AGRICULTURE

Definition

- This is the art and science of growing crops and domestication/rearing of animals
- It is important because of the following factors

  i. Provision of employment opportunities
  ii. Earns a country foreign exchange through exports
  iii. Provides raw materials for industries
  iv. Stimulates the development of infrastructure
  v. Provides income to farmers and raise their living standard
  vi. Provides market for industrial products e.g. farm inputs and machinery

Factors influencing Agriculture

1. **Climatic factors**
   - Different crops require varying limits of rainfall, humidity and temperature.
   - Temperature affects crops maturity, ripening of fruits and determines soil moisture content as well as influences the rate of photosynthesis and transpiration.
   - Crops such as cocoa, oil palm require high relative humidity

2. **Topography**
   - Crops like tea, coffee do well in higher altitude about 1525m while rice, cotton, sugarcane require lower altitudes.
   - Lowland eases cultivation and mechanization of agriculture.

3. **Soil**
   - Different crops require different types of soil in terms of mineral composition and drainage.

4. **Biotic factors**
   - The presence of and/ or absence weeds and parasitic plants, insect pests and diseases largely influence the type of agriculture.
   - Human activities

5. **Social factors**
   - The type of farming practiced depends on the culture of the farmers' concerned e.g.
   - Systems of land ownership and inheritance have led to uneconomical subdivision of land limiting extensive farming.
   - Religion e.g. pigs not kept /eaten by Muslims, Hindus and Jews
   - Traditional diet – some crops are traditionally grown e.g. bananas –Uganda, yams –Nigeria.
   - Certain cultures limit use of modern technology in farming.

6. **Economic factors**
   - These include operational costs of agriculture, marketing expenses, price fluctuations, government policy (subsidies) and international agreements on quota system.

Types of Agriculture

1. **Simple Subsistence Farming**
   - It is also referred to as shifting cultivation
   - It involves growing of food crops for family's requirements

   Characteristics

   - The plot is normally sited in virgin forest
   - Forests are cleared by fire hence the name slash and burn
   - Cultivated areas are usually scattered and separated by thick forests
   - Cultivation is done by use of primitive / simple implements such as hoes and sticks
   - Farmers grow food crops for family use e.g. yams, cassava rice beans, bananas
   - Farm produce is homogenous
   - Mixed cropping is practiced
   - The land is left fallow to regain fertility
   - Field rotation is practiced
   - Cultivators live in temporary huts which are readily abandoned
   - The plots are abandoned when yield decline

   Limitations of Shifting Cultivation
   - Burning destroys soil organic matter
   - Soil loses its fertility quickly (no attention)
   - The system requires vast tracts of land for rotational cultivation
   - It is wasteful as the land is left fallow
   - It cannot produce enough food for a growing population
   - The yields are low

   NB: Shifting cultivation is being phased out due to the following reasons
   - Land tenure systems that allows for individual ownership.
   - Need for more food due to population growth
   - Population pressure on land leading to subdivision of land.

2. Sedentary Subsistence Agriculture

- In this system, farmers give attention to the land and crops; crop rotation is practiced
- Cultivators stay permanently in one spot
- Many animals are kept to supplement the food crop.

Characteristics

- The fallowed fields are frequently re-used since the community occupies a permanent dwelling place
- Sometimes it is combined with cash crop farming and forestry
- Draught animals e.g. oxen, buffaloes, horses are kept
- Farming methods are very intensive and involves use of simple implements

3. Intensive Subsistence Farming

- A type of agriculture where a lot of energy is put on farm work to sustain a large and fast growing population
- It is characterized by two types of agriculture namely
  a. Intensive subsistence agriculture dominated by wet paddy
  b. Intensive subsistence agriculture dominated by other food crops

4. Plantation Farming

- This is a specialized commercial cultivation of cash crops on extensive tracts of land usually by scientific methods.

Characteristics

- Farming is scientifically managed
- The farms are very large more than 40ha/100ac
- Mechanization is embraced in the operations
- Crops grown are usually export /market oriented
- A great deal of capital is involved
- Monoculture is practiced
- Hired labour is employed
- Most farms are foreign owned

Problems facing plantation farming

- Climatic hazards (Harmattan winds, hailstones, frost)
- Insect pest and diseases
- Monoculture –soil exhaustion.

5. Extensive Mechanized Grain Cultivation

- This is the cultivation of grain on large scale marked with dominance of wheat e.g. Canadian and American prairies pampas, Veldt, Downs and Canterbury plain of New Zealand.
- In Kenya it's practiced in Uasin- Gishu, Nakuru and Narok

Characteristics
- Farms in the mid-latitudes range from 240-16 000ha settlement, is confined in farm estates.
- Farming processes are entirely mechanized from field preparation to harvesting.
- Wheat is the principle crop in temperate areas
- Grain is raised on un-irrigated land since it requires little rainfall (325mm per annum)
- The farms are owned individually

6. Mediterranean Agriculture

- Farming is intensive and highly specialized
- Subsistence farming is practiced alongside commercial farming e.g. wheat, barley, vegetables for local consumption, while olives, grapes, oranges, and lemons for export.

Mediterranean agriculture has four aspects;
a. Viticulture-Cultivation of grapes for wine making
b. Orchard farming –Citrus fruits, dates, olives, figs
c. Cereal and vegetable cultivation- wheat, barley, beans, lentils, carrots, onions, tomatoes
d. Limited animal husbandry – keeping of sheep, goat ,and cattle

7. Mixed Farming

- Involves growing crops and also keeping livestock on the same piece of land

Characteristics
- Crops are grown and livestock kept on the same farm
- The farms are moderate in size and grow a variety of crops
- A portion of the farm may be left for animal pasture

Crop Farming

Distribution of Major Cash Crops in Kenya

- Generally, crops are grown anywhere in Kenya with favourable physical and climatic conditions.
- Cash crops are mainly grown in the southern parts due to
    i. Climatic conditions in the south favour the growth of a variety of crops e.g. temperature varies from warm to cool, rainfall ranges between 800 – 2000mm and many areas in this region experience dry and sunny spells in between the rainy seasons
    ii. The soils are volcanic in the Kenya highlands, rich alluvial in the lowlands around the Lake Basin. These soils are fertile and support a variety of crops
    iii. High population that provide adequate labour in the farms
    iv. The colonial government and European settlers introduced cash crops in these areas due to the prevailing conditions

- The principle cash crops grown in Kenya are:

Crop	**Counties where it is grown**
Tea	Kericho, Trans Nzoia, Kakamega, Kisii, Kiambu, Nandi, Embu and Meru
Rice	Busia, Kisumu, Embu and Kirinyaga
Coffee	Kiambu, Trans Nzoia (around Mt. Elgon), Meru, Vihiga, Kisii and Machakos
Sugar cane	Migori, Kisumu, Busia, Kakamega, Kwale
Cotton	Homa Bay, Busia, Meru and Machakos
Cashew nuts	Kilifi
Pyrethrum	Nakuru, Kisii, Kiambu (around Limuru), Nyandarua
Sisal	Kiambu (around Thika), Taita Taveta, Baringo and Kilifi
Wheat	Narok, Uasin Gishu, Nakuru
Maize	Bungoma, Trans Nzoia and Uasin Gishu
Wattle	Uasin Gishu and Kiambu

Tea farming in Kenya

Growing Areas

Western Highlands	**Eastern Highlands**
Kericho	Nyambene
Nandi	Murang'a
Kakamega	Nyeri
Cherangani Hills	Kiambu
	Maragua

Conditions necessary for growing tea

Physical conditions

i. A well distributed annual rainfall of between 1300-1800mm (high) well distributed throughout the growing season/with no dry season
ii. Warm temperatures of between 18^0C to 24^0C during the growing season
iii. Highlands and hill slopes with good natural drainage preferably an altitude of 1000-2200m above sea level
iv. Well drained, deep, fertile and friable soil to allow root penetration, should be slightly acidic with no calcium
v. Protection from strong sunlight and violent winds

