CLIMATE OF EAST AFRICA

Climate is the average weather conditions for a place recorded for a long period of time usually 35yrs. In East Africa, there are four major types of climatic zones which are; Tropical/equatorial climate, Savannah climate, Desert/semi-arid climate and montane climate. Climate influences human activities e.g. agriculture, settlement, feeding, dressing and other physical aspects like vegetation.

Factors influencing the climate of East Africa

a) Altitude: Climate changes with height above sea level. Areas near mountains receive heavy rainfall and low temperature especially on the windward side e.g. Mt. Kenya, Elgon, Kilimanjaro. Altitude also influences temperature differences e.g. areas on a higher altitude are cooler e.g. Nairobi, Kabale and Kampala while lowland areas receive high temperate e.g. Mombasa and Kasese.

b) Distance from the sea: Areas close to water bodies receive heavy and reliable rainfall e.g. shores of Lake Victoria (Kisumu, Entebbe, Bukoba, Mwanza and Nyanza province). This is due to the abundant moisture released into the atmosphere through evaporation whereas areas which are far away from water bodies receive low and unreliable rainfall and hot temperature due to less moisture release e.g. Dodoma, Karamoja and Masailand.

c) Latitude: Climate changes as one moves away from the equator, North or south. The equator influences the occurrence of the Inter-Tropical Convergence Zone (ITCZ). This is in relation to apparent movement of the overhead sun. Areas around the equator receive double maxima of rainfall and hot temperature between February and May and between September and November e.g. Entebbe, Kisumu while areas that are far away from the equator receive single maxima of rainfall e.g. Gulu and Dodoma.

d) Relief: Highland areas act as barriers to prevailing winds. In such areas, there are differences between the conditions on the lee ward side and the wind ward side. The leeward side receives little or no rainfall because it's in the rain shadow e.g. Kasese and Arusha while areas on the wind ward side receive heavy rainfall and lower temperatures e.g. Mbale and Kigezi region.

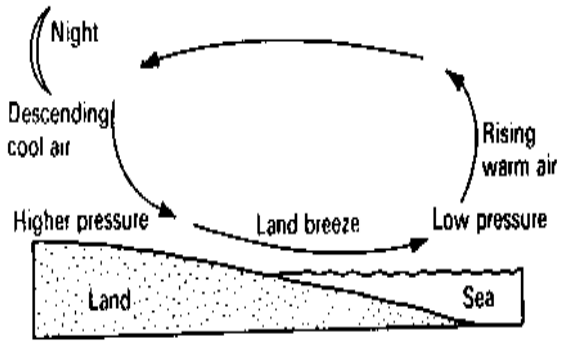
e) Vegetation: Areas with tropical rainforests receive heavy rainfall due to abundant moisture release through evapo-transpiration e.g. near Mabira forest in Mukono district while areas without vegetation cover receive hot temperatures and low rainfall e.g. Kondoa region (Miombo woodlands), Machakos, Turkana land and Karamoja.

f) Influence of man: Due to man's activities such as bush burning, swamp reclamation and deforestation, this leads to disappearance of vegetation hence low rainfall and high temperature. Urbanisation through industrialisation and road construction has also led to global warming hence hot temperatures in cities e.g. Kampala and Dodoma. Activities such as afforestation and re-afforestation have led to growth of vegetation hence leading to heavy rainfall.

g) Influence of trade winds i.e the North East trade winds a dry wind blowing over Karamoja areas and North Western Kenya have led to Hot and dry climatic conditions in the region, South East trade winds and Westerlies are moisture laden winds responsible for heavy rainfall around Lake Victoria and windward slopes on Mt. Rwenzori.

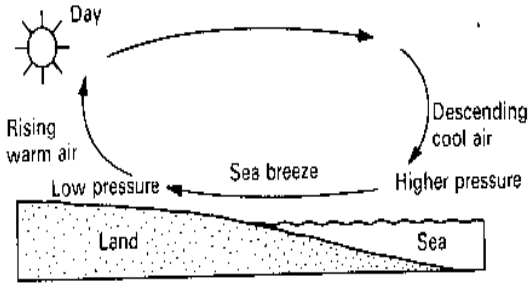
h) Influence of local winds: Trade winds have got an impact especially along the coastal areas and shoes of Lake Victoria. They lead to formation of land and sea breezes.

(i) **Land breeze:** it takes place during the night. After sunset, both the land and the sea cool down but land cools down faster than water meaning that air over land becomes cooler than air over water. Moist air therefore flows from land to the sea or lake. Warm air over the sea is forced to rise up to the condensation level forming clouds and forming rain which falls especially during the morning hours.



(ii) Sea breeze: it takes place during the day

When land heats up faster than the water, Air above land becomes warmer and it's forced to rise up forming a low pressure zone on land. Moist air from the sea begins to push its way beneath the warm air over the land. The warm air is pushed upwards to the condensation level where it forms clouds which fall back as rainfall especially during the afternoon hours.



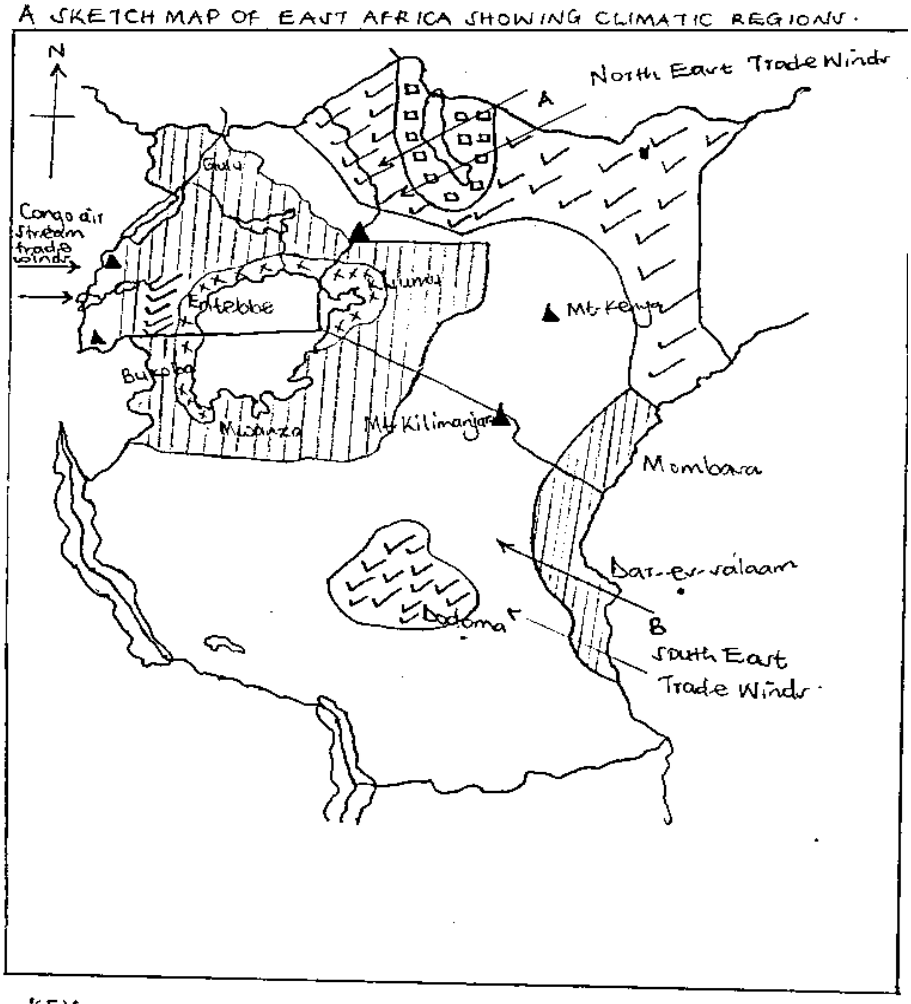
N.B: Temperature inversion: This is a situation where temperatures at high altitude are warmer than those in the valleys or it's a situation where temperatures increase with increase in altitude e.g. near Kenya highlands and Kigezi.

