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CHAPTER 3

DEVELOPMENT OF AGRICULTURE AND
ANIMAL DOMESTICATION

BEGINNING OF ANIMAL DOMESTICATION

1. (a) Explain how animal domestication started.
   (b) Identify the regions of early civilizations where animal domestication started and the animals kept there. (Name the early centres of animal domestication and the animals they first kept).

2. (a) Describe two types of:
   - The earliest cattle.
   - The camel.
   (b) Identify:
   - The animals domesticated by man.
   - The results/benefits of domestication of animals.

BEGINNING OF ANIMAL DOMESTICATION

- Animal domestication started about 10,000 years ago in some regions of earliest civilizations like south-west Asia, Greece, Crete, Algeria, Egypt, North Africa, Sahara, the Lake Turkana region and southern Africa.

- Animal domestication started before crop growing. Development of both crop growing and animal domestication were by chance.

- Animal domestication was gradual. While hunting and fetching water, man established close ties with, caught, took care of and bred the animals in captivity until they were tamed.

- Domestic animals like dogs, goats, sheep, cattle and camels were useful in various ways, e.g. provision of food and protection. The dog, which was the first animal to be domesticated, assisted in hunting, driving away dangerous wild animals and herding livestock.

EARLY CENTRES OF ANIMAL DOMESTICATION

- Goats may first have been domesticated in south-west Asia and then Africa around 5000BC in areas such as Tell Abu Hureyra, Tepe Ali Kosh and De Luren Khuzestan in south-west Iran, Iraq, Upper Tigris valley, Turkey, southern Jordan, Egypt, Sudan and Libya, after which it spread to other parts of Asia, and to Europe. Various species of the goat developed.
Sheep were first domesticated at Zawi Chemi Shanid in Iraq around 9000BC and then in Syria, Egypt, the Sahara region, West Africa and the Indus and Yellow River valleys. It spread to Europe from Turkey in 7000BC. There are various breeds of sheep in the world today.

Cattle were first domesticated in south-west Asia around 5800BC in such places as Catal Huyuk in Turkey, Iraq and Iran, from where it spread to Ethiopia and North Africa. They are of two types, i.e. the short horned and the long horned.

The camel originated from North America, then it spread to Asia and South America. It was first domesticated in Arabia in 3000BC. It is often referred to as the “ship of the desert” as it was commonly used in arid areas. There are two types of the camel. These are:

(a) The one humped, found in the Middle East, Northern China and Africa.

(b) The two humped, found in central Asia.

**BENEFITS OF DOMESTIC ANIMALS**

- Regular food supply e.g. meat and milk.
- Clothing, beddings and other products from animal skins.
- Hooves and horns, which were used as containers, communication and musical instruments.
- Animal bones for making tools, ornaments, needles and weapons.
- Camels, donkeys and horses enabled man to travel longer distances faster with heavier loads.
- Increased crop yields as oxen and donkeys were used for ploughing.
- Animals provided manure for the crop farms.
- Use of the dog for protection from dangerous animals.
- Man now led a more settled life as hunting was now limited since the animals he needed for food were at his doorstep.
- Man now lived in families and villages.

Domestication of plants and animals occurred in the Neolithic period, although animal domestication came first.

**THE BEGINNING OF AGRICULTURE**

What is agriculture?

- Agriculture is cultivation of crops to satisfy human needs.
Identify the factors that made it necessary for human beings to discover agriculture.

(Explain the factors that led to (facilitated) development of agriculture).

☐ Increased human population, for which the natural environment could not provide adequate food.

☐ Climatic changes, which hindered pure reliance on nature for livelihood.

☐ Competition for food among and between people and animals.

☐ Calamities such as floods and bush fires, which cleared vegetation for wild animals.

Describe the two theories that explain how man discovered crop growing and animal keeping.

i) The Diffusion theory, which states that crop growing and animal keeping developed in south-west Asia and then spread to the rest of the world.

ii) That which states that agriculture must have developed independently in various parts of the world.

Explain the stages in which crop growing developed.

(Explain how crop growing started/began.)

Crop growing must have developed in stages as follows:

☐ Man may have accidentally selected plants he considered more nutritious and tasted better than or were superior to others.

☐ It was discovered that wild crops germinated and grew along river valleys, where water and fertile soil were ample.

☐ Crops grew faster as other plants and bushes were cut and weeded out.

☐ Farmers made and used tools to clear bush, dig and plant the seed, which was quite involving.

☐ The crops had to be harvested and then stored in the homes.

☐ Various crops adapted to diverse environmental conditions and gradually spread to other areas.

Identify the early centres of agriculture in the world and the crops domesticated there.

☐ In the Fertile Crescent (south-west Asia), which comprises present-day Iraq, Turkey, Lebanon and parts of Iran and Syria, wheat and Barley were the first crops grown.

☐ In Asia and Africa, particularly the Ganges valley in India, Thailand, Malaysia, Indonesia
and the Niger, diverse rice varieties were domesticated.

- In tropical America i.e. Central America, southern America and Mexico, yams and maize were the first crops grown.
- In Africa, particularly Kenya, Tanzania, Ethiopia, Algeria, West Africa and the Nile Valley in Egypt, the Guinea yam and varieties of rice, millet and sorghum were domesticated.

