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FUTURE *of* AGRICULTURE & FOOD

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It's time for another agricultural revolution

A scientific consensus exists that three of the most important 21st-century issues are food security, depleting natural resources and climate change – agriculture is at the heart of this trilemma

◆ **OVERVIEW**

● **SEAN RICKARD**

Global food demand will rise by at least 60 per cent over the next 35 years, but supplying this production will be challenged by increasingly scarce natural resources, such as land and freshwater, and the impact of climate change on production.

The implication is already apparent – over the past decade, global agricultural prices have averaged 82 per cent above their level in the previous 25 years. While action to reduce food waste could make an important contribution, it will not be sufficient and a supply-side revolution will be necessary to solve the trilemma.

Demand for food rises with population growth, but a bigger influence is development as previously poor populations shift to meat and dairy-intensive diets. Grain production will need to rise to meet the demand for feedstock – as well as its growing use in bio-energy and industry – but arable land is steadily decreasing in response to soil erosion and urbanisation.

Moreover, the rate of growth for crop yields is declining; indeed, in Europe they have plateaued. A return to low-input-low-output systems cannot provide the necessary growth of production and the only practical response to the trilemma is sustainable intensification, defined as delivering the necessary increase in output while reducing the industry's natural resource demands and mitigating greenhouse gas emissions.

More formally it involves a step-change in natural resource productivity (NRP). Biotechnology, and information and engineering technology underpin NRP growth. Advances in plant breeding will raise yields by enhancing the take-up of nutrients and climate adaption, while developments in livestock breeding deliver improvements in feed-conversions, health and disease resistance.

Precision farming – the fusing of information and engineering technology – involves remote sensing, data processing and automation. By bringing sensitivity to the timing and accuracy of input applications, it directly contributes to NRP growth as well as augmenting biotechnological advances.

Sustainable intensification requires research and development by breeders and agricultural engineers to generate and convert new knowledge into products and farming operations, but it is only when these are adopted by farmers that their benefits are captured.

Although precision technologies have the potential to deliver significant-

> **The challenge of the agricultural trilemma will only be solved with a step-change to a more professionally managed industry rooted in high-tech industrial farming systems**

ly lower operating costs, the investment outlays are high and so take-up depends on a farm's ability to fund the necessary capital expenditure. In this respect, larger-scale farms would appear to have an inherent advantage.

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Economies of scale mean they are more likely to be profitable, have greater access to investment funds and a larger volume of output over which to spread the cost.

But scale alone is not sufficient. A positive attitude towards innovation and higher levels of human capital are also required not only to manage a larger enterprise, but also to interpret and act upon accurately the high volumes of data generated by precision farming.

Within the European Union, production is being concentrated on larger-scale farms, but progress is slow. About 70 per cent of EU holdings have an area of less than five hectares and around half are defined as semi-subsistent. In the absence of Common Agricultural Policy (CAP) direct payments, some 80 per cent of EU farms would not break-even; indeed, the value added per labour unit for the EU's largest farms is more than ten times that for the smallest farms.

At the current pace of change, it will be many years before EU agriculture arrives at an optimum structure. One way to speed up the rate of change would be swiftly to phase out direct payments. This would create scope to divert considerable funds to public sector agricultural R&D, while signalling to research centres that in future the European farming industry would be more capable of investing in capital intensive, knowledge-based solutions.

Unfortunately, the CAP has always been first and foremost a social policy and over recent years its relationship to food production has been further undermined by a growing burden of environmental objectives. Yet another benefit of phasing out direct payments would be the scope created for better targeted standalone environmental and rural economic policies.

Unfortunately, the chances of a policy revolution are slim and the authorities' attempts to protect smaller-scale, less-efficient farms by raising hurdles for the adoption of advanced biotechnology are misguided. The challenge of the agricultural trilemma will only be solved with a step-change to a more professionally managed industry rooted in high-tech industrial farming systems.

Indeed, the farmer of the future will operate behind a bank of computer screens to deliver very high levels of NRP, while monitoring markets to maximise revenue. Although this is at odds with the unrealistic but widespread romantic image of farming, it is the only sustainable basis for the delivery of affordable food, environmental protection, animal welfare and a viable rural economy.

RACONTEUR

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Pictures supplied by Getty Images

◆ **MERGERS AND ACQUISITIONS**

● **JEREMY HAZLEHURST**

M&A fever grips emerging markets

The agribusiness sector is booming as global players, particularly in China, move to secure a bigger slice of food production

If proof were needed that the agribusiness sector is thriving, then this should do it – of the top ten biggest ever mergers and acquisitions (M&As) in the sector, five have come since the start of 2014, according to data compiled for Raconteur by Dealogic. And if Monsanto's proposed $47-billion (£30-billion) takeover of fellow seeds and pesticides firm Syngenta goes through, it will be by far the biggest agribusiness deal to date.

Why is it happening? Partly because of the general M&A fever, but also because businesses are desperate to profit from emerging market growth. Of the top ten deals either done or pending in 2015, five of the acquirers are Chinese, while one comes from Indonesia and another from Nigeria. Of the targets, five are Chinese, one Malaysian and one Brazilian.

Here are five of the most important recent agribusiness M&As:

OLAM'S TAKEOVER OF ADM'S COCOA BUSINESS
$1.3 BILLION (£0.83 BILLION)

Olam's $1.3-billion purchase of Archer Daniels Midland Company's cocoa business was not only one of the biggest deals of the past couple of years, but means the Singaporean group is now among the top three players in the cocoa world, along with Barry Callebaut of Switzerland and American giant Cargill.

With the new assets, Olam now has a processing capacity of 700,000 tonnes a year, which is 16 per cent of the world's total. The company says it will now source 900,000 tonnes of beans, over 20 per cent of the global total.

The deal means that Olam has facilities in the UK, Netherlands, Canada, Ghana and Côte d'Ivoire. The purchase was based on Olam's conviction that as incomes rise demand for chocolate, especially in emerging markets, is set to rocket. "It's a growing middle-class play," says Olam's chief executive Sunny Verghese.

The conviction is shared by American agribusiness group Cargill, which recently picked up ADM's chocolate business for $440 million (£281 million).

COFCO TAKES STAKES IN TWO GRAIN TRADERS
$3 BILLION (£1.92 BILLION)

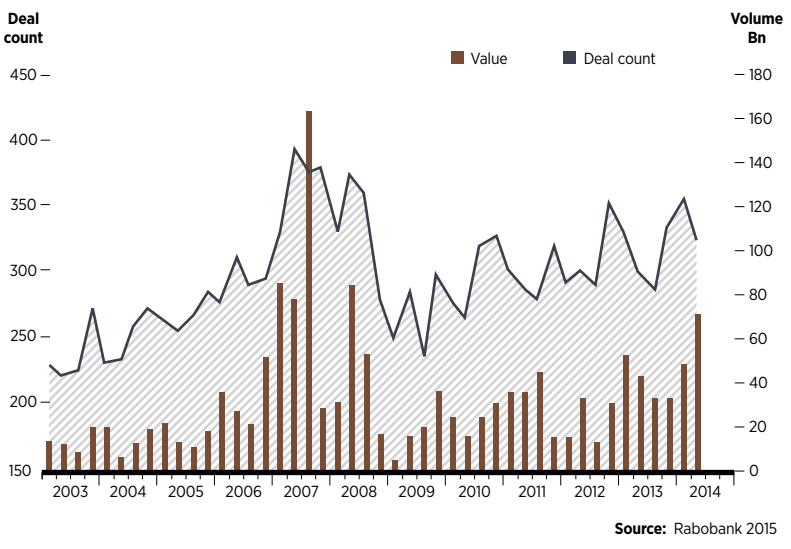
Increasing demand for grain in China lies behind two huge deals by state-backed COFCO (Cereals, Oils and Foodstuffs Corporation). In 2014 it paid about $1.5 billion (£0.96 billion) for 51 per cent of Dutch trader Nidera, which has access to North and South American grain and oilseed.

Just months later, COFCO spent $1.5 billion on a controlling share of Noble Group, a Singapore-based Fortune 500 agricultural supply chain management firm with interests in the Black Sea region.

"COFCO will set up a stable grain corridor between the largest global grain-growing origins and the biggest global emerging market, in terms of grain consumption growth in Asia," says COFCO chairman Frank Ning.

Another way of putting it is that the deals give China the ability to feed itself without using the four big Western agribusiness companies, ADM, Bunge, Cargill and Louis Dreyfus Group, together known as the ABCDs.

MERGERS AND ACQUISITIONS ACTIVITY IN FOOD AND AGRICULTURE ILLUSTRATES CHANGING MOMENTUM



Source: Rabobank 2015

JBS BUYS MOYS PARK
$1.5 BILLION (£0.96 BILLION)

Giant family-controlled Brazilian meat company JBS recently paid $1.5 billion for Northern Irish poultry firm Moys Park. With 8,000 workers, it is Ireland's biggest private-sector employer and makes some of the Jamie Oliver-branded chicken products. The deal gives JBS access to markets in the UK, other wealthy European countries and Scandinavia. As the European market recovers, emerging market businesses are likely to be keen to get involved to diversify their own country risks.

JBS has been on the acquisition trail ever since the financial crisis hit in 2007 and other deals have included the $1.3-billion (£0.83-billion) purchase in late-2014 of Primo Group, an Australia and New Zealand-based pork producer which exports much of its produce to China.

The day before that, JBS paid $169 million (£109 million) for Grupo Big Frango, a Brazilian firm which is said to slaughter about 460,000 birds a day.

DANONE UPS ITS STAKE IN CHINA MENGNIU DAIRY
€486 MILLION (£340 MILLION)

Milk is another area where M&A is hotting up. In 2014 France's Danone paid €486 million to increase its stake in China's biggest milk producer, China Mengniu Dairy, to 9.9 per cent.

As part of the deal Danone formed a joint venture with Danish dairy co-operative Arla, which owns 5.3 per cent of the Chinese firm, and COFCO, which owns 16.3 per cent. So they jointly control about a third of the company.

Dairy consumption in China is expected to increase as the country's diet changes. At the moment, average Chinese dairy consumption is just 3 per cent of the average French person's. Contamination scandals involving Chinese firms means many consumers trust foreign companies more.

Milk is also a big pull in Africa and in June Dutch dairy co-operative Friesland Campina paid €113 million (£79 million) to increase its stake in its Nigerian subsidiary FrieslandCampina WAMCO to 69 per cent.

WILMAR/FIRST PACIFIC'S TAKEOVER OF GOODMAN FIELDER
$1.3 BILLION (£0.83 BILLION)

Despite owning regionally well-known brands such as Wonder White bread and Meadow Fresh milk, Australia's Goodman Fielder has been struggling in recent years, and made a AUS$65 million (£31 million) loss in the first half of 2014.

Enter two of Asia's biggest family-owned groups, Malaysia's palm oil-to-biodiesel group Wilmar and Indonesian conglomerate First Pacific, which owns 50 per cent of giant food business Indofood. In March 2015 they bought the business for $1.3 billion. The buyers plan to launch Goodman Fielder's brands into Asia.

