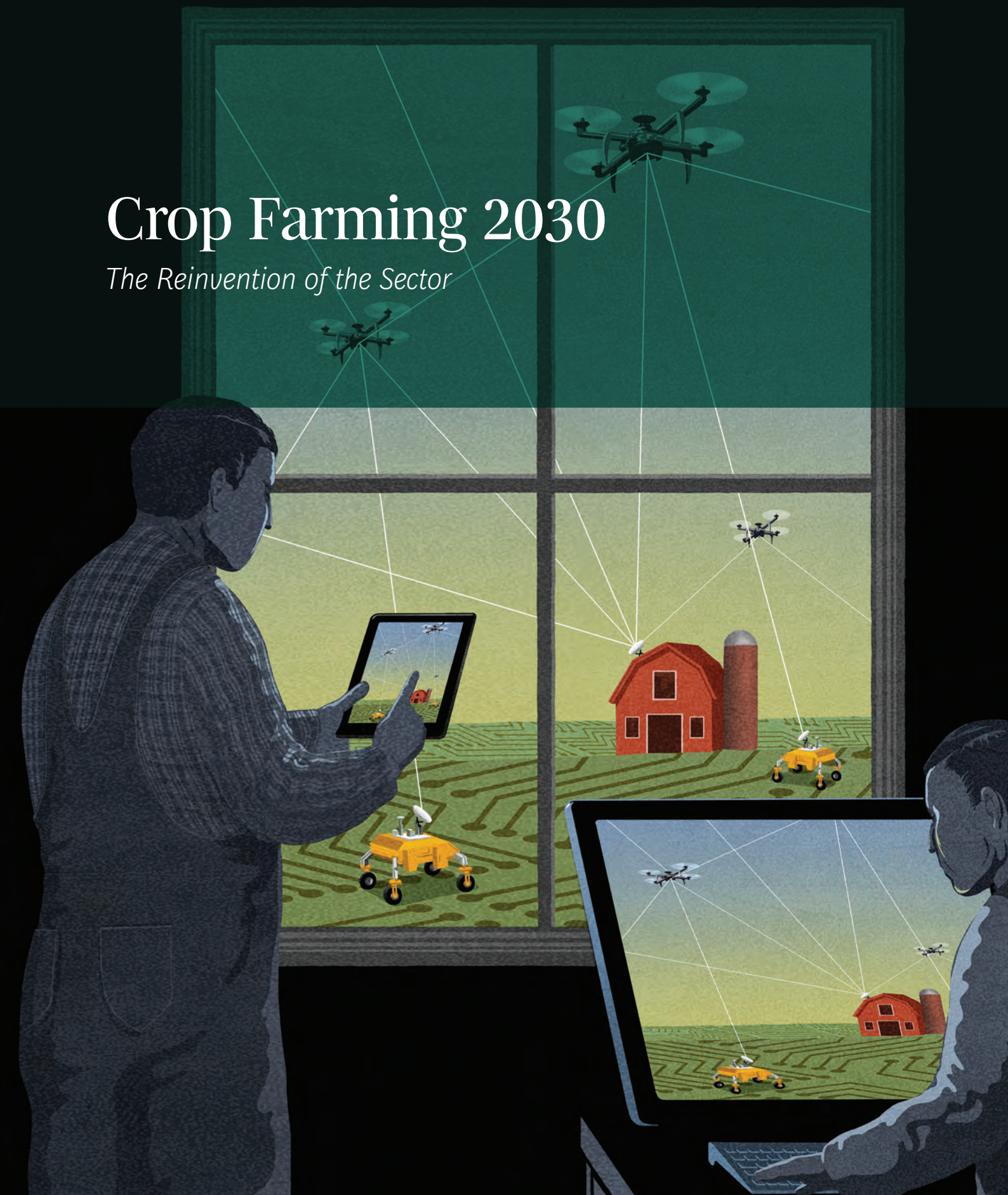
BCG

THE BOSTON CONSULTING GROUP

Crop Farming 2030

The Reinvention of the Sector



The Boston Consulting Group (BCG) is a global management consulting firm and the world's leading advisor on business strategy. We partner with clients from the private, public, and not-for-profit sectors in all regions to identify their highest-value opportunities, address their most critical challenges, and transform their enterprises. Our customized approach combines deep insight into the dynamics of companies and markets with close collaboration at all levels of the client organization. This ensures that our clients achieve sustainable competitive advantage, build more capable organizations, and secure lasting results. Founded in 1963, BCG is a private company with 82 offices in 46 countries. For more information, please visit bcg.com.

BCG

The Boston Consulting Group

Crop Farming 2030

The Reinvention of the Sector

Lorenzo Corsini, Kim Wagner, Andreas Gocke, and Torsten Kurth

April 2015

AT A GLANCE

Five main trends will reshape agriculture through 2030. Businesses that provide equipment and inputs to farmers, as well as nontraditional players like providers of digital services, need to develop strategies and capabilities to capture competitive advantages in the evolving industry.

Emerging Trends Will Shape the Future of Farming

Increased demand for high-quality outputs, new sociopolitical priorities, changes in farming structures and practices, and developments in biotechnology will promote new business models.

Defining Strategies and Building Capabilities

Companies need to identify the most attractive value pools and determine the optimal product portfolio and business models for tapping these new sources of revenue. Implementing new strategies will not be easy. To succeed, companies will need to build new internal capabilities and deploy new operating models.

Imagine a farmer who, rather than relying on his gut instincts, lets farm management software apply smart algorithms and a large pool of field data to make the daily decisions on how to work his fields. Instead of sitting on equipment outdoors, he and a handful of associates operate all the equipment for a farm covering thousands of hectares from a control room. GPS-guided autonomous drones constantly provide the data required for the algorithms, and other GPS-guided equipment works the fields with precision, sometimes even at the level of the individual plant. The crops have been genetically engineered to resist most fungi, viruses, and insects and are highly efficient in their uptake and use of nutrients. As a result, the farm needs less fertilizer, water, and crop protection than it did in the past.

