



Improving Agricultural Yields With Data Analytics Part 2

Description

In [part one](#) of this blog series we explored the data and analytics available for the modern farmer looking to be more data oriented. This part explores the technological innovations allowing farmers to collect and access more data for their operations. As the need for more sustainability and profitability in agriculture increases, so will the application of analytics.

New models in agriculture, particularly precision agriculture are based largely on leveraging data. For them to be successful, the quality of agricultural data collected will also need to increase significantly. This has brought the need to evaluate current data sources and have a detailed understanding of their capabilities.

For this data to be most valuable, meaningful integration needs to be established. Agricultural data will not paint a comprehensive picture if analysed in isolation. Like in the previous post, we will be concentrating on field agriculture. Other forms of agriculture also offer vast and interesting data collection means, but we will touch on them in future posts.

Some of the important sources of data for agricultural analytics include;

Farming Implements and Equipment

Modern farming implements and equipment act as the conduit for the collection of data. Many are mounted with sensors that collect data as they are used. A lot of quality data can be collected because these implements cover every square meter of the farm. They are the most economical as well since they collect data while performing core farming activities.

There is no need to invest extra to collect data using farming equipment. Tractors, harvesters, irrigation rigs, pesticide and herbicide sprayers among others collect real-time data related to their tasks including seeding, soil moisture, yields. Also important is telemetry data which can be used to cost inputs like fuel.

The data on the amount of resources they distribute can be combined with telemetry data to come up with the total cost of the yield per division of the farm. Armed with these insights, the farmer can decide which areas are worth planting.

Source: <http://www.businessinsider.com/big-data-and-farming-2015-8>

Global Positioning Systems

Global Positioning Systems (GPS) has changed possibilities in farming. Traditionally, farmers treat their entire farm as one big extension inputting resources equally across. This system is highly inefficient. Farms are vast expanses, highly unlikely to need equal inputs on every square meter.

Because of this, precision agriculture has arisen. It is based on variable application, inputting resources as necessary across the field. All inputs, from seeds to pesticides and herbicides, irrigation and so on are implemented based on each area's characteristics. All this is possible if the farm is divided into grids that share similar characteristics.

This is where GPS comes in. It allows the farmer to collect data on the differing characteristics of the farm across different GPS coordinates. When this data is analysed, it allows the farmer to variably input resources to cater for these differences. Using vehicle-mounted sensors, GPS is used to apply the resources as determined in the analysis of the accumulated mapping data.

Source: <http://precisionagriculture.re/gps-in-agriculture/>

Sensors and the Internet of Things (IoT)

The interconnectivity of devices on the internet has created a growth in the data we are accumulating. Simultaneously, the number and use of sensors in agriculture have grown exponentially.

This combination is bringing a rise in the amount of agricultural data farmers collect. These sensors collect everything, from soil moisture, plant stress, pesticide and herbicide levels, and together they paint a picture of all the factors that affect a farmer's yield. Many are connected to the cloud allowing for data to be collated and analytics to be performed for broad regions.

This wealth of data is making it possible for predictive analytics to be used to determine if there is an imminent threat to plants and yields. This is based on algorithms that can detect if conditions collected from the sensors are conducive to particular plant disease or pest and weed outbreaks.

Sensor technology is also important for autonomous driving of farm implements. The farm tractor has achieved what the motor vehicle will have to wait a while to achieve. Special receivers that control integrated automatic guidance systems on modern farm equipment allow for precision steering. This data allows the equipment to drive in completely parallel lines with little overlap. Margins of error are allowed up to 2 centimetres, Standard GPS has a margin of at best 5 metres, oftentimes a lot more.

Source: <http://www.mdpi.com/1424-8220/10/9/8504/htm>

Satellite Imaging & Drone Technology

Satellite imaging is important because it can capture data specific to a farm and in the general region. It provides a bird's eye view of the entire crop area. Satellite imaging can be used to collect infra-red photography important for continuous crop monitoring. This bird's eye view is also important for establishing the topographical profile of a farm.

Meteorological data is also collected from satellite imaging. Modern farmers need not rely on general weather services anymore. Data on weather patterns and conditions that affect plant performance is collected in Agro-Meteorology. Analytics then show long and short-term forecasts that determine optimum planting times and choice of cultivar.

Drone technology gives the farmer the same bird's eye view, with a lot more control. Farmers can collect data as and when they need it without having to wait for satellites to come round. Because of their versatility, drones can be fitted with a multitude of sensors. This allows them to not only collect pictorial and video data, but all the data that can be collected through sensors.

Source: <https://goo.gl/9cRFj1> Source: <https://goo.gl/vgpgU4>

Mobile Technology

Mobile technology allows farmers to view and act on data in real time. Most service providers provide native applications for farmers to access insights in real time around the farmer. However, that is not the only value of mobile in data-driven agriculture.

Phones and tablets are an important source of data as well too. Mobile devices allow farmers to take photos and videos while doing rounds or working in the fields. These are valuable sources of data as they have context.

Most pictures we take are taken to capture particular phenomena. Meaning, when the farmer takes a photo or video, they would have seen something worth documenting. This makes data taken on mobile devices the quickest to provide insights because it comes in after the analytical process has begun.

Source: <https://goo.gl/vPKKet>

Public and Government Data Sources

Despite being met with a lot of resistance, there is a move towards sharing data resources. Main issues being faced include data governance, privacy, ownership and who gets to profit from data. Farmers are concerned big businesses will use their data to develop their own profitable products. Despite these issues, businesses are growing in agricultural analytics.

Most are modelled to convert this data into actionable insights farmers can benefit from. Once pending issues are resolved, farmers can expect cloud warehouses to house more and more agricultural data. Governments are also putting efforts into ensuring farmers have access to data-driven insights that improve sustainability and profitability.

Conclusion

Regardless of the level of technology application, farms are generating valuable data. It is also becoming increasingly affordable to implement the technology to collect the data needed. While shared cloud data is going to benefit more farmers across the spectrum, collecting farm-specific data is critical. For this reason, there is an increased need to invest in data collection in all farms.

Analytics projects, properly applied will always have a positive Return On Investment. Agriculture is no exception. The seemingly high costs of implementing data collection and analytics will pay off with increased margins from operational efficiencies. An open culture to data and insights need to be adopted though. This is so that the smaller farmer can also benefit from analytics.

After all, the small farmer who can afford limited application of technology is most in need of these operational efficiencies. The issues surrounding shared agricultural data are by no means small, but the solutions are a worthy investment. By opening data to everyone, we could start solving issues of food security from the most impacted areas, subsistence farms.

Category

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