

## THE NATURAL VEGETATION IN EAST AFRICA

### Definition of vegetation:

- Refers to all forms of plant life growing in an area.
- As a community of plants like trees, scrubs, herbs, woodland and grasses that cover an area and give it a distinct character.
- Vegetation is the living mantle of plants (flora) which covers much of the land surface forming an important aspect of the physical environment.

Vegetation is very important because the natural vegetation provides a good base for rational use of land for economic benefit.

The natural vegetation of East Africa has been adversely affected by human activities that today; East Africa has a very small percentage of her original vegetation cover left.

### Vegetation communities in East Africa

The vegetation of East Africa covers the full range between rainfall forest and semi desert vegetation, and from an equatorial shore line to the highest peaks i.e. Kibo at 5898metres on Mount Kilimanjaro) Plant communities are classified as follow;

Forest	a) Plateau and lowland rain forests
	b) Mountain forests (moist, dry or bamboo)
	c) Mangrove forests
Savanna	a) Savanna Woodland (acacia, palm)
	b) Savanna grasslands
Steppe	a) Tree and shrub woody plants, shrubs, herbs
	b) Bush land
	c) Dry thicket
Swamps	a) Swamp grasses
	b) Swamp forest

### Draw a sketch map of East Africa showing the distribution of natural vegetation

#### Tropical Rain Forests/ Equatorial Forests

##### In Uganda:

They are found around the shores of lake Victoria, lake Victoria islands: Ssese, Bukasa, Bubeke, Bugaia, Lulamba, Ngamba, Buyorii, Bujumba, Funve in Kalangala district; Damba, Kome, Lwaji, Buvuma, in Mukono district; Mabira, Mpanga in central region; Budongo (Masindi), Bugoma (Hoima), Kibale (Kabalore), Bwindi (Kanungu), Kashoha-Kitomi(Bushenyi), Maramagambo (Bushenyi), Echuya, Kalinzu, Ibambaro, Kasato, Muhangi, Itwara, Wambabya in western Uganda; Zoka, Wiceri in Northern Uganda;

##### In Kenya:

They are found in Kisii –Kakamega region, mau, matheus, Loroghi, Molo, Maraket, Chepalungu, and Marsabit etc.

## **In Tanzania:**

They are found in Bukoba region, Songea, Morogoro and Tanga

### **Equatorial forest (vegetation) is characterized by:**

- It comprises of a multitude of ever green trees that yield tropical hard woods like Mahogany, Ebony, green heart, Cabinet wood, Dye wood, Mvule, Musizi, Elgon olive.
- There are climbing plants like the Lianas or Rattan and Epiphytic, and Parasitic plant that live on other plants. There is also a wide variety of Creepers, ferns, Orchids, Lalang and herbaceous plants.
- Forests form three layers of canopies.
- The trees are heterogeneous in nature. They are not found in pure stands of a single species. (Have mixed species).
- The trees are tall of about 45 meters, with slender trunks which are straight.
- The trees have evergreen broad leaves throughout the year.
- There is little or no under growth because of the thick canopy of foliage.
- The trees have huge buttress roots.
- The trees are umbrella shaped

### **Economic Value**

- Development of the tourism industry (fauna and flora) - National parks like Bwindi Impenetrable forest reserves.
- Growing of perennial and annual crops (tropical and temperate crops) like coffee Banana, Sugarcane.
- Lumbering / exploitation of forest resources on a small scale lumbering, charcoal burning and gathering of firewood in Mukono
- Collection of fruits, nuts, roots

### **SAVANNAH VEGETATION**

Savannah refers to wide range of plant communities ranging from unbroken treeless grassland to woodlands in which trees and shrubs form an almost continuous cover.

Savanna Vegetation is categorized into two groups:

- Savanna grassland: It covers the biggest part of Uganda mainly in the central region. It covers the districts of Luwero, Kamuli, Iganga, Muyuge, Mubende, Mityana, Hoima, Apac, Lira, Kasese, Sembabule, Masaka, Mbarara and Kiruhura. In Tanzania, it covers Northern Tanzania, Arusha, Shinyanga, Tabora, Kigoma provinces. In Kenya, it covers the eastern province and some parts of the coast province
- Dry savanna wood land: This area covers parts of Kitodo, Soroti, Kitgum, Kumi, Hoima, Moyo, Nebbi, Masindi, Nakasongola and Kabarole districts in Uganda. In Tanzania, it mostly covers the southern and western Tanzania in Lindi, Dodoma, Ruvuma, Mbeya, Mtwara, Sindiga, Kigoma, Rukwa and Iringa.

### **Savanna vegetation is characterized by;**

- The savanna vegetation varies with the amount of rainfall from wood land with long grass, through acacia woodland which has short grass and scattered trees, to open, short grasslands with thorny bushes in the semi- desert areas.
- Trees and plants have adapted themselves to the savanna climate rhythm of long winter drought and short summer rain both trees and plants are therefore, deciduous in nature, shedding their leaves in the cool dry season to prevent excessive loss of water through transpiration and lying dominant during the long drought.
- They have long roots (like the acacia trees) to search for ground water or broad trunks (like bottle and baobabs trees) to store up excessive water.

- Trees are mostly hard gnarled, thorny and may exude gum.
- Many trees are umbrella- shaped to shield their roots from the scorching heat and to expose only a narrow edge to strong trade winds that blow all the year round.
- The grass is tall and coarse, growing 2 to 4 metres (6-12 feet) high. The elephant grass may attain a height of 15 metres.
- The grass which grows in compact tufts has long roots which reach deep down in search of water.
- The appearance of the savanna vegetation changes with the season. It appears green and fresh in the rainy season but turns yellowish-brown and parched with the ensuring dry season.

### **Economic Value**

- It has led to development of the tourism industry. Savannah grassland in particular is the home of wild animals like Lions, Uganda Kobs, Giraffes and Zebra.
- Livestock farming i.e. Nomadic pastoralism and Beef cattle ranching
- Growing of Perennial and annual crops like Sorghum, Millet, Maize, cassava, sweet
- Api- culture (Bee-keeping).
- Charcoal burning and gathering of firewood from savanna woodlands

### **SEMI – DESERT VEGETATION (DECIDUOUS BUSHLAND AND THICKET/ SCRUB VEGETATION)**

It covers the rest of **North Eastern Uganda in the districts** of Kotido, Moroto, Abin Kaabong and Nakapiripirit. **In Kenya**, the semi desert vegetation is found in the Northern rift valley province, North Eastern Province, part of coast province and part of the eastern province. **In Tanzania**, this type of vegetation is found in Dodoma, Tanga, Manyara and Sangida.

#### **Semi-desert vegetation is characterized by;**

- Most of the scrubs have long roots and are well spaced out to gather moisture and search for ground water.
- Plants have a few or no leaves and the foliage is waxy, leathery, hairy or needle-shaped to reduce the loss of water through transpiration.
- The seeds of many species of grasses and herbs have thick, tough skins to protect them while they lie dormant. They germinate at once when their seeds are moistened by the next rain.
- Some of the plants are entirely leafless, with pricks or thorns.
- The predominant vegetation in semi-desert area is Xerophytic or drought-resistant scrub. This includes the bulbous cacti thorny bushes, long-rooted wiry grasses and scattered dwarf acacia.

### **Economic Value**

- It has led to the development of the Tourism Industry i.e. Kidepo Valley National Park.
- Nomadic Pastoralism by Karamojong, Matheniko, Masai and Galla
- Growing of drought resistant crops like millet, Sorghum in Abim.

### **MOUNTAIN/ MONTANE VEGETATION**

This type of vegetation is found on the **slopes of Mountain Rwenzori, Mountain Elgon, Muhavura Mountain, Kilimajaro Mountain, and Kenya Highlands.**

The vegetation is not uniform all over the mountain due to the effect of latitude, temperature, moistures availability and slope steepness.

#### **The vegetation zonation starts at the base of the mountain**

- At the **base** there is savanna vegetation (or often, at the lower levels, dry bush or scrubs, grading upward into Savanna grassland and then into woodland, which finally merges into true forest).

- On the **lower slopes** of the mountain where the rainfall totals are high, there is thick forest (rain forests –at the lower levels grading upward into temperate forests) at 1800metres above sea level.
- Temperate forest is not as large as those in the equatorial forests, and with altitude they become smaller. Ferns and Epiphytes are abundant. The leading species of trees in these forests include podocarp, Cedar and Camphor. Near its upper limit, these trees dwindle to low forests that are densely populated with mosses.
- Above **3000 metres**, this forest usually merges into a very dense thicket of Bamboo.
- Above **3,500metres**, the vegetation is limited to treeless vegetation. The plants found at this level are adapted to cold and bleak conditions, and the vegetation is alpine, scrub, grassland and heath.
- Other plants in this zone include giant lobelia, giant groundsel, and bromeliad (Heath and moorland. The upper limits of plant growth in East Africa are between **4400 - 4500 metres**).
- Above **4500 metres** there is snow and bare rocks because the temperatures are too cold to permit plant growth as illustrated below:

### **They are characterized by the following**

- Have single canopy.
- Absence of undergrowth
- Thick cover of moss/cabbage leaf growth and tress ferns
- Threes change with attitude i.e. tropical rainforest, bamboo, temperate

### **Economic values**

- Growing of tropical and temperate crops like wheat, barley, pyrethrum, coffee (Robusta), banana, Oranges, on the lower and upper slopes of mountain Elgon.
- Dairy farming because of the low temperature in Kenya highlands.
- Lumbering (presence of Equatorial and temperature forests), this has resulted into the development of pulp and paper industry, soft board and match sticks.
- Development of Tourism (flora and fauna),
- Bamboo shoots are source of food in Mbale, Sironko, Manafwa

### **SWAMP VEGETATION**

This type of vegetation is found in areas that either seasonally (periodically) or permanently flooded. There are two types of swamp vegetation. These include;

**Swamp forests:** There are swamp forest dominated by trees and other woody vegetation. They are mainly found in the Sango Bay area in Rakai district.

### **Swamp vegetation dominated by tall herbaceous vegetation.**

This type of vegetation occurs at the edges of Lakes like Kyoga and Victoria and along the river valleys like river Katonga, Mpologoma and Kagera in Uganda. Swamp vegetation is found in Lorian plains, Boji plain along river Bongal, along river Tana in the coastal area in Kenya. Along rivers Malagarasi, Wembere, Pangani, Great Ruaha, Kilombero, Northern shores of Lake Rukwa and along River Mara in Tanzania

### **Economic Value**

- Art and Craft Industry
- Papyrus for the production of Bio-gas
- Growing of crops – Irrigation schemes like Doho, Kibimba,
- Fishing and fish farming in Bushenyi
- Brick, tiles making from clay
- Grazing of animals

**MANGROVE VEGETATION** They are found along the coastal areas of both Kenya and Tanzania. **They are characterised by:**

- They have medium height trees.
- They have hard wood species.
- They have short stumpy trunks
- They have evergreen broad leaves.
- They are dense with bushy stands.
- They have twisted trunks.
- They have stilt roots.

## **FACTORS AFFECTING THE DISTRIBUTION OF NATURAL VEGETATION IN EAFRICA**

### **PHYSICAL FACTORS**

#### **CLIMATE**

The natural vegetation is a direct response to the type of climate experienced in area. It mainly influences vegetation through the aspects of rainfall and temperature.

- Areas with heavy well distributed rainfall over 1500mm with double maxima high temperatures throughout the year are covered with equatorial vegetation.
- Areas receiving moderate and seasonal ranging between 600mm – 800mm, savanna vegetation are common.
- Areas with unreliable and low rainfall less than 550mm with very hot temperature are covered with thicket, scrub and dry bushes.

#### **RELIEF/ TOPOGRAPHY**

It affects vegetation distribution and growth by influencing the rate at which water moves to the surface.

- Steep slopes experience rapid water movement/ flow hence little water is left for plants and as a result there is stunted vegetation.
- On the gentle slopes, the speed of water is slow and this allows deep penetration of water into the ground and as a result the gentle slopes have well developed soils and dense vegetation

- Relief also influences vegetation in as much as it determines rainfall distribution and formation. The wind ward side receives high amount of rainfall hence thick vegetation compared to the leeward side which has poor vegetation.

### **SOILS**

The mineral composition, depth, maturity, acidity and alkalinity of soil directly influence the type of soils directly influence the type of vegetation.

- Thin immature skeletal soils on steep slopes of the mountains
- Highland soils which are rich in organic matter give rise to dense vegetation on the slopes of Mountains of East Africa
- The rich fertile loam soils around Lake Victoria support dense equatorial vegetation.
- The rich fertile volcanic soils support dense vegetation cover.
- The poor sandy soils have semi desert vegetation.
- Sandy loam soils (dry Land soils) support savanna grassland.

### **DRAINAGE**

- Well drained areas supports different types of vegetation like equatorial vegetation
- Water loving plants like papyrus, are found in poorly drained areas.

### **ALTITUDE**

It is the height above sea level. It plays an important role in influencing vegetation zonation through its influence on temperature and rainfall.

**Other physical factors include;** pests and diseases, wild animals and natural fires.

### **HUMAN ACTIVITIES**

- Cultivation of land destroys the original vegetation types like equatorial forests are replaced by perennial crops like coffee, tea. Abandoned areas regenerate secondary forest vegetation and Savanna grassland degenerate into scrub.
- Bush burning causes destruction or elimination of original vegetation species and promotion of fire resistant species
- Overgrazing leads to loss of vegetation cover
- Swamp reclamation either for settlement or industrial developed Urbanization, settlement, road and railway construction leads to clearance of natural vegetation
- Cutting trees for fuel i.e. Tea curing, fish smoking, Brick baking
- Agro-forestry: introduction of new plant species
- Reforestation and afforestation programmes to replace original forests with quick growing trees.
- Gazette some areas of natural vegetation for conservation
- Planting of Peri-urban plantation to meet future wood requirements in Kampala.

## Forestry in East Africa

### Definition

- The term forests refers to a stand of trees whose crowns (tops) touch and form a closed canopy during or part of the year.
- A forest is a collection of vegetation dominated by trees growing together in a given place which may be naturally occurring or planted.
- **Forestry is the science and practice of exploitation and conservation of the forest resources.**

According to the Global Environment, forests in East Africa covered about 46,373, 000 hectares of the total land by 1980. However the size of the forests has been shrinking due to mismanagement of the forest resources and population increases. East Africa's forest land has been shrinking as follows:

### East Africa: Area under Forest Cover (1000ha) 1980-2000

Country	1980	1990	2000
Uganda	7,011	6,400	6,104
Kenya	1,358	1,309	1,292
Tanzania	38,004	4,123	32,510
East Africa	46,373	41,832	39,906

- Draw a line graph to show the trend of forest cover destruction in East Africa
- Calculate the percentage change in the area under forest cover for each country between 1980 and 2000.

East Africa has one of the most biologically diversified eco-systems in the tropical world. East Africa has many major tree species that is over 200 tree species growing in her forested areas as illustrated below:

### Selected major tree species found in East Africa

Indigenous	Exotic
Mvule,	Eucalyptus
Mahogany	Cedar
Musizi	Cypress
Iron wood	Pine
Ebony	Podocarp
Elgon olive	Camphor
Nkoba	Conifers
Green heart	Spruce

## The differences between natural forest and plantation forest

Natural Forest	Plantation forest
<ul style="list-style-type: none"> <li>• Umbrella shaped</li> <li>• Green broad leaves</li> <li>• Yield hard wood i.e. Mahongany, green heart, ebony.</li> <li>• Have three forest levels/canopies</li> <li>• Heterogeneous in nature (great variety of vegetation)</li> <li>• Have huge buttress roots</li> <li>• Forest are thick</li> <li>• Natural gift (God given gift)</li> <li>• Survive on their own</li> <li>• Tree are bulk in nature and tall;</li> </ul>	<ul style="list-style-type: none"> <li>• Conical shaped</li> <li>• Needle like leaves</li> <li>• Yield soft wood like</li> <li>• Pine, spruce, cypress</li> <li>• Have one forest level</li>   <li>• Homogeneous in nature</li>   <li>• Have Tape roots</li> <li>• Forest are spaced</li> <li>• Planted by man</li> <li>• Need a lot of attention</li> <li>• Trees are slender in nature</li> </ul>

## TYPES OF FORESTS FOUND IN EAST AFRICA

a) Natural forests

b) Plantation forests

### NATURAL FORESTS

A natural forest is a continuous and extensive area of land covered with close cover of trees and other forms of under growth that are growing together in an area where the physical conditions are favouring their existence.

The natural forests are found in areas that receive heavy rainfall of over 1000mm, well distributed throughout the year with double maxima of rainfall.

They are divided into **three** types

- Tropical rainfall forests (equatorial)
- Mountain/ montane forests
- Mangrove forests.

### PLANTATION FORESTS

Planting of trees in East Africa is as old as agriculture since people have always planted both food crops and trees. This involves the planting of exotic trees on a large scale.

The distribution of soft wood plantation in East Africa is shown below



The table below shows the distribution of softwood in East Africa.

Uganda	Kenya	Tanzania
Okavureru	Kitale,	
Abera	Kisumu	
Wampanga	Nyeri	
Namafuma and	Kiambu,	
Namasiga	Nyahururu	
Mafuga, Muko	Londiani	
Kanyawara,		
Kapkwata		
Nakwaya		
Lututuru		
Kachung		
Katugo		
Nyabyeya		
Bugamba Rwoho		
Usi, Awaga and Lendu		
Kateta and Pingire		

Sketch map of East Africa showing the distribution of Natural and Plantation Forests

## **Importance of Forests in East Africa**

- Source of valuable timber both from soft and hard wood trees
- Provision of raw material for wood and pulp industries.
- Provision of fuel wood and charcoal used for domestic and industrial purpose.
- Forests contribution of modification of the micro climate
- It has led to the development of the tourism industry i.e. Kibale forest National park.
- Forests are sources of medicinal plants and herbs i.e. in Mabira forests
- They purify the environment by absorbing carbon dioxide.
- Provision of a sorted forests products like honey, bee waxy, mushrooms, nuts, bamboo shoots, fruits , shea butter oil in Mbale
- Provision of construction and building materials
- Educational and research purposes
- Generation of government revenue through taxation of forest harvesters.
- Provision of round wood, ply wood, block board, pulp and paper.
- Maintenance of soil fertility.
- Environmental protection (flora and fauna)
- Employment opportunities in research centres.
- Provision of extractives like latexes, oils, gums, resins which are collected from forest trees for industrial applications in Mbale.
- Provision of Toxins and pesticides
- Provision of rattan/cane and other fibres in Mabira forests
- Development of eco-tourism

### **Disadvantages of forests:**

- They are habitats for wild animals which destroys crops and attack human-beings.
- Forests trees have suppression effects on crops
- They are dense and damp hindering exploitation of their resources.
- They are used as hiding places for anti-government activities or local thieves.
- Soils near the forested areas lose their fertility very quickly. The soils are heavily leached.

### **Problems Facing Forestry Industry in East Africa**

These include:

- Agricultural encroachment on the forested areas.
- The out break of occasional Wild fires and fires set by man. Fires are a seasonal occurrence in forests, occurring mainly during annual dry spells. Some fires are associated with poaching/hunting, some are started by trespassers, holidaymakers, cattle keepers, crop farmers, while others are started by honey harvesters.
- Insect pests and fungal infections insects pests like the Mvule gall fry and Mahogany shoot bore. These are common in natural forests. Pests of Plantation forests include;
  - Wood borers: termites which generally attack all exotic trees species mainly during the early stages of establishment. I.e. in Mafuga, Muko, Kirima forests in Kabale.
  - Sapsuckers like exotic Conifer aphids cause extensive damages to Cypress.
- Game animal and Vermin: Through natural forests in East Africa contain a very large variety of game animals and vermin, only a few big ones like elephants and buffaloes are responsible for extensive damage to forests trees.
- Illegal cattle grazing in the forested areas have led to the destruction of the forest resources for example Kasambya forests reserves and Luwunga forests reserves in Mubende district.
- Illegal harvesting of wood and non woody products.

