Harvesting knowledge and experience

The challenge of ensuring food security for China's growing population comes with the responsibility of caring with the environment at the same time. The vast increases in crop production made possible through the work of Huazhong Agricultural University (HZAU) horticulturists and crop researchers will be essential to feeding China's population.

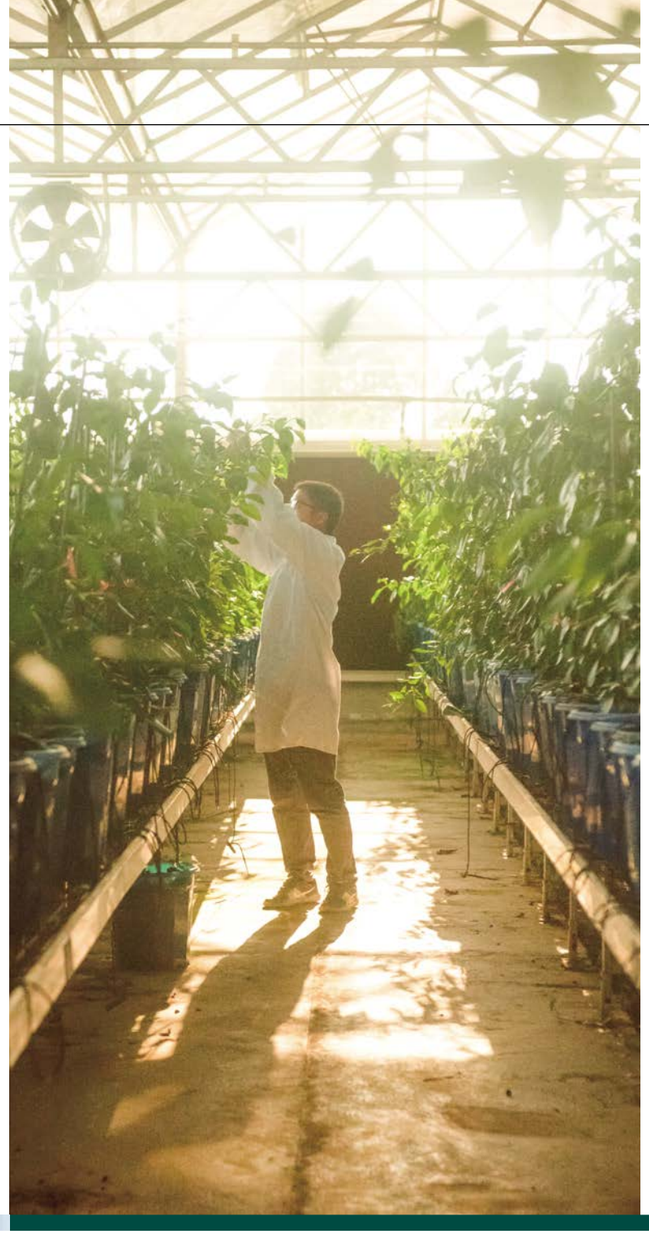
Established in 1940, HZAU's horticulture programme was the first in China to offer a doctorate in fruit studies. Focusing on the study of fruits, vegetables and tea, as well as ornamental gardening, HZAU's faculty boasts world-renowned research on citrus, tomatoes and potatoes.

By building an efficient cell engineering research system, HZAU citrus researchers have substantially shortened the breeding cycle of some citrus fruits by combining conventional approaches with modern biotechnologies. This group also created seedless citrus varieties and various different ploidy germplasm resources using cell engineering techniques. Having analysed the most widely used genomes in citrus and tomatoes, HZAU horticulturists have also located the genes that control the transition from sexual to asexual reproduction in citrus, and the fruit size variation in tomatoes. These results have been published in many key journals, including *Nature Genetics*.

Cell engineering has also been applied to potato studies. HZAU researchers have established a commercialized system that produces 200,000 microtubes in vitro per square metre annually, significantly boosting China's production of the staple. New varieties and breeding technologies for tomatoes, potatoes and tea developed at HZAU are widely applied across China.

