their stock, pastoralist communities are still living relatively poor lives. This is because of increasing population of people and animals. Pasture land is reducing at a very fast rate. There are now more people and more animals than what the land can accommodate.

ii) **Poor Control of Pest and Diseases**
The pastoralists' ability to fight against diseases and pests is low. In addition, there is now serious overgrazing because of overstocking without care for the land. The results have been more serious in causing soil erosion and plant destruction.

iii) **Climate Problems**
Drought among other things has been a major problem facing most pastoralists. It is usually associated with acute shortage of water and pastures. Drought normally causes massive death of domesticated animals.

iv) **Shortage of Veterinary Services**
In most cases pastoralists do not get adequate veterinary services at the right time. Consequently, their animals end up not getting treatments.

Sedentary Livestock Keeping

The concept of shifting cultivation can be used here. If the individual farm families under shifting cultivation decide to remain permanently in the areas they have cleared, the system becomes sedentary cultivation. Similarly, there is a system that is called sedentary livestock keeping. This is whereby an agriculturalist who

cultivates land decides also to keep a small number of cattle. A pastoralist decides now to settle at one place and practices cultivation as well as keeping cattle, sheep, goats, etc. In this way we call him/her an agriculturalist.

Therefore, unlike the pastoralist who keeps on moving from one place to another looking for pasture and does not do any farming, the sedentary (agriculturalist) livestock keeper depends partly on livestock and partly on crop production for his/her livelihood. He/she is found in areas of medium to high agricultural potential. Unlike a pastoralist, he/she owns few animals and usually keeps them in an individual owned land.

Dear learner, I believe you know how to keep livestock at pastoral level as well as sedentary level. Let us now have a discussion on commercial livestock keeping.

Commercial Livestock Keeping

I hope you still remember what you read about commercial agriculture. The aim of commercial livestock farming is to produce animals' products in sufficient quantities for sale locally and in overseas markets.

Types of Commercial Agriculture

Mixed Livestock Farming

The most common form of Commercial Agriculture is mixed crop and livestock. Mixed commercial farming is found in Europe, Ireland, Russia, North America, South Africa, Argentina, Australia and New Zealand.

The characteristics of this kind of farming is that, the mixing integration of crops and livestock, is that most of the crops grown on a mixed farm are fed to the animals rather than consumed directly by humans.

Dairy Farming

Another type of commercial agriculture is dairy farming, which is the most important type. It is merely farming where also dairy keeping is carried out. It is practiced on farms outside the large urban areas of the Northern United States. South-East and North West-Europe. It covers mainly 220 percent of the total value of the agricultural rural output throughout Western Europe and North America. The Soviet Union, Australia and New Zealand also have extensive areas devoted to dairy farming. Nearly 90% of the World supply of milk is produced and consumed in these relatively regions.

Ranching

The commercial grazing of the livestock over extensive areas is a form of agriculture adapted to semi-arid or arid land. It is practiced in relatively developed countries where the vegetation is too sparse and rain is unreliable. The importance of ranching in the United States extends beyond the number of people who choose this form of commercial farming.

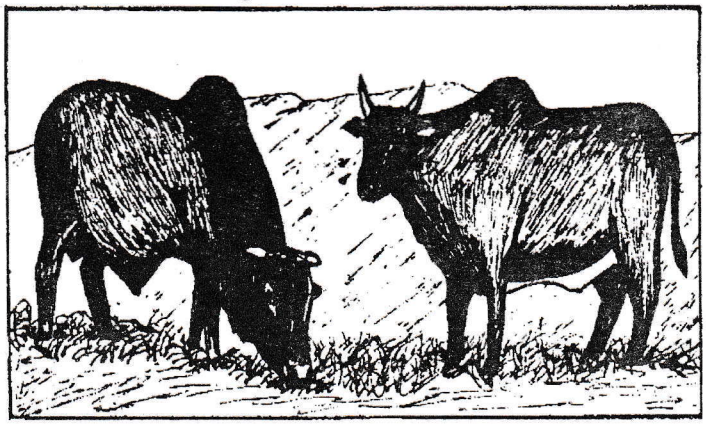

Figure 2.4: Quality bulls

Characteristics of Commercial Livestock Keeping

Under commercial farming, animals are kept in small or large farms which are well managed. this farming is characterized by the following characteristics: It has considerable capital investment, has quality stock, has machinery, has fencing structure, has wide range of labour, has water facilities, has disease control measures and output of animal products is very high.

Domesticated animals include cattle, goats, sheep, pigs, horses, donkeys, chicken and camels. These animals are kept for meat, milk, wool, skins, hides, eggs, manure and for transportation, that is, carrying goods or people from one place to another.

Cattle's rearing is important for beef, milk, cheese, butter, hides and skins. Cattle are kept on large ranches or under zero grazing. The most significant producers include Argentina, the U.S.A., Australia, France, the U.K. and Denmark. Main exporters are the U.S.A., Russia, Italy, Germany and Spain.

Commercial livestock in East Africa is organized on small and large scale. Few animals are kept for commercial purpose. A greater part of this undertaking takes place in ranches, large poultry

and piggery projects. Meat products include bacon, beef, lamb and pork. The Kenyan highlands and its rift valley, the northeast and southern highlands and coastal area of Kenya Highlands of Tanzania are also important in ranching.

The dairy products are milk, butter, ghee and cheese, wool from sheep, skins and hides are other products from animals. Sheep are reared for their wool, skin and meat (mutton). The merino sheep produces high quality wool. Other types of sheep reared in West Africa are kept only for their meat (mutton) and wool. Mutton and wool producers include New Zealand, South Africa, Uruguay, Argentina, Australia and Ireland. Main importers of wool are Japan, the U.S.A., Canada, Greece, the U.K., France, Italy and Germany.

Case Studies

Dear learner, we have learnt on livestock keeping in general. Let us see how Tanzania and Australia keep livestock.

Livestock Keeping in Tanzania

Livestock keeping in Tanzania, is generally not well developed, however it involves both subsistence and commercial livestock farming. Nomadic pastoralism is still practiced among the Maasai. Sedentary pastoralism is practiced by the Gogo and Sukuma. In most towns the people practice zero grazing where animals are kept indoor. There are few ranches for both dairy and beef cattle, some of which include Kongwa (Dodoma), Mabuki (Mwanza) and Ruvu (Coast region) some are in Arusha, Kagera and Mbeya.

Problems Facing Livestock Keeping in Tanzania

The following are the problems that face livestock keeping in Tanzania:

i) **Diseases**

The most common diseases are nagana and rider pest, foot and mouth diseases.

ii) **Soil erosion**

The impact of animals on the ground has caused considerable damage on soils. Much soil has been blown away and therefore not much grass can grow and agriculture cannot be maintained.

iii) **High tropical heat**

The occurrence of high tropical heat affect animals and result into shortage of water (high evaporation) and drying of grass (less nutritious.

iv) **Rigid culture**
It is believed that large herds of animals are prestige; the animals cannot be transformed easily into means of raising people's standard of living. Large numbers of animals result into destruction of the environment and animals' products are of low quality.

v) **Shortage of veterinary services**
In rural areas of Tanzania Veterinary Services are not well developed as a result animals are affected by diseases and this makes products of animal to be low.

vi) **Low level of education among livestock keepers**
Many livestock keepers do not have the appropriate knowledge on how to raise their animals. This has resulted into keeping of animals which are less productive.

Dear learner, I hope you have understood the challenges facing livestock keeping in Tanzania. It is now also important to learn on how other countries apart from Tanzania keep their livestock.

Livestock keeping in Australia
Australia is among the developed countries of the world and has a well developed livestock industry.

The livestock keeping sector in Australia is based on beef and dairy cattle keeping and sheep rearing. The animals are kept in rancher. The three areas are commercialized and the production is for the market, both domestic and international. Australia export wool and mutton (meat) to the European countries Australia is the most important wool producer in the world.

The success of livestock farming in Australia is a result of a combination of factors such as presence of large tracts of land (less suitable for crops production), technological advancement, use of high breeds (e.g. sheep), high level of education of farmers and reliable markets.

Dear learner, livestock keeping in Tanzania and Australia has some similarities and differences. Prepare to study the similarities of livestock keeping between Tanzania and Australia as explained in the following part.

Similarities of Livestock keeping between Tanzania and Australia

i) Livestock keeping in both countries there are common types of livestock kept. There mainly cattle, goats, sheep and poultry.
ii) Animal products and live animals are sold in countries, some common products meat, milk, skin, etc.
iii) In both Countries Sedentary livestock keeping is practiced at both the subsistence and commercial levels.
iv) Sedentary livestock keeping is practiced in both countries. This is done in areas that are highly populated .E.g. Chagga in Tanzania
v) Ranching in Tanzania and Australia is carried out in the sparsely populated areas. In Tanzania, It is mainly carried out in areas such as Kagera, Tanga, and Morogoro which in Australia this is practiced in the areas referred to as outback.

Differences of Livestock Keeping between Tanzania and Australia

i) In Australia more scientific methods are employed in the management and running of livestock keeping compared to Tanzania. Australia they use paddocks, animal food supplements and proper animal health care.
ii) Livestock keeping in Australia is more advanced than in Tanzania for example when it comes to use of machinery in activities such as milking ad sheep shearing.
iii) Pastoralism and sedentary livestock keeping add the main types of livestock keeping practised in Tanzania while in Australia, ranching is the main type of livestock keeping.
iv) In Tanzania main types of animals kept are cattle while in Australia main types of animals kept are sheep.
v) Livestock keeping in Tanzania is geared more towards meeting local demand while Australia export more than 60 percent of her livestock products.
vi) The breeds of livestock keeping reared in Australia yield more than those kept in Tanzania. This is because of continuous research that enhance productivity of the animals.

Unit Reflection

Observe agricultural activities which are carried out around your area. Apply the competence you have learned in this unit to provide education to farmers & livestock keepers to enhance productivity.

Unit Assignment

1. Describe major differences between small scale and large scale agriculture.
2. Explain types of large scale agriculture.
3. What are the advantages of small scale agriculture in Tanzania?
4. How can the status of women be improved in connection with small scale agriculture?
5. Describe any five effects of population pressure on small scale agriculture.

Unit 3

Management of Water Resources for Economic development

Introduction

Dear learner, in unit two you learnt about agriculture as one of important human activity for economic development. Development of agriculture and other sectors of economy depend on other resources for their growth and productivity. This unit will analyse water management practices for economic development where it will cover four areas which are: *Importance of Water and Sustainable use of Water Resources, Water Pollution, River Basin Development and Land Reclamation.* I hope that you will enjoy the lesson. Welcome:

Learning Outcomes

Dear learner, after the completion of this unit you should be able to:

- Explain the economic importance of water and sustainable use of water resources;
- Categorise source of water pollution;
- Analyse approaches to river basin development;
- Appraise various methods of water management; and
- Describe techniques used in land reclamation.

Introduction to Water

Dear learner, water can be explained as the colourless liquid found naturally on the land surface, atmosphere and underground reservoirs. Water can exist in liquid, solid, or gas state. Water indeed is the essence of life on it. About 70% of the earth's surface is covered by ocean water. Although 70 percent of the globe's surface is covered by oceans, less than 3 percent of the world's water is fresh, and more than three quarters, of that is frozen, mainly at the poles. Nine percent of the remaining fresh water is underground.

Water as a Resource

Dear learner, water is a resource. Water is useful and very important resource and commodity. Its importance lies within its usefulness. Probably, a human being can live for a number of days without forests, sunshine or soil but not water. Can you live without water? Impossible!

Sources of Water

When it rains some of the water sinks into the soil; some of the water goes to the seas and oceans; and some evaporates back to the atmosphere to form the clouds in the form of water vapour. Water is found in several places as the source of water like rainfall, wells, and springs, ponds, rivers, lakes, seas and oceans.

Dear learner, Tanzania is one of countries which has many water sources. There is the ocean. Can you name it? There are large lakes and rivers too. If you cannot mention them, you need to look for them in the Atlas. In it, you will find the Indian Ocean, Lake Victoria, Tanganyika, Nyasa, Rukwa, Eyasi, Natron and Jipe. The main rivers such as Rufiji, Pangani, Ruvu, Mara, Malagarasi and Ruvuma can also be seen. Most lakes, rivers and springs have fresh water except very few like the Natron, Manyara and Eyasi which have salt water.

Water is always unequally distributed. Enough water is not everywhere. While some societies have water in excess, others are suffering from shortage of water. While some regions are suffering from flooding, others are suffering from drought. When surface water supplies are insufficient, humans have traditionally mined some of the vast resources naturally stored underground. But ground water is also unequally distributed, only a little of it is economically exploitable and tapping it consumes liquid capital. So water is a scarce resource.

