



Improving Agricultural Yields With Data Analytics Part 1

Description

In this post, we are going to focus mostly on analytics in field agriculture. Analytics can also be used in dairy, beef, greenhouse, fish farming amongst other forms of agriculture, but we will touch on these in future posts. There is at the moment no industry more in need of innovation than agriculture. There is an increasing need to produce more, with fewer resources. Population growth puts upward pressure on yields. Environmental factors, on the other hand, reduce available resources for production.

Because data analytics can [significantly increase operational efficiencies](#), there is an immediate need for its application to agriculture. Not only is there a need for increased production, but also a need for sustainability. Despite these impossible conditions, agriculture needs to be profitable. Agriculture forms the economic base for most developing nations. It is the [primary vehicle for economic empowerment](#), providing the most employment. Unlike other industries though, agriculture cannot increase profitability by randomly increasing prices.

The route to profitable agriculture is through increasing margins by reducing costs. This means using analytics to make sure the optimal distribution of inputs. The existing system of applying inputs equally across fields is very inefficient. Considering the size of most farms, it is unlikely the entire area would need an equal amount of each resource. Cases of over-fertilization, over-irrigation and so on are all too common under the current system. This usually works out worse for yields.

Also, without measured application of resources, how can a farmer know if every part of the field is profitable? Without applying proper analysis, the farmer could be investing time and resources in areas that are unprofitable. This is where [precision agriculture](#) comes in. Under this system, resources are applied variably across fields. This involves collecting data and applying analytics to create profiles that are used to apply inputs as needed.

[Part two](#) of this series will discuss the technology and innovations that are powering this data collection and analytics. This part discusses the data that can be collected as well as the analytics that can be conducted. It is important to note that none of this data should be analysed in isolation. Instead, the

resulting analytics program should combine all sources for the precision agriculture solution. The available data and the analytics that can be conducted include;

Genetic Data and Analytics

Advances in genetic engineering have given farmers the ability to plant produce [resistant to a number of factors](#), including droughts and pests. Clearly understanding the genetic profile of plants that give the best yields under local conditions should be the starting point of precision agriculture. By doing so, farmers complement all other efforts in ensuring profitability and sustainability. Genetic selection should be based not only on proven past yields but combined with analytics discussed throughout the post. This ensures the genetic profile that will be chosen for seeds and seedlings takes into account expected changes in conditions.

Meteorological Data & Analytics

While there has been growth in microclimate farming, field farming will always exist. This is because some plants just cannot be planted in [greenhouse](#) and [hydroponic](#) systems. There is also the matter of Africa being [50 years behind in greenhouse technologies](#); field agriculture has to be applied until the gap is bridged. Because weather plays such a great role in agricultural yields, meteorological analytics is important for precision farming. Climate change has increased the instance of harsh weather, and farmers need to be prepared to mitigate disaster. Not only should farmers know the extent of the shortfall in rainwater, they should also be prepared to extreme heat and cold.

Weed and Pest Data & Analytics

Weeds and pests can be the most variable elements of field agriculture. Because they are organic elements, they vary widely and wildly to many factors. Factors such as adaptation and climate conditions vary the weed and pest profile in every crop cycle. Applying pesticides and herbicides from experience alone is very inefficient. This could lead to over/ under application, or applying chemicals that have ceased to be useful. All scenarios are equally disastrous. Detailed analytics need to be conducted on not only the regional but the weed and pest profile of the farm under analysis. Variable application of chemicals should then be applied. This is important because under application and application to resistant strains will reduce yields. Conversely, over-application of chemicals results in health issues and reduced profitability from higher input costs.

Topography Data & Analytics

Topography is one of the most important considerations in agriculture. The application of precision agriculture would be impossible without data and analytics of topographical characteristics of the farm. Because of its ability to affect the microclimate, topography contributes the most to intra-field variability. Also, topography affects soil properties such as moisture content, and fertilizer and herbicide leakage. Collection and analytics of topographical data is therefore the basis of variable application of inputs that is the starting point of using analytics for precision agriculture.

Salinity Data & Analytics

[Irrigation can cause an increase in soil salinity](#). With rain levels continuing to decrease across the globe, salinity will increase as a problem for farmers. The job of analytics is twofold in helping farmers deal with salinity. Firstly, combined with topographical mapping, salinity data can be used to launch programs to deal with salinity. Secondly, the farmer can use variable seeding to plant [salt-resistant plants](#) where necessary. A bonus third is that the application of variable irrigation would minimize continued salinization by limiting water input to necessary areas.

Source: http://www.knowledgebank.irri.org/ricebreedingcourse/Breeding_for_salt_tolerance.htm

Input Costing Data & Analytics

Variable application of inputs that is necessary for precision agriculture requires the farmer to know the exact quantities of resources used per area of the farm. This gives the farmer an opportunity to know the exact cost of inputs applied. Exact input costing is nirvana for business operations. By knowing the exact amount it costs to produce in particular areas, the farmer can understand areas not worth cultivating. The decision would simply be to cut out areas whose input costs outweigh the market value of the yield. This means the farmer could actually achieve greater profitability while farming less with analytics.

Continual Crop Monitoring

Conditions in the field change rapidly, making field agriculture very unpredictable. Even with the best forecasts, the results can never be 100% accurate. This makes continuous monitoring of crops and conditions very important. The farmer needs to adapt to crop stress in real-time. This will result in the optimal application of inputs such as chemicals and irrigation for maximized yields. The success of applying analytics to improve crop yields could hinge on real-time crop monitoring and analytics.

Source: <https://blog.dronedeploy.com/what-can-ndvi-drones-do-for-my-business-part-2-1d7cb5ee8a5b>

Yield Data & Analytics

Yield mapping (yield monitoring) is one of the oldest developments in precision agriculture. The farmer has to use a combination of technologies to ensure he understands how much crop can be harvested from various parts of the farm. Over time, this data can be combined with other analytics to understand how yields vary under different conditions. The farmer can then combine all this data, input and market to determine if the yields will even be economically viable under expected conditions.

Market Data & Analytics

This involves the collection and analytics of all data relating to getting the product to market. This set of analytics is important to ensuring agricultural efforts are profitable. Not only should analytics be conducted on commodity pricing, but also on intermediate actions such as logistics. This is because transportation and storage of agricultural produce is a major cost contributor for the farmer. A lot of this can, unfortunately, be attributed to food wastage. There is there for a need for data-based logistics in agriculture to make sure a minimal portion of produce is lost as spoilage. All this can be tied with analytics of expected variations in economic conditions so that farmers can hedge risks of economic downturns.

Conclusion

Leveraging data through analytics will continue to shape industry and agriculture is no exception. As innovation in agriculture continues to grow, so will the application and benefits of analytics. Food security and economic development are at the top of the agenda around the world. For this reason, the developing world cannot afford to lag in the application of these innovations.

There is a need to ensure every farmer is equipped with the resources for smart, data-driven farming. Governments should lead collaborative efforts across the board to make this a reality. Because food security and environmental restoration benefits everyone, all should be invested in making agriculture sustainable. Most importantly, let's empower every farmer to be data-driven, sustainable and profitable.

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