The theory is that as Asians become wealthier, they will want more "Western" foods, such as bread and dairy products. Some Asian countries, such as Indonesia, have little agricultural land and so Australian brands are well placed to meet demand. Wilmar, Asia's largest agribusiness group, is well aware of the appeal of Australia and already processes half of the country's sugar crop.

FOOD FINANCE

240 investment funds are operating in the F&A sector, compared with just 33 in 2005

$45bn of assets are managed by operating funds in the F&A sector

41 agri-tech companies raised more than $570m in funding rounds in 2014

40 private equity funds specialise in F&A, excluding farmland investments, and are valued at almost $8bn

Source: Valoral Advisors 2015

COMMERCIAL FEATURE

VISION TO FEED THE WORLD

Planning for the future in any business can be a challenge, but for those operating in the agricultural and food sector it is perhaps even trickier

Rabobank

Like any industry, the agricultural and food sector must contend with usual price fluctuations, but it also has to face the entirely unexpected – harvest failures, freak weather events and changing consumer preferences over safety or quality concerns.

"The pressure on food and agricultural or F&A supply chains is unrelenting and is showing no signs of easing up," says Rossella Schiavini, regional head of global corporate clients, Europe, at specialist food and agricultural bank Rabobank. "The drivers have ebbed and flowed but, wherever they are in the supply chain, businesses feel that pressure every day. Despite this, companies with well-run supply chains are able to manage the pressure and find growth."

Justin Sherrard, global strategist, F&A supply chains in Rabobank's food and agri-business research team, identifies a number of pressures on agricultural and food supply chains, all of which have an impact on how organisations operate.

PRICE PRESSURE

"In developed markets, such as the UK, retailers talk about low prices or value for money in every promotional campaign," says Mr Sherrard. This emphasis on cost spreads all the way down the chain to manufacturers and farmers, he says.

CASH FLOW

In recent years the pressure to improve cash flow has made life difficult for suppliers, and this has been exacerbated recently by the trend to new ownership structures in F&A. Mr Sherrard gives the example of the recent merger between Kraft Foods and Heinz. "This is a great example of where a new owner comes in, strips out a lot of cost and tries to make profit that way," he says. "In that process, the pressure to maintain positive cash flow becomes evermore demanding."

INVENTORY PRESSURES

Linked with the issue of cash flow, the pressure is on businesses throughout the supply chain to avoid tying up cash in stock, yet still be able to cope with the flexibility required by retailers and customers.

The rapid developing of online food shopping has made this even more important. "You have all sorts of different demands around flexibility, stocking levels and delivery models," he explains. "Everyone wants flexibility, but no one wants to hold the inventory that enables this flexibility."

EXTERNAL SHOCKS

The food and agricultural sector is regularly hit by external events, whether that's disruption to supply, or volatility in commodity prices or currency exchange rates. "You also see external shocks in the form of trade barriers with governments opening or closing borders to particular trades or changing tariff structures," says Mr Sherrard.

Shocks can come in the form of food safety and product integrity issues, which can have a huge impact on customer behaviour, as seen in the horse meat scandal and, more recently, the substitution of cumin in the United States by ground peanut meal.

Despite these pressures on their supply chains, companies in F&A remain focused on growth and with good reason – globally and locally there are exciting opportunities for companies that can adjust their supply-chain models.

There are a variety of ways in which organisations can strengthen their supply chains and derive competitive advantage as a result. "The first is to accept complexity," says Mr Sherrard. "Supply chains are no longer simple linear constructions that link a single producer to a food retailer. They are complex webs of interactions, involving producers, processers, traders, distributors and retailers." Organisations that manage accordingly will be at an advantage, he says.

> "Globally and locally there are exciting opportunities for companies that can adjust their supply-chain models

Another focus should be building mutually valuable partnerships with suppliers and partners, moving away from a sole focus on price and focusing instead on creating value.

The logical conclusion of this is a relationship which is not only effective but can deliver innovation. "Innovation is a litmus test of the strength of buyer-supplier relationships," says Mr Sherrard. "When buyers and suppliers start doing things differently – to cut costs, enter new markets or reduce risk – you really know they have harnessed co-operation to achieve growth."

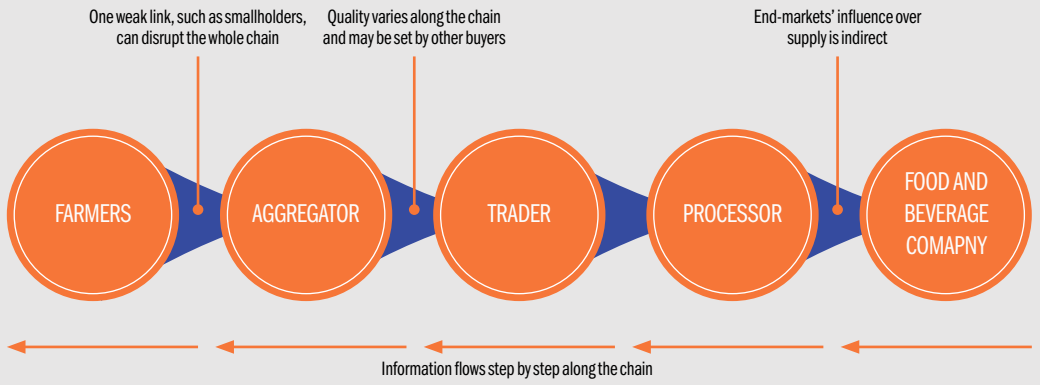
A particular focus of buyer-supplier co-operation should be improving inventory management, he adds. "A better appreciation of who is carrying risk and how they can be rewarded for that together really starts to change things," says Mr Sherrard. "You've got to be careful how much pressure or risk you're asking farmers, for example, to bear."

Those organisations which accept volatility and build effective relationships with partners in the supply chain should be able to not only survive but thrive. "Ultimately companies are looking for efficiency gains, improved resilience, greater transparency and better margins," he says. "Those getting this right are finding strong competitive advantage."

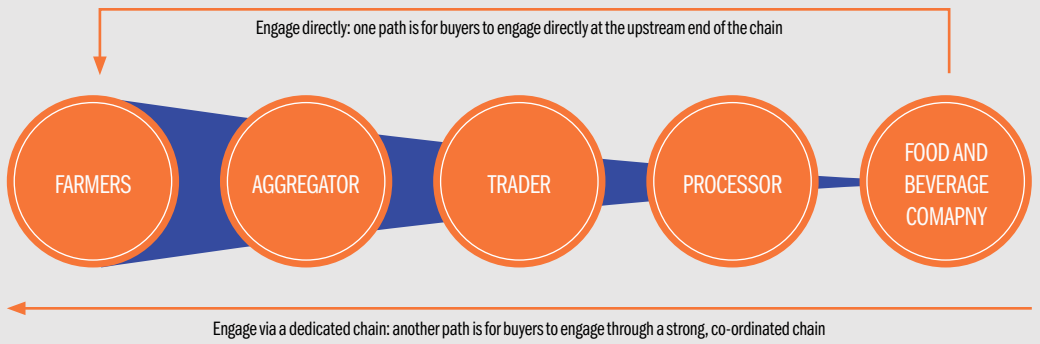
Rabobank is the world's leading financial services provider for the F&A sector – a role made possible in part by the bank's extensive knowledge of the many links in the food chain, such as the stresses and the solutions in the supply base.

"Feeding nine billion people requires a vision and solutions that do not stop at the gate of a farm or the turnstiles of a supermarket," Ms Schiavini concludes. "Accordingly, the Banking for Food vision of Rabobank encompasses all links in the food chains, in and outside the Netherlands, from farmers and horticulturists and their suppliers to businesses processing agricultural products, and transport businesses and supermarket chains."

TRADITIONAL SUPPLY CHAIN MANAGEMENT, ESPECIALLY IN SOURCING TROPICAL COMMODITIES



NEW SUPPLY CHAIN MANAGEMENT MORE FOCUSED ON UPSTREAM END OF THE SUPPLY CHAIN



REGARDLESS OF THE PATH, BUYERS' MOTIVATIONS ARE TO

ENHANCE SUPPLY SECURITY | INCREASE SUSTAINABILITY | IMPROVE CHAIN TRANSPARENCY

Source: Rabobank 2015

KEY FOCUS AREAS FOR F&A ORGANISATIONS

Work at the aggregation points in the chain

Establish multi-year off-take agreements

Support technical assistance programmes

COLLABORATIVE PARTNERSHIPS

Some organisations in the food and agricultural sector are already combining to help devise more effective and collaborative supply chains, says Justin Sherrard, global strategist, food and agricultural supply chains, at specialist food and agricultural bank Rabobank.

He gives the example of a partnership between the retailer Morrisons, dairy processor Arla Foods and genetics business Cogent International, where Morrisons has helped to introduce different genetics into a dairy herd, to help eliminate disease and improve the productivity of animals.

"Everyone is getting something out of it, all the way through to Morrisons, which benefits from improved access to supply and better quality milk," he says. Other examples include Sainsbury's, which is working closely with smallholder farmers to help secure supply of commodities, such as coffee, cocoa and tea, and family firm Mars, which is developing similar relationships with farmers in West Africa.

For more information visit far.rabobank.com

◆ **AGRI-INVESTMENTS**

● **MIKE SCOTT**

Growing yields in agri-investments

Sometimes seen as an alternative – rather than mainstream – investment, agriculture is tipped as a profitable place for investors to put their money

Food is one of our most basic needs and agriculture has been central to human existence for thousands of years, yet the sector has always been curiously under-represented in investment portfolios.

Even today many parts of the agricultural value chain, such as farmland, are seen as alternative investments, while many investors steer clear of investing in commodities because of their volatility.

"Agriculture is a subject little understood by investors," says Hélyette Geman, author of *Agricultural Finance: From Crops to Land, Water and Infrastructure*. "For academics in finance, it does not sound very glamorous and research in the field is scarce and belongs to economists."

Henry Boucher, manager of Sarasin's food and agriculture opportunities fund, agrees. "It is a bit of a Cinderella sector. People think it's both boring and prone to price volatility," he says.

Because of the volatility of commodity prices, it is easy to get caught out by chasing short-term price movements, but if you identify the long-term drivers, the sector offers real opportunities. These are not always obvious, however.

For example, Mr Boucher identifies electrification and the roll-out of infrastructure in emerging markets as two key factors for investors to consider. "Electrification has a huge impact on diet. If you have electricity, it's suddenly worth going to a supermarket," he says. "If you don't have a fridge, there's no point buying Ben and Jerry's ice cream. And the arrival of rail can transform the viability of agricultural land."

> **The pressures caused by climate change and resource scarcity will benefit one sector in agriculture in particular – technology**

The longer-term future for agriculture and food is positive, says Roddy McLean, director for agriculture at RBS and NatWest. "We have all heard that global population will increase from seven billion to nine billion by the middle of this century," he says. "Demand for food will increase faster than this as eating habits in developing countries change from a vegetable diet to sourcing their protein from milk products then to white meat [pig and poultry] to red meat. As you move through these dietary changes more land is required to produce the necessary food."

