

China devises food safety solutions to overcome challenges like limited land, reliance on imports

By DAVID HO in Hong Kong
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Catering is big business and, naturally, so is supplying the ingredients that go into the meals served.

A good example is the humble soybean.

According to the Chinese University of Hong Kong (CUHK), soybeans are the third most important cash crop in international trade.

Yet, it is a crop that Chinese farmers are not producing enough of. Reuters estimates that China imports 60 percent of the soybeans traded worldwide.

According to the US Department of Agriculture, soybeans were the biggest US agriculture export to China last year at a value of \$12.3 billion.

Soybeans were on a list of US goods for recent retaliatory tariffs in the ongoing trade war between the United States and China.

"Despite it being a popular ingredient in Chinese cuisine, about 80 percent of soybeans used in China are imported, mainly from the US or Brazil. The remaining 20 percent comes from domestic sources. This is due to the limited amount of land in the country," said Lam Hon-ming, director of the Center for Soybean Research of the Partner State Key Laboratory of Agrobiotechnology at CUHK.

"Only 41 percent of China's arable land is considered top grade by agricultural standards, which is a very small percentage for such a big country. A large amount of that land is being used for major crops like rice, wheat, corn and cotton."

In addition, a lot of China's land has been overexploited through over 3,000 years of agricultural use.

"In the last few decades, China has had a boom in its population. To up agricultural productivity, fertilizers have been used, but that is not the sustainable way to go about it. It makes the soil become mineralized and changes its texture. Producing fertilizer also creates greenhouse gases and causes pollution," said Lam.

He suggested intercropping as a way to expand the variety of agricultural production.

"Intercropping is the practice of growing two or more crops in close proximity to each other. Growing legumes like soybeans helps as it naturally fertilizes the soil through nitrogen fixation," said Lam, who sees this being practiced more now in northwestern parts of China.

"It's also an innovative and creative way to achieve greater and more diverse yields on a piece of land. Growing more soybeans can also help reduce the dependency on imports."



Farmers weed rice seedlings on the outskirts of Lianyungang city, East China's Jiangsu province, on May 28. Researchers are finding ways to produce crops, including rice, with better adaptability to help farmers in regions with harsher farming conditions. IMAGINECHINA

Sustainability on the menu

A lot of the land faces problems with high soil salinity, droughts and limited water flow. That reduces the areas that can be used for agriculture as not many crops can withstand those conditions. Salinization poses a severe threat to agricultural productivity, affecting more than 20 percent of irrigated lands globally.

But one avenue that can help Chinese agricultural producers utilize such lands is through genetic testing.

In collaboration with genome giant BGI, headquartered in Shenzhen in South China's Guangdong province, and the Chinese Academy of Agricultural Sciences, Lam and his team used genome sequencing technology to construct soybean genetic maps and successfully identified key genetic regions that control 11 important agronomic traits of soybeans. One of the findings was a major salt tolerance gene in wild soybeans.

"Through genetic testing, we can identify seeds that are able to withstand adverse environments. Production of stress tolerant soybeans enables a better use of marginal and low-fertility lands, and hence could promote sustainable agriculture," said Lam.

Since then, Lam has been working with China soybean breeders to produce soybeans that can be grown on saline lands, via non-genetically modified methods. He and his team have also continued their experiments in semi-arid and arid lands in Northwest China, with a goal of identifying drought-tolerant genes from wild soybeans.

The final goal of his research is

to produce a 'super soybean' that is tolerant to both salt and drought.

"Producing crops with better adaptability will help farmers in regions with harsher farming conditions," said Lam.

Unveiling novel genomic information may be the key for improvement in other essential crops, such as rice.

Lam has also uncovered the structure and functions of the Rice YchF-type G-protein. He found that this particular family of G-protein binds to two main triphosphates to restrain a plant's defense response and increases its stress tolerance to avoid the waste of energy in normal circumstances.

To understand how to control this type of protein would be helpful for maintaining high agricultural productivity under adverse conditions, such as crop disease and high salinity.

Lam said this falls in the area of gene-edited crops (GECs). GECs, as distinct from genetically modified organisms (GMOs), only require the editing of an organism's native genome, whereas GMOs involve the introduction of foreign DNA sequences.

However, GECs are still in a gray area for the time being, which could hinder the application of such findings.

"China does not allow for its domestically cultivated major crops, like rice and wheat, to be GMOs. It is still making up its mind about defining gene editing in crops as such. In the US, GECs are not considered GMO," said Lam.

But in July, the European Union's

top court ruled that GECs were to be subject to the same tough regulations as GMOs.

Where China swings on this may have an impact on whether the country's food supply could be further sourced closer to home in the future.

Sustainability is not just measured by the environmental impact, but the effects on the people producing the ingredients as well.

Science is but one of the many parts in the overall picture. Fair trade is also important in ensuring fair prices, wages and community benefits for farmers, workers and their families. And it would be up to catering customers to drive that.

"At present, some companies in the catering industry in China have a special emphasis on fair trade, but generally it's been foreign brands that have led in this space, such as Starbucks with its fair trade coffee," said Jacky Wong Suk-hung, transportation, hospitality and services leader for Deloitte China.

"But this concept is still relatively new in the domestic catering market, and currently it is not seen in practice. The catering consumers themselves do not have a good understanding of this concept and they would be the ones driving this trend. So the rise of that concept should still be slow in the short to medium term."

But Wong is hopeful of substantial growth in its acceptance in the long run.

Lam from CUHK said companies also have a duty beyond financial considerations. "Besides fair trade practices like offering market access

and fair prices for crops, they should also buy from small farms," he said.

According to *National Geographic*, more than 90 percent of all Chinese farms are less than 2.5 acres (or 1 hectare) in size. The average farm size is also among the smallest in the world.

"These types of farms have limited land and not much bargaining power. These farmers tend to grow crops based on last year's trends, and sometimes they lose money from that, depending on the market. It would be ideal if companies could communicate and advise them on what they need them to grow. That way, they can also ensure these farmers adopt environmentally friendly and sustainable farming practices," said Lam.

Besides customers and corporations, the government also has to get involved.

"China has been talking about food safety since the case where (the industrial chemical) melamine was found in milk powder in 2008. There was public awareness and new laws and regulations about food safety after that. So the same thing needs to be done with sustainable agriculture and food supply before there is a crisis," said Lam.

"With the population in India and African countries booming exponentially, they will look toward China and how it will handle sustainability. This is where it should be an example for other countries," he added.

"Sustainability in food not only means secure access to it, but the supply chain is one that will last hundreds of years from now with limited environmental impact."