MAJOR CLIMATIC TYPES IN EAST AFRICA

The major climatic types in East Africa include

- Equatorial/tropical climate
- Savannah climate
- Desert and semi desert climate
- Montane climate

A SKETCH MAP OF EAST AFRICA SHOWING CLIMATIC REGIONS.



KEY

- Equatorial
- Desert
- Humid Tropical
- Semi-desert
- Montane (modified by altitude)
- Wind systems
- Tropical (one rain season, one dry season)

Characteristics of climatic zones

a) Equatorial/tropical climate:

- Heavy and reliable rainfall of about 1500mm per annum is experienced throughout the year.
- There are two rainfall seasons/peaks (double maxima) in a year.
- The length of the days and the nights is almost equal throughout the year (equinox).

- Humidity is always high due to high rate of evaporation.
- The climate is both hot and wet.
- It has a small annual temperature range of about $3^0 – 4^0$C.
- The rainfall is received throughout the year and is well distributed.
- Rainfall is mainly convectional resulting from high evaporation from lakes, rivers and forests.
- Rainfall mainly falls in the afternoon accompanied by lightning and thunder.
- Temperatures are high in this region and even throughout the year.
- The region is also characterized by dense cloud cover making both days and nights warm.
- Low pressure all year round due to high evaporation rates.

Economic activities carried out in equatorial climate regions

✓ Due to the existence of dense forests, wild life conservation has been made possible and this attracts tourists.

✓ Equatorial climate has also favoured the existence of numerous water bodies giving rise to fishing activities.

✓ The dense vegetation in equatorial regions harbours wild animals making hunting possible.

✓ The dense forests due to heavy rainfall and hot temperatures experienced in that region have favored lumbering activities e.g. in Mabira forest.

✓ Agriculture and forest products existing in equatorial region have made industrial growth possible.

✓ Growing of perennial crops like coffee, palm oil, cocoa and tea due to heavy rainfall received throughout the year.

✓ Charcoal burning due to existence of dense forest cover.

✓ Food gathering e.g. passion fruits due to thick forests with fertile and dump grounds.

Problems faced in equatorial regions

➢ Rampant occurrence of pests and diseases which attack man, livestock, crops and this has scared away settlements leading to low development rates.

➢ Heavy rainfall received throughout the year and existence of the dense forested regions has made the establishment of transport network very difficult.

➢ The region with its dense forests has made it difficult to exploit such areas leading to remoteness.

➢ The equatorial forests are commonly inhabited by robbers and this has constrained any attempts to the development of the region.

➢ The heavy rainfall received throughout the year has caused a danger of erosion especially in areas where agriculture is practiced.

➢ Heavy rainfall may also lead to flooding which destroys peoples' lives and property.

➢ Leaching of the soils due to heavy rains and erosion has also led to serious loss of soil fertility.

➢ High rate of weed growth hence increasing costs of farming and clearance of land.

Steps taken to improve conditions in equatorial regions

- Establishment of transport and communication networks such as roads to reduce remoteness.
- Ensure political stability by talking peace with the respective rebel groups so as to allow development to take place in the affected areas.
- Practice modern methods of agriculture such as application of both organic and in-organic fertilizers to check on the rate of soil fertility loss.
- Setting up processing and manufacturing industries to take up products from agriculture and forestry to minimize wastage.
- Use of herbicides to control growth of weeds.
- Market research so as to enable the farmers in the region to sell their agricultural produce.
- Provision of capital in form of soft loans to enable different activities like agriculture and lumbering.
- Planting of trees to control soil erosion.

Conditions leading to equatorial climate

- **Influence of trade winds** especially the south east trade winds which blow over the Indian Ocean causing inter- tropical convergence zone leading to heavy rainfall, high humidity along the equator.
- **Distance from the sea**: areas near water bodies e.g. Lake Victoria and Kyoga receive heavy rains due to on-shore and off-shore breezes hence equatorial climate.
- **Latitudinal location**: Areas along the equator experience hot and wet conditions due to inter-tropical convergence zone (ITCZ) formed when winds converge at the equator blowing from different areas especially over the Indian Ocean.
- **Ocean currents** especially the warm Mozambique currents that bring heavy rainfall along the equatorial belt of East Africa.
- **Man's activities** through afforestation & re-afforestation programs which lead to creation of green belts of vegetation leading to heavy rainfall along the equator.
- **Influence of vegetation**: Thick forests e.g. Mabira lead to rainfall formation through evapo-transpiration.

b) Savannah climate: it occurs between 5^o to 15^o north and south of the Equator. It's found in the broad zone between the equatorial climate and the hot desert.

Characteristics of savannah climate

- Rainfall varies in amount from 1000 mm near the equator and decreases towards the desert about 250 mm.
- Rainfall is mainly received in summer when temperatures and evaporation rates are high.
- The rainfall received in the region is convectional in nature coinciding with the over head sun.
- Receives single maxima of rainfall i.e. one peak.
- Annual temperature range is moderate ranging between $7^oC - 9^oC$.
- Humidity is relatively high throughout the year due to high evaporation rates.
- The region experiences a low cloud cover generally though the cloud cover is a bit dense during the summer seasons.
- Alternate wet and dry seasons are experienced.

Economic activities that can be carried out in savannah regions

- ❖ Crop growing i.e. Annual/seasonal crops are grown e.g. maize, millet, groundnuts beans, and cotton due to seasonal rainfall.
- ❖ The natural vegetation in the savannah consists of mainly grasslands that favour livestock rearing.
- ❖ Lumbering has also been carried out in savannah from the woodlands.
- ❖ The Savannah grasslands provide a natural habitat for many species of wild life which forms the basis for the tourism industry.
- ❖ Due to agriculture that takes place in the savannah, development of processing and manufacturing industries has been made possible. E.g. grain mills, ginneries for cotton, milk processing plants e.t.c.
- ❖ Charcoal burning and extraction of wood fuel also has been favored in the savannah due to the existence of woodlands.
- ❖ Hunting of animals has also been favored in the savannah due to the existence of the wild animals.
- ❖ Bee keeping can also survive in the savannah woodlands.

