

Agriculture in high-growth markets

Securing global food supplies



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Foreword

The world is at the start of a new agricultural era, in which boosting yields and reducing harvest losses will be essential to feeding the world's growing populations. Emerging markets—and in particular the most advanced developing economies—are at the forefront of this movement. In recent years Brazil, Russia, India and China, among others, have had a major influence on changing global food production and consumption patterns. They have also been some of the world's most successful food producers over the last two decades. As their influence on global food markets rises, it is worth investigating these countries' success factors in the field of agricultural production.

The Economist Intelligence Unit has conducted this research to assess the agricultural successes of the high-growth markets of Brazil, Russia, India and China. Based on these successes, the report offers a number of best-practice solutions for other regions of the world. The hope is that, by examining these markets' agricultural practices, some consensus might emerge about how best to co-operate on a global level to secure food supplies over the coming decades.

About this research

Agriculture in high-growth markets: securing global food supplies is an Economist Intelligence Unit report which discusses the food supply challenges that the world faces in the coming decades; successful measures being taken to expand food production in high-growth countries; and the potential for further improvements in food productivity. The findings of this white paper are based on desk research and interviews with food and agriculture experts conducted by the Economist Intelligence Unit.

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- Dr Alysson Paolinelli, president, Brazilian Association of Corn Growers (Abramilho), Brazil
- Professor Jikun Huang, director, Centre for Chinese Agricultural Policy, Chinese Academy of Sciences, China
- Dr Dmitri Rylko, general director, Institute for Agricultural Market Studies, Russia
- Dr Shenggen Fan, director general, International Food Policy Research Institute, US
- Dr Mendes Ribeiro Filho, minister of agriculture, livestock and food supply, Brazil
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Executive summary

Demand for food continues to accelerate, driven by growing populations, rising prosperity and ongoing urbanisation, among others. These factors are particularly evident in high-growth markets, most notably the populous nations of Brazil, Russia, India, and China—the so-called BRIC countries. At the same time, food production is coming under pressure owing to limitations on resources and other environmental considerations. In the coming decades, doing more with less will be a key priority.

Already, many high-growth markets are demonstrating a strong commitment to tackling the challenges of food supply in their countries. While these countries' agricultural systems are diverse, their successes can provide valuable lessons for other high-growth areas—and for developed markets too. After all, increases in agricultural productivity across the world, including in North America and western Europe, are vital to meeting demand for food.

This paper, based on desk research and on in-depth interviews with food and agriculture experts spanning the private sector, public sector and academia, discusses rising agricultural productivity in high-growth markets. The research examines the challenges of food supply in the coming decades; agricultural successes

in high-growth markets; and further options to secure global food supplies.

The key findings of the research are as follows.

- **Global food production must expand as much as 3% annually to meet demand.**

Drivers behind the continuing rise in food demand include growing populations, increasing prosperity, and ongoing urbanisation. To secure food supplies for the planet's population, agricultural output must expand as much as 3% annually in the years to 2030, in contrast to recent growth of just over 2%. Improvements in food productivity are needed to reach this goal.

- **Agriculture will increasingly be ecologically sustainable, technologically driven, and inclusive of small suppliers.**

Food production will have a lesser environmental impact; it will be driven by plant breeding technologies, including hybridisation and genetic modification; and it will embrace smaller suppliers as well as larger ones. Ongoing efforts to drive food productivity are likely to be concentrated in high-growth economies, where demand for food is rising most sharply.

- **High-growth economies are acting decisively to boost agricultural productivity.**

High-growth countries are already taking

action to increase agricultural productivity. Governments are investing heavily in agricultural research, offering financial backing, promoting best practices in farming, and strengthening rural infrastructure. Far from being one-off initiatives, these measures are part of wide-ranging agricultural programmes.

● **There is still scope for improvement in food productivity.**

Despite clear successes in food production in high-growth economies, there is still scope for improvement. In some cases, further mechanisation may boost output; in other cases, better crop management may drive productivity; and in others still, improved infrastructure may ease access to market. Across the board, plant breeding technologies also hold the key to productivity gains.