- Smuggling of timber and other forests products across the East Africa's borders from DRC.
- Limited market for timber and forest products in Kaabong.
- Gestation period of the indigenous trees is too long for example Mvule and Mahogany takes up to 45 years.
- Limited research because of inadequate funds provided by the central government.
- In natural forests, trees are heterogeneous in nature (do not exist in a single stand of three species) hindering the exploitation of forest resources.
- Dense forest cover hindering the exploitation of the forest resources
- Political insecurity in the country.
- Government policy of degazetting and re-allocation of forested areas to individuals, tribal communities, companies and ministries i.e. 4686 ha of Bukaleba forest in Iganga was given to Ministry of Agriculture.
- Narrow market due to the low level of demand for forestry products.
- Low level of technology for harvesting forest resources.
- Poor infrastructure i.e. Roads and railways
- Few valuable tree species of Mahogany, Ebony, Green heart, Mvule, Nkoba.
- Limited Navigable Rivers to transport the logs.
- Nature of the terrain i.e. rugged areas restricts forestry activities mainly in Mountainous areas
- Climate: Harsh climatic conditions at certain times i.e. excessive rainfall and humidity in forested areas hinders the exploitation of the forest resources.
- Poor drainage of the forested areas limiting the construction of communication routes in Sango bay in Rakai.

## Questions

1. Outline the steps being taken to conserve the forests in East Africa
2. Explain the effects of deforestation on the environment

## TOURISM INDUSTRY IN EAST AFRICA

Tourism is an invisible trade which involves the movement of people away from home to places of interest within the country or outside their countries of residence.

**REASONS FOR TOURISM:** Holiday making, Leisure, Adventure, Education, Business

**TYPES OF TOURISM:** There are two types:

(i) **Local/internal/domestic tourism:** this is the type of tourism undertaken by the local people within the same country.

(ii) **External/international tourism:** this tourism involves people from other countries visit East African countries.

In E. Africa International tourism is the most important among the two because of its greatest contribution to economic development of East Africa. Kenya receives more tourists than Tanzania and Uganda.

### TOURISM IN:

#### A) KENYA:

- Ranks 1<sup>st</sup> in tourism development because it have the largest flora and fauna.
- Transport network is highly developed making the country more accessible by the tourists.
- Accommodation facilities are well developed to international standards. I.e. international hotels like Serena, Hilton, and Sheraton.
- The tourism is well developed, organized and funded by K.T.B.
- Most of the tourists come from mainly U.S.A., France, Britain, Spain and Belgium. Most of them visit Masai-Mara game reserve, Nairobi National Park.
- The largest national park is Tsavo and Marsabit game reserve being the largest.

#### B) TANZANIA:

- Ranks 2<sup>nd</sup> after Kenya in development of the industry and has a great potential for improving the sector.
- The major tourist attractions in Tanzania are its abundance of wildlife, the coastal land forms and mountain scenery.
- The most frequently visited areas are Serengeti national park, Arusha National Park (North Eastern Tanzania). Selous game reserve is the largest in Tanzania.
- Most of the tourists come from Germany, Italy, Switzerland, Austria, U.S.A. and Japan. Tanzania has a wide range of tourist attractions but it has lagged in tourism development because of;
  - **Inadequate accommodation facilities,**
  - **Unevenly distribution of transport network.**
  - **Remoteness.**

#### C) UGANDA:

- In the 1960's tourism was the 2<sup>nd</sup> foreign exchange after coffee and cotton.
- From 1971-1986, the tourism industry declined and collapsed because of political instability and mismanagement of wild life resources.
- In 1987, the tourism sector was rejuvenated. Since the time, the sector has been growing at a very fast rate. It is ranked 3<sup>rd</sup> after coffee and fishing.
- Uganda is now ranked as the 10<sup>th</sup> most popular tourist destination in Africa. Most of the tourists come from U.S.A, Netherlands, Japan, China, Ireland, and Canada. However the industry is still under developed due to;

- **Insecurity in some parts of country.**
- **Inadequate funding of the sector.**
- **Encroachment on the gazette areas.**

#### **MAJOR TOURIST ATTRACTIONS IN EAST AFRICA**

1. **WILD LIFE:** it refers to animals (fauna) and plants (flora) which live and grow under natural conditions. Examples of fauna include; lions, elephants, buffaloes, hippopotamus, rhinoceros, giraffes, zebras, chimpanzee, baboons, hogs, Uganda Kobs, monkeys, **mountain gorillas in Bwindi**, crocodiles, snakes, monitor lizards etc. birds like African grey parrot, shoe bill, ostrich in Kidepo, **flamingos in Nakuru** and insects like butterflies. Flora (different types of vegetation found in E.A.). **The wildlife is the most important tourist attraction in E.A.** Wildlife resources area found in the protected areas like:

A) **NATIONAL PARKS:** They are gazetted by Parliament for the protection of national and scenic and international scientific educational, recreation and ethnical values. All extractive land and resource exploitation are prohibited unless authorized by park management. Most of the national parks are found in marginal areas (areas which receive low rain fall amount below 1000 mm). The national parks include

**Table 1: Shows the National Parks Found in Each E. African Country**

<b>UGANDA</b>	<b>KENYA</b>	<b>TANZANIA</b>
<b>Murchison</b>	<b>Sibilo</b>	<b>Serengeti</b>
<b>Queen Elizabeth</b>	<b>Malka Mari</b>	<b>Arusha</b>
<b>Kidepo Valley</b>	<b>Meru</b>	<b>Tarangire</b>
<b>Lake Mburo</b>	<b>Mountain Elgon</b>	<b>Ruaha</b>
<b>Bwindi Impenetrable</b>	<b>Ruma</b>	<b>Mikumi</b>
<b>Mgahinga Gorilla</b>	<b>Lake Nakuru</b>	<b>Udzungwa</b>
<b>Rwenzori Mountain</b>	<b>Masai Amboseli</b>	<b>Katavi</b>
<b>Kibale</b>	<b>Aberdares</b>	<b>Mahale Mountains</b>
<b>Semlik</b>	<b>Mountain Kenya</b>	<b>Mountain Kilimanjaro</b>
<b>Mountain Elgon</b>	<b>Nairobi</b>	<b>Lake Manyara</b>
	<b>Tsavo East</b>	<b>Rubondo Islands</b>
	<b>Tsavo West</b>	<b>Gombe stream</b>
	<b>Arabuko Sokoke</b>	
	<b>Oldonyo Sabuk</b>	
	<b>MARINE NP</b>	
	<b>Malindi Marine Park</b>	
	<b>Watumu Marine Park</b>	
	<b>Mombasa Marine Park</b>	
	<b>Kisite Marine Park</b>	

B) **GAME RESERVES(WILD LIFE RESERVES):** These are large pieces of land set aside for future development and expansion of the existing national parks.

**Table II: Shows the Game Reserves Found in E. African countries**

UGANDA	KENYA	TANZANIA
Ajai (Arua)	Marsabit	Selous
Bukora Corridor	Losai	Ngorogoro
Bugungu	South Turkana	Mkomazi
East Mandi	Rahole	Lukwika
Katonga	Kora	Lukwati
Kabwoya (Hoima)	North Kitui	Ugalla
Karuma	South Kitui	Moyowosiand Kigosi
Kigezi	Boni	Birigi
Kyambura	Dodori	Biharamulo
Lomunga	Arawale	Ikorongo
Matheniko	Tana River Primate	Grumeti
Pain-Upe	Masai- Mara	Ki jereshi
Toro-Semlik	Mwea	Newal Lulwiki
	Buffalo Spring	Mkokotoni(Zanzibar)
	Samburu	
	Shaba	

- C) **WILDLIFE SANCTUARIES:** A sanctuary is an area used to preserve, conserve, and protect wild life, mainly birds of rare and localized existence. They are also used as habitats where wild life is facing danger of extinction from the activities of man.

**Table III Show the Wildlife Sanctuaries in E. Africa**

UGANDA	KENYA	TANZANIA
Uganda Educational Centre(Entebbe)	Nakuru Game Sanctuary	
Mountain Kei(Yumbe)	Maralal	
Otze Forest(Moyo)	Mwalugale Elephant s.	
Jinja ,Kazinga,Kyambura		
Ngamba Island(baboons)		

- D) **COMMUNITY WILD LIFE ARAES(CONTROLLED HUNTING AREAS):** These are pieces of land set aside for conservation of wild life; however, some activities are permitted like sport hunting, agricultural activities. Examples:-Amudat, Iri, Karenga and Kaiso-Tonya.

**Assignment:-**

- a) Name the wildlife sanctuaries found Tanzania.
- b) Draw a sketch of E. Africa showing the National parks and Game reserves

NB: Areas of wildlife conservations in East Africa contributes greatly to over role economic development because they;-

- Preserve the flora and fauna.
- Attract tourists.
- Bring improvement in transport and communication networks.
- Avail employment opportunities to the people where they are found.
- Make use of marginal areas (“waste lands”).

## 2) BEAUTIFUL SCENERY:

- Mountains such as Kilimanjaro, Kenya, Ruwenzori, Muhavura, Meru, Usambara.
- Rift Valleys like the western and eastern arms of E. African rift valley.
- Lime stone landforms like stalagmite, stalactites, pillars, underground caves.
- Semi –desert landforms
- Coastal landforms like caves, stumps, headlands, stacks, beaches.
- Volcanic landforms like batholiths, sills and dykes.

## 3) DRAINAGE FEATURES:

- Lakes like Victoria, Tanganyika, Turkana, Kyoga, Rukwa, Albert and Baringo.
- Rivers like Nile, Katonga, Tana, Galana, Ruvuma, Ruaha, Rufiji and Kafu.
- Hot springs /jet stream/geysers like Kitagata, Sempaya, and Lututuru in Uganda.
- Waterfalls like Budhagali, Sipi, Karuma, Murchison, Sezibwa, and Itandain UGANDA. Lugard and Fourteen fall on Galana River in Kenya.
- Extensive wetlands

## 4) HISTORICAL SITES/ARCHAEOLOGICAL SITES:

UGANDA	
Karambi Tombs (Kabarole), Kasubi Tombs, Dufile in Moyo, Namugongo martyr's shrine Wadelai in Nebbi, Naggalabi, Fort Portal, Bigo Byamugenyi, Lugard in Kampala, Nyero Rock Sheltered Paintings in Kumi, Opegi in Kumi, Kakoro Rock Painting in Pallisa, Baker's fort in Gulu Mparo Tombs, Uganda Museum-Kampala and Kabale.	
KENYA	TANZANIA
Fort Jesus in Mombasa	Unguju(Zanzibar)
Karindusi	Isimila stone Age site
Olorgesailies	Kilwa -Kisiwani Ruins
Nyahururu falls	Ruins of Songo Mnara
Gedi near Malindi	Oldovia Gorge fossils
Lamu old Town	

5) **CULTURAL DIVERSITY:** Dressing, Dancing, Cultural ceremonies and rituals, Traditional dishes.

6) **CLIMATE:** This attracts tourists who come and enjoy the abundant sunshine especially when their countries are experiencing winter.

7) **Sports activities** organized at local and international levels in E. Africa like motor rally, cricket, rugby, basketball, goat racing, white water rafting, indoor games, and football.

## TOURISM /TOURIST ACTIVITIES IN EAST AFRICA

- ❖ Bird watching
- ❖ Sight seeing
- ❖ Extensive semi-desert safaris
- ❖ Sun bathing
- ❖ Horse racing/ridding
- ❖ Nature trailing/walk and guided forest walks
- ❖ White water rafting and Kayaking
- ❖ Fishing safaris/sport fishing/Angling
- ❖ Canoeing/canoe regatta/Boating racing
- ❖ Gorilla tracking in Bwindi impenetrable national park
- ❖ Chimpanzee ,Monkey viewing
- ❖ Fish watching at Marine parks in Mombasa
- ❖ Game drives
- ❖ Buggy jumping at Jinja
- ❖ Mountain climbing –Rwenzori, Kilimanjaro
- ❖ Holiday making
- ❖ Educational activities

## **FACTORS FOR THE DEVELOPMENT OF THE TOURISM INDUSTRY IN E. AFRICA**

- East African countries experiences different types of climate like; Equatorial climate, Savanna (dry and wet) climate, semi desert climate, Montane climate which provide ideal conditions for different tourism activities like sun bathing, mountain climbing, bird watching and savanna safaris.
- Presence of the varied beautiful scenery in different parts of East Africa.
- Presence of Wildlife (flora and fauna) in different parts of East Africa.
- Improved tourism infrastructures for example east African countries have a number of hotels, inns / lodges, casinos which are comfortable and are found in all the major towns of East African countries.
- East African countries are relatively and politically stable hence promoting the tourism sector.
- Improved transport and communication networks: East African countries have an improved transport network of: roads which connect to different parts of the East Africa, water transport on Lake Victoria, Air transport- Entebbe, Arusha, Kenyatta, Mombasa and several air strips found in different parts of the East Africa. Communication networks- telecommunications companies which provides fixed and mobile telecommunications services like MTN, Zain, Orange and Safari com.
- There is high levels advertisement of the tourist sector. This is done through the use of the different electronic and print media like Televisions (Local and international Televisions like NTV, CNN, DSTV, BBC, KTV), magazines like Kenya Msafari and New York Times and Newspapers.
- Presence of well-organized tour packages which are offered by different tour and travel agencies making it cheaper and efficient to travel to different parts of the East African region.
- Better banking, insurance and health facilities
- Presence of abundant skilled labour
- Availability of adequate capital to invest in the tourism sector.
- Favourable government policies like liberalization of economy.
- Presence of different sources of power
- Hospitality of the people of East Africa

## **IMPORTANCE/BENEFITS OF TOURISM TO THE DEVELOPMENT OF E. AFRICAN COUNTRIES**

- Provision of employment opportunities to the people like the drivers, hotel staff, guides, wardens.
- Source of foreign exchange like bills for accommodation and photography.
- Provides revenue to the government through the issuing of licenses to tour and travel agencies, hotels and hunters.
- Provides ready market for local food stuff, art pieces, and crafts.
- It has facilitated the growth and development of infrastructure like roads, hotels.
- Makes good use of marginal areas which are not agriculturally viable.
- It enhances international relationship between East African countries and other countries where tourists come from like U.S.A. Japan, Italy, Spain.
- It has led to conservation, preservation and protection of the environment in its natural setting.
- It has led to the diversification of the economy thereby releasing the over reliance on a few sectors like agriculture, fishing.
- Promotes the preservation of the African cultures, values, customs and historical sites
- Tourists help to advertise the African products outside East African region.
- Development of rural areas of East Africa
- Promotes the development of urban areas.
- Educational and research purposes



## **PROBLEMS FACING THE TOURISM INDUSTRY IN EAST AFRICA**

- Political unrest in Kenya (1997 and 2008), ADF in Uganda (1996-1998), LRA (1996-2008).
- Seasonal migration of animals from one place to another for example elephants sometimes migrates from Queen Elizabeth National Park to Democratic Republic of Congo.
- Poaching and smuggling of wildlife has depleted some of rare species for example crested crane.
- Poor transport and communication networks i.e. most of the roads are in a poor state and inaccessible during the rainy seasons.
- Competition for tourists within East Africa and other Africa countries like Egypt, South Africa.
- Conflicts between land use types for example agriculture vs. tourism, lumbering vs. tourism
- Shortage of skilled labour.
- Animal pests and diseases for example in 2004, anthrax killed about 200 hippos in Queen Elizabeth National park.
- Limited advertisement of tourist site and activities.
- Inadequate capital to invest in the tourism sector.
- Encroachment on the gazetted areas by the people either for settlement or agriculture.
- Hostile tribes
- Corruption and embezzlement of tourism funds mainly Uganda and Kenya.
- Language barrier which limits tourists from some parts of world like people from Latin America.

## **STEPS BEING TAKEN TO SOLVE THE PROBLEMS**

- Strict laws against poaching and smuggling of wildlife have been enacted and Special Forces are trained to enforce the laws and patrolling the protected areas.
- Settlement and agricultural practices in the protected areas are prohibited by the governments.
- Governments have been improving upon transport and communication networks to tourist's sites.
- There has been an increase in advertisement of the tourist potential of the East African countries through both local and international electronic and print media.
- Manpower is being trained within East Africa's higher institutes of learning and abroad on tourism management.
- Massive education is going on about the importance of tourism ,the main aims of conserving the environment through electronic and print media ,seminars and workshops
- Deployment of the armed forces in troubled areas.
- The office of Inspector General of Government,Public Accounts Committee and Criminal Investment Department of Police have been strengthened and charged with responsibility of curbing down corruption in Uganda.
- Governments of E.A. are soliciting funds from World Bank, IMF, and African Development Bank to improve upon the tourism infrastructure.
- Game cropping is occasionally carried out in national parks with excess number of wild life in order to match with the carrying capacity of the land.
- Different bodies i.e. UWA (Uganda), KTB (Kenya), TWA (Tanzania) have been established to co-ordinate the wildlife and tourism activities.

## MINING IN EAST AFRICA

Mining is a term generally used to mean all the processes involved in the extraction of valuable minerals either in liquid or solid form from the earth's crust for economic use. Minerals in East Africa are found in regions where ancient rocks have been affected by volcanic activity.

### THE STATUS OF THE EAST AFRICAN MINING INDUSTRY

- The annual output of minerals industries is small compared to agricultural production.
- The output of minerals is very low due to use of crude technology in extracting the minerals.
- The poor transport and communication network in some parts of East Africa has led to valuable deposits being unexploited e.g. coal in Southern Tanzania.
- Limestone (for cement), quarrying of rocks, sand and clay are, however, on the increase throughout the east African region and they are consumed locally.
- Some minerals have not yet been found in great quantities to be exploited for commercial markets like iron ore, coal, tin, wolfram but they are being mined on small scale.
- Vermiculite gold and cobalt are the leading exports of value for Uganda: Diamond and lime stone for Tanzania, and soda ash, limestone (cement), fluorspar for Kenya.
- Oil drilling in western Uganda (Semliki valley basin) in its final stage.

### TYPES OF MINERALS FOUND IN EAST AFRICA

There are three major types of minerals. These include:-

- a) Metallic minerals: Iron ore, lead, Niobium, tantalum (columbite), Tin, Tungsten, Chromite, Beryllium, copper.
- b) Non metallic minerals: Clay, feldspar, Glass, (Silica sand), limestone, marble, phosphates, Trona, Vermiculite
- c) Fuel minerals. Oil, natural gas and coal.