Human conditions

i. Large pool of labour for field preparation, weeding, pruning and picking of tea leaves
ii. Good and passable transport routes for quick delivery of picked tea to the factory for processing
iii. Capital for buying farm inputs and paying labour and setting up tea factories

Cultivation of Tea

- This is done on either plantations or small scale holdings
- The land is first cleared
- Tea cuttings/seedlings are raised in a nursery
- After about 18 months, the seedlings are transplanted into the already prepared farms
- Weeding, application and pruning are done at intervals till it attains maturity

N/B

- The main tea species grown in Kenya are *Assam* and *China*

Harvesting of Tea

- Tea is ready for harvesting after 2 – 3 years
- Tea is harvested by picking the two top leaves and a bud at the tip of each shoot
- The picked tea is then put in aerated baskets ready for transport to the collection centres (they have to transported as fast as possible for processing as their quality deteriorates if they start withering)

Processing of Tea

- The leaves are then transported to a collection point and then to the tea processing factories for sorting out and weighing
- They are then spread out on long wire trays
- The leaves are then dried by blasting warm air from below the trays
- They are then passed through a set or rollers to chop or crush them
- The leaves are then placed in containers for fermenting, reducing the tannic acid and changing colour to grey
- The fermented leaves are then roasted and dried over fire until they turn black in colour
- The dried leaves are then sifted, graded and classified
- The graded tea is packed ready for marketing

Marketing of Tea

- Some of the tea is consumed locally but a greater percentage is exported to Europe and Middle East/sold on the international market
- Marketing of tea is done by the Kenya Tea Development Authority (KTDA)

Other functions of KTDA include: -

- KTDA also promotes production of tea among small scale farmers
- It also sensitizes the small scale farmers on high quality tea production
- It also ensures prompt collection of tea payments from tea buyers

Achievements of KTDA

i. Provision of farm inputs e.g. fertilizers and seedlings to small scale tea farmers
ii. It assists in marketing of tea i.e. the farmers have a good bargaining base through KTDA
iii. It has financed many tea processing industries
iv. It has increased the total tea production by assisting small scale tea farmers

Problems Facing Tea Farmers in Kenya

i. Pests and diseases e.g. black tea thrip, red spider mites, beetles, weevils and root rot that reduce the quality and the quantity of the tea in the farms – leads to marginal profits
ii. Poor and dilapidated feeder roads in the tea growing area lead to delays in collection and delivery of green tea leaves causing wastage
iii. Adverse weather conditions e.g. prolonged droughts and hailstorms that destroy the tea crop reducing the quality and quantity of the yields
iv. Delayed payments of delivered tea and mismanagement of tea funds from the cooperatives that lowers the farmers' morale – farmers uproot tea crop to grow horticulture
v. Fluctuations in the prices of tea at the world market making them to incur marginal profits
vi. Competition from fast maturing horticultural crops has made some tea farmers to uproot their crops to venture in horticulture
vii. High costs of farm inputs e.g. fertilizers that reduces the farmers' profit margins

Significance of Tea Farming in Kenya/Importance of Tea Growing to Kenya's Economy

i. Foreign exchange earnings through export of tea
ii. Creation of employment opportunities as many are employed in the tea farms to weed and pick tea, in the tea processing factories thus improving their living standards
iii. It leads to development of tea related industries e.g. tea processing and packaging industries
iv. Development of infrastructure e.g. roads to link the farms, collection centres, factories and markets

Sugar Cane Farming in Kenya

- Main sugar cane growing areas/counties in Kenya
  1. *Western Kenya Sugar Belt*
     - Kakamega County – Kabras and Mumias
     - Busia County – around Nzoia
     - Bungoma County

  2. *Nyanza Sugar Belt*
     - Kisumu County – Chemelil, Miwani, Kibos, Koru and Muhoroni
     - Migori County – South Nyanza Sugar Belt at Awendo

  3. *Coast Sugar Belt*
     - Kwale County – Ramisi

Conditions favouring Sugar Cane Growing in Kenya

i. High temperatures of 20^0C –27 ^{0}C throughout the year
ii. A dry sunny season near the harvest time to promote sugar accumulation
iii. High rainfall of 1200 – 1500mm throughout the growing period
iv. Deep, fertile and well drained soils that are water retentive preferably alluvial, clay or black cotton soils
v. Gently sloping/undulating lowlands that allows mechanization
vi. Good infrastructure in terms of roads for delivering cut cane to the factories
vii. Abundant and cheap labour supply especially during planting, weeding and harvesting (dense population around the sugar belt)
viii. Large capital outlay for acquiring farm inputs and machinery

Cultivation of Sugar Cane

- The land is first cleared, ploughed and then reploughed
- Sugar cane is then planted vegetatively i.e. from cane cuttings that are planted in furrows
- Fertilizers are applied at the early stages
- Weeding and spraying against pests and diseases are done at regular intervals till the crop attains maturity

Harvesting of Sugar Cane

- This is done after about 18 months
- It is cut manually using pangas or machetes
- The cut/harvested cane is loaded onto trucks/tractors and quickly transported to the factory (to preserve sugar quality)

Processing of Sugar Cane

- At the factory, the canes are mechanically cut with rotating knives/shredders
- The cut cane is then washed with sprayed water to remove impurities.
- The washed cane is then crushed between rollers to obtain raw juice.
- The raw juice is then filtered to remove insoluble matter
- The filtered juice is then boiled with lime and allowed to crystallize to form raw/brown sugar
- The brown/raw sugar is refined and graded ready for marketing

N/B

- Bi products from sugar cane processing include cane residue (bagasse) and molasses
- Cane residue is used as fuel, manure, fodder and raw material in paper production
- Molasses is used to process industrial alcohol

Outgrower Schemes

- This is an arrangement where a sugar cane processing factory assists small-scale farmers in its surrounding areas to increase production and supply of cane to the factory.
- They help the small scale farmers to grow and sell their sugar cane to the factories
- They also manage the local sugar cane processing factories
- Their other benefits include
    i. Increased sugar cane production to meet the local needs
    ii. Availing to farmers selected seed cane/cane cuttings for high quality sugar
    iii. Availing fertilizers and other farm inputs to the farmers
    iv. Constructing and maintaining access roads to the farms
    v. Provision of credit facilities to the farmers to improve their farms
    vi. Availing extension services to the farmers
    vii. Provision of tractors for ploughing and paying for labour during harvesting
    viii. Undertaking transportation of cut cane from the farms to processing factories

Marketing of Sugar

- This is done by various wholesale outlets and individual sugar processing factories

Problems Facing Sugar Cane Farmers in Kenya

i. Stiff competition from sugar imported from COMESA countries
ii. Pests and diseases such as ratoon stunting, yellow wilt, leaf spots, white scales, termites. These lower yields and quality of sugar cane.
iii. Delayed payments to farmers and mismanagement of funds in sugar factories kill farmer morale.
iv. Fire outbreaks before maturity during dry season that destroy large acreage of cane
v. Adverse weather conditions such as excessive rainfall, prolonged drought that lower the quantity of the yield.
vi. Expensive farm inputs (fertilizers, pesticides) lead to low income returns.
vii. Overproduction of sugar cane leads to lower prices.
viii. Competition for land use from other crops – cotton, maize
ix. Poor transport network leads to delay in the collection and delivery of cane.
x. Low payments – excessive deductions and taxation of farmers' income.