Cedric Lecamp, senior investment manager of the agriculture fund at Swiss investment firm Pictet, adds that health and nutrition is now a key focus for the sector.

"The importance of the focus on health and nutrition is that it highlights that certain products and ingredients can be beneficial, while others are detrimental. There are exciting opportunities looking at the nutritional aspects of food," he says.

"Fish is a very exciting area, for example. Technological developments mean that producers can use less food, making it possible to replace wild fishing with fish farming."

Pictet, which has been running an agriculture fund since 2009, invests throughout the value chain, splitting the investment universe into three segments – upstream, midstream and downstream.

Upstream includes inputs to agriculture, such as seeds, fertiliser, machinery and technology for new areas such as precision agriculture. Midstream is food production, including meat, fish, animal feed and dairy, while downstream is the food processing industry.

Focusing on all three areas helps to smooth the volatility of the sector, explains Mr Lecamp, because the upstream sector does well if raw material prices are high, while downstream companies tend to perform better when prices are low.

"The upstream companies are positively correlated to prices. If the price of corn goes up, farm incomes go up and farmers spend more money," he says. "But as you go downstream, the relationship to prices switches. Processors have significant fixed assets so they do best when harvests are good. Good harvests mean they can run at full capacity and also have the effect of pushing prices lower."

Both Pictet and Sarasin have a strong focus on environmental factors that informs their investment strategies. This leads Pictet to invest only in sustainable palm oil companies and to focus on issues such as packaging, Mr Lecamp says.

"The amount of waste created in the agricultural world is huge, both on farms and downstream. Experts suggest that 30 to 50 per cent of agricultural produce is wasted. The value of that is huge and the further towards the consumer you move, the more value has been added to a product and the higher the cost of that waste.

"We look at ways to improve the shelf life of produce, such as breathable films or recyclable materials," he adds.

Climate change is now a real risk for the sector, Mr Boucher points out. "Climate change is still very low on many investors' agenda, but we pay a great deal of attention to it. Many people will wake up to the risks with a jolt before too long," he says. "The idea that agriculture could pollute its way to higher productivity cannot go on for ever. There are real issues around monoculture and agriculture will come under massive pressure to use less water in future."

The pressures caused by climate change and resource scarcity will benefit one sector in agriculture in particular – technology. "The agriculture sector will have to produce more food with less water, way fewer chemicals and with less impact on biodiversity," Mr Boucher says.

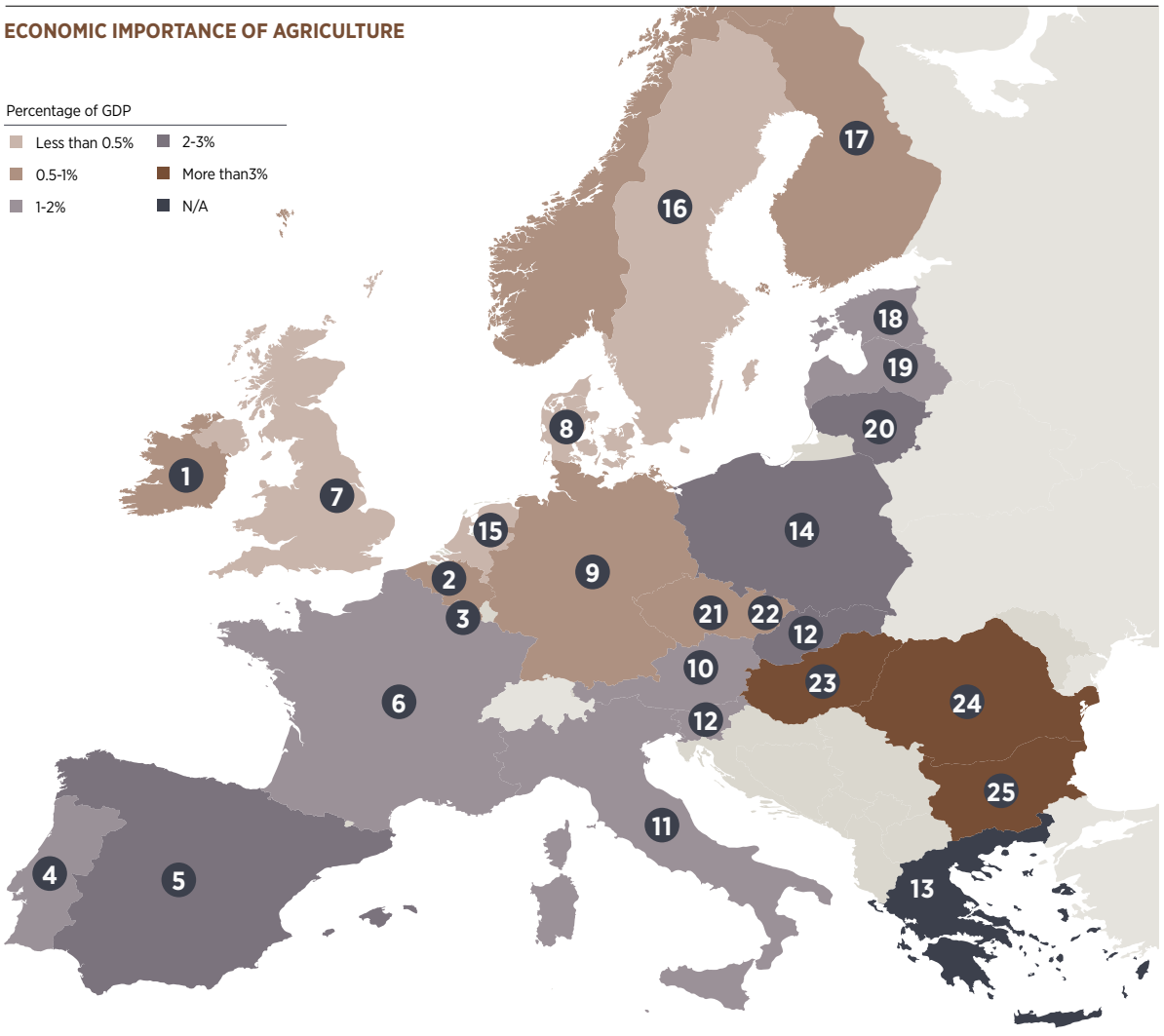
This trend will benefit companies such as John Deere and Agco, makers of farm machinery, seed companies such as Syngenta and Monsanto, and those that offer equipment related to precision farming techniques such as drip irrigation or supply chain management.

"The agricultural and food industry in the UK has changed beyond recognition over the past decade thanks to the growing influence of technology. There have been major developments in both machinery on the farm and the IT systems which help streamline the business processes," says Robert Frost, chief executive of Linkfresh, a provider of supply chain software technology for the food industry. "As the digital revolution continues, technology and IT is a major area of investment for the food industry."

The other key requirement for farming is farmland, and it too can be a very good investment. "Over the decade to 2014, an apartment in the most exclusive part of Mayfair produced a 177 per cent return, while UK farmland returned 277 per cent," says Ms Geman.

"Land is not made any more, in fact it is probably a diminishing resource due to infrastructure projects, building houses, erosion and, in some parts of the globe, desertification salinisation," adds Mr McLean. "But if land is looked after properly, it tends not to wear out like many other investments. The current price of land of £8,000 to £20,000 per acre will in all probability appear cheap in two generations time."

ECONOMIC IMPORTANCE OF AGRICULTURE



1	Ireland	6	France	11	Italy	16	Sweden	21	Czech Republic
2	Belgium	7	UK	12	Slovenia	17	Finland	22	Slovakia
3	Luxembourg	8	Denmark	13	Greece	18	Estonia	23	Hungry
4	Portugal	9	Germany	14	Poland	19	Latvia	24	Romania
5	Spain	10	Austria	15	Netherlands	20	Lithuania	25	Bulgaria

9bn

global population forecast by 2050; 60-100% rise in food production needed to feed the world's population by 2050

Source: United Nations

14%

rise in the value of UK prime arable farmland to almost £10,000 an acre in 2014, following a 12.3% rise in 2013

Source: Savills

COMMERCIAL FEATURE

LANDING A GOOD INVESTMENT

Farmland has long offered good returns with relatively low risk. Now an innovative investment vehicle offers a better and more ethical option for investors

AGRI PARTNERS

The credit crunch of 2008 and the subsequent recession affected almost every part of the British economy. As homeowners found mortgages difficult or even impossible to obtain and businesses complained about the problems they faced getting essential financing from banks and other lenders, the problems of one sector – agriculture – were largely overlooked.

Since 2008, as financial markets first entered turbulent waters, the amount of UK farmland for sale almost dried up as the asset class became a popular safe haven. Now investors wanting to invest are likely to discover difficulty in accessing available farmland for sale, especially in the light of Savills announcing they alone boast a collection of buyer applicants estimated to be equivalent to 10 years of current supply.

> As a specialist lender, Agri Partners provides a range of structured farm finance solutions exclusively for the UK farming sector

Savills World Research says: "The overall availability of farmland remains historically low and inevitably supports market values. Factors, such as potential increases in interest rates and subsequent debt servicing problems, which may increase supply, don't appear likely to impact in the short term."

Farmland categorised by Savills as an "investment safe haven" is an asset class with a growing appeal; farmland has great potential for forward-thinking investors. Population growth, resource scarcity and climate change are the three defining trends of modern times, and all three are inextricably linked. Over time, as their impacts converge, the effects on the global economy will become progressively pronounced. Agriculture, and by extension farmland, is positioned at the nexus of this convergence.

Yet on the supply side, the supply of land is static, and could even fall due to the effects of climate change and the need for increased housing. All this suggests that the food price spikes of 2008 and 2011 are an indication of things to come.

According to the *Knight Frank Farmland Index* for the second quarter of 2015: "The average price of bare agricultural land in England rose by 2.6 per cent between April and June 2015, the tenth consecutive quarter of growth... values have now risen by 33 per cent, or £2,050 per acre, since the end of 2012 and now stand at a record high of £8,265 per acre. Over the past ten years prices have almost trebled, a far stronger performance than many other asset classes."

However, despite the impressive performance, the Basel III requirement for banks to increase their capital and liquidity ratios meant banks were and still are just as unwilling to lend to agricultural businesses that do not meet their more stringent serviceability criteria; given farming is mainly seasonal, this poses a real issue for many small and medium sized enterprises.

To meet the needs of those looking to invest in farmland and at the same time to help fill this debt funding gap, Robert Bourn, an experienced agricultural investment manager, began to look at how to create a more innovative, holistic approach.

Last year he established Agri Partners, a specialist agricultural real estate and mortgage investment business. As a specialist lender, it provides a range of structured farm finance solutions exclusively for the UK farming sector. These structured farm finance solutions are evaluated with asset-based standards rather than the new criteria used by banks and other credit institutions. It might be essentially conservative, but this collateral-based approach opens up opportunities for more agricultural borrowers to obtain the finance they need and allows them to borrow at lower rates than the volatile nature of their business has previously allowed.