● **Lessons can be drawn from the successes of the high-growth economies.**

Agricultural successes in high-growth emerging markets are often based on a widespread adoption of plant breeding technologies, including hybridisation and genetic modification. A further success factor appears to be an entrepreneurial environment, which promotes innovation and attracts investment. At the same time, subsidies appear to play a limited role in the agricultural sector in high-growth economies.

● **Closer global co-operation can drive food production.**

To capitalise on agricultural successes in high-growth markets, the sharing of resources such as research capabilities, technology and knowledge is critical. Furthermore, closer co-operation across countries and regions, and across the public and private sectors, looks certain to help stabilise food prices and secure global food supplies in the next decades.

1

Addressing the challenge of rising food demand

Food demand is on the rise. Drivers of accelerating consumption include growth in the world population, which the UN expects will reach 9bn by 2050, from 7bn today. By some estimates, 90% of this increase in population will take place in developing countries. Economic expansion in populous high-growth countries is leading to rising per-head calorie consumption, most evident in an ongoing shift from rices, grains and pulses towards meats. Meanwhile, urbanisation levels are rising, spurring demand for processed foods and ready-to-eat meals (see box: *China – Linking smallholders to supermarkets*).

Yet, if the world's swelling population is to count on continued access to food at reasonable prices, policymakers across the globe must address fundamental issues relating to agricultural production. Ramesh Chand, the director of the National Centre for Agricultural Economics and Policy Research in India, calculates that, to secure global food supplies, agricultural production must expand as much as 3% annually in the years to 2030, in contrast to annual growth of just over 2% between 1990 and 2007. More than ever before, rising food output will depend on increasing productivity, rather than on expanding the area under cultivation.

Against this background, there is some cause for concern that the growth rate of agricultural

productivity in industrialised nations is falling. "We are seeing a declining trend of growth in total factor productivity in agriculture and in food production, in the US and in Europe," says Shenggen Fan, the director general of the International Food Policy Research Institute in the US. "The developed markets, like the US and Europe, have really under-invested in their agriculture," Dr Fan adds. Another expert who voices concern is Thaís Affonso, the head of business intelligence at Syngenta, an agribusiness company based in Switzerland. "The pace of yield improvement in the major crops that use most of the agricultural area has slowed down," she says, "and we must reverse that."

As policymakers address the challenge of rising food demand, they face a number of obstacles. Chief among these, perhaps, is the physical limitation of resources. The availability of agricultural land is on a downward trend, in part through rising levels of urbanisation, industrialisation and infrastructure, as well as degradation through salinisation or waterlogging. At the same time, biofuel demand is placing pressure on existing arable land, and the expansion of agriculture in tropical areas carries a high environmental cost.

A further obstacle that policymakers face is the volatility of food prices. Jikun Huang, the

China – Linking smallholders to supermarkets

Since 2004, when the Chinese government eased restrictions on foreign capital in China's retail sector, the number of supermarkets in the country has increased sharply. Rising incomes and rapid urbanisation in China have guaranteed the widespread adoption of this grocery model.

In part, the success of supermarkets in China has come at the cost of open markets selling local agricultural produce. To ensure that smallholders are not excluded from the new food supply chain, China's Ministry of Commerce launched a promotional programme, called Linking Farmers with Supermarkets, in 2007.

Since the launch of the programme several supermarket chains have reviewed their purchasing models to ensure that local producers continue to play a significant role in supply. These include the following.

Carrefour: The French supermarket group started its Farmer Direct Purchase plan in

2007. As part of the scheme, Carrefour buys its agricultural produce through certified farmers' co-operatives in the region.

Walmart: The largest foreign retailer in China, Walmart buys direct from farmers through a so-called dragon head company, which coordinates smallholders.

Wumei: China's fast-growing domestic supermarket chain began its direct purchase programme in 2009. It buys agricultural produce from a so-called production base, organised either by a dragon head company or by a group of farmers or co-operatives.

The aims of the Linking Farmers with Supermarkets programme include securing consumers' access to food at reasonable prices, by purchasing directly from farmers; and boosting agricultural economies by ensuring that a fair part of the retail sales price reaches farmers.

director of the Centre for Chinese Agricultural Policy at the Chinese Academy of Sciences, remarks that domestic prices are fluctuating more than in the past because of rising price volatility in international markets. Today, price movements in one market often affect prices in other countries, whereas before countries had better control over domestic price stability. Price volatility makes it more difficult for households to plan their consumption, and it increases risks for agricultural producers too.

