DIGITAL AGRICULTURE: IMPROVING PROFITABILTY

ACCENTURE DIGITAL AGRICULTURE SERVICE AND CONNECTED CROP SOLUTION HELP THE AGRICULTURE ECOSYSTEM FULFILL ITS POTENTIAL

TODAY, THERE ARE MORE THAN 7 BILLION PEOPLE ON THE PLANET, A FIGURE THAT'S EXPECTED TO REACH 9.6 BILLION BY 2050.[1]

BY THEN, THE MIDDLE CLASS—WHO TYPICALLY HAVE MORE MONEY AVAILABLE FOR FOOD, LEADING TO GREATER DEMAND—COULD REACH 5 BILLION PEOPLE BY 2030.[2]

IF THESE NUMBERS HOLD, OVERALL FOOD PRODUCTION WILL NEED TO DOUBLE IN A RELATIVELY SHORT PERIOD OF TIME TO MEET DEMAND TO FEED THE WORLD'S POPULATION.[3]

The good news is that new digital technologies now make it possible to collect and leverage huge amounts of critical data at minimal costs—thus making a farm's field operations more insight-driven, and potentially more productive and efficient. The agriculture ecosystem is already starting to invest in these digital technologies. The total market size for digital-based services is expected to grow at a CAGR of 12.2 percent between 2014 and 2020 to reach $4.55 billion.[4] Greater use of digital agriculture services is vital to not only improving a farm's financial performance, but also to meet the food needs of an expanding population.

Until recently, the impact of digital agriculture solutions (e.g., variable-rate treatment application)—while an improvement over traditional methods—has been limited by the granularity and timeliness of the data they use and their lack of day-to-day operational decision support. According to the U.S. Department of Agriculture, over 60 percent of U.S. agricultural input dealers offer some kind of variable-rate technology services. However, less than 20 percent of acreage is managed using the technology due to the high cost of gathering precise field data.[5]

It's clear that digital agriculture still has considerable untapped potential. That's why Accenture has combined digital technologies such as the Internet of Things (IoT) with its big data analytics, visualization capabilities, and industry knowledge to create two major advancements in the market: Accenture Digital Agriculture Service and Accenture Connected Crop Solution. Geared toward mature, large-scale farms, the Accenture Digital Agriculture Service helps farmers gather and cross-correlate a wide range of critical data to make meaningful and timely operating decisions that can enhance yield and profitability. Designed for developing countries and smallholder farmers, the Accenture Connected Crop Solution can enable agro-input providers to boost field agent productivity and help farmers improve yields by providing fertilizer, pesticide, and seed recommendations personalized for each farmer's land and needs.

