Data-Driven Agricultural Behaviors

by Matthew D Edwards
Chief Operations Officer
AppCore Technology
http://www.appcore.com

Agriculture around the world has historically been as much art as science. Individuals and families who have been around long enough and witnessed enough planting and harvesting seasons have learned through trial and error which crops successfully co-exist and which ones compete for resources, what weeds are actually helpful versus detrimental to soil and crop, how much crop a particular plot of land will bear, how much crop can successfully be managed by a family, which plants and soil types consume the most and least water, which pests are drawn to what crop based upon location and season, and what market exists outside the family for the crop being produced. Improving yield, margin and return on investment year over year depends upon learning. And learning happens through the aggregation of data. This is why the old farmer that everyone greatly respects has so much to teach. This old farmer has been around, seen what there is to see, experienced what there is to experience, and has decades of data collected, organized and constantly revised in his head. The mind of that old farmer out in the rural areas is in fact a database. That database is the key to scaling agricultural efforts for mass production. Success is in the data.

A September 2009 article titled, “2050: A third more mouths to feed“ by the Food and Agriculture Organization of the United Nations (FAO) suggests that:

> “Producing 70 percent more food for an additional 2.3 billion people by 2050 while at the same time combating poverty and hunger, using scarce natural resources more efficiently and adapting to climate change are the main challenges world agriculture will face in the coming decades...” (FAO, September 2009)

An April 2010 article titled, “The Impact of the World Food Demand in Africa: Addressing the Land Property Issue” by Jerry John Rawlings, a Former President of Ghana, observes that globalisation, international subsidy for exporting bio-fuels versus feeding local populations, increased populations, increased prices for petroleum, oil and fertilizers, as well as, more resource intensive crops make it even more challenging to successfully produce and deliver crops that feed local populations (Rawlings, 2010).

Another study titled, “How to Feed the World in 2050” by the Food and Agriculture Organization of the United Nations (FAO) very candidly states, “...farmers will need new technologies to produce more from less land, with fewer hands” (FAO2050).

Agriculture requires the vigilant pursuit of data to artfully apply science to the variability of the earth. The earth will not relent. Therefore neither will we. We have no time, money or effort to waste.

There are technology solutions available today that allow farmers to view satellite imagery of the land they are farming every morning before they head for the day's work. This satellite imagery tells them contour, elevation, moisture saturation, erosion velocity and soil composition. Furthermore, given satellites orbit the earth repetitively, the data collected during multiple passes of a single satellite is aggregated into a database in order to show the farmer history of the land in question, as well as, to infer trends and forecasts of what to expect purely based upon the data. However, one data point or set of data points never tells the whole story and it is customary to collect at least three different data points in order to arrive at a postulate.

Weather monitoring, data collection and forecasting is the secondary point of data from which the farmer will anticipate today, tomorrow and the immediate future. Climatology is a science, but the earth refuses to be predictable. Coupled with satellite imagery telling us about the land we are farming, we're additionally able to study historical weather, know today's anticipated weather, and to forecast what types of challenges the earth will contrive for us into the future. Collecting data about the weather allows us to understand historical and forecasted relationships between weather, crop and land evolution. The land will not evolve without influence from the weather. And the crop will not evolve without the combination of land and weather. We must understand all of them, which leads us to the tertiary point of data collection and study.

Physical inspection of the soil is science. Physically walking the land, taking soil samples for the purposes of validating satellite imagery and providing even more information regarding soil health, is a requirement. To assume data is the only truth is short-sighted. Such technology still requires the analysis, assessment and validation of the person working the land. Farmers today have available to them laboratories that analyze soil samples across different period of time and different parts of the land. After the soil is analyzed, the data is stored yet again in another database that allows the farmer to understand how soil composition and general health has changed historically and is expected to change in the coming planting seasons.

What happens next is art and science, blended through data, to sculpt the earth.

Historical trending and forecasting of weather data, physical soil inspection data and satellite imagery combine together in a dynamically generated report for the farmer to read over a cup of tea in the morning. By reading this data, collected through days, months and years now, the farmer is able to discern what he needs to do for optimum success. All of this data is simply suggesting to the farmer how much money he will need to spend in order to prepare the soil, contour the landscape, at what saturation to plant seed per hectare, how to choose fertilizer type and composition, as well as, an estimated sum total of what to purchase, how long it will take and the estimate cost to do all of this work. To yield a successful crop with a positive operational cost margin just to get to market is not enough. And without this data, the old farmer wouldn't even make it this far.