"Although we deal with a wide range of property investments, we've often been asked by our clients for a means to gain exposure to farmland investment in a way that minimises their risk and doesn't involve trading in commodities" says Richard Shepherd-Cross of Custodian Capital.

"We believe that the UK agricultural sector represents a unique market opportunity and farmland in particular has been one of the best performing asset classes over the short, medium and long term, with prices continuing to rise. We've therefore worked closely with Agri Partners to develop attractive and socially responsible investment propositions, which have been well received by our clients."

By virtue of finance being funded through private funding syndicates, investors have an opportunity to participate in the consistent, uncorrelated returns realised through secured loans, while using tried and trusted origination channels, experience and track record within the sector.

The syndicates target a net return of 8 per cent a year using a combination of fixed income and capital growth in farmland values. Risk of capital is also managed because the investment is underpinned by UK farm real estate. And as uncertainty continues to provoke market volatility, the syndicates have the additional benefit of being uncorrelated to the wider financial markets.

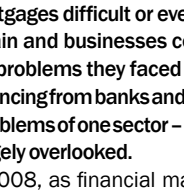
Although aimed at professional investors only, the firm is finding that high-net-worth individuals are among syndicate investors who have invested through their wealth managers. Pension funds, corporate investors and charities are also welcome to invest.

The Agri Partners team also believe that unlike traditional equity models, which can end up putting investors in competition with farmers looking to buy farmland for themselves or can result in investors rather than those farmers owning great swathes of the countryside, their approach is more ethical.

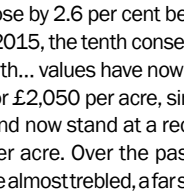
Timing is also key to successful investing and here too Agri Partners believe they are ideally positioned. They point out that they are in the early stages of an investment boom in agriculture, driven by a unique set of fundamentals which offers a compelling case for early-movers.

As a growing number of investors are discovering, Agri Partners Private Funding Syndicates offer a compelling means by which to achieve exposure to these exciting, fast-moving trends.

To learn more about farmland as an asset class, Agri Partners offers readers free access to its agricultural investment and credit research reports, which can be downloaded from www.agripartners.co.uk/research
If you are an investor and wish to explore this niche investment in more detail, contact Agri Parters by telephone on 0203 289 6800 or by e-mail info@agripartners.co.uk



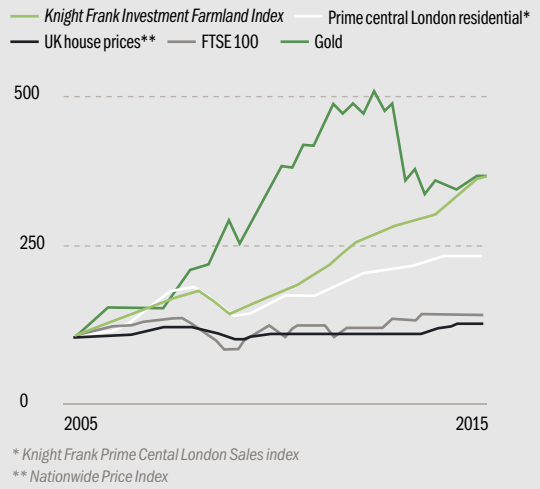
acres were sold annually some 70 years ago



acres of farmland currently sold each year in the UK

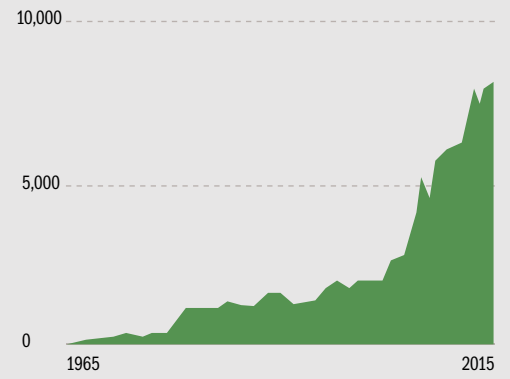
in buyer mandates waiting for farms to come to market (Savills)

CHANGE IN CAPITAL VALUES (REBASED 2005)



* Knight Frank Prime Cental London Sales index
** Nationwide Price Index

50-YEAR FARMLAND PERFORMANCE



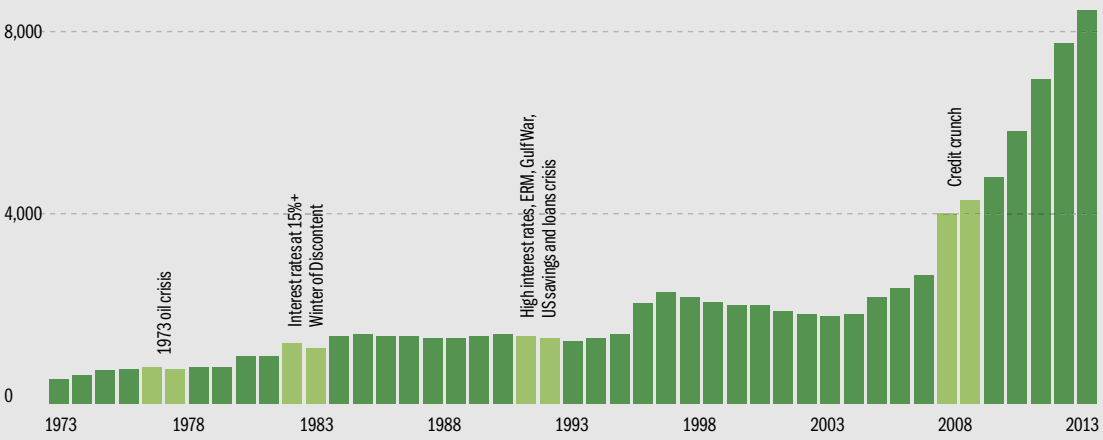
Source: Knight Frank Rural Research, 2014

10-YEAR ASSET PRICE VOLATILITY (Q4 2003 TO Q4 2013)

ENGLISH FARMLAND PRICE GROWTH ADJUSTED FOR INFLATION

Source: Knight Frank Residential Research, 2014

RESILIENCE OF UK FARMLAND TO RECESSIONS



Source: Strutt and Parker/RICS, 2013

More meat eaters means UK

Agriculture has lived with volatility in the highs and lows of production and demand, but now comes an even greater test as globa

◆ **GLOBAL CONSUMPTION TRENDS**

● **MICHAEL WALE**

Forecasts predict that as world prosperity widens so the demand for beef, lamb and pork will increase.

Farmers in the UK will have to make life-changing decisions as farming is not like running a factory where changing markets can be dealt with comparatively swiftly. In contrast, agriculture is governed by the seasons and, therefore, has to take its time, governed by uncontrollable elements, the state of the soil and diseases that can affect animals as well as crops.

But changes are already taking place as the Agriculture and Horticulture Development Board (AHDB), representing farmers and food producers of meat to potatoes, cereals and dairy products, sees in export patterns around the world.

Eating habits are changing for various reasons, but largely due to rising standards of living. This still leaves millions poor who, ironically, are often the ones providing the better off with their food. But in general more money in pockets internationally has changed the eating habits of the world, and will ultimately benefit growers and producers.

The biggest change is an ever-growing demand for meat. As Stephen Howarth, AHDB's market specialist manager, notes: "The trend for meat consumption is an upward one." His organisation joins

> **More money in pockets internationally has changed the eating habits of the world, and will ultimately benefit growers and producers**

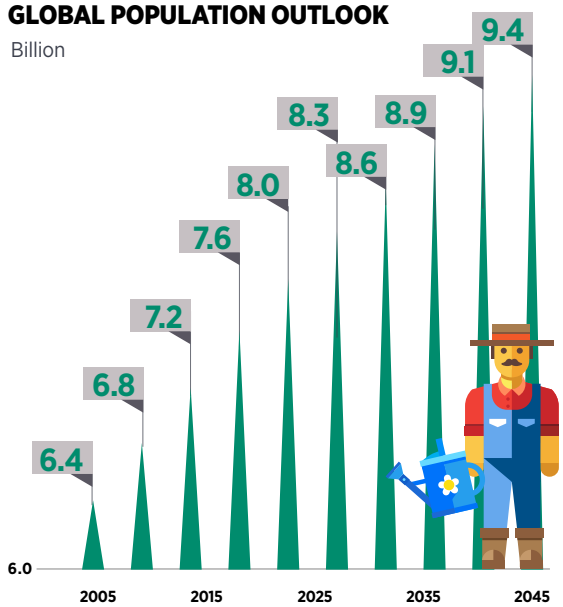
DEFRA, the government department representing food, farming and the environment, among much else, in attending trade shows in the Far East to find new export markets far from the guarantees of the European Union. A success story is Macau in China where UK farmers were this year given the go-ahead to export beef and lamb. Macau's important gastronomy sector opening up to UK meat is important as our farmers aim for the niche luxury market.

Mr Howarth has other examples. "The Thai government is keen to cater for quality food and drink for their 27 million tourists each year," he says. "The UK export beef, pork and lamb to Singapore, which is seen as one of the most attractive markets in the world for premium meat and food products; the country produces little food and needs to import it."

These market conditions are repeated in Hong Kong, where one of the largest food and hospitality shows in the region was held earlier this year. Earlier this