In response to the challenge of securing global food supplies, experts agree that new approaches are needed. Professor Huang, for one, believes that "challenges on the demand side and on the market side are really calling for a new agricultural revolution." The focus of these new approaches looks certain to be in the high-growth markets, in particular the populous BRIC countries—Brazil, Russia, India, and China—in which the largest share of growth in demand for food will take place. Nevertheless, increases in

agricultural productivity in developed regions, including North America and western Europe, are also vital to secure global food supplies.

"Agriculture in the next decades will be very much different from the agriculture we see today," expects Mauricio Lopes, the executive director of research and development at the Brazilian Agricultural Research Corporation (Embrapa). Experts interviewed for this research paper say that agriculture will become more sustainable, making better use of resources such as land and water and minimising the use of fertilisers and other agrochemicals. The agricultural sector will also continue to research and adopt plant breeding technologies as part of efforts to drive crop yields, minimise water and fertiliser usage, and shorten crop cycles. And experts foresee easier access to advances in agricultural practice, so that productivity gains will become widespread, even among smallholders.

2

Boosting agricultural productivity in high-growth markets

To secure food supplies, high-growth countries have stepped up public investment in agriculture. In China, for instance, agricultural investment rose to more than 10% of government expenditure in 2011, from 8% in 2005, according to Professor Huang. Experts remark that governments in high-growth markets have tended to increase their commitment to productive investments such as agricultural research, technology and rural infrastructure—rather than committing cash to direct farm subsidy initiatives. Private investments have grown, too. In India, for example, Professor Chand points out that private investment in agriculture by farmers has increased from 12% of agricultural GDP to 17% of agricultural GDP in the past six years alone.

As part of these investments, high-growth nations are investing heavily in agricultural research. In China, for example, average annual growth in public agricultural research and development expenditure increased in real terms to more than 20% in 2010-11, from 16% in 2000-09, according to Professor Huang. Furthermore, some governments are investing in rural structures to ensure that innovations reach farmers. Consider India, for example, and its Krishi Vigyan Kendra farm science centres in each district, which improve the interface between technology and the extension agencies that

promote agricultural practices through farmer education. “A lot of our technology was not reaching farmers previously,” Professor Chand says. “The technology was not converted into innovation.”

In some cases, policy frameworks include financial support measures. In Brazil, for example, banks are required to lend one-quarter of deposits to the agricultural sector at rates determined by the government. Furthermore, Brazil is beginning a programme of weather-related rural insurance, for instance, against drought or hail, according to Mendes Ribeiro Filho, the country’s minister of agriculture, livestock and food supply. The Brazilian government will subsidise part of the insurance premium, he says. In Russia, meanwhile, the government offers farmers interest rate subsidies for loans to expand working capital or to invest in plant and equipment. It has also established a fund to stabilise prices of selected commodities (see box: *Russia – A grain intervention mechanism*).

Investments such as these have led to productivity gains through developments in agricultural practice. One example is minimum-tillage farming, which lessens erosion and loss of soil and keeps fertiliser use in check. Says Embrapa’s Dr Lopes: “Minimum tillage in my view

Russia – A grain intervention mechanism

As part of efforts to support farmers through stable prices in its grains markets, Russia launched its Grain Intervention Fund in 2001. The aim of the fund is to stabilise prices by buying up excess stocks when market prices are low. The fund covers milling wheat, feed wheat, rye, barley and maize.

The mechanism is based on a price band that is established between specified minimum and maximum prices. When market prices fall below the minimum level, the Grain Intervention Fund makes large grain purchases from farmers direct, at the minimum price level. Traders and middlemen are excluded from the intervention transactions.

And if prices exceed the maximum price level, the Grain Intervention Fund may sell the grain in

the market at the maximum price. As conditions improve, farmers may also have the option to repurchase stocks they have sold to the fund, at the minimum price plus a consideration for storage and insurance.