The key to the farmer's success is data. The farmer needs data before breakfast telling him what to expect for the day, week and months ahead of him. The farmer, while sitting in a tractor preparing, planting, caring for and harvesting the land, needs to be looking at his on-board internet- and satellite-connected computer telling him all of the same things he learned before breakfast. However, the on-board sensors of his tractors and harvest machines are actually doing more for him than he could get at breakfast. As he drives, looking at the weeds on the end-rows and watching the birds and animals on the land, the on-board sensors on his tractors and harvesting equipment are collecting even more data. As the data is collected in real-time, it is sent over the internet to a large database used by all farmers in the region, the local government and private corporations, as well as, researchers from around the world. This data, including seed and row spacing, tractor type, velocity, mileage, fuel consumption, soil composition, moisture, elevation, contour, humidity, estimated money spent and GPS coordinates along the way, are all collected into the same database that house satellite imagery, physical soil inspection results and weather data. Together, all of these data points exist in a database accessible on the internet to anyone in the world at anytime, so that together with the farmer, we can figure out how to succeed in feeding people.

Real-time data collection, storage and reporting in extremely large databases housed on the internet that show trends, forecasts and associative cost models are the future. These databases are stored in cloud computing technology infrastructures. These large databases are often called data warehouses. And the software they use need not bankrupt a country to get there. By using commodity computer hardware, open-source software solutions and cloud computing infrastructures from vendors who specialize in global data systems, technology becomes cheaply accessible to everyone and the data our farmers and scientists collect becomes useful for the entire world. The limits to our agricultural evolution exist only in our minds and choices thereafter. Technology adoption is a choice fostered through government and private sector goals, policy, marketing and education programs. Becoming successful happens through purposed choice.

As I sit here this morning writing this article watching the sun come up, I reflect on the old rural farmer also enjoying the shades of red, yellow and blue that come with a clear sky and beautiful sunrise. This farmer, especially the older, more experienced one, has an idea of what he will pursue and accomplish today contextual to the weather and circumstances he sees in this morning's sunrise. Were it dark and cold or rainy and windy, it wouldn't matter. This old farmer will adapt because he has decades of experience adapting. In fact, he has decades of experience organized in the database that is his mind. He will adapt to the unpredictability this planet serves up because he has data that teaches him what he might expect in this morning's sunrise. This old farmer knows the earth will serve him, but will not make it easy on him – ever.

There are a couple of new things this old farmer has learned as well. He knows that he has to produce more this year than he ever has and that there are more consumers of his effort than he has ever experienced.

This old farmer, who everyone looks up to because he has lived so long, experienced so much and knows even more, surprises everyone at breakfast when he tells them he bought a computer. You see this old farmer knows from his experience that he must adapt to new methods of planting, harvesting, caring for the soil and distributing his product throughout the country, continent and world – all through science and technology adoption – in order to mass produce for the masses.

This old farmer is going to use data collected during years of science in his home land, as well as the rest of the world, to enhance the art of sculpting the earth to serve him, his family and the masses who all need him to be smarter this year than he was last. There is no room for mistakes and this old farmer knows it. He knows his future success is in the data. He knows his future success is in the technology and science that makes him a better sculptor of the earth. He knows people will survive because of his choices.

That's why he's the old farmer in the rural area that everyone looks up to every morning when they see the sun rise. They have breakfast because of him.

(FAO) Food and Agriculture Organization of the United Nations. “2050: A third more mouths to feed”. http://bit.ly/9SAkqj September 22, 2009.

(FAO2050) Food and Agriculture Organization of the United Nations. “How to Feed the World in 2050”. http://bit.ly/Wcg4v 2010 High-Level Expert Forum.

(Rawlings) Rawlings, Jerry John. “The Impact of the World Food Demand in Africa - Addressing the Land Property Issue”. http://bit.ly/c3iBuD April 10, 2010.

Biographical Profile

Matthew D Edwards is currently the Chief Operations Officer for Appcore Technology where his responsibilities lay in helping teams, companies, non-government and government organizations alike determine the most effective way to get local and global work done with the most current ICT solutions available while still leaving money in the budget. He is a published author, speaker, world traveler and lover of good food, wine and company. For more information on Matthew please visit http://appcore.com/Content/Leadership-Team.html , http://www.linkedin.com/in/matthewdedwards or just simply Google "matthewdedwards".

Appcore Technology Profile

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