Problems faced in savannah regions

- Low and unreliable rainfall which leads to crop failure after planting.
- Shortage of adequate pasture for the livestock especially during the dry season forcing people to live a pastoral life.
- Large herds of livestock are kept which leads to over stocking, over grazing and eventually soil erosion.
- Wide spread fire out break especially during the dry seasons which leaves the surface bare leading to erosion when the rain season begins.
- Occurrence of pests and diseases which affect the crops and livestock e.g. tsetse flies which spread sleeping sickness in human beings and Nagana in livestock.
- Poaching of wild animals and this has affected the tourism industry.
- The severe occurrence of drought conditions forces wild animals to migrate which affects tourism.
- Some savannahs have inadequate transport and communication net work which has led to remoteness and low levels of economic development.
- Inadequate capital to develop savannah regions.
- Growth of weeds during the wet season which makes crop growing very expensive.

Solutions to the above problems

- ✓ Use of chemical spraying to control weeds and pests.
- ✓ Provisions of soft loans to reduce shortage of capital for developing the regions.
- ✓ Encourage crop rotation to ensure soil fertility and high productivity.
- ✓ Construction of valley dams to store water for the dry season.
- ✓ Establishing ranches to act as demonstration farms for the pastoralists.
- ✓ Extending veterinary services to reduce animal diseases.
- ✓ Construction of roads to reduce remoteness of such areas.

(c) DESERT AND SEMI DESERT CLIMATE

This type of climate is mainly found in the sub-tropical belt. These areas include Karamoja, Turkana land and Chalbi desert in Northern Kenya.

Characteristics of desert and semi-desert climate

- They receive low and reliable Rainfall.
- Annual Rainfall total is below 250 mm per year.
- The region experiences hot temperatures above 30^{o}C throughout the year.
- The days are very hot while the nights are very cold due to absence of cloud cover.
- These regions experience low relative humidity because of the extreme dry conditions.
- They experience hot and dry conditions throughout the year.
- Rainfall is rare but torrential which leads to seasonal floods.

Factors that have led to desert type of climate

- ✓ Latitudinal location far away from the equator where rainfall is low and unreliable.
- ✓ Location on Eastern side of the continent where off-shore winds especially the North East trade winds lead to aridity.
- ✓ Absence of large water bodies in the interior hence reduced evaporation e.g. Chalbi desert.
- ✓ Rain shadow effect due to presence of Ethiopian highlands hence dry descending winds reaching Karamoja and Turkana land.
- ✓ Presence of scanty vegetation which limits evapo-transpiration leading to low rainfall totals.
- ✓ Presence of off-shore winds which blow parallel to the coast diverting moisture bearing winds from the land mass.
- ✓ Bush burning by pastoralists which leads to rise in temperatures.

Economic activities in desert and semi-desert climate

- Tourism due to the existence of numerous desert landforms that attract tourists e.g. sand dunes.
- Nomadic pastoralism due to existence of scanty pastures e.g. the Karamojong.
- Mining and sand quarrying e.g. gold in Karamoja although it exists in small quantities.
- Cultivation of drought resistant crops under irrigation e.g. cotton in Kasese.
- Bee keeping due to the existence of scattered trees.

Problems faced by people living in desert regions

- ❖ Inadequate/limited supply of surface water for livestock and human consumption.
- ❖ Shortage of pasture for livestock rearing leading to nomadism.
- ❖ Infertile soils which don't support crop growing.
- ❖ Low and unreliable rainfall which limits growth of crops and vegetation.
- ❖ Excessively high temperatures during the day making settlements difficult.
- ❖ Very cold nights due to absence of cloud cover.
- ❖ Desert areas are remote due to absence of road network.
- ❖ Limited supply of food leading to frequent famine.
- ❖ Sandstorms due to strong winds are common leading to loss of lives and poor visibility.
- ❖ Small population makes it difficult to provide social services.

- ❖ Temporary flooding due to torrential downpours.
- ❖ Overcrowding near oases, rivers and water points.
- ❖ Shortage of labor and market due to small and sparse population.

Solutions to the above problems

- ✓ Construction of valley dams to help store water for pastoralists.
- ✓ Irrigation farming to improve food production and reduce famine.
- ✓ Planting of trees to help in climate modification through rainfall formation.
- ✓ Use of machines especially where labor is not enough.
- ✓ Educating pastoralists about the dangers of bush burning.
- ✓ Extending social services to attract big population and encourage people to settle down.
- ✓ Resettlement of people away from congested areas e.g. oases and river valleys.
- ✓ Encouraging tourism to acquire revenue for development of social services.

(e) MONTANE CLIMATE: This is experienced in highlands and mountainous regions of East Africa. Examples of these areas include; Kikuyu land (Mt. Kenya), Chagga land (Mt. Kilimanjaro), Bugisu land (Mt. Elgon) and Kigezi land.

Characteristics of montane climate

- The temperature decreases with an increase in height or altitude.
- They receive relief or orographic rainfall mainly on the windward side of highlands.
- The tops of the mountains do not receive as much rain as the lower slopes.
- Where altitude exceeds 4500m above sea level, the areas are covered by permanent snow/glaciers e.g. Mt. Kenya, Kilimanjaro and Ruwenzori.
- The leeward slopes are often dry due to the rain shadow effect e.g. Kasese and Ankole-Masaka corridor.
- Lower slopes are warmer than higher slopes.

Economic activities carried out in montane climate

- ➢ Tourism due to existence of permanent snow and glacial features that attract tourists that brings in foreign exchange.
- ➢ Lumbering especially from the mountain forest favored by the heavy rains.
- ➢ Slopes that have fertile soil and receive heavy rains favor agriculture for food production especially on the windward side.
- ➢ Nomadic pastoralism especially on the lee ward sides of the highlands.
- ➢ Mineral exploitation due to occurrence of some mineral deposits in mountain rocks e.g. copper at Kasese.
- ➢ Stone quarrying which provides materials for road construction and building

VEGETATION OF EAST AFRICA

Vegetation is the general term given to all living plants of various categories i.e. the trees & grass that cover the earth's surface and those that grow in water. Biologically, vegetation is known as Flora. There are four major

types of vegetation in East Africa which include; Equatorial /tropical rainforest, Savannah vegetation (woodlands and grasslands), Swamp or mangrove vegetation and Semi-arid/desert vegetation.