**Analyse cultivation of the crops cited in the various centres you’ve mentioned.**
(Explain how the crops you cited in the above-mentioned centres came to be cultivated by man.)

- **Wheat** grew wildly in different types. It was first harvested as Brittle Wheat: a type that was gradually replaced by „emmer” wheat, which then spread from the Mesopotamian plains by 6000BC and reached Egypt by 3000BC and to the Mediterranean region, central Asia, India and southern Europe.
- **Barley** was widely grown in Mureybat on the Euphrates in Syria from 700-600BC. It then spread to Ali Kosh in Iran, Jericho in Jordan and Fayum in Egypt. By about 2000BC, cultivation of barley had spread to India and China.
- **Yams** may have been the first of the Root and tuber crops to be domesticated. They were grown in South-east Asia by 9000BC. The Brazilians grew a different variety. Africa grew its own variety i.e. the White Guinea yam, which was a wild variety found in the Ivory Coast.
- **Maize** was first grown around 5000BC at Tehuacan in Mexico from where it spread to South America, Africa, Asia and Europe. It was introduced by the Portuguese in Africa, where it became a staple food unlike America and Europe where it is largely a fodder crop.
- **Rice** originated from Thailand around 3500BC, from where its production spread to India, Europe and Japan. In Asia, Oryza Glaterima rice is widely cultivated. The African variety of rice was grown along the upper Niger around 1500BC, from where it spread to other areas within the region.
- **Bulrush millet** was first grown at Hoggat in southern Algeria around 6000BC. By 1500BC, sorghum was grown around the Sudan, the area between the Nile and Lake Chad and other parts of West Africa, Ethiopia and east Africa (from where finger millet originated).

**EARLY AGRICULTURE IN MESOPOTAMIA**
In Mesopotamia, which today is part of Iraq, food production began around 8000BC having been introduced by settlers from the Iranian plateau. Jarmo in the Kurdish foothills represents the earliest stage of Agriculture. As men went hunting and gathering, the women they left behind may have experimented with wild grasses that grew around their compound until they found out and grew the edible plants, paving the way for organized agriculture.

1. (a) Identify:

   - The animals domesticated in Mesopotamia.
   - Crops grown in Mesopotamia.

(b) Name:

   - Two methods of irrigations used in Mesopotamia.
   - The farm implements that were used in Mesopotamia.

© Explain the factors that facilitated agriculture in Mesopotamia.

2. Analyse farming activities in Mesopotamia. (Explain how farming activities were carried out in Mesopotamia).

**FACTORS THAT FACILITATED AGRICULTURE IN MESOPOTAMIA**

   - Use of water from the Tigris and Euphrates for irrigation. At first, Sumer in southern Mesopotamia was unsuitable for farming as it had very little rain. But the Sumerians skillfully dug canals to channel water from the two rivers to summer, boosted by the Shadoof or Bucket method of irrigation.

   - The rich fertile silt deposited on the lower Tigris and Euphrates river valleys and soils in the region, which were mostly fertile.

   - Good leadership by, among others, Sargon the great and Hammurabi the law giver.

   - Invention and use of farming implements like the ox-drawn plough and the seed-drill in place of digging sticks and stone hoes fastened with sticky earth onto a short wooden handle for tilling the land as well as baked clay sickles, baskets and pots in reaping and storing the harvest.

   - The fact that the region was endowed with indigenous crops and animals like wheat, dates, figs, olives, vines, palms, onions, melons, cucumber, ducks, pigs, geese, horses, cattle, sheep, goats, a variety of vegetables and a variety of grains.

   - Heavy rains in the Zagros mountains, which caused the much needed floods on the
Euphratese and Tigris river valleys.

- Reclamation of more land for agricultural purposes by skilfully draining and directing water through dykes, ditches and canals from swampy land to the dry land, making both cultivable.

**FARMING ACTIVITIES IN MESOPOTAMIA**

- The Sumerian civilization, which was thriving in Mesopotamia by around 3000BC comprised twelve separate city states. Farming, fishing, crafts making and keeping of livestock were most practised.

- The city states were surrounded with walls, outside of which were farming fields, on which the urban people depended.

- Most land was in the form of large estates belonging either to the rulers or to the wealthy classes. The workers were given small plots and seeds, farm implements and livestock in return for labour and surplus produce to the land owners.

- Wheeled carts were used to transport farm produce to various storage points.

- Goats and cattle provided milk while sheep supplied wool: Mesopotamia’s main textile fabric.

- City states often fought over water rights.

**What were the consequences/RESULTS of early agriculture in Mesopotamia?**

- Invention of writing (Cuneiform) and Arithmetic for better farming management, e.g. accounts on rents paid by Tennant farmers, the size of the herds, etc.

- Increased food production.

- Population increase, particularly along river valleys, arising from healthy feeding.

- Emergence of urban centres like Uruk, Eridu, Nippur, Kish and Babylon.

- Development and expansion of trade due to surplus agricultural produce.

- Specialization in crafts, religion and other non-food producing endeavours, as not all could engage in farming.

- Invention and use of the wheel, which improved transport and pottery.

- Development of science and mathematics, particularly in measurement of time, distance and area.

