CHINA’S INSATIABLE APPETITE FOR CHANGE

AN OVERVIEW OF THE COUNTRY’S EVOLVING FOOD SECURITY STRATEGY
This white paper was created by Fortune Industry Perspectives and DuPont. It is the first of a series showcasing sustainable development thought leadership, which will help inform the discussions at the 2013 Fortune Global Forum, June 6–8, 2013, in Chengdu, China. For more information on sustainable development in China, please visit www.cnnmoney.com/sponsoredinsights/dupont
Introduction

IT WASN’T SO long ago that parents in Western nations reminded recalcitrant children that “people were starving in China.” This admonition to reluctant eaters was based on harsh realities. For much of its history—and as recently as the 1970s—China was the setting for recurrent famine and starvation. But in a little more than a generation, the country has transformed itself into a model for a world increasingly concerned about feeding an exploding population. China’s journey from a state of persistent hunger to a net exporter of food is a success story that offers important lessons for the rest of the world.

China’s transformation is the result of long-term planning, consistent policies to encourage food production, and a willingness to embrace cutting-edge scientific advances. Aware that its own know-how was limited, China has welcomed science-driven companies like DuPont for food security expertise that has helped transform it into a showcase of agricultural production and improved nutrition.

“We believe that in a time of development, especially when China is now in a transitional phase, R&D and innovation will lead China from its current economic structure to where its 12th Five-Year Plan wants it to be,” says Tony Su, President of DuPont Greater China.

Feeding its burgeoning population is one of China’s top priorities.
“And science and technological R&D for sustainable solutions is the only way to go.”

The Asian nation’s success has repercussions far beyond its own borders. With nearly one in five of the world’s population, China’s demand for food affects an interconnected global economy and a worldwide supply chain. Its purchases of wheat and soybeans in the 1990s raised prices around the world, and gave a boost to economies as far-flung as Australia and Brazil. Today, its moves toward self-sufficiency and its investments in farmland abroad are also having an impact around the globe.

DuPont, a 210-year-old company with a history of doing business with China, is a global player in agriculture, food, and nutrition. Since establishing the Du Pont China Holding Company Limited in Shenzhen in 1988, it has forged 50 wholly-owned subsidiaries and joint ventures to serve the domestic marketplace in these same three areas, among many other business sectors. Among its flagship operations is its R&D center in Shanghai that focuses on product development and materials testing. Its interactions with the Chinese government offer an ideal spotlight for the company to demonstrate its commitment to science, collaboration across borders, and the evolution of locally based solutions to problems that have international repercussions.

This white paper offers a vision of advancing food security through scientific cooperation. Its purpose is to promote a discussion of the critical collaborative role that multinationals, NGOs, governments, and other organizations can play in finding solutions in China and in many other parts of the world where food security remains a challenge. With productivity of the human society at unprecedented levels, providing citizens with enough to eat is not a political option—it is a fundamental human right. China has demonstrated that this is an achievable goal for itself, and for many other countries that face the same obstacles.

While China’s success so far has been remarkable, it still has a long way to go toward establishing a sustainable food system for its people. Though it ranks first in world agricultural output
d, the world’s most populous nation faces a severe shortage of arable land—a shortage exacerbated by the effects of climate change and industrialization, as well as rapid urbanization. At the same time, as China’s people grow richer and more urbanized, they are demanding better, safer, and more nutritious diets.

The world has much to learn from China as the country works to reengineer its food supply chain—from more efficient farmland use and better infrastructure to the deployment of new bioscience and farm machinery technologies. China’s challenges are not unique; rather, they are shared by developing
WHILE CHINA’S POPULATION OF 1.3 BILLION WILL GROW ONLY MODESTLY, THE GLOBAL POPULATION IS EXPECTED TO SWELL BY NEARLY 30%, TO 9 BILLION.

economies around the world and, to some extent, by developed economies as well. While China’s population of 1.3 billion will grow only modestly—to a projected 1.5 billion by 2050—the global population is expected to swell by nearly 30%, to 9 billion².

China has 19% of the world’s population but only 7% of its farmland—an average of just 0.23 acres of farmland per person, compared with the U.S.’s three acres. A steady loss of farmland from urbanization, desertification, and flooding may help explain why China has been buying up farmland in Africa, Australia, and New Zealand³. Much of that lost farmland has been in areas that were once the country’s most fertile regions⁴.

The good news is that, despite its challenges, China—and all those who play a role in feeding its people—has reason to be optimistic. The country has made remarkable strides toward food sustainability over the past 30 years. Now the world’s largest agricultural producer, the country has increased production of coarse grain by 114% since 1983, meat by 395%, and milk by more than 1,100%, according to the Organisation for Economic Co-operation and Development (OECD)⁵. And China is the first developing country to achieve the UN Millennium Development Goal of reducing by half the number of people living in extreme poverty and hunger.