GLOBAL POPULATION OUTLOOK

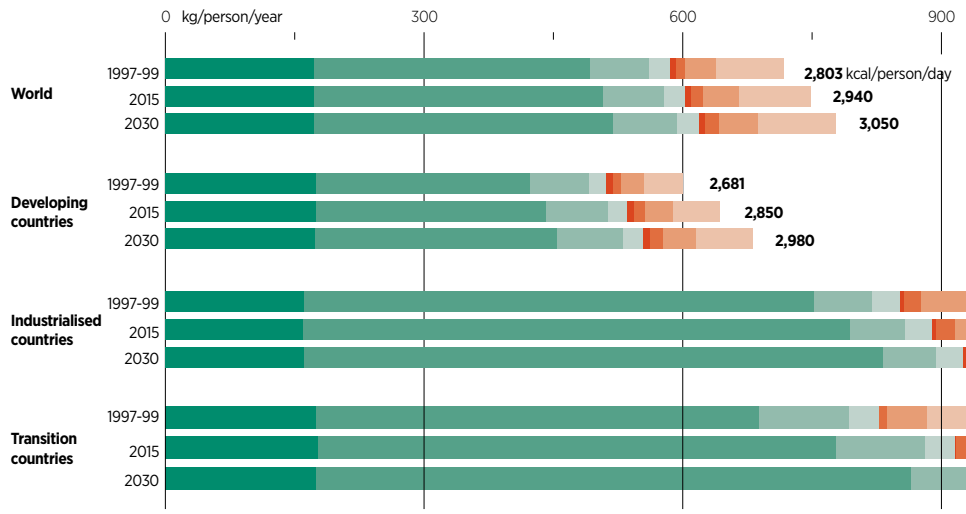
Billion



Source: US Census Bureau 2015

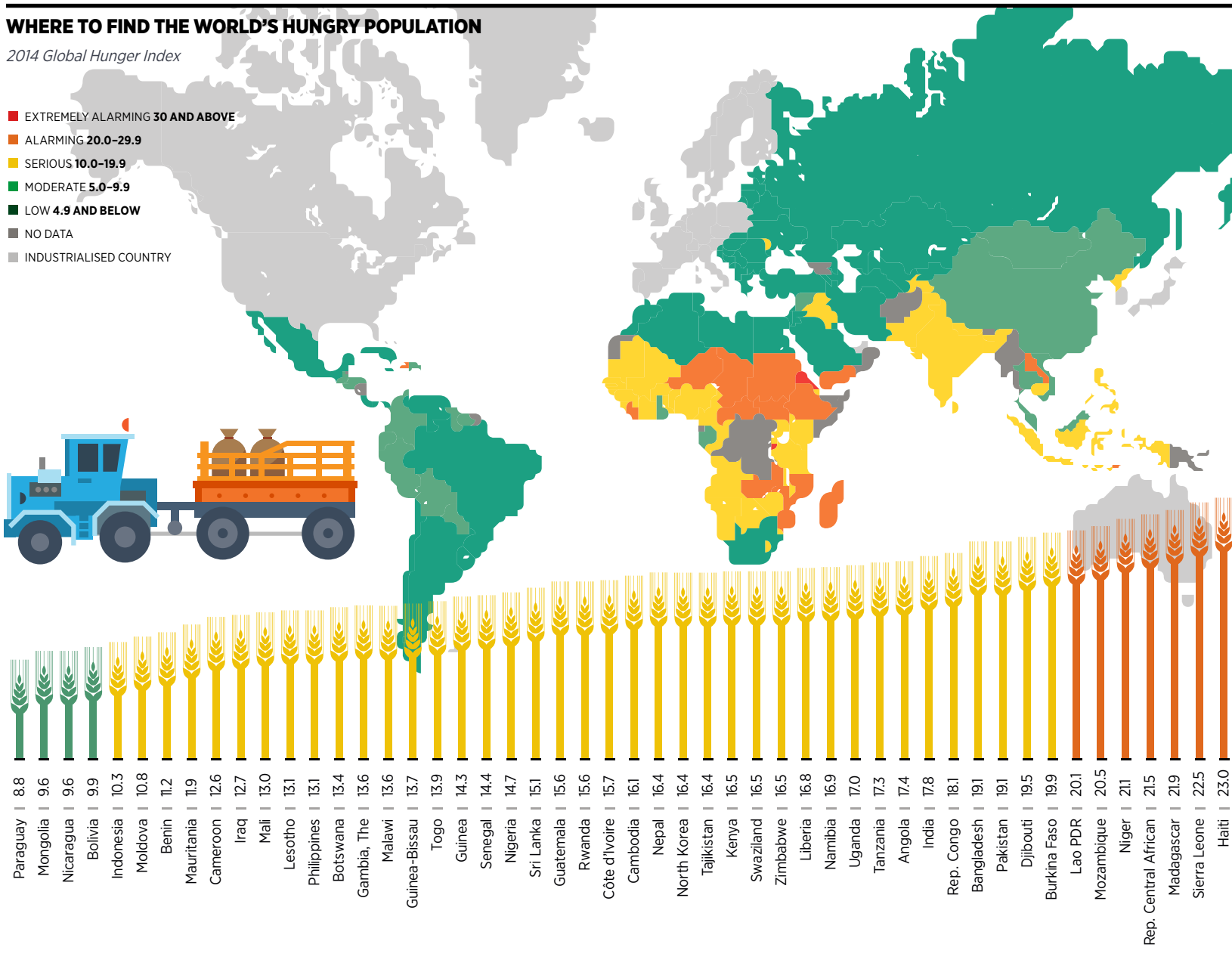
GLOBAL FOOD AND NUTRITION SCENARIOS

Changes in the commodity composition of food consumption



WHERE TO FIND THE WORLD'S HUNGRY POPULATION

2014 Global Hunger Index



Source: Welthu

t farmers can cash in

l eating habits signal more change for farming

month, environment secretary Liz Truss announced that global UK pork exports had rocketed by 44 per cent in the last five years, bringing in £214 million a year, with China providing our top growing market.

Wagyu beef from Japan and Australia, and premium offers from North America and Australia, are popular in the high end of the Hong Kong market, which accounts for nearly 70 per cent of the food consumed there, while Brazil and other suppliers provide large quantities of beef to the mass market.

But it is the niche markets that farmers seek out, because the prices they receive are at premium levels.

Mr Howarth says this year's mission was to sell beef, lamb and pork to the Far East, notably Japan and South Korea, and to India, but draws attention to the need to address religious requirements. Large areas of the world, and many international airlines, demand meat killed in the halal manner, which currently favours lamb from New Zealand and Australia, the world's largest suppliers.

A visit to Waitrose in Dubai, in the United Arab Emirates, underlines the global nature of today's market, with little from the UK, but Australian and American beef and fruit dominating the shelves, along with New Zealand lamb and potatoes from Ireland.

On the outskirts of Dubai, where genetically modified (GM) foods are banned on environmental grounds, there is the International Center for Biosaline Agriculture (ICBA). Here experiments are taking place to see which crops can thrive on the least water, to feed countries that are or will be affected by climate change. Research crops in the surrounding fields are cultivated to test which plants can live on saline soil. In the Arabian Peninsula, where the environment is harsh and most soils are saline and poor in nutrients, only a limited number of crops can be grown successfully, the researchers say.

It may be best known in the UK as a dish served by up-market chefs, but quinoa could solve many problems as a high-protein grain crop for wherever temperatures are high and water scarce. It is tolerant to salt water and is grown in the salt beds of Bolivia and northern Chile. Seeds can be used as a breakfast cereal, to make soup, brew beer and as animal feed. It tolerates drought and has a low water requirement. It is thriving on the ICBA experimental soil.

Dietary changes worry researchers at the Netherlands-based Water Footprint Network, who feel that the projected increase in the production and consumption of animal products is likely to put a further strain on the globe's freshwater resources.

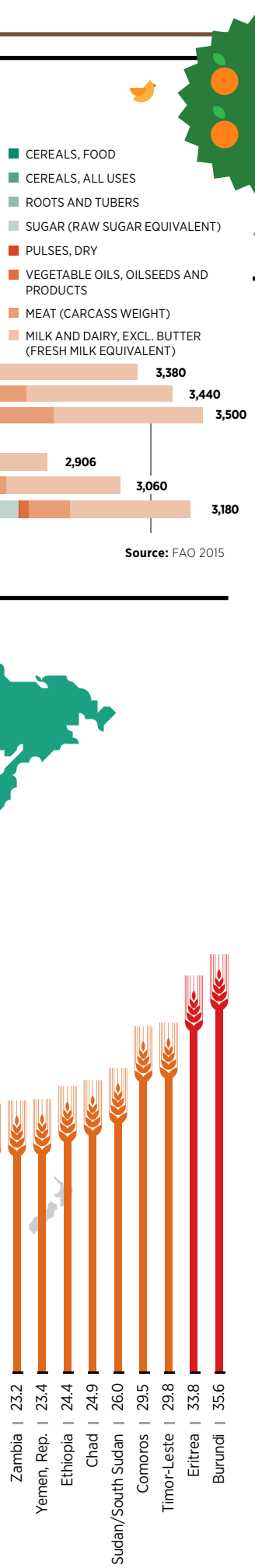
In a recent report, the network points out that animal products per ton generally have a larger water footprint than other crops. The same is true when the water footprint per calorie is measured. Their researchers found that the average per calorie for beef was 20 times larger than for cereals and starchy roots.

So how could changes in diet and greater demand for meat, which put immense pressure on the world's diminishing water supply, be met? Dr Ashok Chapagain, the Water Footprint Network's science director, says this can only happen through education, which could take at least 30 years. But, optimistically, he told how he had spoken to children at an Austrian primary school about water shortage, and that they were already aware of the water footprint of the food in their daily lunch boxes and had changed eating habits to reduce the footprint.

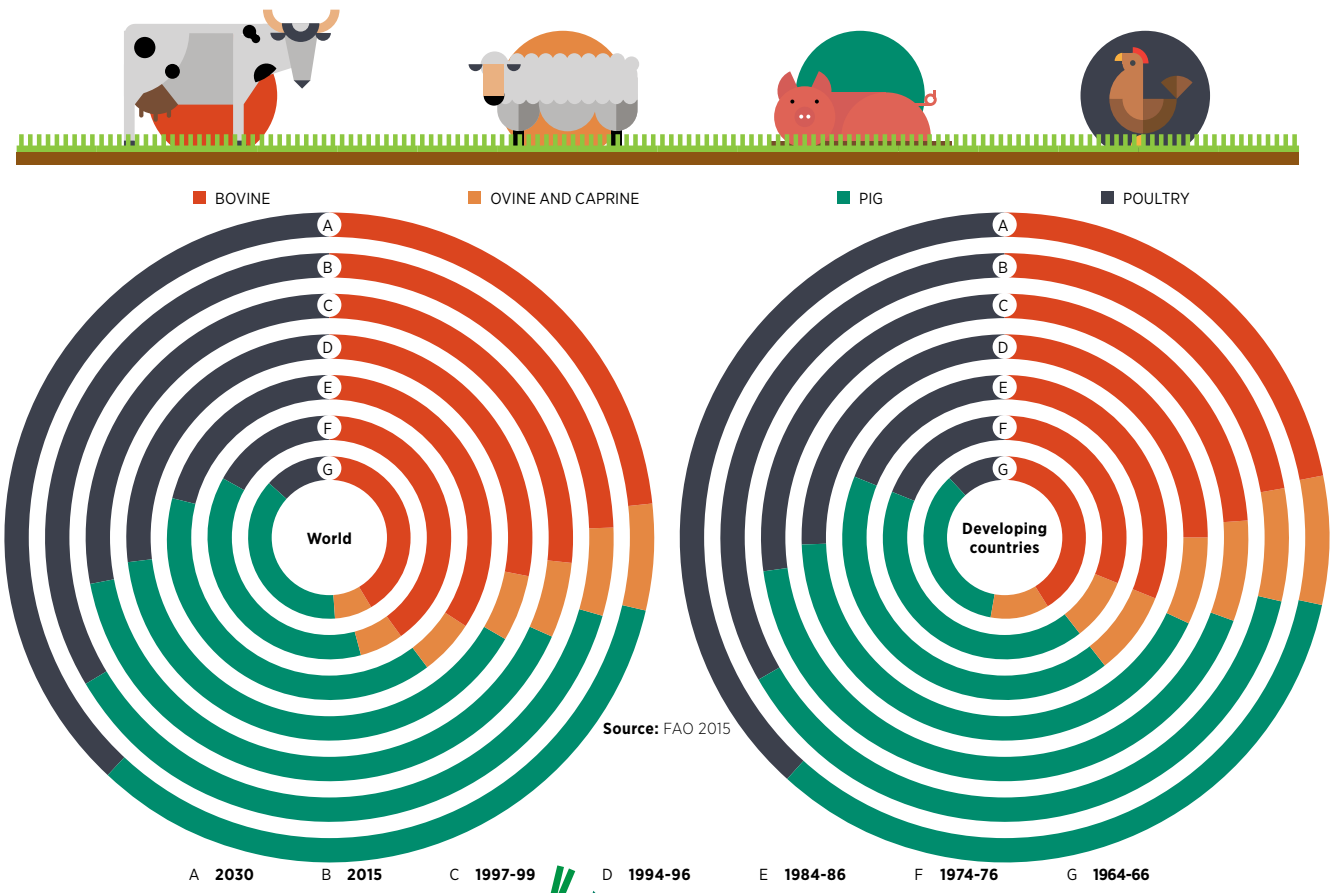
The other big threat to stability caused by the expanding global market for food is land-grabbing. This is the practice of richer countries taking over the land in poorer countries to grow themselves food for the future.