This scenario may sound like a vision of farming's future, but most of the individual elements are already available today to early adopters—and not just at very large farms in the U.S., Latin America, and Russia. In Germany, for example, groups of farmers have "virtually consolidated" their small plots by working across field boundaries using GPS-guided equipment and a smart data-driven approach. This technology allows them to precisely allocate yields to each of the group's members, who realize the synergies and benefits of scale enjoyed by large farms without having to unify ownership of their plots.

We expect the adoption of smart systems that integrate big data and analytics software, wireless connectivity, advanced equipment, and even molecular biology to increase dramatically through 2030. By integrating inputs, farmers will gain better control over them, thereby driving a step change in productivity and yields and altering agricultural value pools and business models.

Farmers will gain better control over inputs, driving a step change in productivity and yields and altering agricultural value pools and business models.

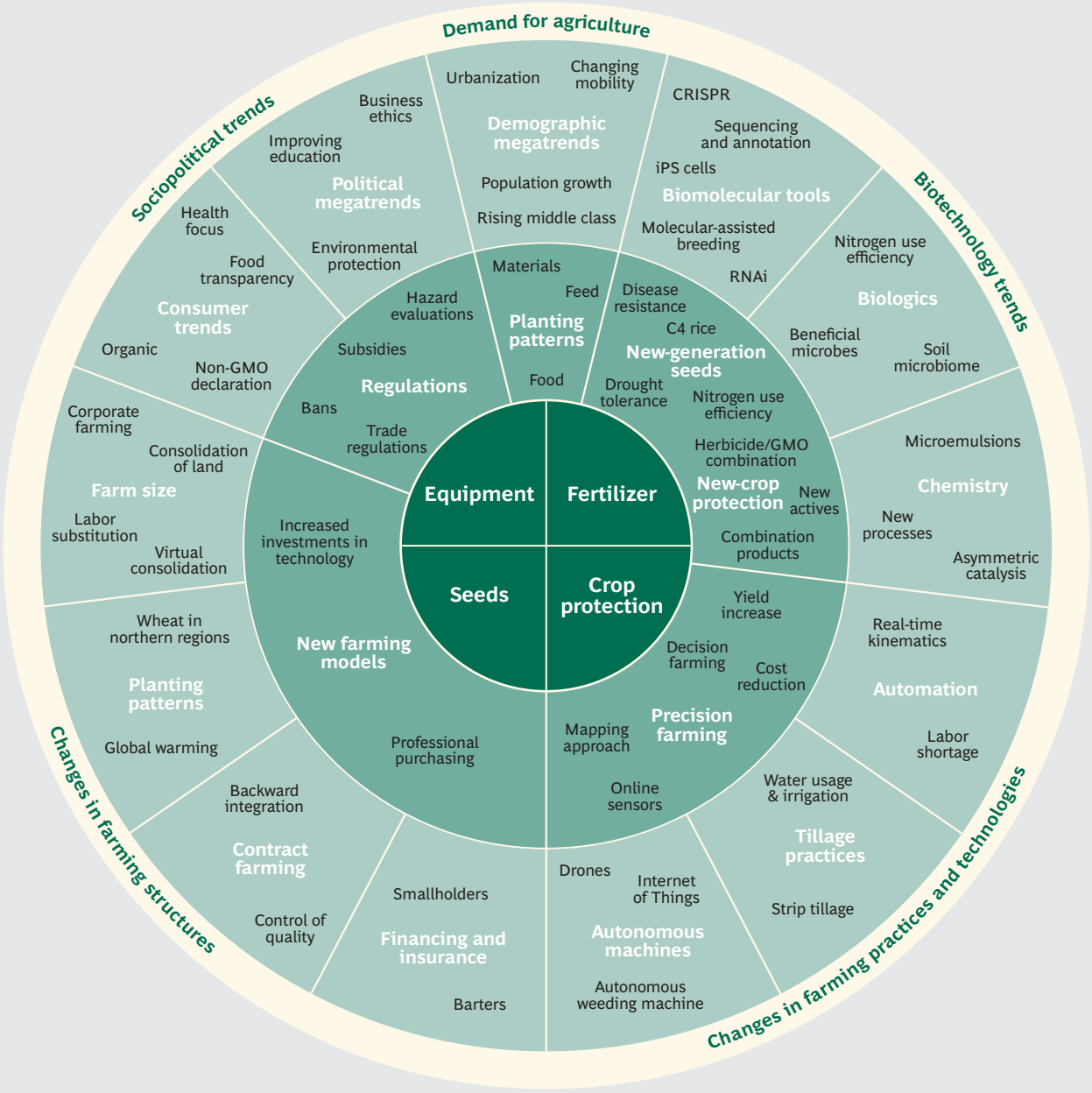
To thrive in this new environment, businesses providing equipment and inputs to farmers, as well as nontraditional players like providers of digital services, should take action now to adapt their strategies and capabilities and prepare for the changing landscape.

To help companies tackle this challenge, The Boston Consulting Group has explored the key trends that will reshape agriculture during the next 15 to 20 years. Our research included an analysis of all agricultural patents registered worldwide from 2010 through 2014 and interviews with a panel of European farmers, as well as with selected industry experts. Although our research focused on Europe, the strategic implications are applicable globally. Companies can apply our findings to develop the strategies and capabilities that will allow them to harvest value from emerging business models in agriculture.

Which Trends Will Shape the Future of Farming?

Through 2030, five main categories of trends will reshape the agriculture industry and promote the emergence of new business models. As shown on Exhibit 1, these trends will influence the four main agricultural inputs— equipment, fertilizer, seeds, and crop protection. The exhibit's inner rings show the specific trends that

EXHIBIT 1 | Trends That Will Shape Crop Farming Through 2030



Sources: BCG interviews with a panel of farmers in France, Germany, Poland, and the U.K.; interviews with industry experts; analysis of approximately 16,000 Derwent World Patent Index patent families registered from 2010 through 2014; BCG analysis.

will directly affect these inputs, while the outer ring shows the trends that will affect them more indirectly.

Trends in Agricultural Demand and Production

Several megatrends are combining to increase demand for agricultural outputs and thereby promote the development of productivity-enhancing innovations. As the global population approaches 9 billion by 2050, the U.N. Food and Agriculture Organization (FAO) expects that demand for agricultural outputs will increase by 60 percent compared with the annual average from 2005 through 2007, representing an increase of approximately 1 percent per year.[1] However, the acreage cultivated globally will increase only negligibly. Furthermore, a growing middle class, especially in emerging economies, will demand more diverse types of food, including meat, fruit, and vegetables, as well as higher-quality food. At the same time, consumers will demand more healthful food options as their dietary awareness increases.