The government of China, well aware of the country’s food challenges now and in the future, is pushing ahead with programs to address them, say experts at the International Food Policy Research Institute (IFPRI). That is why current Chinese President Hu Jintao noted that food security was of vital importance to the national interest in his keynote speech at the Asia-Pacific Economic Cooperation forum in September 2012. He pledged support to strengthen the food security sector. China’s transition from a country of recurring hunger to a showcase for food security is a model for global change.

DEMOGRAPHIC TRENDS
A growing population is spurring demand for land to be used for agriculture.

1. **FOOD AVAILABILITY AND AFFORDABILITY.** “Today, humanity produces enough food to feed everyone,” Raj Patel wrote in *Foreign Policy* in 2011, “but, because of the way we distribute it, there are still a billion hungry.” Poor distribution and the sheer size of global food inventories aren’t the only issues, however. Affordability and availability are equally important. High food prices cause insecurity on the part of consumers. As recently as 2007-08, a global spike in food prices fueled instability and unrest in numerous poor countries throughout the world, accompanied by hoarding and food trade embargoes. At the same time, low prices can be just as damaging, causing insecurity for farmers and others involved in food production and related sectors.

Global food prices are nearly certain to rise over the next 15 to 20 years, says the Food and Agriculture Organization of the UN (FAO)’s Kostas Stamoulis, and they will become more volatile. As a result, China and other nations must prepare for inevitable price gyrations.

One measure of real prosperity is the percentage of household income spent on food, and despite all the progress, China’s citizens pay a high price for food. In 2006, Chinese households spent an average of 39.8% of their income on food, vs. 13.7% in the U.S. The Global Food Security Index, developed by the Economist Intelligence Unit and sponsored by DuPont, shows that China experienced the least volatility of any country in agricultural production over the past 20 years, in part because of its geographic size but also because of heavy government incentives for grain production, a practice the government is now moving away from.

2. **NUTRITION AND HEALTH.** As its population grows, China’s goal is not only to boost food production but also to improve nutritional content, increasing the micronutrients and vitamins in staple food products. And as China’s people become more affluent, food habits are changing. Like upwardly mobile people everywhere, China’s people want more nutritious, agriculturally intensive foods like meat, fish, poultry, eggs, and dairy products, as well as packaged and convenience foods compatible with their more urban and industrial lifestyles. China’s consumption of retail food products (as opposed to food grown and consumed locally) is rising by a remarkable 11% a year, according to Business Monitor International. Maintaining a healthy, balanced diet to improve population wellness for the long term is important.

Nutritional food value is a complex issue. Poor nutrition concerns rich and poor alike. “The classical Chinese diet—rich in vegetables and carbohydrates with minimal animal-sourced food—no longer exists,” Barry Popkin wrote in *Health Affairs* in 2008. The consumption of meat went from 6% to 27% of the Chinese diet between 1965 and 2005, according to the FAO.

Not surprisingly, obesity is now a growing problem in China, with attendant problems like diabetes and heart disease. According to the same article in *Health Affairs*, one in five Chinese adults is overweight. *Diabetes Care* recently estimated there were 92.4 million people in China with diabetes in 2010. In China and other developing nations, the diseases of affluence are closely tied to urbanization and increased demand for processed foods with high fat and sugar and low nutritional content.
3. **FOOD SAFETY.** Food safety is a dominant concern in China. Frequent episodes of contamination have shaken public confidence. A survey in late 2010 reported in *The Lancet* found that China’s people consider food safety their second-greatest risk in daily life, after earthquakes. Highly publicized food scandals include melamine in infant formula, steroid-contaminated meat, rice containing cadmium, and cooking oil recycled from the streets. Liu Xiumei, a researcher in China’s National Center for Food Safety, says the initial safety focus by government was on illegal additives because of the publicity those cases garnered. A national reporting system set up in 2011 has found more common causes of illness.

“From the initial research, we found that food-borne diseases caused by microorganisms make up about 60% of all reported cases,” says Liu. “The problem is more serious than chemical contamination or contamination caused by animals or plants.”

More than 94 million Chinese become ill each year from food-borne bacteria, according to a 2011 study in the *Chinese Journal of Food Hygiene*. Pathogen detection is a pressing need. This has created opportunities for foreign companies, says Hong Yang, senior researcher at Eawag, a research center near Basel, Switzerland: “People don’t trust local products, especially when they relate to children. Foreign companies and their products have higher reputations.”

Food safety is in part an infrastructure issue. China has more than 600 million farmers, with an average farm size of less than 0.65 hectares (1.6 acres). The diminutive size of most Chinese farms means that few could survive without government subsidies. Most are so marginal in economic terms that their operators lack the knowledge and technology to prevent or deal with disease outbreaks, writes Michael Boddington of Asian Agribusiness Consulting in Beijing. According to one small-hold farmer recently interviewed in *China Today*, a man named

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**CHINA: AGRICULTURAL REGIONS & ZONES**

Sources: Columbia University, Prof. Hu Zizhi & Dr Zhang Degang
Liu Shili, small-scale farming operations often contribute to the abuse of agricultural chemicals. Related challenges include counterfeiting, use of cut-rate pesticides, and industrial pollution of land and water. Better crop protection and farmer education will reduce the excessive use of chemical products and the consequent harmful residues. DuPont has collaborated with the Institute for the Control of Agrochemicals (ICAMA) in the Chinese Ministry of Agriculture to develop crop safety guidelines. DuPont has also introduced Coragen, a pesticide with far lower toxicity levels.