Thaís Affonso, the head of business intelligence at Syngenta, an agribusiness company based in Switzerland, observes that wheat production has benefited from the intervention scheme. “Wheat started picking up in Russia once the government put in place a system to price the wheat,” she says. “It’s important that farmers have a system that [enables them to] know that they can sell their produce, and how much they are going to get for it.”

was a tremendous revolution.” Another case is integrated crop-livestock farming, popular among smallholders in high-growth regions but less common on large-scale farms in developed regions, whereby crop residues feed livestock, and livestock manure fertilises crops. Brazil is now extending integrated farming systems to forestry, promoting crop cultivation and livestock farming in forested areas.

Work on genetic resources and traditional plant breeding have also led to clear successes in high-growth markets, enabling the adaptation of crops to tropical areas, for example. Dr Lopes confirms that “through plant breeding, we’ve been able to tropicalise several crop systems, including corn, soybeans and apples. We worked a lot with the genetic resources and breeding to adapt our crops to a harsher climate.” Where Brazil previously imported apples from Argentina, the country is now an exporter of the fruit, points out Dr Lopes, “because we did a sort of sub-tropicalisation of apples”.

Behind successful practices such as these lie coherent policy frameworks and agricultural

strategies put in place by national governments. Far from being isolated, one-off initiatives, these are part of wide-ranging, long-term agricultural programmes. Says Dr Lopes, for example: “What we had in Brazil was really a mix of solutions, technologies, public policy, infrastructure—lots of things combined. It was a co-ordinated action to bring a lot of things together in order to bring in the changes that were needed.”

Scope for further productivity gains

Despite these clear successes, there is further scope to improve food productivity in high-growth economies. As Dr Affonso of Syngenta remarks: “Many practices are available, but either because people don’t have access or people don’t have the information, or the regulatory systems are not in place, they are not actually implemented.” A case in point is China, where Professor Huang points out that one-third of the labour force works in farming. “This is a challenge in terms of promoting mechanisation and thus increasing labour productivity,” he says. It also acts as a disincentive to further innovation. Yet China still has the potential to increase its yield

India – Soil health cards for farmers

A multitude of studies have demonstrated that excessive use of fertilisers and pesticides has a negative impact on soil quality, with potential in particular to harm soil fertility and nearby vegetation, as well as human and animal health. While overuse of agrochemicals is widespread, it stems from little more than a lack of information.

To address this, India's government launched its Soil Health Card programme in 2009, to carry out soil analysis for farmers and to provide fertiliser recommendations tailored to the specific nutrient requirements of each crop in each field. Analysis is carried out in 500 new soil testing laboratories across India, and in a further 250 mobile laboratories.

Following the collection and analysis of the soil samples, the labs produce so-called soil health cards for the farmers. The cards provide a snapshot of the quality of the soil on the basis of its various characteristics, as well as recommendations specific to each crop.

The Indian government plans to issue soil health cards to every farmer in the country by 2013. According to the government, the scheme will increase the efficiency of agrochemical use, and most importantly keep excessive fertiliser use in check. At the same time, the government is promoting more widespread use of organic fertiliser.

by using more modern technologies, making more efficient use of water and fertilisers. Dr Affonso calls for "better agricultural protocols", too: "That means the right product applied at the right time in the right quantity." (See box: *India – Soil health cards for farmers*).

Crop cultivation is a particular area that offers scope for further productivity improvement. Dr Affonso highlights that there is huge potential to improve seed quality and hybridisation: "There are some crops, like wheat and rice, with which, if we can develop new hybrids, or expand existing hybrids, we can significantly boost productivity." Meanwhile, in India, there is room to intensify crop cultivation by making more widespread use of double-cropping. Professor Chand points out that while 36% of agricultural land in India currently provides two crops per year, this figure has the potential to be as high as 70%.

Furthermore, improvements in infrastructure—such as roads, railways and warehouses—may have the potential to boost food productivity. As Rustem Mirgalimov, the chief executive officer of Razgulay Group, an agro-industrial holding company based in Russia, points out: "In Brazil and Russia the cost of food production is growing due to lack of infrastructure. We don't have enough infrastructure facilities, and it makes food production more costly." One example is better storage infrastructure to minimise post-harvest losses. And while Russia plans to expand the country's port facilities and double its export capacity in the next five years, Dmitri Rylko, the general director of the Institute for Agricultural Market Studies in Russia, also highlights shortfalls in Russia's transport infrastructure: "Huge investments are needed to develop our [freight rail] unit train industry."