Water is not only becoming scarce but also its quality is also degraded. The River Vistula in Poland, for example, is so polluted with industrial and municipal wastes that its water is unusable even for industrial purposes. The industrialized countries have dumped billions of tons of pollutants into their rivers, estuaries and coastal waters. Aquifers are also becoming contaminated with chemical poisons.

Hydrological Cycle

Hydrological cycle is continuous circulation of water from the earth's surface to the atmosphere through about by evaporation, condensation into clouds and falling as rainfall.

Evaporated water from the surface of the earth is converted into water vapour which later condenses to form clouds. Some of these clouds form rainfall which flows overland or soaks into the earth to form rivers then back to the ocean. Great amount of water collects in ponds, river, lakes, dams, seas and oceans as surface water, while the rest sinks into the ground to form underground water.

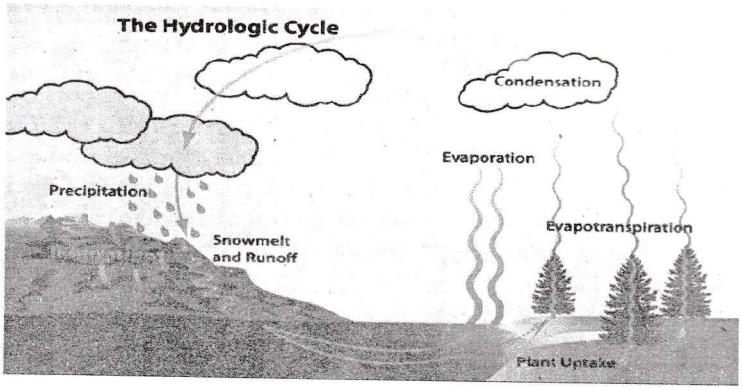

Figure 3.1: Hydrological cycle

Uses of Water

Dear learner, I hope that you have been using water from time to time. We usually use water for cleaning or washing, for cooking, for drinking. We also use water for some other occasional activities. So water is useful to every human being. The following are common uses of water in our daily life.

i. At homes, water is used for drinking, washing, cooking and in building. In agriculture water is used for irrigation in such areas as Kilombero and Arusha Chini. Rice farming depends on water for irrigation for example, in Rufiji and Pangani valleys and Usangu plains. Major rivers, which are used for irrigation in Tanzania, include Ruvu, Rufiji, Pangani and others.

ii. Water is also used to maintain vegetation because if there is no water, the vegetation will die. Do you know what happens if vegetation die? Of course you have heard of deserts. Haven't you? The environment will be affected if many areas will turn into deserts because vegetation help to bring rainfall and regulate climate, hence making human beings live happily.

iii. Wild and domestic animals require water for their survival, and these animals are also important for the country's economy as they provide meat, milk, hides, fertilizers, etc.

iv. Water is used for cooling and running machines in industries. Some industries use water as raw materials e.g. soft drinks, and other industries manufacturing juices.

v. Power used in industries is the hydro-electric power generated from rivers, e.g. Pangani and Rufiji. The Hydro-Electric Power (HEP) generated from those rivers is used to supply electricity to areas such as Dar es Salaam, Moshi, Arusha, Morogoro, Kilosa etc. People uses HEP for cooking and lighting in most urban areas.

vi. Water provides means of transport in Bukoba, Mwanza and Kigoma through Lakes Victoria and Tanganyika (Navigation).

vii. Water is also a good source of fishing. Marine fisheries in the Indian Ocean forms the major fisheries export for prawns, which are good for foreign exchange of the country. So, water is essential for all life in Tanzania and everywhere else in the world.

Figure 3.2: Great Rivers and Lakes of Tanzania

Dear learner, in Tanzania, water is used for domestic affairs (at home), in agriculture, for example in irrigation, in industries, for generating power, for transportation and for fishing.

Water Pollution

Dear learner, water pollution is an addition of pollutants to water making it unsafe for use by organisms and people. Also water pollution happens when toxic substances enter water bodies such as lakes, rivers, oceans and so on, getting dissolved in them, lying suspended in the water or depositing on the bed. It is said to be polluted if it contains much organic and inorganic wastes.

Differentiating the Main Source of Water Pollution

Dear learner, there are different source of water pollution which make water unsafe for domestic use. These are sewage (waste water), agricultural activities, oil pollution, radioactive substances, River dumping, and marine dumping.

i) **Sewage (Waste Water)**

Sewage is another name for waste water from domestic and industrial processes. Despite strict regulatory control, the Environment Agency data shows that water and industrial sewage accounted for almost a quarter of the serious water incidents in England and Wales in 2006.

ii) **Agricultural Pollution**

The agriculture industry covers 76% of the land area of England and Wales. Agricultural processes such as uncontrolled spreading of slurries and manure, disposal of sheep dip, tillage, ploughing of the land, use of pesticides and fertilizers can cause water pollution. Accidental spills from milk dairies can also affect the quality of water.

iii) **Oil Pollution**

Every year there are about 3,000 pollution incidents involving oil and fuels in England and Wales Oil spillages affect water quality in a number of ways. Oil can make drinking water unsafe to drink. A substantial amount of oil released into oceans and seas will destroy wildlife and the ecosystems that sustain them. Oil spills also reduce oxygen supplies within the water environment. The main causes of oil related water pollution are:

i) loss from storage facilities;
ii) spillage during delivery and;
iii) deliberate disposal of waste oil to drainage systems.

iv) **Radioactive Substances**

Radioactive waste is another source of water pollution. Radioactive substances are used in nuclear power plants, industrial, medical and other scientific processes. They can be found in watches, luminous clocks, television sets and x-ray machinery. There are also naturally occurring radioisotopes from organisms and within the environment. If not properly disposed of, radioactive waste can result in serious water pollution incidents.

v) **River Dumping**

River dumping is among major sources of water pollution. Garbage, thrush and litter are thrown inside and along the river banks every day. This practice is more common in city town and sub urban area where waste collection is poor and legal enforcement for protection of river is low.

Marine Dumping

The Worldwide Fund for Nature (WWF) estimates that a staggering amount of waste enters into the sea every year. Part of this is due to deliberate dumping of waste into coastal waters. Other sources of waste at sea include plastics and other materials blown or washed from land. Marine dumping is illegal under international and UK legislation. For more information visit the Marine Pollution page.

Ways of Conserving Water

Dear learner, after learning about sources and uses of water in the previous section, now continue with how water is conserved. The purpose of water conservation is to maintain a high level of infiltration and percolation through the soil and ensure that surface water is usable. Water conservation is best done when collective efforts from individuals, groups, private agencies and the government bring about the desired results.

Dear learner, each member in a given nation has a role to play in water conservation. The following are the different ways of conserving water.

i. Fishing by using chemicals should be prohibited.
ii. Much attention should be paid to all oil containers and pipe lines and other transportation systems so as to avoid contamination through spillage.
iii. Discourage settlement in catchment areas.
iv. Population control so as to avoid / reduce wastes production dumplings in the water bodies.
v. Use of fertilizers and chemical in farming should be cut down as much as possible to avoid contamination through surface run off.
vi. Wastes should be properly disposed of by burning or burying.
vii. Sewage disposal centres should be located far from water sources.
viii. Wastes should be recycled for example iron and steel materials, papers boards.
ix. Avoiding mining activities near water bodies.
x. Encourage the use of good fishing methods.

River Basin Development

River basin is an area of land drained by a river and its tributaries. It encompasses the entire land surface dissected and drained by many streams. It has features such as distributaries, watershed, and

convergence. Distributaries are small rivers flowing into Lager Rivers while watershed is an area of highland surrounding river basin. Convergence is the area where the river joined to another river.

River Basin Development Projects

River Basin Development projects are the schemes which are developed for different purposes. They are called multipurpose schemes because they are aimed at meeting many goals like flood control, water supply in the industries, irrigation schemes, settlement etc.

Example of river development projects in Africa are Volta River projects in Ghana at Akasombo dam, Orange River projects in South Africa, Gezira irrigation scheme in Sudan at Sonar dam, Aswan High in Egypt located on the Nile Mwea Tebere and Galole irrigation schemes in Kenya Rufiji Basin development, Kilombero basin development and Kagera development river basin development scheme. Out of Africa are the Tennessee valley projects, Indus in Pakistan and Ganges project in India and Amazon Basin development scheme in Brazil.

Processes of River Basin Development

Dear learner, there are several processes in the River Basin Development. These are:

i. Construction of the dams for retaining water.
ii. Dredging of the river. This refers to the removal of silt or mud from the river.
iii. Straightening and widening of the river channel so that it can accommodate more water.
iv. Clearing of vegetation where economic activities are going to take place.
v. Planting of trees of the sides of the river so as to prevent soil erosion and check the movement of the surface run off so as to reduce or prevent flooding.
vi. Creating some canals and installing the pipes that can help in irrigation.

Economic Importance (Benefits) of the River Development project

i. They help in the control of floods where they are established.
ii. They lead to the improvement of navigation in the respective rivers especially when the dams are constructed.
iii. Lead to the development of the fishing industry especially after the construction of the dam.
iv. Water is provided for the domestic use and industrial purposes.

v. Water also is provided for the irrigation schemes hence leading to the expansion of farms and increased agricultural production.
vi. They are used as research centre for studying ecosystems and their importance to human being.
vii. River projects encourage environmental conservation like the control of soil erosion by planting trees.
viii. They are used as research centres for studying ecosystems and their importance to human being.
ix. River development project have encouraged the development of towns in many places e.g. in Germany most of the towns like cologne, Bonn and Frankfurt are found along the rivers. Hence they can help in solving the problem of overpopulation.
x. Employment is usually created in river basin development projects.
xi. They are centre for hydroelectric power generation.
xii. Silt removed from the river during dredging adds fertility to the soil and hence promotes farming.

Problems and Disadvantages of River Basin Development Project

Dear learner, River basin development has various disadvantages based on the problems, which are caused by scheme itself. These include:

i. The projects lead to the increased debt crisis in the developing countries because of borrowing money from the developed countries.
ii. The projects can cause soil erosion if they are not well managed.
iii. They cause environmental pollution like the increase in salt (Salinization) in the soil, acidification because of the use for chemicals in agriculture and industrial waste disposal as well as air pollution as a result of introduction of gases like methane and carbon monoxide into the air.
iv. The construction of dams leads to the displacement of people. This is disturbance and can cause loss during migration.
v. The projects are expensive to establish hence they consume a lot of capital.
vi. They also lead to the outbreak of diseases, which affect people.
vii. They can cause overpopulation since many people are attracted to establish their settlement.
viii. Occurrence of conflicts between countries that share the river.

Case study

Dear learner, after looking the benefit, organization and problems faced river basin development; it is the time now to see different case studies concerning the river basin projects as case study.

Hydro-Electric Power Projects

Electricity power stations in Africa are of two main types: **thermal power stations** and **hydro-electric power stations.**

Hydro-electric power is one among the main sources of energy used in developing countries. This type of power comes from the power of water. The best site for a H.E.P. generation station is to be close to a large market where electricity will be consumed.

The necessary conditions for generation of HEP are heavy rainfall spreading over the year so that there is a regular supply of water to turn the turbines, large and fast flowing river, deep, narrow valleys whereby the dam can be build, and a firm (very strong) rock base for building the dam.

Hydro-electric power provides more than a fifth of the entire world's electricity output. The World's Energy Conference had predicted a raise in HEP output to at least six times by the year 2020. The most potential for this lies in developing countries. North America, which has accounts for about a third of global production, has already used 59 per cent of its potentials for dams. The third world has harnessed only 7 percent of its HEP resources.

How Water is used to Generate HEP

The diagrams below shows how HEP is generated.

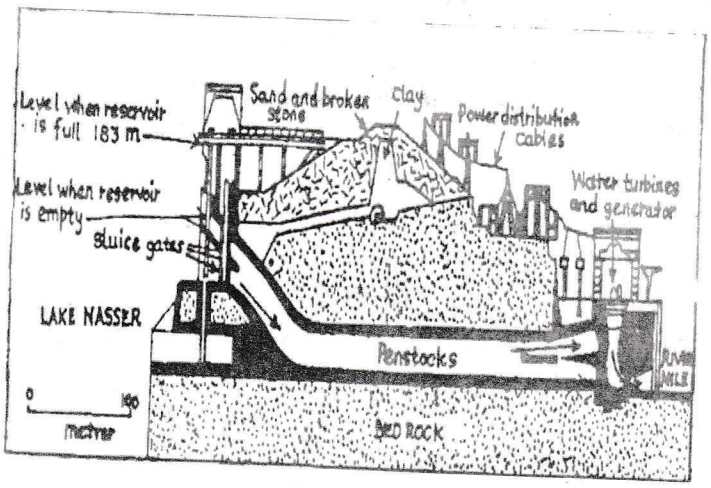

Figure 3.3: A section through the Aswan High dam

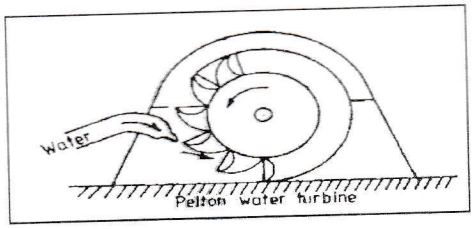

Figure 3.4: How water turns the turbine to produce electricity

In hydro-electric power stations, the force of running water is used to turn the turbines. Large quantities of water pour down from behind the dam wall through pen stock pipes which turn the turbines with great speed so that electricity is generated. When the valves are opened jets of water strike the cups of the pelton wheel turbines, forcing them to rotate. A **turbine** is a machine, which can be driven round by water steam or gas under pressure. A *transformer* is a device without any moving parts which changes the voltage of the electricity supplied to it.