4. FOOD WASTE. A recent FAO study estimates that food loss and food waste in China may amount to one-third of its total food production. “Such losses are startling,” declares Zhang Tianzuo, director of farm produce processing at the Ministry of Agriculture. China’s food loss is vast in part because the country must contend with high temperatures and humidity, which increase vulnerability to disease and spoilage. Although 100% of seed in China is hybrid, the level of their resistance to disease, pests, and temperature swings varies. The nation also needs to improve quality standards in crop harvesting and storage. There is an especially critical need for ingredients that increase product shelf life by protecting food against yeast and mold for longer, as well as better food packaging that lowers the risk of food decay, contamination, and leakage during transit and on the store shelf.

5. SUSTAINABLE AGRICULTURE. While expanding the food supply, China must re-engineer farming, infrastructure, storage, and waste while improving and preserving farmland and water resources. As part of its alarming loss of arable farmland and water resources, northern China has been hit with historic dust storms and drought in recent years, and parts of the coastal south have suffered unprecedented flooding. Adding to China’s agricultural sustainability challenges is its shrinking rural workforce. True, the country has some 600 million farmers, but their average age is thought to be between 50 and 60.

In large part that’s because farming in China remains largely a subsistence activity. The average farm size is less than two-thirds of a hectare (1.6 acres), and these small farms typically consist of a half-dozen tiny, scattered fields, with farmers commuting two to three hours a day to reach them all, says Xiaobo Zhang, senior research fellow at IFPRI, who himself grew up on a collective farm. Little wonder, then, that China’s rural young are turning their backs on farm life in favor of industrial and white-collar work.
FOOD SECURITY REQUIRES an integrated, holistic approach that includes infrastructure investment, agricultural and economic development, and a host of related factors like increased human understanding and interaction. Nonetheless, science and technology are essential parts of that equation.

Recognizing the scope of needed change, China has adopted a principled approach to tackling its food security issue. The goal: to leverage breakthroughs in science and technology and create a sustainable food system for its growing population. The private and public sectors are now working closely together on the Asian nation’s targeted objectives. Spinning out of laboratories across the country are improvements in everything from seed strains to fertilizer and nutritional food ingredients. But that alone is not enough. The key to success is igniting the adoption of new best practices—modern farming techniques, food testing, and storage—at the grassroots level.

From a broad perspective, there are four pillars that represent the overarching imperatives in China’s pursuit of a sustainable food system that have been noted in the government’s long-term strategic plan:

**1. INNOVATIVE LOCAL SOLUTIONS.** Food security challenges may be global, but the solutions have to be local. Food needs to be grown and produced close to where it is most needed. Science can provide universal answers, but wide variations in environment, soil and culture, food manufacturing practices and preferences, and transportation and distribution call for local solutions. Governments need to develop policies to catalyze the adoption of best practices developed by scientific know-how.

**2. COLLABORATION.** Private-sector companies and a broad range of globally and locally focused NGOs are working in collaboration to help China achieve food security at the national and local levels—NGOs like the International Fund for Agriculture Development (IFAD), the UN’s Food and Agriculture Organization (FAO), and the World Bank. Together these participants are looking for answers that will increase production, reduce waste, fight disease, and deliver nutrition to those most in need.

**3. KNOWLEDGE TRANSFER.** Agricultural and efficient food production know-how must be brought to people and places that need it. The improved yields that farmers need come down to things like choice of seed, fertilizers, and how land is managed. In parts of China, as elsewhere in the world, small-hold farmers are working with the same planting methods that have been used for thousands of years, and keep producing and eating food that lacks the micronutrients needed for good health. Education, outreach, and knowledge transfer are vital to enhancing their productivity and viability.

**4. SUSTAINABLE SOLUTIONS.** In China and elsewhere, solutions have to be sustainable in the broadest sense of the word. This principle encompasses how food is produced, how it gets to market, even how it’s served on people’s plates. The food supply must expand in accordance with social, economic, and ecological factors such as infrastructure, storage and waste, and water quality preservation needs.
The 21st-century food supply must continually expand—in China and elsewhere—but the resources to grow and distribute food are finite. We must use them as efficiently as we can and apply inclusive scientific innovation. Sustainability encompasses social, economic, and ecological considerations, such as infrastructure, storage, waste reduction, and improving and preserving water quality—all of which are essential to achieving food security. We face a dilemma of simultaneously needing to grow food rapidly and to manage depleting resources, says the World Business Council for Sustainable Development in a 2008 report titled “Agricultural Ecosystems: Facts & Trends.”