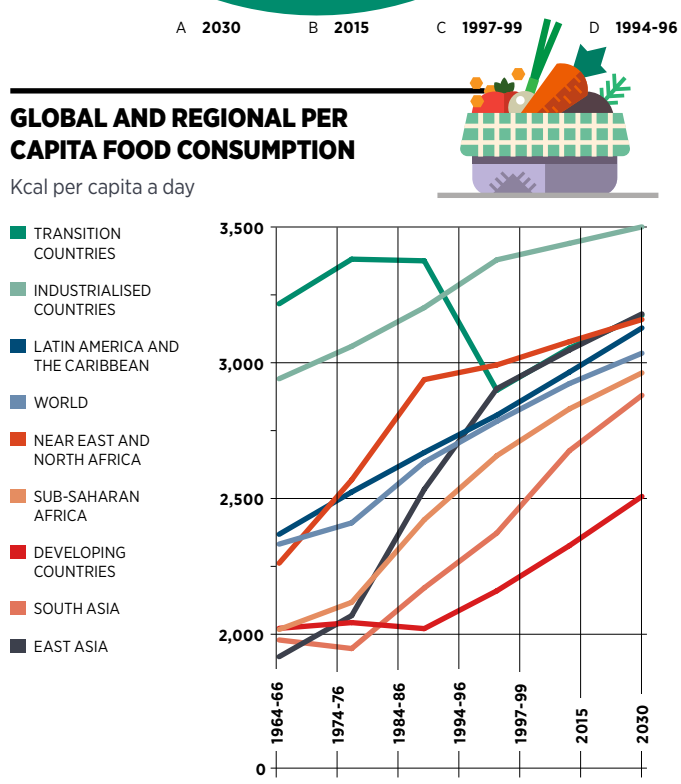
Oxfam's land rights policy lead Kate Geary explains: "Cheap land, high food prices, speculation and drivers such as European biofuels targets have sparked a rush for land with Africa at the bullseye. The scramble for land has seen food crops being exported to richer countries far away or being used for fuel instead of food – at the expense of local communities."

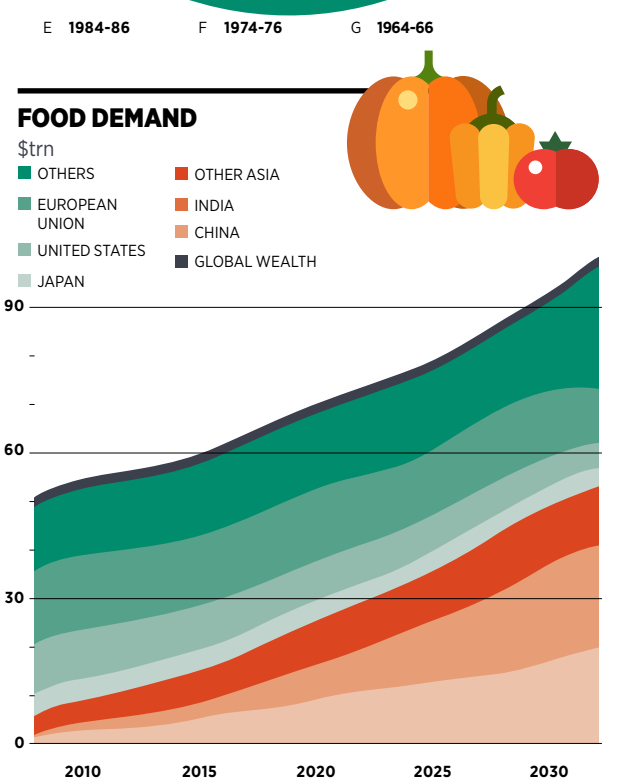
This has led to thousands of people losing their land, their homes and their way of life without consultation or compensation. However, it can be negotiated legitimately. China, for example, has taken over land in Australia and New Zealand with the full co-operation of both governments.



ngerhilfe/IFPRI/Concern Worldwide 2014







Fields of thought and the seeds of time

Opinion on genetically modified foods remains divided, but can such agricultural technology help to avoid widespread and imminent famine?

◆ **GENETICALLY MODIFIED CROPS**

● **JIM McCLELLAND**

GM is everywhere – not in the sense of fields and foods, but in public debate and the press.

Genetically modified organisms (GMOs) have been championed in the fight against the threatened "banana apocalypse" by fungal diseases, but challenged on safety grounds by the Norwegian government.

Engineered to help tackle vitamin-A deficiency, "golden rice" has been heralded as both a potential lifesaver by Danish author Bjørn Lomborg and a hoax by Indian environmentalist Vandana Shiva.

Biotech giant Monsanto has been seen holding open-house on the social networking website reddit, but heard under attack on the new album by Neil Young. Like it or loathe it, you cannot ignore it – GM makes news.

However, to have the issue front and centre in the agriculture and food debate is more hindrance than help, argues Peter Melchett, policy director at the Soil Association.

"GM is a huge distraction. At best, pro-GM campaigners claim they have a solution to one or two problems," he says. "The technology cannot deliver integrated solutions to the range of challenges facing farming – climate change, hunger, loss of wildlife, poor animal welfare, soil degradation, and all other environmental and human problems caused by industrial agriculture."

This tendency of GM to hog the public agenda is also a source of frustration for Danielle Nierenberg, president of Food Tank. "The thing that happens when you are talking about GMOs is the issue itself takes up all the oxygen in the room," she says.

What troubles her more, though, is lack of progress. "My concern is that investment and research into GMOs has been going on for more than 20 years now and we still have about a billion people hungry," she says. "We are still grappling with the same challenges we were grappling with 40 years ago. GMOs haven't lived up to their promises."

One key media battleground at present is the issue of the use of chemicals, with a case for GM made by Professor Jonathan Jones, of the Sainsbury Laboratory, in Norwich. He points out: "Already, there has been a vast reduction in insecticide applications worldwide. Over 400,000 tons of insecticide – nerve poisons – have not been applied thanks to GM."

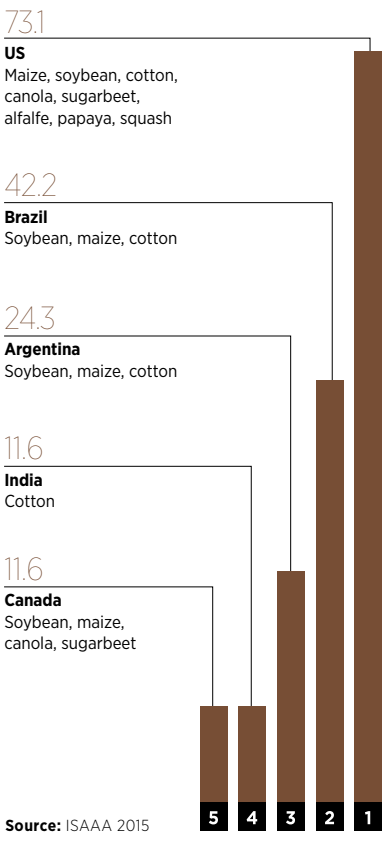
While Professor Jones acknowledges that usage totals for certain herbicides have gone up, particularly glyphosate (a hot topic at present, with its own hashtag in hourly use on Twitter), he suggests this is because they're being substituted in place of what he describes as "nastier" alternatives.

Forecasting reductions in fungicide applications from next year, when the potato blight resistance gene he cloned is deployed commercially in the United States, Professor Jones also tips Brazil for the country to watch, as biotech inputs begin eating into $1 billion-worth of fungicide applications used annually to control soybean rust.

He is at pains to place GM in context. "An important general point is that GM is just a method, not a thing, and it can be deployed to address many different agricultural problems, but only if there is a cost-effective business model for either private or public-sector actors," he says.

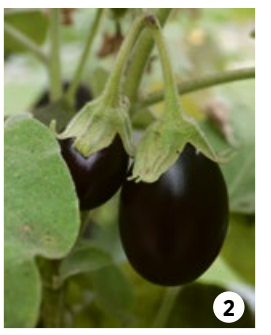
For Rich Kottmeyer, senior vice president at Cheetah Development, getting the numbers to add up constitutes the day job, working to make smallholders investible. Mr Kottmeyer contends it is not just a matter of the total global shortfall in future food production that makes GM a must-have, but how the figures break down geographically. "Productivity gains are very uneven," he says. "Sub-Saharan Africa is projected to reach only 13 per cent of food needs. If we don't use all tools and techniques, we must be comfortable with an outcome of hunger and malnutrition that could have been prevented."

TOP FIVE GLOBAL AREAS OF BIOTECH CROPS IN 2014: BY COUNTRY (MILLION HECTARES)



Source: ISAAA 2015

1



2

1. Bags of Syngenta Golden Harvest hybrid seed corn produced in Illinois, United States

2. Countries including Bangladesh have been trialling pest-resistant GM aubergines, known as Bt brinjals

"Productivity gains are very uneven," he says. "Sub-Saharan Africa is projected to reach only 13 per cent of food needs. If we don't use all tools and techniques, we must be comfortable with an outcome of hunger and malnutrition that could have been prevented."

In Mr Kottmeyer's analysis, willingness to embrace modern practices, including GMO, approaches a moral imperative. "The gap between agricultural 'haves' and 'have-nots' is astonishing. Data clearly shows that it is the poor smallholder farmer that suffers the most from a lack of technology access," he says.

"Ironically, the hungry bear the brunt of the fight and have little voice. This has to move to being an issue of social justice or the poorest of the poor will continue to suffer needlessly."

For Ms Nierenberg, though, GM is part of an ag-tech image problem. "When people think technology, they think GM and they can't think anything else. It makes technology seem bad and technology isn't bad in agriculture," she says. "If we are concerned about figuring out the challenges – whether climate change, hunger or protecting the environment – we need technology to do that."