In short, water moves from the reservoir to the penstock where it turns the turbines and forces them to rotate. The generators then start to operate sending energy to the transformer, which passes electricity to consumers through the transmission lines.

Problems of Power Production and Distribution in East Africa
The problems which face power production and distribution are the following:

(a) Market Problem
The amount of electricity produced in East Africa is at present small, the region has a great potential for the development of HEP. The main problem of not producing much is the small size of the market. Do you know what it means when one says small size of the market? It means there are few people who use electricity both in their homes and offices.

(b) Uneven Distribution of Human Population/Settlements
Another problem facing power production and distribution in Africa including Tanzania is that people are scattered (there is a long distance between houses or villages, people are not found to be clustered).

(c) Fall of Water Levels in Dams and Reservoirs

Due to rain shortage, this have resulted into equate shortage of electricity. This hinders smooth operation of industrial activities.

(d) Silting of Dams and Reservoirs

Gradually accumulation of sediments in dams used to generate electricity has resulted in a decrease of the depth of dams, causing problems in the generation of electricity.

HEP in Tanzania and Africa

Dear learner, we have several rivers in Tanzania which have good sites for the production of HEP and there are several power projects such as Mtera, Kidatu, Pangani, Nyerere and Nyumba ya Mungu. Power stations situated in Pangani River are at Hale, Pangani Falls and Nyumba ya Mungu. Other bigger power projects in Africa include the Aswan High Dam in Egypt, the Akosombo Dam in Ghana, Owen Falls project in Uganda.

In Tanzania, the Tanzania Electric Company, (TANESCO) indicated that Tanzania would require more electricity for fast development, and they are encouraging people to use electricity. They are also asking people to take precautions against electricity by taking care of themselves because electricity is also be dangerous. People are asked to use electricity for development. If the number of people who use electricity will increase, automatically the speed of using firewood will decrease, hence trees will not be cut down for firewood and charcoal, therefore, the environment will be protected.

The map of Africa below shows key river projects which are producing HEP in the African continent.

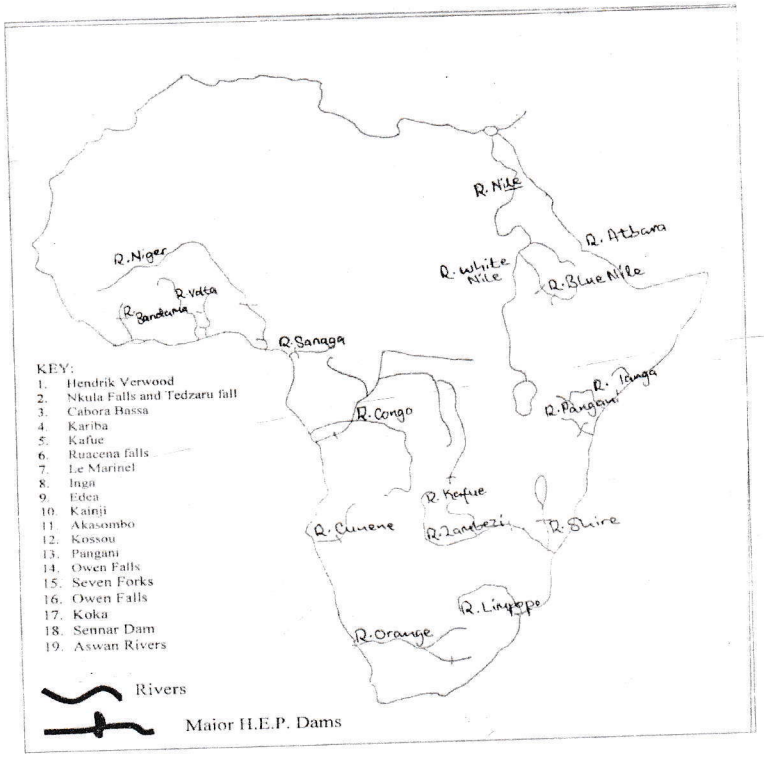

Figure 3.5: Iimportant H.E.P. Schemes in Africa

Dear learner, although hydro-electric power produced in most African countries is fairly small, it has a number of advantages as well as disadvantages, which include:

Advantages

i) It stimulates development of industries.
ii) Encourages environmental conservation since it reduces the dependence on the forest for power.
iii) It encourages development of the agricultural sector, tourism and the mining section.
iv) It promotes the living standard of people.
v) It provides foreign currency when it is exported to other countries.
vi) It encourages the development of science and technology especially in the communication system like internet services.

Disadvantages

i) The major disadvantage of HEP is the fact that the cost of building the project tends to be very high, especially if a very large dam is needed.
ii) Construction of HEP dam raises problems of resettlement in towns and villages as there should be the displacement of people. For example, 60,000 people had to be resettled when the Kainji Dam was built in Nigeria, and 80000 when the Akosombo dam was built in Ghana.
iii) Spreading of water borne diseases through irrigation channels example bilharzias, malaria, etc.
iv) They also trap silt that would otherwise fertilize land downstream.
v) When dams bust floods can occur downstream resulting into loss of life are properties.

River Basin Development Projects

Dear learner, remember that you learnt something about river basin in the previous unit. Here it's going to be elaborated more.

A river basin is the drainage area of a river and its tributaries. Tributaries are small rivers which contribute its water to a main river by discharging it into the latter from either side, and at any point along its course. Most of the rivers in East Africa have large basins, which are not developed, and in these basins a lot of activities are practiced. The river basins are rich in good soils. Examples of river basins in Africa include Tana in Kenya and Kagera in South West Uganda and North Western Tanzania. A lot of people settle in the river basins to carry out farming activities. So if a country wants to develop such areas and own them to the government, people should be shifted to other areas. The shifting of people to other areas causes disturbance to those people because it takes a lot of time for them to establish new settlements.
Let us take a few examples as our case study of river basin development projects.

The Kagera River International Development Scheme

The Kagera River is one of the major sources of River Nile, via Lake Victoria. The Kagera forms part of the boundary between the four countries, so it is an international river basin. The countries are Tanzania, Uganda, Burundi and Rwanda which agreed in principle to cooperate and they prepared a plan in 1979. Uganda joined in 1981. Each member country's government has to be consulted, represented and has to approve any plan for its development. The establishment of Kagera River basin was done in three phases as follows:

Phase I: In 1977 Tanzania proposed building a high dam at the Rusumo falls to generate 120 megawatts of electric power. But it was later on argued for a 40-megawatts dam. Do you know what happened? It was realized that nearly 10,000 hectares of Rwanda's land would be consumed, leading to the resettlement of 22,000 families. Burundi would lose 5600 hectares and would have to resettle 3000 families.
If this had happened what do you think would have been the effects to the environment? Probably the flooded soils would have lost, production would have been minimum, life standard could have dropped and people would have been many in new areas.

Phase II: In May 1981 a smaller dam and reservoir was agreed to be built. Still, this also was realized to cause flooding of some land in Rwanda and Burundi.

Phase III: This was about resettling of people. People were shifted to new areas so that the whole basin area would be left for development.
However, whenever there is a development on one hand, there are also problems on the other hand. Two problems occurred. The first one is that many people had to be moved away before the work starts on the project site. So, people were to be disturbed. The second one was that clearing bushes and building to have access roads. All these activities needed labour, so people were to be forced to work; the environment was also affected by the clearing of the land.

The Tennessee River Valley
Tennessee River is the tenth largest river in the United States of America. In 1933 the Tennessee valley had a population of about two million. People settled there because of the fertile soils. Once people started to increase they cleared more and more land until they began to cultivate on steep valley side. Do you know what happened? This was a very poor method of cultivation, so the unprotected soils were severely eroded.

The government then planned to develop the Tennessee River basin and solving the economic problems of people. The task was given to the Tennessee Valley Authority, and the aims were to:;

i) To control flood,
ii) To raise the standard of living of the population,
iii) Improve navigation,
iv) Develop hydro-electric power,
v) Improve the use of land,
vi) Carry out reforestation projects (planting trees).

Therefore, 32 dams were built so as to control floods. In order to control or prevent soil erosion farmers were educated on how to practice soil conservation, including crop rotation, terrace farming, etc. Trees, which were planted on the eroded hills, provided timber, pods for cattle and food for human consumption. Farmers were also taught the use of fertilizers and insecticides.

As a result, the production of food increased, navigation was made possible because of building of the dams. Before 1935 only 3% of the farms in the Tennessee valley had electricity. Today almost 100% of the farms enjoy this service which is provided by hydro-electric power plants below the dams.

Electricity is now used for both industrial and domestic purposes. The use of electricity has stimulated the development to industries in the Tennessee valley; the water reservoirs created by building dams look like huge natural lakes which attract tourists from all over the country who also increase the income to the states and increase development. Fishing activities developed both in the rivers and in man-made lakes.

Land Reclamation in the Netherlands

Reclamation is the process of turning waste land into productive land. In most cases, land reclamation bases on the improvement of land, these are covered by water and make it useful for human's purposes.

In the Netherlands, natural and man-made defences (dykes) protect areas below sea level from the sea. Areas, which have been reclaimed from the sea or lakes, are called **polders**. Do you know the main purpose of reclaiming the land in the Netherlands? The agricultural land was not enough, and there was frequent flooding from seas and rivers hence there was a need to increase the land, especially for agriculture. In 1932 they completed 29-km along sea and five polders were created. (See figure 11). The famous reclamation project in Netherlands was the Zuider Zee, which begun in 1927, and today half of the Netherlands consists of reclaimed land, and these lands are the most fertile and densely populated parts of the country.

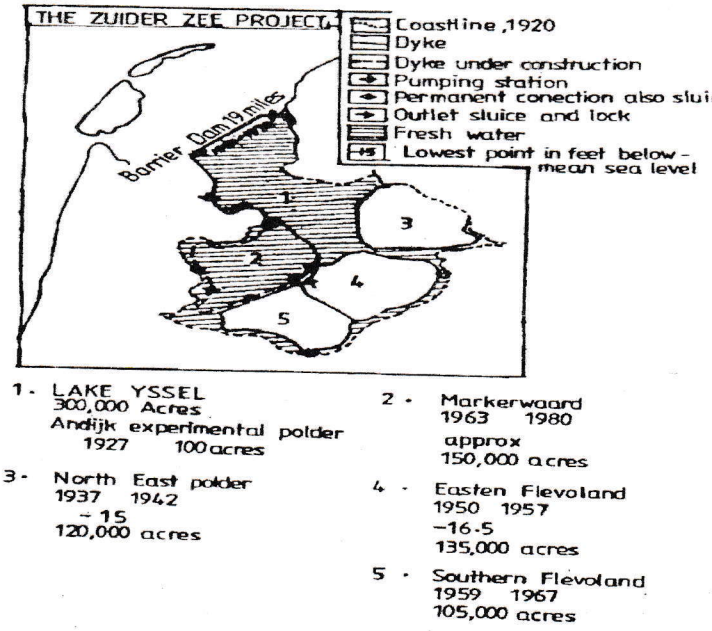

Figure 3.6: Reclaimed Land in Zuider Zee

Techniques used in Land Reclamation

In order to reclaim the land from sea or lake advanced engineering and drainage techniques had to be developed. The boulder clay is brought to construct the walls; the central part between the bolder clay walls is filled with sand pumped from the seabed. Bush wood mattresses sunk into position by weighting with stones protected the outer parts of the boulder clay walls. Finally the exposed slopes of the dyke are faced.

When the enclosing dyke has been completed, the polder is still a long way from being ready for use. The water inside the protective dyke has first to be pumped out, revealing the former sea or lake bed. Then the exposed land can be surveyed in detail to find out what type of soil is in the area.

At this stage, the soil is too wet to use and in order to dry it reeds are sown. Reeds prevent weeds from growing, and because they transpire water, they help to dry out the soil. When the soil has dried out sufficiently, the best quality reeds are cut and used in the making of the brushwood mattresses, which face the enclosing dykes. Drainage ditches are then cut in the land and drainage pipes are laid below the soil.

