5.1.1

Domesticating and transforming nature to produce food

Human beings have always **used nature to meet their needs**. They first relied on hunting, fishing and gathering to obtain their food.

The Neolithic revolution occurred around 10 000 years BCE. Humanity abandoned gathering food and moved on to agriculture. This evolved over time, as techniques and means of production improved.
The terms 'agriculture' and 'farming' both cover all tillage and animal stockbreeding activities, as well as work in the natural environment, which enable growing crops and the breeding of living beings that are useful to humans, mainly for food. This includes plants and animals, and fungi and microbes too.

Our ancestors began to develop techniques that modified nature, to create favourable conditions for the cultivation of crops and for stockbreeding. The aim was to increase yields, i.e. the quantity of products obtained in relation to the area used and the work involved.

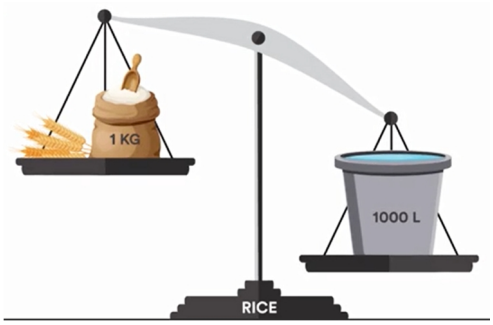
The main methods developed included deforestation, irrigation and soil fertilisation, as well as control of animal and plant reproduction.

DEFORESTATION

Deforestation is the destruction of forests to make usable areas. Nowadays, most deforestation is to free up land for farming. The world population is increasing; we have to produce more food, so we have to expand arable land.

IRRIGATION

Growing plants and vegetables requires enormous quantities of water. As an example, manufacturing 1 kg of cereals requires an average of 1000 L of water!



There are two possible ways of guaranteeing such a water supply:

- Using rainwater. This is called rainfed agriculture.
- Using rivers, lakes, reservoirs or groundwater. This is known as irrigated agriculture.

Some ancient civilisations developed ingenious irrigation systems, most often by exploiting the overflow of major rivers. For example, in Ancient Egypt, the overflow of the Nile deposited silt that increased the fertility of the fields. However, farmers still had to irrigate them. To do this, they dug channels which they fed by using shadufs, a form of tipping device, which could draw water from wells to the fields.

Today, as in the past, farmers choose the system best suited to the crops and to their natural environment.
For example, they can direct water to crops by digging channels. On sloping ground, they can create a system of terraces to facilitate the flow of water and its infiltration into the soil.
Of course, there are also systems for watering crops by imitating rainfall. Such methods can be carried out on a very large scale, for example to water fields of wheat or corn.

It is estimated that over 70% of the water currently consumed in the world is used in farming.

FERTILISATION

If soil is cultivated just as it is, it will gradually deteriorate and, with time, will produce less and less. To remedy this, the first farmers introduced fallowing, where land is not sown for a period of time, but instead is ploughed and fortified with manure, a mixture of animal droppings and bedding, to make the soil fertile again. This method of fertilisation gradually became widespread, with or without leaving land fallow.

Today, the chemical industry produces mineral fertilisers, which are widely used to enrich the land in phosphate, potassium, nitrogen and nitrates.

CONTROLLING ANIMAL AND PLANT VARIETIES

Improving animal breeds and plant varieties improves products and increases yield.

For example, through mass selection, which consists of selecting and using only the most effective seeds and animals.

Another technique used is that of **crossbreeding**, where animals or plants are selected based on the characteristics to be transmitted to the daughter species. Crossbreeding produces what is called a **hybrid**, which presents a combination of its parents' genetic characteristics.

Corn, for example, was created by selecting and crossbreeding a wild grass called teosinte. Pre-Columbian civilisations cultivated corn and, by selecting the most productive plants, over the years, they increased the size and number of kernels of corn on each cob.

For a very long time, these improvements were based on experience rather than knowledge of biological processes. It is only very recently that we have begun to understand how living organisms function and how to use these discoveries to improve the efficiency of selection. This is the era of genetics, DNA and GMOs.

TWO MAJOR TYPES OF FARMING

There are two main types of farming, which evolved alongside each other and address different issues: extensive and intensive farming.

Extensive farming does not aim to maximise production. As such, it does not use extensive irrigation systems or industrially produced chemical fertilisers. It relies mainly on local natural resources. Extensive farming brings lower yields than intensive farming.

Techniques developed from the 19th century onwards bring higher yields. **Intensive farming** uses agricultural machines and large-scale irrigation methods, and relies on fertilisers and on industrial phytosanitary products to protect crops.
Likewise, **intensive stockbreeding** aims to increase yield, in particular by increasing the density of animals on the farm.

Intensive farming has enabled many countries to achieve food security, making it possible to feed the population better by providing sufficient quantities of food. However, it also poses problems, such as depletion of soil fertility (thus requiring the use of ever-larger quantities of fertiliser), or reduction in biodiversity, and pollution of soil and water.