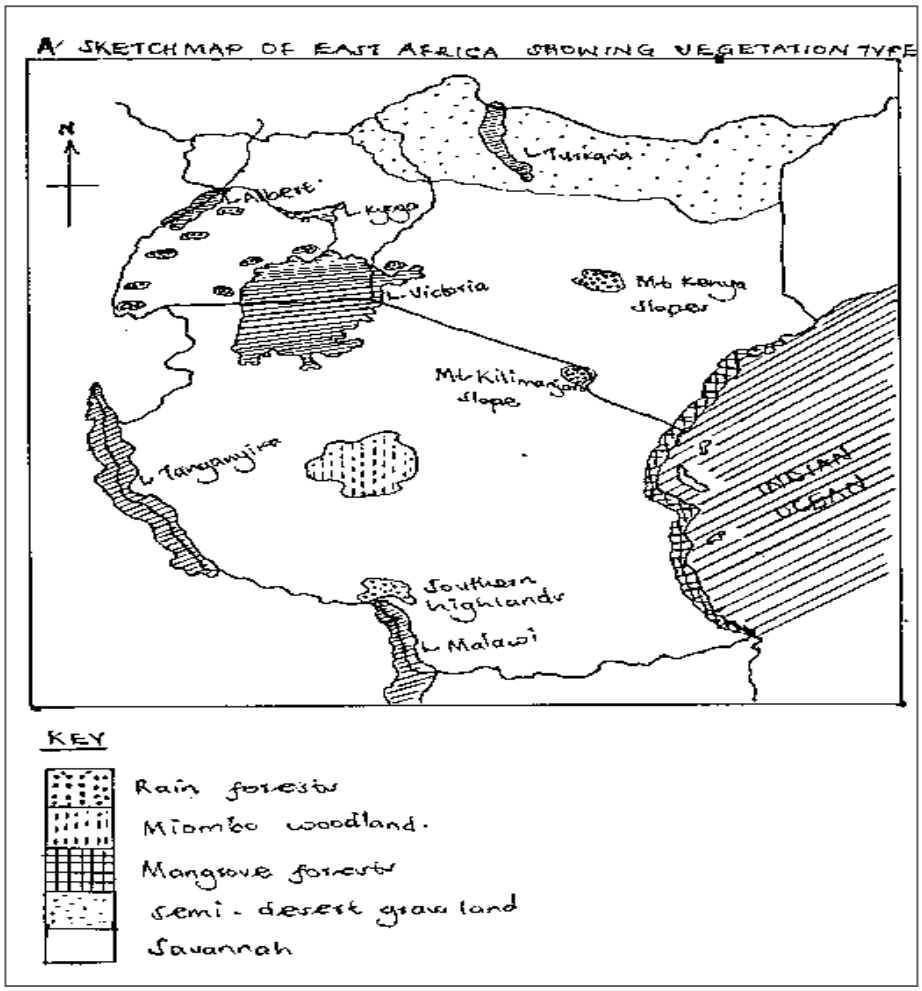
Factors influencing vegetation distribution in East Africa

1. **Climate:** tropical forests grow in areas that experience heavy and reliable rainfall of about 1500mm and above. They also thrive well where temperatures are high throughout the year e.g. Mabira and Budongo forests. The amount of rainfall reduces as one moves away from the tropical region and this has led to Savannah vegetation consisting of Savannah Woodland and Savannah Grass Land e.g. Miombo woodlands. Desert regions receive rainfall which is very low, hence shrub and dry bush are dominant e.g. in Karamoja and Turkana land.
2. **Altitude:** Tropical rain forests, mangrove forests and savannah vegetation thrive well on the low altitude areas e.g. Masai Mara while montane forests, heath and moorland thrive well on high altitude areas e.g. in Kabale.
3. **Drainage:** Areas with permanent and stagnant water have favored swamp vegetation as well as mangrove forest e.g. at the East African Coast. Areas with no permanent drainage features such as lakes and rivers tend to be very dry and these have a dominance of semi-arid vegetation e.g. Karamoja. Areas that are well drained have a dominance of savannah and tropical rain forests e.g. along mountain slopes.
4. **Soils:** Areas with deep and well drained fertile soils tend to favor tropical forest vegetation. Areas with moderately fertile soils favor the growth of Savannah grasslands whereas very infertile areas will favor semi-arid vegetation and at times do not favor vegetation at all e.g. Karamoja region. The water retention capacity of the soil (soil porosity) will also influence vegetation. High water retaining soils e.g. clay soils lead to occurrence of swamp or mangrove vegetation e.g. along the coastal belts.
5. **Biotic factors: s**ome areas that are infested with pests tend to scare away settlement creating favorable conditions for the growth of dense vegetation or savannah wood lands e.g. Miombo Woodlands of central Tanzania. Areas without pests attract settlements and lead to savannah grass land. Areas that are infested with locusts tend to have scanty vegetation because these insects destroy the existing vegetation.
6. **Human activities:** Large areas of forested land have been cleared for timber to create room for settlement and cultivation which has resulted into forested areas turning into savannah grasslands. Large areas of savannah vegetation have been turned into shrubs and wood lands because of activities like over grazing, bush burning, charcoal burning e.t.c. Some areas have been left without vegetation because of human practices like monoculture and shifting cultivation e.t.c leading to semi-desert and desert vegetation. In areas where man has engaged in afforestation and re-afforestation activities, he has led to luxuriant tropical rain forests.

TYPES OF VEGETATION IN EAST AFRICA

The major types of vegetation in East Africa include;

- Equatorial / Tropical Rain forests.
- Savannah vegetation
- Swamp/mangrove vegetation
- Semi-desert / Desert vegetation
- Montane vegetation:



Characteristics of vegetation zones

i) Equatorial / Tropical Rain forests.

- Trees have big trunks
- They are ever green through-out the year because of high rainfall.
- They have little or no undergrowth.
- Trees are very tall above 30-40 meters.
- Trees form canopies of about 3 different layers due to varying tree heights.
- Trees have many climbing plants (lianas) because of search for sunlight e.g. passion fruits.
- The trees mainly provide hard wood e.g. Mvule, Mahogany and Ebony.
- Trees have broad leaves.
- The trees have buttress roots to hold the huge tree trunks.
- Trees appear in impure stands.
- Forests are always thick i.e. impenetrable e.g. Bwindi impenetrable forest.
- Trees have a long gestation period of over 60 years.

ii) Savannah vegetation: it's divided into two i.e. grasslands which include; Queen Elizabeth National Park, Serengeti National Park, Kidepo valley National Park and Murchison Falls National Park and Woodlands which include; Miombo woodlands in Tanzania.

- Trees are ever green because of relatively high rainfall especially during the wet season.
- During the dry season, trees have brown leaves which they shade off to prevent loss of water (deciduous trees).
- Trees have got long tap roots in order to reach underground water.
- Trees are always scattered e.g. acacia.
- Grass grows up to 2m e.g. elephant grass.

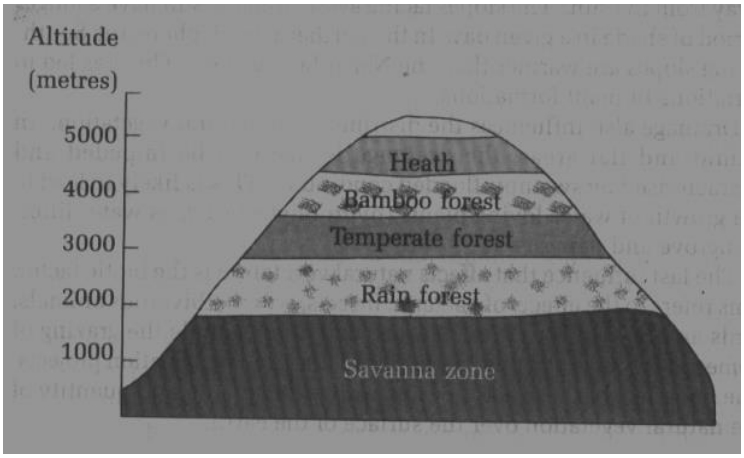
iii) Semi-desert / Desert vegetation: Mainly found in areas that receive low rainfall below 750mm per year. Areas with this type of vegetation include; Turkana land, Karamoja region and Ankole-Masaka corridor.