Significance of Sugar Cane Growing

i. Creation of employment opportunities in sugar estates and factories
ii. Saving foreign exchange that would have been used to import sugar by producing sugar for domestic consumption
iii. Industrial development through creation of sugar processing industries and provision of raw materials to sugar related industries
iv. Urbanization/growth of towns e.g. Mumias, Awendo and Muhoroni. These are provided with basic social amenities

N/B

Uses of Sugar

- Used in baking
- Brewing soft drinks
- Sweetening beverage and fruit juice making
- Confectionary making

Maize Growing in Kenya

- Maize is grown almost everywhere in Kenya. This is because it tolerates a wide variety of climatic conditions and soils. But the main maize growing counties in Kenya include
  - Trans-Nzoia
  - Nakuru
  - Bungoma
  - Uasin Gishu

Conditions Favouring Maize Growing in Kenya

- Moderate to high temperatures ranging between 15^0C and 27^0C
- Rainfall of between 635 – 1145mm during the growing period. However maize tolerates a variety of rainfall ranging from 380mm and even above 2500mm depending on the location – semi arid regions or highlands
- Grows in a wide range of soils (acidic podzols to strongly leached red soils) should be deep and rich in nitrogen.
- Undulating/rolling and gently sloping topography to allow mechanization
- Altitudes of 0 to 2200m above sea level where there is no frost

Cultivation of Maize

- The land is first cleared and ploughed
- The seeds are then sown at the beginning of rains by manual dibbling or mechanically by maize planters
- Constant weeding during the growing period is done to keep out weeds

Harvesting of maize

- This is done after about 4 – 12 months depending on the variety and the area where it is grown
- The harvesting is done by hands for small scale farmers or using combine harvesters for large scale farms

Processing of maize

- Maize grains are weighed and then put on trays
- Any undesirable grains and broken cobs are removed.
- It is then sieved to remove unwanted particles – soil, rocks, and cobs.
- The maize is passed through a milling machine that grinds it into flour according to the desired grade.
- The flour is then packed appropriately ready for sale.

Uses of Maize

- Grains are used as food for human consumption
- Grains are used to manufacture cooking oil, making starch and industrial alcohol
- Maize stalks and cobs are used as domestic fuel
- Maize stalks and cobs are used as animal feeds
- Stalks and cobs are used as manure
- Grains are used as animal feeds – cattle, horses, sheep, poultry

Give four significance of growing maize in Kenya

- Maize is a staple food to many Kenyan communities
- Maize cobs and stalks provides domestic fuel
- Maize farming creates employment opportunities and source of income to farmers
- Maize provides raw materials for industries – alcohol, vegetable oil, rayon and plastics
- The stalks, leaves and other remains are used as cattle feed

Problems Facing Maize Farmers in Kenya

- Adverse weather such as prolonged drought and frost lower crop yield thus low income.
- Pests and diseases such as stalk borers, armyworms, birds, aphids, stalk rot, white leaf, duce the maize yields in the farms.
- Low prices arising from bumper harvest discourage farmers
- Dumping of cheap imported maize from COMESA and European Union.
- Delayed payments by National Cereals and Produce Board lowers the farmers' morale.
- Expensive high quality seeds have forced farmers to use uncertified seeds.
- Expensive farm inputs e.g. fertilizers, pesticides lead to marginal profits
- Poor marketing strategies e.g. through middlemen who exploit farmers by buying the produce at low prices.
- Lack of sufficient/appropriate facilities compels farmers to sell their produce at throwaway prices for risk of weevil attack thus low profits.
- Poor crop yields arising from soil exhaustion due to prolonged planting of maize/monoculture

Cocoa in Ghana

- Main cocoa growing areas in Ghana are
  a. Accra
  b. Kumasi
  c. Takoradi
- Other cocoa growing countries in Africa are Nigeria, Ivory Coast and Cameroun

Map KLB Geography Students' Book 3 page 205 or Certificate Geography page 263/Moran Atlas pg 64

Factors favouring Cocoa Growing in Ghana

- High relative humidity (over 75%) throughout the year
- High annual rainfall 1300 – 1500mm well distributed throughout the year
- High temperature all year of between 24^0C – 27^0C throughout the year
- Deep well drained soils rich in humus (loamy soils, light clay)
- Lowland/low altitude below 750m above sea level.
- Absence of strong winds that may blow off premature cocoa pods.
- Young trees require protection from direct sunlight i.e. shade condition
- Sufficient sunshine when pods are ripening
- Plenty of labour for cultivation and harvesting

Cultivation of Cocoa

- This is done on small scale holdings and plantations
- The land is first cleared and ploughed
- Cocoa seeds are raised in a nursery
- After about 4 – 5 months, the cocoa seedlings are transplanted into the prepared fields
- Application of manure and weeding is done to improve the quality

Harvesting of Cocoa

- This begins during the fifth year. It is done twice a year
- The ripe pods are cut from the trunk and branches by use of a long knife.
- The pods are heaped at a central place awaiting delivery to the collection points.

Processing of Cocoa

- The pods are split open with a sharp knife and the beans embedded in the pulp removed/scooped out by hand.
- Beans are heaped and covered with banana leaves to ferment /drain away the juicy pulp.
- The fermented beans are washed, cleaned and then dried in the sun till they turn brown.
- Dry beans are sorted out, graded and packed in bags to be delivered to collecting centres
- Importing countries further process cocoa through cleaning, roasting and removal of husks to produce cocoa nibs.
- Cocoa nibs are ground into powder and cocoa butter is separated

Marketing of Cocoa

- From the marketing centres, the dry cocoa beans to the ports of Accra, Tema and Takoradi by rail or road
- They are then shipped to Europe and other African countries

Problems facing Cocoa Farming in Ghana

i. Prevalence of cocoa diseases and such as the swollen shoot, manillla disease, black spots, and pests e.g. capsid bug destroy the crop leading to low yields.
ii. Monoculture/over cultivation of cocoa over time has contributed to poor soils and low yields.
iii. Fluctuation in production due to adverse weather especially drought and dry Harmattan winds that reduces humidity and destroy the cocoa pods.
iv. Competition from other land uses e.g. settlement and subsistence agriculture in the cocoa growing areas has reduced the acreage.
v. Overdependence on cocoa leads to economic uncertainties especially during price fluctuations.
vi. Smuggling of cocoa across the borders leads to loss of/minimal profits
vii. Poor roads that are impassable during the rainy seasons create difficulties in transportation to collecting centres.
viii. Use of hired labour which is sometimes not available as some are immigrants.

Contribution of Cocoa to Ghana's Economy

i. It is a major foreign exchange earner in Ghana through the export of cocoa
ii. It has created employment opportunities thus raising the living standards of the cocoa farmers through earning income

Oil Palm in Nigeria

- Oil palm fruit resembles a green coconut but smaller than the coconut. Palm oil is contained in two parts of the fruit – in the pericarp (fibrous fleshy outer coating) and in the kernel (a nut inside the pericarp)
- The main oil palm growing areas in Nigeria are
  - Port Harcourt
  - Calabar
  - Sapele

Draw map of Nigeria KLB pp 206/Certificate Geography pp 269/Moran Atlas page 64

Factors Favouring Oil Palm Growing in Nigeria

i. High rainfall of over 2000mm that is well distributed throughout the year
ii. High temperatures of between 21^0C and 30^0C throughout the year
iii. High (relative) humidity of 80% - 90% during the growing period
iv. Protection or shelter from strong winds
v. Fertile, deep and well drained soils
vi. Altitude of below 750m above the sea level that is gently sloping

Cultivation of Oil Palm

- The land is first cleared and then ploughed
- Oil palm seedlings are then raised in a nursery
- The seedlings are then transplanted onto the already prepared fields after some time
- Weeding and control of pests is done regularly till the crop attains maturity

Harvesting of Oil Palm

- This is done after about 3 – 4 years
- It is done by cutting the base of the bunch containing the fruit using harvesting knives
- The harvested fruits are immediately collected and transported in trucks/lorries to the processing factories