3

Enabling the transfer of best practice

There are lessons to be drawn from the agricultural successes of high-growth countries. These may be of relevance to other high-growth markets, such as those in Africa, whose agricultural economies are ripe for development. Equally, emerging agricultural practices in high-growth markets may put existing practices in developed regions, such as North America and western Europe, under the spotlight. "Some elements of the BRIC countries' success really are replicable," notes Dr Rylko. "And at the same time, they present some kind of challenge to the rest of world."

What are some of the conditions that have enabled success in the high-growth markets? One is an entrepreneurial approach. "Normally the BRIC economies have a more entrepreneurial mindset than those in the developed regions, and they are very open to innovation," remarks Dr Affonso. "Our experience in Brazil is that farmers are very willing to work with developers to be the first in the market with new technology; they are very willing to test new things." Behind this willingness, Dr Affonso points out, lies the possibility to be rewarded commensurately for taking risk. "What the regions could learn from each other is how to guarantee that farmers' profitability is maintained. One element of that

is that the price they get for their produce is a fair price."

According to experts from high-growth countries, another factor that has helped agriculture to flourish in those countries is a low level of state subsidies. They say that in some cases subsidies can cause market distortion, lead to efficiency loss, and crowd out productive investment. Professor Chand says: "I am now coming to the view that if you do not distort the situation through subsidies, you find that farmers take opportunities, and there is better use of resources and more growth." High-growth economies have experienced strong performance in agriculture without direct government support, according to Professor Chand. He points out that, in contrast, "in the Western world, a lot of subsidies are given".

The widespread adoption of modern plant breeding technologies, including genetic modification, in high-growth countries is a further factor behind the success of their agricultural markets. Yet, says Dr Fan: "Many countries in Europe are still against genetically modified organisms and biotechnology. That really limits [their] future agriculture or food production." Meanwhile, Dr Lopes expects that it will be natural for countries in North America

or western Europe to face challenges related to crop adaptation as temperatures rise owing to global warming. “There is quite a bit to be learnt from the South in terms of adaptation to such a change in conditions,” Dr Lopes says.

Room for co-operation

To capitalise on the agricultural successes of high-growth markets, closer co-operation is key—across countries and regions, across the private and public sectors, and across industry sectors. For Professor Huang, a cross-sector effort is needed: “People are talking about a nexus of food security, water security and energy security. The agricultural sector needs to work with these other sectors to ensure sustainable agricultural production.”

Says Professor Chand: “Modern agriculture research is highly capital-intensive, and it is also highly knowledge-intensive. So it doesn’t

pay, nor is it feasible, that every country does its own research or has its own resources, particularly developing countries.” Instead, he says, technologies aimed at boosting agricultural productivity need to be seen as “a global public good.” Co-operation is one way in which BRIC countries may help to increase production and productivity in developing regions, such as Africa (see box: *Brazil – Transforming Mozambique’s savannah*).

Already, there are a number of new co-operation projects involving high-growth markets. One example is Brazil, Russia, India and China, whose agriculture ministers signed an agricultural co-operation agreement in 2010. Mendes Ribeiro Filho, the Brazilian minister of agriculture, livestock and food supply, says they plan to “strengthen co-operation in four areas, including information exchange, food security, climate change and agricultural scientific innovation.”

Brazil – Transforming Mozambique’s savannah

In 1979 the Japan International Cooperation Agency (JICA) launched a US\$300m programme to help transform Brazil’s Cerrado—its vast barren savannah region—into fertile agricultural lands by putting down chemicals which counter the soil’s acidity. On the back of that success, the Brazilian Cooperation Agency and the JICA launched a programme in late 2010 to promote a similar transformation, this time in Mozambique, in south-east Africa.