### The major minerals found in East Africa

The distribution of minerals in East Africa is not uniform because of differences in geological events like earth movements

Mineral	Uganda	Kenya	Tanzania
Copper	Kilembe		
Cobalt	Kasese		
Diamond	Bushenyi, Kabale		Mwadui-Shanyanga Province
Iron Ore	Muko, Manafwa		Southern Tanzania
Tin	Mbarara, Kisoro, Kabale		Karagwe North West
Titanium	Tororo, Manafwa		Metelani Northern Tanzania
Tungsten	Kabale, Kisoro		Karagwe Northwest
Gold	Buhweju, Tira, Karamoja,		Around L. Victoria, Mbeya, Mpandu,

	<b>Kabale, Kamalenge</b>		<b>South West Tanzania</b>
<b>Gypsum</b>	<b>Mbarara,Bundigyo</b>		
<b>Limestone</b>	<b>Kasese, Tororo, Hima</b>		<b>Morogoro Region,Tanga</b>
<b>Marble</b>	<b>Moroto</b>		
<b>Phosphates</b>	<b>Tororo</b>		<b>Minjingu in Arusha Region</b>
<b>Salt</b>	<b>L. Katwe</b>		
<b>Vermiculite</b>	<b>Namekhara (Manafwa)</b>		
<b>Fluorspar</b>		<b>Kerio Valley</b>	
<b>Soda Ash (Trona)</b>		<b>L. Magadi</b>	<b>L. Natron, Balangida, Eyasi</b>

***DRAW A SKETCH MAP OF EAST AFRICA SHOWING THE DISTRIBUTION OF MINERALS***

**METHODS OF MINING USED**

Mining is an extractive industry; once the minerals are extracted from the ground, they cannot be replaced. The deposit in which minerals are contained is called as an **ore** and these vary considerably in how rich they are. For a mineral to be mined:

- There must be a high demand for it.
- The ore deposits must be sufficiently rich and large.
- There must not be great problems of extraction, processing, and transportation.
- There must be large sums of capital to invest in the extraction.

A wide variety of different methods of mining are employed in East African countries ,in some cases mineral bearing rocks are easily accessible but in other cases, deposits are less accessible hence they require expensive equipment to work on them.

The main methods include:

Open cast mining, Drilling, Adit mining, Underground mining, Placer mining and Panning method

**OPEN CAST MINING.**

Open cast is the exploitation of minerals that occur close to the surface. It involves the removal of the overburdening materials that is the vegetation and unwanted material and dumped nearby. The rock ores are blasted using explosives, and then huge power shovels are used. The mineral ore is removed from the blasted rocks and taken for processing

**THE BENCH METHOD**

This is the open cast mining where terraces or benches are constructed to remove the Ore found at deeper levels. IT ensures that the sides do not become so steep and it helps in transporting of the Ore.

**UNDERGROUND MINING**

Underground mining is used in areas where the mineral deposits are covered by a great thickness of earth rocks. In this method, most minerals occur in deep rocks that are extremely hard to remove using mechanical shovels.

Vertical shafts are sunk downwards for several meters to reach mineral seams. From these shafts, horizontal tunnels are driven outwards to reach the seams of the mineral bearing rocks. Explosives are used to blast the minerals being extracted. Railway tracks are used to transport ore and waste materials to the foot of the shaft for hoisting to the surface.

### **ADIT MINING**

This is employed where minerals occur in gently sloping seams with outcrop on the side of the high land or valley. They are horizontal or gently inclined tunnels that are driven into the hillside.

### **ALLUVIAL/PLACER MINING**

This is employed when minerals occur in alluvial deposits. It is done by mixing the alluvium with a great deal of water and tilting or rotating the gravels until the lighter practices (sand, mud, dust, stones) are washed off, leaving behind the heavier ores like gold, tin, chromium, platinum which have a higher specific gravity. Depending on the extent of the alluvial deposits, the quality of the mineral particles and the nature of the underlying surface, one of the following methods are employed:

- In small deposits, streambeds', panning is used. It is done by hand, the material being swirled round in a circular pan until the lighter material has been washed away.
- A dredge
- Hydraulic mining

### **FACTORS FOR THE DEVELOPMENT OF THE MINING INDUSTRY IN EAST AFRICA**

- Presence of Rich minerals deposits in different parts of East Africa has enabled mining to take place.
- Presence of adequate capital provided by governments of East Africa, the private sector and donor agencies to purchase the equipments for mining, paying the workers.
- Presence of large market for the minerals because of their high quality or grade.
- Improved transport and communication networks like Road, Railways plus communication
- Availability of different sources of power/energy like Hydro Electricity Power and thermal Power in the East African region which is used in the processing of the minerals
- Presence of abundant unskilled, semi skilled and skilled labour used in the mining, processing, transportation, marketing and distribution of the minerals.
- Presence of appropriate technology used in the mining and processing of the minerals.
- Nearness of the minerals to the earth's surface like lime, vermiculite alluvial gold has made the extraction of the minerals easier.
- Geological research carried out by the minerals departments of East Africa.
- Relative peaceful region/ politically stable region.
- Favourable government Policies like liberalization and privatization, giving of incentives to the investors. This has encouraged both local and foreign investor to invest in the mining sector of East Africa.

### **BENEFITS/IMPORTANCE OF MINING**

- It has development of industries because minerals are raw materials.i.e. Bamburi cement, Tororo Cement Industry.
- It is sources of foreign exchange after exporting the minerals
- Provision of employment opportunities to surrounding communities which has enhanced the improved standard of living of the people.
- It has enhanced educational and research activities.
- It has led to development of towns/urbanization in EA for example Kasese in Uganda and Mwadui in Tanzania.
- It has led to development of social amenities like Schools and Health centres in the mining areas.
- It has led to development of infrastructure such as roads and railway lines.
- It has led to economic diversification
- It has contributed to generation of government revenue through licences and taxes imposed on the mining companies in East Africa.
- It has led to exploitation of other natural resources like soils, water and vegetation.
- Improvement of international trade relationship
- Tourism industry development because the mines are tourist attractions.

### **Problems facing the mining industry**

- Minerals exist in small quantities for example **iron ore** and **coal** in Southern Tanzania.
- Low quality of minerals for example gold in Mubende
- Competition from other mining countries for example gold mining in Republic of South Africa.
- The use of inappropriate technology- crude technology in the extraction of minerals for example use of hand hoes and shovels in the extraction of lime in Muhokya-Kasese.
- Inadequate capital to invest in the mining industry.
- Remoteness of the minerals that is minerals are found in areas without social services.
- Limited local market for the East African minerals due to poverty among the people of East Africa.
- Inadequate power and energy supply because there are few power stations and they are low capacity.
- Inadequate transport network and unevenly distributed communication networks have hindered the transportation of the minerals.
- Shortage of the skilled labour due to the nature of the education system.
- Hostility of some tribes like Jie and Matheniko tribes in Northern Uganda
- Political insecurity mainly Uganda and Kenya
- Nature of the terrain for example rugged landscape hinders mining.
- Accidents
- Unfavourable climate conditions for example areas experiencing very hot temperatures of about 30°C discourage mining.
- Smuggling of minerals across the East African boundaries.
- Profit repatriation because most of the mines are owned by foreigners
- Restrictions from environmental conservation like National environmental organization.
- Misallocation of government resources or embezzlement/ corruption.

### **Problems created by the mining sector**

- Industrial pollution-air, water and land.
- Excavated hollows created due to mining of minerals in different mining areas have become breeding grounds for mosquitoes
- Destruction of the agricultural land by dumping of molten slag

- Deforestation is on increase in the mining areas.
- Growth of slum areas and their associated evils i.e. Kasoli in Tororo
- Unemployment and under employment due to the decline in the mining activities for example copper mining at Kilembe mines in Kasese.
- Destruction of the wetland ecology i.e. in Bushenyi.
- Accidents-loss of life
- Destruction of the beautiful landscape through dumping of mineral residues/molten slag.
- Profit repatriation because the mines are mainly owned by foreigners.

#### **Steps being taken to improve the mining sector**

- Encouragement of foreign investor in East African countries,
- Liberalization of the mining industry
- Extension of hydro electrical power to mining areas
- Recycling of minerals by products i.e. cobalt from copper pyrites
- Training of manpower in geology mapping and extraction of the minerals,
- Improvement of the transport and communication system
- Fighting corruption.
- Accessing loans from local and International banks i.e. Africa development Bank, World Bank.
- Empowering of local investors

## **MINING IN TANZANIA**

### **DIAMONDS AT MWADUI – WILLIAMSON MINES**

Diamonds are by far the most important minerals being mined in Tanzania. Tanzania has been a significant diamond producer for several decades, with the bulk of production coming from the Williamson Diamonds mine at Mwadui where commercial production began in 1925.

Williamson Diamonds mine located on central plateau of the Northwest of Shinyanga, 142km from Mwanza and 27km from Shinyanga. It covers an area of 146 hectares.

#### **Draw a sketch map showing the Location of Williamson Diamond mine at Mwadui**

The diamond bearing rock has outcropped pipes at Mwadui and is one of the largest in the world. In diamond bearing rocks are known as Kimberlites and there is over 300 Kimberlites known in Tanzania of which 20% are diamondiferous. The diamond bearing rocks are near the Earth's surface therefore open cast method is used to extract the diamonds.

#### **Method of mining and processing of diamonds**

- Open cast method is used on the surface i.e. Heavy excavators are used to dig the rock ores out. Heavy buckets crush and scrub the ore.
- Ores are loaded on the Heavy Lorries and rail wagons and transport the Ores to crushing station where the rocks are broken and loaded on the conveyor belts which carry them to treatment plants.
- The Ores are then passed through water separators where heavy diamonds sink to the bottom.
- The coarse matter is passed over grease covered belts to which diamonds stick.
- Waste materials are removed electronically and diamonds remain behind.

## Uses of Diamond

- making Jewell (Gemstone)
- Cutting glass,
- Drilling of hard rock to sink pipes in the oil wells .

## Factors which favoured the development of the Williamson mines at Mwadui

- Presence of large deposits of diamonds in North West Tanzania at Mwadui in Shinyanga province.
- The Nearness of the minerals to the earth's surface has made their extraction easy by use of open cast method of mining.
- The Nature of the terrain/ land scape in North West Tanzania is gently rolling landscape (Central Plateau) which has favoured the construction of the Transport and communication networks and eased the mining of the diamonds.
- The mineral is of high quality or grade therefore great demand for diamonds on the international market because they are used for a wide range of purpose like cutting glass drilling of hard rocks. Diamonds are exported to England, German & Spain.
- Improved transport networks like railways and roads which facilitate the transportation of Machinery, diamond products and workers.
- Availability of adequate capital provided by the Tanzanian government and De Beers family of Companies.
- The nature of the diamonds. The diamonds are dense, hard and repel wastes hence easy extraction of minerals from the rest of wastes.
- Peaceful and stable political environment in Tanzania.
- Constant supply of food stuffs to mine workers since the mines are located in regions which receive moderate rainfall with fairly the fertile soils.

## Benefits of Diamonds

- It is one of the leading components in generating foreign exchange earnings within the non-traditional exports which helps in the development of other sector of Tanzanian economy like educational and Health sectors.
- Provisional of employment opportunities to Tanzanians whereby over 2000 people are involved in the extraction of diamond in Shinyanga region of Tanzania hence better standards of Living.
- Provisional of social amenities to the people of Tanzania like schools, hospitals, recreation facilities, worship places.
- Promotion of the agriculture sector in Tanzania. This is because the Williamson diamond mine provide ready market for the agricultural product to the workers and miners.
- Improvement of the transport and communication networks which has made mobility easier in Northern Tanzania.
- Improved human resource skills, this is because training programmes are organized and carried out by the mining company at Mwadui to enrich to workers' skills and techniques.
- It has led to development of towns in Northern Tanzania like Mwadui town.
- Industrial development e.g. Treatment plants, agro-based industries.
- Provisional of hydro-electrical power and clean, safe piped water to people of Tanzania.
- Promotion of international trade relationship.

### Problems facing diamond mining at Mwadui

- Smuggling of diamonds out to Tanzania to neighbouring countries.
- Environmental hazards
- Accidents are common
- Exploitation of the workers whereby on average only US\$25 are given to a digger per month.
- Shortage of labour because Northern Tanzania is sparsely populated.

### FLUORSPAR MINING IN THE KERIO VALLEY IN KENYA

Fluorspar deposits are located in Western Kenya, in the Kerio valley. This valley is known for significant fluorite deposits, which were first discovered in 1967. Fluorspar is found in thick bed and outcrops on the earth's surface along the sides of the Kerio rift valley near Kimwarer.

#### Draw a sketch of Kenya showing the location of Kerio mining area

Quarrying/open cast mining is used in the extraction of fluorspar because of its nearness to the earth's surface.

### STAGES OF PRODUCTION

- Fluorspar is transported by the conveyor belts to the crushing plant to reduce its size.
- It is further crushed with water and sodium bicarbonate to produce a thick gritty cream known as slurry.
- Conditioning is done by adding more chemicals.
- It is partially dried to reduce the moisture.
- Fluorspar (Fluorite) is separated from waste materials called filtrate
- Conveyor belts are used to transport fluorite to warehouse where it is bagged and filtrate is taken to waste dip.
- Bagged fluorites are transported by lorries/trucks to Kaptagat rail station and then it is taken to Mombasa.

### USES OF FLUORSPAR

Calcium fluoride (CaF<sub>2</sub>) or fluorspar is the major source of fluorine for the chemical industry and used in three main industrial sectors:-

- In the chemical sector for the production of hydrofluoric (HF) which is a precursor in the synthesis of a wide range of fluoro chemicals e.g. tooth paste, pharmaceuticals, herbicides etc
- In metallurgy as a fluxing agent for steel plants, in magnesium metallurgy, and to form aluminum fluoride (AlF<sub>3</sub>) for use in the production of aluminum by electrolysis.
- In the glass and ceramics' industries as an opacifier, in surface treatments, lens coatings, additives and coloring agents and for welding rod coatings and in cement production.

Fluorspar is mainly exported to European countries like Germany, Poland, UK and C.I.S of Russia. A small percentage of fluorspar is used in East African steel rolling mills, Bamburi cement works at Mombasa and Uniliver.

### Factors which favoured the mining of Fluorspar of Kerio Valley

- Presence of large deposits of fluorite in Kerio valley Western Kenya
- The nearness of the fluorite to the earth's surface has made the extraction of easy by use of open cast method of mining.
- Presence of large local and international markets for fluorspar because it is of a high quality and used for a wide range of purposes.
- Availability of adequate capital provided by the Kenya fluorspar company Ltd to purchase the equipments required in mining of fluorspar.



- Improved transport and communication networks in Western Kenya for the distribution of the minerals.
- Favourable government policy of privatizing the mining sector
- Relatively stable political environment in Kenya has enhanced the mining of fluorspar.

### **Importance of fluorspar mining in Kenya**

- Kenya Fluorspar Company is the only large-scale operation of its kind in Kenya and is a leader in foreign exchanger earnings.
- Provisional of employment opportunities to Kenyans.  
The company is the leading employer in the area of KerioValley.
- The company provides a wide range of social amenities like health, education and other facilities to its employees as well as the local community
- Development of the industrial sector in Kenya because it is used as a raw material in a wide range of industries e.g. manufacturing of cement at Bamburi
- Promotion of the agricultural sector in Kenya because the workers of Kenya fluorspar company ltd provided ready market for agricultural produce.
- Promotion of international trade relationship.

### **Problems facing fluorspar mining at KerioValley**

- Displacement of the Kenyans. Over 1,400 families were displaced.
- The extraction of fluorspar in Kerio area has exposed the communities to constant health hazards through its mining activities like noise from explosives and discharging the harmful effluents into the Kerio –river
- Industrial pollution through the dumping of effluents with fluoride, phosphate and sulphate on the land and water bodies and emitting of dangers gases into the air during the processing of fluorspar.
- Competition with other fluorspar producing countries like USA, Republic of South Africa which has led to the price fluctuation on the world Market.
- Transport is difficult due to the rugged terrain in Western Kenya.
- Water problem. Lack of enough water supply to the mines yet fluorspar extraction requires a lot of water in processing

## INDUSTRIALIZATION IN EAST AFRICA

An industry is the collection of firms that produce goods and services that a community uses.

Industrialization is a process through which countries become increasingly involved in the processes of production of goods.

East Africa's industrialization seriously started in the early 1960s based on agro processing, manufacturing of consumer goods and extractive industries producing cement and other minerals like diamond, salt, Copper.

## STATUS OF INDUSTRIAL SECTOR IN EAST AFRICA

- It is pre-dominated by agro-based industries i.e. processing industries.
- East African countries have an industrial sector of only a relatively moderate size, which typically include industries connected with either agriculture or mining i.e. textiles, cement industries.
- It is dominated by import substitute industries than export oriented industries.
- It is also composed of small-scale industries with few heavy industries.
- It is dominated by use of poor methods of processing goods i.e. manual packing of manufactured goods i.e. sweets.
- Most of the industrial products like soda, beer, mineral water are locally consumed within the East African region.
- Some industries are producing at low capacity.
- Setting of new industries like chemical works.
- Most of the industrial are found in the major towns of East African

East African countries have put a lot of emphasize on industrialization mainly due to the following reasons: **(Factors that have influenced the establishment of industries in East Africa)**

- Creates self-reliance other than importing manufactured good.
- Creates job opportunities for the ever-increasing population of East Africa.
- Diversification of the economy i.e. not depending on only the agricultural sector whose products experience severe price fluctuation and also affected by natural hazards.
- Facilitates the rapid development of the infrastructure like roads, railways, which facilitate rapid development.
- Improved standards of living of the people of East Africa i.e. cash incomes of the industrial workers lead to increased purchasing power of the people to buy consumer goods.
- Exploitation of the natural resources like minerals ores, water and forestry resources.
- Leads to increased earning of foreign exchange through the exportation of manufactured goods.
- Improves the country's balance of trade.
- Promotes international understandings/ relationships between East African countries and those importing their manufactured goods.

- Facilities the development of social amenities like schools, health centers, recreational centers which accelerates development.
- Attracts foreign investors

East African region like other developing areas, the level of industrialization has remained at minimal or not yet industrialized despite all the advantages offered by industrial development. This is mainly attributed to the following factors:

- Lack of the basic minerals like Coal, Iron Ore, Uranium which are prerequisite for industrial development hence East Africa imports all the required raw materials to feed their industries.
- Inadequate capital to invest in the industry sector because the East African budgets are mainly financed by the World Bank, IMF and donor countries.
- Limited market for the manufactured goods because of the low incomes earned by the East African people.
- Poor infrastructure especially railway lines which are required in initial development of heavy industrial complex. In and water ports are in poor state and roads are impassable during the wet seasons and they are unevenly distributed in East African region.
- Inadequate skilled labour force required in management of the industrial sector.
- Competition from already heavily industrialized countries of the west and Asia, which dump their industrial products thereby heavily handicapping the infant industries of East Africa.
- Misallocation of government resources.
- Political instability and insecurity in the great lakes regions, which has a number of effects like scaring away skilled labour, destruction of infrastructure, heavy government expenditure on purchasing of arms etc.
- Low levels of technological development.
- Competition among the East African countries due to the production of the same manufactured goods.

### **TYPES OF INDUSTRIES IN EAST AFRICA**

The industries in East Africa can be divided into three (3) major groups. These are:-

#### **a) Primary/Extractive Industry**

This industry deals with the extraction of natural resources i.e. fishing industry, mineral mining, tea processing coffee curing, cotton ginning, and forestry industry. They represent the 1<sup>st</sup> stage of industrial development.

#### **b) Secondary/Manufacturing/processing Industry**

These industries turn organic and inorganic raw materials into finished goods/products. The largest number of industries in this category in East Africa are processing industries i.e. food processing, beverage and tobacco, chemical works, textile and clothing industry, metal and engineering.

### **c) Tertiary/Service Industry**

These industries include transport, tourism, service or repair of electronics i.e. radios, computers, television.

NB. The Industries can be characterized according to the following:-

#### **1. Labour and capital**

- Labour intensive industries.
- Capital-intensive industries.

#### **2. Size**

- Small scale industries
- Large scale industries

#### **3. Contribution to trade**

- Import substitute industries
- Export oriented industries

#### **4. Type of Production**

- Light industries
- Heavy industries
- General manufacturing industries

### **THE MAJOR INDUSTRIAL AREAS IN EAST AFRICA**

The major industrial areas in East Africa are found in towns, which have developed their own industrial zones i.e.