THE CASE FOR OPTIMISM
One reason to be optimistic about China’s food security in coming years—and indeed, the world’s—is the remarkable progress that the country has made to date. Contemporary visitors can scarcely imagine the fragility of China’s food supply as recently as the 1970s, when food came from collective farms whose local officials controlled everything from crop mix and farming practices to selling prices. Systemic inefficiencies left millions of Chinese with diets far below the minimum 2,100 calories needed by the average adult. Today it is estimated that just 10% of China’s population does not get enough to eat. “For a country of that size with the recent memory of hunger, that is quite an achievement,” says Kevin Chen, China program leader for the International Food Policy Research Institute.

A second cause for optimism is that China’s government fully recognizes the challenges ahead and is pushing forward with efforts to cooperate on food security, sustainable development, agricultural trade, science, and development with multinationals, NGOs, and agricultural experts. This open approach has opened opportunities for multinationals including DuPont, Unilever, Sumitomo, and many others to establish relationships with Chinese companies and government agencies to bring advanced technology to China and adapt it to local conditions.

The secret of China’s success in addressing its food needs reflects effective long-term strategies. Investment in science and technology has helped the country make huge leaps in agricultural production in the past 25 years, and those investments are ongoing. China plans to spend more than 4 trillion yuan ($636 billion) over the decade following 2012 in seed breeding, livestock production, and agricultural transportation and storage, according to domestic media. And as attention has shifted to green concerns, R&D spending has also focused on irrigation, water conservation, soil erosion, and desertification, according to a study by Chen for the British Office of Science.

In addition, the government fully recognizes the importance of partnerships and collaboration with those who can bring cutting-edge scientific expertise to bear on China’s food security issues—leading companies, NGOs, and academics the world over who are eager to participate in helping China develop the right solutions to challenges that will ultimately be shared by other nations, if they are not already.

DuPont China, established in Shenzhen in 1988, exemplifies the kind of close partnership China has forged with many of the world’s most innovative companies. DuPont operates through some 50 subsidiaries and joint ventures in China, focusing on solutions in agriculture and nutrition, safety and protection, performance materials, and electronics and communication technologies. DuPont works directly with China’s government, its customers and consumers, including farmers, and local and global NGOs, as well as other companies, providing more than 300 product families in China—from synthetic fibers to agriculture, from food ingredients to electronics. DuPont views China as a hotbed of innovation. Over the years, it has witnessed the nation’s determination to address its major food problems—and to do so in partnership with the widest possible range of private companies and others who possess the greatest expertise and scientific know-how.
Governments like China’s don’t act alone in their quest for food security. They partner with the world’s leading industry experts from both the public and private sector to ignite change and achieve their goals. Key to that success is investing in R&D, and leveraging science and technology. Another is spurring mechanization and teaching local farmers best practices so there is a transfer of innovation at a grass-roots level.

**INVESTING IN SCIENCE**

Science and innovation are, of course, important keys to China’s ongoing progress in agriculture. China has a long history of agricultural innovation, having invented transformational water pumps and grain processing techniques more than 2,000 years ago. Once again the nation is depending on strong technological innovation to enhance its food security. “China, which in three decades has become the world’s workshop, is slowly becoming the world’s laboratory because scientific advances are steadfastly encouraged and new technologies developed,” says Pierre Pagesse, chairman of Momagri, a private think tank on global sustainable agricultural policies.

The country now invests less than half of the 1% of agricultural GDP recommended by FAO on agricultural R&D and has incentives to promote innovation in this sector, according to a report by the U.K.’s Government Office for Science. However, in its “Road to 2050” publication, the Chinese Academy of Sciences calls for an increase in R&D spending to 1.5% by 2020 and 2% by 2050. Also, private investment in agricultural R&D is growing rapidly but is still low compared with that of developed nations (22% as a proportion of public R&D, vs. 50% in developed nations).

**GOING LOCAL**

Since food security is a priority for China, currently more than half of government spending on agricultural R&D is focused on crops. The private sector is also heavily committed to improving food production for future generations. Companies like DuPont are investing in food-related R&D as well. DuPont is committing $10 billion globally to R&D and introducing 4,000 new products that will meet local needs for better nutrition, sustainability, and safety. And the company has focused on adapting its technologies to the specific needs of China by 2020. “It’s the localization...”

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**INNOVATION ON THE RISE**

China has been boosting expenditures on agricultural R&D to levels recommended by FAO.

**BILLIONS OF PPP* DOLLARS**

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*PPP is current purchasing power dollar.
**includes public, private and non profit entities
Source: OECD.Stat
of science that creates a very powerful impact in a country or a society,” says DuPont Chair and CEO Ellen Kullman.

In addressing food safety issues specific to the Chinese market, DuPont BAX® System has developed a test for Shigella, a bacteria that is one of the three most common causes of food contamination in China but encountered far less in other countries. Shigella was difficult to detect using traditional culture processes, says Jason Wang, a DuPont technology manager responsible for food safety. “The DuPont BAX® system has great sensitivity,” says Wang. “In a 5ml sample, as long as there is even one single bacterium, it can be detected with our method.”