1 World population projected to reach 9.6 billion by 2050 with most growth in developing regions, especially Africa says UN. © 2013 United Nations. Reprinted with the permission of the United Nations. http://esa.un.org/wpp/documentation/pdf/wpp2012_press_release.pdf
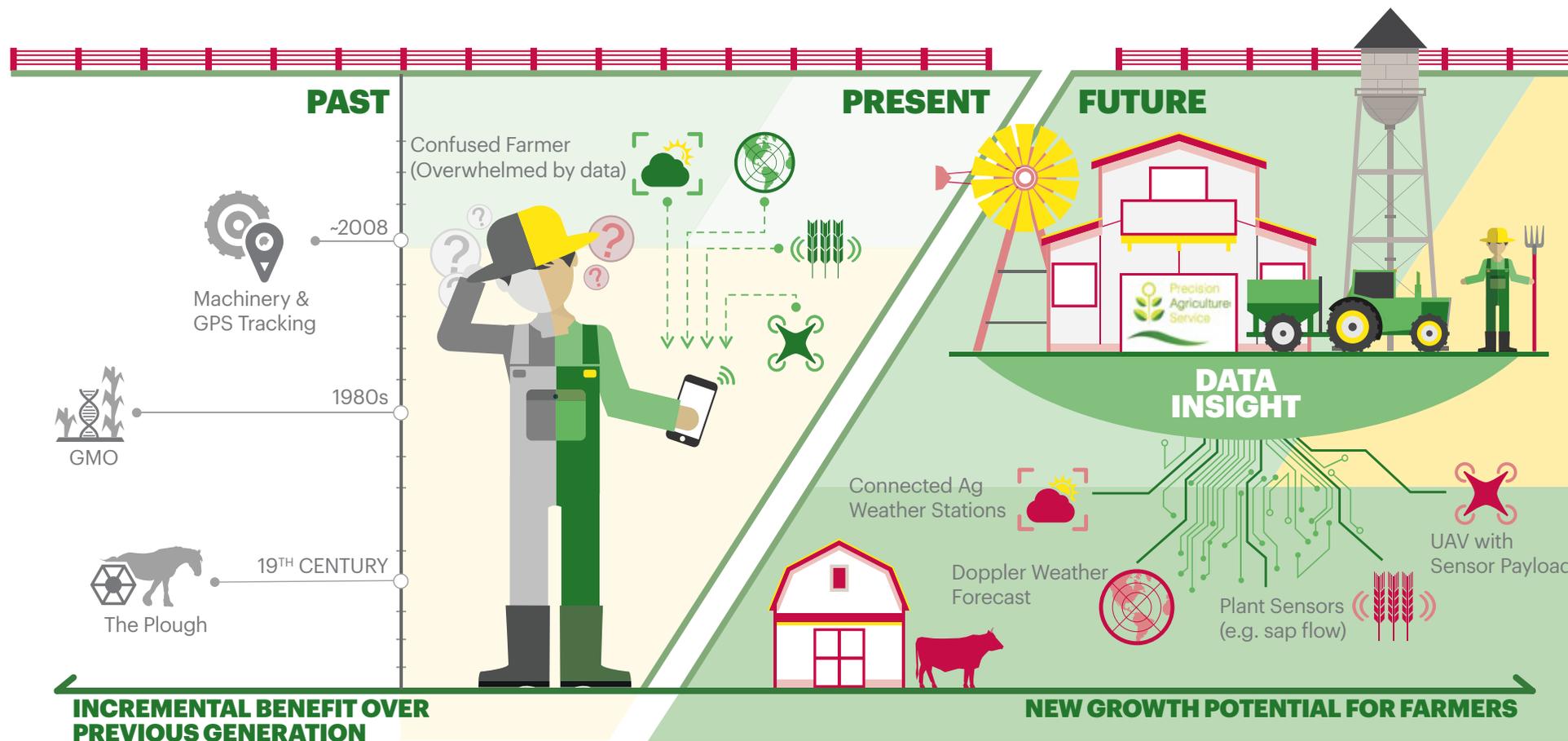
2 OECD (2012), OECD Yearbook 2012: Better Policies for Better Lives, OECD Publishing. http://www.oecd-ilibrary.org/economics/oecd-observer/volume-2011/issue-5_observer-v2011-5-en

3 Food Production Must Double by 2050 to Meet Demand from World's Growing Population, Innovative Strategies Needed to Combat Hunger, Experts Tell Second Committee. General Assembly, Meetings Coverage. © 2009 United Nations. Reprinted with the permission of the United Nations. http://www.un.org/press/en/2009/gaef3242.doc.htm

4 Precision Farming Market by Technology (GPS/GNSS, GIS, Remote Sensing & VRT), Components (Automation & Control, Sensors, FMS), Application (Yield Monitoring, VRA, Mapping, Soil Monitoring, Scouting) and Geography – Global Forecasts to 2020", MarketsandMarkets, October 2014. http://www.marketsandmarkets.com/Market-Reports/precision-farming-market-1243.html

5 The Precision Agriculture Revolution, by By Jess Lowenberg-DeBoer, Foreign Affairs, https://www.foreignaffairs.com/articles/united-states/2015-04-20/precision-agriculture-revolution

Figure 1. The evolution of digital agriculture

PAST

PRESENT

FUTURE

Confused Farmer
(Overwhelmed by data)

~2008

Machinery &
GPS Tracking

1980s

GMO

19TH CENTURY

The Plough

INCREMENTAL BENEFIT OVER
PREVIOUS GENERATION

Precision
Agriculture
Service

DATA
INSIGHT

Connected Ag
Weather Stations

Doppler Weather
Forecast

Plant Sensors
(e.g. sap flow)