- Kampala, Jinja, Tororo, Mbarara, Kasese, Soroti, Lira in Uganda.
- Nairobi, Mombasa, Nakuru, Eldoret, Kisumu, Meru, Kitale, in Kenya and Dar-es-Salaam, Morogoro, Dodoma, Moshi, Shinyanga, Tabora, Kigoma, Mbeya, Songea in Tanzania.

Draw a sketch map of East Africa showing the distribution of industrial areas and industries.

## CASE STUDIES OF THE MAJOR INDUSTRIAL AREAS IN EAST AFRICA

Industrial area/town	Major industries
<p><b>NAIROBI</b></p> <ul style="list-style-type: none"> <li>• Found in Kenya</li> <li>• Leading industries city in East Africa</li> <li>• Manufactures both for export and domestic markets</li> </ul>	<p>General Engineering, Food processing Beverage, Leather goods, Wood processing, Chemicals and Plastics, Textiles, Vehicle assembling plants, motor vehicle repairing plants, printing and publishing, metallurgical industries, mineral processing industries Breweries</p>
<p><b>DAR-ES-SALAAM</b></p> <ul style="list-style-type: none"> <li>• Largest town in Tanzania, popularly known as Haven of peace.</li> <li>• Started as a fishing village and transformed into a well-industrialized town.</li> <li>• Is a major sea port</li> </ul>	<p>Chemicals and Plastics, Oil Refining, Textiles, Food Processing, Metal and Engineering, Cement, Ship Repairing, Wood Processing, Construction Companies, Non- Metallic Industries, Beverages, Breweries, Printing and Publishing Industries</p>
<p><b>KAMPALA</b></p> <ul style="list-style-type: none"> <li>• Largest town in Uganda</li> <li>• The main industrial area in Uganda</li> </ul>	<p>Food processing industries, chemical works industries, metal and Engineering industries, printing and publishing industry, textiles, leather and foot wear industries, vehicle Assembling plants, non-metallic industries i.e. cement, bricks, tiles,foam mattresses, plastics, etc, Breweries, Beverages, pharmaceuticals</p>
<p><b>JINJA</b></p> <ul style="list-style-type: none"> <li>• Located in the Eastern region of the country</li> <li>• Where the R. Nile started its journey to Mediterranean Sea</li> <li>• It was the leading industrial town in Uganda up to 1989.</li> </ul>	<p>Food Processing Industries, Chemical Works Industries, Metal and Engineering Industries, Wood Processing etc</p>
<p><b>MOMBASA</b></p> <ul style="list-style-type: none"> <li>• Second largest industrial town in Kenya</li> <li>• It is the major Sea Port of East Africa</li> <li>• Located on Eastern Coast of Kenya</li> </ul>	<p>Oil refineries, metal and Engineering, Chemical Works, Cement Manufacturing, Food processing industries, Textiles, Ship Repairing</p>
<p>ELDORET</p>	<p>Metallurgical industries, engineering, food processing, leather tanning/foot ware, textiles, tobacco processing,</p>
<p>TANGA</p>	<p>Cement manufacturing, food processing, beverages, chemical works, textiles, metallurgical industries, furniture making</p>

## **FACTORS THAT HAVE FAVOURED THE DEVELOPMENT OF INDUSTRIES IN EAST AFRICA:**

- Availability of adequate power supply to run the industries.
- Presence of large supply of raw materials to feed the industries.
- Existence of large markets at and home and abroad to consume the finished products
- Existence of large amounts of water supply.
- Accessibility by water, land and air to enable assembly and distribution of finished products.
- Availability of extensive land to set up the industry and expansion of industries.
- Availability of commercial or auxiliary services e.g. banking industries.
- Availability of reliable and abundant skilled and unskilled labour to run the industries.
- Favourable government policy on industrialization which encourages both local and foreigner investors to establish the industries
- Availability of adequate capital for investment in the industrial sector.
- Industrial initial (linkages) some industries in East Africa use the by products of other industries therefore such industries have been established near each other e.g. bi-product of cotton in ginneries mainly; seeds are used for the production of cooking oil and has led to development of soap industry within the ginnery
- Initiative or decision of the entrepreneurs: Some industries in East Africa have been located where they are depending on the aims of the investors. Some have located the industries in their home areas for political or personal reasons.
- **Other factors** like historical factors, political stability.

### **Advantages of industries:**

- It provides employment to many people who are skilled, semi-skilled and unskilled. It is estimated that 10% of all civil servants of East Africa are employed in the industrial sector.
- Industries earn foreign currency to the countries of East Africa through the export of products such as sugar to Zimbabwe, and Rwanda. Drinks are exported to Rwanda, DRC, Textiles to USA, fish product to USA and European countries like Spain, Italy etc. [These items are exported to USA under African Growth and Opportunity Act (AGOA), Europe and Middle East).
- The industrial sector provides market for the locally produced raw materials e.g. tobacco from West Nile is used by British American Tobacco turning it into cigarettes, cotton from Soroti, Lira, Iganga, Kasese are used by textile industries like in Jinja produce clothes and is also used by Lira Spinning Mills to produce yarn for exporting, hides and skins used by leather turning industry.
- Improvement of infrastructure e.g. roads, railways lines, warehouses, stores. Telecommunication, power lines etc.
- Industries provide on job training to the workers thereby facilitating them to acquire skills and also to improve their skills. On job training is usually carried out for the intermediate staff in simple skills such as welding and blacksmith, carpentry and book keeping.
- Industries provide social services to the surrounding areas which include schools, health centres, and places of worship e.g. Kampala, Jinja, Mombasa, Nairobi, Mwanza, Dar-es-salaam.

- Industries lead to the growth and development of towns. The towns that have developed as a result of industrial establishment i.e. Kampala, Jinja, Mombasa, Dar-es-salaam Dodoma
- Industries provide inputs for other sectors of the economy leading to their growth and development as well as industries provide inputs such as hand hoes, slashers, sickles, fertilizers in the agricultural industry
- The industrial sector has led to the establishment of international relations between East African countries and trading partners in industrial goods.
- Manufacturing industries have also improved peoples standards of living by availing them with cheap commodities e.g. sugar from Kilombero and Miamus, tea from Kericho estates.
- Industrial sector has also promoted research in East Africa e.g. research in industrial development is carried out at Industrial Research Centre. In addition, students carry out academic studies on major industries such as in Jinja, Nairobi, and Dar-es-Salaam. This research is called industrial field work.
- Industrial Sector has led to the diversification of the economy in East Africa in so doing, it releases dependence by the country on sectors like agriculture, tourism and mining because it provides revenue, jobs to East African people.

#### **NEGATIVE CONTRIBUTIONS/DISADVANTAGES OF INDUSTRIES:**

1. Lead to environmental pollution. They pollute the air, water and land e.g. Hima Cement Industry in Kasese discharges 400 tones of dust per day into the atmosphere.
2. Loss of government revenue though tax holdings and subsidies that the government extends to upcoming industries and promotions.
3. Some industries are owned by foreigners e.g. Mukwano owned by Asians, Kakira owned by Madhvan mostly employ their people all the time, repatriate profits and they invest less in East African countries.
4. They are intensively adopting capital-intensive techniques of production. Some of them have automated production lines. In so doing, they provide less job opportunities to the local people since they are less labour intensive e.g. breweries, century/crown bottles, used to employ only 8000 people but after automation it now employs 1500 people.
5. It spends a lot of foreign exchange importing some raw materials for some manufacturing industries i.e. Picfare imports paper from Canada.
6. The policies of protectionism adopted by the government to boost the industrial sector e.g. banning the import of goods similar to those that are locally manufactured in the country has made some industries produce goods of low quality due to lack of competition from imported goods e.g. toilet paper, rose. Tomato sauce by Britannia, Batteries by UMA.
7. Due to increased costs of production, some items produced in East Africa are expensive compared to those that are imposed from other countries. As a result. Many people especially in rural areas can't afford them.
8. Industrial centres have developed into urban centres leading to rural-urban migration with its macro-economic problems like open urban unemployment in Kampala and Nairobi, poor living in Kampala, Dar-es-Salaam, Nakuru.

9. A lot of capital is required to establish industries. Raising this capital may necessitate neglecting other important sectors e.g. fishing, agriculture.
10. Manufacturing industries such as brick and tile production, lime production, furniture production have led to depletion of forests.
11. It has also directly destroyed forests e.g. Namanve forest in Mukono as a result of establishment of century bottling industries. The swamps at Kyambogo, Nakawa were drained to establish industries e.g. Shumuk, Grain Millers.
12. Government owned industries drain the scarce foreign exchange of the East African countries. A lot of money is required to maintain them.
13. There are local dangers or accidents caused by industrial machines and other occupational health hazards like respiratory diseases got from coffee processing plants, lung and heart complications.

### **FISHING IN EAST AFRICA:**

Fishing refers to the extraction of aquatic life from the different aquatic environments mainly lakes, rivers, swamps (wetlands) and fishing ponds. The commonly extracted aquatic life in East Africa is fish.

In East Africa fresh water fishing grounds accounts for over 70% of the total catch with Lake Victoria taking a share of over 75% of the total catch.

East African countries export their fish to countries like DRC, Egypt, Sudan, Burundi, Malawi, Rwanda, Holland, Portugal, Britain, Sweden, Spain, Australia, Israel, Saudi Arabia, Japan and United States of America.

East African countries export fish in different forms and they include: dried fish, Smoked fish, fresh fish, chilled and frozen fish, fish meals, fish maws, fish skins and fish oil.

### **MAJOR FISHING GROUNDS IN EAST AFRICA:**

There are mainly two types of fishing grounds namely:

- **Inland Fresh water fishing grounds**
- **Marine fishing grounds**

#### **The major inland fresh water fishing grounds are:**

##### **1. Lakes;**

- **Lake Victoria** is the largest tropical lake and second largest in the world. It is the most important fresh water lake of commercial fishing in East Africa. The lake is shared between Kenya (4080km<sup>2</sup>, 6%), Uganda (43%, 29,732km<sup>2</sup>) and Tanzania (34,680km<sup>2</sup>, 51%). **Nile perch, tilapia, Nkejje (Haplochromis), Silver fish (mukene), bagrus** are the major species of fish caught from Lake Victoria. **The major fish landing sites include; Masese, Ggaba, Kasenyi, Katosi, Entebbe, Bukakata, Dimu, Kasensero, Bugoto, Namugoba and Kamuhangi in Uganda; Bukoba, Musoma, Mwanza, Bukima, Muleba in Tanzania and Kisumu, Homa Bay and Karungu in Kenya.**
- **Lake Kyoga** is the second most important fishing ground in Uganda. **Tilapia, Nile perch, bagrus, cat fish, barb, lung fish and nkejje** are the major fish species caught on Lake Kyoga. **The major fish landing sites include; Lwampanga, Nabyeso, Gogonya, Muntu, Mugalama, Galiraya and Chawent.**



- **Lake Albert** is the third most important fishing grounds in Uganda. **Ngara, barbus, Nile perch and Ngasia** are some of the fish species caught from Lake Albert. **The main fish landing sites found on Lake Albert are Butiaba, Wanseko, Kasenyi, Ndaiga, Ntoroko, Toonya, Kibiro, Bugaiga and Kiina.**
- **Lakes Edward, George and the Kazinga channel** are very important for fishing activities. **The main fish landing sites found on George are Katunguru, Kamukungu, Kahendero, Kayanja, Kasheka and Manyoro. The main fish landing sites found on Lake Edward are Rweshama, Kazinga, Katwe, Kayanja and Kishenyi.**
- **Other lakes found in Uganda** are;
  - Bisina, Opeta, Nakuwa, Nawampasa, Lemwa, Kwania, Nyaguo, Agu and Kimira. These are part of the Kyoga minor lakes which consist of over 24 small lakes all of which are joined by extensive papyrus swamps.
  - Kijanebalola, Kachira, Mburo, Nakivali plus about 14 smaller lakes.
  - Nabugabo, Manywa, Kayugi, Kayanja and Kitunda.
  - Lava dammed lakes like Bunyonyi and Mutanda.

#### **Lakes found in Kenya**

- **Lake Turkana** is the second most important fishing ground in Kenya. It is located in Northern Kenya which is sparsely populated. Both commercial and subsistence fishing is practiced mainly at Ferguson's gulf. **Nile perch and tilapia** are some of the fish species caught from Lake Turkana. **The main fish landing site is Kalokolo.**
- **Other lakes found in Kenya** are Logipi, Baringo, Bogoria, Nakuru, Elementaita and Naivasha.

#### **Lakes found in Tanzania**

- **Lake Tanganyika** is the second most important fishing ground in Tanzania. Commercial fishing is concentrated at Kigoma where there is large population providing the ready market. **The most common fish species caught from Lake Tanganyika is the dagaa. The main fish landing sites are Kasanga, Wampembe, Kipii, Karema, Ikola, Ujiji and Kigoma.**
  - **Lake Malawi** is the third most important inland fresh water fishing ground in Tanzania. The main fish type caught on Lake Malawi is **Kapenta/tilapia and Black fass**. **The main fish landing sites found on Lake Malawi are Mbamba Bay, Manda and Kyela.**
  - **Other lakes found in Tanzania** are **Rukwa (Ngomba is the main fish landing site), Manyara, Eyasi and Natron, Ihema, Twamwala and Bungi.**
2. **Rivers:** Examples of rivers are Victoria Nile, Albert Nile, Mpanga, Pager, D, Aswa/Achwa, Rwizi, Nkusi, Sezibwa, Katonga, Kafu, Muzizi in **Uganda**; Tana, Galana, Esawo-Nyiro, Turkwel, Kuywa, Mara, Malaba, Nzoia, Ngala in **Kenya** and Ruvuma, Rufiji, Malagarasi, Kagera, Pangani, Matanda in **Tanzania**.
  3. **Wetlands** are found around the shores and bays of lakes like Victoria, Kyoga, George and Edward; along the river banks of rivers like Mpologoma, Katonga, Kafu, Mayanja, Dopeth-Okok, Victoria Nile in **Uganda**; Lorain swamp along the river banks of Esawo-Nyiro and Tana in **Kenya** and shores of Lake Rukwa and Manyara; along the river banks of Great Ruaha in Kilombero valley, Malagarasi, Wembere in **Tanzania**.
  4. **Fishing ponds (Aquaculture):** This is the keeping of fish on managed water bodies like ponds. Fish ponds are found in Kibale, Kabale, Pallisa, Kabarole, Luwero, Kumi, Iganga, Kajjansi, Sembabule, and Mbale in Uganda; Sagana, Homa Bay and Bamburi in Kenya.

#### **Marine fishing grounds:**

This takes place on waters of the Indian Ocean, mangrove swamps at the East African coast, the estuaries of rivers like Rufiji and Tana, the reef coral areas and channels of Zanzibar and Pemba islands. Marine fishing is restricted to the continental shelf because the local fishermen do not have mechanized vessels for deep-sea fishing. Most of the people living on the coast are engaged in either part-time fishing or commercial fishing.

***DRAW A SKETCH MAP OF EAST AFRICA SHOWING THE MAJOR FISHING GROUNDS AND FISHLANDING SITE***

**The major Species of fish caught in East Africa:**

**(a) Inland fresh fish species are;**

English	Local name	Scientific name
Nile Perch	Mputa	Lates niloticus
Tilapia	Ngege/Zogoro/Kapenta	Oreochromis niloticus
	Semutundu	Bagrus Docmac
	Kisinja	Barbus altianalis
Cat fish	Male	Clarias
Lung fish	Mamba	Protopterus aethiopicus
Mud fish	Nsonzi	Clarias allauadi
Electric fish	Kasulubana	Mormyus Kanne
Moon fish	Nkejje	Haplochromis
	Ningu	Labeo victorianus
Silver fish	Mukene	Rastrineobola argentea
Tiger fish	Ngasia	Hydrocynus
	Ngara	Alestes
Inland salmon	Dagaa	

**(b) The salt- water fish:**

These spend their entire life in the Indian Ocean. They are the largest group of fish and are sub-divided according to their habits into two groups:

- **Pelagic fish:** these spend greater proportion of their lives close to the surface of the Indian Ocean. They are generally small in size and swim in shoals (groups). For example **Yellow-Fin Tuna, sardines** (are commercially exploited in the coral reefs, Zanzibar and Mafia Channels), **mackerel and anchovy; Prawns, crabs, Mullet, Crustacea and Lobsters** are found in Mangrove swamps at the coastal areas; **Oysters and Shrimps** are concentrated at the Kenyan coast.
- **Demersal fish/white fish:** these are found mainly at the bottom of the Indian Ocean and usually feed on smaller fish and other aquatic animals. For example **halibut and plaice**.

**METHODS OF FISHING:**

There are mainly two methods of fishing used in East Africa, these are:

**TRADITIONAL METHODS:**

It is imperative to note that the traditional methods of fishing are commonly used in under developed areas of the world in the inland water bodies and off-shore fishing areas for subsistence. These include:

**Fishing baskets/Basket traps:**This is a method where locally woven baskets made up of papyrus are used to catch fish. Inside the baskets are baits placed in the basket and one end of the basket is closed. The basket is placed in water; the fish is attracted to the bait. The opening of the basket is placed in line with the moving water and once the fish enters the basket, it is unable to find an escape. The method is used in fast flowing water. This the most common method used on Lake Kyoga.

**Barrier trap:**In this method, polls are stack into the water on either side of the channel to narrow the passage. In the remaining opening, the cone-shaped basket is placed in which fish is trapped. This method involves use of spears; the fisherman has to step in the water to scare the fish.

**Hooks/line and baited hooked method:**In this method, a baited hook tied to a line is placed in water. When the fish identify the bait, they try to swallow it and in the process it is caught.

**Lampara method/Lamp (Use of light):**In this method, the fishermen lower a lit lamp into the open water and then the shining lamp attracts swarms of small fish (pelagic fish). The fish are then quickly scooped out of the water into the boat.

**Use of spears, bows and arrows:**This method involves using these implements to catch fish like cat fish. That is by spearing the fish. It is carried out in shallow waters and swamps. This method is dying out due to the introduction of different methods of fishing.

**Beach seining method:**In this method net are generated in shallow water. One end of the net is tied to the boat and cast in the water while the other end is held at the shore. Ropes are pulled from the shore to get the fish trapped.

**Gill netting:**It involves the use of nylon gill nets fixed with floats on top and weights at the bottom in order to make it stretch out. The net is stretched out in water in form of volleyball net. Fish is then trapped within the net by its gills. Gill nets are usually cast in the afternoon and removed in the morning hours. This is the most common method of catching fish for commercial purposes in East Africa. **Others are scoop and cast nets.**

## **MODERN METHODS:**

### **Drifting:**

This involves the use of drift nets and they are used to catch fish that lie near the surface of the lakes. They are drawn using vessels known as drifters. A net is suspended in water with floats at the top and weights at the bottom. The drift net hangs vertically in the water and the fish are caught by their gills as they try to pass through the net. Once trapped, they can move neither forward or backward. When the fish has been caught the net is removed onto the drifter/ship for transportation to the processing plants.

### **Line fishing:**

This method is used to catch fish found in deep water. It involves the use of a long main line with attached drop lines which have hooks and baits attached. The main line may stretch for several metres with about 200 drop lines (may be as long as 1 or 2 km). The fish are caught as they try to eat the baits. When enough fish has

been caught, the line is pulled from the water onto the ship and the fish is removed for processing. **OR** the use of a series of hooks attached to plastic or metallic lines which are pulled by a trawler. The lines have a luring light, which attracts the fish.