Localization can be more than just good policy. Products developed locally can open new markets elsewhere. DuPont was concerned about the distribution chain for mild yogurt drinks popular in China, where cold storage is not always guaranteed. The company developed YO-MIX® yogurt cultures, which resist post acidification even at room temperature. Tony Su, President of DuPont Greater China, says that a substantial amount of his company’s sales in China comes from products developed locally. The added bonus is that the success of YO-MIX® in China led to global distribution in the Middle East, Africa, and elsewhere, an example of a product developed locally that can generate global revenues.

China’s openness to science and new technologies has led to numerous cases of collaboration between domestic companies and agencies and foreign entities. Dr. Harold Snyder, who heads DuPont technology in Asia Pacific, cites China’s fast-growing scientific prowess—No. 2 globally in R&D spending, No. 1 in published papers in material sciences and chemistry, and No. 3 in patents—as an indicator that such collaborations benefit both partners. “If I had to predict a country that would be a science leader 10 years from now, China will be on the map,” says Snyder.

Leading examples of science collaboration include the following:

• DuPont Pioneer has formed three joint ventures, one with Dunhuang Seed Co., based in Jiuquan. Pioneer® brand hybrid seed has been bred to better withstand insect and disease pressure in the local environment, thus reducing the number of tractor trips over a field during the growing cycle for cultivation or spraying, thereby achieving higher yields while also saving fuel and reducing emissions. This venture is engaged in R&D, production, processing, and selling of hybrid corn seed. Chinese farmers who use hybrid seed say they have enjoyed a substantial increase in productivity. “In the past, the harvest was several hundred jin [a pound] for each mu [sixth of an acre],” says Wang De Lian, a corn farmer in Qinggang, in western Heilongjiang province. “[Now] for each mu, you harvest 1,500 to 1,600 jin.”

• Unilever’s three-year-old R&D center in Shanghai aims to combine the company’s expertise in traditional Chinese medicine, structured materials, and organic chemistry to drive unique innovations for Unilever worldwide. At the same time, it brings the...
company’s global strengths in product safety and sustainability to China. Unilever has also collaborated with Chinese company COFCO Tunhe, Asia’s largest ketchup manufacturer, to develop a sustainable agriculture program that makes minimum use of water, pesticides, and fertilizers.

- Since 2003, Solae, now a fully owned part of the DuPont company, has partnered with Henan Luohe Shineway Industry Group, the largest meat processing company in China, to develop soy proteins that add nutritional quality to meat products for the Chinese market. The two companies opened a manufacturing facility in Luohe City in 2007. (DuPont acquired full ownership of its Solae joint venture in 2012.) Soy, a staple of the Chinese diet, is used in tofu, of course, and soy cooking oil is the preferred oil in Chinese cooking.

**INDUSTRIALIZATION AND MECHANIZATION**

Even as the Chinese diet becomes more complex and demand for agricultural products increases, the number of people willing to stay on the farm is shrinking. Chen says more and more small farmers see their farm income as secondary to that from a city job.

A shortage of labor means a growing need for farm equipment. In order to make agriculture more effective, China is industrializing its agricultural sector to improve productivity and achieve higher standards. Mechanization will play a key role in accomplishing this. China has set a goal of 70% mechanization by 2020, and this year’s figures for plowing, sowing, and harvesting are expected to reach 55.6%, according to the Ministry of Agriculture.

To spur the adoption of agricultural machinery, the government has boosted subsidies to farmers. They rose from $196 million in 2008 to $3.3 billion in 2012. Chen says mechanization has progressed more rapidly for certain crops, like wheat and rice, than for products like oil seeds because equipment does not exist for some of these crops, and crops like corn are often grown by small farmers on plots that cannot accommodate farm equipment. He estimates that crops like wheat and rice are 70% to 80% mechanized. Because holdings are small, says researcher Hong Yang, mechanization and the latest technologies can make farms viable: “When [others] rent the land from people who don’t want to farm and use modern technology, the income can be even higher than working in cities.”

One important role foreign companies play is exposing farmers to technological options like mechanization. DuPont Pioneer realized that while its seeds were significantly increasing yields for Chinese farmers, inefficient manual picking contributes to the waste. Globally, according to a survey by the UN’s Food and Agriculture Organization, one-third of all food crops are lost or wasted each year. Pioneer worked with a local combine manufacturing company in Heibei Province to demonstrate mechanized harvesting to local farmers.

PepsiCo is partnering with China’s Ministry of Agriculture on a pilot farm in Inner Mongolia, using advanced irrigation techniques to turn desert into potato farmland. The company is also investing $5 million in efforts by the All-China Women’s Federation to improve rural access to clean water.