- Trees are very short and usually stunted.
- Trees have very long tap roots to reach to the water level which is very deep.
- They have scattered bushes and thickets.
- Trees have thorny leaves e.g. lantana camara and baobab trees to prevent the animals from eating their leaves.
- Some plants have swollen trunks in which they store water to use during the long dry season e.g. Baobab.
- The plants have seeds that can lay dormant on the ground for a long time until the rain falls to allow germination.
- Many plants complete their life cycle within a few weeks before the soils dry up e.g. shrubs.

iv) Swamp/mangrove vegetation: In East Africa, swamps are found around water bodies e.g. around Lake Victoria and Kyoga, along the coast (mangrove swamps) and around the various rivers (Riverine swamps) e.g. River Kafu, River Katonga and River Nzoia. Some swamps are also found in Dombos (broad valleys) e.g. Awoja swamp in Soroti, Olwenyi swamp in Lira.

- Swamp vegetation is found in water logged areas.
- Vegetation is a mixture of mangrove trees, palm trees, coconuts and papyrus.
- The ground has a lot of mud and it's marshy.
- Trees are evergreen throughout the year.
- Trees are medium height usually less than 10m due to high temperatures.
- Trees grow close to each other making forests thick.
- Trees have fibrous roots and straight stems.
- Trees have broad leaves and are characterized by hard wood.
- Some trees have twisted stems/trunks

v) Montane vegetation: This occurs in mountain ranges and highland regions e.g. along Mt. Kenya, Elgon and Kilimanjaro. Due to varying altitude, the vegetation changes as one moves up the mountain as shown below.



- ***Savannah:*** this is found at the lowest level of the mountain below 1000 meters and consists of dry grasses and shrubs. It's due to man's interference through clearance of tropical forests.
- ***Tropical rain forests:*** these are above savannah at an altitude between 1500 to 2500 metres. It consists of thick luxuriant and evergreen vegetation.
- ***Temperate and bamboo forests: a***s altitude increases, the rainfall amount reduces and this gives rise to the temperate and bamboo forest which thrive well under cold conditions.
- ***Heath and moorland: a***t the level between 3500 to 4500 m above sea level. The temperatures are very low as well as rainfall. Vegetation here consist of flowering plants, grasses and shrubs e.g. cedar and camphor.
- ***Snow and bare rock: a***bove 4500 above sea level, temperatures are extremely cold thus the existence of snow and bare rocks. No vegetation grows at this level.

Characteristics of montane vegetation include;

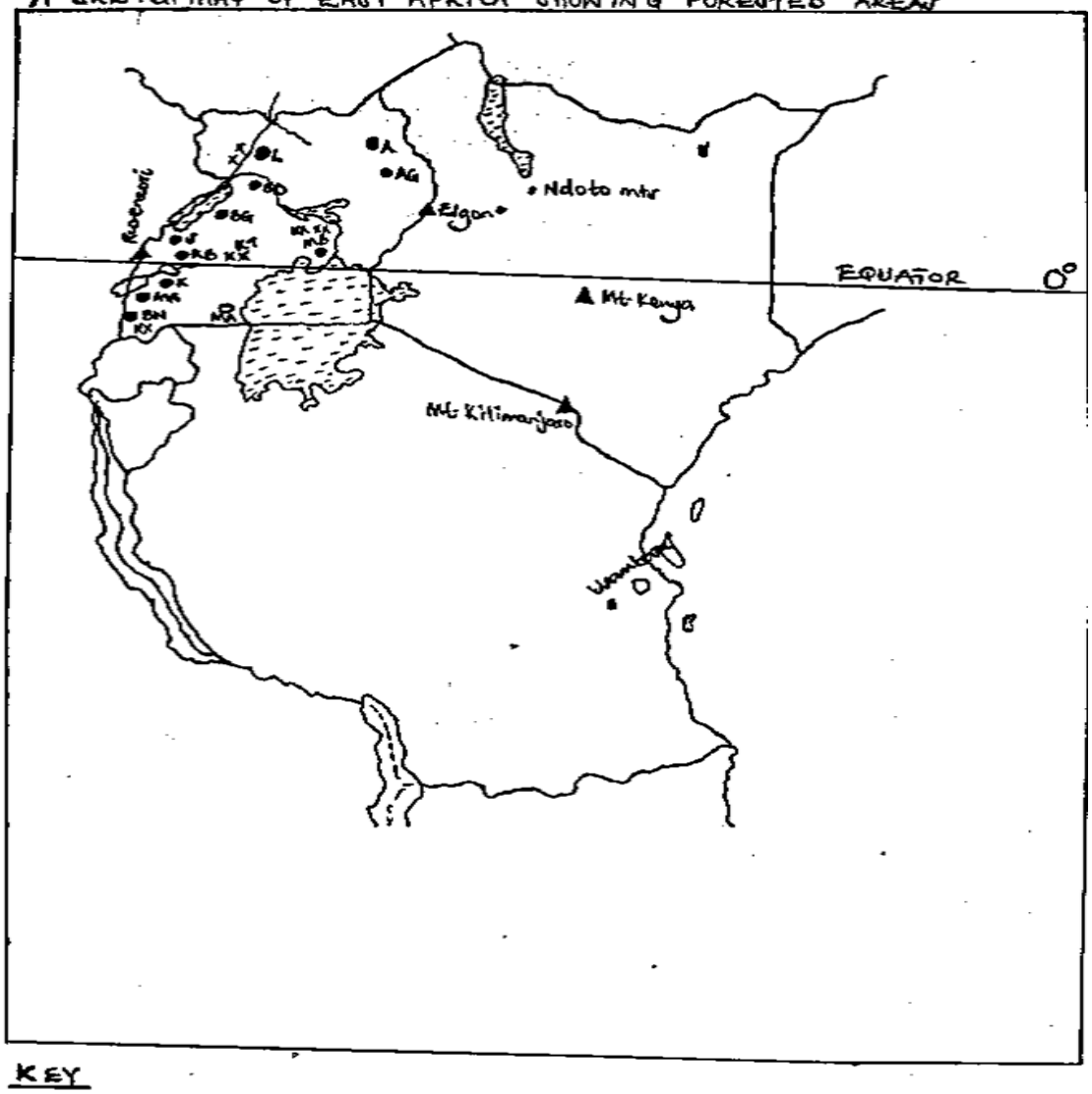
- Altitudinal zonation of forest vegetation i.e. tropical forests at lower slopes, temperate slopes at mid-slopes, coniferous and bamboo slopes at higher slopes.
- Tropical forests (low altitude) are of mixed stand and have two layers of canopy.
- Tropical forests are of hard wood.
- Temperate, coniferous and bamboo forests are in pure stands and have single canopy.
- Temperate and coniferous forests are soft wood, have thick barks, cone shaped trees, needle shaped leaves, straight trunks and some species have hollow stems.

N.B: for the economic activities carried out, problems faced and solutions to problems faced, in a particular vegetation zone, refer to climatic zones as seen above.

FORESTRY IN EAST AFRICA

A forest is an extensive tract of land covered with a close stand of trees. It can be natural or planted by man with either hard wood trees or soft wood trees or both. Forestry is the science of cultivating forests and is also called tree farming.