- Invention and improvement of farming tools such as the plough, which eased and increased
agriculture. For example, it reduced the number of people needed to cultivate a large piece of land.

- Development in astronomy, arising from the need to predict rains, floods and eclipses, which led to the invention of the calendar.
- Development of law:
- Discovery and use of metals to make farm tools, which revolutionized agriculture. Bronze tools were made and used in Mesopotamia as early as 3000BC.

**Explain two main factors that facilitated development of law in Mesopotamia.**

- Advances in religious practices. Mesopotamians had many gods, most of who were connected to agriculture, e.g. Ninurta the god of floods.
- Compilation of cords of law to limit conflict in their civilization, e.g. Hamurabi’s law.

**EARLY AGRICULTURE IN AFRICA**

In Africa, agriculture first spread to Egypt along the Nile valley, where it was practiced as early as 700BC.

1. Identify:

- The animals domesticated in ancient Egypt.
- Crops grown in ancient Egypt.

2. Identify the farm implements that were used in Egypt.

3. **Explain the factors that promoted (facilitated) agriculture in ancient Egypt.**

- The river Nile, which provided the water needed for irrigation and for domestic use.
- The fertile soil and the warm climate of the Nile Valley.
- Invention and use of irrigation technique, characterised by Shadoof and Basin methods.
- Availability of food crops that had already become indigenous to Egypt, e.g. wheat and barley.
- Availability of many tameable animals in Egypt e.g. goats and sheep.
- Good and able political leaders, who directed agricultural production, distribution of food and other crafts. The government owned huge granaries and go-downs for storage of grain, animals, cloth and metals for use in times of scarcity.
- Natural protection of the Nile valley from foreign invasion by the Libyan desert to the west, the Nubian desert and the Nile cataracts to the south and the harbourless coast of the Nile
delta on the north.

- Egypt’s close proximity to Mesopotamia (the first centre of agricultural development), which encouraged a lot of borrowing.
- Use of implements like sticks, knives, axes, sickles, wooden and bronze hoes and others of their kind, which eased farming.
- Farmers had several seasons in a year and, because of irrigation, no longer depended on annual Nile Valley floods.
- Introduction and adoption of iron technology in Africa by 1000AD, which enabled the Egyptians to make and use iron tools like ploughs, which made farming more efficient.

Describe farming activities in ancient Egypt.

- Various crops were grown, such as wheat, barley, fruits, flax, beans, vegetables, cucumbers, onions, lentils, dates, figs and grapes.
- The Broadcasting method of planting (scattering seed on land) was used. Animals were driven over the fields to cover the seed in earth for germination or budding.
- Shifting cultivation was practised before the human population increased, but more settler cultivation was encouraged as days went by.
- Various animals were kept such as cattle, sheep, goats, pigs, donkeys, poultry and bees.
- The King was regarded as the guardian for food supply for all. Some senior government officers were assigned the responsibility of ensuring food security.

Describe the irrigation methods practised in ancient Egypt.

Irrigation technique in ancient Egypt was characterised by Shadoof and Basin methods in addition to construction of dykes to direct water to the farms during drought. A Shadoof is a wooden device consisting of a long pole swinging up and down between two supporting wooden posts. On one end of the pole was hung a heavy weight and a skin bucket at the other. The bucket was pulled down and dipped in water by a person. The weight on the other side would then cause the bucket to rise up to another person above, who would empty the water into the canals, which then directed it to the fields.

Describe two senior government officers that were assigned the responsibility of ensuring food security in ancient Egypt.

- The Master of Largesse was responsible for all livestock in the country.
The head of the exchequer ensured distribution of seeds and livestock when agricultural output was poor.

**Explain the impact of early agriculture in Egypt.**

- Improved farming, leading to increased and regular food supply.
- Rise in population due to healthy feeding.
- Development of writing, arithmetic and Geometry for keeping records and accounts to manage agricultural resources.
- Invention of irrigation technique, which made the Nile valley an all-season farming area.
- Emergence of urban centres along the Nile valley, such as Memphis, Akataten, Thebes and Aswan.
- Invention of farming implements such as the plough, sickle, etc.
- Development of Astronomy and other sciences, as a way of predicting floods.
- Development of religion, for divine protection of the farms.
- Emergence of a new class of people, constituted by priests and soldiers, which produced scribes and other Egyptian elites.
- Specialization of some people in non-food producing activities e.g. tool making, crafts and geometry.
- Increased trading activities due to surplus food production.
- Permanent settlement by farmers, which improved living standards as settled communities accumulated more property than nomads.

**EARLY AGRICULTURE IN SUBSAHARIAN AFRICA**

Identify the crops cultivated in sub-Saharan Africa.

- Millet,
- Sorghum,
- Eleusine,
- Semeseme,
- African rice,
- Yams,
- Ensete,
- Barley,
Name the animals domesticated in sub-Saharan Africa.

- Cattle,
- Goats,
- Sheep
- Camels.

Discuss early farming activities in sub-Saharan Africa.

- In West Africa, domestic animals and serial agriculture were acquired from the then fertile and green Sahara by 1500BC. African rice, which was first cultivated in the Middle Niger lake region, was among the crops grown. Yams may have been grown earlier than any other crops.