Processing of Oil Palm

- At the factory, the fruits are sterilized by passing through hot steam to arrest acid development.
- The sterilized fruits are then passed through stripper where the individual fruits are stripped of the stalks and other unwanted materials.
- The fruits are then put in digesters for further cooking to soften them into pulp.
- The pulp is then separated from the kernel and then pressed to extract oil by the oil extractors.
- Extracted oil is then kept in settling tanks to allow unwanted material to settle.
- The oil is then packed in containers ready for marketing

Marketing of Palm Oil

- A greater percentage of the palm oil produced is consumed locally in Nigeria as cooking oil
- Most of the kernel and kernel oil is exported to Europe and USA

Uses of Palm Oil

i. In making cooking oil
ii. Crushed nuts are used as animals feeds
iii. The leaves of oil palm tree are used for roofing, making baskets and brooms
iv. The shells and fibre are used as fuel
v. The fruit is a raw material in soap and candle making industries
vi. The stems of the plant are used as building poles
vii. The sap from the stem is used for making wine/other alcoholic drinks

Case Studies

Coffee in Kenya and Brazil

Coffee in Kenya

- Varieties of coffee grown in Kenya are the *Arabica* and *Robusta*
- Coffee is grown small holdings as well as in plantations
- The main coffee growing counties in Kenya are as below

Province	**Counties**
Central	Murang'a, Nyeri, Kirinyaga, and Kiambu
Nyanza	Kisii, Nyamira, Kisumu (Nyabondo), Homa Bay (Oyugis)
Western	Bungoma, Vihiga and Kakamega
Coast	Taita Taveta (around Wundanyi)
Eastern	Meru, Embu, Machakos, Makueni and Tharaka – Nithi

Conditions Favouring Coffee Growing in Kenya

i. Cool to hot climates with temperatures averaging between 15^0C – 30^0C but not fall below 11^0C
ii. High rainfall of about 1000mm – 2000mm well distributed throughout the year
iii. Fertile, deep and well drained volcanic soil
iv. High altitude of between 610 – 2000metres above sea level
v. Undulating/gently sloping landscape/topography to ensure the soils are well drained
vi. Young trees should be sheltered from direct sunlight
vii. About two months dry period for ripening of the pods

Cultivation of Coffee in Kenya

- The land is first cleared and then ploughed
- The coffee plants area first raised in a nursery for about six months
- After this, they are then transplanted into the main fields
- The young coffee plants are sheltered from winds and strong sunlight by trees or artificially made shades
- Pruning, mulching, weeding and spraying against pests and diseases is regularly done

Harvesting of Coffee in Kenya

- Harvesting begins after 3-4 years; ripe berries are handpicked then delivered to the factory the same day

Processing of Coffee in Kenya

- At the factory, the coffee berries are passed through a machine that removes the outer covering pulp; a process referred to as skinning
- The beans are the heaped in a tank to undergo fermentation for about 14 hours
- The beans are then washed in clean water
- They are then cured by drying them in the sun
- Two layers of the inner coffee husks are then peeled off by machines
- The layers are then winnowed, graded and sorted according to size and quality
- The beans are then roasted at temperatures of about 100^0C
- They are then ground into powder and packed ready for marketing

Marketing of Coffee in Kenya

- Most of Kenya's coffee is handled through cooperative societies who own factories
- The cooperatives then sell the processed beans to the Kenya Planters Cooperative Union that in turn passes them to the Coffee Board of Kenya which arranges for overseas auctioning.

Problems facing coffee farmers in Kenya

i. Overproduction leads to price fluctuations discourages farmers
ii. Pests and diseases such as leaf rust, root rot and coffee berry disease lower the quality and output
iii. Delayed payments on coffee delivered to cooperatives kill/lowers farmer morale
iv. Climatic hazards such as prolonged drought, excessive rain, frost destroy the crop in the farms
v. Soil exhaustion due to monocropping.
vi. Labour shortage especially during harvesting
vii. High costs of farm inputs
viii. Stiff competition from alternative crops with high returns

Importance of Coffee Growing to Kenya's Economy

i. Foreign exchange earnings through export
ii. Creation of employment opportunities
iii. Establishment of coffee related industries
iv. Infrastructural improvement and development e.g. construction and maintenance of feeder roads in the coffee growing areas

Coffee in Brazil

- Brazil is the leading coffee producer and exporter in the world
- Coffee growing is done in Sao Paulo, Ribeirao and Preto

Map of Brazil showing the major coffee growing Areas – KLB Geography Book 3/Moran Atlas pg 85

Conditions favouring coffee growing in Brazil

i. Deep, porous, volcanic soils that are rich in humus and potash
ii. Adequate rainfall of around 1525mm per a year and a dry period to allow the berries to ripen
iii. Warm and humid climate of South East Brazil and moderate temperatures of $14^0C - 26^0C$
iv. The rolling Brazilian plateau around Sao Paolo that are wet and well drained
v. Availability of cheap labour due to dense and high population
vi. Well developed transport system (railway) that connects various plantations to export ports

Problems facing coffee growing in Brazil

i. Soil exhaustion and erosion as little attention is paid to soil with no attempt to renew fertility or manage erosion. Land is abandoned once yields decline.
ii. Climatic hazards such as frost, drought lowers the yields/farmers incur great loss for instance frost has made coffee estates to be replanted with sugarcane and Soya beans
iii. Over production leads to price fluctuations .This is encouraged by new plantings consequent upon high returns or coffee booms
iv. Increased competition from other world coffee producers such as West Africa, Colombia, East Africa
v. Introduction of new crops on speculative basis such as tobacco, sugarcane and cotton has reduced the acreage of coffee.

Solution to problems

i. Prohibiting new planting to reduce/minimize overproduction
ii. Buying and storing surplus coffee when there is overproduction to supplement poor harvests
iii. Encouraging crop diversification and mixed farming to reduce overreliance on coffee
iv. The government lobbies for higher quotas for coffee in the international market
v. Establishing an institute that manipulates the amount of coffee released to the world market by creating artificial shortages so as to maintain high prices

Significance of Coffee Growing in Brazil

i. Foreign exchange earnings through exports
ii. Creation of employment opportunities
iii. Improvement of infrastructure through construction of roads and railway lines

Comparison of Coffee Farming in Kenya and Brazil

Similarities

- Both countries grow similar species of coffee i.e. Arabica and Robusta
- In both countries, coffee is a major foreign exchange earner
- In both countries the coffee farms are scientifically managed

Differences

- In Kenya the production is on a small scale while in Brazil the production is on large scale
- In Brazil , the farms are exclusively on coffee while in Kenya the farmers practice mixed farming alongside coffee growing
- Kenya relies heavily on artificial fertilizers to curb soil exhaustion while in Brazil farmers rely mainly on natural soil fertility/minimal use of artificial fertilizers

Wheat Growing in Kenya and Canada

Wheat Growing in Kenya

- The main wheat growing counties in Kenya are Nakuru, Narok, Uasin Gishu, Nyandarua, Meru, Trans Nzoia, Laikipia and Elgeyo Marakwet

Conditions favouring wheat growing in Kenya

- An open rolling topography provides adequate drainage and facilitates the use of machinery.
- Moderate to high rainfall ranging between 500mm – 1270mm during the growing period
- Warm temperatures of 15^0C – 20^0C for at least three months to enable maturity of wheat
- Warm and dry sunny period to enhance ripening and harvesting of wheat
- Deep and fertile well drained volcanic soils
- High altitude areas ranging between 1500 – 2900m above the sea level to reduce incidences of pests and diseases

Cultivation of Wheat

- The land is first cleared and ploughed using tractors
- The land is then harrowed to allow weeds and stray wheat grains to germinate and be killed during the next harrowing
- Fertilizers and manure are added to the land after the last harrowing
- Wheat seeds are then sown using drills pulled by tractors or broadcasting in case of small scale farmers
- Spraying the crop against weeds and weeding is done at regular intervals till it attains maturity

