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Reinventing the farm

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Hirofumi Yamamoto

PHOTO: Spread's lettuce factory in Kyoto

Consider it a wake-up call from nature. Asian crops were devastated by a severe drought this year, highlighting the urgent need to stabilize farm output and brace for the consequences of climate change. And with the region's population projected to continue growing over the long term, this is no easy task.

The good news is that answers are starting to emerge. Agribusinesses are harnessing information technology. Organic farms and so-called plant factories are becoming hothouses for innovation. International investors are keen to water the seeds.

This week, we head out into the fields -- and some cutting-edge facilities -- to glimpse the future of Asian farming.

TOKYO Even the most technologically advanced indoor farm starts with a very basic problem. When you take sunlight out of the equation you gain more control, but you also lose a whole lot of free energy.

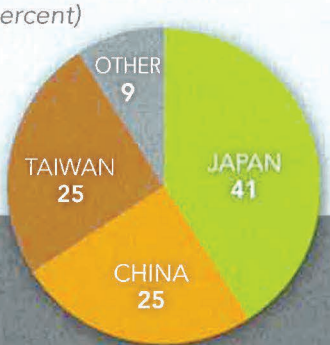
The bankruptcy of a Japanese farming venture in 2015 highlighted this dilemma. The factory had been touted in the media as the future of farming. Partly due to power costs, however, its break-even price was simply too high compared with conventional farms.

Still, the bankruptcy does not mean the hype was baseless. Under new ownership, the factory is becoming a viable business by finding buyers who are willing to pay a premium for high-quality produce. Similar indoor farming ventures are adding value by growing vegetables rich in specific nutrients.

And then there is Spread, which is taking a different approach. It wants to win in the mass market -- in supermarkets -- and that means competing against veggies grown in the field.

LOCATION OF ASIA'S PLANT FACTORIES

(in percent)



Indoor vegetable farming has surged in Japan, with an estimated 210 factories operating in 2016 versus 34 in 2009. Overall, the country accounts for 41% of Asia's plant factories. These roots are gradually spreading across borders: Panasonic runs a plant factory in Singapore. Tanabe, an auto component manufacturer, produces leaf lettuce and other vegetables in Vietnam. Fujitsu teamed up with Vietnamese internet company FPT to open a plant factory and other facilities in the suburbs of Hanoi late last year.

Sources: Japan Plant Factory Association, Dr. Wei Fang, Dr. Changhoo Chun, Dr. Qing Yang, Singapore Farming, Newbean Capital analysis

Spread's secret? Volume. The company packs a lot of lettuce into its 3,000-sq.-meter factory in western Kyoto, Japan's ancient capital. The heads grow on rows upon rows of shelves under fluorescent lights. The factory has the capacity to ship 21,000 of them per day -- enough to make the lettuce profitable even if it sells for 198 yen ($1.79). The average price in Tokyo as of November was 251 yen, according to Numbeo, which tracks the cost of living in big cities.

The facility, which started operating in 2008, was stuck in the red for the first five years. But efficiency improvements lifted it into the black in the year ended March 2014. Shinji Inada, Spread's CEO, explained that putting the hardware in place is only half the battle. "It is up to the staff to adapt to the environment," he said. "Once the business becomes profitable, profit is generally stable."

Just because the lettuce grows indoors does not mean the weather is a complete nonfactor. Air conditioning must be set up to keep the temperature steady for all four seasons. Even then, there are changes in humidity. So it takes time to determine how to manage all the variables, including the light and carbon dioxide essential for photosynthesis.

All this is part of Spread's plan to live up to its name. The company is building expertise for a new factory in Kansai Science City, a research hub that straddles the prefectures of Kyoto, Osaka and Nara. The plant, now under construction, will use artificial intelligence to automate tasks like sowing seeds, replanting and harvesting. The new facility is expected to be completed in 2017.

Whether by growing crops indoors or other means, Asia needs to boost yields and mitigate extreme weather. Consumption in big markets like China and India is likely to continue growing steadily.

"Asia cannot produce enough to support itself," the Netherlands' Rabobank wrote in its "Asia-Pacific: agricultural perspectives" report. The bank noted that "limited arable land, inadequate water and poor resource management" are constraining production.

Justina Lee

PHOTO: Peter Chia, left, chief operating officer at Singapore's TLL, and Yin Zhongchao, the lab's senior principal investigator, inspect Temasek Rice.

That is at the best of times. This year, vast swaths of Asia were hit by drought linked to the El Nino weather phenomenon, resulting in massive crop failures.

RESILIENT RICE To feed itself, Asia needs solutions, and Singapore's Temasek Life Sciences Laboratory aims to provide some.

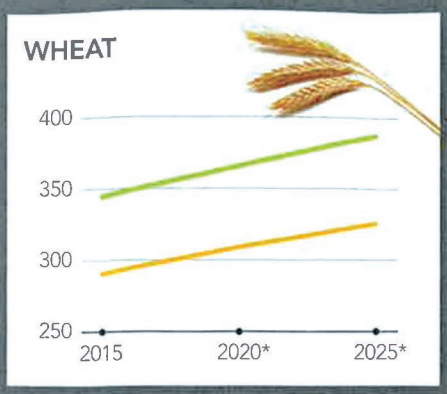
The nonprofit research institute is funded by Temasek Trust -- the philanthropic arm of sovereign wealth fund Temasek Holdings. TLL, as the lab is known, spent eight years developing Temasek Rice, a resilient breed capable of withstanding extreme weather conditions and producing higher yields.