In the crop sciences, HZAU researchers have developed breeding theories and new varieties for rapeseed, cotton, rice, barley and corn. Their world-leading analyses of important agronomic traits and their links to genes have contributed to attempts to harness hybrid vigour for improved breeding. Their theories and technological innovations, including a rice rationing system, have contributed to green and efficient crop production, earning HZAU a number of national science and technology awards. Several HZAU researchers are also among the most prolific or the most cited authors in rapeseed, rice, corn or cotton studies.

HZAU is striving to become a world-class crop research centre, which will also provide technical support to commercial growers. It is planning to construct a comprehensive genetic editing service and crop information research platform, which will add to its two national key laboratories to complement its existing research facilities. ■



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Making the most of a growth business

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China's agricultural development is in a critical transition period that demands systematic studies on its agricultural resources and environmental economy, food economy and security, agribusiness management, and research on how the agricultural industry impacts rural development. The agricultural economic management programme at HZAU will focus on these emerging issues and seek to address the challenges of China's agricultural development.

The programme opens ideas at the intersections of agricultural science, economics and life sciences, and seeks to leverage HZAU's existing resources and research strengths to develop in new interdisciplinary areas. Its researchers are experts in sustainable agriculture, working on the mechanisms of carbon emission increase, the impact of climate change on agricultural yields, and recycling and using agricultural waste. These specialities have helped on projects in Africa, to help alleviate the poverty of local farmers.

HZAU food economists have led large-scale projects examining Chinese nutrition and health, particularly the health and economic effects of nutrition enhancement technologies, such as hybridization and gene editing. Their studies on China's food market inform many of the development strategies employed by the nation's food industry.

Against the backdrop of China's promotion of an 'internet-plus' strategy for economic development, agribusiness researchers are looking into the effects of internet technology on the food supply chain. They also focus on the trade, circulation and marketing of agri-products. Their monitoring of the price and market fluctuations of agri-products helps to protect against the risks of the market.

Committed to the study of agricultural industry, the programme has seven experts on China's agricultural economy and biotechnology industry. Researchers are also regularly engaged in field work in rural areas, investigating patterns in local economic development and providing policy advice on agricultural development. HZAU acts as a thinktank and is currently leading a strategic study on Chinese food security.

The programme also boasts exchange programmes that take researchers to Cornell University and the International Food Policy Research Institute, among other international research institutions, and has organized a number of international conferences. A partnership with Harper Adams University in the UK has led to a joint undergraduate programme on international agri-food marketing. ■

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The fruits of hard work

China is the world's biggest citrus producer and has the largest land area cultivated for this purpose. The rapid development of its citrus industry is inseparable from the innovative work of Deng Xiuxin and his team at HZAU.

Deng was China's first doctoral graduate in fruit studies and is a leading player in citrus research, after tackling many of the key constraints in the development of the Chinese citrus industry. He has been devoted to genetic improvement and cultivation technologies since his graduate studies at HZAU in 1981. Basic research by his team on somatic cell hybridization has led to a new approach for generating seedless citrus cultivars via cell fusion. Deng has also applied modern molecular marker technology to genetic analysis of regenerated plants, having established a complete cell fusion technology system for fruit trees and other woody plants. Through cell engineering, his team has developed new citrus varieties with improved qualities.

In recent years, Deng's research on citrus genomes and the genes associated with polyembryony has gained global recognition, pushing China's citrus research reputation to world-standing. One of the world's most prolific researchers in this field, Deng is the first Chinese researcher to receive the Outstanding International Horticulturist award from the American Horticultural Society, and the first Chinese fellow of the International Society of Citriculture. He became a member of the Chinese Academy of Engineering in 2007.

Contributing to local economy and societal development is at the heart of Deng's efforts. He travels around China's major citrus growing areas, providing policy recommendations to support industrial planning. In Hubei province, for example, Deng's strategies for variety selection and breeding have led to improved citrus varieties that bring greater economic benefits and increased income to farmers. His team is also helping to build experimental stations and breeding centres for improved citrus varieties.

Finally, Deng's technology to keep fruits fresh and prolong maturation periods has enabled the year-round provision of fresh citrus fruits to the market, which has boosted the local citrus industry. ■