Harvesting of Wheat

- This is done manually by cutting the wheat heads using sharp knives/sickles for small scale holdings or using combine harvesters (reaps, threshes the wheat and bales the straw in a single operation) for large scale farmers

Processing of Wheat

- The harvested wheat grain is threshed in the field or using the combine harvesters
- The grain is then milled to obtain wheat flour

Marketing of Wheat

- Producers sell the wheat directly to the millers or through the National Cereals and Produce Board

Importance of Wheat Farming in Kenya

i. Development of wheat related industry e.g. bakeries and confectionaries
ii. Development of infrastructure especially roads in the wheat growing areas
iii. Creation of employment opportunities as wheat farmers earn income thus improving their living standards

Problems facing wheat farming in Kenya

i. Pests e.g. dustry brown beetle, cereal weevils, quelea birds and diseases e.g. stem rust, brown leaf rust that reduce the quality and quantity of produced wheat
ii. Price fluctuations in the domestic markets due to broking by middlemen; farmers get very low profits
iii. Inadequate capital/high costs for buying farm inputs (machinery and fertilizers) leads to marginal profits

Wheat Farming in Canada

- Canada is the leading wheat producer and exporter in the world
- Wheat is grown in the Canadian Prairies provinces of Saskatchewan, Alberta and Manitoba.

Draw map of Canada on Certificate Geog Bk Three page 279 /Moran Atlas page 80

Factors favouring wheat growing in Canada

i. Suitable climate characterized by warm summer temperatures of about 15^0C and mean annual precipitation of 460mm that are ideal for wheat growing
ii. Warm summer temperatures of about 15^0C ideal for wheat growing
iii. Gently rolling/undulating landscape that allows mechanization
iv. Availability of cheap tracts of land on account of her small population density and majority of people live in urban centres and cities
v. Elaborate transport network through extension of the railway into the prairies facilitates transport of wheat to the markets
vi. Fertile prairies' soils with high potassium content essential for wheat growing
vii. Ready market in the urban population and the neighbouring countries

Cultivation of Wheat in Canada

- Wheat is mainly grown on plantations/through large scale farming
- The entire processes from land preparation to harvesting is heavily mechanized

Marketing of Wheat in Canada

- Majorly consumed in the Canadian urban centres and cities
- The rest is exported through the Great Lakes and St. Lawrence Seaway to Europe, Africa and Far East

Problems facing wheat farming in Canada

i. Difficulty in transportation during winter season when much of Canada is under snow. This leads to delays in delivery to the markets
ii. Pests and diseases e.g. cereal weevils and stem rust destroy the wheat in the fields leading to low yields
iii. Price fluctuations of wheat in the world market affecting the farmers' income/leading to difficulties in planning ahead
iv. Adverse climatic conditions e.g. excessive drought and hail that affects the production
v. Monoculture that leads to soil exhaustion requiring the use of fertilizers

Importance of Wheat Farming in Canada

i. Foreign exchange earnings through exports
ii. Industrialization through the development of wheat related industries
iii. Creation of employment opportunities/source of income
iv. Production of wheat for domestic production

Comparison between Wheat Farming in Kenya and Canada

Similarities

- Mechanization is done in both the countries - sowing and harvesting
- It is done on a large scale in both the countries

Differences

- In Kenya, wheat farming is less mechanized while in Canada it is less mechanized
- In Kenya, wheat farming is mainly for local consumption while in Canada wheat farming is done mainly for export
- In Kenya, wheat farmers do mixed farming alongside wheat production whereas in Canada, the farmers are specialized in wheat farming

Horticulture and Market Gardening

- Horticulture refers to the intensive cultivation of vegetables, fruits and flowers for sale and export
- Market gardening is an intensive cultivation of vegetables and fruits for sale in the nearest urban centre.

Differences between Horticulture and Market Gardening

- In horticulture, fruits, flowers and vegetables are grown while marketing gardening involves growing of fruits and vegetables only
- Horticulture is export oriented while market gardening is local market oriented
- Horticulture is less labour intensive/highly mechanized while market gardening is more labour intensive/less mechanized
- Horticulture adheres to high international quality requirements and standards of hygiene while market gardening lack standard/quality requirements
- Horticultural farms are highly scientifically managed while farms engaged in market gardening are less scientifically managed

Features/characteristics of Horticulture in Kenya

i. It requires a lot of farm inputs e.g. fertilizers, pesticides and herbicides hence needs high capital outlay
ii. The farms are smaller in size except for the large scale flower farms in Naivasha
iii. Farms are located in areas with good and reliable transport infrastructure since horticultural products are highly perishable
iv. Advanced scientific techniques of crop production are applied to ensure high yields

Factors favouring horticultural farming in Kenya

i. The hot and wet climate favours the growth of tropical crops while the cool and wet conditions in the highlands suit temperate crops (plums, pears, apples grapes)
ii. The fertile volcanic soils that are well drained and rich in nutrients favour the growth of a variety of crops
iii. High population in the rural areas provide labour in the farms and in urban centres that provide ready market
iv. Investment by large companies such as Del-Monte ,Pan African foods, Oserian that provide capital for the horticultural industry
v. Technical and financial assistance by the German Agricultural team who carry out research, and train farmers.
vi. Establishment of Horticultural Cooperative Union and Horticultural Development Authority to help farmers export their products
vii. The government through its export promotion drive is encouraging the diversification of export crops with the aim of broadening the country's export base
viii. Improvement of road network to enhance accessibility to local and overseas markets

Cultivation

- Fruits and vegetables are grown in open fields
- Flowers are grown at the shores of Lake Naivasha and in Kibwezi
- There is increased use of greenhouses in the growing of fruits, flowers and vegetables

Description of Greenhouses

- They are large in size – resemble warehouses/go downs – spacious
- Their framework is made of wood or metal tubes
- They are covered by translucent heavy polythene material to allow small amounts of sunshine/heat
- The polythene falls freely and can be raised to desired heights to control humidity
- The moisture/water is availed to the plants by sprinkling/irrigation

Reasons for increased use of greenhouse in horticultural farming

i. It is easier to control the amount of moisture that flowers require
ii. The plants are protected from excessive rainfall, hailstones and drought thus ensuring maximum yields
iii. Spread of pests and diseases is controlled as chemicals (pesticides) are used more effectively and efficiently
iv. Plants are protected from the damaging effects of strong winds and airborne diseases
v. Semi artificial climate is created within the greenhouse which is uniform for all plants in there
vi. Crops are grown all year round since external climatic conditions do not affect their growth
vii. It is easy to control weeds through application of herbicides

Production

- Floriculture is the practice of growing flowers. It is mainly concentrated in Central, Eastern and parts of Rift Valley in Murang'a, Nyeri, Kirinyaga, Embu and Kericho counties
- The main flowers grown include roses, orchids, carnations, gladioli, solidago, lilies, anthurium and chrysanthemum
- The flowers are mainly for export to Europe
- A large variety of vegetables are grown in Kenya such as: -
    a. Starchy tubers: - cassava, yams and potatoes
    b. Root crops: - carrots and turnips
    c. Pulses: - leguminous peas, beans, lentils, soya beans and groundnuts
    d. Green vegetables: - cabbage, cauliflower, kales and green grams
    e. Miscellaneous vegetables: - onions, tomatoes and chillies
- Fruits grown in Kenya are for local consumption and a few are exported. The main fruits grown are citrus (grapes, oranges, lemons and tangerine), deciduous fruits (apples, pears, peaches and plums) and tropical fruits (bananas, dates, pawpaws, pineapple and avocadoes)

Marketing

- Most of the horticultural products are consumed locally mainly by the urban population
- A small portion of the produce (flowers)is exported
- The farmers transport the fruits and vegetables to the collecting centres
- They are then checked and graded
- The buyers and middlemen then transported to airports in refrigerated trucks ready for external markets
- The major destination for the flowers are Europe and the Middle East

Problems Facing Horticultural Farming in Kenya

i. Pests and diseases lower crop yields e.g. aphids, nematodes, birds, worms, rodents (pests); blight, black rot, bacterial wilt
ii. Inefficient marketing system that lacks proper organization lead to rotting of produce
iii. Stiff competition on the international market by other horticultural producers (Israel, Netherlands).
iv. Price fluctuations due to overproduction results to marginal profits
v. Climatic hazards (frost, hailstones, prolonged drought) that destroy the produce in the farms
vi. High freight charges and production costs that lead to marginal profits (due to hiked costs of farm inputs and airfares)
vii. Seasonal floods that make the feeder roads impassable during the rainy season limits accessibility between the farms and collecting centres/leads to delay in delivery of the products
viii. Inadequate refrigeration facilities may lead to reduction in quality of highly perishable produce.