- In North Africa, Ensete, barley, chick peas and cattle were cultivated and domesticated, particularly in the Lalibea area to the east of Lake Tana in Ethiopia. Other plants were brought to Ethiopia from the Middle East across the Red Sea.

- In east Africa, especially at the Ileret area on the northern shores of Lake Turkana, in Kenya, cattle, goats, sheep and camels among others were kept between 3000-1000BC. Food production was most practised in southern Kenya and northern Tanzania.

- In the Congo basin, food production started late, around 1000BC, probably because the region had low population and plenty of wild food varieties.

- Some crops cultivated in sub-Saharan Africa spread to the Middle East. For instance, semeseme reached Mesopotamia from the southern fringe of the Sahara before 2350BC. Much of southern Kenya and Northern Tanzania were in the past inhabited by Cushitic herdsmen, who may have had agricultural knowledge. The regions are now inhabited by Nilotic and Bantu speakers.

**EARLY AGRICULTURE IN ASIA**

Name the places associated with early agriculture in Asia.

- The Yellow River valley,
- The Middle East,
Identify the animals that were domesticated in Asia.

- Zebu cattle,
- Water buffaloes,
- Elephants,
- Horses,
- Goats,
- Sheep,
- Pigs.

Assess/analyse early agriculture in Asia.

- In Asia, intensive irrigation was practised along river valleys in the Indus plain, where food supply was adequate. Cattle keepers from central Asia gradually settled down to farming in India.
- Garden cultivators of south-east Asia grew rice, which boosted productivity at the Ganges valley.
- Zebu cattle, water buffaloes, elephants, horses, goats, sheep and pigs were domesticated in the Ganges region.
- However, because early farmers had not yet mastered weather patterns, they were victims to long periods of drought and floods. Their crop yields were low due to lack of scientific knowledge.

In spite of these and other problems, the positive agricultural outcome in Asia was unhindered.

EARLY AGRICULTURE IN EUROPE

Identify the crops and animals that were cultivated and domesticated in ancient Europe.

- Beans,
- Peas,
- Lentils,
- Oats,
- Rye.

Name the farm implements used in Europe as early agriculture developed.

- Hoes,
Analyse/Discuss early farming activities in Europe.

In Europe, food production started at about the same time as in Egypt.

The Mediterranean region favoured extension of initial farming methods from the Middle East, from where early food producers passed into southern Europe.

European farmers practised shifting cultivation. In areas near river valleys, irrigation was practised.

Hoes and sticks were used, though ploughs were later introduced for tilling land.

Beans, peas and lentils were grown in the Neolithic times, but oats and rye were major serial crops in the Iron Age. Keeping of sheep was widespread.

IMPACT OF EARLY AGRICULTURE

Explain the impact of the discovery of agriculture.

(What were the results of development of early agriculture?)

Population increase due to healthy feeding.

Change of man from hunter-gatherer to food producer. Man no longer relied totally on the environment for his survival

Adequate food production, with a surplus for future use.

Improved cultivation methods in addition to invention and use of better farm implements like ploughs. More land was put into use through dyking and irrigation. These helped remedy the problem of drought, floods and inadequate rainfall.

Development of High Breed seeds and better quality livestock, with more yields.

Better settled life, with less migration.

Emergence of villages, towns, trading and urban centres.

Development of religion, laws, rules and regulations to safeguard their fields, flocks and other aspects of life.

More division of labour and specialization in different crafts.

Development of scientific and technological knowledge and skills, influenced by agriculture as farmers had to invent and improve farm implements, interpret weather patterns, divide land geometrically, count seasons and record agricultural produce using the calendar.
Agrarian Revolution refers to radical changes and improvements in agriculture and animal domestication.

Describe the characteristics of agriculture in Western Europe before the 18th century.

Agrarian revolution started with invention and use of machines from mid 18th century, when food production increased as the number of workers on the farm reduced. By the Neolithic period, agriculture had reached Europe, particularly Switzerland, Spain, Italy and Turkey, where rice and barley were mainly grown.

The following were the characteristics of agriculture in Western Europe before the 18th Century (before the agrarian revolution)

- Land belonged to the feudal lords, the church and the royal family.
- Land was rented out to peasants, who paid by their labour.
- Paths and cart tracks criss-crossed the land.
- Farmers used the Broadcasting methods of planting.
- Small scale farming and intercropping (growing of more than one crop on a piece of land at the same time) was practised.
- Farmers practised the Open Field system.

THE OPEN FIELD SYSTEM

Describe the Open Field system as practised by farmers in Western Europe before the 18th century.

(Explain farming in Britain as practised under the Open Field system.)

- A piece of land was divided into three portions: one for growing corn and wheat, the second for beans, peas, barley, oats and bush wheat, while the third was left fallow to regain fertility. Sometimes, this third piece was left for grazing and homes.
- Each portion of land was divided into several strips, depending on the number of peasants in a village.
Each peasant had his own strip, on which he was meant to cultivate just enough for the needs of his family since agriculture had not yet been commercialized.

What were the disadvantages of the Open Field system of farming? (Explain the disadvantages of the traditional system of farming in Britain before the 18th century.)