UAV with
Sensor Payload

NEW GROWTH POTENTIAL FOR FARMERS

ACCENTURE
DIGITAL AGRICULTURE SERVICE

GENERATING VITAL OPERATIONAL INSIGHTS FOR LARGE FARMS

To be successful, a farm must grow as much per acre as it can, reduce the risk of crop failure, minimize operating costs, and sell crops for the highest price possible. This requires, among other things, effectively managing input resources like fertilizer, water, and seed quality and minimizing the impact of unpredictable variables (such as the weather and pests). However, achieving that objective is far from easy. Conventional methods like physical crop inspection are time-consuming and can be inaccurate, while fixed and tractor-mounted sensors alone can't provide a real-time picture of what's happening in the field. Farmers face further challenges in translating this data into operational insights that can help them understand which actions to take, when and where.

This is where the Accenture Digital Agriculture Service can help. By generating detailed insights into operations and the environment, it assists farmers in making data-based operational decisions to optimize yield and boost revenue while minimizing expenses, the chances of crop failure, and environmental impact. Depending on the crop, the Digital Agriculture Service can help increase overall profitability by $55 to $110 per acre.

The Digital Agriculture Service aggregates granular, real-time data from a variety of sources, including environmental sensors in the field, NDVI images from UAVs (that show crop stress before it's visible to the naked eye), sensors mounted on field equipment, weather forecast data, and soil databases. By combining telemetry from these different sources and leveraging a proprietary decision support engine encoded with crop-specific business rules, the Digital Agricultural Service can provide practical recommended actions for farmers to take to improve their farms' economic output. The Digital Agriculture Service can be connected to the farm's work management system, which enables the platform to automatically schedule the relevant machinery and people when the farmer accepts specific recommendations.

The Digital Agriculture Service also calculates the economic impact of each recommendation so farmers can immediately understand the financial implications of a particular course of action. This feature helps farmers make better real-time operational decisions based on economic measures versus continuing with inherited farming practices. In addition, the service allows farmers to review historical information on similar issues that may have been encountered so they can learn from the actions taken at that time and make better operational decisions today. One of the key features of the Digital Agriculture Service is its user interface, which is tailored to farmers' unique demographics. It's not unusual for several generations to work on a farm together, which means farmers often don't share the same level of technological sophistication. Thus, the main interface is simple and straightforward so everyone can use it. But it also provides an opportunity for more technologically proficient farmers to "dig behind the data" on which recommendations are based, for example, to take a closer look at NDVI or infrared images or telemetry data from a specific sensor in a certain part of the field.

The Digital Agriculture Service can be used in a wide variety of ways to address inefficiency in farming operations across crop types. These range from reducing the time and improving the accuracy of scouting; to measuring growth rates; to providing input data to variable-rate application of pesticides and irrigation. The service can be further "tuned" to learn from situations on a given farm to better tailor future recommendations

An example of a Digital Agriculture Service use case is helping a farmer decide when to harvest. For instance, the service can alert a farmer that a particular plot might be ready for harvest earlier than expected. Different harvest scenarios are presented—e.g., harvest 10 days early, five days early, or as currently scheduled—and the financial impact of each of these scenarios given expected crop market conditions at the time of harvest are clearly shown. Thus, the farmer can quickly see how each scenario would affect the farm's profitability. Further, if the Digital Agriculture Service is integrated into a farm management system, the farmer can schedule the harvest from within the service, making the whole workflow seamless from insight, to decision, to execution.

As the preceding examples show, farmers can use the Digital Agriculture Service in many ways to increase their operating margin by boosting revenue, increasing operational efficiency, and reducing the cost of goods sold.

BY GENERATING DETAILED INSIGHTS, FARMERS CAN MAKE DATA-BASED OPERATIONAL DECISIONS THAT WILL OPTIMIZE YIELD AND BOOST REVENUE WHILE MINIMIZING EXPENSES AND THE CHANCES OF CROP FAILURE.