Importance of Horticultural Farming to Kenya's Economy

i. It is a major source of raw material for local horticultural industries e.g. fruit canning, manufacture of vegetable oils thus stimulating industrialization and other related industries such as freight services, pesticides and banking services.
ii. Export of flowers, fruits and vegetables earns foreign exchange
iii. Creation of employment opportunities since it provides a source of income to farmers hence raising their living standards
iv. It has stimulated expansion and development of transport infrastructure through construction of roads and airports to facilitate the delivery of horticulture products to various markets
v. It has ensured effective/maximum use of land and even reclamation of swampy areas.

Horticulture in the Netherlands

- Netherlands or Holland is highly specialized in horticulture
- The horticultural farming areas in the Netherlands include

a. The Wasteland: - this includes The Hague, Hook of Holland and Rotterdam. It mainly grows vegetables e.g. carrots, lettuce, cucumbers, spinach, and grapes.
b. Leiden – Harlem area: - this includes Aalsmeer near Amsterdam and mainly grows flowers
c. Arnhem – Nijmegen area: - includes Guelderland, Limburg and Utrecht and it mainly grows fruits

Draw map on page 287 certificate Geog/Moran Atlas pg 69

Factors favouring horticultural farming in the Netherlands

i. The coast of Netherlands is washed by the warm Gulf Stream Current making it free from ice/frost thus favours growth of fruits throughout the year
ii. Fertile soils: - the sandy coastal dunes, which are well drained and quickly warmed up in spring, are ideal for Horticulture.
iii. Advanced technology in the Netherlands e.g. the use of greenhouses with heating systems has led to highly developed horticultural farming
iv. Highly developed transport system e.g. good harbours, canals, navigable rivers, roads and railway lines eases and quickens the movement of horticultural crops in/outside the country
v. Central location of the Netherlands in Europe makes it accessible to external/foreign markets
vi. Ready Market from the populous urban areas and Europe (high purchasing power)
vii. Highly organized marketing systems due to well developed cooperatives to market the produce, supply inputs, organize auctions and advance credit to farmers.
viii. Availability of skilled labour with a long tradition in floriculture has ensured high production and quality packaging
ix. Extensive and successful research in horticulture has led to high quality crop varieties and effective pest and disease control

Cultivation

- The horticultural crops are grown in open fields as well as in greenhouses
- The vegetables grown in the Netherlands are tomatoes, cucumber, lettuce, cauliflower, melons, and spinach among others
- Flowers include tulips, chrysanthemum, roses, carnations and lilies
- Fruits; apples, pears, cherries and red currants

Marketing

- The farm produce is transported by road, railway and air to the nearest market
- Some of the produce is sold locally with the major local markets are concentrated in the major urban centres in the Netherlands
- Majority are exported to the major foreign markets e.g. Britain, Germany, Sweden and France.
- The produce are sold by auction

Importance of Horticultural Farming to the Economy of Netherlands

i. Foreign exchange earnings through export
ii. Creation of employment opportunities thus source of income
iii. It has contributed to development of good transport infrastructure network in the Netherlands
iv. It has encouraged polderization – reclamation of land from the sea for expansion of horticulture farms
v. Development of related industries through provision of raw materials

Problems facing Horticultural Farming in the Netherlands

i. Occasional weather changes such as unexpected frost affect the crops grown in the open fields leading to loss of yield

Comparison between Horticulture Farming in Kenya and the Netherlands

Similarities

- Greenhouse technology is applied in the both the countries
- Similar vegetables and flowers are grown in both the countries
- Horticultural products are export market oriented in both the countries

Differences

- Horticultural farmers in the Netherlands are highly skilled due to long history while in Kenya the farmers are less skilled due to short history
- In the Netherlands, there is higher local demand for horticultural products due to higher incomes of the locals/citizens while in Kenya there is lower local demand for horticultural products due to lower incomes of many citizens
- Netherlands is centrally located in Europe thus has a wider foreign market within easy reach while in Kenya, freight charges limit access to European market
- In the Netherlands the scale of production is large while in Kenya small scale

Livestock Farming

- This refers to the rearing of domesticated animals such cattle, sheep, goats, pigs, horses, camels and poultry for subsistence and sales
- It is divided into the following: -
  a. Traditional livestock farming
  b. Livestock ranching
  c. Commercial livestock farming

Traditional Livestock Farming

- This is also referred to as nomadic or subsistence pastoralism or pastoralism
- It is the extensive grazing of livestock on natural pasture involving constant and seasonal migration of the nomads/pastoralists and their livestock in search of water and pasture; a process referred to as transhumance
- It is mainly practiced in the arid and semi-arid lands e.g. in Turkana, Wajir, Garissa, Mandera, Kajiado, Narok and Marsabit counties
- The pastoral communities in Kenya include Maasai, Samburu, Somali, Borana, Turkana and Pokot
- In other parts of Africa, it is practiced by the Fulani (West Africa), Hottentots (Southern Africa – Botswana, Republic of South Africa and Mozambique) the Tuaregs of North Africa and the Nuba of Ethiopia and Sudan

Characteristics of Nomadic Pastoralism

i. It involves constant and seasonal migration of the pastoralists and their livestock in search of water and pasture
ii. Large herds of animals are kept i.e. emphasis is laid on quantity and not quality of the animals
iii. Many kinds of animals are kept
iv. The nomads rely on natural pasture for grazing
v. The animals are grazed communally
vi. The animals of low quality and weakened by diseases/high incidences of pests e.g. ticks and diseases e.g. foot and mouth, rinderpest
vii. Animals are kept as a sign of wealth and for slaughter during social functions

Factors favouring Nomadic Pastoralism in Kenya

- The grazing areas are free from tsetse fly due to hot and dry conditions.
- Availability of large tracts of land for grazing due to the sparse population in Northern and North eastern regions.
- Availability of natural pasture in the wooded savanna lands.
- The gentle slopes/undulating terrain enable easy movement of stock from one place to another.

Problems facing pastoralism in Kenya

i. Prolonged drought leads to shortage of water and scarcity of pasture.
ii. Overstocking leads to overgrazing hence poor pastures.
iii. Pests and diseases such as rinderpest, east coast fever, foot and mouth, ticks and tsetse fly reduce the quality of the animals.
iv. Low quality local breeds e.g. zebu, boran that yield little milk and provide low quality meat.
v. Animals are frequently attacked by wild animals.
vi. Shortage of extension/veterinary services due to their nomadic nature.
vii. Insufficient marketing systems, lack of information on market conditions makes them be exploited by middlemen.
viii. Frequent livestock raids/cattle rustling.
ix. Low level of education and culture hinder them from practicing modern methods of livestock farming.
x. Competition for range pastures with wildlife.
xi. Poor transport connection hinders accessibility to potential markets.
xii. Fire outbreaks destroy huge tracts of the grassland hindering their regeneration/reducing pasture land.