- It did not allow efficient farming as land was not fully utilized.
- Division of land into small strips discouraged use of farm machinery.
- The existence of fallow pieces of land, cart tracks and paths that went through the unfenced fields wasted land.
- It was difficult to control diseases or to practise selective breeding since livestock grazed together.
- The broadcasting method of planting led to wastage of seeds as some were eaten by birds and rodents.
- Families had to travel long distances to reach their fields as pieces of land were scattered all over.
- Agricultural yield was low and could not meet the growing urban population’s food demand.

AGRARIAN REVOLUTION IN BRITAIN

From mid 18th century onwards, scientific ideas and new techniques of farming were applied as a result of the scientific and industrial revolutions.

The changes that marked the Agrarian Revolution in Britain.

(What were the characteristics of the agrarian revolution in Britain?)

- The land enclosure system (fencing and hedging of plots), which replaced the Open Field system in 1750.
- Mechanization, i.e. use of new farming methods, which required large farms as opposed to the previous small strips.
- Abolition of fallows. Farmers could no longer leave the land fallow to regain its fertility as was the tradition. Increase in population meant demand for more food, which required most of the land to be put to use.
- Introduction of crop rotation. Lord Viscount Townsend developed a four-course
rotation system called the Norfolk, which consisted of barley, clover, turnips and wheat on the same plot of land over a four-year period, by which land retained or gained but would not lose its fertility.

- The introduction of intercropping. It was discovered that growing crops like maize and beans on a given piece of land at the same time enabled land to regain fertility, since such crops did not require the same nutrients from the soil and they grew well if planted together.

- Use of fertilizer. This was pioneered by Lord Viscount Townsend, who recommended manuring of land to increase yields per hectare.

- Use of machines. This changed agriculture from a small scale subsistence activity to a large scale business for both subsistence and commercial purposes.

- Selective breeding of livestock. This was invented between 1725-1795 by Robert Bakewell.

- Introduction and all-time availability of cattle feed, which helped ensure supply of fresh meat all the year round.

The animal breeds that resulted from Robert Bakewell’s Selective Breeding technique.

- New improved cattle breeds like Devon, the Short-Horn, Hereford, Ayshire and Aberdeen Angus

- Sheep breeds such as the Leicester, Shropshire, Suffolk and Oxford.

- Pig breeds like Yorkshire, Berkshire and Tamworth.

The inventions/innovations that were made during Agrarian revolution in Britain.

- Jethro Tull’s invention of the Seed Drill and the horse-drawn hoe in 1791, with which seeds could be sown in rows, which eased interrow cropping and kept the land between the rows clean.

- Introduction of the Iron plough in place of the wooden plough in 1825.

- Formation of the Royal Agricultural Society in 1838, which publicised new ideas and techniques of farming all over Britain. This encouraged adoption of modern methods of farming.

- Opening of a super phosphates factory in London in 1843 by Sir John Bennet Lawes, following the earlier discovery by scientists that Nitrogen Phosphorus (in phosphates)
and Potassium (in Potash) are nutrients for all plants.

- Andrew Meikles’ invention of the Mechanical Thresher in 1876, which improved Patrick Bell’s earlier invention of the Mechanical Reaper, which replaced the sickle in harvesting corn. A Binder was added to the reaper so that corn was cut and bound at the same time. Other modern machines like tractors and the combined harvester could reap and thresh corn simultaneously.

THE LAND ENCLOSURE SYSTEM

How the Enclosure system serve as an agricultural landmark in Britain

- It was necessitated by use of new farming methods that required large farms as opposed to the previous small strips.
- Rich farmers bought up all the land and, through the Enclosure Movement, demanded that land be enclosed by fencing.
- Through the Enclosure act of 1750, the British government mandated farmers to fence their land. This enabled the rich to acquire a lot more land and created large farms that were easily managed as farmers could specialize in crop or animal production, which was highly profitable.
- The farmers that bought up the land got title deeds, which they could use to borrow money from firms to improve their farms.
- Peasants, who could not buy their own estates were evicted from and lost their land, which was sold off to rich landlords.
- There was displacement and a lot more hardship for those who lost their land as they had to sell their labour to the rich farmers and to the factories in the urban as others emigrated to the USA, Canada, Australia, New Zealand and South Africa.
- There were many changes in lifestyle as agriculture was transformed from a simple human occupation to a complex highly profitable business.
- Fallow land was cultivated and wasteland reclaimed. Food could now be grown round the year due to increased irrigation.
- Cultivation methods and equipment improved, which meant adequate and surplus food production.
- By 1800, all farmland in Britain was enclosed, which greatly reduced the risk of
animal and crop diseases. Aggressive farmers could now increase production without the hindrance of their neighbours.

**The results of Agrarian revolution In Britain**

- Improved farming methods, which led to increased food production.
- Population increase as food was abundant. Life expectancy was higher too.
- A large variety of crops e.g. clover, potatoes, beans, maize, vegetables and citrus fruits.
- New animal breeds such as the Friesian cow as well as Leicester and Suffolk sheep, among others.
- Large scale farming in place of subsistence farming.
- Mechanization of farming as cultivation of large farms was adopted.
- Rural-urban migration as peasants were compelled by the Enclosure movement to sell their land to rich farmers.
- Availability of raw materials required in the agro based industries, thus contributing to the industrial revolution.
- Expansion of both local and international trade
- Expansion of the transport network.
- Enhancement of research and scientific innovations.
- Migration of some of the landless to the USA, Canada, Australia, New Zealand, South Africa and other places overseas.
- Minimization of pests, diseases and epidemics.
- High standard of life, particularly for farmers due to increased agricultural income.
- Availability of food and feeds round the year.
- British culture was spread and administered overseas.
- Emergence and growth of more and more urban centres due to rise of a non-food producing population.