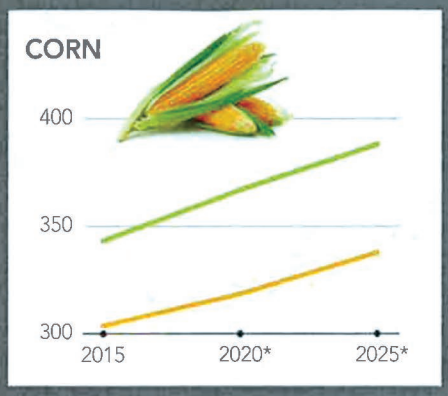
Temasek Rice was created using a modern technique known as marker-assisted selection. This allows scientists to zero in on desired traits and breed new, improved crops. Yin Zhongchao, TLL's senior principal investigator, said this type of breeding

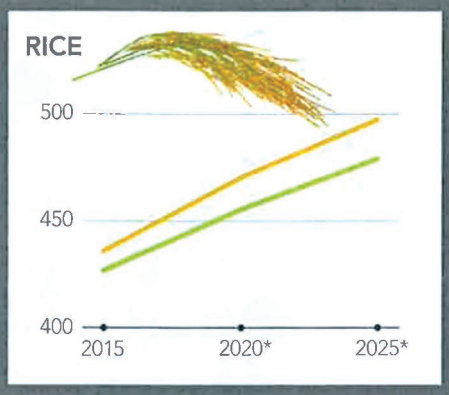
ASIAN PRODUCTION, CONSUMPTION OF AGRICULTURAL COMMODITIES

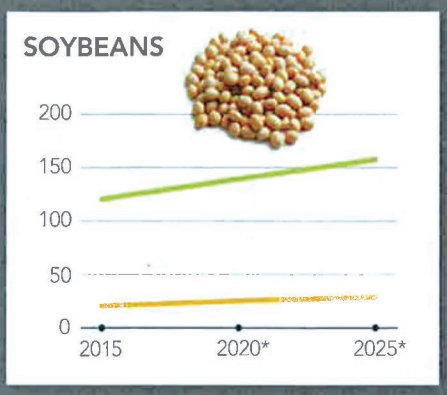
(in millions of tons)

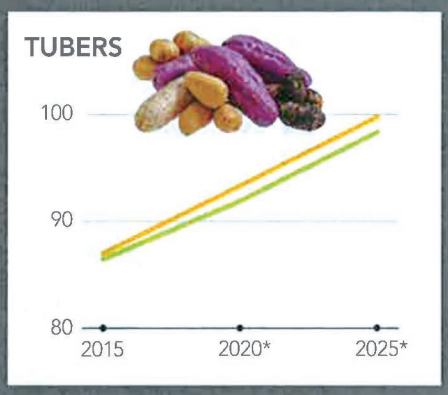
Asia's population will increase to 5 billion in 2030, from 4.4 billion in 2015, according to U.N. projections. This means that 58% of the world's 8.5 billion people will be concentrated in the region. Asian consumption of wheat, corn and soybeans is projected to consistently exceed production through 2025.











Production Consumption

Source: OECD-FAO Agricultural Outlook 2016-2025 database
** Forecast*

can enhance food security by increasing production "in a more efficient and sustainable manner."

Since land is limited in Singapore, TLL's rice is being grown in Indonesia, and the lab wants to partner with more companies to boost production.

The 2008 global food crisis was a key motivator behind the Temasek Rice project. Rising oil prices and severe weather sent food prices soaring. In developing countries, domestic rice prices climbed as much as 90% between the third quarter of 2007 and the same period of 2008, according to the FAO.

Peter Chia, TLL's chief operating officer, said the crisis showed "how vulnerable rice cultivation could be as a result of climate change."

"As agriculture becomes more knowledge intensive," he added, "our role in agriculture is not limited to production but using science, innovation and technology to create a positive impact across the whole value chain."

Thanks to the spread of mobile communications, farmers have quite a bit of knowledge at their fingertips. Even without souped-up seeds, detailed weather data and other information can help them to cope with climate change -- and other threats that come their way.

This past January, Vietnamese state telecom company VinaPhone started a service called Nong Thon Xanh, or Green Country. Basically, it turns mobile phones into farm assistants.

Through a social network, farmers can subscribe to three packages. For 10,000 dong (45 cents) per month, they get access to an agricultural warning package that includes a range of information: weather forecasts, prices, plant disease alerts, guidelines on relevant state policies, advisories on abnormal conditions affecting agriculture and so on. Coffee and rice packages, available for 31 cents and 22 cents a week respectively, offer tailored guidance to help farmers prevent diseases from wiping out their crops.

With a local partner, AgriMedia, VinaPhone has set up automated weather stations across the country. AgriMedia, in turn, has partnered with Japan's Weathernews in an effort to improve its forecasts.

VinaPhone's next step will be to build a call center, where agriculture experts will be on hand to answer questions from farmers. It also plans to expand the advice to cover gum trees, pepper and cashews.

In Indonesia, startup 8Villages provides similar services.

The advent of the internet of things -- the ever-growing web of connected gadgetry -- is bringing further big changes to the field. Japanese companies Kubota and NTT group have allied to develop automated agricultural machinery that taps big data. They envision a system that analyzes crop conditions and issues the machines instructions, be it to harvest vegetables or