### **Trawling:**

This is used to catch fish that live in deep waters. A cone-shaped net is dragged along the bed of sea by ships called trawlers. The trawl net is kept open by otter boards either wooden or metal that pulls outwards as is towed at the floor of the sea. The fish moving in the opposite direction swims into the net and is trapped at the cod end. The net is then removed and emptied onto the ship for processing.

### **Purse seining:**

This is a method used to catch fish, which live near the surface of the water. Here, a purse-seine net is laid out in a circular form below the water to trap a shoal of fish. These fish shoals are located by using an echosounder. At the bottom of the purse seine is a ring through which a rope attached to a small boat/dory. A small boat is used to lay the net which net is suspended by floats at the top and weights at the bottom. When a circle has been made, the rope is then pulled to close the bottom of the net, thereby engulfing/trapping the fish in the process. The net is lifted onto the vessel/seiner.

## **FISH PROCESSING AND PRESERVATION IN EAST AFRICA:**

Fish processing refers to any preparation done to harvested fish in order to maintain the quality of fish acceptable to consumers. Fish is one of the most perishable food products. There are mainly **two** categories of processing. These are:

### **Traditional categories:**

These are basically artisanal and consist of indigenous methods of fish processing which are well known in rural communities of East Africa. These include;

#### **Smoking:**

It involves the use of kiln with a mesh that has fire lit under it. The fish are placed on the mesh depending on their size. It is the most popular method used around the major fishing grounds in East Africa and provides the best returns to the processors.

#### **Sun drying:**

In this method, the fish are spread out under the sun and the fish dries up slowly. In this method the process can take days for the fish to be fully processed depending on the weather condition. It is commonly used to preserve small pelagic fish species like Haplochromis(Nkejje) and Rastrienobola (Mukene). It is also used for large fish species after they have been split. It is used to prepare fish maws (bladders) of Nile perch.

#### **Salting:**

This method involves sprinkling or smearing of salt on the fish after cutting it open or splitting it.

### **Frying:**

In this method, pieces of mainly Nile Perch and tilapia are placed in boiling oil.

### **MODERN CATEGORIES:**

Several industrial plants have been established to handle and process specialized fish products for exports and the premium market. These include;

#### **Deep freezing:**

In this method, trucks are specifically constructed are fitted with refrigerators, which are used to freeze the fish to facilitate fish to be carried from the landing sites to processing centres.

#### **Use of ice and salt:**

In this method, the fishermen use blocks of ice to preservation of the fish they have caught. The blocks are put in boats and the ice is used to cover all the fish caught. The ice preserves the fish until it is brought to the landing sites where it's sold to the fish processing plants. The salt is used to reduce on the rate of ice block melting.

#### **Fish canning:**

This is carried out at large factories for example Hwan Sung in Nakawa and Mombasa. In this method, fish fillets are packed in tins after preservatives have been added to them.

### **CONDITIONS WHICH HAVE FAVOURED FISHING IN EAST AFRICA**

#### **Physical factors:**

- Presence of water bodies both fresh water bodies like Lakes Victoria, Turkuna, Kyoga and Tanganyika and marine water fishing ground for example Indian Ocean which are suitable for fish breeding.
- Presence of abundant plant plankton these are micro-scopic organisms (algae) which constitute the fish food. Planktons are influenced by a number of factors;
  - Shallow waters like Lake George which is 3m deep allows easy penetration of sunlight to the lake bottom so that plankton can be formed through a process of photo plankton.
  - The presence of inlets which add water to the lakes and carry mineral salts required by photo plankton in order to grow for example Rivers like Nzoia and Katonga feed Lake Victoria with minerals like calcium.
  - Oxygenated water favours the growth of plankton in different fishing grounds of the East Africa.
- The marine fishing ground of East Africa is indented and backed by strong relief structures. The coastal areas are also sheltered from the strong currents and they have estuarine coasts that provided ideal sites for the construction of fishing towns/coastal towns like Mombasa.
- Presence of different fish species of commercial value like tilapia that are caught in different fishing grounds like Victoria.
- Presence of equatorial forests found at the shores of Lakes and along the river banks of rivers. These are used as raw materials for the production of boats and dugout canoes which are used for transportation of the fishermen and their fish products on water. The forests provide firewood used for smoking of fish at fish landing sites. Timber is also used in the construction of fish piers and shelters at the fish landing sites.

- The forests help to control the silting of water bodies because silts lead to destruction of plankton. The forests also help in the formation of rainfall thereby maintaining the water levels in lakes and in addition, they purify the atmosphere by taking in harmful gases like carbon dioxide from industries.
- Presence of extensive shallow continental shelf.
- Favourable climatic conditions facilitate the growth of plankton in different fishing grounds.
- The gently sloping landscape has favoured construction of landing sites and transport routes.

#### **Human factors;**

- Presence of large markets both internally and externally. The local market provided in urban centres like Kampala, Jinja in Uganda; Mombasa, Kisumu in Kenya and Dar-e-salaam, and Mwanza in Tanzania. The fish processing companies also provide market for fish especially Nile Perch and Tilapia. Market is also provided by industries that manufacture poultry feeds. These industries add pelagic fish such as Haplochromis and shells as they are processing animal feeds. Externally, importers like Spain, Saudi Arabia, Kuwait, United States of America, Egypt, Sudan and Democratic Republic of Congo.
- Availability adequate transport and communication facilities. The transport facilities ease the transportation and distribution of fish and fish products to different marketing centres.
- Availability of adequate capital to invest in the fishing industry to purchase fishing gears like fishing nets, floaters and weights, out boat engines, and machines used in the processing of fish at the fish plants.
- Availability of abundant labour supply ranging from unskilled to skilled is readily available in the East African countries. This labour is required for harvesting fish, transportation of fish and fish products, processing of fish, marketing fish and carrying out research.
- East African region is relatively stable and peaceful. This has provided a conducive environment for fishing activities. It has encouraged both local and foreign investors to invest in the fishing industry.
- Availability of the different sources of power or energy like HEP, biomass (fuel wood), and thermal energy are used which are used in the processing of fish. Wood fuel is used for smoking of fish to preserve it. HEP and thermal energy are used mainly in the fish processing industries. Paraffin is used to light lamps to catch pelagic fish using the Lampara method.
- Modern technology has facilitated fishing especially on Lake Victoria and Kyoga, Tanganyika and Indian Ocean. Modern technology is used in harvesting, transportation and processing of fish. The modern methods of fishing include the use of drifters and trawlers.
- Favourable government policies on fishing and water management have led to the development and growth of the fishing industry in East Africa. The governments extend soft loans to both the local and foreign investors; security to fishing industry and training of the fisheries personnel. Laws have been set up and re-enforced against illegal fishing methods and fish smuggling.
- There has been improvement of transport mainly roads leading to the fish landing sites.
- Research done by Uganda Fisheries Institute in Entebbe, Lake Victoria Fisheries Research Organization both under NARO and ministries of fisheries in Kenya and Tanzania.
- Economic integration thereby creating wider external market like COMESA; East African countries are allowed to export to EEC, US markets under African growth and economic unity.
- Presence of improved storage facilities at Entebbe Airport, Mombasa, Kigoma and Dar-es-Salaam.
- Presence of other activities like salt mining on Lake Katwe to preserve fish, Uganda Roofings manufactures nails used in construction of boats and iron sheets for construction of shelter as well as the forestry industry provide timber for making boats and some used as wood fuel.

#### **THE ROLE OF FISHING IN ECONOMIC DEVELOPMENT OF EAST AFRICAN COUNTRIES:**

- Fishing provides employment opportunities to the people mainly those living around the fish landing sites. This has helped the people to improve on their standard of living.

- Provision of foreign exchange to the East African countries' economy. Fish and fish products from fish landing sites are exported to various countries like Egypt, Belgium, Britain, and Holland. This earns the East African countries foreign exchange which is used to set up infrastructure like roads and hospitals.
- It is a source of food mainly rich in protein. It has contributed to nutritional welfare of people living in urban areas such as Mbamba Bay and Mombasa by providing a lot of proteins, vitamins A and D and fats.
- Source of medicinal value for example *Haplochromis* (Nkejje) is used to treat measles mainly in the rural areas of East Africa
- The fishing industry provides revenue to the government through taxing the fishermen found at the different site landing sites, fishing companies and fish dealers.
- It has led to industrial development in the East Africa. The fishing industry provides raw materials for the fish processing plants, animal and poultry feeds.
- It has also led to development of related industries like industries manufacturing the gillnets and boat making industries.
- The fishing industry has led to the development of infrastructure of the East African countries mainly roads that have been constructed to connect the fish landing sites to the markets.
- Fishing has led to the development of trading centres (urbanization) mainly along the fish landing sites for example Kasenyi, Ggaba, Butiaba, Masese in Uganda; Kisumu, Mombasa in Kenya and Kigoma, Bukoba in Tanzania. This has promoted trade and commerce in items like food stuffs and manufactured commodities.
- Fishing has led to the diversification of the country's economy. It provides an alternative economic activity in some areas where agricultural activities cannot be carried out for example the dry areas of the northern Kenya.
- Fishing has promoted the tourism sector of East African region. One of the major tourist attractions in East Africa is Sport fishing which is carried out on Lakes and coastal areas and in the process it brings about foreign exchange.
- Fishing has facilitated the exploitation of other resources in the country for example the need for timber to construct boats and fuel wood for fish smoking has facilitated the exploitation of equatorial forests.
- The fishing industry provide market for various items such as fish nets, hooks, ice blocks and fuel used in the motor boats.
- It has led to development of international trade relations between East African countries and the countries that import their fish like Nile perch.
- It has enhanced the educational and research activities for example the students of Gayaza High School conducted their fieldwork at Ggaba fish landing site in order to fulfill the UNEB requirements.
- Development of the art and craft industry for decoration purposes

#### **PROBLEMS FACING FISHING INDUSTRY:**

- Use of poor methods of fishing whereby fishermen use simple equipments like hooks and baskets on Lake Kyoga which are time consuming leading to less output. The poor methods also reduce the quality of fish hence affecting the market for fish.
- The water weed was a major threat to the fishing industry between 1992 and 2002. The other common water weeds in East Africa include the floating papyrus reeds on Lake Kyoga, water lettuce on Lake Edward and floating vegetation on Lake Bunyonyi.
- Limited market for fish and fish products in East Africa for example *Haplochromis* are of poor quality, therefore, have a limited market both within and outside East Africa. Some tribes like the Mamba clan of Buganda don't eat lung fish because it's their totem.
- Stiff competition for the market by the close substitutes to fish like chicken, pork and beef. There is also stiff competition from leading fish producing countries like Japan, Peru, Norway, and Canada who are the leading fish exporting countries hence out competing East African fish on the world market.



- Existence of predators in the water bodies like Nile crocodiles in Lake Albert and Victoria which consume large amounts of fish equal to their weight and they also attack fishermen, Nile Perch feeds on small aquatic animals like Haplochromis and cat fish feeds on young tilapia. This has led to depletion of fish species like Kasulubana and Kisinja in the waters of Lake Victoria.
- Climate change, this induced unnecessary variations in the water levels in the major fishing grounds of East Africa for example the El-Niño in 1997-1998 led to increase of water levels of Lake Kyoga which led to the flooding of the lake hampering the fishing activities and decrease in the water levels of Lake Wamala due to high temperatures and extreme evaporation, this exposed the rocks in the lake and made the fishing activities difficult and expensive. The hot temperatures also increase the rate of post harvesting losses.
- Unreliable transportation and communication network, the uneven distribution of transport routes coupled with poor state of roads limiting the transportation of fish from the fishing grounds like Lakes Albert and Turkana in Northern Kenya to market centres. This has made the distribution of fish very difficult.
- Remoteness of some fishing grounds whereby these fishing grounds are inaccessible for example Nakuwa, Turkana fishing grounds are inaccessible. This in effect makes distribution of fish in East Africa difficult.
- Nature of water bodies, some lakes in East Africa are salty, therefore, they limit the multiplication of fish plankton which is the fish food. This is common in the volcanic lakes like Katwe.
- Territorial conflicts between East African countries for example Uganda share Lake Victoria with Kenya and Tanzania; Uganda share Lakes Albert and Edward with Democratic Republic of Congo; Tanzania shares Lake Tanganyika with DRC. This has led to conflicts among the fishing communities because of lack of clear demarcations of borders of countries hence hampering the fishing activities.
- Smuggling of fish across the boundaries of East Africa countries.
- Inadequate storage facilities like refrigerators at fish landing sites and market centres.
- Inadequate capital to invest in the fishing industry, therefore, the fishing sector is under funded by the East African governments.
- Shortage of skilled manpower to develop the fishing sector
- Political instability and insecurity have affected the fishing industry in two ways that is it has limited the distribution of fish and fishing activities in areas under political insecurity.
- Pollution of water bodies, due to rapid industrial growth, urbanization and modernization of agriculture. It has led to pollution of the water bodies with untreated waste products affecting the aquatic life.
- Reclamation of wetlands or swamps
- Silting of the water bodies due to deforestation.
- Strong winds and rain storms which leads to accidents on the water bodies.
- Seasonality of the fishing grounds like river Okok and Okerere in north eastern Uganda.
- Poverty among people of East Africa-low purchasing power of local consumers to wide spread poverty.
- Effects of moonlight in some seasons lead to low catches because the fish see the nets.
- Limited research to determine the amount of fish in the fishing grounds.
- Over fishing and indiscriminate fishing on the water bodies. This leads to the depletion of fish.

### **Solutions:**

- Introduction of modern fishing facilities like trawlers and drifters.
- Construction of fish processing plants near the fishing grounds. This reduces the transport costs.
- Training of skilled labour. These are required to monitor the fish exports and their distribution and sensitize the fishermen about the value of the sector.



- Increased research is being carried out by Lake Victoria Fisheries Research Organization, Fisheries Research Institutes in East Africa. This is intended to improve upon the methods used restocking of the depleted water bodies of fish.
- Improving on transport network, this is being carried out central governments.
- Privatization of the fishing industry as well as liberalizing the fishing activities.
- Education and sensitization of the people about the importance of fishing, the appropriate methods of fishing, problems that results from fish poisoning. This sensitization is being carried out by the local authorities and through the print and electronic media.
- Encouraging and promoting of fish farming in the rural areas to increase fish outputs.
- Setting up of modern infrastructure around fish landing sites like fish piers constructed at the fish landing sites to facilitate fish landing, construction of kilns and cooling facilities.
- Re-stocking of fishing grounds by fisheries departments with high quality fish species. This has been carried out on Lake Kyoga.
- Provision of security to fishermen, this is being done by armed forces of East African countries as well as the anti-smuggling unit that check on fish smuggling activities as well as local thefts around lakes.
- Advertising to improve the fish markets as well as joining of large trade organizations like COMESA.
- Quality control to meet international standards in order to compete with other countries for the international market.
- Treating of waste before discharge in the fishing grounds.

#### PROJECT work

- (a) Explain the physical factors that have led to development of marine fishing in E. Africa.
- (b) i) Name any four species of fish caught in the marine waters of East Africa.  
ii) Identify and describe the methods used to catch fish in the marine waters.
- (c) Outline the problems faced by the fishermen at the coast of East Africa.
- (d) State any four major products from the fishing industry.

#### Two:

- (a) Distinguish between gill-netting and drifting methods of fishing
- (b) Name any three types of fish caught in (i) Fresh water and (ii) marine fishing grounds in EA.
- (c) Describe the conditions which have favoured the development of fishing industry in EA.
- (d) Explain the contribution of fishing industry to the people of East Africa.

#### Three

Study the table below showing land use in Uganda and answer the questions that follow:

Land use	Area in percentage (%)
Game parks	3
Swamps	6
Forest reserves	7
Cultivated land	13
Open water	15
Grazing land	56

- a) Given that the total land area of Uganda is 244, 000sq. km, calculate the area in sq.km of -open water, swamps and game parks.
- b) Draw a bar graph to represent the information obtain in (a) above.
- c) i) Name five examples of open water in Uganda.

ii) Identify the economic activities carried out in the open waters of Uganda.

d) For any **one** economic activity chosen from c (ii) above, explain its benefits to the economy of Uganda.

## CLIMATE AND WEATHER

### Definition

**Climate:** Is the **state of the average weather** conditions of a **given place** recorded over a **long period of time** usually **about 35 years** and above.

**Weather:** Is the **state of the daily atmospheric conditions** of a **given place**. It considers elements such as rainfall, temperature, wind, atmospheric pressure, humidity, sunshine and cloud cover. Climate of a place is determined when the elements of weather like precipitation, temperature wind are measured and recorded for along period of time- 35 years.

In East Africa, climate experienced is mainly hot and wet although there are some place experience different types of climate i.e. semi desert climate in North West Kenya, Tropical continental/Savanna climate in Kenya highland areas.

**The elements of weather and instruments used to record them are listed in the table below:**

Element	Instrument
<ul style="list-style-type: none"> <li>• <b>Wind</b> <ul style="list-style-type: none"> <li>○ Direction</li> <li>○ Speed</li> <li>○ Strength</li> </ul> </li> </ul>	Wind Vane/Wind Cock  Anemometer  Wind sock
<ul style="list-style-type: none"> <li>• <b>Rainfall</b></li> </ul>	Rain gauge
<ul style="list-style-type: none"> <li>• <b>Sunshine</b> <ul style="list-style-type: none"> <li>○ Duration</li> <li>○ Radiation</li> </ul> </li> </ul>	Sunshine Recorder/Camp Bell stokes  Solarimeter
<ul style="list-style-type: none"> <li>• <b>Temperature</b></li> </ul>	Six's Thermometer/Maximum and minimum thermometer/Digital Temperature Indicator
<ul style="list-style-type: none"> <li>• <b>Humidity</b></li> </ul>	Hydrometer/Hygrograph
<ul style="list-style-type: none"> <li>• <b>Atmospheric pressure</b></li> </ul>	Mercury Barometer/Aneroid/Barograph

<ul style="list-style-type: none"> <li>• <b>Cloud Cover</b> <ul style="list-style-type: none"> <li>○ Form and shape</li> <li>○ Velocity and direction</li> </ul> </li> </ul>	Binoculars/Telescope  Nephoscope
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Each of the elements of weather is represented on a map using line. The lines joining places with the same element of weather as summarized below:

Element of Weather	Name of the line
Rainfall	Isohyets
Sunshine	Isohels
Wind (Speed)	Isokinetic
Cloud cover	Isoneph
Temperature	Isotherm
Atmospheric Pressure	Isobar

**Nb: ISO-** from Greek word meaning “equal”, used as prefix to lines on maps linking points with similar values or quantities.

## TEMPERATURE

Temperature is the degree of hotness or coldness of an area.

The highest and lowest temperature of a day is measured by a six’s thermometer.

- The difference between the highest and lowest temperature recorded in a day is called the **diurnal range or the daily range of temperature.** The highest temperature of the day is normally recorded at 2pm.
- The average of the highest and lowest temperatures of the day is called the **mean daily temperature.** For example, if the maximum and minimum temperature of Kabale is 30<sup>0</sup> C and 20<sup>0</sup>C respectively, then the mean temperature will be 25<sup>0</sup>C, and the daily range will be 10<sup>0</sup>C.
- Over a month, readings are taken each day, and the average of the mean daily temperatures for the several days of the month yields a figure known as the **mean monthly temperature.** However, the figures quoted in climatic statistics are based on long period observations covering several years. The period that is considered adequate to include all the likely variations that may occur is at least fifteen years. Thus a mean temperature for a given month is really an average of probably at least fifteen mean monthly temperatures based on records extending over fifteen consecutive years. Therefore, the **average of the mean daily temperature** of a given month for at least 15 years is **the mean monthly temperature.**

- The difference between the hottest month and the coolest month mean monthly temperature in the year gives the **annual range of the temperature**.