> **This has to move to being an issue of social justice or the poorest of the poor will continue to suffer needlessly**

The debate about the urgent need for technology in agriculture is perhaps strongest in relation to Africa, where food insecurity is highest and GM slow to gain acceptance.

Reality for the have-nots there is stark, concludes Richard Munang, Co-ordinator of the United Nations' African regional climate change programme. "In Africa, the major vulnerability is climate driven – 25 per cent go to bed hungry, more than 200 million suffer chronic to severe malnutrition, which also accounts for over 50 per cent infant mortality," says Dr Munang.

"In the face of climate change, 11 to 40 per cent declines in productivity of key staple foods in the continent are projected, implying a 25 to 90 per cent increase in the undernourished by 2050."

Led by the UN Environment Programme and acknowledged by the African Union, the call is for policies of ecosystem-based adaptation. The role for GM is still up for negotiation, backed by the Alliance for a Green Revolution in Africa, but facing political resistance and public unease.

With strong opinions across continents both for and against GMOs, media controversy is seldom far away. In the face of an impending global food crisis, healthy debate about the future role of technology in sustainable agriculture is desirable, even essential. However, associated delay and disruption is not.

Against the clock, the question to ask is not perhaps whether GM is the answer, but whether GM is the question.

BIOTECH CROPS

4
African countries have commercialised GM crops

Source: Friends of the Earth International

448m
acres of biotech crops worldwide in 2014

Source: International Service for the Acquisition of Agri-Biotech Applications (ISAAA)

82%
of all soybean planted in 2014 was biotech

Source: ISAAA

53%
of global biotech crops in 2014 were grown in 20 developing countries

Source: ISAAA

OPINION COLUMN

For and against GM

Supporters and opponents of genetically modified food are passionate in their beliefs, but who is more persuasive?

FOR | STEPHEN TINDALE
Former Greenpeace UK executive director

Genetic modification can be used for good or bad purposes, environmentally and ethically. So biotechnology should be assessed case by case – what does this aim to achieve, will it work, what are the possible side effects and do the potential benefits outweigh the risks? Opposition to all genetically modified organisms (GMOs) on the basis that they are not "natural" makes no sense. Most things in the modern world are not natural, including the crops produced by centuries of plant breeding.

Climate change requires environmental campaigners to rethink their stance on many issues, including agriculture. Humanity urgently needs more drought-resistant crops, more saline-resistant crops, crops that can grow on marginal land. We do not have time to produce these through conventional plant breeding, so must use GMOs. The price of not doing so is mass starvation in Africa, Asia and Latin America.

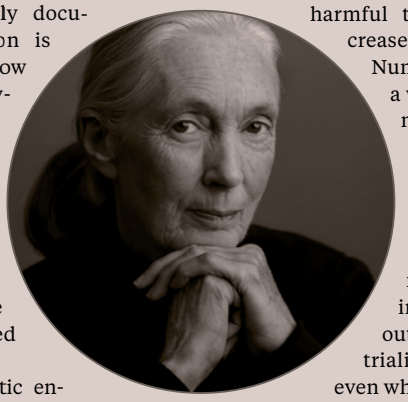
Oxfam states that it "does not support GMOs as the solution to hunger, poverty and development". This is understandable. GMOs are not the solution, but they could be part of the solution. Hunger and poverty could be eradicated through redistribution of global wealth. But that is not going to happen any time soon. So why not use some GMOs – golden rice, BT aubergine – to help tackle problems of hunger and ill health?

Jeremy Hobbs, executive director of Oxfam International, wrote in 2010 that "Oxfam understands technology does matter and that modern biotechnology might play a role in helping to achieve global food security, but only so long as farmers are central to the process and their rights are strengthened, not harmed". So, Oxfam takes a selective, rational approach to biotechnology – it does not support or oppose the technology *per se*, but considers how it is used.

Hang on, GM opponents will say, biotech has not been proven to be safe. They would be right in one sense as science does not definitively prove anything. New discoveries are always possible. But the overwhelming majority of scientific research over the last 20 years finds GM to be safe. Similarly, it has not been proven that pollution causes climate change, but almost all peer-reviewed scientific publications find that it does. Green campaigners often point this out, but don't mention that a similar majority of scientists find GMOs to be safe.

With biotechnology, the science says the risks of action are small, while the risks of inaction are enormous. So, cautiously and case by case, GMOs should be supported.

AGAINST | DAME DR JANE GOODALL
Campaigning environmentalist



We're repeatedly assured modern genetic engineering is merely a minor extension of natural breeding, that there's an overwhelming scientific consensus the modified foods it creates are as safe as naturally produced ones, that this consensus rests on a mass of solid evidence and these foods are necessary for meeting the world's future nutritional needs.

But I believe none of these claims are true. This is well established by extensive evidence that's skillfully presented in the excellent free resource, *GMO Myths and Truths*, and also within the pages of an important new book, *Altered Genes, Twisted Truth: How the Venture to Genetically Engineer Our Food Has Subverted Science, Corrupted Government and Systematically Deceived the Public*, for which I wrote the foreword.

This book explains in detail how the GM food venture has been "chronically and crucially dependent on disinformation" and could not have survived without it. The disinformation is still being dispensed today – if the truth had been widely shared from the beginning, GM foods would probably never have come to market and we would not be having this debate.

Furthermore, the sheer extent of the irrefutably documented deception is itself proof of how strongly the evidence weighs against the safety of GM foods, because (as the book points out) if it were truly supportive, there would be no need to distort it.

In reality, genetic engineering is a radical break with natural processes and there has never been a consensus among scientists that its foods are safe, with cautions issued by institutions such as the Royal Society of Canada and the Public Health Association of Australia. A significant number of well-conducted studies published in peer-reviewed journals have detected serious harm to the animals that consumed them.

Finally, extensive research has demonstrated they are not the solution for world hunger and that in fact the GM food venture is actually harmful to efforts to increase food production. Numerous studies in a variety of African nations have consistently shown agroecology and permaculture are not only safe and sustainable methods of farming, but can also outperform industrialised approaches even when GMOs are employed. Unfortunately, however, the GM venture is capturing a large portion of the money and attention that should be directed towards establishing these patently superior forms of farming.

Clearly, GM foods are unacceptably risky, deceptively promoted and obstructing genuine progress. The world will be much better off without them.

Risking the weather and global politics for food

The UK is dependent on food imports and therefore at the mercy of policies and events outside its control

◆ **INTERCONNECTED RISK**

● **MICHAEL WALE**

According to the National Farmers Union (NFU), the amount of food now produced in the UK has slumped to 60 per cent of what we need to be self-sufficient, making us more dependent than ever on imports.

The NFU, which represents 70 per cent of UK farmers, have drawn up a table showing, at ten-year intervals, the number of days domestically produced food will last. In 2013 this was 219 days and by 2023 it will have fallen by an estimated six days.

In a policy document released in the run-up to the recent general election, the NFU called on the future UK government to tackle European Union agricultural policy, especially the EU's emphasis on "greening" the countryside.

NFU policy director Andrew Clark believes far too much of the rural development money granted to the UK is spent on environment management rather than food production.

Mr Clark says: "The point of farming is food production. This is something the market wants." He points out that the reverse happens in the Netherlands and Ireland, where the focus is on producing food, underlining he is not against improving the environment, but that this should not be at the cost of food production.

He believes that if we are to become more self-sufficient as a nation then the government should be backing capital grants to farmers so they can invest in new machinery, polytunnels and buildings. "Once you have those buildings up, you can produce for the market," he says.

The NFU is also fighting an EU temporary ruling banning pesticides containing neonicotinoid chemicals. The EU ruled that they were harmful to honey bees, whose large loss across Europe, including the UK, is troubling environmentalists and the public. Farmers claim that the oil seed rape crop has been particularly affected by the ban, reporting yields dropping by up to 30 per cent and crops being attacked by flea beetles.

Richard Tiffin, director of the Centre for Food Security at Reading University, agrees that we have to produce more food and questions how resilient the UK food system would be subject to future extreme weather events.

He says we are likely to see more of these events with researches estimating the probability of extreme weather is likely to increase from once in every two hundred days to once in thirty.

"If the North American and European wheat harvests fail through drought, and the Asian monsoon also fails – then we're in trouble," says Professor Tiffin. "That will happen at some point in the next 100 years. We will have civil unrest associated with that and we need to think how we defend ourselves. We have to work it out as a global community."

Visit any supermarket and you will see how much food we import. But why? For example, although we export more than £300 million-worth of poultry meat to countries around the world, we are not self-sufficient, importing 26 per cent of the poultry consumed in the UK, according to the British Poultry Council.

Watts Farms is a family business that grows more than 70 varieties of vegetables and herbs in ten locations, totalling 600 hectares in Kent, Essex and Bedfordshire. It has an annual turnover of £30 million, supplying major retailers and wholesalers, as well as the NHS and 500 up-market restaurants.

Director Joe Cottingham believes that supported by government-backed research and development, the UK could boost food production. "We have to keep up with the rest of the world," he says. "We're going to fall behind and we cannot increase land. If we let our self-sufficiency drop, it becomes more of a challenge. It concerns me – and there are more and more lorries on our roads full of foreign produce."

> **If the North American and European wheat harvests fail through drought, and the Asian monsoon also fails – then we're in trouble**

Tim Mead, who runs Somerset's Yeo Valley organics, a company with a £300-million turnover in dairy products, says that 300,000 tons of yogurt comes into the UK annually from countries as far away as America, Canada, Poland and Portugal. "That is one truck every half hour," he says.

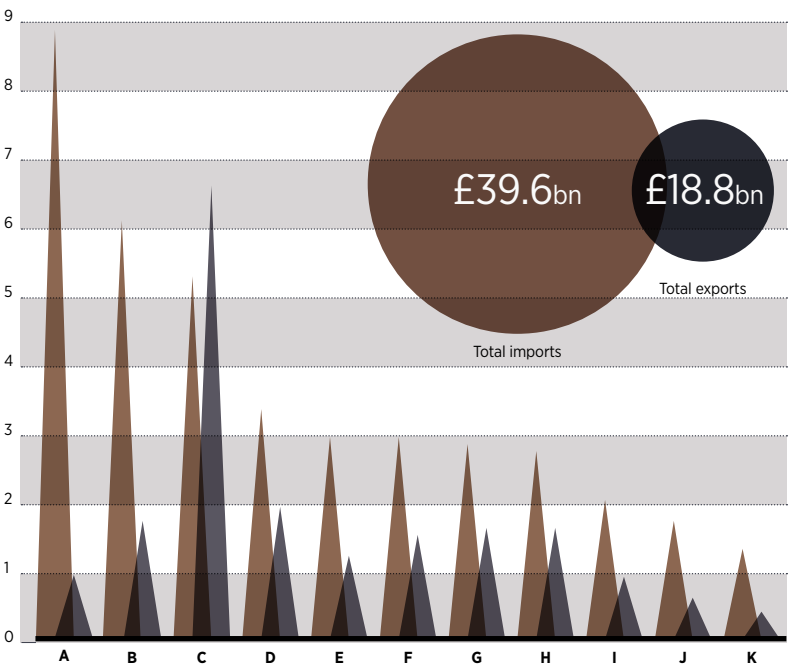
So do we need a radical new approach to farming to achieve self-sufficiency?

