4300 PHENOCROP

European SME competes with the world's best

The Eurostars Programme, which funds research projects driven by SMEs, gave a biotech company a push that will help it to compete on a market estimated to be worth nearly 30 billion euros.

KeyGene, a Dutch-based SME in the vegetable and field crop seeds sector, develops new traits through what is known as molecular plant breeding - an updated version of an approach historians believe has been around since almost the beginning of humanity. The company's researchers do not directly manipulate the plant genes but take advantage of their natural genetic diversity to select the best of them.

The observation of a plant's characteristics necessary for this selection is called phenotyping. What KeyGene's biologists are good at is knowing which plant is really the best, thanks to the most advanced phenotyping technologies. In the agro-industry, phenotyping is key to the development of new varieties, but it is also a work-intensive procedure. In 2007, sensing market demand, KeyGene decided to invest in the development of a technology to make the whole process much easier.

Phenotyping technology

KeyGene's agronomic engineers brought together two techniques, which were until now used separately: the investigation of a plant's DNA and the automated observation of its growth and characteristics. The result of the Eurostars Phenocrop project is a technology able to determine which phenotypes are linked to a gene. This novel technique has already been implemented in the company's greenhouses: phenotyping is performed by cameras and a conveyor belt transports plants through different scanning areas. During its participation in the Eurostars programme, KeyGene increased its capacity to 1.300 plants, which can be automatically monitored day and night.

The plants are subject to conditions that mimic those found in the fields where they will be grown by KeyGene's clients, with the same watering conditions, sun exposure, temperature and soil type. The company's researchers are then able to compare the results obtained with the genetic profile of the plant, making it possible to investigate characteristics such as colour, architecture, leaf-shape and water content. KeyGene engineers are the first in Europe to offer this service to their customers all over the world.

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> **Herco Van Liere -** Vice-President Business Development, Keygene N.V.

'We enable the companies we work with to have a constant competitive edge, helping them to innovate,' says Herco van Liere, responsible for the company's business development. Being selected for the Eurostars Programme was a

great opportunity for the company. 'Investing in new technologies is easier with the backing of public money, and Eurostars will also help us to get on the market faster, with a return on investment for the crop monitoring technology in an estimated three years instead of four.'

A breeding success

The Dutch vegetable producers that have been working with KeyGene from the beginning have seen their turnover increase to 400 million euro a year, and KeyGene itself is set to cross over to the territory of big businesses. Most importantly, it intends to do so without growing any genetically-modified (GM) organism, the company being engaged in what it calls a 'green gene revolution'. 'It is commonly believed to be the case, but completely false that only genetic modification can make plants more resistant to drought or diseases, it can also be done in different ways,' says Marco van Schriek, KeyGene's team leader, Digital Phenotyping and Greenhouse.

Early on, KeyGene's management decided to use non-GM breeding approaches to improve crop varieties. Obtaining the authorisation to introduce a GM plant to the market requires high investment. 'This is a model we cannot follow,' explains van Schriek. 'But we were able to develop patent protected non-GMO traits developed through advanced breeding'.

An international collaboration

During the years of research necessary to develop the technology, the company's team of engineers collaborated with another research group called LemnaTec, based in Aachen, Germany. LemnaTec brought in the engineering and hardware know-how, whereas KeyGene provided its thorough knowledge of plants and innovative spirit. The collaboration has put both companies on the right track. 'Anybody who grows seeds in the world could be a potential customer,' says van Schriek.

After almost 25 years of existence, KeyGene works with a client base that represents a significant part of the worldwide seed market, worth an estimated 30 billion euro. But there is also another explanation for KeyGene's amazing trajectory. 'The world population explodes, and the damages brought by climate change increase rapidly: the scarcity of water resources and the impact of new plagues and insects on cultures grow apace, we must adapt our plants' says Herco. The technology developed in KeyGene facilities, with the support of Eurostars, is one of the few that give an environmentally friendly solution to the problem.

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Project participants:
Netherlands, Germany

Budget: **1.5 MEuro**
Duration: **23 months**

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