**Study the table of temperature of Mombasa (at 17m) and Nairobi (at 18 20 m) and answer the questions that follow:**

Month	J	F	M	A	M	J	J	A	S	O	N	D
<b>Nairobi</b>	18	19	19	19	18	17	16	16	17	18	18	18
<b>Mombasa</b>	27	28	28	27	26	25	24	26	25	28	27	27

- Calculate the annual range and mean annual range for each place.
- Comment on the values you have obtained in (a) above.

### **THE MEASUREMENT OF TEMPERATURE**

The six's thermometer is used to measure the maximum and minimum temperatures of a day.

- When the temperature rises, alcohol in the left hand limb expands and pushes the mercury downwards and up n the right hand limb. The alcohol in the right hand limb heats up and part of it is vapourised, and occupies the space in the bulb. The maximum temperature is read from the right hand limb.
- When the temperature falls, alcohol in the left hand limb contracts and some of the vapour in the bulb liquefies. This causes the mercury to flow from the right limb downwards and up the let where the lowest temperature is read. **DRAW THE SIX'S THERMOMETER**

### **TERMS USED TO DESCRIBE TEMPERATRE OF A GIVEN AREA**

- Very hot 30<sup>0</sup> and above
- Hot 20<sup>0</sup>-29<sup>0</sup>c
- Warm 10<sup>0</sup>- 19<sup>0</sup>c
- Cool or mild 0<sup>0</sup>-10<sup>0</sup>c
- Cold -10<sup>0</sup>-0<sup>0</sup>c
- Very cold - 10 and below

### **FACTORS INFLUENCING OR AFFECTING TEMPERATURE;**

- Latitude, areas near the equator gets much hotter than these near the pole do. Therefore, low latitude regions experience hot temperatures while high latitudes experience progressively cool or mild temperatures.
- Altitude and aspect
- Distance from the sea
- Ocean currents
- Winds
- Cloud cover, vegetation, soils, and human activities

## PRECIPITATION

Precipitation refers to the **form** in which water takes the form of tiny droplets. Precipitation occurs when water droplets or particles became too heavy to remain as suspensions in clouds and fall to the ground by gravity as rain drizzles, hail, snow, sleet, dew.

The main form of precipitation in East Africa is rainfall and it is crucial for the development of the countries, this is because 80% of the East African population depends on agriculture for their survival hence the fall or absence of rain would mean wither plenty or nothing

Over much of East Africa, rainfall is insufficient, unreliable or destructive to crops and soils on some occasions.

### MEASURING AND RECORDING OF RAINFALL

Rainfall is measured by means of a rain gauge. It consists of a funnel, glass jar, metallic container and a measuring cylinder. It is sunk into the ground and at least 30cm or 12 inches above the ground.

The rain falls over the area of the top of the cylinder and passes through the funnel into a jar. The rainwater collects in the gas jar.

The water is poured into a measuring cylinder that is graduated to read directly the depth of rain that has fallen over the area. Rainfall is measured in mm or inches because it is depth that is measured and not quantity.

A rain gauge is placed in an open so that no run off from trees or buildings may enter the funnel. The outer case is sunk into the ground to prevent the sun's heat from evaporating the collected rainwater. It projects 30cm above the ground to prevent any rain from splashing up into the funnel.

**Draw a well-labelled diagram of a rain gauge.**

### TYPES OF RAINFALL

East African receives mainly convention rainfall and relief/ orographic rainfall.

#### RELIEF RAINFALL

The moist laden winds are forced to rise above a mountain. The wind rises until the condensation level is reached then cumulo-nimbus clouds begin to form and result in rain. Rain occurs on the windward side and the leeward side receives no or little rainfall. This type of rainfall is common in **the mountainous areas** of East Africa.

**Draw a diagram illustrating the formation of relief rainfall.**

#### CONVECTIONAL RAINFALL

Results from heating water surface and the ground thereby the water vapour rises, cools, condenses and forms clouds which later result into rainfall. Through the process of evaporation

Conventional rainfall is usually in the afternoon, it is very heavy in form of short showers, sometimes accompanied by thunderstorms and lightning. The convectional rainfall is received in areas **around water bodies and forested areas.**

**Draw a diagram to illustrate the formation of convectional rainfall.**

### **CONCEPTS USED IN RAINFALL**

- Rainfall probability is the chance of receiving a certain amount of rainfall in a given period.
- Rainfall reliability is the degree of there being a high or low probability of receiving rainfall. Higher probability means rainfall is reliable and low probability means it is unreliable.
- Rainfall variability refers to the fluctuation in rainfall supply within given period. It accounts for the droughts and floods in East Africa.
- Rainfall seasonability is the number of days/months rainfall is received in a year. It determined the wet/dry seasons.
- Rainfall intensity is the amount of rainfall received i.e. heavy rainfall signifies intense rainfall.
- Rainfall effectiveness is the ability of rainfall to help in agriculture.
- Rainfall frequency is the number of times rainfall is received in an area.
- Rainfall duration is the time between rain starts falling and when it stops falling.

### **CONCEPTS IN MEASUREMENT OF RAIN FALL**

- a) **Total monthly rainfall** is the sum of the daily rainfall for a given month.
- b) **Mean monthly rainfall**, when the total for a particular month are added for at least 15 years and the average worked out, it gives the mean monthly rainfall.
- c) **Annual rainfall/total mean annual rainfall** is the sum of the mean monthly rainfall and is got by adding the annual totals for at least 15 years and the average is worked out.

Although East Africa lies astride the equator, its climate is not truly equatorial (hot and wet) because not all the areas experience a hot and wet climate. It is only the highland areas ((Kenya highlands). North and West coast of Lake Victoria, East Africa coast and some highland areas, which receive over 1500mm of rainfall. While other parts experience semi-desert climate.

This is because of the following factors:

- The impact of the relief
- The influence of the prevailing winds like NE and SE trade wind and local winds i.e. eddy wind
- The influence of the vegetation cover
- The influence of attitude
- The influence of latitudinal location
- The influence of the water bodies
- The influence of position of the sun, which in turn influence the position of, inter tropical convergence zone (ITCZ).

- Influence of man's activities.
- Influence of the Ocean currents

The types of climate of East Africa include **Equatorial climate (Lake Shore equatorial and modified equatorial climate)**, **savanna/tropical continental climate**, **semi-desert/arid climate** and **mountain/montaine climate**.

### **RAINFALL REGIONSS AND PATTERNS**

These are **seven** different rainfall patterns in East Africa and they are classified into two major types: **Bimodal** and **Unimodal**.

#### **BIMODAL (TWO PEAKS)**

This is an Equatorial type of climate.

Areas in this climatic zone receive heavy well-distributed rainfall throughout the year with two peaks or double maxim of rainfall. High amounts of rainfall are received in this zone.

#### **UNIMODAL: Tanzania types (regions 7)**

- Found far away from the equator and has one main rain season and one dry season. The two rainfall patterns are altered by:
  - Distribution of highlands in East Africa
  - Size o the land mass of Asia from which the winds blow (Monson)
  - The North-South Direction of the East Africa coast

#### **Questions:**

##### **I. Describe the characterictics of the:**

- **Equatorial climate,**
- **Savanna/tropical continental climate,**
- **Semi-arid/desert climate,**
- **Mountain climate**

##### **II. Outline the economic activities carried out in each climatic zone/area of East Africa.**

##### **III. Explain the problems faced by people living in each climatic zone of East Africa.**

**DRAW A SKETCH MAP OF EAST AFRICA SHOWING THE RAINFALL SEASONS AND PATTERNS**

**REGION 1:** is found at the coast of East Africa and received a total rainfall of 1191mm. It is wet from March to many and October to December. The heavy rainfall in the coastal area is due to the effect of Monsoon winds from Asia.

**REGION 2:** has a same pattern, as region one, but the rainfall totals are lower are 760mm. The temperature is also low one to high attitude.

**REGION 3:** The rain season is so concentrated with the wettest period between March and September and the dry season from October to February including June. Rainfall total is 1010mm due to the effect of mountain Elgon.

**REGION 4:** shows a well-distributed rainfall pattern with two peaks from March to May and October to December. It is drier between July and September and January and February. The peaks are related due to the Northward and Southward movement of the ITCZ. Total amount of rainfall is 1506mm.

**REGION 5:** Is farther from the equator and peaks are close together; they are March to May and July to October. It is dry between November, March, and June. Heavy rainfall in Gulu is due to moist winds from the Atlantic Ocean, which bring rainfall to the Congo basin and extend up to South West Uganda and Northern Uganda

**REGION 6:** Is a semi-arid area although it has two small peaks. Total rainfall is 221mm. The arid conditions are due to the winds, which originate from desert areas, thereby making condensation light. The winds also come from Egypt, Sudan and NE Arabic thereby causing aridity in NE Kenya and NE Uganda.

**QUESTION:**

Study the climate statistics of Entebbe and answer the questions that follow:

Month	J	F	M	A	M	J	J	A	S	O	N	D
Temp °c	22	22	22	22	22	21	20	21	21	22	22	22
Rainfall	66	91	160	256	244	122	76	74	74	94	132	117

- a) Calculate:
  - i) mean annual rainfall
  - ii) mean and annual temperature
- b) State the coolest and hottest months
- c) State the wettest and driest months
- d) Draw a graph to represent the information above.
- e) Describe the characteristics of the climate of Entebbe



- f) Identify the economic activities carried out in Entebbe.
- g) What problems are faced by the people living in Entebbe

#### **FACTORS AFFECTING RAINFALL DISTRIBUTION:**

These include **Relief, Latitude, Man's Activities, Vegetation, Winds, and Distance from Sea, Attitude, Ocean Currents and water bodies.**

##### **1. WINDS:**

Winds that blow from dry lands towards the ocean take up the moisture and carry it to the land thereby causing rainfall. The Asian Monsoon winds that blow towards East Africa have been responsible for the alternative wet and dry season in Northern Uganda and South Tanzania

- Over much of East Africa, it has been noticed that there is rain in each part of the year and maximum rain is not in June or December when winds are strongest but around March and April then October and November when winds are weakest.
- It's believed that the high pressure that develops over southern and central Africa extends northwards into Tanzania and it interferes with air circulation hence the rainfall period is reduced.

##### **2. RELIEF/ALTITUDE:**

- Affects rainfall, i.e. several high mountains in East Africa receive as much rainfall as 1500mm on the NE and SE slopes while the lowlands around them experience and conditions.
- It should be noted that the wettest slopes of Mt Elgon are on the North West and wettest month is August. This is because of the Eddy wind that blows towards the mountains from the Teso plains, they are forced up the mountain slopes, and moisture drops relief rainfall.

##### **3. EQUATORIA LOW PRESSURE ZONE (ITCZ)**

- This is the region of unstable air masses i.e. during the day, heating causes the rising air currents to cool rapidly and condensation occurs and heavy rainfall results.
- There is also a general uplift of the air at the ITCZ as the higher-pressure trade winds blow in from the NE or SE. Violet thunders are experienced especially at night.
- The ITCZ normally follows the migration of the overhead sun through the year moving a few degrees North and South of the equator i.e. if the sun is overhead the tropic of Cancer, the ITCZ will move to the Northern hemisphere and when it is overhead the tropic of Capricorn, the ITCZ moves to the Southern hemisphere. The amount of rainfall received will depend on the position of the ITCZ.

##### **4. LAKE VICTORIA**

- This is associated to land and sea/lake breezes, land and water surface are heated by the sun's rays but they heat and cool at different rates.
- Land heats up quickly during the day as compared to water hence the air above the land becomes warm and expands until it is at a lower pressure than the air over the sea. The cool air from the lake flows towards the land to replace the risen air thereby causing a high pressure over the sea.

**Draw the illustration**

- During the night, land cools faster than the water in the Lake (5x more). The water loses heat very slowly hence it will be warmer than the land. Cool air will then flow from the land to the sea as warm air from the sea moves towards the land. A higher pressure is then created over the land and low pressure over the sea. **Draw the illustration**

**NB:** Land breeze occurs at night, i.e. from the land to the water and the lake breeze is during the day i.e. from lake to land.

- Land and Lake Breeze, therefore contribute to the rainfall distribution of districts near Lake Victoria. It is important to note that, the total amount of rainfall received and its distribution throughout the year are crucial to the farmers. This is because the way of life of a farmer is tied to the falling of rain e.g. in many areas 500mm of rain if spread over 12 months is not enough to grow crops, but in places where 500mm fall within a few months of a rainy season, crops may be planted and harvested for example Songea and Ankole.

## **COMPARISON OF RAINFALL IN EAST AFRICAN COUNTRIES**

### **Uganda:**

- About half of Uganda has a high prospect of receiving over 760mm of rainfall each year. Areas that receive heavy well-distributed rainfall throughout the year include Kigezi highlands, shores of Lake Victoria and islands, Slopes of Mountains like Elgon, Rwenzori, Muhavura, Gahinga and Sibinyo.
- Areas that receive unreliable and little rainfall-semi-desert/arid include North East part-Karamoja (Abim, Kaabong, Moroto, Kotido, Nakapiripit districts), the dry corridor of Ankole-Masaka in the districts of Kiruhura, Sembabule, Rakai and Isingiro and western rift valley in Kasese district.
- High rainfall totals in Uganda are due to the following factors
  1. Movements of the sun and position of the equator
  2. Presence of Lake Victoria and surrounding swamps in central Uganda
  3. Prevailing winds-North east and South east trade winds
  4. Local winds like eddies
  5. The influence of mountains
- The heaviest amounts of rainfall are experienced between March and May, August and November and dry season in December to January and June to July.
- The two rainy seasons are close together, and are partly responsible for the reliable and well-distributed rainfall except for Karamoja and the Ankole-Masaka dry corridor.
- Uganda farmers have fewer problems compared to those in Kenya and Tanzania, hence the high population density.

### **Kenya:**

Kenya has some of the best and worst areas of rainfall. Areas receiving high rainfall include, central area of Kenya (Kenya highlands) the highlands east and west of the rift valley, the central part of the rift valley and Slopes of Mountain Elgon.

- Most of Kenya receives little rainfall, mainly because the wind and nature of landscape and because of the rainfall distribution, the population in Kenya is concentrated in small areas compared to Uganda.

## **Tanzania**

A great part of Tanzania main land experienced arid conditions although they are less severe than NE Kenya where the rainfall totals are less than 500mm.

- Areas that receive high rainfall include coastal area, Highlands e.g. Usambara and Kilimanjaro and the Lake Victoria area.
- Tanzania experiences one rainy season which begins November/December- April
- Dry areas include the southern and central parts of the Tanzania. The amount woodland receives reliable rainfall and experiences two rainy seasons.

Nb: The amounts and distribution of rainfall have dictated the economic activities carried out in each of the East African countries. However, the major economic activity is agriculture to the extent that irrigation farming is practiced in areas with very low rainfall.

## **IMPORTANCE OF MEASURING WEATHER**

- Information enables farmers plan activities like weeding, planting
- Helps in forecasting weather
- Planning journey by sailors and pilots
- Help describe the climate of an area.
- Employment for meteorologists
- Data is used for study and research
- enables to detect change in climate

## **PROBLEMS RESULTING FROM CHANGES IN WEATHER AND CLIMATIC CONDITIONS IN EAST AFRICA**

- Drought resulting from seasonal rainfall distribution with longer periods of a dry spell
- Famine/food shortage/food crisis
- Occasional floods resulting from the concentration of rainfall in a few months in some places of East Africa
- Hail storms resulting from over condensation and water vapor accumulation in the atmosphere leading to destruction of crops.
- Lands slides and mass wasting resulting from very heavy rainfall in highland and hilly areas
- Increased soil leaching in humid areas of East Africa
- High incidences of diseases and pests

## Question:

Study the table below showing the climate of station X and answer the questions that follow:

Month	J	F	M	A	M	J	J	A	S	O	N	D
Temp °c	23	23	22	22	22	20	19	19	22	24	25	24
Rainfall	203	191	365	627	244	109	33	31	28	05	114	190

- (a) Calculate: (i) rainfall total,  
(ii) Range of temperature for station X
- (b) Draw a suitable graph to show the climate of the station.
- (c) Describe the characteristics of the climate experienced at station X.
- (d) Giving reasons or your answer,  
(i) State the hemisphere in which the station is located  
(ii) Outline the economic activities that can be carried out around station X

## AGRICULTURE IN EAST AFRICA

Agriculture is the growing of crops (arable farming) and rearing of animals (Livestock) either for subsistence or commercial purposes. In East Africa, agriculture is the engine or the back bone of the East African countries, whereby 85% of its population derive its livelihood from agriculture either directly or indirectly, employs about 85% of the East African population and provide the raw materials for the agro-based industries.

The biggest percentage of East Africa's population lives directly or indirectly on land either cultivation, grazing or processing of agricultural products.

In recent, there has been introduction of new agricultural techniques, mechanization, scientific methods to increase agricultural output.

The East African continent displays every type of agricultural system from shifting cultivation to plantation agriculture.

Agriculture is sub-divided into two major broad groups that is **arable farming** and **animal husbandry**

**ARABLE FARMING** is the growing of crops either for subsistence or commercial purposes. It is sub divided into two groups.

## SUBSISTENCE FARMING

This is basically a tropical type of agriculture. Sometimes it is referred to as primitive subsistence farming. This is the growing of crops and rearing of animals for home consumption or survival. However, if there any surplus products are always stored for future use in periods when the harvest is poor.

Subsistence farming, some time becomes intensive so that a surplus of food crops and animal products is produced. This surplus is then sold. It is generally characterized by;

- Use of simple techniques of cultivation i.e. hand hoe, digging sticks, crude axes, Machetes.
- The farmer produces purposely for daily home consumption

- Farmers rely on the natural environment
- Employment of the family labour
- A low standard of living.

It is mainly/generally carried out by farmers who live in economically backward areas of the tropics mainly in Africa. Subsistence farming is subdivided into:

### **A). SHIFTING CULTIVATION**

It is sometimes known as slash and burn system of migratory type of farming.

Is a primitive form of crop cultivation and it has been used through the world for than 200 years now.

It still being practiced in many parts of the East Africa

Shifting cultivation involves clearing a piece of land of a forest or grass land by slashing and burning, and after using it for one or two crop harvests, the farmer abandons it and move to a new virgin piece of land. The formerly cultivated plot is therefore, allowed to grow into a forest or grass/ and the process continues. The farmer may only return to the original piece of land after a very long period of time and sometime he might not even return.

#### **Characteristics of shifting cultivation**

Shifting cultivation is characterized by;

- Crops are grown mainly for subsistence purposes (for home consumption only)
- Simple/elementary tools are used, for clearing the land, cultivation and harvesting of crops i.e. crude hand hoes, rough axes, pangas, digging sticks, bush-knives etc.
- It involves shifting from one place to another after a short period of time; therefore, there is no permanent settlement.
- Settlement are temporary, the cultivators build their homesteads using simple materials (local) to construct grass hatched huts.
- It is mainly carried out in sparsely populated areas with less than 10 persons per sq km where there is abundant land.
- They grow a wide range of crops and vegetables like sweet potatoes, corn (maize), millet, pumpkins, Sorghum, ground nuts, cassava, beans and plantains
- Low level of development (rural dependence)
- Family labour is used and there is division of labour i.e. cutting of trees and slashing is done by men, pilling of cut down trees and branches is done by women, hunting of wild game by men while harvesting of crops is done by women.
- Shifting cultivation depends mainly on the physical factors like rainfall for growing of crops, dry season (hot temperatures) for harvesting and clearing of land and burning of the cut down trees and branches, soil fertility determines the duration of crop growing in any area where it is carried out.
- Farming is based on traditional knowledge.
- Use of fire to clear the land (bush burning).
- It is mainly carried out on small scale where by the cultivator clear a small piece of land ranging from 0.5 hectares to 1.0 hectares on average and grow crops.
- Farm plots have no defined boundaries and usually subsume into open forest or bush or grass land.