This is the case put forward by Patrick Holden, former director of the Soil Association and founder of the Sustainable Food Trust. Mr Holden, who farms 320 acres in West Wales, producing cheese from his dairy herd, says we could go a long way towards self-sufficiency and sustainability by changing our diet and farming practices.

He advocates not using nitro-fertilisers and pesticides, which he says have diminished the soil, and switching to eating pasture-fed red meat and occasionally chicken.

Mr Holden's faith lies in the millennial generation of young people under the age of 30. "Already in America there are signs they are leading a change and no longer going to fast food restaurants," he says. "It's no longer cool to eat fast food from intensive agriculture."

UK TRADE IN DIFFERENT FOOD GROUPS



		Total imports	Total exports
A	Vegetables and fruit	8.7	0.9
B	Meat and meat preparations	6	1.7
C	Beverages	5.2	6.5
D	Cereals and cereal preparations	3.3	1.9
E	Coffee, tea, cocoa, spices	2.9	1.2
F	Dairy products and eggs	2.9	1.5
G	Miscellaneous edible products	2.8	1.6
H	Fish	2.7	1.6
I	Feeding stuff for animals (excluding unmilled cereals)	2	0.9
J	Oilseeds, oils, fats	1.7	0.6
K	Sugars, sugar preparations and honey	1.3	0.4

Source: HM Revenue & Customs

£26.5bn

contributed by food and drink manufacturing to the £103bn of gross value added in the UK agri-food sector in 2013

Source: Office for National Statistics/Defra

OPINION COLUMN

Sustainable farming

Reconnecting farmers and consumers through their food is a route to sustainable agriculture

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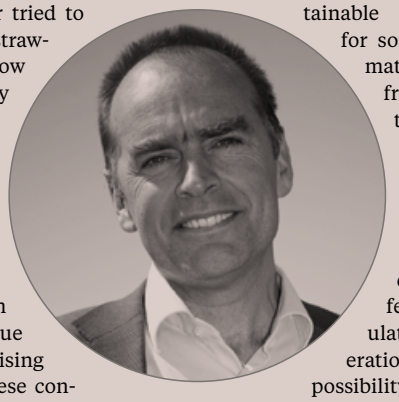
Doñana, a region in southern Spain, produces most of the country's important strawberry crop, close to one of the world's most valued wetlands, designated a UNESCO World Heritage Site.



If you have ever tried to grow your own strawberries, you know they are a thirsty crop. If you forget to water for two days in summer, then both the plant and your strawberries will die. A thirsty crop. An arid area. Unique biodiversity. Rising demand. All these concerns taken together give some idea of the challenges faced by members of the Sustainable Agriculture Initiative (SAI) Platform.

This is why some 70 leading food and drink companies in the world, all buyers of agricultural raw materials ranging from corn to coffee and from oranges to dairy, join forces to find solutions to a variety of environmental, social and economic issues in farming.

They have long since realised that issues such as water scarcity, loss of biodiversity and poverty in farming communities are too big and complex to tackle alone. So they decided to send their buyers to SAI Platform to create a common understanding and find solutions, in a pre-competitive way.

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Agriculture uses around 70 per cent of all the freshwater in the world, but there are many more concerns that need to be addressed as an integral part of what we call 'sustainable agriculture'. There's soil, biodiversity, climate, pollution and depletion, to mention a few, which we put under the heading of 'planet'. We also pay attention to 'people' issues, such as labour conditions, child exploitation and safety, and the 'profit' dimension related to risks, prices and fair wages.

SAI Platform aims to develop a common understanding of all these topics in order to start addressing them. We have created a set of principles for sustainable agriculture for a number of agricultural materials and complemented them with recommended good practices. We have developed universal and free-to-use assessment tools that farmers can use to show and improve their level of sustainable production.

More than 60 per cent of SAI Platform member companies have sustainable sourcing targets for some or all the raw materials they buy from farmers. These targets together form a unique potential to support the transition towards a way of farming that is capable to last and feed a growing population in future generations. It includes the possibility of reconnecting current impersonal and abstract value chains. Sustainable practices and information technology combined now allow farmers to become visible to the consumer and vice versa.

Farming is a complex maze of interrelated pressure points, which needs a variety of skills and abilities to deal with the inherent risks. For buyers to work with farmers, it requires everyone to speak the same language of sustainable agriculture. With this common language, collaboration among competitors in specific regions, such as Doñana, becomes feasible. Farming and food is the art of balancing all this.

In the absence of legal frameworks, green and fair trade certification schemes have been necessary, voluntary and useful ways to start addressing some of these concerns. However, we need to be smarter. Information technology can enable farmers to assess and upload their sustainability profile to reconnect with consumers.

Meanwhile, back to Doñana, where we have united the buyers of some 15 per cent of all the region's strawberries. Because these customers understand and acknowledge that continuously taking increasing amounts of water is not sustainable – and they speak the same language of sustainable agriculture – we have been able to engage with local government, non-governmental organisations and other experts to work towards regulatory, technical and organisational solutions. This is the future of agriculture – and what it should be about.

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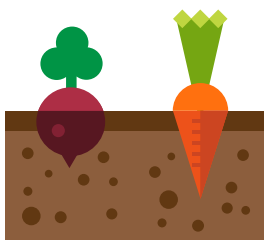
Advances in technology are key to the future of agriculture as farmers strive to feed the world with limited natural resources

◆ AG-TECH INNOVATION

● JIM McCLELLAND

There are an estimated 570 million farms in the world and, in a neat twist of number synergy, according to Valoral Advisors, funding rounds in technological innovations along the agriculture and food value chain also raised around $570 million in 2014.

While much of this investment is directed at ag-tech startups and disruptive market newcomers, in many ways priorities remain the same as ever – innovation in resource use, especially in terms of land and water (also energy), to boost efficiency and yields. Here are five of the solutions helping to support global growth of sustainable agriculture and food production...



1 DATA PRESERVED IN SOIL

For traditional farming models, perhaps the primary determinant of supply capacity is simply the availability and suitability of land. However, any idea of future potential must be built on current data, with what data there is then mapped to tell the story of a region. This story is effectively written in the dirt, the soil.

The Africa Soil Information Service (AfSIS) is developing continent-wide digital soil maps for sub-Saharan Africa using new analysis, statistics, field trials and crowdsourcing. Funded by the Bill and Melinda Gates Foundation, the ISRIC World Soil Information AfSIS project has forged key partnerships with governments, plus a range of stakeholders and academic institutions, including the Earth Institute at Columbia University.

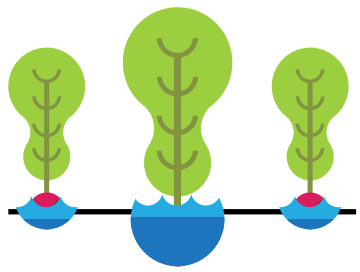
Digital soil mapping, especially in data-sparse regions such as Africa, is key to planning sustainable agricultural intensification and natural resources management. With open access, these interactive maps are publicly available to be explored on Google Earth.

2 LETTUCE WITH YOUR MICROCHIPS?

Singapore relies heavily on imports for more than 90 per cent of its fruit and vegetables. Therefore, diners in Japanese restaurants there might be surprised to discover their rocket, radish and baby spinach has not only been cultivated locally in the country's first licensed indoor vegetable farm, but by an electronics giant better known for TVs – Panasonic.

Annual soil-based production capacity at the initial Panasonic facility launched last year was 3.6 tonnes, but the company is by no means the only high-tech brand setting up urban and vertical farms, to showcase technology rather than make profit.

Sharp is growing strawberries in Dubai, while Sony, Toshiba and Fujitsu are all utilising former clean-room facilities at semiconductor plants across Japan for lettuce. These no-wash, no-soil greens are cultivated by means of hydroponics and grown at more than twice the speed of normal field production, thanks to specialised LED lighting to optimise photosynthesis.



3 GREENS FED ON RAINBOW WASTE

Hydroponics, as the name suggests, is a growing method based on use of mineral-enriched water, whereas aquaponics takes matters a step further, bringing together fish and plant farming in one recirculating system.

At Bioaqua Farm at Blackford in Somerset – the largest integrated aquaponic farm in Europe – vegetables are grown and Rainbow Trout reared together in organic symbiosis, without chemicals or pesticides, but with the help of bees and worms.

The fish provide most of the plant nutrition, by way of aquaculture effluent. In turn, fish waste metabolites are removed by nitrification and direct uptake by plants, with the suitably treated water then flowing back to the fish. In all, it is claimed this virtuous circle of reciprocity requires up to 95 per cent less water than traditional horticulture farming.

For sustainable food production and agriculture, the aquaponics ecosystem principles also appear attractively scalable, from back gardens to commercial facilities.

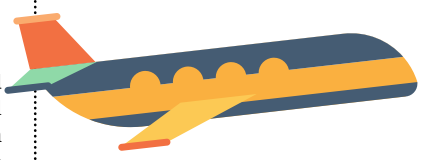
4 POWER OF A NO-SALT DIET

Water efficiency in farming and food production, whether for traditional rural irrigation, arid regions or urban farms, represents a key metric in the face of global population growth and climate change.

Considered together, scarcity of freshwater resources and the fact that 71 per cent of the Earth's surface is nevertheless covered in water, therefore make a compelling argument for desalination. The stumbling block, historically, has been its energy-hungry nature and prohibitively high running costs relative to agricultural profit margins.

The innovative solution offered by Sundrop Farms draws on one of the few renewable resources in even more abundant supply than seawater – sunlight. Sundrop Farms harvests solar power to generate energy for desalination to supply hydroponic greenhouses.

Requiring no freshwater, farmland or fossil fuels, this potential game-changer for sustainable farming is creating 300 jobs in Port Augusta, South Australia, with a ten-year contract won to grow tomatoes for Coles supermarkets.



5 SIDE ORDER OF WINGS

In the media, drones have mostly been associated with the military and spying, plus the odd pizza-delivery publicity stunt.

An annual competition in the United Arab Emirates, UAE Drones for Good Award, acknowledges both this dark reputation and that things are changing. Competition finalists this year pitched benefits for unmanned aerial vehicles from conservation support to medical deliveries, as well as farming help.

The Munich-based Quantum-Systems entry was a transition aircraft combining capabilities of a multicopter and fixed-wing model – vertical take-off, plus fast forward flight like a normal plane. Quantum VRT design allows farmers to adopt precise fertilisation strategies via accurate flight-planning software with evaluation of crop conditions, so reducing reliance on fertilisers and boosting yields.

Dubai plans to scale up agriculture drone technology usage in a bid to become self-sufficient in food security by 2030. With 98 per cent imports, the emirate currently outstrips Singapore.

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