1. What is plant breeding?

Breeding:
Breeding is turning wild species into cultivated plants. The breeding of agricultural crops is as old as agriculture itself. It started with the selection of wild grasses that produced a lot of seed. Ultimately this resulted in cereals. Nowadays breeding is an art in itself. Breeders seek out the ideal combination of characteristics by combining a property of plant A (for example 'high yield') with a property of plant B ('good quality'). They do this by crossing the two plants with each other. In nature this happens as the result of pollen being spread by bees or the wind; the new seeds contain a variation of combinations of these characteristics.

In breeding a similar thing happens: crossing is brought about by collecting pollen from one plant and placing it on the pistil of the other plant, see Figure 1. This specialist work can be quite a fiddly job depending on the species of plant. It depends, among other things, on the size of the flower and the number of seeds with one crossing.

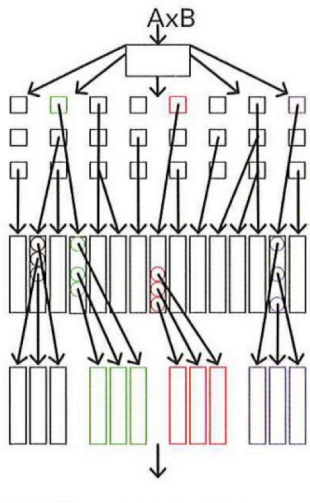
Left: two onion plants in the field are crossed with each other by being placed next to each other in a gauze enclosure with several flies, which carry out the pollination (Photo: Louis Bolk Instituut).

Rights: the pistil of a tomato flower on the mother plant is manually dipped into a pile of pollen collected from the father plant (Photo: F. Meijer-Dekens, Wageningen University).

Figures 1 and 2. Different pollination methods in breeding

A crossing produces offspring (seeds) that have all taken a different mix of characteristics from the parents (just as brothers and sisters do). Breeders choose and select those plant types that have the desired combination of characteristics. Breeders sometime repeat this process of crossing and selection for several years until they have achieved the desired result. Ultimately the development of a new variety can take around ten years.

Breeders first of all create a lot of variation through crossing, then they select the desired plant types, see Figure 3.



A crossing between plant A and plant B produces the F1 (first generation of offspring) from which individual plants are selected.

In the F2 the seeds of every selected plant are harvested separately and sowed in plots.

In the F3 individual plants are again selected from the best plots and the seeds of these are sowed so that the best plants or plots can again be selected for F5 or F6.

In the F6-F8 the best lines are tested for a few years at various locations. The best ones are registered as a new variety. On average the whole process from crossing to variety takes 8 - 10 years.

Figure 3. Selection process to create a new variety by crossing plant A and plant B.

Breeding is always necessary

Breeding is on ongoing process that aims to meet the constantly changing requirements of growers, supermarkets and consumers. Growers, for example, find resistance to new diseases and pests important, whereas other characteristics such as shelf life, colour, shape and taste are important to consumers. The climate too changes, which means that varieties are needed that are able to withstand changing and irregular weather patterns that involve long periods of drought or rain.

Growers will always be on the lookout for an even better variety that suits their business. A variety is always a sort of compromise, as it is impossible to get all the desired characteristics in one variety.

Figure 4. Pollinated tomato flowers with a tag indicating the father and the mother (photo left). One of the seeds may become a successful variety (photo right)