A SKETCH MAP OF EAST AFRICA SHOWING FORESTED AREAS



KEY

- ▲ Montane forestr
- XX Planted forestr
- ● Tropical lowland forestr

MA- Malabigambo
BW - Bwindi
MR- Maramagambo
K- Kasyoha Kitomi
KB - Kibale
KT- Kateera
S- Semliki
BG - Bugoma
BD- Budongo
A- Aber
AG - Agwata
MB- Mabira
KA- Katogo
L- Lendu

Conditions favoring the natural growth of forests

- Availability of extensive land with sparse population where forests grow with limited interference.
- Heavy rainfall of over 1500mm per annum for proper tree growth.
- Reliable and well distributed rainfall throughout the year for proper maturity of the trees.
- Hot temperatures of about 20^0C- 30^0C for the proper growth of trees.
- High humidity level which is responsible for heavy rainfall that supports tree growth.
- Altitude especially at higher altitude where the population is small and temperatures do not favor human settlement hence leaving aside the land for forest growth.
- Supportive government policy of emphasizing afforestation and re-afforestation programs.
- Deep, fertile and well drained soils which support the growing of trees.
- Control of growing population to reduce on human interference with forests through settlement and agriculture.
- Abundant sunshine for the growth of natural forests.

Tree species in East Africa

1. **Hard wood trees:** These are mainly found in tropical rain forests e.g. Mabira, Budongo, Maramagambo, Bugoma, Kalinzu, Marabigambo and Bwindi. Examples include; Red heart, Musizi, Mvule, Mahogany and Ebony.
2. **Soft wood trees:** these are mainly planted forests. They include tree species like Eucalyptus, Pine, Cyprus and red cedar. They are mainly found in low lying areas e.g. Namanve.

NB: Montane forest also exists near the high mountains of East Africa e.g. Kilimanjaro, Kenya, Ruwenzori and the vegetation appears in zones.

Other important trees in East Africa include; wattle (soft wood tree) planted because its bark contains Tannin used in leather tanning industries.

- Pines are largely used for pulp and paper making e.g. at Webuye.
- Eucalyptus trees are not indigenous trees but are important for the provision of firewood, electric and fencing poles and paper and pulp.

Problems facing the forestry industry in East Africa

- Deforestation due to the increased need for land for agriculture and settlement.
- Wild animals graze freely in the forests leading to their destruction e.g. elephants.
- Wild fires caused by either lightening or careless farmers leading to loss of extensive forested lands.
- Scarcity of rainfall and prolonged drought due to increased desertification leading to short and stunted trees.

- Population increases hence the need to create more land for settlement leading to clearance of forested land.
- Limited alternative power sources have led to high demand for wood fuel and charcoal hence destruction of forests.
- Increased urbanization has led to destruction of forests e.g. road construction and industrialization.
- Mining and quarrying activities have also led to the destruction of forests due to the need to expose mineral bearing rocks
- Occurrence of tree pests and disease that attack specific tree species leading to their depletion.
- Long gestation of some tree species has also led to shortage of wood fuel.
- Inadequate labor force to carry out forestry management.
- Inadequate capital for investment in forestry management.
- The bulky nature of some tree logs makes it difficult to transport them to saw mills.
- Inaccessibility of some forests has made it difficult to exploit some of them.
- Corruption and embezzlement of forest funds by some forestry officials.
- Limited valuable commercial tree species which leads to importation that is very expensive.
- Insecurity and wars due to rebel activity has led to destruction of forests that are used as hide-outs for rebels.
- Unfavorable government policies e.g. giving forested land to private investors to set up plantations hence clearance of forests.
- Low levels of technology for exploiting forests e.g. use of axes and pangas.
- Hostility of local communities towards forest staff hence creating insecurity for the forest guards.

Solutions to the above problems

- Offering licenses to lumbering companies and individuals to reduce deforestation.
- Evicting encroachers on forested land e.g. the Bakiga and Balaalo migrants in Kibaale forest reserve were evicted by government.
- Formation of a ministry to supervise forests and other aspects of the environment i.e. Ministry of Lands, water & Environment.
- Setting up Non-Governmental Organizations to control environmental mismanagement e.g. National Environment Management Authority (NEMA).
- Training and equipping forest managers with modern skills on how to look after forests.
- Establishment of forest reserves where lumbering is prohibited e.g. Kibaale forestry reserve.
- Encouraging re-afforestation and afforestation programs e.g. cut one tree and plant two trees.
- Educating the masses about the dangers of deforestation.
- Practicing agro-forestry to ensure extensive tree growth by the farmers too.
- Encouraging the use of alternative sources of power e.g. solar energy to reduce forest destruction for wood fuel.
- Encouraging use of alternative building and construction materials e.g. plastics, metal and glass and reduce the demand for timber.
- Campaigning against degazetting forested land by government.

- Growing of quick and fast maturing species to ensure constant supply of forest products.

Effects of deforestation on the environment

- ❖ Reduction and lowering of water table due to reduced rainfall totals.
- ❖ Global warming and increased world temperatures due to reduced cloud cover.
- ❖ Mass wasting and soil erosion along the slopes due to absence of trees to trap the soil.
- ❖ Reduction of wildlife due to destruction of their natural which reduces foreign exchange.
- ❖ Loss of soil fertility due to severe erosion leading to low agricultural output.
- ❖ Desertification may arise leading to expansion of deserts.
- ❖ Flooding may occur due to mass wasting and soil erosion due to deposition of soil materials in the valley.
- ❖ Silting of river valleys due to increased erosion along slopes.
- ❖ Shortage of food leading to famine due to less agricultural output.