- Crops are usually mixed or intercropped in ashes and soils, the pieces of land have no defined planted row since most cereals and legumes are planted by the broad casting them.
- When crop yields from the cultivated piece of land decline due to decline in soil fertility usually after 2 to 3 harvests, the piece of land is abandoned and a new virgin piece of land is cleared.
- There is no use of modern scientific methods of farming and soil maintenance. Land is allowed to regain its fertility by natural means.
- A few animals are domesticated, though most of the tribe supplements their diet by hunting and gathering.

### **Advantages of shifting cultivation**

- It provides a form of livelihood to rural farmers because it's cheap to practice use of family labour and use of simple tools e.g. digging sticks, hand hoes.
- It's a simple form of land use in sparsely populated areas where land could remain idle.
- Burning of natural vegetation adds soil nutrients like potash, which is important for growing of crops like beans, corn, and cassava.
- It also provide a continuous supply of food stuff because crops are grown at different times
- It gives the farmer time to carry out other activities like hunting, fishing leading to balanced diet because little attention is given to the crops
- This type of mixed cropping guarantees a variety of crops and a reliable harvest to the farmers.
- It allows trees and grass time to regenerate
- Burning of the vegetation helps in destroying the parasitic weeds like lalang which is menace to crops.

### **Disadvantages of shifting cultivation**

- Low yields- poor yields due to use of simple tool plus poor soils.
- Environmental degradation through
  - Deforestation o the tropical forests
  - Destruction of soil factor through burning i.e. soil compaction.
  - Destruction of the biotic factor (soil living organisms)
  - Soil erosion due to use of fire to clear the land.
- It is inefficient because it supports only a relative small proportion of the people.
- Over dependence of the physical factors
- Low standards of living
- It is a human resource waste- unemployment of the farmer for most of the year
- It is a waste full system because the land is out of use/stays fallow for a very long period of time i.e. more than 10 years
- Development is not possible because there is no permanent settlement
- Limited range of crops are grown- poor diet

### **REASONS WHY SHIFTING CULTIVATION IS DISAPPEARING**

In many parts of the developing countries shifting cultivation is disappearing at higher rate. Most of the farmers have shifted away from it to permanent farming mainly because of the following factors:

- High population growth rate of the developing countries has led to population increased. This has led to increased pressure on land. Forcing them to abandon their traditional way of farming.
- Introduction of better farming methods like tropical farming plantation (agriculture), irrigation farming, beef cattle ranching, discouraged shifting cultivation because they required large pieces of land
- Government policies of environment conservation. Most of the savannah grass and wood lands have been gazetted into national parks and game reserves hence limiting the activities of shifting cultivators.
- Private ownership of land
- Government influence- development of other sectors of the economy and regional development.
- Introduction of cash crop growing in the developing countries
- Introduction of the monetary economy
- Government policies of agricultural modernization poverty, alleviation and food security programmes.
- Discovery of mineral resources
- Level of education
- Improvement in soil conservation and maintenance methods.

## **B) ROTATIONAL BUSH FALLOWING**

With increasing population every year, shifting cultivation cannot go on, people have had to change their way of farming to rotational bush fallowing. It is sometimes referred to as mid-way stage between shifting cultivation and permanent field operations. It is one of the main systems of farming carried out in East Africa where the population densities are moderate (area with 101-2000 persons per sq km).

It is a traditional method of farming where by the land is divided into clear defines plots/holdings with field divisions and permanent housing.

The system involves the rotation of cultivated land so as to allow for the fallowing of the exhausted plots of land. During the resting or fallow period land regains its fertility by natural means. Plant nutrients and humus are replenished by the vegetation that grows on the plot of land.

The period of fallowing depends on the density of the population in any given area and fallow periods of up to 6 years are still common.

The land near the homestead is always under permanent cultivation using household refuse to fertilize the land but the main fields are cultivated in ration so that each field is allowed to lie fallow for a few years.

A wide range of crops are grown like beans, banana, cassava, maize millet, ground nuts, cotton and tobacco. It is the common type of farming in Africa for example parts of central and southern Tanzania including Miombo wood lands,

### **Characteristics of rotational bush fallowing**

It is characterized by the following

- A wide range of crops are grown i.e. both annual and perennial crops. Food crops like millet, cassava, sweet potatoes, sorghum, banana and non food crops like cotton, tobacco and sugar canes



- Simple techniques of farming are used like hand hoes, pangas, use of manure
- Settlement is permanent. Houses are constructed using local materials
- Land is cultivated on bush rotational fallow basis.
- Farming systems is based on the traditional knowledge.
- It is mainly carried out in areas with moderate population
- Land is divided into different plots of land and different crops are grown at different seasons of the year.
- Crops are mainly grown for subsistence but in case of any surplus. It is sold to surrounding communities.
- There is care for crops even after planting them

### **Advantages of Rotational Bush Fallowing**

- Simplest form of growing crops since little capital is required.
- Maintenance of soil fertility hence increased crop output.
- Easy to control to pests and diseases
- Enough food supply for the family
- Effective utilization of the available land incoming generating farming system
- Enough attention is given to crops leading to high yields.

### **SEDENTARY FARMING/SMALL HOLDING FARMING**

This system of small crop growing is associated with densely populated areas of under developed countries. It is based mainly upon simple crop rotation and the use of manure on well-defined farms. The land is intensive cultivated and the crops are rotated on the same piece of land

It is mainly carried out in the following areas:-

- Central western and eastern Uganda,

### **Characteristics of sedentary farming**

This farming system is characterized by;

- Extensive use of manure from animal dropping and household wastes, chemical fertilizers has led to increased crop output.
- It carried out in densely populated areas of the underdeveloped countries.
- Use of family and waged labour to clear to land, preparing the land, sowing the seeds, weeding, harvesting of the crops.
- Crops are rotated on the same piece of land (mono-culture is practiced)
- Crops are grown for both, subsistence and commercial purposes
- Both food crops and cash crops are grown intensively on the same piece of land e.g. cocoa growing in the cocoa triangle of Ghana, coffee in Ethiopian Highlands, Rubber growing in Nigeria, Palm oil growing in Congo Republic.
- Use of better farming techniques like irrigation farming on small scale, pesticides and herbicides.

### **Advantages of small holding/ sedentary farming**

- Provision of employment opportunities hence improved standards of living.
- Provision of government revenue from the taxation of the farmers who are involved in the growing of crops.



- Provision of foreign exchange after exporting agricultural produce to other countries
- Food security because there is constant supply of food due to the use of modern farming methods like irrigation farming
- There is high crop yields obtained because the farmers employ modern farming methods
- Development of the infrastructure like transport networks
- Development of towns trading centres
- Development of social amenities like schools, clinics, recreational centres.
- Promotion of international trade relations

### **PLANTATION AGRICULTURE**

This is a distinctive type of commercial agricultural practiced in the tropics. Sometime it is referred to as estate farming/tropical agriculture. This is the growing of one or two perennial crop(s) on a large scale using scientific method of farming like use of mechanization, use of chemical fertilizers on the same piece of land for commercial purposes.

It is not an indigenous form of farming. It was introduced by the Europeans in the developing world to enslave African on their own land in order to get raw materials for their home industries.

**The following crops are grown under this system of farming**

<b>Crop grown</b>	<b>Areas</b>
Coffee	<ul style="list-style-type: none"> <li>• Kenya highlands,</li> <li>• Mubende in Uganda</li> </ul>
Sugar cane	<ul style="list-style-type: none"> <li>• Kilombero valley in Tanzania,</li> </ul>
Tea	<ul style="list-style-type: none"> <li>• Nyanza Province of Kenya, Mukono, Bushenyi, Wakiso, Mityana, Jinja</li> </ul>
Palm oil	Uganda-Kalangala District

### **Characteristics of Plantation Agriculture**

Plantation (tropical agriculture) is characterized by the following:-

- Crops are grown on a large scale (cover 200 hectares of land for crop production) in sparsely populated areas of the developing countries. Thus crops are grown extensively. Crops are grown for commercial purposes to maximize the profits.
- Estates or tropical agricultural farms usually specialize in one commercial crops i.e. they practice monoculture.
- Plantation agriculture is a capital intensive activity
- They employ large numbers of labourers (it is a labour intensive activity). Labour force is needed to prepare the land, planting, weeding, harvesting and processing of the agricultural crops. Others are employed in plantation clinics, laboratories and schools
- Farming is scientifically practiced. There is use of scientific methods of farming like mechanization, spreading of fertilizers and herbicides, use of pesticides, irrigation farming, carrying out organic farming, scientific knowledge and skills are used in seed to increase the yields and crop output (better quality yields) which are marketable.

- Plantations have their own processing factories. This is aimed at reducing the bulk of their products as well as ensuring large returns in form of profits. Grading, packing and branding of the agricultural crops are done by the estates.
- The estates are self sustaining i.e. they provide social services like health and educational services, clean safe piped water, accommodation communication services to the workers.
- Plantation farms are crosses by network of roads. There is a dense road networks in the plantations.
- Most of the tropical plantations are owned by foreigners.
- The estates carry out extensive research in order to improve on the quality of crops, to control pests and disease on the estate etc.

### **Advantages of tropical farming/plantation**

- Employment opportunities. A thousand of people are employed on the estate directly and indirectly. Farm work like preparing the land, pruning, and transplanting, harvesting all need large labour force. Other works are employed in research laboratories, work shops, clinics, schools, drivers, chemists etc. this has led to improved standards of living of the workers
- Government revenue is increased after exporting agricultural products
- Development of social services amenities i.e. medical services through hospitals and clinics, schools provide education to children of the workers and surrounding areas, provision of scholarships to workers to go for further studies abroad, fellowship, provide vocational education, adult education, provide entertainment to the workers, provide clean safe piped water, accommodation facilities to the workers
- Development of industries. They provide raw materials to the industries (they have promoted the agro-based industries) i.e. sweet manufacturing industries, sugar cane refineries, tobacco processing. They have led to the development of related industries i.e. industries manufacturing tractors, hoes, shoves etc because the estates provide ready market for their products. These related industries also provide employment opportunities.
- Development of rural areas of the developing areas. Estates have set up physical and social infrastructures in rural areas. The set up roads and communication networks, airstrips, they have opened up the rural areas to other economic activities like fishing and tourism.
- They have promoted international trade relationship between the developing and developed countries. This has promoted mutual understanding between the two countries.
- Promotion of out grower's schemes (out growers grow the same crop grown on the estates but on a small scale). The estates provide ready market for their agricultural crops, advice them on how to grow crops using modern methods of farming, give them chemicals and seeds at no cost.
- The estates are providing ready market to the farmers who are engaged in the growing of food crops i.e. banana, maize, sweet potatoes, fruits, vegetables etc because they cannot grow cash crops and at same time food crops.
- Development of towns. It has contributed to process of urbanization in East Africa and other areas. Therefore attract other economic activities i.e. medical care centres, schools, entertainment centres, hotels, industries etc leading to the development of towns

- It has promoted maximum utilization of the natural resource (soil) because the crops are grown on large scale.
- Plantations normally carry out research involving the breeding of improved varieties, the use of specialized fertilizers. This results in higher outputs of crops.
- The most outstanding advantage lies in their efficiency in production. This is because of their sound financial reserves; owners afford to use scientific methods of farming as well as efficient machinery. This has enabled them to ensure high yields and a constant good quality output.
- Plantation farms act as research and experimental centres for various crops. With their research laboratories in place, plantation farmers carry out research in crops varieties, soil and plant diseases. These researchers have benefited the countries and the farmers
- Government income which has increased the tax base of the countries where plantation agriculture is carried out. Governments get revenue by taxing the workers' wages, collecting export dues, income tax as well as rent on land from the plantation owners mainly foreigners.
- These plantations have advantage of marketing or exporting their agricultural products.
- **Negative Contribution of plantation agriculture**
- Environmental degradation; forests are cleared/destroyed in the name of tropical agriculture hence contributing to global warming.
- Over exploitation of the workers i.e. unskilled by the owner of the estates
- The estates are expensive to maintain
- There is profit repatriation (Capital flight) because most of them are owned by foreigners. These foreigners repatriate profits back to their countries of origin and this confers marginal benefits to the hosting countries.
- The growing of one crop on a large scale increases the risks of crop loss. Crop loss results from crop pests, diseases and other natural disasters like hail storms, droughts. These affect the quality of crops hence affecting the marketing of the crops i.e. hail storms in Nyanza Province of Kenya.
- Stiff competition due to:
  - Production of the same agricultural crop by different countries i.e. coffee growing in Kenya and Uganda
  - Production of synthetic fibres, which are close substitutes to agricultural produce. These have led to price fluctuations on the world market affecting proper planning in the affected countries
- Plantations are associated with rapid deterioration of the tropical soils because of monoculture practice, coupled with deep ploughing and clean weeding. They also encourage soil leaching during the heavy rainfall seasons.
- Plantation farmers are exposed to wild animals during harvesting, weeding of the crops i.e. snakes are common in tea estates of Nyanza province. This has resulted into the death of the workers.

## **AGRICULTURAL DEVELOPMENT IN EAST AFRICA**

Agriculture is growing/cultivation of crops and raising/rearing of domestic animals either for subsistence or commercial purposes. The common crops grown are

- The nontraditional crops like maize, beans, soya beans, banana and cut flowers.
- Traditional export crops like coffee, tea, cotton, tobacco, sisal and pyrethrum.

### **Factors influencing agriculture in East Africa:**

#### **Physical factors:**

- **Moisture:** East Africa has different zones, each of which allows certain agricultural practices i.e. Areas with high rainfall over 1500mm p.a. a variety of crops are grown like bananas, coffee, tea and make several harvest in a year.
- **Temperature:** Areas experiencing Warm to hot temperatures between 15°C-27°C support the growing of perennial crops. Areas that experience hot to very hot temperatures support the growing of annual crops and nomadic pastoralism.
- **Soils:** Well drained fertile soils like volcanic and loam soils support the growth of different crop varieties e.g. coffee, banana and sisal while poor soils don't support arable farming and therefore are used for grazing.
- **Drainage:** Well drained areas support many agricultural activities compared to the poorly drained areas.
- **Relief:** Relief influences the amount of rainfall received i.e. windward sides of mountains receive more rain than the leeward and therefore there are more agricultural practices in the windward side. Relief also influences mechanization.
- **Vegetation:** Vegetation influences rain formation and reduces soil erosion i.e. in some areas where vegetation is so thick there are limited agricultural practices.

#### **Human factors:**

- **Transport and communication:** Areas with improved transport networks have facilitated the growing a variety of crops. In areas where transport networks are not well developed, there are very few agricultural activities.
- Land tenure system
- Government policies
- Capital
- Market
- Availability of manpower
- Culture/cultural preferences

### **THE ROLE OF AGRICULTURE IN THE DEVELOPMENT OF EAST AFRICA:**

- Agriculture provides all the food required to feed the population of E. Africa. This saves the East African countries from the dangers of famine and malnutrition.
- Agriculture is the biggest source of employment in the E. African countries. Agricultural associated industries such as textiles, tea processing plants provides employment to the people. People are also employed in different sectors like transport.
- It provides foreign exchange to the E. African countries. Items exported include cotton to Britain, coffee to USA and Britain. The foreign exchange earned is used for the importation of machinery, petroleum products and medicine, etc.
- It provides raw materials for industries. It has led to the development of agro-based industries.
- The governments of E.A generate revenue through taxes that are imposed on agricultural products when either being exported or locally marketed. The revenue generated is used in development and improvement of infrastructure.
- Agriculture has facilitated the growth and development of urban centres.
- Agriculture provides market for the agricultural machinery like tractors, simple tools like sickles, hand hoes and inputs like agricultural pesticides and fertilizers.
- Agriculture facilitates the development of rural areas. Through prosperous farming, farmers have attracted governments to construct infrastructure like roads, installation power lines, provision of water in many rural areas.

- It has facilitated the development of international relations between East African countries and their trade partners in agricultural products.
- It is a tourist attraction to the country.
- It has stimulated research in both crop and livestock production. This has led to the establishment and development of research institutions.

#### **PROBLEMS HINDERING AGRICULTURAL DEVELOPMENT IN EAST AFRICA**

- Poor soils in some parts of East African countries leading to low production.
- Climatic vagaries especially drought which leads to low production e.g. El-Niño in 1996 led to destruction of crops in many areas of EA, hailstorm/stones in Kericho tea estates in Nyanza province of Kenya.
- Pest and disease leading to decrease in quality and quantity of agricultural produce e.g. coffee wilt which affects coffee and tsetse flies that transmit Nagana into livestock hindering animal production.
- Poor pastures in the livestock keeping areas in EA. especially the cattle corridors.
- Fluctuating agricultural crop prices especially the traditional crops like cotton.
- Poor marketing systems of agricultural products.
- Stiff competition from outside goods like rice from Pakistan is more preference.
- Limited skilled labour because most of the farmers are peasant and have no skills and agricultural extension workers are very few to cover all farmers in EA.
- Limited capital to purchase agricultural equipment like tractors and agricultural inputs like fertilizers, pesticides.
- Rugged landscape has hindered effective use of machinery on the slopes of highlands in East Africa.
- Low yielding varieties of crops.
- Poor storage facilities leading to post harvest losses.
- Inappropriate technology leading to the use of poor farming methods e.g. use of simple tools like hand hoes, harvesting knives for millet and sorghum.
- Political insecurity in Uganda especially the northern districts like Pader, Gulu, have prevented the farmers from cultivating because of fear of abduction. This has limited the farmers' capacity to produce crops, distribution of farm inputs and marketing of the farmers' produce.
- Cattle rustling: This is common among the different pastoral tribes i.e. between the Pokot and Karamojong.
- Cultural rigidity among the different tribes e.g. among the pastoral groups a large number of animals are kept respective of the quality. It is difficult to charge them from pastoralism to another economic activity.
- Corruption/ embezzlement of funds meant for agricultural development.
- Land fragmentation limits the acreage of cultivated land thereby leading to low agricultural output.
- Shortage of land due to high population.
- Commercial agriculture in EA. is still dominated by foreign investors leading to profit repatriation.
- Limited agricultural research in both livestock and crops.

#### **Steps being taken:**

- Intensification of research in both crop and animal varieties.
- Improvement of varieties of crops e.g. bananas through technology called tissue culture and varieties of animals e.g. goats imported from South Africa, cross breed of livestock within the E. African countries.
- Improved storage facilities e.g. milk, dairies, giant silos for storing grains and ware houses in urban centres.
- Control of soil erosion through mulching, terracing in hilly areas and application of fertilizers and organic manures to improve soil fertility.
- Use of pesticides to control the pests and diseases.
- Establishment of micro-finance schemes to farmers.
- Increased agricultural education and awareness through seminars.

- Promotion of fish farming or aquaculture.
- Improvement of transport system to reach agricultural areas.
- Liberalization of the economy to promote agricultural marketing.
- Encouraging farmers to form co-operative societies to benefit from the advantages of collective farming.
- Extension services to farmers up to sub-county levels.
- Provision of incentives to farmers e.g. tea seedlings
- Mechanization of agriculture to improve on produce.
- Agricultural diversification through introduction of non-traditional crops like cut flowers, vanilla and mushroom growing.
- Irrigation of dry areas, construction of valley dams and sinking of bore holes into semi-desert areas to provide water for the livestock.
- Processing or agricultural products to prevent post-harvest losses like coffee hulking. This is intended to improve marketing.
- Positive government policy on increased agricultural output through agricultural modernization.