Demand for agricultural outputs will increase by approximately 1 percent per year, but the acreage cultivated globally will increase only negligibly.

Specifically, the FAO and the Organisation for Economic Co-operation and Development predict that global cereal production will increase by 350 million tonnes by 2023, a 15 percent increase compared with the annual average from 2011 through 2013. This higher production will be driven primarily by a yield increase of 10 to 14 percent.[2] The increase in arable land will be low in comparison. Planted area for cereal will increase by 2 to 4 percent globally, but this will mainly be driven by increased arable land in Eastern Europe.

Although demand and production will increase globally, their levels are expected to differ among regions. North America and South America will see an increase in net exports of most commodities, while Asia (especially China) will see a corresponding increase in net imports. For countries in Western Europe, flat production growth will cause their net negative trade balance in agricultural products to persist. In Eastern Europe, a net export surplus in cereals and oilseeds is forecast; however, this will require political stability in Ukraine, the main contributor to the surplus.

From this high-level perspective, the outlook for the agriculture industry looks promising—notwithstanding temporary downturns, such as the current slump in corn and soy prices. These trends will increase demand for the innovative equipment, inputs, and digital services needed to improve farm productivity, especially yields. At the same time, they will help consolidate the customer base for input providers, which, in turn, will increase the professionalism of purchasing decisions and the use of pooled purchases.

Sociopolitical Trends

Trends shaped by consumer preferences will determine the specific methods, locations, and outputs of agricultural production. For example, broad trends, such as "green" farming, tend to start as consumer initiatives that governments eventually adopt and formalize through regulation.

In large parts of Europe, "back to the roots" farming is inhibiting the adoption of new technologies and even reversing agricultural progress. Recent examples include the passionate and vocal opposition to the use of genetically modified organisms (GMOs) and crop protection chemicals, and the European Union's restrictions

on the use of neonicotinoids, a group of insecticides, for two years beginning in December 2013. The EU has also implemented stricter hazard evaluations that will jeopardize the renewal of registrations for many crop protection products already in use. Moreover, subsidies under the EU's new Common Agricultural Policy framework favor smaller farms and programs that promote environmental sustainability.

Interviews with European farmers suggest that farmland consolidation and a labor shortage will be among the major trends affecting farming structures though 2030.

Driven by consumers' increasing preference for organic produce, the amount of organically cultivated land in the 27 EU member countries grew by 6 percent per year from 2002 through 2011, when the total organic planted area represented 5.4 percent of total agricultural land.[3] This is a much larger share than in the U.S., where the organic planted area was approximately 0.6 percent of total agricultural land in 2011.[4] The trend in Europe toward more organic farming works against the need for increased yields, as organically grown crops produce only 70 to 80 percent of conventional yields, with large variations by crop.[5]

We expect the back-to-the-roots trend to persist in Europe and result in additional regulations and restrictions. At the same time, it will drive the demand for products and innovations that increase the efficiency of organic farming. One such innovation is autonomous weeding robots that can dramatically increase the yields of fields that have not been treated with herbicides. The adoption of such innovations will reduce the cost of organic farming, ultimately making organic products more affordable and further increasing their market share.

Back to the roots will also have the effect of promoting conventional agriculture in other parts of the world. Exporting countries in Latin America, for example, will seek to make up for the reduced yields associated with organic farming in Europe.

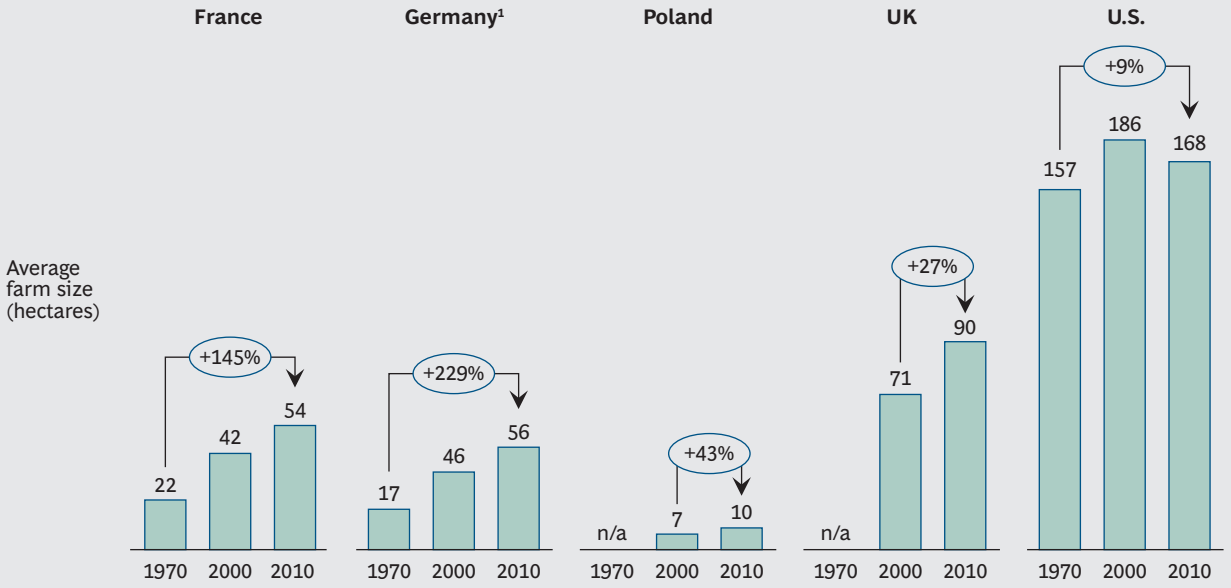
Changes in Farming Structures

In recent decades, farm size in most regions has increased as ownership of contiguous plots consolidates, typically to achieve scale advantages. In Europe, the average farm has grown significantly during the past half-century. (See Exhibit 2.) In France, for example, farm size increased by 145 percent, on average, between 1970 and 2010, from 22 hectares to 54 hectares.[6] In Germany, farms grew by 229 percent during the same period, from 17 hectares to 56 hectares.[7] We expect this trend to continue in Europe, as well as in other regions.