However, before allowing people to live in these areas state organizations used the newly reclaimed land for the first few years during which time further testing of the soil takes place, and experimental cropping is done. In addition, farms are laid out, roads and houses built, and other services are provided, pumping has to naturally continue all the time to prevent water from building up in the soil.

Now, after you have read on what real took place in the Netherlands, are you aware that even other lands can be reclaimed for economic uses? These are such as marshes, bogs, wetlands, swamps and deserts can be reclaimed and used for agriculture, settlement, offices and even industries.

Application of the methods which were used by the people of Netherlands seems to be difficult for Tanzania and most of African countries. This is because the cost of reclamation is very big and some of the areas, which need reclamation, are not big enough for reclamation techniques to be applied.

All in all, other means can be applied. In wetlands and swamps plants which dry water quickly can be planted so as to make those areas dry. A country can even try to import those types of plants.

For the deserts countries can plant trees which survive dry conditions, and these trees will later on regulate the climate and nature of those areas to be productive ones. Also trees can produce a lot of products such as timber, medicine, and food.

For badly eroded lands e.g. the gully eroded areas of Kondoa, trees can be planted and irrigation used. But, again the cost will be high because water for irrigation will have to be carried from far.

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Unit Reflection

Now, reflect on what you have learned in this unit and try to make a summary of it.

How effective are water resources utilized in your local community level?

Unit Assignment

1. Explain the economic importance of water in your local area.
2. Explain the necessary conditions for generation of HEP?
3. Draw a map of Tanzania to show Hydro-electric power stations.
4. Briefly describe the major problems limiting the development of River Basin Project in Tanzania.

Unit 4

Sustainable use of Forest Resources

Introduction

Dear learner, the wealth of a nation is to a large extent determined by the ability of its people to utilize natural resources. Proper and sustainable utilization of the resources can result into sustainable development of the country and its people. Forests make one of the natural resources that contribute to national development. This unit is about forest resources. I believe this unit is relevant to you.

Learning Outcomes

Upon completion of this unit you should be able to:

- Describe the importance and value of forest in socio and economic life ;
- Explain factors for distribution of forests;
- Examine the contribution of forests to economic development;
- Describe problems facing forest resources harvesting.

Introduction to Forests

Dear learner, do you know the meaning of forest? A forest is a large area dominated by trees or it is a large area where trees grow close together. Sustainable use of forest enhance the economic, social and environmental values of all types of forests, for the benefit of present and future generations.

Forests and trees, when sustainably managed, make vital contributions to both people and the planet, bolstering livelihoods, providing clean air and water, conserving biodiversity and responding to climate change.

The Importance and Values of Forests in Social and Economic Life

Look around your home environment. Which products are produced from forest resources?

List them below:

i) _____

ii) _____

iii) _____

Dear learner, forests play an important role in our daily lives. A variety of goods and services that we use to simplify our lives are derived from forests. It is not possible to sum up the importance of forests in a few words. Forests impact our lives in so many ways. They are of great social and ecological significance to mankind.
The following are some of the reasons why forests are very important:

a) Forests are of immense economic importance to us. For example, plantation forests provide humans with timber and wood, which is exported and used in all parts of the world. Timber is used in building and construction, making furniture, tool handles and for ship building, among other various uses.
b) Trees also provide tourism income to inhabitants (people living in or close to forests) when people pay a visit to see the beauty of nature (ecotourism).
c) Forest trees are valuable sources of wood and charcoal which are used as fuel in many parts of the world. In many developing countries, Tanzania inclusive, more than 80% of total energy (fuel wood and charcoal) consumed by people and industry is derived from forests.
d) Wood pulp which is used to make paper is derived from a variety of softwood trees.

Dear learner, apart from importance and values of forests in social and economic life, there is importance of forests in ecological and environmental balance as explained below;

The Importance of Forests in Ecological and Environmental Balance

The following are the importance of forests in ecological and environmental balance

a) Forests serve as habitats to a diversity of animal species and they also serve as settlements for many different wild tribes. Certain tribes such as the Hadzabe and Tindiga in Tanzania live and earn their living in forests. They live by gathering fruits from the forests, hunting wild animals for meat, and harvesting honey. They get all their daily needs from the forests.
b) Forests protect the watersheds (water catchments). Many rivers and streams have their sources intense forests. This is because of the heavy rainfall often experienced in these areas. So forests serve as sources of rivers and springs, the water resources that are needed by man for livelihood. The Amazon is by far the largest watershed and largest river system in the world occupying over 6million square kilometers. Over two-

thirds of all the fresh water found on Earth is in the Amazon Basin's rivers, streams, and tributaries.

c) Forests help in maintaining the water cycle. When the rain falls some of the water is absorbed by plants in the soil through roots. The water absorbed by trees is then released into the atmosphere through plant leaves (transpiration) where it condenses to form a mass of tiny water droplets (clouds). After these water droplets have gained enough size and weight, they fall down as rain under the influence of gravitational pull.

d) A variety of chemical substances are obtained from the forest trees. The barks of mangrove trees that are common along the coast of East and West Africa provide tannin which is used for tanning leather. Chicle, a milky sap obtained from the bark of the zapote tree from the tropical rainforest of Central America is a raw material used for making chewing gum. Wild rubber and balata juices used for making machinery belting are also obtained from tropical forests.

e) Forests play the most important role in environmental conservation. Trees give out moisture via transpiration, a phenomenon which increases the atmospheric moisture content and hence rainfall. The air in and around forests is cold for most of the time, there by providing a pleasant micro–climate. Acer saccharin (Sugar maple) is best known for being the primary source of maples Forest trees also serving as wind breaks, thus helping to reduce soil erosion by wind. Trees also prevent soil erosion by providing a soil cover that offers protection to the soil against the impact of direct rain drops. In this way, they both protect the soil from water erosion and loss of water via evaporation of moisture from the soil.

f) Climate control and atmospheric purification is crucial for human existence. Trees and soils help regulate atmospheric temperatures through a process called evapotranspiration. This helps to stabilize the climate. Additionally, they enrich the atmosphere by absorbing bad gases (for example, carbon dioxide and other greenhouse gases) and producing oxygen. Trees also help to remove air pollutants.

Types of Forests

Dear learner, can you identify types of forests you know? As we have learnt, a Forest is a dense growth of trees, plants and undergrowth covering a large area of land. Forests can be

categorized into *two* broad types: *Natural forests* and *planted (artificial) forests.*

Natural Forests

Natural forests are forests which develop naturally without intervention of man. Natural forests have some characteristics including the following: trees of different types grow together, most of the trees are hardwood, the trees in these forests are indigenous to the area, and there is dense or thick undergrowth.

Figure 4.1: Natural Forest

Distribution of Forests by Type

Due to factors such as climate and tree species, natural forests can further be subdivided into the following broad categories:

1. **Tropical Rainforests**; they are found around the equator, between 23.5°N and 23.5°S. Trees in the tropical rainforests are tall and often take a very long time to mature. They consist of indigenous trees which are typically broad-leaved, and they contain thick under growths of shrubs and other vegetation.

2. **Temperate Forests**: These forests occur in the mid-latitudes of both hemispheres. There are four distinct seasons in temperate deciduous forests and precipitation falls throughout the year, as rain in the spring, summer and fall and snow in the winter. The forest floor in temperate forests supports mosses, ferns and wild flowers. Maple, oak and birch trees are some examples of the deciduous trees that dominate these forests. There are also small numbers of evergreen trees such as pines and fir.

3. **Coniferous Forests**: Coniferous forests are typically found in coastal areas with mild winters and heavy rainfall or in in-land mountainous areas with mild climates with temperature that fluctuates little throughout the year. Evergreen conifers dominate these forests. They are characterized by evergreen, needle-leaved trees, with little undergrowth and tall trees which take very long time to mature. Dominant tree species found in coniferous forests include cedar, cypress, douglas fir, pine, spruce and redwood. Some deciduous trees such as maple, and mosses and ferns are common in coniferous forests.

4. **Boreal (Taiga) Forests:** These are the northernmost forest type and are found between 50°N and 60°N. Boreal forests are characterized by long winters and short summers. Most precipitation is in the form of snow. Trees are mostly evergreen and include species such as spruce, fir and pine.

Planted forests

Planted forest is a type of forest that at maturity is predominantly composed of trees established through planting and/or deliberate seeding. Some characteristics of planted forests include having trees are mainly of one species, planting in rows in order to make harvesting work easy, having trees which are or may not be indigenous to the area, and having trees which most of the are softwood. Fig 12. Show image of planted forest in Iringa region.

Figure 4.2: Planted Forest

Factors for Distribution of Forests

Forest distributions are affected by a number of factors which include the following:

1. **Soil**: Different types of soil offer various types of vegetations. For example, a damp and marshy soil will favour growth of types of trees such as mangroves, which are generally found on

3. **Coniferous Forests**: Coniferous forests are typically found in coastal areas with mild winters and heavy rainfall or in in-land mountainous areas with mild climates with temperature that fluctuates little throughout the year. Evergreen conifers dominate these forests. They are characterized by evergreen, needle-leaved trees, with little undergrowth and tall trees which take very long time to mature. Dominant tree species found in coniferous forests include cedar, cypress, douglas fir, pine, spruce and redwood. Some deciduous trees such as maple, and mosses and ferns are common in coniferous forests.

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the coastal areas of the tropics or subtropics. On the other hand, sandy soils located in dry desert areas will support prickly bushes and cactus where the aim of the plant is to conserve water.

2. **Rainfall:** Water is an essential component of all living organisms. Trees need water for various physiological functions such as photosynthesis and cooling. Hence, it is essential for growth and development of any particular vegetation. Forests thrive well in areas that receive sufficient rainfall which is evenly distributed throughout the year.

3. **Temperature**: The warm and wet equatorial climate supports the growth of mainly huge, tall, deciduous trees. The cooler temperate climate supports needle-leaved trees which are adapted to that particular climate. The moderately hot tropical climate supports a variety of softwood and hardwood trees which thrive best in the tropics.

4. **Relief**: Relief refers to variation in altitude in an area. Differences in altitude along the slope of a mountain bring about differences in the type of forests along a mountain slope. For example, you will always find dense forests on the foot of Mount Kilimanjaro. As you move up from the foot of the mountain, the vegetation type and density changes gradually. At a height ranging between 1800 and 2800 m, there is the tropical rainforest, followed by the temperate forest at around 4000m. Between 3000 and 3500 m, the forest is dominated by scanty vegetation, with patches of a bamboo forest.

5. **Aspect**: In physical geography, aspect generally refers to the horizontal direction to which a mountain slope faces. The slope of a mountain facing the direction of prevailing winds (windward side) will always receive higher amounts of rainfall than the slope facing the opposite side (leeward side). For this reason, dense forests will always grow on the windward side, due to abundant rainfall, while the leeward side will consist of scanty and poor vegetation.

6. **Drainage:** If the soil has too much water, plants cannot get enough oxygen from the soil. This will affect root respiration and the plants may eventually die. On the other hand, plants cannot grow well if they do not have healthy roots for absorbing water from the soil. So, the proper balance of plant health, water and air is necessary for maximum plant growth and development. Well drained soils support growth of a variety of big trees compared to water-logged and swampy

lowland. However, few plants such as mangrove can thrive in shallow sea shores which are more or less permanently covered by water.

7. **Human Activities:** Human activities such as clearing the vegetation to get land for agriculture or settlement greatly affect the distribution of forests. Most of the natural forests of the world have been cleared by man. In some parts man has planted forests (artificial forests) on bare lands or in place of natural forests.

Importance of Forests

i. Forests prevent soil erosion; trees and grasses prevent movement of agents of erosion like water winds and moving ice.
ii. They maintain water sources like rivers, catchment areas, springs and lakes. This is due to the fact that forest support rain formation.
iii. Forests are also used for scientific studies (research).
iv. Where there is a variety of trees, tourism can develop because of scenic beauty. Hence the country can gain foreign money.
v. Forests provide habitats for animals and birds of different varieties.
vi. Forests contribute to the modification of the climate especially through rain formation and moisture conservation.
vii. Forests also introduce Oxygen in the environment which is produced during photosynthesis. In this process the trees clean the air by absorbing Carbon dioxide. Carbon dioxide is the raw material used during photosynthesis.
viii. Trees are also a source of fuel energy since they are used for firewood and charcoal making.
ix. Forests also provide raw materials for paper and pulp industries from which writing materials are produced.
x. They provide building material like poles and timber.
xi. Some tree species are used for making medicine and also provide fruits as well as ornamental flowers.
xii. Forests contribute to soil development through rotting of leaves which lead to formation of humus. Humus is very important in plant growth.

Types of Forest Resources

Dear learner, there are many forest resources products which include the following:

- Timber for making furniture and constructional works or match making for pit pups and making of wood pulp for manufacturing new prints and crayon. In Brazil 30% of timber is used mainly for furniture, harbor piles and clock

gates, boat building and tanning extractions, 70% is used for fuel.