John Deere & Co. has created smaller combines and tractors that suit small farm plots and tightly packed crops in some regions of China, including the shorter corn plants that have been developed for China’s soil and climate. In addition, this year the company is opening a new manufacturing facility in northeast China, in Harbin in Heilongjiang province, to support the increased demand for large agricultural products in the region. The factory—John Deere’s seventh in China—will build midsize
and large tractors, sprayers, planters, and harvesting equipment. A major player in the Chinese market since the 1970s, John Deere has worked closely with local officials to make this project an important priority.27

NUTRITION

China has collaborated with foreign companies to address a two-headed nutritional challenge in its rapid economic advancement. There are still some 130 million Chinese who do not receive adequate nutrition, according to the FAO.28 At the same time, there is the problem of the affluent segment’s evolving taste for less healthy foods.

China’s heavy subsidies to farmers, expanding agricultural production, and rising incomes from the booming economy have much to do with the dramatic reduction of hunger over the past decade. But Chinese officials have also welcomed the involvement of private companies and NGOs to tackle issues of child nutrition and healthy diets. Some partnerships to address these issues go back more than a decade. When Chinese officials decided in 2001 that they wanted to ensure that schoolchildren had an adequate diet, the food company Danisco (acquired by DuPont in 2011) worked together with Tetra Pac, a dairy machine company who cooperated tightly with Chinese Ministry of Agriculture on China’s newly created National School Milk Program. DuPont tested 10 flavored milk recipes and partnered with Chinese dairy companies, including New Hope Dairy, who supplies student milk to 2 out of 12.5 million children benefiting from the program currently. Jiang Jianping, a professor at the Chinese Academy of Agricultural Sciences who helped create the national milk program, says the role of foreign companies has been critical. “During the process of implementing the school milk program, we have to adopt advanced technology from other countries, their advanced management experience, their advanced formulations and their research results regarding nutrition and health,” says Jiang. “In this way, we can better improve our school milk program.”

In another effort targeting schoolchildren, By-Health Biotechnology in Guangzhou signed a three-year school feeding agreement earlier this year with the Global Child Nutrition Foundation to provide schools with oatmeal porridge fortified with protein and micronutrients. The product, which will feed an estimated 6,300 children in 18 schools in Guangdong province, will draw on the food science expertise of DuPont Solae.

Unilever is also working with global charity Save the Children, the China Development Research Foundation, and the Meishan government of Sichuan province to jointly carry out pilot projects for mountain village kindergartens in Sichuan that will eventually promote infant health, nutrition, and early childhood development in Beijing, Shanghai, Sichuan, Yunnan, and Tibet.

SUSTAINABILITY

The Chinese government’s new emphasis on environmental and sustainability issues is defined in the 12th Five-Year Plan. It represents a significant shift from the single-minded focus in the past on expanding agricultural production. One significant step will be to more sustainably use insecticides and other chemicals. William S. Niebur, Vice President and General Manager of DuPont Pioneer China, says the company has developed enhanced corn seeds that enable farmers to reduce their pesticide usage, favorably impacting the environment.

Other steps include the preservation of fundamental resources like water. At its industrial park in Hefei, in central China, Unilever has invested more than 14 million yuan in waste-water recycling facilities where 1,300 tons of reclaimed water can...
be processed daily. The company has also introduced a biomass furnace that could help reduce greenhouse gas emissions by 15,000 tons a year.

In the future, both domestic and foreign investments in agriculture and food processing can be expected to focus on green requirements.

**GOVERNMENT POLICY**

China’s government has gone beyond endorsing collaborations to adopt numerous policies aimed at shoring up food security and modernizing its agriculture and food-processing sectors. This is a delicate balancing act, since the country must reconcile its policy of market liberalization with the growing imbalances between its rural and urban communities. Clearly the 30-year policy of industrialization and urbanization has led to a shortage of arable land. Kevin Chen of IFPRI in Beijing says the Chinese government has been investing heavily in agriculture and irrigation to ensure the supply of food. “They will need to invest in technology to support productivity growth,” he says. He lists the following policy priorities:

- **a.** The elimination of taxes on farm income.
- **b.** Consolidation of farmland and creation of more specialized farms (farmer professional cooperatives, or FPCs) to make farming more productive and more prosperous. The percentage of villages with FPCs rose from just above zero in 1997 to more than 20% today.
- **c.** Direct subsidies to farmers for grain production and the purchase of agricultural machinery, to be directed to the most productive regions of the country. According to OECD data, subsidies to farmers soared sixfold between 2008 and 2010, to $147 billion, making China the global leader. By contrast, producer support in the U.S. reached just $25.5 billion in 2010.
- **d.** Doubling investment in water conservation reform and development, including the development of irrigation systems. The government has promoted the expansion of irrigated farmland, which rose from less than 50% of cultivated land in 1980 to nearly 60% in 2010.

**ENHANCED REGULATIONS AND STANDARDS**

On Feb. 28, 2009, China’s National People’s Congress passed the country’s first comprehensive Food Safety Law. Since then China has tightened these rules, particularly for dairy quality and safety. In June it released a five-year plan to revamp outdated or overlapping standards. The country has more than 2,000 national food regulations and more than 2,900 industry-based regulations. Many overlap or contradict one another.

