HYBRID
The history and science of plant breeding
Noel KINGSBURY

Blanca Van Hasselt

Humans have always been doing plant selection of some kind or another. In prehistoric times, people came back to places where they had found grains, fruits or plants they liked. The seeds of these plants were replanted so that next season there would be a new batch of the same.

In the book "Hybrid" Noel Kingsbury describes the long history and successive steps in the evolution of plant selection and breeding. Initially, there are the farmers that sow, grow and harvest their crop. They keep a part of the harvest during the winter to sow these seeds the next spring for the following cycle of wheat, corn, onions, potatoes, carrots or whatever the crop may be. In this traditional way, each farmer is doing his own selection. The knowledge and insight of Gregor Mendel about plant genetics led to deliberate crossing of plants and the creation of hybrids. The aims were to "improve" the plants for: higher yields; resistance to pests and diseases; and adapting plants to grow in different latitudes where seasons and daylight is longer or shorter than in the place where the plants originally occur. Some other "improvements" aim at, for example, wheat or rice with shorter stalks so that it does not fall over and the grains are not lost for consumption, or waste energy in the stalks which is the unproductive part of the plant. It is also important that the grains ripen exactly at the same time so that the harvest can be done on a large scale and gives a homogeneous crop. While in nature it is important that seeds are able to spread, this is not the case with farming: seeds or grains should not fall out of the ear before the harvesting machine comes along. For fruit, the breeding focuses on shape, colour and on aspects of handling. These days apples, pears and tomatoes are handled by machines, transported by conveyor bands, and have to travel half the country to be sold in the cities, therefore it is important that they keep well and still look fresh when they are on the shelves. But the requirements are different for tomatoes that are eaten fresh, that are canned or that are worked into ketchup; hence the breeding aims at different factors. Among the chapters discussing selecting, breeding and improving, it appears that among the many aspects of "improvement" one is missing: taste! Indeed, taste is an individual factor, it differs from one person to the other, but worse, taste means natural sugars, and sugars mean that the fruits ripen or rot fast and thus, no longer transport or mechanical handling. Taste is not a top parameter for breeding.

Another aspect of breeding is the fact that in nature the ancestors of our cultivated plants often have different genders. So for example the ancestors of the strawberry had female and male plants. Only the female plant could produce the strawberries, but it would only do so if a male plant was nearby. The breeding has led to the creation of plants that combine the two genders so that each individual plant is able to bear fruit even for an isolated plant.

The book discusses grains (wheat, barley, rice, corn or maize), roots (carrots, potatoes, onions, sugarbeets), fruits (apples, pears, plums, cherries), all kinds of berries, flowers (roses, orchids, tulips and daffodils) and ornamental plants (dahlia).

A specific chapter is dedicated to corn or maize. Maize is not a plant you will find in the wild. It has been thoroughly improved by the Aztecs. As is the case for most hybrids, a stable product is only obtained from the first generation of hybridisation. Successive generations give unpredictable results. Maize can self-fertilise (by male and female parts on the same plant) so when a hybrid is wanted, the plant must be cross-fertilised. In order to ensure the cross-fertilisation, two types of maize would be planted in alternate rows. Then for one type the male parts (tassels) would be cut out to avoid the self-fertilisation. This is intensive and tiring work. Later a machine was developed which could do this much faster. Today genetically modified (GM) strains with male sterility are used for creating the hybrids, so detasseling is no longer done. Of course there is a lot of discussion about GM of plants used for consumption, with headlines about 'Frankenfood' (in association with the monster of Frankenstein). However more unsettling breeding techniques are seldom spoken about. An illustration is the "Nashi" or Asian pear. This pear is a result of Radiation Breeding. This technique had considerable support in Japan, something of an irony given the country's history as the only recipient of nuclear weaponry. Japan's Institute for Radiation Breeding used circular fields of 100m radius with an 88.8 terabecquerel Cobalt-60 source at the centre of the field, surrounded by a shielding dyke of 8 metres high. Globally around twenty such fields were constructed during the 1950's and 1960's, but few now remain.

Other chapters discuss aspects of Green Revolution, where the breeding of high yielding hybrids allows for big harvests and significant improvement of economic and social conditions in countries which were formerly dependent on import and which are now exporting. However, the use of high yielding hybrids requires that seeds can no longer be produced by farmers (a share of the previous year's harvest). It requires that seeds are bought from breeders, specialised industries and laboratories. This leads to a very different economic system where farmers are no longer independent. Farmers have to buy their seeds every year, and the breeders are setting the price and conditions. This situation also leads to a narrowing of variety and large numbers of species to become lost. In case of plant diseases or pests it leaves the crop very vulnerable.

This book with more than 400 pages has a lot of interesting topics. Unfortunately, the text is difficult to read because of a lack of structure. Often reference is made to future or past chapters, which makes the reading confusing. However if you don't mind this then there is a lot to learn from this book.