- Fiber materials for different uses such as shifting for upholstery cushions etc.
- Oil from nuts which can be processed for vegetable oil.
- Fruits and flowers for human and animal consumptions.
- Wood pulp USA, Canada, Russia, Japan, Sweden, Finland, France, Germany, China, Brazil, Norway, New Zealand.
- Tannin, which is obtained from the hemlock tree of North America and Europe.
- Oak and chestnut of the temperate hardwoods, quebracho of Southern Brazil, Paraguay and Northern Argentina, wattle tress of East, Central and South Africa and mangrove from the tropical coastlands.
- Palm and creeper products, such as: palm oil, coconuts, mat and basket weaving materials from many varieties of palms such as pandamus and raffia; and furniture, basketry and weaving materials from bamboo and creepers like rattan.
- Medicinal materials, such as: quinine from cinchona tree, cocaine from coca plant, and camphor from the camphor tree.

Ways of Obtaining Forest Resource.
Dear learner, there are two ways of obtaining forest resource which are *uncontrolled method and controlled method.*

Uncontrolled Method
Plant cover is removed over an extensive area and leave the land open unreliable to erosion agents i.e. using fires, shifting cultivation, deforestation.

Controlled Method
Are governed by government directions which discourage the use of fire and encourage sustainable development of forests for the benefits of the people and the creatures that inhabit such places. They include reforestation i.e. planting trees to replace harvested forest resources.

Important Areas and Transportation of Forest Products in the World

Important Countries in Timber Production
Dear learner, there is important countries in timber production because forests exist in almost every country; they are equally

exploited for their products. Many countries produce, use and export a variety of forest products.

The following are the world's leading countries in production of forest products:
Countries in timber and wood fuel are: Russia, USA, Brazil, China, Canada, Indonesia, Japan, Sweden, Nigeria, France, Finland, and Germany.
Timber from hardwoods: Indonesia, Brazil, India, China, USA, Russia, Nigeria, Tanzania, Malaysia, Philippines.
Timber from softwoods: Russia, USA, Canada, China, Sweden, Finland, Brazil, Germany, Japan.

Factors Which Have Led to the Development of the Timber Industry

i. Low temperature discourage settlement hence leave room for trees.
ii. Enough rainfall leads to the growth of the coniferous forests
iii. Availability of capital.
iv. Cheap means of transport.
v. Sound forest management strategies.

The Means of Transportation and Problems of Timber Transportation in the World

Harvesting and transportation of timber face many challenges in many ways. The movement of logs and timber from the forests to sawmills or market face many challenges. The logs are pulled by tractors or lorries out of dense forests to saw mills or markets. Where sawmills are located far away from the forests, they are loaded and transported to sawmills by Lorries. The sawn timber is then transported to local markets for sale or exported overseas.

In Tanzania, timber and logs are transported by lorries from production areas (mostly Iringa, Mbeya, Mtwara, lindi and Ruvuma regions) to Dar es Salaam where they are sold or shipped to overseas markets.

Within the tropics, the major problem is moving logs from deep in the heart of the forest to the mills. The areas where valuable trees are found are undeveloped, impenetrable, and remote and they often lack access roads. The valuable tree species are also scattered within the forests. This means covering large areas of the forest harvesting the desired tree species, a situation which makes transportation of logs very difficult. Many tropical trees have big trunks and are heavy. This makes it impossible to transport them by floating on rivers. Bad enough, some rivers that could be used to transport the logs are interrupted with waterfalls and rapids, and are covered with dense floating vegetation's such as water hyacinth.

Timber transportation in temperate forests is much easier. The tree species grow in pure stands. This means that one area is covered by one species of trees all of which are almost of the same age. The tree trunks are smaller and lighter than their tropical counterparts. So the logs can easily be floated downstream to the saw mills which are located along rivers. In comparison to tropical forests, transportation problems are minimal. The logs are pulled along the partly frozen ground in winter by tractors and caterpillars onto the rivers. Also, there is little undergrowth in the forests. So transportation is not hindered as it is the case in the tropical forests.

Timber Industry in Gabon

In Gabon natural hard wood is available like; Mahogany, Ebony and iron wood.

Factors which Have Led to the Development of the Timber Industry in Gabon

i. Availability of many tree species.
ii. Availability of rivers like Ogowe facilitates the transportation of the timber products.
iii. Large foreign companies which were given concession to exploit the forests have capital.
iv. Constant market for timber products.

Problems Arising from Exploitation of Forest Resources

Dear learner, over the last fifty years about half the world's original forest cover has been lost. The most notorious cause for this loss is unsystematic use of forest resources by man. When we take away the forest it is not just the trees that go. The entire ecosystem begins to fall apart with dire consequences for all of us. Over exploitation of forest resources can cause the following problems;

Cutting down trees indiscriminately exposes the soil to agents of erosion. If correct measures are not taken in time, the soil may get eroded badly to such an extent that it can turn into bad lands or even semi-arid.

Many forests form water catchments. Clearing the forests from such places can lead to destruction of water sources, a fact which can cause drought and hence water shortage and eventually aridity. Cutting down trees carelessly, without taking actions to replant the new ones, can eventually lead to change in climatic conditions leading to drought and famine. It also deprives the animals of the habitat.

Trees also help to absorb Carbon dioxide gas from the atmosphere. So reduction of the forest cover through deforestation can cause accumulation of Carbon dioxide in the atmosphere and result in greenhouse effect, which causes global warming.
Uncontrolled harvesting of forest resources eventually leads to scarcity of forest resources. This may, in turn, lead to extinction of some forest species.

Forests are a habitat to a variety of animal species ranging from crawling insects to flying birds; and extremely small organisms to very big animals. Uncontrolled tree harvesting interferes with the ecological balance of the forest flora and fauna. In time, some of the animals migrate to other regions where the habitat is unfavourable or die leading to species extinction.
Some tree species are very rare and unique to the region. If tree harvesting is not done with care, some of the rare plant species would become extinct; a fact that would negatively affect the ecosystem balances.

Ways to Address Problems Facing Forests in the World
The problems facing forests in the world can be addressed through sound management and conservation of forest resources. There are a number of measures that can be taken effectively to manage forests, which include the following:

Carrying out researches to determine the growing requirement of certain tree species so that correct species are planted in the correct soil and climatic conditions for optimum growth. This can also involve the development of tree species that withstand harsh conditions and which take a short time to mature.

Educating the people on the importance of conserving forests and how the destruction of the forest cover can have negative impacts on their livelihood. This can be done via mass media, posters, seminars and introduction of forest conservation education in school and college curricula.

Encouraging the use of alternative energy sources instead of relying heavily on charcoal and firewood as the major sources of fuel for homes and industries. The alternative and clean energy sources include solar power, hydroelectric power, wind energy, biomass energy (biogas), oil, kerosene and natural gas.

Encouraging the use of energy–efficient devices which consume a little amount of energy. Examples of these devices include energy–serving bulbs and stoves which can be purchased from local shops.

Use of devices that consume less energy not only help to conserve energy but also lowers electricity bills.
Enacting and enforcing laws that govern conservation of forest resources. This can involve setting rules and guidelines about selective felling of trees, that is, rare species such as the mninga should only be harvested after getting a permit from forest officer.

Where new forests are established, trees should be planted in blocks. Planting should be done in phases such that trees in different blocks mature and are harvested at different periods. When trees in a given block mature, they are cut down and the new ones are planted to replace them. This will ensure continuity in supply of timber as well as conserving the soil. The forestry department should supply seed and or seedling to people to encourage them to plant more trees. Also people should be encouraged to plant indigenous tree species so that the trees do not become extinct.

The forestry department should be very keen in detection and control of pests and diseases that attack the planted and natural forests to ensure constant supply of timber and other forest resources.

Planting trees where other trees have been cut down (reforestation) and planting trees where there never existed any tree before (afforestation). People should be encourage to take part in tree planting through campaigns such as "Kata Mti Panda Mti", a campaign aiming at planting trees to replace those cut down. The forestry department should provide seedlings and seeds to people and everybody must participate to plant trees on the Environment Day (1st April each year), a day which is celebrated in Tanzania by planting trees countrywide.

The government should enact and enforce laws in order to manage forests and protect them against destruction. This may be done by setting aside some forests and declaring them as protected areas. Anyone caught harvesting trees from the protected forests should be heavily fined, jailed or both. Forest guards should be deployed to patrol the forests.

Population control should be encouraged in the countries to reduce pressure on the forest resources and the land in general. The ever growing human population is becoming a threat to forest resources as people's requirement of timber, firewood and other forest resources is in on the increase.

Unit Reflection

Does forest cause problems to your community?
What are the problems and what can you do to reduce them?

Unit Assignment

1. Outline the types of forests found in Tanzania and other parts of the world.
2. Explain different methods of forest harvesting.
3. Explain factors for distribution of forests.
4. Describe the problems facing forestry resources harvesting in Tanzania.

Unit 5

Sustainable Mining

Introduction

Dear learner, the wealth of a nation is to a large extent determined by the ability of its people to utilize natural resources. Proper and sustainable utilization of the resources can result into sustainable development of the country and its people. Minerals make one of the natural resources that contribute to national development. This unit is about mining industry.

Learning Outcomes

Dear learner, upon completion of this unit you should be able to:

- Describe the concept of mining;
- Explain the types of minerals;
- Explain types and methods of mining;
- Identify important mining regions in the world;
- Examine the contribution of mining to economic development; and
- Explain the impact of mining activities to the environment.

Introduction to Minerals

Dear learner, do you live in an area which has minerals? For sure you use minerals in your everyday life. Can you name some minerals that you know?

Minerals are substances, which make up the rocks of the earth. The earth's land and oceans all rest on a layer of rocks which is made of minerals. Even soil is made of tiny pieces of minerals broken from rocks. Minerals include such substances as rock salt and such rare ones as Gold, Diamond, Copper, Tanzanite, Silver and Germs. There are about 2000 to 3000 kinds of minerals but only about 100 of them are common. Most of them are harder to find.

Mineralogists use the term mineral to mean a substance that has all of the following features:

i) It is found in nature. A natural Diamond is a mineral but a synthetic diamond is not a mineral.

ii) It is made up of substances that were never alive. Coal, petroleum and natural gas are not true minerals because they were formed from the remains of animals and plants (living things). However, coal is obtained through mining.

iii) Has some chemical make-up wherever it is found. Sand for example is not a mineral because samples from different places usually have different chemical make-up.

The atoms of a mineral are arranged in a regular pattern, and form solid units called crystals. The Calcium and Phosphorus found in milk for example are not dissolved in a liquid and are crystals.
Based on your experience how can you tell that a piece of rock you have collected is a mineral?

The main characteristics of minerals are:
i) Lustre – metallic or non – metallic.
ii) Cleavage – splitting into pieces.
iii) Hardness – by scratching one mineral with another.
iv) Colour – depend on the substance that makes up the crystals.
Now, using these features, can you identify the minerals which are found in your local area? List them.

Types of Minerals
You have become aware of the meaning of minerals. You have found that there are many minerals but only 100 are very common. These minerals are categorized in different classes or groups. There are mainly three groups of minerals as described below:

Fuel Minerals
These are like coal, oil and natural gas. But remember, you have been told earlier that these are not minerals because they are made up of substances that were alive. The reality is that coal is obtained by mining. Also, the economists have grouped it as fuel minerals. Economists deal with economy of countries.

Metal Minerals
These are ferrous (containing Iron) and non – ferrous (containing for example Aluminium, Copper, Manganese and Tin).
Non-metal Minerals
These are for example phosphate, limestone and salt.

Mining

What does mining mean?

Dear learner, mining is the process of extracting minerals or ore from the earth. Most substances that we get from the earth are obtained through mining. From mining we obtain iron for refrigerators, making aeroplanes; automobiles etc. Mining also supplies salt for food, Gold, Silver and Diamonds for jewellers, and coal for fuel. We mine stones for buildings, phosphate for fertilizer and gravel for highways (roads).

Mining activities started so many years ago. By 3,500 B.C people were mining copper. They combined these metals to make bronze,

a hard alloy (mixture of metals) that makes better tools and weapons. The ancient Romans were the first people to realize that mining could make a nation rich and powerful.
During the 1,400 AD, coal, Iron and other materials were mined in Europe especially in Germany, Sweden and France. Mining also developed in South America. Mining began in what is now the United States during the early 1700 AD in French Valley of the Mississippi River. In the 1800 AD miners began to dig up large amounts of coals and also discovered copper, lead, silver and other useful minerals.

For a mineral to be mined, the following conditions should be considered:

a) There must be good demand for it.
b) The ore deposits must be sufficiently rich and large to attract investing in it.
c) There must not be great problems of extraction, processing or transportation.