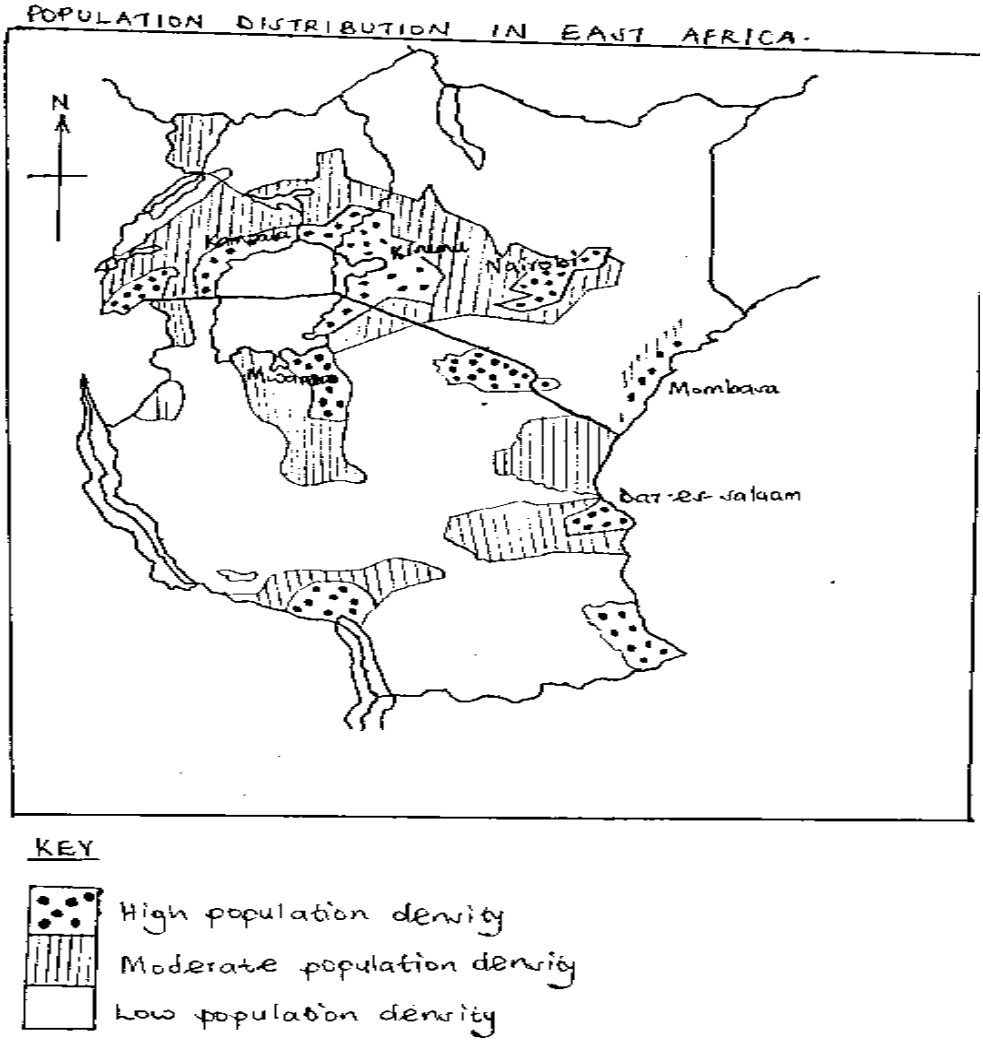
POPULATION IN EAST AFRICA

- Population refers to the number of people living in an area at a given time. Over 80% of the total population in East Africa depends on farming either directly or indirectly.
- Rainfall distribution and temperature as climatic factors play a big role in population distribution within East Africa because areas with heavy rainfall can support agriculture and therefore attract many people.
- On the other hand, areas with low and unreliable rainfall cannot support agriculture and these attract sparse population.
- Areas with **dense population** include shores of Lake Victoria, Kenya Highlands, Kigezi highlands, Slopes of Mountain Elgon and Ruwenzori, Southern Tanzania highlands such as Usambara ranges and areas around Lake Malawi, islands of Zanzibar and Pemba along the East African coast. The major towns and cities like Kampala, Nairobi, Dodoma, Dar-es-salaam, Mombasa, Kilwa, Tanga, Mtwara, Mbale, Kisumu, Eldoret and Nakuru have got dense population totals.
- Areas with **moderate population** density are between Kenya highlands and Nairobi and some parts of the rift valley in Kenya and Tanzania, northern Uganda in Gulu, Acholi land and Lira, western Uganda in areas of Hoima and Mubende.
- Areas with **sparse population** include North-Eastern Uganda covering areas of Kotido, Kitgum, Moyo and other areas of game reserves and forest reserves. Northern Kenya including Turkana, southern Tanzania, West and central Tanzania i.e. Miombo woodlands.

Concepts used in population studies

- ❖ **Over population:** This is a situation where the number of people in a given area exceeds the available resources.
- ❖ **Under population:** This is a situation where the number of people in a given area/country is less than the available resources.
- ❖ **Optimum population:** This is where the available resources are equivalent to the population for maximum resource exploitation.

- **Population density:** It refers to the number of people per square kilometer.
- **Life expectancy:** This refers to the average age at which most people die in a country. In East Africa, the life expectancy is 50years for women and 45years for men.
- **Population distribution:** This refers to the way people are spread out on the earth surface in a given area.
- **Population census:** This is the process of counting the number of people in the country or region. It's usually done after every 10years. The major purpose for population census is for government to plan and provide services for its people.
- **Fertility rate:** This refers to the average number of children per woman in her productive life. The fertility rate in East Africa is seven children per woman.



FACTORS INFLUENCING POPULATION DISTRIBUTION IN EAST AFRICA

- **Climate:** Areas which receive heavy and reliable rainfall which support the growth of crops have attracted people in large numbers e.g. shores of Lake Victoria, Kenya highlands, slopes of Mt. Elgon and Kigezi highlands while areas which receive low and unreliable rainfall attract very few people e.g. Karamoja, Turkana land and Miombo woodlands.
- **Soils:** areas with deep and well drained fertile soils that support agriculture have attracted dense settlements e.g. Mbale, Kabale, shores of Lake Victoria while areas with infertile soils have sparse population e.g. Nyika plains, North Eastern Kenya and Masai land.
- **Altitude/relief:** areas with very high altitude e.g. top of Mt. Elgon and Rwenzori, Bundibugyo have sparse population because of the high pressure, difficulty in constructing houses and roads. However low altitude areas have attracted large settlements due to ease in constructing settlements and roads. However, areas in broad valleys occupied by swamps have sparse population due to presence of disease vectors like mosquitoes. Also, lowland areas are subjected to floods and therefore are always avoided.
- **Vegetation:** dense forests, bush lands and swamps are unfavorable areas for settlement because it's hard and expensive to clear the vegetation. They also habour wild animals and disease carrying vectors like tsetse flies which scare away settlements. Areas with savannah vegetation are easy to clear for agriculture and settlement hence attracting dense population e.g. Masaka, Mpigi and Mukono.
- **Natural water resources:** The existence of natural water resources can attract dense population e.g. shores of Lake Kyoga and Victoria. Also, in areas of low rainfall many people are attracted near water courses or rivers e.g. along river Athi, Nile because the dense population utilizes the rivers for small scale irrigation, livestock rearing and domestic use. However, areas without surface water bodies have scared away settlements leading to sparse population e.g. in Karamoja and Turkana land.
- **Drainage:** Poorly drained areas e.g. coastal margins of Kenya and Tanzania are full of mangrove swamps which are unproductive in terms of agriculture, therefore leading to sparse population while areas which are well drained have high population densities like central Uganda, slopes of Mt. Kenya and Elgon.
- **Economic Activities:** Areas that have activities like mining, trading and manufacturing industries especially towns like Dar-es-salaam, Nairobi, Kisumu, Kampala, Jinja attract large population than areas where they are few economic activities e.g. Karamoja. This because people are more attracted to areas that have enough job opportunities than areas with less employment opportunities.
- **Government policy:** The government may determine settlement in an area e.g. the creation of national park and game reserves discourages settlement e.g. Kidepo valley game park and on other hand, the setting up of resettlement schemes and refugee camps has attracted settlement in large number e.g. in Kiryandongo and Internally Displaced Peoples' (I.D.P) camps in Gulu.
- **Political stability:** Areas that are unstable and insecure have got low population e.g. Karamoja where there is a lot of cattle rustling compared to areas which are generally politically stable and secure hence attracting dense settlements e.g. towns like Kampala and Mombasa.
- **Culture:** some areas have got low population density because of their culture of e.g. Ankole, Karamoja, Masai land areas are sparsely populated because of their practice of nomadic pastoralism which keeps them on

the move always. Within central Uganda, dense settlements exist because of the settled ways of life that encourage family development e.g. in Mukono and Wakiso districts.