Our interviews with European farmers suggest that farmland consolidation and a labor shortage will be among the major trends affecting farming structures through 2030. (See Exhibit 3.) The labor shortage will intensify as a growing number of family members choose to pursue careers outside of farming. Combined with the drive to consolidate, this will force many retiring farmers to sell their land. Potential purchasers will include not only neighboring farmers but also private-equity and sovereign wealth funds—although in some countries their investments may be limited by restrictions on farmland ownership. These investors may try to optimize yields and improve operational efficiency in order to increase returns.

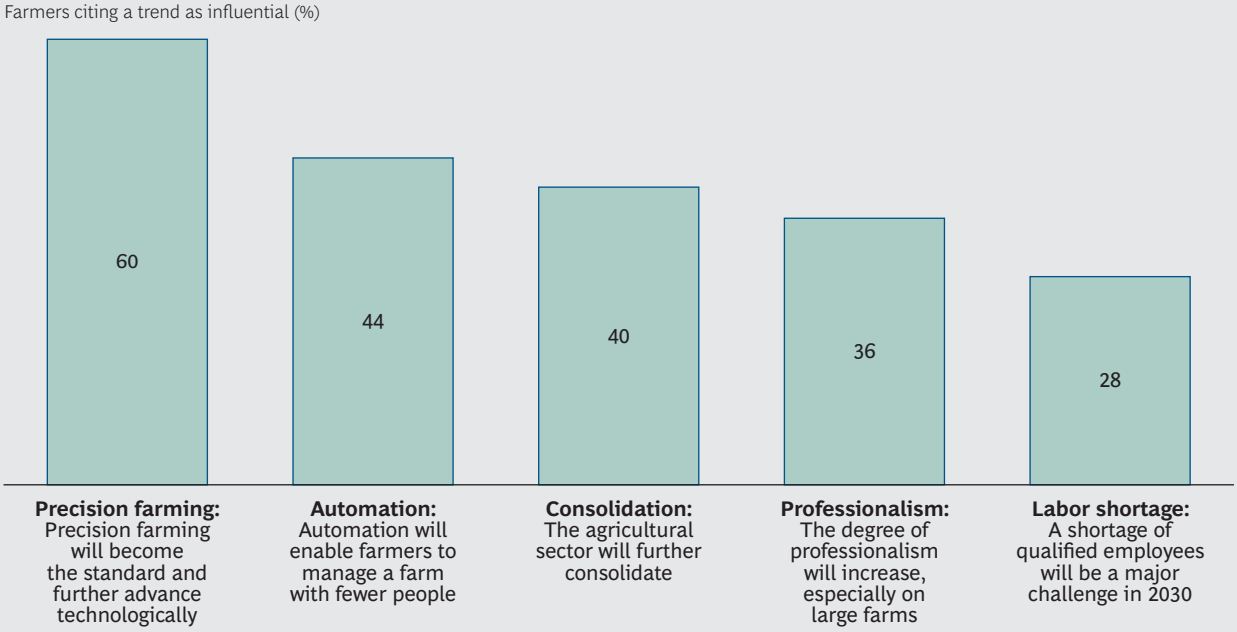
In Europe and other regions where farms tend to be relatively small, consolidation will be driven by the need for higher yields and higher rates of machinery usage. On European farms larger than 500 hectares, the cost of machinery typically rep-

EXHIBIT 2 | Average Farm Size Increased Significantly in Europe from 1970 Through 2010



Sources: Aruna Singh et al., "Farm Size and Productivity: Understanding the Strengths of Smallholders and Improving Their Livelihoods, *Economic & Political Weekly,* June 25, 2011; Eurostat data; German Ministry for Food and Agriculture data; U.N. Food and Agriculture Organization data; U.S. Department of Agriculture, ARMS Farm Financial and Crop Production Practices; 1970 values from Carolyn Dimitri, Anne Effland, and Neilson Conklin, "The 20th Century Transformation of U.S. Agriculture and Farm Policy," USDA Economic Information Bulletin Number 3, 2005; BCG analysis.
[1]Figures for 1970 include West Germany only.

EXHIBIT 3 | The Most Influential Trends Affecting Farming Practices and Structures Through 2030



Source: BCG interviews with farmers in France, Germany, Poland, and the UK.

resents 10 to 20 percent of a farmer's revenue, according to our panel's estimates. Higher utilization will allow farmers to more quickly break even on their investments in high-value precision equipment.

Smaller farms will not necessarily need to consolidate under a single owner in order to increase cultivated acreage. Alternative models will be employed more frequently through 2030, including the use of contractors working across several separately owned plots and cooperatives that allow equipment to be shared. Also, as mentioned earlier, the adoption of virtual consolidation will grow, with farmers jointly cultivating and harvesting across boundaries and using GPS technology to allocate yields, thereby increasing efficiencies of scale.

The trend toward consolidation creates opportunities for input companies to include among their offerings equipment and data services that will help farmers use traditional products—such as fertilizer, crop protection, and seeds—more effectively and efficiently. However, it will also be essential for providers to augment such offerings with precise directions on how to use them.

Changes in Farming Practices and Technologies

"Precision farming" uses data at the level of the square meter or decimeter, or even of a single plant, to optimize the consumption of inputs and make adjustments to accommodate variable characteristics within and among fields. In the past decade, precision farming has already begun to revolutionize farming practices, and we expect its growing influence to promote improvements in variable-rate applications in seeding, fertilizing, and crop protection.