Some substances can be mined more cheaply than others because they are found at the earth's surface. Some lie far beneath the surface and can be removed only by digging deep underground. Other mined substances are found in oceans, lakes and rivers. These call for different types of mining.

Types of Mining

Dear learner, list down different areas where mining takes place and explain how mining is done.

Dear learner, you have already understood that minerals lie at different depths in the earth. Mining is an extractive industry. By extractive, it means that once the minerals have been removed from the ground, they cannot be replaced. The deposit in which minerals are contained is known as an *ore* and these can vary considerably in how rich they are.

There are different methods of extracting minerals depending on the location (depth), and type of the minerals. Some minerals are found as compact mass, and others are widely scattered. Minerals also vary in hardness and in the ease with which the mineral-bearing material called **ore** can be separated from the surrounding rocks. Some minerals occur in such large bodies of water as oceans and seas, and are obtained by pumping. So, the types of mining are based on the methods of mining.

There are many methods and hence types of mining. Today, most mines are highly mechanized. The miners use modern machines and technology.

There are four common kinds of mining, which are:

a) Surface mining.
b) Underground mining.
c) Submarine mining.
d) Pumping mining.

Now, look at the different methods which are used in each kind of mining.

Surface Mining

This involves mining where the minerals are located on or near the surface of the earth. The following methods are used in the surface mining.

1. **Open Cast Mining**

   When a mineral deposit lies at or near the surface, it may be simply dug out of the ground. Iron, coal, Bauxite and phosphate are examples of minerals that are excavated in this way. When ordinary rock materials such as Granite and limestone are obtained, the site is known as a quarry. When loose or soft materials are obtained the site is known as a *sandpit, clay pit* or a *borrow pit.*

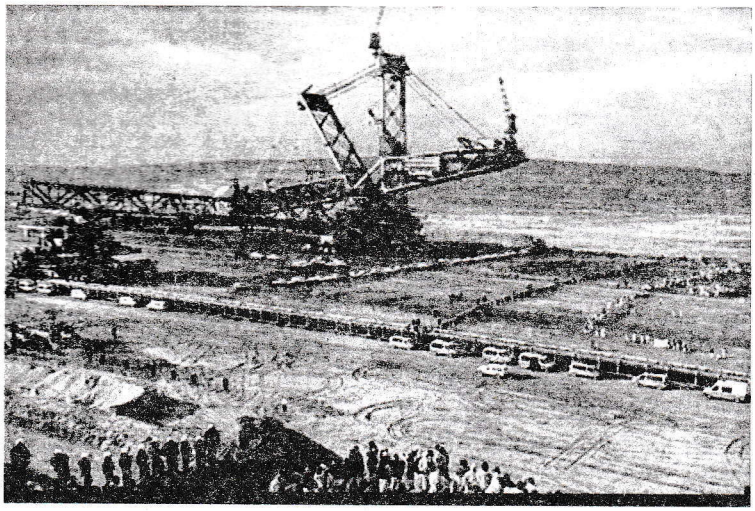

Figure 5.1: Open cast lignite mining in Germany

2. **Open Pit Mining**
   This method is used to uncover valuable minerals from large thick ore bodies lying close to the surface. The miners remove the layer of rock and other materials that cover the deposits. Then they use explosives to break great masses of ore – bearing rocks.

3. **Quarrying**
   This is a way of mining a deposit that lies at the surface of the earth with little or no over burden. Such rocks and minerals as limestone, gypsum and mica are produced from quarries. Sand and gravel used for making concrete and large stones used for building are also mined in quarries. Miners have several methods of quarrying. Hard minerals are drilled or are blasted with explosives. Sand and gravel are simply shovelled onto trunks or trains and shipped.

4. **Alluvial**
   Sometimes minerals such as Tin, Ore, Gold or Diamond lie mixed with loose alluvial deposits such as clays, sands or gravel. In such circumstances, the minerals may be washed out quite easily, for example by using powerful water hoses or dredges which can excavate and wash large quantities of material at a time.

Figure 5.2: Alluvial mining for tin ore

Again, under the alluvial method there are other smaller methods. These are placer mining, dredging mining, strip mining.

5. **Placer Mining**
   This is a way of obtaining Gold, Platinum, Tin and others, so called heavy minerals from gravel and sand deposits where nearby water supplies are plentiful. The exact technique used depends on the size and kind of deposit.

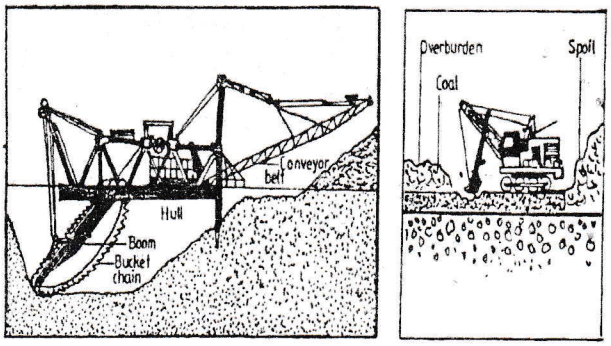

Figure 5.3: Placer mining

6. **Dredging Mining**
   This is a method used especially where minerals beaming sand and gravel layers are exceptionally thick. In dredging, a pond or lake must be formed so that a large, barge like machine called a dredge can be floated.

7. **Strip Mining**
   This is a method of obtaining coal and such minerals as phosphate that lie flat near the earth's surface. Strip mining around the hills or mountains is called contour mining or collar mining.
   Well, those are the methods that are used in surface mining, that are for minerals that are not very deep in the ground. Now, how about those minerals that is beneath the ground!

Underground Mining
This is a type of mining where the deposit lies deep beneath the earth's surface. First, the miners drive (dig) an opening into the mine. A vertical opening obtained is called a shaft.

A passage that is nearly horizontal, dug into the side of a hill or mountain, is called **adit.** In coal mining, it is called a slope. From those passages, miners dig systems of horizontal passages called levels.

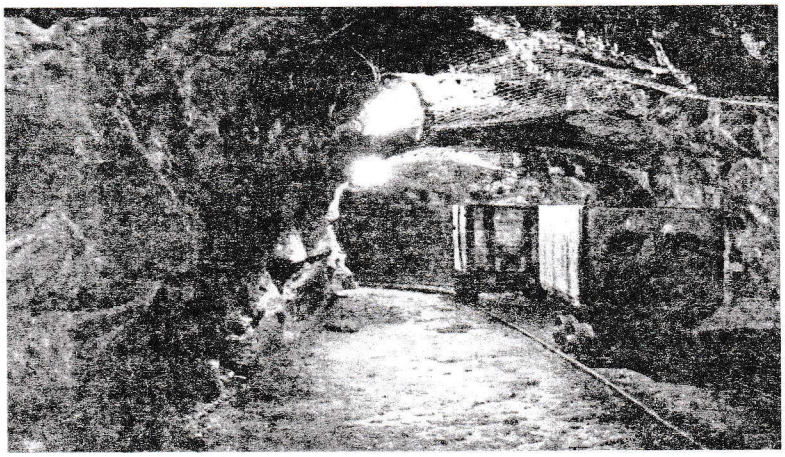

Figure 5.4: Underground mining of Gold in Kenya

There are a wide variety of mining methods available for removing the ore in this type. The following are some of the methods used in underground mining:

1. **Drift Mining**
   When a mineral deposit such as coal occurs in horizontal layers, then it may be quite easily reached by digging tunnels known as **adits** from the valley into the hillsides. These are known as drift mines.
   The ore rocks are broken with explosives and then usually crushed first underground and then having been lifted to the surface crushed again. Then the ores are refined using thermal mechanical and electrolysis methods to obtain pure metals.

2. **Room-and-Pillar-Mining**
   This is a method of recovering ore from horizontal or nearly horizontal ore bodies. Miners dig the ore body as completely as possible, leaving parts of the ore as pillars to support the hanging wall. Room-and-pillar mining is the most widely used method of underground mining in the United States. Materials commonly mined using this method include coal, Limestone, Potash, Salt and Uranium.

3. **Long-Wall Mining**
   This is used to dig ore from horizontal seams. Miners use a machine to cut or break ore from a single long face called *long wall*.

4. **Sub-Level Stopping**
   This is used in ore bodies with a steep dip. A dip is the angle the ore body makes with the horizontal. Miners develop sub-levels between the main levels and drill and blast the ore from both the sub-level and main.

5. **Cut-and Fill Mining**
   This is a method of removing ore vertical veins in horizontal slices, starting at the stop's bottom and advancing upwards. After miners excavate a slice of ore, they fill the stop with waste materials called **gangue** or waste sand from ore processing plants. This material supports the walls and provides a working platform from which to mine the next ore slices.

6. **Block Caving**
   It is the way of mining such ores as Copper and Iron when they are scattered throughout the waste material. In this method, the miners dig wells, dividing the ore body into large sections or blocks. Then they undercut each block with a horizontal slot.

7. **Sub-Level aving**
   This is used in a large, steeply dipping ore bodies. Miners divide the ore body into sub-levels, 25 to 50 feet (7.5 to 15 meters) apart. Each sub-level is developed with network of drifts (horizontal massage) that penetrate the complete section.

8. **Pumping Methods**
   These are used to recover minerals that occur in large bodies of water or that can be changed into liquid form. Miners often obtain them by pumping the water where it is treated. This is common in the waters of the ocean or lakes such as the Great Salt Lake in Utah contain huge amounts of mineral elements.

   Pumping is sometimes used to get salt from beds beneath the surface of the earth. Mine workers drill holes and circulate the water underground to dissolve the salt and form a salt-water solution called ***brine***. The brine is then pumped to the surface and taken to a factory.

   The Frasch process, is another pumping method, often used in mining Sulphur, a mineral that melts easily. The miners bore holes in buried Sulphur bed and inject superheated water, The Sulphur then melts and forms a

liquid. The miners force the liquid Sulphur to the surface by pumping compressed air into the holes. After the Sulphur cools, it becomes solid again. Figure 5 shows the Frasch process.

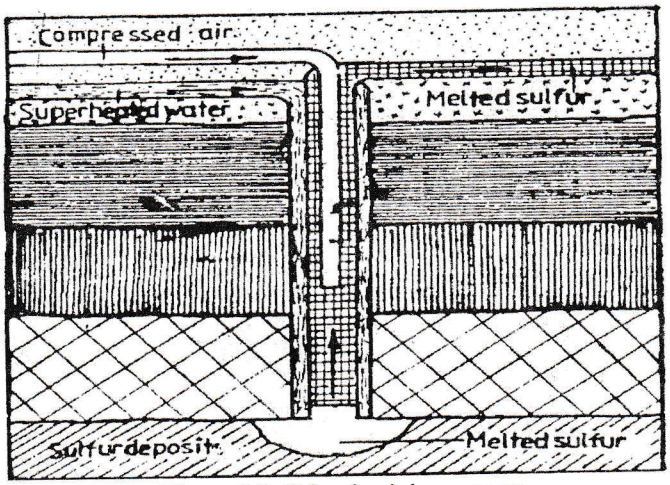

Figure 5.5: Friasch mining process

Submarine Mining

Another kind of mining is the submarine. Usually, submarine refers to a kind of ship that travels in the ocean underwater i.e. below the level of water. One cannot see it on the surface of the ocean. In mining, submarine method is used to get mineral deposits that are deep down the ocean floors. Some minerals occur as round nodules lying deep down on the ocean floor. Tests are now being made to extract minerals by submarine dredgers.

Dear learner, you have covered about types of mining and methods used in mining. I am sure you have found some terms new and difficult for you to understand, especially because they are not commonly used in Tanzania. You need to be aware of them since mining industry is a worldwide economic activity and you will find yourself involved in it in some ways.

Distribution of Mining Regions in the World

Dear learner, all kinds of minerals are not found everywhere in the world. Different minerals are distributed unevenly to different places. Some of the minerals are found in your country. Many others are found in other parts of the world. This difference in the location of minerals is what is referred to as distribution of minerals.

Please, find the Atlas or any world map then use it to identify the location of the countries in which the following minerals are located: Iron Ore, Coal, Petroleum, Copper, Bauxite, Tin, Gold, Uranium, Phosphate, Diamond, Potash and Salt.

Aluminum/Bauxite

Aluminium compounds occur in ordinary clays, which are common almost everywhere. It is in fact the common metal mineral in the crystal rocks of the earth. But as the quantity of Aluminium in the clays is very small, they cannot be regarded as ores. Bauxite is an ore from which Aluminium is extracted. Aluminium products are wire, sheets and machine parts.

Australia is the leading producer of Bauxite in the world. Jamaica is the second largest producer. Guinea is also among largest producer with ore deposits of over 6500 million tons of ore. Other producing countries are Surinam, Russia, Guyana, and France. USA, Japan, Canada, Russia, Germany, Norway and France are the major Aluminium importers.