N.B: Population growth: this refers to the natural increase in population. Uganda's population growth rate is 3% per annum/year. East Africa's population has been increasing over the years and this increase is due to the following factors;

(a) Natural increase/ high birth rate: in most areas of East Africa, the number of births in the year exceeds the number of deaths and such a difference has caused high population growth.

(b) Improved medical services: this has led to low infant mortality rate and death rates causing population growth.

(c) Early marriages: people tend to marry/get married at a tender age and this has led to a longer period of the child production cycle.

(d) High fertility rate: this refers to the number of children a woman can produce during her child bearing age. On average, African women give birth to 5 to 7 children and this has led to high rate of population growth.

(e) Value attached to children: many families value children especially girls as a source of wealth or boys as a source of labor and security. Others look at children as a source of insurance and help at an old age. They thus end up producing many hence leading to population growth.

(f) Polygamy: it refers to the act of marrying more than one wife. Polygamy is common because it is looked at as a sign of prestige in society and as a traditional obligation which has led to high population growth.

(g) Low levels of education: many people do not know the value of a small family. Besides, most people drop out of school early and end up into early marriages leading to production of many children.

(h) Religion: Some religions encourage polygamy which has resulted into high birth rates especially among Moslems, while others religions are opposed to family planning methods e.g. Catholics.

(i) Poverty: many families can't afford to buy pills, condoms for family planning and this has led to many families producing children without birth control measures.

(j) Improved nutrition levels: this has ensured balanced diet and steady supply of food which encourages people to have large families.

(k) Increased immigrations: many people have entered East Africa from other regions e.g. Asians, Europeans, Sudanese and Congolese and this has led to population increase.

Advantages of high/large population size

- High population provides enough labor force for the economic development of the country.
- It can be a source of a large amount of taxes that avails the country with enough revenue for development.
- It is easy and economical to provide social services in a situation where many people are concentrated in the same area.
- In case of security, a large population can easily provide enough man power for the army/defense of a country.
- It is a source of cheap labor since many people are willing to work at a low wage rate.
- A high population encourages the exploitation of idle resources.
- A high population also provides a large market for goods and services within a given country.

- It also encourages a high level of innovation and invention as people try to look for survival in a competitive environment.
- It encourages increased agricultural output as people try to produce enough food for their own survival.

Disadvantages of large population size

- Shortage of land for settlement and farming leading to land fragmentation.
- Shortage of social services e.g. schools and hospitals.
- High government expenditure to provide social services for the people.
- High dependency ratio since much of the population is made up of children hence reducing investments and future savings.
- High rates of unemployment because of the less available jobs.
- Unemployment leads to high rates of crime and social unrest especially among the youths.
- Exhaustion of resources due to over exploitation.
- It encourages rural-urban migration and its evils like high crime rate, unemployment and drug abuse.
- Shortage of accommodation leading to development of slums.
- Shortage of food which results to famine and starvation.
- Overcrowding which results into congestion and poor hygiene hence easy spread of diseases.
- High cost of living due to competition for scarce resources.
- Poverty as a result of high dependency ratio.
- Environmental degradation through pollution, soil erosion, swamp reclamation and deforestation.
- Desertification/global warming due to pollution, deforestation and industrialization.

Steps being taken to solve such problems

- ✓ Encouraging family planning methods to reduce on the birth rates involving the use of pills, condoms and other contraceptives.
- ✓ Encouraging outward migration from the densely populated region to the sparsely populated areas.
- ✓ Setting up resettlement schemes for people from densely populated regions.
- ✓ Low enforcement policies are being emphasized to reduce the level of crime rates.
- ✓ Agriculture modernization has also been emphasized through the use of high yielding food varieties to increase food production and combat the problem of famine.
- ✓ Vertical expansion of towns and cities through building of storied buildings has been embraced to solve the problem of congestion in most African cities.
- ✓ Land reform policies like land consolidation are being emphasized to solve the problem of land fragmentation.
- ✓ Industrialization is also being encouraged in most African countries to reduce over dependence on the land and reduce the level of u employment.
- ✓ The governments are also trying very hard to establish enough social services such as health centres, schools and transport to contain the problem of congestion over these services.
- ✓ Encouraging monogamy to reduce polygamy.
- ✓ Rising the marriage age for girls to reduce early marriages.

LOW/UNDER POPULATION:

It refers to a situation where the number of people is less than the available resources within a given area.

Advantages of low/under population

- ❖ It avails enough land for agriculture and settlement.
- ❖ It minimizes the problem of congestion and overcrowding.
- ❖ Dependency ratio is low and this may encourage savings and investments.
- ❖ Less possibility of slum development since people are few.
- ❖ Less government expenditure on the provision of social services.
- ❖ Social conflicts over land are not likely to come up due to a low population.
- ❖ It avails people with enough food hence reducing the possibility of famine.

Disadvantages of low/under population

- ▪ Limited supply of labor.
- ▪ Small market size for goods and services due to low demand.
- ▪ It is expensive for the government to provide social services to a few users.
- ▪ It leads to low tax base hence low government revenue.
- ▪ It leads to under utilization of resources such as minerals and land.
- ▪ It leads to slow economic growth which leads to dependency on other countries for skilled labor and market.
- ▪ It limits the level of innovation and invention since most of the resources are not put to use.

POPULATION DENSITY:

It refers to the number of people living in an area per square km. In East Africa, some places have got high population density while others have got low population density.

Causes of high population density (why some areas have high population e.g. Shores of Lake Victoria, Kabale, Mbale and along the coast)

(a) Hot and wet climatic conditions that favor the growth of various crops to support high population e.g. shores of Lake Victoria.

(b) Presences of deep and well drained fertile soils which support farming also attract a large number of people e.g. Kabale and Mbale.

(c) Availability of abundant supply water for both domestic and commercial use e.g. Kampala and Nairobi.

(d) Presence of many industries that attract a large labor force e.g. in Jinja and Dar-es-salaam.

(e) Availability of a variety of minerals such as Diamonds in Shinyanga and limestone in Tororo.

(f) Urbanization attracts many migrants into large cities for social amenities e.g. in Dodoma, Kampala and Mombasa.

(g) Easy accessibility due to well-developed transport and communication network for easy movement.

(h) Availability of a relatively flat landscape which make settlement and development of infrastructures relatively easy hence attracting large settlements.

Causes of low population density (why some areas have low population e.g. Karamoja, Ankole-Masaka corridor, Masai land and Turkana land)

1. Low and unreliable rainfall that cannot favor agriculture e.g. the desert region of Chalbi in northern Kenya.
2. Hot temperatures of 30^0C and above that make it impossible for many people to live in such areas e.g. in Karamoja.
3. Absence of surface water that is essential for human life e.g. in Masai land.
4. Poor quality soils that can't support agriculture tend to scare away settlements e.g. Miombo woodlands.
5. Pests and diseases such as tsetse flies and mosquitoes in some parts of central Tanzania scare away man due to fear of loss his life.
6. Remoteness of the area that hinders accessibility due to poor transport and communication lines.
7. Limited economic activities which mean that jobs are not existent.
8. Limited social services which scare away people.