The plan calls for coordination among 14 different government departments, including the Ministry of Health, the Ministry of Science and Technology, and the Ministry of Agriculture. Together they will work to modernize standards by 2015. The government will prioritize safety.
standards for dairy products, infant food, meat, alcohol, vegetable oil, and food ingredients to specify limits for dangerous ingredients in these foods. It will also set standards for testing contaminants, food ingredients, pesticides, and drug residue in food production.

China recognizes that food security can’t be achieved simply through the creation of policies. The policies also must be implemented. The government is partnering with both private-sector companies and NGOs to bolster agricultural standards, food quality, and nutrition. For example, DuPont Pioneer is assisting China’s Ministry of Agriculture to build capacity among agricultural professionals and increase technological collaboration and information exchange.

**EDUCATION AND TALENT DEVELOPMENT**

China and its partners are pursuing multiple initiatives to educate the rural workforce on new technologies that make farming more efficient and productive—as well as initiatives to educate Chinese consumers on nutrition and food safety.

DuPont is committed to engaging 2 million young people globally in educational opportunities by 2020 and to improving the livelihoods of at least 3 million farmers and their rural communities by strengthening agricultural systems. As part of this effort, DuPont Pioneer has an agronomy team to help Chinese farmers learn about hybrid corn technology, sustainable farming techniques, agribusiness, and grain marketing. This means running more than 200 pilot projects in China to demonstrate seed varieties and technologies for increasing productivity. Wang Wei, DuPont Pioneer’s Agronomy Manager, has 22 agronomists working with farmers year-round. “We have seminars in the sprouting period, the middle period, and the maturation period,” says Wang. “We also have winter training sessions so that we can provide farmers with the best planting technology so that they can apply it in their production.”

Abbott Labs is promoting a unique model for advancing clinical nutrition in China, where it established its Abbott Fund Institute of Nutrition Science in 2007, working in partnership with Project HOPE and the Shanghai Children’s Medical Center to address gaps in pediatric nutrition. Abbott is engaged in extensive training of local physicians, nurses, and dietitians, and in integrating nutrition training into local medical school curricula31.

Kraft Foods China won a CSR award last year from the Rotary Club of Shanghai for its 100 Kraft Hope Kitchens, established in partnership with the China Youth Development Foundation. The project is aimed at improving food supply, nutrition, and nutritional education for rural Chinese schoolchildren.

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**AGRICULTURAL OUTLOOK**

PRODUCTION, THOUSANDS OF KILOTONS

Source: OECD, data extracted on 20 Aug 2012 12:05 UTC (GMT)
The Kraft Hope Kitchens supply Shanghai children and their teachers with improved nutrition and nutrition education, in addition to foodstuffs donated by Kraft. To date the program has reached 50,000 children, and more kitchens are on the way. Better information flow throughout the supply chain is important too. There is often a long chain of intermediaries between the farmer and the end consumer. Farmers find it hard to foresee demand for different types of crops, and their guesswork inevitably results in scarcities of certain foods and excesses of others. DuPont's Grower Management Program issues credit cards to farmers that track their purchases and will enable the company to better understand the needs of the 8 million to 10 million farmers it serves.

**INNOVATIVE APPROACHES**

China is looking at numerous innovative approaches to achieving food security, including foreign investment in land and R&D in such places as Africa, Australia, and New Zealand. Its goal is to develop deeper trade ties with key countries to secure a pipeline of food supply for future generations. Notable long-term ventures:

- **Over the past six years, China has put down agricultural roots in Africa and has invested $3.5 billion in the sector, according to Standard Chartered Bank. But over the next few years, it has pledged to provide up to 3,000 experts for technical assistance and training, as well as to train 2,000 African agricultural technicians and set up 14 agricultural centers. China’s investment in Mozambique illustrates this commitment. Through a series of agreements, it has pledged $800 million to modernize Mozambique’s agricultural infrastructure and has financed the building of a dam and canal to bring water to arable land. Additionally, at least 100 Chinese agricultural experts are stationed in several research stations within Mozambique, working with local groups to increase crop yield and improve the performance of the agricultural sector.**

- **Fonterra is the world’s largest milk exporter. The New Zealand dairy farm is known for its technological expertise in this sector. It is now receiving Chinese government subsidies to boost dairy farms in China, since milk consumption is expected to double over the next 10 years. To date it has opened two large dairies totaling 12,000 cows, and it has two more in development, including one in Yunan province near Beijing. The goal is to produce up to 1 billion liters of high-quality milk by 2020.**

- **Australia and China are cooperating on ways to open Australia’s Northern Territory for farming. Australia’s Trade and Competitiveness minister, Craig Emerson, initiated a joint study with China’s commerce minister, Chen Deming, last May to examine policy changes needed to facilitate large-scale investment by Chinese agricultural interests. This benefits both countries, since it will help Australia in economic development while helping China bolster food imports.**

- **China is looking to the private sector to develop innovative technology solutions tailored to its particular market needs. For example, to help with China’s food waste challenges, DuPont Packaging is working with TetraPak and a local packaging company to develop custom resin applications that meet specific market needs.**