The Project for Improving Research and Technology Transfer Capacity for Nacala Corridor Agriculture Development is reported to be one of the largest trilateral co-operation projects in the world. The aim of the project is to launch a similar transformation of Mozambique’s Nacala Corridor, an area similar to, and sharing the same latitude as, the Brazilian Cerrado.

In Mozambique, the agricultural sector employs some 80% of the workforce, yet only 2m ha of the country’s 55m ha of tropical savannah are cultivated. If these areas can be transformed

into arable land, say the project’s backers, agriculture can make greater strides in reducing poverty and boosting economic development.

“That would be an interesting shortcut for African countries that have conditions which are quite similar to the conditions that we had to overcome in the 1970s,” says Mauricio Lopes, the executive director of research and development at the Brazilian Agricultural Research Corporation (Embrapa).

For Japan and Brazil, meanwhile, the benefits of the project include making a meaningful contribution to ensuring global food security as well as opportunities for private financial investments in Mozambique’s agricultural development. Furthermore, says Dr Lopes, Brazil and Japan look set to learn from the project. “I think strategies like these can maybe enlighten us for new ways and new approaches for the future,” he says.

Another is Embrapa's plan to open a new laboratory in China in 2012, to intensify joint research efforts with the Chinese Academy of Agricultural Sciences. Yet another example is the World Economic Forum's New Vision of Agriculture initiative, launched in 2011 and led by the Consumer Industries Community of the World Economic Forum, whose aim is to advance social and economic development. "We believe that public-private partnerships can be much more effective than they have been in the past," says Dr Affonso of Syngenta, which forms part of the initiative.

There is room to co-operate on further issues too, at a global level. One such issue is food price volatility. As Dr Fan points out: "We need to work together to stabilise global food prices." According to him, co-operation here could include measures to ensure that adverse weather patterns do not lead to price volatility, for example by means of restraint in the use of export bans by individual states, and by

means of a build-up of strategic food reserves for emergencies, at national, regional and global levels. "This requires organisations that are capable of devising feasible strategies and bringing together the right players," says Dr Fan.

In the long term, closer co-operation may enable geographical specialisation, with the potential for gains in total agricultural output across the globe. "We need to make more rationalisation of agricultural production on a global basis," says Mr Mirgalimov of Razgulay Group. "For example, the production of small grains is probably cheapest in countries including Russia, Kazakhstan, Ukraine. In total it would be more output for everybody in the world." Professor Huang agrees with the need for closer co-operation to secure global food supplies. "We need effective action across countries, and across regions," he concludes. "And we need more global action."

Conclusions

Demand for food continues to accelerate, driven by growing populations, rising prosperity and ongoing urbanisation, particularly in high-growth economies such as Brazil, Russia, India and China. At the same time, food production is coming under pressure owing to limitations on resources, including land and water, and other environmental considerations.

In response, high-growth economies have committed to wide-ranging programmes to increase agricultural output. Measures to promote food productivity include minimum-tillage farming and crop modification; investments in agricultural research and in structures to promote innovation among smallholders; and rural lending programmes and agricultural insurance cover.

Across the high-growth countries that have achieved notable agricultural successes, it is possible to identify a number of actions aimed at boosting food production. These include the following.

Fostering an entrepreneurial environment in agriculture.

High-growth economies are proving successful in creating a dynamic, entrepreneurial environment

in the food production sector. This, in turn, helps to promote innovation and attract private investment. Keeping to relatively low levels of state subsidies appears to contribute positively to this environment.

Maximising the potential of plant breeding technologies.

Time and time again, successful cases of growth in agricultural output in high-growth regions are based on modern plant breeding technologies. This includes breeding crops to suit different climates, to shorten the crop cycle, and to reduce the use of water and fertilisers. The result is higher agricultural output relative to input.

Promoting closer international co-operation.

Advanced high-growth economies are a driving force behind co-operation efforts across the globe, including between developing and developed regions and between the private and the public sector. In the long term, these efforts look certain to help stabilise agricultural prices and secure food supplies.

While every effort has been taken to verify the accuracy of this information, neither The Economist Intelligence Unit Ltd. nor the sponsor of this report can accept any responsibility or liability for reliance by any person on this white paper or any of the information, opinions or conclusions set out in this white paper.

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