Technology changes in the Hungarian hybrid maize seed industry over the past 50 years

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The first written evidence of maize production goes back five thousand years, to the Maya culture. Compared with this, modern hybrid maize, with its fifty-year history, is still in its infancy.

The first major step towards hybrid maize was the development of maize lines, which began about a hundred years ago (EAST, SHULL 1909). The history of hybrid maize in Hungary began with the registration and marketing of the hybrid MV5. Up till then, no special technology had been required for seed production and sowing. The farmers simply shelled cobs from the previous year and sowed the seed by hand, using a seed drill. With the development of lines, mass crossing and mechanical sowing, it became necessary to elaborate a large-scale technology for seed production.

The first seed drier was installed in Martonvásár in autumn 1956, while 1957 saw the construction of the first seed plants, which underwent substantial reconstruction in the 1970s. Four new plants have been built since 1987 (Kiskun Research Centre, Kiskunhalas; IKR, Bábolna; Pioneer, Szarvas; Syngenta, Mezőtúr).

The history of developments in the seed industry has simply followed the need to satisfy requirements stemming from the physiological, chemical and biological properties of the seed.

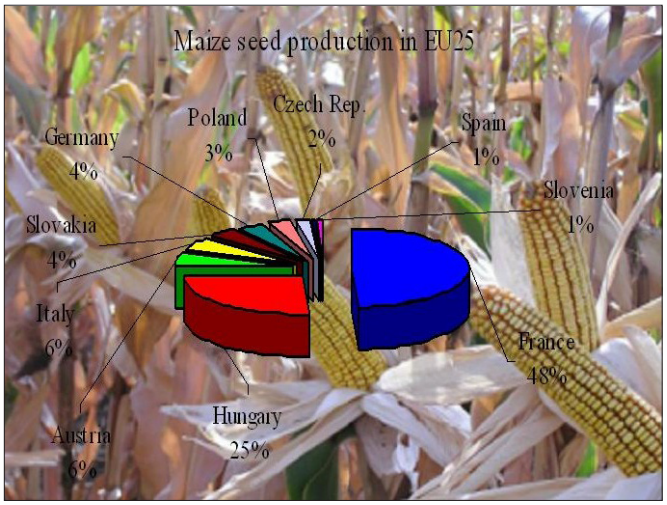
The seed represents the value created by breeders in new hybrids. The seed must therefore equal the hybrid in excellence. The criteria are very strict: the seed sold to farmers should contain only genetically pure, undamaged kernels (technical purity), almost all of which are capable of growing into viable, fertile plants (germination ability, cold test index). This necessitates a high standard of field multiplication (mass crossing) and great care in handling the seed produced by the plants.

One major criterion for successful field multiplication is that the parental lines should flower in synchrony. Despite many efforts, the only technique that has proved effective is the careful choice of sowing date. This is no longer the subject of research, but variations in the number of male lines, the ratio of male and female rows and the territorial ratio of the male rows compared to the female rows have led to important technological solutions. The aim of field multiplication technologies is to achieve the best rate of fertilisation for the given hybrid, which means choosing the most appropriate row ratio and the best number and arrangement of male rows, which may be anything from none to an 8:2 ratio.

Genetic purity is also determined in the field, and little can be done to improve it in later stages of the technology. The removal of non-typical plants and of the tassels of female plants is carried out mainly by hand in order to ensure that the female line cannot act as pollinator. This can also be achieved by using male sterile lines, but in the vast majority of cases detasselling is applied in practice.

Due to the declining availability of manual workers, mechanical solutions are being increasingly sought. Harvesting is now carried out exclusively by machines. Whether harvesting is carried out with or without dehusking depends on the technology applied in the seed plant and on the opinions of the relevant experts. The starting and finishing dates of harvest are crucial and the choice of the optimum date is based on regular checks on the grain moisture content.

The technology applied is also a limiting factor, but considerable progress has been achieved in this field. The most up-to-date driers for corn on the cob are



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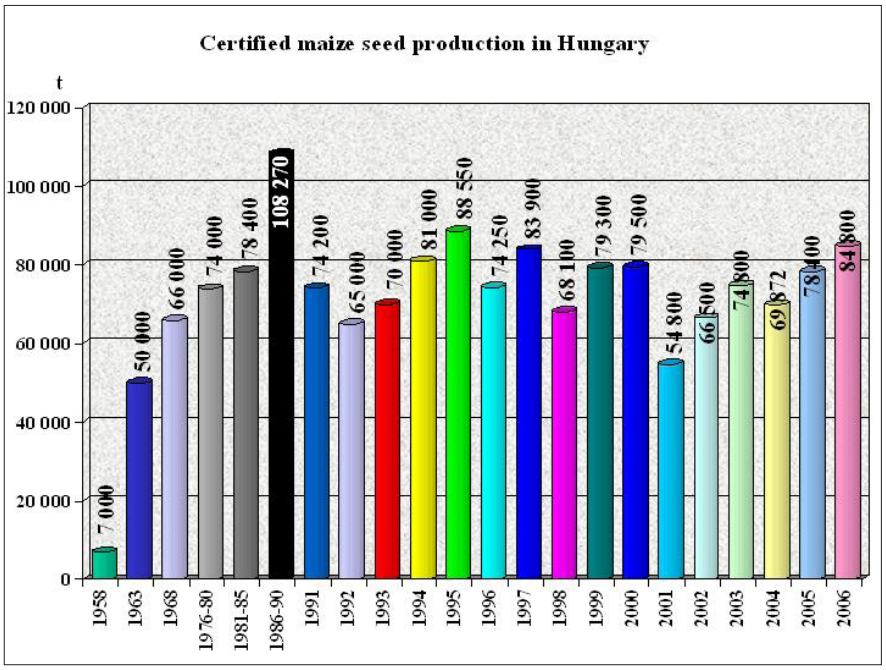

capable of drying maize with a high (38-42%) moisture content to the optimum 12-13% level using extremely gentle water extraction.

The level of technical purity depends primarily on the processing of the dry seed, followed by size grading (seed width and thickness), calibration (width, thickness and length) and selection based on specific weight. Calibration has exhibited the greatest variation over the years, beginning with a single fraction and at one time involving separation into 16-18 fractions, while nowadays only 2-4-6 fractions are distinguished.

This can be attributed mainly to technical improvements in seed drills and to the uniform size of the kernels within each line.

Seed protection has been an important aspect right from the start, and there can be no doubt that fungicidal seed dressing is essential for the production of seeds satisfying modern criteria and is now required by law. Many different formulations of seed dressing agents were used in earlier years, but now only liquid dressing agents are used, which provide excellent adhesion on the seed. The greatest advances have been made in the field of insecticidal seed dressing, where instead of the traditional litre/tonne rates, the quantities are now calculated for individual seeds. For this purpose computer-controlled seed dressing machines have been developed, which are now an integral part of all up-to-date seed processing plants.

In the field of packaging, the emphasis is now on the use of environment-friendly materials. Instead of plastic sacks, the seed is now packed in paper sacks or boxes. Each sack contains the quantity of seed required for unit sowing area (50,000, 70,000 or 80,000 seeds per sack).

Hungarian regulations on quality have always been extremely strict. The seed was originally classified as first or second grade, but these categories disappeared when Hungary entered the European Union. The general principle now is that only the top quality is saleable. Due to the fierce competition, there is now an unwritten law that any maize seed with a germination percentage of less than 93% cannot be sold as seed.

The development of the seed industry in Hungary can be regarded as a success story. This can be attributed to the rapid rate of development in breeding, leading to the release of excellent hybrids for farm cultivation, and thereby making it essential to produce seed of the best possible quality.