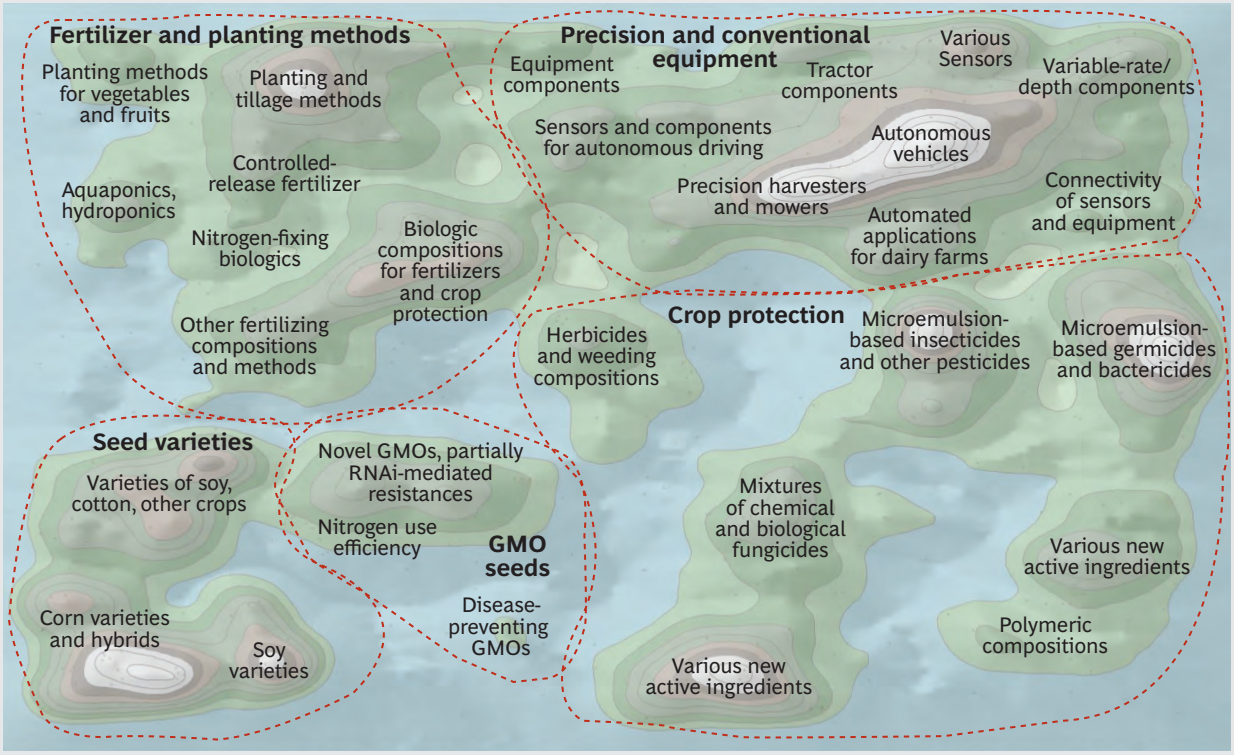
As shown on Exhibit 3, 60 percent of the farmers we interviewed believe that precision farming will be widely adopted by 2030. Its spread will be enabled by the increased use of sensors, software, and wireless connectivity on farming implements, thereby turning plows, planters, spreaders, sprayers, and other add-ons into intelligent equipment. Such implements will control the tractor through two-way communication, providing information about the current load, for example, or sensor data about the soil. Innovative technologies will drive further improvements, but the pace and extent of their adoption remains to be seen. A diverse group of players is competing to offer the best combination of equipment and services.

Precision farming's growing influence will promote improvements in variable-rate applications in seeding, fertilizing, and crop protection.

Which innovations will drive improvements? Our analysis found a large number of new patent registrations relating to equipment for precision farming, particularly autonomous vehicles and precision harvesters and mowers. (See Exhibit 4.) Remote-controlled and autonomous vehicles have already been developed and their performance is expected to improve dramatically. Some experts anticipate that technology will allow a small team to manage a farm's production process without even needing to leave its office. Technology-enabled management will also help offset, at least partially, the expected decrease in the agricultural labor force.

We expect these innovations and the availability of more elaborate data sets to promote further improvements in precision-farming technology. One example is the real-time approach, in which sensor data on soil and other factors enables instantaneous control of variable-rate seeding, fertilizing, and other equipment.

Exhibit 4 | Agriculture Patents Registered Worldwide from 2010 Through 2014



Sources: Thomson Innovation; BCG analysis.
Note: Analysis based on approximately 16,000 Derwent World Patents Index patent families registered from 2010 through 2014.

Another example is smart tillage, which will enable farmers to automatically till at variable depths depending on local soil conditions. Linking and combining data from different sources—such as real-time nitrogen sensing, GPS-connected prescription maps, and images provided by drones—will further enhance accuracy. Farming practices aimed at reducing resource consumption will also become more widespread. These include open-field techniques like conservation tillage that will require farmers to purchase specialized equipment for seeding and other applications.

How rapidly will precision technologies be adopted? The pace and extent of adoption of precision technologies through 2030 is a matter of debate in the industry. For comparison, it took ten years, starting in 1997, for GMO corn in the U.S. to increase from 5 percent of cultivated acreage to more than 90 percent. In Brazil, the penetration of GMO soy occurred even faster, rising from no cultivated acreage in 2003 to 70 percent of cultivated acreage in 2010.[8] As a proxy for what might happen with precision technologies, consider variable-rate seeding, which in 2013 reached 10 percent of cultivated acreage in the U.S.[9] This practice continues to grow and, according to some estimates, could ultimately be applied to as much as 80 percent of cultivated acreage in the U.S. However, because the benefits in terms of yield value have yet to be demonstrated, it remains to be seen how pervasive its adoption will be. (Data on the penetration of variable-rate seeding in Europe is scarce.)

Which companies will emerge as winners? A diverse group of players—including crop protection and seed companies, equipment companies, fertilizer companies, retail distributors, and pure-play digital start-ups—are competing to provide the best precision equipment and digital services. Some companies have already developed an integrated offering of equipment and services for farmers, mainly in the U.S. Corn Belt. Other companies, especially digital start-ups, can offer only a portion of the full suite of equipment and services that farmers need. The absence of integrated offerings for the overall market creates an opportunity for large companies with more financial resources, whether they be producers of seeds, fertilizer, crop protection, or equipment. These companies can gradually build a compelling one-stop solution that will allow them to compete for the lion's share of the market.

Biotechnology Trends

First-generation GMO traits, introduced in the 1990s and 2000s, took decades to develop. These include GMO versions of corn, soy, cotton, and rapeseed, such as Roundup Ready (tolerant to the herbicide glyphosate), LibertyLink (tolerant to the herbicide glufosinate), and Bt (protected against certain types of insect pests).