### **TYPES OF FARMING**

- A) **Subsistence** involves the growing of crops and rearing of animals for home consumption/survival. However, if there any surplus products are always stored for future use in periods when the harvest is poor. It is characterized by; use of simple techniques of farming, farmers relies on natural environment and they produce purposely for daily home consumption.
- B) **Plantation/tropical/estate farming** involves the growing of one or two perennial crop(s) on large scale using scientific methods of farming on the same piece of land for commercial purposes. Crops grown include tea estate in Kericho in Nyanza Province - **Kenya**, sugarcane in Kilombero-**Tanzania**, palm oil in Bugala islands in Kalangala-**Uganda**.
- C) **Large scale mixed faming** involves growing of crops and rearing of animals on the same piece of land for commercial purposes. It is common in Kenya highlands.
- D) **Livestock farming:** This is the rearing of animals either for subsistence or commercial purposes. The animals reared include cattle, goats, sheep, rabbits, pigs, and poultry. Livestock farming is carried out under different practices; **TRADITIONAL PRACTICES like Nomadic pastoralism:** Here animals are reared entirely on natural pastures i.e. on free range. The practice is carried inthe range lands of Rakai-Isingiro, Abim, Kaabong,Kotido, Moroto in **Uganda**; Northern Kenya, Western Kenya in the rift valley and central **Kenya**, and Northern and central **Tanzania**. The pastoralists include true nomads without permanent homes like Karamojong, Jie, Matheniko-Uganda, Pokot, Turkana and transhumants with permanent homes but move in search for water and pasture according to ITCZ like Masaai of Kenya and Tanzania.

**MODERN LIVESTOCK REARING PRACTICES: a) Ranching:** Here animals especially cattle are kept on a large scale for the production of beef. They rear mainly indigenous cattle and cross breeds. Ranches are common Sembabule, Kiruhura in Uganda, Western Kenya and Central Tanzania.**b) Dairy farming:** Animals are reared for production of milk. Animals are reared on fenced paddocks with improved pastures supplemented with crop residues. This is common in Wakiso, Mbarara, Kiruhura, Ishaka, Isingiro in Uganda; Nakuru, Nyeri, Eldoret, Limuru, Uasin, Gishu in Kenya and Kongwa in Tanzania.



E) **Horticulture** involves the growing of vegetables and flowers either on small or large scale using modern farming techniques and the land is intensively cultivated. It is most common in peri-urban and urban areas i.e. Nairobi in Kiambu district, Kampala and Wakiso

### **MAJOR CROPS GROWN**

**COFFEE** is a major cash and export crop grown in East African countries. There are two types of coffee namely Robusta and Arabica coffee. **Arabica coffee** is mainly grown in slopes of highland areas. It grows in areas of fertile and well-drained soils, high altitude and generally cool temperatures.

**Robusta coffee** is grown in low lying areas of EA. Its growth is facilitated by fertile and well drained soils, heavy rainfall which is well distributed throughout the year, hot temperatures of over 21°C and generally low altitude. Coffee requires;

- Heavy rainfall totals 1000-1500mm with about 2 dry months.
- Well distributed rainfall through the year.
- Well drained deep fertile soils
- Warm-hot temperature during the day and more than 10°C (night)
- Availability of trees to protect the crops from strong winds.
- Availability of large supply of labour since work is labour intensive.
- Sunny dry period for harvesting the coffee.
- Availability of adequate capital for controlling pests and diseases.
- High humidity.
- High altitude 1000-1500m for Robusta and 1500-2300m for Arabica
- Presence of large tracts of land for the growing of coffee.

Coffee is grown on plantations in East Africa. Areas include Kisii district, Kenya highlands, Kakamega, Nakuru, Nyeri, Nyanza, slopes of Mt. Elgon, and Limuru in **Kenya**; Kigezi highlands, slopes of Mt. Elgon, Central Uganda that is Mukono, Mubende, Masaka, Kampala, Kayunga, slopes of mount Rwenzori in **Uganda** and slopes of Kilimanjaro, slopes of Mt. Usambara, Meru, Bukoba, Moshi and Arusha in **Tanzania**.

**TEA** is a leaf crop used as a beverage. It is grown on both plantations and small scale by out growers.

#### **CONDITIONS FOR TEA GROWING:**

- Warm to hot temperature over 20°C with a minimum 15°C
- Heavy rainfall between 1270-2000mm.
- Reliable well distributed rainfall throughout the year.
- Deep, light and well-drained acidic soils.
- Gently sloping promotes well drained soils.
- Shielding from sunlight.
- High humidity.
- Availability of vast/extensive land for tea growing.
- Trees provide fuel for processing.
- Availability of abundant labour for planting and harvesting.

**Areas growing tea; Uganda** - Mukono (Kasaku), Lugazi, Kajjansi, Mubende- Mityana, Bushenyi, Kyenjojo, Kabarole. **Kenya**- Kericho, Nyeri, Kisii, Muranga, Limuru (Tea the second important crop in Kenya) and **Tanzania** – Bukoba, Iringa, Mbeya, Mufindi, Tukuyu, Njombe, Tanga (East and West Usambara mountains)

**NB: Kenya is the leading producer of tea in Africa and fourth in the world.**

**PROCEESSING:** Leaves are picked, hurried to factory, dried in controlled conditions. Crushed to free juices, fermented, dried cooled, graded and packed for export.

**SUGARCANE:** This crop is grown on a commercial scale for the manufacture of sugar on the plantations with the help of irrigation. Some sugar cane is grown on small scale and it is consumed as raw cane. Most plantations in East Africa are owned by big foreign companies.

It requires:

- Heavy rainfall of at least 1500mm.
- Fertile, deep, well drained soils.
- Warm to hot/High temperatures above 20<sup>0</sup>c.
- Relatively flat relief
- A dry season for ripening the canes.
- Availability of abundant labour force since work is labour intensive.
- Availability of vast/extensive land for tea growing.
- High humidity.

**Areas; Uganda-** Jinja (Kakira), Masindi (Kinyara), Sango bay (Rakai), Lake Victoria basin, Mayuge, Mukono and Lugazi;**Kenya** - Coastal province, Mumias, Chemelil, Nzoia, Muhoroni, Awendo, Kakamega, Nyanza, Mwaru and **Tanzania** – Kilombero valley, shores of L. Victoria, Moshi, Arusha, Bukoba, Morogoro.

**PROCESSING:** Canes are cut using pangas and transported to the factory where they are crushed between rollers to squeeze out the juice which is then mixed with lime and sulphur to purify it. Impurities sink to the bottom. Juice is then boiled until crystals formed and separated from molasses; weighed and bagged.

**COTTON** is grown on small farms using manual labour. It is one of the major traditional cash crops of East Africa. It requires:

- Moderate rainfall about 500mm- 750mm during the growing season.
- Well drained fertile Sandy loam soils.
- One rainfall peak period during planting season and high rainfall for flowering.
- Hot temperatures of above 20<sup>0</sup>c
- Abundant sunshine /dry season during harvesting
- Presence of large tracts of land.
- Availability of cheap labour.
- Altitude between 700 — 1500 m above sea level.

**Areas: Uganda** – Jinja, Kamuli, Soroti, Gulu, Apac, Arua, Kumi, Pallisa **Kenya** - Nyanza province, Lower Tana, Kirinyaga, Busia, Kilifi, Kitui, Machakos. **Tanzania** – South East Mwanza, Western Tanzania  
Cotton in East Africa is mainly grown in Uganda. Uses: Textiles, Soap, Seed cake for animals, Lubricants, Seed oil for cooking, margarine.

**HARVESTING AND PROCESSING:** When the balls open, the lint is picked and taken to the village ginnery where it is ginned by machine to separate little seeds from the lint. The cotton is then packed into bales and sent for export or to mills where it is manufactured into cloth. Seeds are crushed to produce vegetable oil and waste used as animal feed.

**SISAL:** it is a drought-resistant fibre plant. It requires the following conditions;

- Adaptable in most well drained soils.
- Warm to hot temperatures.
- Moderate rainfall of about 750mm.
- Low altitude between 0-1800mm.
- Abundant sunshine /dry season during harvesting



- Presence of large tracts of land.
- Availability of cheap and abundant labour.

**Areas: Tanzania**-Moshi, Tanga, Arusha, Morogoro, Kilosa;**Kenya** – Lindi, North of Mombasa, Kitale and Kilifi district (**sisal is grown on large scale in Kilifi district**)

**HARVESTING AND PROCESSING:** Leaves are cut, decorticated; fleshly stripped off the leaves leaving fibres. Fibres are washed, dried, and breached in sun, brushed, graded and baled for export.

**Uses;** to make sack cloth; making rope, strings, raw material for pulp and paper industry. Juice squeezed used for medicine. The major problem facing sisal growing is competition from synthetic fibre.

**RICE:** It has become an important food crop in East Africa as it has high yield per acre and easily stored. There are **two types** of rice; **upland** which is rain fed and **valley /paddy** rice grown under water. It is a plantation crop based on irrigation schemes. It requires the following conditions:

- Heavy water retaining fertile soils
- Abundant water mainly for valley rice.
- Dry season for harvesting.
- Altitude below 1200m.
- Flat land/gentle slope to allow water to flow under gravity.
- Warm to hot temperatures.
- Availability of large track of land.

**Areas: Tanzania** – A long Rufigi, Pangani, Kagera, Usangu and shores of L. Malawi. **Kenya** – Mwea-Tebere irrigation scheme, Ahero scheme, Yala, Buru and **Uganda**-Kibimba irrigation scheme (Tilda), Dokho, Aringa and west Nile (Valley rice). Upland is rice grown in Kakira, Wakiso and Gulu.

**TOBACCO:** It is being grown for both local consumption and sale to companies for local manufacture of cigarettes and for export. The Conditions for its growth

- The crop requires well distributed rainfall of about 1000mm-1500 mm
- Drier conditions during ripening and harvesting.
- It requires well drained light sandy soils, deep soils, fertile soils
- Grows well in gently sloping areas.
- Altitude between 900-1500m.
- Warm to hot temperatures 15<sup>0</sup>c-27<sup>0</sup>c
- Availability of abundant land
- Existence of wood fuel for tobacco curing

**AREAS: Tanzania:** -Urambo and Tumbi areas near in Miombo woodland. **Uganda:** - Arua, Adjumani, Nebbi, Gulu, Kitgum, Masindi, Hoima, Mubende, Kibale, Rukungiri and Kabale districts.

**PYRETHRUM** is a white flowering plant which contains a high concentration of pyrethrins for used in insecticide. Conditions necessary for its growth;

- High temperatures of over 15<sup>0</sup>c/warm to hot temperatures
- High rainfall between 1000mm-2500mm.
- Reliable rainfall well distributed throughout the year with
- A short dry season helps to stimulate new growth.
- Rich, deep, volcanic well-drained soils.
- Altitude of about 2000mm.
- High humidity.
- Availability of vast/extensive land for crop growing.
- Availability of abundant labour for harvesting because picking of flowers is labour-intensive activity.

**PROCESSING:**-flowers are dried in sun or over burners; bagged and to factories for extraction of pyrethrins for use in insecticide.

**AREAS;**It is grown in Molo, Nyeri, Kiambu, Kisii, Nyandarua and Kericho in Kenya

Pyrethrum faces problems of pests, diseases and competition from synthetic chemic pesticide.

❖ **Explain the conditions favouring each of the following crops; wheat,Cloves, Bananas, Beans, Groundnuts, Millet, Maize, Sorghum andWattle.**

❖ **Identify where each crop is grown in East Africa.**

**Effects of growing of crops to the environment are**

- Land is exposed to erosion because there is mono culture
- Soil exhaustion as some crops like tobacco take a lot of minerals from the soil.
- Pollution of the environment
- Break of soil structure
- Change of the natural vegetation
- Destruction of the ecosystem
- Change of local climate

### INCREASING AGRICULTURE PRODUCTIVITY

**Irrigation schemes:** Changes in agriculture are beingcarried out on a large scale in East Africa. This has led to increased production which has benefited both individuals and governments.

**Irrigation farming**is the artificial application of water for crops in areas where rainfall is unreliable **or** it refers to the process whereby water is constantly or occasionally applied to the growing of crops.

It's carried out where soils have the right plant nutrients and right temperatures for crops growth but useless without water. **Examples of irrigation schemes** are

NAME	SOURCE OF WATER & WHERE	CROP(S)
<b>UGANDA</b>		
MUBUKU	R. Sebwe a tributary of Mobukuin Kasese	Rice, Cotton, Vegetables
DOHO	R. Manafwa in Butaleja	Rice
KIBIMBA	R. Kitumbezi in Bugiri/Iganga	Rice
KIIGE	R. Victoria in Kamuli	Citrus
ONGOM	R. Adip in Lira	Citrus
OLWENY	R. Adip in Lira	Citrus
AGORO	R. Aringa in Kitgum	Rice and Vegetables
ATERA	R. Victoria in Apac	Rice and Vegetables, citrus
KAKIRA	L. Victoria in Jinja	Sugarcanes
LUGAZI	R. Musambya in Mukono	Sugarcanes
<b>KENYA</b>		
MUMIAS	R. Nzoia in Nzoia valley	Sugarcane
AHERO PILOT	R. Nyando&Miruiin Kano plains	Rice, maize, beans
MWEA -TEBERE	R. Thiba&Nyamindi-central Kenya	Rice
KANO	L. Victoria-near shores	Rice & Sugarcane
BUNYALA & YALA	Shores of L. Victoria	Rice & Sugarcane
GALOLE	R. Tana	Cotton
<b>TANZANIA</b>		
KILOMBERO	R. Kilombero & Ruaha	Sugarcanes, maize, beans

### MWEA-TEBERE IRRIGATION SETTLEMENT SCHEME

It is the largest settlement irrigation scheme in Kenya. It covers an area of about 8800ha and about 96km North East of the capital city-Nairobi near the foothills of Mount Kenya at the height of 1160 above sea level. Water for irrigation is drawn from rivers Thiba and Nyamindi which are tributaries of river Tana as illustrated below;

The soils found there are black cotton, clay for rice growing and free drain clay loam for the other crops. Irrigation was possible because there was unreliable rainfall which varies from 750mm and 1000mm.

**ORGANISATION OF THE FARM-** The ground is leveled and divided into shallow unbanked basins. Access roads, irrigation and drainage ditches were constructed. Two streams were dammed to provide constant water to the land. Scheme is divided into three blocks of Mwea, Tebere and Thiba. Each farmer is given one acre surrounded by earth bank to keep water from draining away.

**CULTIVATION-** Land is flooded, tractors plough, tenants plant, weed and harvest. Water is drained during harvesting and harvesting is done by hand using sickles. Rice is threshed, winnowed, collected and taken to Mwea, Tebere and Thiba. Rice is weighed and processed at Mwea mill. The settlement provides agricultural machinery; provide fertilizers, bags and insecticides.

#### **CONDITIONS WHICH HAVE FAVOURED THE LOCATION OF THE PROJECT**

- Presence of permanent water sources such as Tana, Thiba and Nyamindi.
- The gently sloping landscape-piedmont plain on the lower slopes of Mount Kenya allowing irrigation by gravity flow.
- Presence of well drained fertile black cotton volcanic soils; red clay loams which support rice growing.
- Inadequate -low average -unreliable rainfall of less than 750mm per annum.
- Extensive tracts of land which was sparsely populated thus ideal for the project.
- Favourable government policy of setting up projects in remote /marginal lands.
- Proximity to communication lines i.e. the Nairobi-Nyeri railway.
- Availability of adequate capital to be invested.

#### **BENEFITS OF THE SCHEME**

- Foreign exchange when rice is exported.
- Created employment for tenants who are farmers.
- Effective utilization of marginal land.
- Source of vital food i.e. rice.

- Sources of income to farmers through the sale of rice to the government.
- Resettlement of the population which was formerly landless
- Improvement in infrastructure i.e. roads, schools, market centers, hospitals
- Source of government revenue through taxation.
- Improvement in research in the rice varieties.
- Establishment of processing industries.
- Urbanization and acquisition of skills.

#### **PROBLEMS FACING THE FARMERS ON THE IRRIGATION PROJECT**

- Pests and diseases for example rice rust which destroys the crops.
- Poor yields of rice.
- Soil exhaustion /reduction in soil fertility due to monoculture.
- Shortage of labour because of low population.
- Price fluctuation due to over production.
- Limited capital to invest in the growing of rice and maintenance.
- Silting of the canals which require regular dredging.
- Excessive evaporation leads to salinity of the soil
- Weeds which compete with crop for nutrients.
- Single crop/farming seasons.
- The problem of weather conditions i.e. cool temperatures, storms

#### **SUGARCANE GROWING IN KILOMBERO VALLEY IN TANZANIA**

Kilombero found in Tanzania and is located within the Kilombero river valley. The main crop grown is sugarcane; other crops are maize and beans. Fish is also caught from the rivers.

#### **Location of Kilombero irrigation in Kilombero valley**

#### **FACTORS FAVOURING THE LOCATION OF THE SCHEME**

- Presence of Rivers that is Ruaha and Kilombero to provide water.
- Gently sloping land or flat relief favouring use of machine.
- Large market/high demand for sugar.
- Positive government policy to open up remote areas.
- Opening up of Tanzam/Tanzara Railway which increased accessibility.
- Extensive land or spare population which encouraged setting up a large scheme
- Availability of adequate capital from Kilombero.
- Presence of abundant labour both skilled and unskilled.
- Warm temperatures of 20<sup>o</sup>c and above.
- Well drained fertile soils which led to high yields.
- Low rainfall totals hence need for irrigation.

### **BENEFITS OF THE SCHEME**

- Foreign exchange after sugar is exported to foreign countries.
- Provision of employment opportunities to the farmers.
- Effective utilization of marginal land/waste lands
- It has reduced dependency on sugar imported from Kenya therefore, saving foreign exchange for the country.
- Encouragement of the out growers by providing market for their produce.
- Sources of income to the farmers through the sale of sugarcanes to the factories.
- Improvement in infrastructure i.e. roads, schools, market centers, hospitals
- Source of government revenue through taxation.
- Improvement in research in the sugar cane varieties.
- Establishment of processing industries i.e. sugar processing plant.
- Urbanization /development of towns like Ifakara, Kidatu

### **PROBLEMS FACED BY FARMERS ON THE KILOMBERO IRRIGATION SCHEME**

- Pests and diseases for example yellow wilt.
- Leaching of soil due to excessive water.
- Soil exhaustion due to monoculture.
- Shortage of labour because of low population.
- Price fluctuation due to over production.
- Inadequate capital to invest.
- Inefficient transport within the scheme.
- Fire out breaks.
- Silting of the canals which require regular dredging.
- Excessive evaporation leads to salinity of the soils.
- Long hours of work for labourers.
- Dangerous animals for example snakes.
- Weeds which compete with crop for nutrients.
- Rapid loss of water due to evaporation.
- Strong winds and hail stones.

### **SOLUTIONS TO THE PROBLEMS**

- Spraying to kill pests and diseases.
- Research on sugarcane varieties.

- Mechanization to solve labour.
- Construction of feeder roads and railways.
- Price regulation and control by the government.
- Diversification of the economy.
- Application of fertilizers to increase soil productivity.
- De-silting or dredging of the canals.
- Use of herbicides to control the weeds.
- Fire breaks or leaving bare land between the plots.
- Mulching to control weeds.
- Acquiring loans from banks.