Steps taken by Kenyan Government to Improve the Quality of Livestock in the areas practicing Nomadic Pastoralism

i. Establishing demonstration ranches to sensitize pastoralists on better methods of animal husbandry.
ii. Cattle dips have been constructed to control pests.
iii. The government is encouraging group ranching to enable the pastoralists to view livestock keeping as a commercial undertaking.
iv. Boreholes have been sunk and dams constructed in the practicing areas to provide water for livestock.
v. Introduction of drought resistant nutritious grass.
vi. Encouraging cross breeding of indigenous breed with hybrid breeds to improve the quality of livestock.
vii. Improvement of transport system in the areas to facilitate transportation to the markets.
viii. Establishment of Kenya Meat Commission to guarantee market for livestock.
ix. Establishment of Anti Stock theft police to curb cattle raids.
x. Educating the pastoralists on land carrying capacity so that they control the number of livestock.
xi. Research centres have been established for pest and disease control.
xii. Provision of veterinary and extension services.

Livestock Ranching

- This is the large scale and extensive rearing of cattle for meat products
- In Kenya it is mainly done in the Rift Valley Province in Laikipia County

Characteristics of Livestock Ranching

i. Large herds and flocks are kept on large tracts of land
ii. The ranches are highly specialized and produce only one product
iii. The ranches are scientifically managed to ensure high quality production
iv. Products are mainly for sell/few are exported

Commercial Livestock Farming

- This involves the rearing of animals for sale/export of their products
- It involves dairy and beef farming

Dairy Farming in Kenya

- This is the practice of keeping livestock for milk and milk products.
- It is divided into highland and lowland commercial dairy farming
- Highland commercial dairy farming is practiced in the Kenya highlands in the following counties

Province	**Counties**
Rift Valley	Nakuru, Laikipia, Uasin Gishu, Laikipia, Kericho, Nandi and Bomet
Central	Kiambu, Kirinyaga, Nyeri, Murang'a
Western	Kakamega, Vihiga and Bungoma
Eastern	Meru, Embu, Machakos & Makueni
Nyanza	Kisii, Nyamira and Migori

- Lowland commercial dairy farming is carried out in the coast province in Kilifi and Kwale conties
- The types of dairy cattle kept in Kenya include
  - ✓ Friesian/Holstein Block
  - ✓ Guernsey
  - ✓ Alderney
  - ✓ Ayrshire
  - ✓ Sahiwal – local/indigenous

Conditions favouring dairy farming in Kenya

i. Low temperatures (15^0C-18^0C)/cool conditions are ideal for survival of high quality exotic breeds, which have low tolerance to high temperatures.
ii. Heavy rainfall throughout the year ensuring availability of pasture all year round
iii. Fertile volcanic soils that ensure constant growth of pasture and high quality nutritious grass
iv. Permanent water sources from rivers and lakes due to heavy and reliable rainfall
v. Low incidences of tropical pests and diseases due to cool conditions
vi. Well established transport infrastructure in terms of roads that ensures quick transportation of milk to processing plants and to the markets
vii. High population in the Kenya highlands and the neighbouring urban centres that offer ready market for the dairy products

- Artificial Insemination is used in the breeding of the dairy cattle – semen collected from good breeding males/high quality bulls and placed in the reproductive tract of dairy animals to ensure high milk production

Milk Processing

- This is done by the Kenya Cooperative Creameries and private creameries located in major urban areas
- At the creameries, the milk is weighed and recorded against the farmer's name
- The milk is then processed into liquid milk, Ultra Heat Treated (UHT) milk, powdered milk, butter, ghee and cheese
- It is then packed ready for marketing
- The milk is then sent to distributors/depots for sale

Problems facing dairy farming in Kenya

i. Stiff competition from imported milk and milk products and from alternative land uses e.g. horticulture, tea and coffee.
ii. High incidences of pests and diseases e.g. ticks, foot and mouth, rinderpest that reduce the quality of dairy cattle thus low milk yield
iii. High costs of farm inputs has limited and minimized the mechanization of the dairy farms
iv. Poor management of dairy cooperatives results to misappropriation of funds leading to delayed payments that lowers the farmers' initiatives
v. Prolonged and abrupt droughts that lower the quality/quantity of pasture resulting to low yields
vi. Poor roads that is impassable during the rainy season. This leads to delays in delivery of milk to the creameries

Measures the government of Kenya has undertaken to improve dairy farming.

i. Reopening of Kenya cooperative creameries and improving its management to provide ready outlet to milk produced by farmers.
ii. Holding agricultural shows/trade fares to offer education on good dairy farming management
iii. Improved and intensified extension services to update the farmers on ways of improving their stock/dairy cattle
iv. Improvement of/extending access to credit facilities e.g. revamping of Agricultural Finance Cooperation.
v. Introduction of high quality breeds through artificial insemination and cross breeding.
vi. Setting up demonstration projects such as Emali Livestock Multiplicity Project for breeding of high quality bulls.
vii. Building cattle dips to control tick borne diseases.
viii. Improving road network in the dairy farming areas.
ix. Setting up cooling and processing plants in various parts of the country.
x. Funding of research institutes for disease and pest control.

Dairy Farming in Denmark

- Dairy farming is one of the major agricultural activities in Denmark

Factors that favour dairy farming in Denmark

- Cool climate (10^{o}C-15^{o}C) which is ideal for high quality dairy cattle/low incidences of pests and diseases due to the cool conditions.
- Low-lying and relatively flat landscape for grazing of dairy cattle.
- Fertile soils that support good pasture and highly nutritious fodder crops.
- Reliable rainfall (1500mm) throughout the year supports plenty of pasture.
- Well-developed cooperative movements, which advance credit to farmers.
- Advanced technology leads to high production e.g. operations in all the farms are heavily mechanized.
- Availability of market both locally and in the rest of Europe due to dense population in Denmark and the neighbouring European countries.
- Well-developed transport network for easier movement of milk and finished products to the markets.

Organization of dairy farms in Denmark

- The dairy farmers in Denmark depend mainly on fodder. This is because climatic conditions do not favour the growing of grass all year round and also fodder is more nutritious compared to natural grass
- During the winter (6 months between to), the dairy animals are kept indoors and fed on fodder

- The rest of the months (summer), the dairy cows are grazed outdoor on natural pasture
- Dairy farming is done by individual farmers on very large scale. The farms are heavily mechanized e.g. machines are used in milking
- Every dairy farmer belongs to a dairy cooperative that provides research, processing and credit facilities
- Types of animals kept are Danish Red (traditional cow), Friesian, Ayrshire, Jersey, Guernsey and Alderney

Milk Processing in Denmark

- The dairy cattle are milked using machines provided to the farmers by the co-operative
- Fresh milk is processed next to the farms
- Liquid milk is treated through pasteurization, sterilisation, homogenization and ultra-heat treatment
- Pasteurization is heating the liquid milk to temperatures of about 750C for about 20 seconds to kill harmful bacteria
- Sterilisation involves heating the pasteurized milk for a short time at 1000C to ensure that all the bacteria that could have survived pasteurization are killed. This ensures that the milk stays longer without going bad
- Homogenisation involves breaking up and distributing fat particles in the liquid milk. It ensures that a layer of cream does not form on top of the milk
- The liquid milk is then heated beyond 1000C through ultra-heat treatment and packed ready for consumption
- Other by products from milk processing include butter, cheese and ghee

Marketing of Dairy Products in Denmark

- This is done by the co-operatives

Problems facing dairy farming in Denmark

i. Fluctuating weather conditions between winter and summer affects the growth of fodder and natural grass, making it expensive to feed the dairy cattle
ii. Competition from other dairy producers in the world market
iii. Dairy cattle diseases e.g. mastitis affect the dairy cattle