In the coming years, breakthrough technologies in molecular biology will accelerate the development of other genetically engineered traits. For example, two technologies—TALEN/Fok1 and CRISPR/Cas—allow genetic scientists to expedite the process of introducing or editing target genes. The CRISPR/Cas system makes it possible to introduce mutations that are genetically indistinguishable from those resulting from natural breeding. Scientists have therefore proposed that such traits not be classified as GMOs under European law, which could dramatically increase their public acceptance.

Another technique, RNA inhibition (RNAi), allows scientists to selectively control the expression of individual genes, both in the plant itself and in the organisms that attack it. Remarkably, RNAi-mediated resistance is so specific to the target pathogen that it is possible to prevent collateral damage to beneficial insects such as bees.

What types of products and applications will be developed? Our analysis of filings from 2010 through 2014 found RNAi patents applied not only to alter the biochemical characteristics of plants but also to kill different types of fungi, nematodes, and even viruses that attack plants. Enabling resistance to viruses would be revolutionary because antiviral crop protectants are not currently available. In some cases, these new traits are organized on "gene cassettes," which ensure that they are inherited together and will not separate upon further breeding. As these innovations are refined during the next decade, plants will be made resistant to devastating diseases like wheat rust, potato blight, and mosaic viruses. The introduction of such plants to the market will not only reduce yield volatility resulting from disease pressure but possibly also the need for chemical pesticides.

As innovations are refined during the next decade, plants will be made resistant to diseases like wheat rust, potato blight, and mosaic viruses.

A particularly visionary and scientifically challenging development is the attempt by a consortium of research groups, coordinated by the International Rice Research Institute and co-funded by the Bill & Melinda Gates Foundation, to create C4 rice. By introducing a much more efficient biochemical pathway for photosynthesis, this innovation is expected to increase rice yields by up to 50 percent compared with existing varieties, while also reducing water and fertilizer requirements.

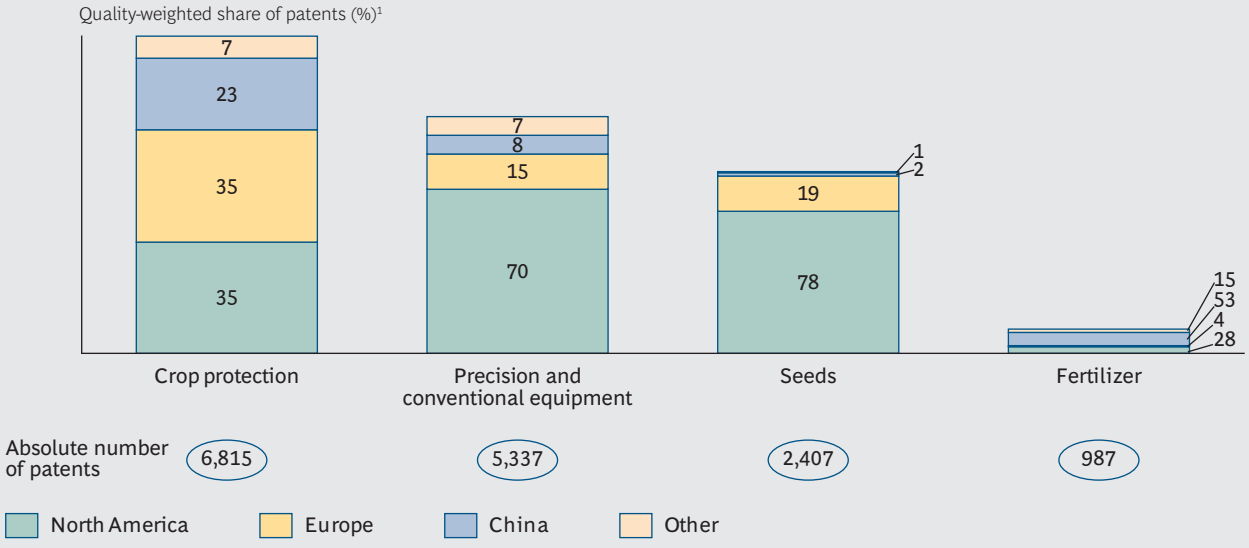
Another application for the new bioengineering techniques is molecular farming, where plants or plant cells are used to produce specific metabolites (such as medicines or biofuels) or other functional proteins. Pharmaceutical companies have already begun using molecular techniques in limited areas, and we expect their applications to expand significantly.

The patent filings we analyzed related more to crop protection than to equipment, seeds, or fertilizer. (See Exhibit 5.) During the next decade, we expect many active ingredients with greater pest specificity to be introduced, as well as more potent combination products like dual and ternary fungicides. In addition, the largest providers of crop protection products and seeds are already working on new combinations of broad-spectrum herbicides and resistance traits in response to the prevalence of glyphosate-resistant weeds. The demand for these products will be high, as glyphosate-resistant weeds are present in nearly 50 percent of arable land in the U.S.[10]

How will biologics affect farming? As noted above, organic planted area in Europe is relatively large, and many people are very opposed to genetic modification of crops. Consequently, biologics will be particularly important as a means of increasing the efficiency of organic farming. Patents have been registered for microbes supporting nitrogen assimilation or phosphorus uptake, each of which has the potential to promote higher yields while reducing the need for synthetic fertilizers. Advocates of organic farming strongly support the use of biologics, but scientific evidence of higher yields and other benefits will be required to open the door to broader adoption.

The arms race to create more advanced GMO crops and biologics will continue. Companies should closely monitor their R&D programs to avoid overspending on

EXHIBIT 5 | Patent Registrations by Sector and Region



Sources: Thomson Innovation; BCG analysis.
Note: Analysis based on approximately 16,000 Derwent World Patents Index patent families registered from 2010 through 2014. Patents assigned to regions based on the location of the filing company's main headquarters.
[1]The quality index is a proprietary BCG metric for evaluating a patent record based on key bibliometric points.

projects that have a low probability of technical and regulatory success. At the same time, they should engage key stakeholders and the public to promote a science-based risk-benefit evaluation of their innovations and foster increased acceptance.