ACCENTURE CONNECTED CROP SOLUTION

IMPROVING THE PRODUCTIVITY AND EFFECTIVENESS OF AGRO-INPUT COMPANY FIELD AGENTS
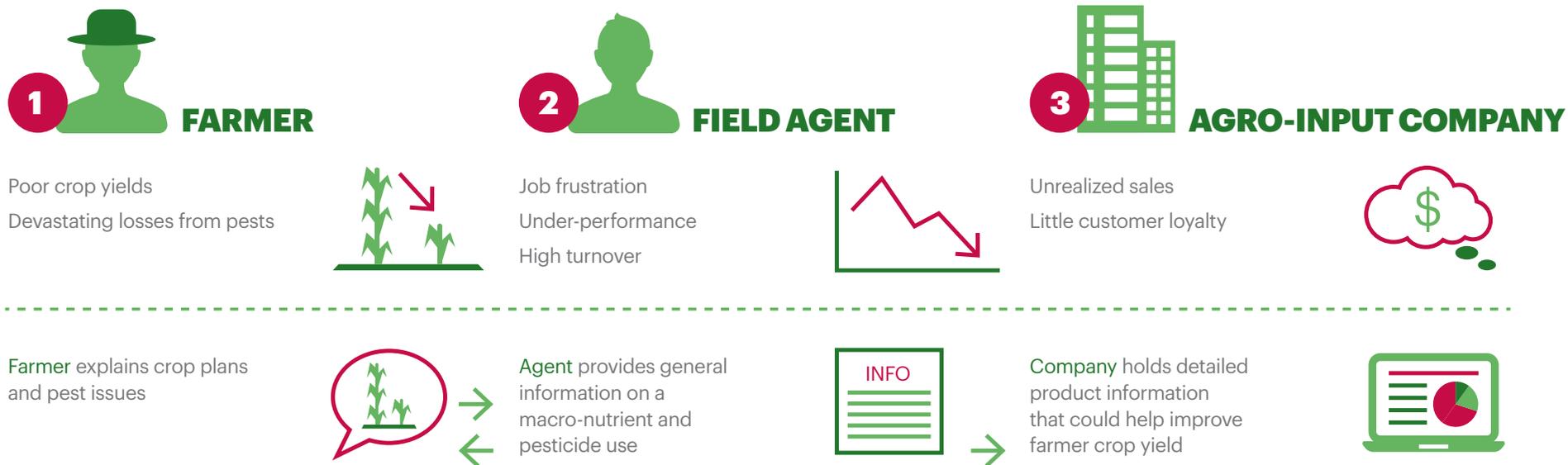
Many farms around the world—particularly those in emerging markets—are small, comprising only a few acres. These smallholder farmers continue to follow traditional farming practices because they lack access to knowledge about current practices. Living in remote areas of the world, struggling to nurture crops on tiny plots of poor land, they overuse macro fertilizers and miss the benefits they could gain from micro-fertilizers appropriate for their crops and soil. They also lack a scientific understanding of pest life cycles, and thus often experience crop failure when a preventable infection or infestation arises.

Agro-input companies have the products—including fertilizer, seeds and pesticides—to help these farmers grow healthier, more abundant crops. However, these companies are challenged to reach smallholder farmers with the products and product advice they need. Without access to meaningful market information, these companies struggle to develop aggregate demand forecasts needed to drive costs out of the supply chain and maximize sales.

The field agent is the link between company and farmer, yet these workers lack the agricultural knowledge to recommend the right products to farmers for their specific crops at each stage in the crop cycle. And because they, too, are remote, it's difficult for the agro-input company to increase their product knowledge, manage their productivity, and capture their insights about upcoming product demand. Agents also lack a mechanism to easily record and review farm and crop details.

As a result, field agent visits with individual farmers are few and generally unproductive. Farmers, seeing limited if any results, show no loyalty to the company or the agent. The result is a high level of job frustration and attrition among field agents.

Figure 2. Ecosystem challenges for smallholder farmers

1 FARMER

Poor crop yields
Devastating losses from pests

2 FIELD AGENT

Job frustration
Under-performance
High turnover

3 AGRO-INPUT COMPANY

Unrealized sales
Little customer loyalty

Farmer explains crop plans and pest issues

Agent provides general information on a macro-nutrient and pesticide use

INFO

Company holds detailed product information that could help improve farmer crop yield

THIS STATUS QUO, SEEN IN COUNTRIES AROUND THE WORLD, KEEPS SMALLHOLDER FARMERS, FIELD AGENTS AND AGRO-INPUT COMPANIES FROM ACHIEVING THEIR FULL POTENTIAL IN THE AGRICULTURE INDUSTRY.