Iron ore

There are four main types of Iron ore; magnetite, haematite, limonite and siderite. The Rides iron ores, with an iron content ranging from 50 to 70 percent are magnetic (Which is usually of an igneous origin) and haematite, which occurs in sedimentary rocks. Iron ore is useful for industrial purposes. It is useful for making steel. Steel is used in the production of sheets, pipes, bars, rods and wires. These products are essential in shipbuilding, steel girders, locomotives, vehicles, and engines.

Major producers are India, France, Sweden, Brazil, Venezuela, Australia, Liberia, the USA, Chile, Peru, Italy, Germany and Malaysia. In fact there are few countries in the world without some resource of iron ore. The leading producers of iron ore in Africa are

South Africa, Liberia, Mauritania and Algeria. The deposits in South Africa, Egypt, Algeria, Morocco, Zimbabwe and Nigeria supply the raw material for domestic Iron and steel plants. Look at Figure 5.6.

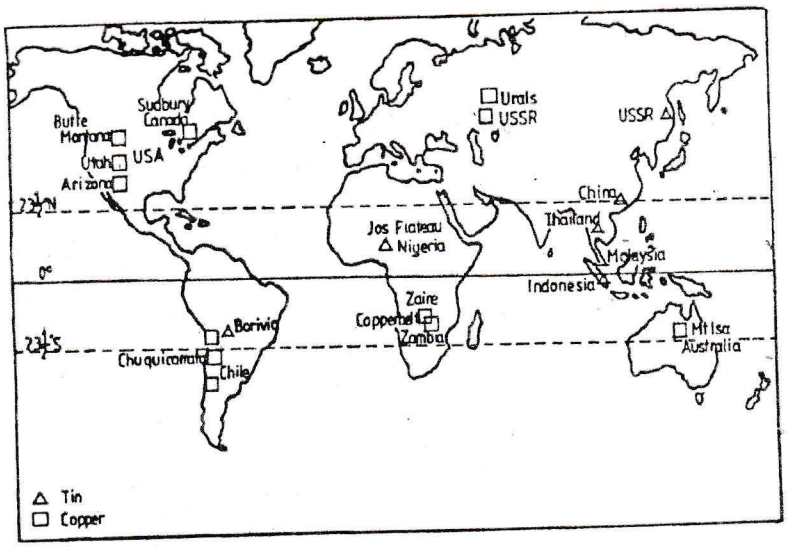

Figure 5.6: The main world Iron ore mining centres

Coal

Coal is an organic mineral. It was said that coal is not a mineral because it comes from some dead substances. The major types of coal are bituminous, lignite and anthracite. Coal is a source of energy, which is used mostly in industries. Tar, benzoyl ammonium, benzene detergents insecticides, fertilizers, petroleum and synthetic fibres are coal products. Major world producers include the USA, Russia, the United Kingdom Belgium, Holland, Luxembourg, Germany, Italy, China, India, Japan, Australia, Chile and South Africa

Continue to look at the distribution of other minerals.

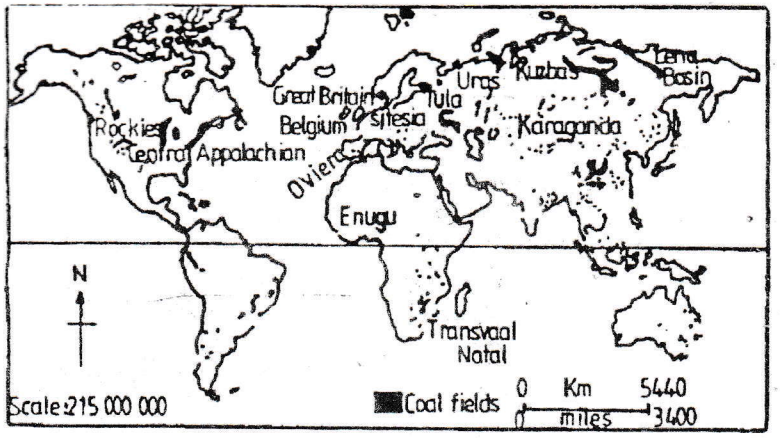

Figure 5.7: Major world producers of coal

Petroleum

Petroleum is also a non-metallic mineral and it is one of the major fuels. Petroleum, gasoline, kerosene, gas oil, bitumen, lubricating oils and wax are refined from crude oil. Major oil producers are the USA, Russia, Iran, Saudi Arabia, Venezuela, Kuwait, Libya, Nigeria, Canada and Iraq. Look at Figure 5.8.

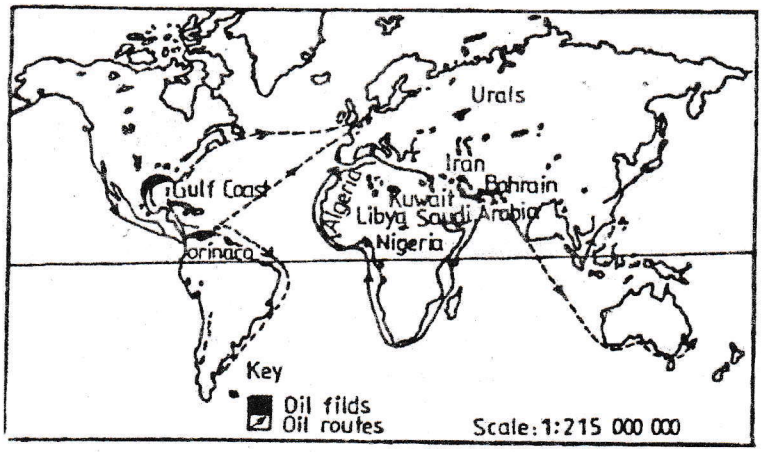

Figure 5.8: Major oil producing countries in the world

Natural gas in Tanzania

Where is natural gas obtained in Tanzania?

Dear learner, natural gas is another important resource which is mainly used as an energy source. The natural gas produced in Tanzania is a non-Petroleum associated gas and it is produced at Songosongo Island in Kilwa District, Lindi Region.

The natural gas of Songosongo benefits the people of Tanzania in the following ways:

a) Provision of low cost electricity,
b) Potential for industries to replace costly oil,
c) Surplus power can be exported,
d) Communities along the pipeline will have future access to gas for industrial or power generation needs,
e) Songosongo residents will have access to power and fresh water plus economic opportunities, and
f) Employment opportunities to other people in the country.

Gold

List areas where Gold is found in Tanzania.

Gold is a precious mineral. It is essential for making coins, jewellery and dental alloys. South Africa is the largest producer of Gold in the world. In South Africa, mining began in 1886. Gold is found in many other countries in Africa. Zimbabwe produced 11.7 tons of gold in 1980, about 1 percent of world production. Russia is the second world producer of gold. Canada, Brazil, Australia, USA and Ghana also have significant gold deposits.

Copper

Copper is a metal. It is mostly used for industrial purposes like for making electrical transmission wires, coins, electrical parts and equipment. Over 40 countries around the world produce copper. The leading producer is the USA where the mines are located in the West State of Moutons, Utah and Arizona. The second world producer is Russia where the mines are located in the Rah Mountains and to the west of Lake Balkhash. Chile is the third producer from two mines located at the margin of Atacama Desert and the Andes Mountains. The copper belt in Central Africa is divided between two countries, the Republic of Congo and Zambia and these two form the largest copper mining region in the world. The other copper producing, countries in Africa include South Africa, Namibia, Botswana and Morocco. Figure 5.9 shows the major world distribution of Copper.

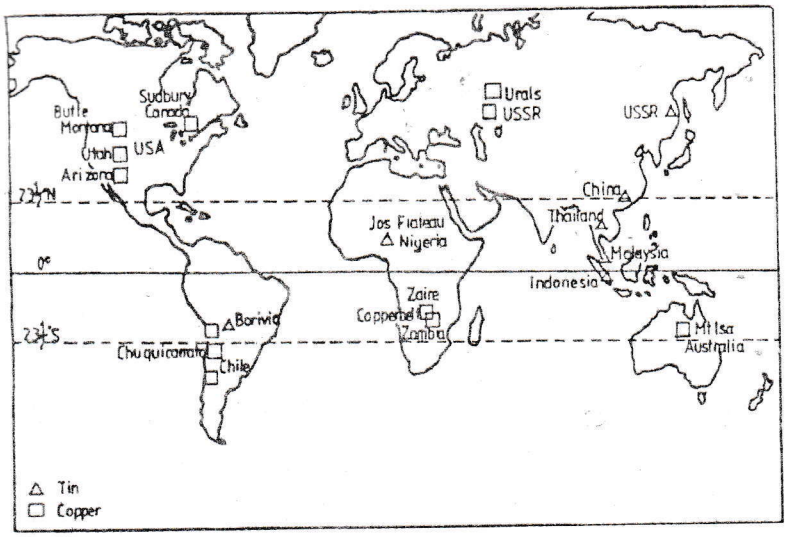

Figure 5.9: The main world mining centres of Copper and Tin

Tin

Tin is also a metal. Bronze, solder gunmetal and tin cans are tin products. The leading Tin producing country is Malaysia, which produces about 20 percent of the world supply. It is followed by other countries in South East Asia mainly Thailand and Indonesia.

In Africa, Nigeria is the leading producer, followed by South Africa, Zimbabwe and Republic of Congo. The East African countries: Tanzania, Uganda and Rwanda are small producers.

Tungsten

The element tungsten is contained in the mineral ore wolfram. China is the leading producer with about half of the world reserves. Some tungsten is produced in several African countries in Rwanda, Namibia, Republic of Congo, Tanzania and Uganda.

Manganese

The main producing countries include: Russia, South Africa, India, China and Brazil. Other African producers include Gabon, Ghana, Republic of Congo and Morocco. Although South Africa produces 21 percent of world supplies of manganese it has as much as 53 percent of world's reserves. Considerable manganese deposits have recently been found in Burundi and await exploitation after careful examination.

Diamond

Which area in Tanzania is famous for this metal?

Most diamonds come from Africa, the Republic of Congo (former Zaire) and Russia followed by South Africa and Botswana. South Africa is the world's largest producer of genuine diamonds. Other African producers of diamonds include Ghana, Angola, Liberia, Tanzania, the Central African Republic, Namibia, Guinea and Ivory Coast.

Uranium

Uranium is important for the production of energy in nuclear weapons. Nuclear reactors are plants for converting uranium into nuclear power. The power is used for domestic industries, communication and military purposes. Major reserves are found in USA. In Africa, the largest reserves are in Namibia, Gabon, Niger and South Africa.

Phosphate

In Africa, Morocco and Western Sahara have very large reserves, while other producing countries include Benin, Uganda and South Africa.

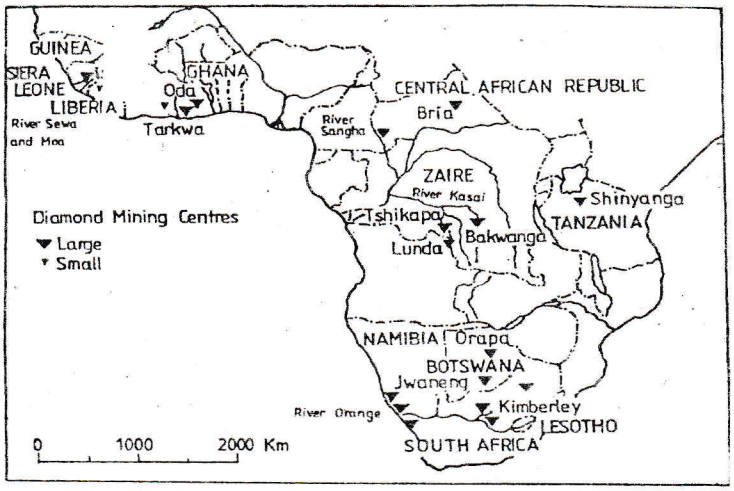

Figure 5.10: Diamond deposits in West Central and Southern Africa

Potash

The main producers of this mineral are Canada, Russia and East and West Germany.

Salt

Producing countries are those with an arid climate bordering the sea including for example Somalia, Ethiopia, Senegal and Mauritania.

Dear learner, you have got a long list of minerals and areas where they are found. From this distribution, you can now tell where certain minerals come from.

Contribution of Mining Industry to the Economy

Dear learner, mining has big contribution to the economy of people and countries. The following are the ways through which it contributes.

1. Mining leads to the development of industries in a country for example the steel cutting industry. Also coal has led to the development of heavy industries in China and the USA.
2. Mining stimulates the development of transport and communication systems in any country. Example in South Africa mining has led to the development of dense, network of roads and railway lines in the eastern part.
3. Mining provides employment opportunities to people e.g. in Zambia copper mining employs a lot of people, also many people are employed in the gold mining areas in South Africa.
4. Mining also leads to the development of towns and large cities like the industrial conurbation of rural in South Africa.
5. Mining also leads to the improvement in the international relations through forming the international organization for the countries mining and exporting certain type of minerals e.g. Nigeria is a member of OPEC.
6. Mining contributes to the earning of foreign currency in a country for example Copper in Zambia, Gold in South Africa, and oil in Nigeria, Libya, Algeria, Middle East and Kuwait.