**The negative effects of the Agrarian revolution.**

- Land was concentrated in the hands of a few rich people, leaving the wider majority under poverty and insecurity due to forced sales of their land.
- The fact that work, for which those who lost their land had to look, was not easy to find, for the landless outnumbered the landlords by a greater margin.
Most of those who migrated overseas died due to exposure to strange climates.

Some of the emergent non-food producing population indulged into permissive and unbecoming behaviour, a lot of which remains to date.

Some fertilizer and pesticides, such as DDT, became destructive to the environment.

Urban centres were overcrowded, with poor living conditions due to influx of poor landless peasants into towns.

The idea of colonization stems from Agrarian revolution since almost all places where British emigrants went to after the Agrarian Revolution, such as the USA, Canada, Australia, New Zealand, South Africa, etc became British colonies.

AGRARIAN REVOLUTION IN CONTINENTAL EUROPE

Reasons why farming in continental Europe was not as advanced as it was in Britain.

Continental European countries learnt modern methods of farming from Britain. Initially, farming in continental Europe was not as advanced as it was in Britain because:

- The French were affected by frequent wars.
- Italy was restricted to Spain, which was prospecting for minerals in South America.
- Holland, Denmark and Germany were involved in large scale world trade, which was more profitable at that time.

Continental European farmers went for practical scientific and agricultural research in England.

How Continental Europe contribute to development of farming.

- Continental European countries imported new crops from the Americas.
- Agricultural science and research were advanced, leading to a fivefold increase in yields. For instance, soil was fertilized with phosphates-rich Guano from the Pacific islands and nitrates from Chile.
- More advances were made in medical sciences.
- Continental European farmers improved livestock breeding through scientific practices. Today, continental Europe is known for their high quality animals, e.g. the Friesian cow from Holland.

The continental European countries that sent their farmers to Britain for practical
scientific and agricultural research.
- France,
- Germany,
- Holland,
- Spain,
- Italy.

The crops that were imported by continental European countries from the Americas.
- Wheat,
- Barley,
- Peas,
- Oats,
- Beans,
- Maize,
- Vines,
- Potatoes,
- Subtropical citrus fruits.

Two advances in medical science that add up to continental Europe’s contribution to development of farming.
- Louis Pasteur made great advances in the control of plant and animal diseases. He discovered that most diseases are caused by bacteria and therefore sterilization of food such as milk through boiling can help keep it fresh and bacteria free for long periods.
- Justus Von Liebig from Germany, urged for greater reliance on agricultural chemistry.

The impact of Agrarian Revolution in Continental Europe.
- Adequate food supply to manufacturing towns and cities.
- Introduction and use of farm machinery, which compelled people to seek employment in industries.
- Rural-urban migration, which provided ample labour for factories and industries.
Adequate and surplus food production due to improved agricultural methods.
- Improved living standards, with higher life expectancy due to efficiency and better
health standards.

- Doubling of the European population due to general peace, stability, and medical care.
- Emergence of a non-food producing population, which took up industrial and other jobs.
- Eventual establishment of the European Economic Community (EEC), which always has surplus food and has virtually advanced in export trade due to highly mechanized and scientific farming.

**AGRARIAN REVOLUTION IN NORTH AMERICA**

The Americas is the origin of many crops in the world today. Indigenous Americans (American Indians) were subsistence farmers. They grew a wide range of crops. From the 17th century, many people, particularly from Western Europe, migrated into America, bringing with them skills, enterprise and enthusiasm. They took and established animal breeds and crop varieties, which led to increased export trade.

**The countries that make up North America.**

- Canada,
- Mexico,
- The United States of America.

The crops that originated from the Americas.

- Maize,
- Yams,
- Potatoes,
- Beans,
- Pineapples,
- Cocoa,
- Tomatoes,
- Cotton,
- Tobacco,
- Cassava.

**The methods that made up Agriculture in North America.**

(Explain the American contribution to Agrarian revolution (In what ways did the
Americas contribute to Agrarian revolution?

The agriculture that developed in North America was a blend of new and old methods such as:

- Recognition of individual land ownership rights.
- Introduction and use of slave labour in clearing forests apart from other forms of farm work.
- Greater freedom of settlers.
- Modern plantation and estate farming.
- Crop zoning and rotation.
- The use of farm machinery and high breed seeds.
- Extensive education on agricultural economics.
- Increased use of fertilizers.

The problems encountered by new settlers in the USA.

Unfortunately, the pioneer years in America were difficult, for the new settlers faced many problems such as:

- Many deaths due to diseases and exposure to strange climate.
- Hostility from the American Indians.
- Heavy losses due to lack of knowledge on the suitable crops for the area.
- Great difficulty in exporting food crops and beef products to the American cities and elsewhere as the food often went bad before reaching the market.