The Accenture Connected Crop Solution connects these three stakeholders in rural agriculture—field agent, agro-input company and farmer—in order to improve agent productivity, product sales, and farmer crop yield.
An end-to-end farm management solution, Accenture Connected Crop Solution integrates and processes data from multiple sources—including field agents, weather forecasts and UAVs—in a single hub. This data, along with data from the agro-input company's marketing or CRM systems, is then fed into a cloud-based analytics engine that generates product recommendations based on a predetermined set of rules, as shown in Figure 3.

The Accenture Connected Crop Solution uses a handheld/smartphone application to connect field agents to the cloud-based analytics engine. With this mobile app, a field agent can capture and send a field's land and crop details, as well as a farmer's planting plans, to the analytics engine. At regular intervals, the agent receives via the app personalized recommendations for each farmer on regular nutrition management for crops, timing and quantity of fertilizer application, irrigation needs, and seed quality, as well as actions needed to address specific crop issues. The mobile app also provides access to training videos on topics such as applying fertilizer to crops and crop nurturing. The application maintains farmer-level details, which allows the field agent calling on several farmers or farms to have a summary view of farmer and field demographics, requirements and performance.
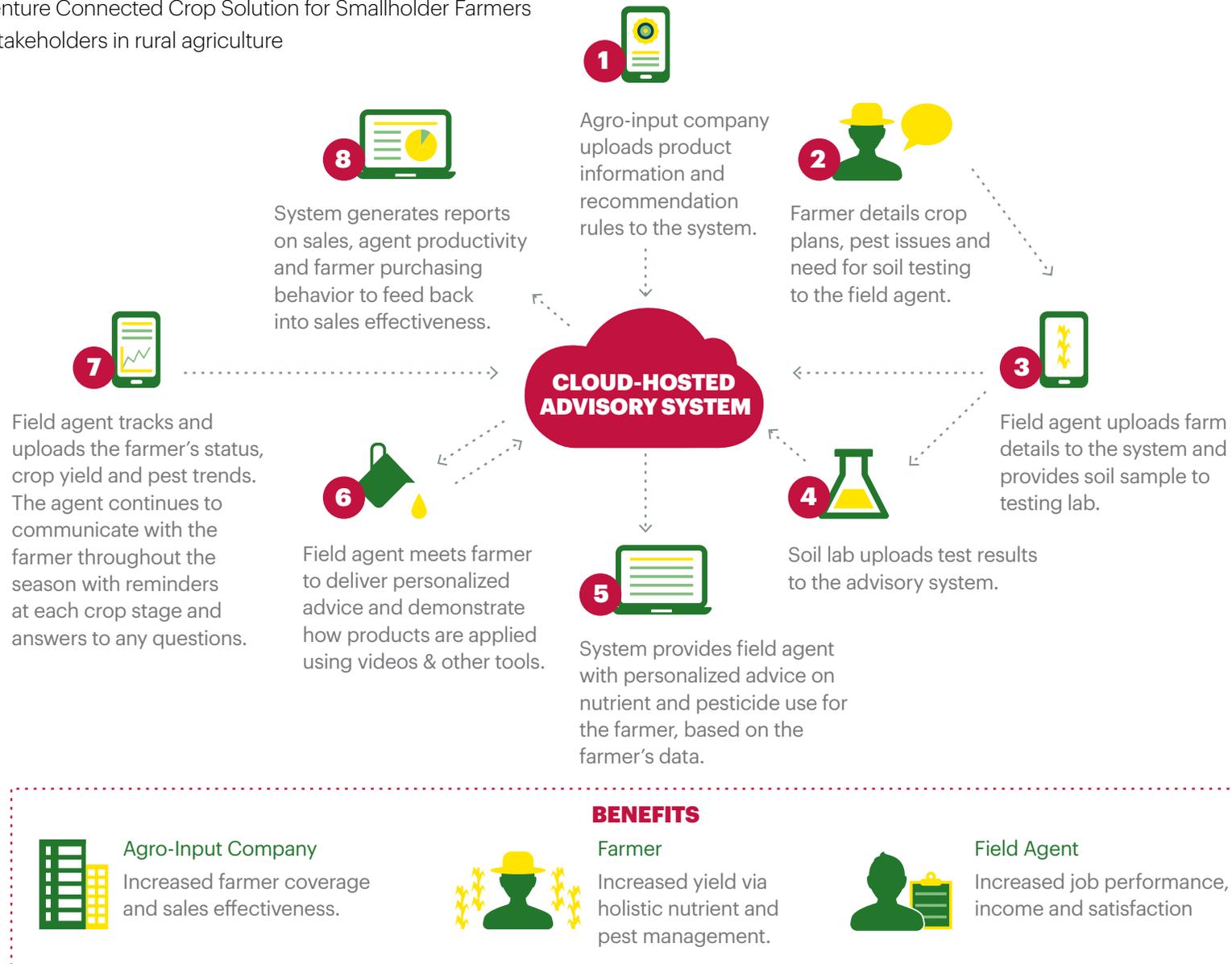
An example of how the Accenture Connected Crop Solution can improve both agro-input company and farm performance is the pilot project Accenture conducted to help a nearly $600 million agro-input company boost sales to rural farmers. One of the company's biggest challenges was that the field agents it relied on to deliver product information to farmers were not equipped with the right knowledge and expertise to make product recommendations based on existing challenges across various crops.