- **Investing in biotechnology is a key part of China’s agricultural reform strategy. The government is steadily increasing its investment into bio-crops to boost yields, working with such organizations as the International Service for the Acquisition of Agri-biotech Applications. Its National Transgenic New Variety Development Project includes investment in this sector.”**
CONFLUENCE OF CONCURRENT forces has made this an opportune time to study China’s path toward food security. Over the past three decades, the nation has made great strides in boosting agricultural output, improving food standards and quality, and developing technology to meet the nutritional requirements of its growing population. Government-led reform that has turbocharged the economy has helped propel these changes. So has the transfer of technology and know-how. The result is that today China is the world’s largest agricultural producer, and the proportion of Chinese suffering from hunger and malnutrition has dropped from 21.4% in 1990 to 11.5% in 2012, according to the FAO.

Progress has been made amid sweeping demographic shifts. Besides a boom in population, urbanization has literally changed China’s landscape with a loss of some of its best farmland, or about 6.5% of its total arable area. Other concurrent forces are also at work, including rising demand for water and increasing incidence of drought in southern China due to climate change; the loss of local farmers to city centers; and changing dietary habits of a more affluent middle class.

But China has made its remarkable progress despite these challenges because the government has made investing in food security a national priority. It increased its spending on agricultural R&D from $403 million in 1986 to $4 billion in 2008. Looking ahead, it plans to invest more than 4 trillion yuan ($636 billion) over the next decade in seed breeding, livestock raising, agricultural transportation and storage, irrigation, and better use of fertilizers, according to domestic media. In addition, efforts are under way to preserve farmland for future generations. That’s because sustainability is crucial if any long-term strategy will succeed.

That has not meant that China has been insular and focused only on developing its domestic market. As a member of the World Trade Organization, it recognizes that it is just one piece of the global food puzzle. So it has gone beyond its borders to invest in farmland and technology ventures around the world—from Africa to Brazil to New Zealand—to begin to develop an international approach to the challenge at hand. The interesting twist is it’s a pay-it-forward strategy. While forging cross-border relationships that can help extend access to the additional farmland it needs for future generations,
China is also transferring its own science and know-how to other emerging-market countries so they, too, can move up the food chain and contribute to global food security. These policies have paid off in real improvements in the standard of living for ordinary Chinese and new levels of expectation from customers. “We must innovate locally from the Chinese perspective to satisfy future needs,” says Tony Su, President of DuPont Greater China.

William S. Niebur of DuPont Pioneer recalls meeting a Chinese farmer whose small farm in Jilin Province produced just enough corn to fill his crib. His dream, the farmer confessed, was to fill the corncrib twice over. Using a Pioneer® brand seed and attending some seminars, he was able to do that within a few years. With the profits, he was able to afford to send his son to secondary school, and the son was able to find a job in Jilin City. But the son now comes home on breaks and holidays to help with the harvest, maintaining the family tie between rural and urban China.

The Jilin farmer’s story encapsulates many of the objectives and the impact science-based solutions can have on China’s quest for food security. This form of inclusive innovation generates positive benefits on improving the human condition globally.

This rapid evolution of living standards has emboldened Chinese consumers to insist on a wider range of foods, better nutrition, safer products, and economic development that won’t worsen the environment and further deplete natural resources. The government has responded with stricter standards for food safety and greater crop varieties, and opened the door for foreign companies to bring to China scientific knowledge that can be adapted to the specifics of the local environment.

At the same time, China’s considerable and continuing investments in new agricultural technologies, biotech, and nutrition present business opportunities for science companies like DuPont. With so much at stake, says Niebur, “the opportunity to participate in the greatest transformation of agriculture that will occur in this century, is unique and important for DuPont.”

As China expands its capabilities and capacity, there will be opportunities for NGOs, SOEs, private sector and academia, with expertise in agriculture, nutrition, and the food chain. Groups that bring global resources to bear in solving local issues, through inclusive innovation, will generate sustainable solutions to these most pressing issues.

The time is ripe for the international community—and multinationals in particular—to follow the lead of other institutions that are collaborating with China to make its agricultural and food sectors more sustainable. These trailblazers recognize that their investments will have a multiplier effect for the citizens of the world. That’s because problems solved in China often offer solutions that can be applied in other countries—with the necessary local cooperation and adaptation. China’s openness to science and new technology makes it an ideal laboratory, but with a market size that provides powerful incentives for companies to innovate. China’s success in addressing these problems, and its handling of partnerships with a wide range of entities—including NGOs, foreign companies, and local governments—has made it an important benchmark for some developing nations that are still struggling to solve many of the same problems.

The next step for China is to spark a global dialogue—one that engages every stakeholder in discussion and debate about the broad range of food-security issues and possible sustainable solutions. An integrated national approach that is able to knit the myriad industry initiatives under way is needed. After all, the country’s efforts to achieve food security are, in effect, doable only if all the parties work together toward a common goal.
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