Into what farming zones is North America divided? (Describe the farming zones into which North America is divided).

North America is divided into farming zones like:

- The cotton and corn belts,
- The wheat areas,
- The dairy areas,
- The ranch areas,
- The livestock areas,
- The rice areas,
- The potato areas,
The citrus fruits areas, etc.

**Agrarian revolution in North America.**

(Explain the process of Agrarian revolution in north America).

Early European settlers went into farming, mainly to meet the demand for raw material in England and the entire Europe. For example, in Maryland and Virginia, tobacco was produced. Rice and Indigo were grown as major crops in Georgia and South Carolina. There was large scale cotton growing in North Carolina, Arkansas, Louisiana and Texas. Other crops grown include sugarcane, fruits, vegetables, wheat and corn. The drier north-eastern parts of the USA specialized in ranching and dairying. The south emerged as a cotton zone, the central region as a maize zone and the north-western region as a wheat growing area.

Before mechanization, Agriculture in the USA, particularly cotton and sugarcane plantations, depended on slave labor from West Africa.

Agriculture in the USA underwent great changes that promoted her development in industry, transport and urbanization.

**The inventions made in Agriculture in the USA during the Agrarian Revolution.**

In 1791, the Spinning Mule was invented in Britain to separate cotton seed from the fibre, to spin the thread and to weave the cloth, all at the same time. This transformed farming in the USA tremendously.

In 1834, John Perkins invented the Refrigerator, which was perfected by John Gorrie and a Frenchman called Ferdinand Carre. The refrigerator preserves food by keeping it under low temperatures. With it, farmers could now transport and export large quantities of food crops and beef products.

In 1837, John Deere from Illinois invented the Steel plough, which was stronger than the wooden and iron ploughs and could be used on hard ground. In 1847, Deere opened a factory for mass production of much needed steel ploughs.

In 1839, American businessmen invented the skill of heating and storing food in airtight tins for it to last for many years without going bad. This, together with the refrigerator, solved the problem of produce failing to reach the market in good time and condition. The produce could now draw good prices and big profits.
In 1847, Cyrus McCormick established a factory in Chicago for manufacturing reapers, which he had invented in 1831 in Virginia. Daniel Massey in Canada also invented the reaper. Cormick’s invention of the reaper was negatively received by slave owners, who preferred cheap human labour.

In 1862, the Homestead Act was passed, which legalized individual land ownership and authorized the federal government to grant financial assistance and loans for farmers to buy and develop land. With this, farmers took up large scale farming.

In the 1890s, transport and communication systems and the entire infrastructure were stepped up, enabling American farmers to easily transport their products and acquire fertilizers, machinery and other necessities much faster than ever before.

How the invention of the spinning Mule in 1791 transformed farming in the USA

- Cotton farmers got quick big profits.
- More land was opened up for cotton cultivation.
- Cotton yields got higher as improved methods were applied.
- Cotton became so valuable that it sustained employment for many people in England.

How inventions in and stepping up of transport and communication systems in the 1890s boosted agricultural activities in the USA.

- Alexander Graham Bell’s invention of the telegraph and telephone by 1877 further enhanced communication.
- Michael Faraday’s invention of electricity and Thomas Edison’s invention of the electric lump in 1879 as well as discovery of oil further provided the fuel required by farmers and industrialists for agricultural purposes.
- Agriculture and industry were further boosted by the full development and regular or mass production and sale of motor vehicles to the public by 1891 and the invention of the aeroplane by the Wright brothers in 1903, all of which turned the world into a global village.

How features of American agriculture.

(Identify the characteristics of Agrarian revolution in the Americas).

- Large scale farming for adequate food supply and provision of raw materials for industries.
Zoning and diversification, due to differences in climate and soil fertility, with various areas specializing in certain farming activities e.g. ranching and dairying in the drier north-eastern parts, cotton cultivation in the south, maize growing in the central region and wheat cultivation in the north-west.

Heavy investment in the field of science and research. This resulted in better high breed seeds and different strains of livestock. As the use of fertilizer increased, pest control measures were invented.

Monumental changes and milestones in the development of agriculture in the world, fuelled by peasant emigration into the USA from Europe, bringing skills, enterprise and enthusiasm as well as animal breeds and crop varieties.

Export trade. American agriculture largely comprised cash crops like sugarcane, cotton, tobacco and indigo, grown to provide raw materials for European (especially British) industries.

Grants and loans to farmers, for buying and developing land.

Explain the impact of the Agrarian revolution in the USA.

Diversification of agriculture through the introduction of new crops and animals from Britain.

Inventions, e.g. the steel plough by John Deere and the reaper by Cyrus McCormick.

Use of fertilizers and high breed seeds.

Improved food production.

Expansion of agriculture-related industries.

Mechanization of farming to replace slave labour.

Improvement and expansion of transport network.

Increased population due to adequate food supply and emigration into the USA from Western Europe.

Enhancement of research and scientific inventions, particularly in the field of agriculture.

Increased trade between the USA and Western Europe.

**FOOD SITUATION IN AFRICA AND THE REST OF THE THIRD WORLD**

Most third world countries underwent colonialism. This greatly weakened their
economies, which explains why most of them had very poor food situations by the time they got their independence.