Defining Strategies and Building Capabilities to Harvest Value

Understanding these trends is just the starting point. To devise a strategy that puts insights into action, companies need to identify the most attractive value pools and determine the optimal product portfolio and business models for tapping these new sources of revenue. To support their strategy, they must build the right internal capabilities and deploy effective operating models.

Identify the Most Attractive Value Pools

Companies should seek to exploit sources of revenue that were not traditionally accessible to them, either by applying new technology or by expanding along the value chain or geographically.

Monsanto provides a prime example of how companies can expand into adjacent business areas. Having already transformed itself from a chemical company into a seeds company, Monsanto moved into crop-planting technology by acquiring Precision Planting, a manufacturer of precision equipment and software used to tailor planting to different parts of a field. Monsanto likewise moved into data science by acquiring Climate Corporation, a provider of hyperlocal weather monitoring, agronomic data modeling, and high-resolution weather simulations. Finally, Monsanto developed FieldScripts, a high-tech service that applies field data to increase planting efficiency and yield potential. The company is expected to further expand into variable-rate fertilization and crop protection. Through these efforts, Monsanto is building an integrated, "beyond the seeds" solution that will allow it to exploit new sources of revenue relating to equipment, fertilizer, crop protection, and even software.

We expect that other agricultural companies will similarly venture into nontraditional businesses. These initiatives will enhance collaboration among industry segments and, to some extent, blur the boundaries between them.

In addition to playing offense by moving into adjacent segments, companies will need to play defense to protect their core businesses.

In addition to playing offense by moving into adjacent segments, companies will need to play defense to protect their core businesses. They should closely monitor the moves made by competitors and new entrants into agriculture, such as Silicon Valley players and digital start-ups. Our patent analysis shows that Chinese companies have registered a significant number of patents worldwide during the past several years, particularly relating to crop protection technology. This surge in patent filings may have been triggered in part by the country's Twelfth Five-Year Plan, but whatever the cause, established multinational players in agricultural inputs should expect and prepare for new competitors and innovations to emerge from China.

Each company should focus on identifying not only which nontraditional value pools might emerge in the future but also, crucially, which ones it will be well positioned to pursue. Companies need to consider the significant variations among crops, regions, and farming structures and practices, as well as how each of the trends described above will disrupt the status quo. Executives and their teams can

use a scenario-based approach to consider the different ways these trends might combine to affect their businesses. To apply the resulting insights effectively, they will need to think creatively about which value pools are most attractive for the company. Equally important, companies will need to decide which value pools they will not invest resources to pursue.

Input manufacturers should consider ways of generating revenue that go beyond selling physical products.

Combine Products and Services into a Strong Business Model

To pursue nontraditional opportunities, a company needs to combine the right products and services into a strong business model. Each combination of products and services, along with specific revenue and cost models, make up a "tool set" for exploiting these opportunities.

Precision-farming applications will be an important component of a tool set that allows companies to capture a share of the market for agricultural inputs. For farmers who use precision farming, investments in autonomous weeding machines would replace—at least to some extent—investments in herbicides (as well as labor), thereby offering equipment manufacturers an opportunity to tap a value pool that traditionally has been the exclusive domain of makers of crop protection products. Similarly, manufacturers of biologics or GMO traits that increase nitrogen assimilation and nitrogen-use efficiency could grab a portion of the revenues that fertilizer companies have traditionally controlled.

A business model that combines agricultural inputs with mobile payments and crop insurance would open up opportunities to earn greater revenues in countries with poor infrastructure. This would create value by making state-of-the art inputs and financial services accessible to smallholder farmers, many of whom are not able to invest in yield-enhancing inputs.

Input manufacturers should also consider ways of generating revenue that go beyond selling physical products. For example, farmers who pay Monsanto to use its FieldScripts service are essentially paying for better outcomes, in this case higher yields. Such pay-for-yield models may soon change how farmers pay for inputs such as fertilizer, seeds, and crop protection. These models will also increase competitive advantage and profits for companies that succeed in developing a compelling value proposition for farmers.

Other nontraditional approaches to generating revenue could draw on concepts developed in car-sharing programs established by automakers; for example, an equipment manufacturer could maintain ownership of a tractor used by multiple farmers. Input manufacturers might consider establishing barter programs, such as those popular in Brazil, in which farmers obtain inputs at the beginning of the season in exchange for a commitment to provide a share of their future harvest. In return for sharing risks associated with the harvest, the input manufacturer avoids the potential downside of being paid in local currency.

Determine Which Capabilities and Operating Model Will Support the Strategy

Companies will need new capabilities in order to develop and implement new and disruptive business models. From precision equipment to digital services, a very di-

verse group of companies is embarking on the journey. However, it is likely that only a few will succeed in getting large numbers of farmers to adopt their offerings. Several capabilities and features of the operating model, among many others, stand out as essential for success:

Companies must avoid the trap of deprioritizing a new business in favor of traditional businesses that will be more profitable until the new business gains traction.

- *Entrepreneurial Culture.* Companies seeking to be innovators need an entrepreneurial culture throughout the organization, from the top managers who make the critical strategic and operational decisions to the employees who plan for and execute those decisions. In an entrepreneurial culture, everyone in the organization is ready and willing to excel, and the company rewards innovative ideas while banishing complacency.

- *Strong Skills for Investing and M&A.* Management should be prepared to invest in new businesses and have the resources and patience needed to ride out initial setbacks. To succeed when a window of opportunity opens for an acquisition, companies will need an "always on" corporate-development organization that has very clear ideas about potential targets and can respond quickly, especially when opportunities arise involving digital start-ups.

- *Strong Skills for New-Product Development and Program Management.* Project teams should define clear learning objectives for each development project and track progress in achieving them. If a project encounters significant obstacles, management should be ready to adapt in order to overcome them or, if necessary, cancel the project without delay.

- *Agility.* Organizations need to be agile in order to initiate and sustain a new business model in a rapidly changing environment. During the period, however short, in which a digital innovation takes hold in the market, farmers will likely be exposed to high volatility with respect to yields, demand, commodity prices, and regulatory requirements. Successful companies will be able to quickly adapt their businesses in response.

- *Separate Management of New Businesses.* Companies should ensure that their organizational setup encourages the success of the new business model. They must also avoid the trap of deprioritizing a new business in favor of traditional businesses that will be more profitable until the new business gains traction. Some companies can accomplish these objectives by creating a new-business unit within their existing organization, while others will benefit from establishing an external "partner" organization.

