Selective breeding
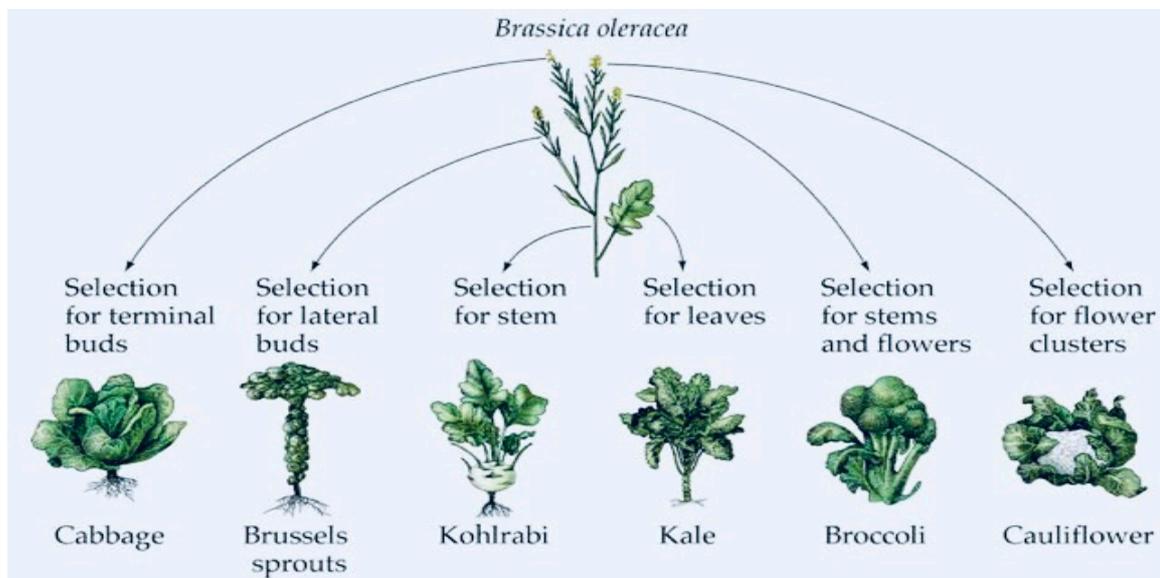
➤ **Selective breeding**, also known as **artificial selection**, is when humans breed specific individuals from a **species** together to produce offspring with particular **genes** and **desired traits**.

➤ Humans have been doing this process for thousands of years, the most early examples being **domesticating** animals and producing **crops** from wild plants.

    1.   **Parents** with specific **desired traits** are selected and **bred** together.

    2.   **Offspring** that have the **desired traits** are selected and **bred** together.

    3.   This repeats over many **generations** until the whole population will have the **characteristic** selected for.

Brassica oleracea

Selection for terminal buds — Cabbage
Selection for lateral buds — Brussels sprouts
Selection for stem — Kohlrabi
Selection for leaves — Kale
Selection for stems and flowers — Broccoli
Selection for flower clusters — Cauliflower

➤ **Examples of selective breeding**

    1.   Breeding **animals** that produce the most **meat** or **milk** together can increase **yields**.

    2.   **Crops** with **disease resistance** are be bred together to increase **crop yields.**

    3.   **Dogs** have been selectively bred to have desired traits such as a **gentle nature** or to look a certain way.

   4.   **Plants** can be selectively bred to have **bigger** or more **unusual flowers** for aesthetic purposes.

Main steps of Selective Breeding

Selective breeding takes place over many generations. These are the main steps for both plants and animals involve:

1.   Decide which characteristics are important enough to select.

2.   Choose parents that show these characteristics from a mixed population. They are bred together.

3.   Choose the best offspring with the desired characteristics to produce the next generation.

4.   Repeat the process continuously over many generations, until all offspring show the desired characteristics.
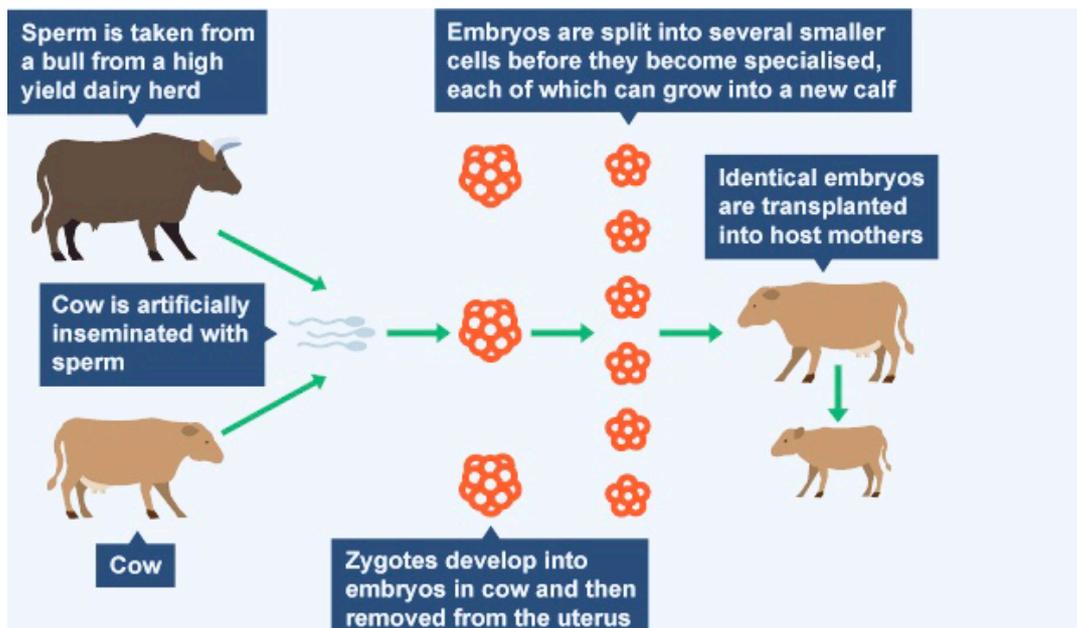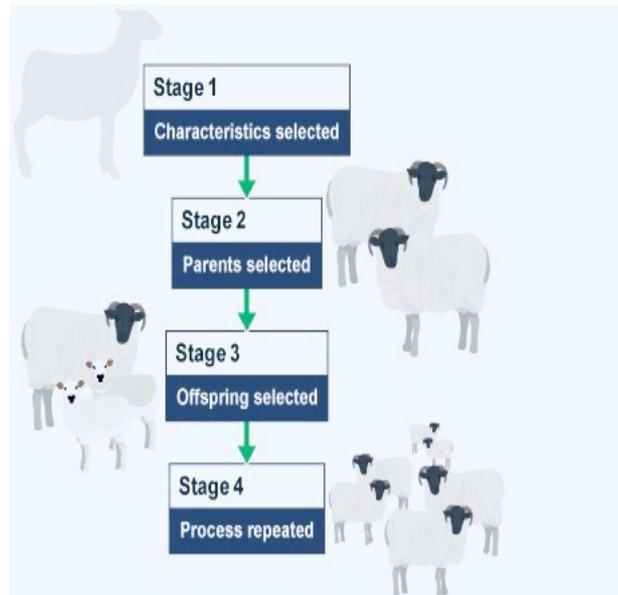
Desired Traits of plants and Animals

➤ Farmers selectively breed different types of cows with highly desirable characteristics in order to produce the best meat and dairy.Characteristics can be chosen for usefulness or appearance:

➤ **Desired characteristics in plants:**

There are many desired characteristics but some common characteristics are given below

1.   disease resistance in food crops
2.   wheat or any other grain plants that produce lots of grain
3.   large or unusual flowers

➤ **Desired characteristics in animals:**

There are many desired characteristics but some common characteristics are given below

1.   animals that produce lots of milk or meat
2.   chickens that lay large eggs
3.   domestic dogs that have a gentle nature

➤ The new varieties may be economically important. For example, they may provide more or better quality food, or allow farmers to feed more people.

Benefits and risks of selective breeding

➤ Because of selective breeding, future generations of selectively bred plants and animals will all share very similar genes which will reduce variation.
➤ Genes and their different alleles within a population are known as its **gene pool.**
➤ Inbreeding can lead to a reduced gene pool, making it more difficult to produce new varieties in the future. This also makes organisms prone to certain diseases or inherited defects.

Benefits of selective breeding include:

1.   New varieties may be economically important, by producing more or better quality food
2.   Animals can be selected that cannot cause harm, for example cattle without horns

Risks of selective breeding include:

1.   Reduced genetic variation can lead to attack by specific insects or disease, which could be extremely destructive

2.   Rare disease genes can be unknowingly selected as part of a positive trait, leading to problems with specific organisms, eg a high percentage of Dalmatian dogs are deaf.

3.   Can create physical problems in specific organisms, eg large dogs can have faulty hips due to not being formed correctly.

Difference between Natural selection and Artificial selection

Natural Selection	Artificial Selection
It's long and slow	It's faster
There's more variation in the population hence, if the environment changes/ there is a disease, survival chances for the offspring are higher	There's not much variation in the population hence, survival chances for the offspring are lower
Reproducing individuals have characteristics that suit their environment	Reproducing individuals have characteristics that are desirable by humans
There's less likely to be inbreeding so offspring are healthier	There's more likely to be inbreeding which reduces variation and increases the chances of getting genetic disorders
It occurs naturally in the wild to all organisms	It only occurs in the organisms chosen by humans