Effects of Mining Exploitation to the Environment

Dear learner, you have discovered that mining is very important to the economy of a country. So, despite good things about mining industry, as we shall see in our next section, this industry has some effects to the environment where the mining activities are taking place. In this section we shall discuss three environmental effects namely the pollution, land degradation and deforestation.

Define the term pollution

1. Environmental Pollution

This is a term that refers to the ways by which people pollute their surrounding through their different activities including that of mining. Environmental pollution is one of the most serious problems facing humanity today. Air, water, and soil all harmed by pollution are necessary for the survival of all living things. Badly polluted air can cause illness and even death. Polluted water kills fish and other marine organisms.

Pollution of soil reduces the amount of land that is available for growing food. In addition, environmental pollution also brings ugliness to our naturally beautiful world. Environmental pollution damages our surroundings. Gases and smoke in the

air, chemicals and other substances in water, and solid and land are all common forms of pollution.

i. Air Pollution

Air pollution caused by mining activities has adverse effects on human, animals and plants. They can damage materials and reduce visibility that is the ability to see well. Air pollution caused by mining activities can spoil the eye and cause respiratory lung diseases.

ii. Solid Wastes

Mining produces solid wastes that are the unwanted products that come in the process of mining. Solid wastes present a serious problem because most of the methods used to dispose them result in some type of damage to the environment. When the wastes are put into open dumps, they ruin the attractiveness of the surrounding areas. Also burning them can destroy some solid wastes. But burning produces smoke that causes air pollution. When wastes are dumped in water, they contribute to various forms of water pollution.

iii. Other pollution

Metals such as Mercury and Lead, among many other things also pollute the environment. They 'travel' through and affect various parts of the environment. The following diagram shows how Mercury reaches people.

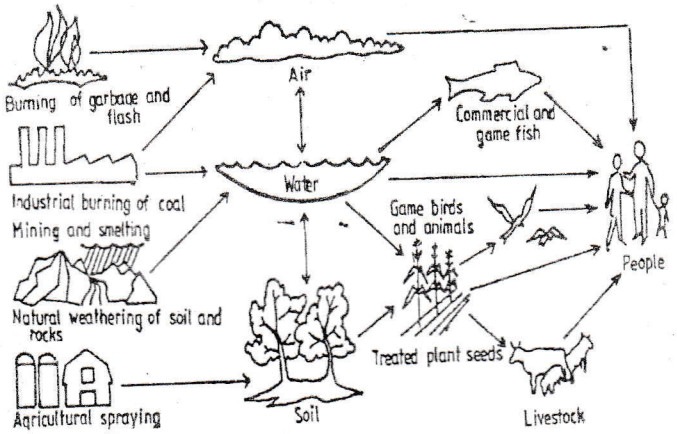

Figure 5.11: How Mercury (mineral) reaches people

2. **Deforestation**
   It is obvious that some mineral resources are explored in the forest areas or in the river and other vegetation sites. Once such a place is found, for example in a forest area, all the land will be cleared including the cutting down of trees and clearing of bushes around. This will greatly destroy the environment.

3. **Land Degradation**
   Dear learner, land degradation is another effect that can come about due to the mining exploitation. In all the mining processing the first thing is the digging up of pits beneath the earth. Some pits are further down than others according to the method of mining being used and or the kind of mineral being sought about as you saw while we were discussing the different kinds and ways (method) of mining. So once the minerals are exhausted in the pits, the miners would abandon them to go and start digging somewhere else. This is common with small miners in places like Kahama and Nyarugusu. Also such a sight is common in Dar es Salaam where they have been digging sand and gravel in places like Kunduchi, Tegeta, Namanga. Quarry miners have caused most of the soil erosion in Dar es Salaam. In fact, mining activities affect the good looking of a land surface and thereby becoming almost useless for any other important activity.

Ways of Minimizing the Effects of Mining to the Environment

i. Improving the methods of extraction.
ii. Reducing the population pressure.
iii. Reclaiming the areas which have been affected by mining like planting the trees.
iv. Developing other sources of energy rather than depending on energy resources from the ground.
v. Establishing other economic activities like fishing, tourism and market gardening instead of depending on mining only.

Case Studies

Dear leaner, mining activities are practised in various countries all over the world according to the availability of certain types of minerals found in those particular areas.

The following are the Case studies which show the mining activities.

Coal Mining in USA

Dear learner, USA is the leading producer of coal in the world and accounts for 24% of the world's total production? The major coal fields include: The eastern province which is the most producer in which there are states like Kentucky, Pennsylvania, West Virginia and Ohio. The interior that include states such as Indiana, Illinois,

Missouri, Oklahoma and Kansas. The gulf province that include states such as Texas, Alabama and Arkansas.

Factors that stimulate the Development of Coal Mining

i. Presence of large deposits in many parts of USA.
ii. Advanced technology used in the mining activity. Due to the uses of advanced machines in mining.
iii. Good market within and out of the USA due to the presence of iron and steel industries.
iv. Well-developed transport system.
v. Capital availability since the country is very rich.

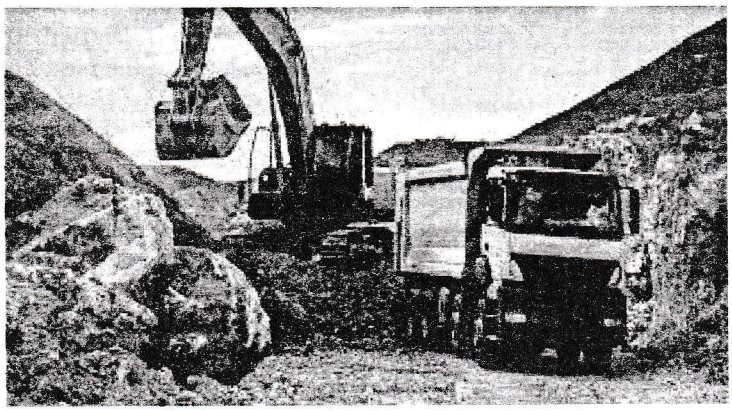

Figure 5.12: Coal Mining in the USA

Advantages of Coal Mining in the USA

i. It has stimulated the development of industries since it provides power.
ii. It has led to the development of the transport system especially the railway lines.
iii. It has created employment opportunities.
iv. It has stimulated the development of the iron mining sector.

Disadvantages of Coal Mining

i. It has led to the creation of pits in the ground leading to the formation of ugly landscape.
ii. Coal has contributed to the environmental pollution like air, water and noise pollution.
iii. It is facing a great challenge from the environmentalists and other sources of energy.
iv. It has led to the reduction in the size of the arable land. Coal is a non-renewable resource hence it gets exhausted when exploited.

Diamond Mining in South Africa

South Africa is the third world producer of Diamond, the first is DRC and the second is the former USSR. Others are Botswana, Ghana, and Sierra Leone. Diamond is the hardest mineral. In South Africa mining began in 1871 at Kimberley. The methods involved in the mining process are placer method for alluvial Diamond and shaft method for the Diamond found in the deep ground.

Diamond is used for making jewelleries, manufacturing drilling bits, making cutting instruments like for cutting glass, Diamond dust for polish.

Areas Where Diamond is Produced in South Africa are;

i. Kimberley; Cape Province.
ii. 2. Transvaal.
iii. Postmusburg.
iv. Orange free states (Pretoria).

Importance of Diamond Mining in South Africa

i. Provision of employment opportunities not only in South Africa but also in other countries.
ii. Development of social services.
iii. Development of towns and cities e.g. Pretoria.
iv. Increases the national income from its sales.

Problems Facing Diamond Mining in South Africa

i. Price fluctuation in the world market which causes low profit making.
ii. Labour unrest, no peace, misunderstanding among blacks and whites.
iii. Shortage of food among workers caused by overpopulation around mining centres.
iv. Competition from other mining countries.

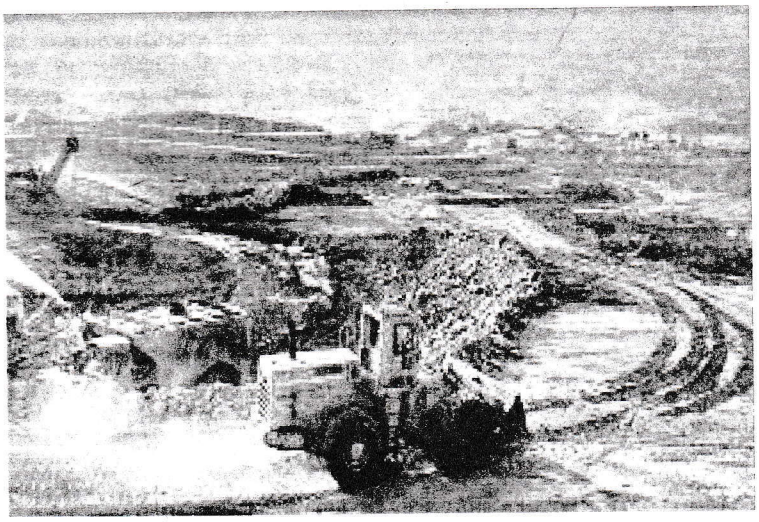

Figure 5.13: Diamond mining in South Africa

Iron Mining in Liberia

Liberia is well endowed with large resources of Iron ore. Liberia is the leading producer of Iron ore in Africa. Iron mining is very important to the economy of Liberia. The areas with mineral deposits include Walogosi mountain ranges in Western Liberia, Bomi hills, Bong Mountains, Nimber mountains ranges and Bio mountain ranges. Open cast method is widely used.

Factors for the Development of Iron Mining in Liberia

i. Availability of iron ore both high grade and low grade.
ii. Development of the railway to Bomi hills from Monrovia.
iii. Labour availability since West Africa has high population.
iv. The government policy favours mining industries in Liberia.

Advantages of Iron Mining in Liberia

i. It has contributed to the export earning.
ii. It has encouraged the development of towns.
iii. It has contributed to the development of industries especially steel industry and Buchanan.
iv. The mining industry has stimulated the development of social services like schools, roads, hospitals, shops and police stations.
v. It has led to the improvement of the port facilities such as Buchanan.
vi. Iron mines have provided market for the locally produced food stuffs.

vii. It has stimulated the development of infrastructure like the railway system etc.
viii. It creates employment opportunities.

Problems Facing Iron Mining in Liberia

i. Competition from other countries like South Africa which produce Iron.
ii. There is exhaustion of deposits in the mining areas.
iii. Poor transport from other West African countries.
iv. The deposits are scattered.
v. Civil war between the government and rebels.

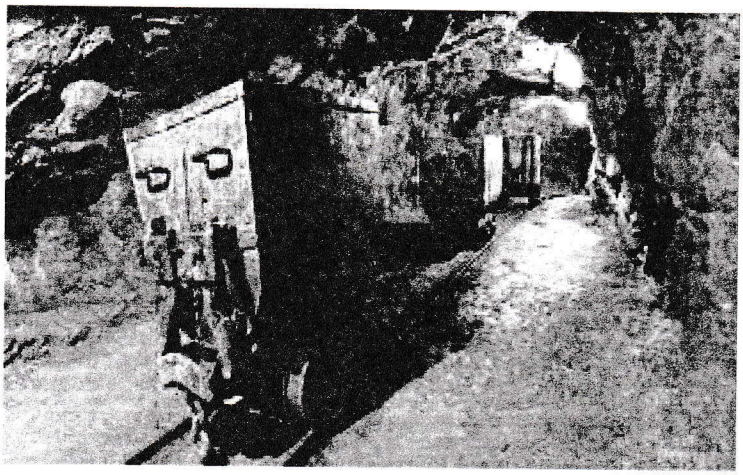

Figure 5.14: Iron Mining in Liberia

Unit Reflection

Does mining cause problems to your community?
What are the problems and what can you do to solve them?

Unit Assignment

1. Define the following terms:
   a) Minerals;
   b) Mining;
2. Outline the types of minerals which are found both in Tanzania and other parts of the world.
3. Explain different methods of mining.
4. Explain the advantages and disadvantages of mining industry in Tanzania.

References

Tanzania Institute of Education (2003). *Geography Course Book for Secondary School: Book One.* Dar es Salaam.

Mzezele, S & Kibuka,P. (2009) *Geography in Focus Form* One. Oxford University press. Dar es Salaam.

Urasa A. & mafiga, R.Y. (2007*) School Certificate Geography: Form One Pupil's book:* Ujuzi Education Publisher.

Tanzania Institute of Education (2019). *Geography for Secondary School: Student Book, Book One.* Dar es Salaam.

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