Starting the Journey

To assess how well positioned they are to pursue new value pools in agriculture, and to increase their likelihood of success in implementing new business models, companies should ask the following questions:

- Which crops, regions, and types of farmers should we focus on?

- Into which parts of the farmer's growing cycle should we extend our offerings?

- What is the value proposition for farmers of our products and services?
- How would extending our products and services into adjacent businesses support our core business?
- What is the market potential of each adjacent business? How can we achieve scale in our operations in adjacent businesses?
- Which roles are we best suited to play in adjacent businesses? For example, are we positioned to be a fully integrated provider, the orchestrator of a network, or a partner of an established player?
- Which capabilities do we need to develop so that we can bring strategic adjacent businesses to market?

For many companies, the answers to questions like these will point to significant opportunities to capture advantages in the evolving agriculture industry. The winners will ride the wave of innovation, while the losers will notice too late that other players have eroded their competitive advantage. The strategic foresight and decisiveness of management teams will separate the wheat from the chaff.

Notes

1. Nikos Alexandratos and Jelle Bruinsma, "World Agriculture Towards 2030/2050: The 2012 Revision," ESA Working Paper No. 12-03, U.N. Food and Agriculture Organization, June 2012, http://www.fao.org/docrep/016/ap106e/ap106e.pdf.
2. OECD-FAO Agricultural Outlook 2014–2023, OECD and U.N. Food and Agriculture Organization, http://www.agri-outlook.org/.
3. DG Agriculture and Rural Development, Unit Economic Analysis of EU Agriculture, *Facts and Figures on Organic Agriculture in the European Union,* October 2013, http://ec.europa.eu/agriculture/organic/eu-policy/data-statistics/index_en.
4. U.S. Department of Agriculture, Economic Research Service, "Organic Production," October 2013, http://www.ers.usda.gov/data-products/organic-production.aspx.
5. Tomek de Ponti, Bert Rijk, and Martin K. Van Ittersum, "The Crop Yield Gap Between Organic and Conventional Agriculture," *Agricultural Systems,* Vol. 108, April 2012, http://www.sciencedirect.com/science/article/pii/S0308521X1100182X.
6. Aruna Singh, P.A. Lakshmi Prasanna, and Ramesh Chand, "Farm Size and Productivity: Understanding the Strengths of Smallholders and Improving Their Livelihoods," *Economic & Political Weekly,* June 25, 2011, http://www.epw.in/review-agriculture/farm-size-and-productivity-understanding-strengths-smallholder-and-improving-thei, and Eurostat, Farm Structure Statistics, April 2014. http://ec.europa.eu/eurostat/statistics-explained/index.php/Farm_structure_statistics.
7. German Federal Ministry for Food and Agriculture, "Landwirtschaftliche Betriebe nach Größenklassen der landwirtschaftlichen Fläche," http://www.bmelv-statistik.de/de/statistisches-jahrbuch/kap-c-landwirtschaft/, and Eurostat, Farm Structure Statistics.
8. Philips McDougall, "Seed Service," 2011 edition.
9. Jacqueline K. Holland, Bruce Erickson, and David A. Widmar, "2013 Precision Agricultural Services Dealership Survey Results," Department of Agricultural Economics, Purdue University, November 2013.
10. Stratus AG Research blog, Glyphosate Resistant Weeds—Intensifying, January 25, 2013, http://stratusresearch.com/blog/glyphosate-resistant-weeds-intensifying.

About the Authors

Lorenzo Corsini is a principal in the Vienna office of The Boston Consulting Group. You may contact him by e-mail at corsini.lorenzo@bcg.com.

Kim Wagner is a senior partner and managing director in the firm's New York office. You may contact her by e-mail at wagner.kim@bcg.com.

Andreas Gocke is a senior partner and managing director in BCG's Munich office. You may contact him by e-mail at gocke.andreas@bcg.com.

Torsten Kurth is a partner and managing director in the firm's Berlin office. You may contact him by e-mail at kurth.torsten@bcg.com.

Acknowledgments

The authors are grateful to Andreas Possel for his contributions to the research and analysis underlying this report. They also acknowledge the contributions of their colleagues Marcos Aguiar, Katharina Dragon, Patrick Dupoux, Ketil Gjerstad, André Kronimus, Zarif Munir, Javier Romero, Justin Rose, Ulrik Schulze, Andrew Taylor, Decker Walker, and Bernd Ziegler. Finally, they thank David Klein for writing assistance and Katherine Andrews, Gary Callahan, Kim Friedman, Abby Garland, Gina Goldstein, and Sara Strassenreiter for contributions to editing, design, and production.

For Further Contact

If you would like to discuss this report, please contact one of the authors.

To find the latest BCG content and register to receive e-alerts on this topic or others, please visit bcgperspectives.com.

Follow bcg.perspectives on Facebook and Twitter.

4/15

BCG

THE BOSTON CONSULTING GROUP

Abu Dhabi
Amsterdam
Athens
Atlanta
Auckland
Bangkok
Barcelona
Beijing
Berlin
Bogotá
Boston
Brussels
Budapest
Buenos Aires
Calgary
Canberra
Casablanca
Chennai
Chicago
Cologne
Copenhagen
Dallas
Detroit
Dubai
Düsseldorf
Frankfurt
Geneva
Hamburg
Helsinki
Ho Chi Minh City
Hong Kong
Houston
Istanbul
Jakarta
Johannesburg
Kiev
Kuala Lumpur
Lisbon
London
Los Angeles
Luanda
Madrid
Melbourne
Mexico City
Miami
Milan
Minneapolis
Monterrey
Montréal
Moscow
Mumbai
Munich
Nagoya
New Delhi
New Jersey
New York
Oslo
Paris
Perth
Philadelphia
Prague
Rio de Janeiro
Riyadh
Rome
San Francisco
Santiago
São Paulo
Seattle
Seoul
Shanghai
Singapore
Stockholm
Stuttgart
Sydney
Taipei
Tel Aviv
Tokyo
Toronto
Vienna
Warsaw
Washington
Zurich

bcg.com