Similarities between dairy farming in Kenya and Denmark

- Exotic and traditional breeds are kept in both countries.
- Artificial Insemination and cross breeding is practiced in both countries.
- Both countries, dairy farmers sell their products to the co-operatives.
- Both open and zero grazing are used in the two countries.
- Milk processing is similar in both the countries
- Dairy products are similar in both the countries e.g. liquid milk, cheese and butter

Differences between dairy farming in Kenya and dairy farming in Denmark

i. In Denmark, the practice is carried out throughout the country while in Kenya; it is restricted to the cool areas especially the highlands.
ii. In Denmark, the cattle depend on fodder crops and commercial feeds while in Kenya they depend on natural grass with limited use of fodder and commercial feeds.
iii. In Denmark, mechanization is widely used while in Kenya, it is limited especially on small-scale farms.
iv. In Denmark, dairy farmers are highly specialized while in Kenya farmers practice mixed farming.
v. In Denmark, all farmers have access to Artificial Insemination, in Kenya; Artificial Insemination is limited to most farms.
vi. In Denmark, high yields are achieved throughout the year because animals are kept indoors and fed on fodder in winter while in Kenya dairy yields are affected by climate changes and drought.
vii. In Denmark, dairy products are mainly for export while in Kenya; dairy products are consumed locally.
viii. In Denmark, the cooperatives are highly developed and have enough funds, in Kenya; dairy cooperatives are young and lack adequate funds to advance to farmers.
ix. In Denmark, cattle are kept indoors in winter and autumn while in Kenya; cattle are grazed outdoor throughout the year.

Beef Farming

Beef farming in Kenya

- Involves rearing of cattle for meat products
- Mostly done in the following areas
    - Laikipia

- Nakuru
- Kwale
- Kajiado
- Trans Nzoia
- Kilifi

- Done at a small scale for subsistence/nomadic pastoralism
- Also done in ranches that scientifically managed
- Livestock ranching is a modern and scientific method of rearing one type of animal for commercial purposes on extensive land, which is fenced and divided into paddocks.

Characteristics

- High quality animals are reared through selective breeding.
- Movement of beef cattle is confined within the ranch.
- Animals are owned and grazed on individual basis not communally.
- Farmers practice artificial insemination and cross breeding.
- One type of animal is reared.
- Fodder crops are grown to supplement the natural pasture.
- Pests and diseases are controlled.
- The ranches have piped water, cattle dips, etc.

Breeds of beef cattle kept include
- Aberdeen Angus
- Hereford
- Charolais
- Zebu
- Boran
- Short horn
- Galloway

Factors that favour beef farming in Kenya

- Extensive flatlands with natural pasture/grass that offer room for extensive grazing especially within the Nyika plateau and the Rift Valley region
- Moderate rainfall of about 750mm or above which ensures supply of pasture/water.
- Moderate temperatures of about 28^{o}C lowers pest and disease incidence/favours survival of exotic breeds
- Presence of watering sites such as Lorian, Lotikipi and Saiwa swamps/several permanent rivers that provides water for the beef cattle.
- Ready market due dense/high population in the practicing areas.
- The communities have a long tradition of cattle keeping.

Problems experienced by beef farmers in Kenya.

- High temperatures in some areas are unsuitable for pedigree/exotic breeds.
- Natural grass of poor quality/low nutritional value.
- Tsetse fly infested areas discourage beef farming.
- Poor soils prone to erosion to sustain pasture.
- Unreliable rainfall leading to shortage of water and scarcity of pasture.
- Kenya tropical environment encourages spread of pests and diseases (spread by wild animals) e.g. ticks, tsetse flies, nagana, east coast fever
- Competition for rangeland between beef farmers and wildlife.

Steps taken by government of Kenya to improve beef farming

- Decontrolling the price of meat products.
- Funding research in Animal pest and Disease control.
- Introduction of pedigree/exotic cattle and encouraging cross breeding with local breeds to improve their quality.
- Introduction of drought resistant high quality grass.
- Educating beef farmers on modern methods through trade fairs, tours and seminars.
- Investigating the prevailing market situations and make appropriate recommendations.
- Creating ranching schemes in arid and semi-arid lands.
- Encouraging setting up of group ranches.

Other uses of beef cattle products.

- Bones are used to manufacture fertilizers.
- Horns and hooves are used for making glues/adhesives.
- Hides and skins for making leather shoes, bags and belts.
- Provision of cooking fat.

Beef Farming in Argentina

- Argentina is located in South American continent and is one of the leading beef producer in the world

Factors favouring beef farming in Argentina

<u>Physical factors</u>

i. Moderate and well-distributed rainfall throughout the year of about 1000mm favours growth of pastures and regular supply of water for cattle.
ii. The moderate temperatures of 10^{o}C-24^{o}C favour the growth of grass all year round.
iii. Fertile soils washed from the foothills of Andes by rivers are deposited in the low-lying areas, giving rise to good natural pastures.

iv. Extensive and rolling grasslands (pampas) at the foot of Andes Mountains provides good sites for natural grazing and pasture
v. Availability of highly nutritious temperate grass.

Human factors

i. Well-established railway network eases accessibility.
ii. Adequate capital to mechanize farm operations and install refrigeration facilities.
iii. Highly organized cattle ranches, which are fairly mechanized.
iv. Availability of market locally in the European countries.
v. Introduction of exotic breeds (short horn, Hereford) ensures high quality meat.
vi. Replacement of natural pasture with alfalfa, which is highly nutritious and matures faster.

Organization of Beef Farms in Argentina

- Beef cattle are reared in ranches that are heavily mechanized
- Each ranch has a manager, meat packing factories, farm houses, windmills and transport facilities
- The beef cattle are fattened using cultivated pasture

Distribution of Beef farms in Argentina

- The farms are evenly distributed
- The major farms are located around Chaco, Formosa and Santiago del Estero

Map Certificate Geography Bk 3 page 309

Processing & Marketing of Beef in Argentina

- The beef cattle are slaughtered then transported to the meat packing plants by trains
- The meat is packed in tins
- Ships with refrigeration facilities carry the beef to external/overseas markets

Significance of Beef Farming in Argentina

i. It has led to the growth and development of towns e.g. Bahia, Blanca and Rosario
ii. Creation of employment opportunities as managers in the beef farms, and other beef related industries
iii. It has promoted industrialization through development of beef related industries such as canning
iv. It has earned Argentina foreign exchange through export to Europe and Middle East
v. Improvement of infrastructure through establishment of roads and railways that link the farms and processing/packing plants

Processing and Marketing of Beef Products in Argentina

- The beef cattle are slaughtered then transported to meat packing plants by trains
- At the plants, they are put in cold storage and packed into tins
- Ships with refrigeration carry the packed beef products to external/overseas markets

Problems facing beef farming in Argentina

i. Diseases such rinderpest, foot and mouth that reduce the quantity of beef products
ii. Stringent sanitary conditions in the world market
iii. Local and international economic and political crises that affect the production

Comparison between beef farming in Kenya and Argentina

Similarities

i. Both countries keep similar breeds of beef cattle e.g. Aberdeen Angus, Hereford, shorthorn, etc.
ii. In both countries, the beef cattle are kept in ranches that are scientifically managed
iii. Both countries keep local and exotic breeds
iv. Beef products are for local consumption in both the countries

Differences

i. In Kenya, beef farming is carried out by both pastoralists and commercial ranches whereas in Argentina, beef farming is done on extensive ranches
ii. Kenya has inadequate/lack adequate pastures for grazing beef cattle while Argentina has extensive natural pasture in the pampas
iii. In Kenya, beef farming is done on a small scale/less mechanized while in Argentina, beef farming is heavily mechanized and done on a large scale