**The main causes of food shortage in Africa.**

- Population growth rate that is higher than that of food production.
- Poor land use and inefficient agricultural practices.
- Adverse climatic or weather conditions e.g. floods and long spells of drought.
- Desertification or formation of wasteland due to destructive human activities e.g. deforestation, overgrazing and pollution.
- Concentration on cash crop growing, with least or no attention to cultivation of food crops.
- Rural-urban migration, whereby the innovative young people leave farms in the countryside to search for better means of livelihood in towns.
- Lack of inputs such as fertilizers and pesticides.
- Political instability arising from coups as well as civil and international wars, which causes diversion of attention from production to dependence.
- Declining popularity of indigenous crops like cassava, yams, millet and sorghum, which are resistant to drought and diseases. Farmers have resorted to cultivation of exotic crops like maize, rice and wheat, which may be unsuitable for particular areas, causing artificial food shortage.
- Poor or lack of storage facilities, which leads to great postharvest losses.
- Foreign debt burden as well as over-reliance on foreign aid, which have created a Dependency syndrome and apathy towards problem solving.
- Poor economic planning as governments have no sound food policies. Government funds are often put to development of unviable industrial projects.
- Poor land tenure systems, whereby, in most countries, most arable land is in the hands of a few influential people while more industrious farmers own very small pieces, which they have exhausted due to overuse.
- The HIV-AIDS scourge, which has caused death of many among the work force, who are in their prime years and are economically productive, particularly in the agricultural sector.
Lack of funds for carrying out irrigation and other forms of land reclamation, purchase of machinery, or hiring labour.

xvi) Colonial education, which was geared towards white collar jobs in urban centres and neglected manual jobs such as farming.

xvii) Poor infrastructure, particularly transport and communication, which hinders or undermines transportation of food from one place to another.

xviii) High dependency ratio, whereby the population in the third world largely comprises people that are not involved in food production.

What are the effects of food shortage in Africa and the Third world?

Starvation, which has been widely experienced.

The Refugee crisis. As people flee or migrate from their home countries mainly due to starvation, countries to which they flee (host-countries) strain their resources in trying to accommodate such refugees.

Social problems such as cattle raids among pastoralist communities, which have caused heavy loss of life and property.

Dependence on food aid.

Disruption of children’s education due to constant search for food.

Poor economic development as hungry people can hardly concentrate on work.

Stagnation of the agro based industries such as sugar milling factories.

A lot of unemployment since most industries in the third world are agro based e.g. baking and confectionery, milk processing, etc.

The possible solutions to the problem of food shortage in Africa and the rest of the Third world.

Land reclamation to produce and bring more land to substantial use, e.g. Yala swamp reclamation scheme in Kenya and desert reclamation in Libya.

Irrigation as well as use of fertilizer and machinery for better yields, as is the case in Egypt, India and Pakistan.

formulation and adoption of sound national food policies to open the agricultural sector to new ideas on better food production.

Introduction of new methods of farming rather than relying on traditional ones, most
of which are outdated.

- Giving farmers incentives in form of loans, grants and other subsidies for the development of farms as well as buying of fertilizer, machinery and other farm inputs.
- Reduction of taxes on farm inputs to encourage more farmers to take up food production.
- Educating farmers on good farming methods e.g. soil conservation, intercropping, terracing and afforestation to provide soil cover and reverse the trend in soil erosion.
- Intensive agricultural research to produce cheaper affordable fertilizer and to develop better crop varieties, adaptable to various climatic conditions and which can mature quickly.
- Assistance to farmers in marketing their produce as well as subsidizing expensive farm inputs.
- Stressing self sufficiency by devoting sizable portions of family land to cultivation of food crops through strong government food policies.
- Building good storage facilities and educating farmers on better storage practices to minimize loss before, during and after harvest.
- Control and elimination of pests and diseases, which are a great hindrance to farming.
- Improvement of infrastructure and transport systems as well as better pricing of farm produce to the advantage of farmers.
- Cultivation of indigenous crops for provision of food where exotic ones fail.
- Peaceful conflict resolution for enhancement of democracy and an end to civil and other forms of strife for alleviation of poverty and devotion of resources to food production instead of funding useless wars.

The steps taken to remedy food shortage in Kenya.

- Extensive research by research bodies such as the Kenya Agricultural Research Institute (KARI), which have resulted in production of crop varieties that are resistant to drought and diseases. A good example here is Katumani maize.
- Introduction of genetically engineered crops and animals, which are resistant to pests and diseases.
- Establishment of agricultural training institutions e.g. Edgerton University, the
University of Nairobi and the Jomo Kenyatta University of Agriculture and Technology for training and production of experts such as Agricultural officers, Veterinary doctors and horticultural experts.

- Inclusion of the teaching of agriculture in the school curriculum to educate learners about new and better techniques of farming that should boost food production in Kenya.

- Educating people on the need for family planning so that families only have the number of children they can feed and provide for.

- Formulation of a Food Security policy for enhancement of food production and to ensure that a certain amount of food is kept for emergencies and that unscrupulous businessmen do not export certain foodstuffs when the country needs them.