By equipping agents with the Accenture Connected Crop Solution mobile app linked to the analytics engine, the company was able to capture important internal and external farm and weather information in real time and translate it into actionable advice that field agents could give to farmers. Over the course of the six-month project, the company selected 2,000 farmers to participate and delivered product information and recommendations for raising yields for nearly 30 crops most common among these farmers.

The results were impressive: At the end of the pilot, the company had generated a 56 percent year-over-year increase in sales and an average 15 percent increase in crop productivity for farmers—with a boost of as much as 30 percent for some cash crops.

A MOBILE APPLICATION ON THE FIELD AGENT'S HAND-HELD DEVICE IS THE HUB FOR CONNECTING THE FARMER TO THE AGRO-INPUT COMPANY WITH A STEADY STREAM OF INFORMATION AND ADVICE FOR IMPROVING CROP YIELD THROUGHOUT A SEASON.

Figure 3. Accenture Connected Crop Solution for Smallholder Farmers connects the stakeholders in rural agriculture

CLOUD-HOSTED ADVISORY SYSTEM

1. Agro-input company uploads product information and recommendation rules to the system.

2. Farmer details crop plans, pest issues and need for soil testing to the field agent.

3. Field agent uploads farm details to the system and provides soil sample to testing lab.

4. Soil lab uploads test results to the advisory system.

5. System provides field agent with personalized advice on nutrient and pesticide use for the farmer, based on the farmer's data.

6. Field agent meets farmer to deliver personalized advice and demonstrate how products are applied using videos & other tools.

7. Field agent tracks and uploads the farmer's status, crop yield and pest trends. The agent continues to communicate with the farmer throughout the season with reminders at each crop stage and answers to any questions.

8. System generates reports on sales, agent productivity and farmer purchasing behavior to feed back into sales effectiveness.

BENEFITS

Agro-Input Company
Increased farmer coverage and sales effectiveness.

Farmer
Increased yield via holistic nutrient and pest management.

Field Agent
Increased job performance, income and satisfaction

AN INNOVATIVE APPROACH TO THE FARM YIELD CHALLENGE

Improving yield is an age-old challenge for farms and always will be. However, for the first time in a generation, digital technologies enable farmers to achieve a quantum leap forward in their performance. While improving yield is good for a farm's profitability, it's also increasingly critical to addressing the growing demand for food among an ever-increasing global population. Couple this with a lower environmental impact due to reduced water wastage, chemical run-off and CO_2 emissions, and one can see the critical role digital technologies play in fostering sustainable farming practices.

That's why it's important for all participants in the agriculture ecosystem to embrace new and emerging digital technologies to make their operations more efficient, productive and profitable. By using the Accenture Digital Agriculture Service, large farms can harness and make sense of a wide range of relevant data to increase the amount of food they produce from the same acreage while potentially improving their financial performance. Similarly, with the Accenture Connected Crop Solution, agro-input companies can improve field agent productivity and product sales while helping smaller farms use inputs more effectively in order to improve their yields.

For the first time in a generation, digital technologies enable farmers to achieve a quantum leap forward in their performance.

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