



Big Data: Alive and Growing in the Food Sector!

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Big Data already is being extensively employed at the genetics and consumer ends of the food and ag supply chain. This article will stress the potential for capabilities and knowledge generated at these levels to affect new opportunities within production agriculture. This is the fourth of a six part series on [Big Data and Agriculture](#).

Production agriculture is the focus of this article series. However, managers in many industries have learned that strategic change often can emerge from firms and technologies that aren't their direct competitors. In the early 1990s, Walmart, Kmart, and Target undoubtedly understood the competitive landscape of US retailing. The firm called Amazon did not exist. Shortly thereafter, Amazon and others used novel technologies and approaches to redefine retailing.

Changes that could be strategically important to the farm sector can originate outside of agriculture. Therefore, this article illustrates how Big Data is fueling change in the broader food sector. In addition to being of interest in themselves, such developments have the potential to affect how output from the farm will be produced and marketed.

Consumers, Genomics, and Everything Between

The actions and attitudes of consumers are an active source of Big Data. Figure 1 identifies just a few initiatives of major retailers and manufacturers in the food sector.

The range and extent of these initiatives provides insights as to likely directions for food retailing. For example:

- Any mention of food and large numbers brings McDonald's to mind. Not surprisingly, that firm is routinely cited as an innovative user of Big Data. For example, "...although McDonald's around the world look the same, each restaurant is slightly different as they are optimized using all that data for the local market. In addition, operational data is employed to automate and optimize the inspection of the burger buns to ensure a perfect seed distribution and color" ([van Rijmenam 2013](#)).

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Figure 1. Food Retailing and Big Data

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From Big Data to Big Mac; How
McDonalds Leverages Big Data



Whole Foods CIO Invests to
Satisfy Shopper Data Cravings



How Walmart Plans to Use Big Data



Insight - At Nestle, Interacting
with the Online Enemy



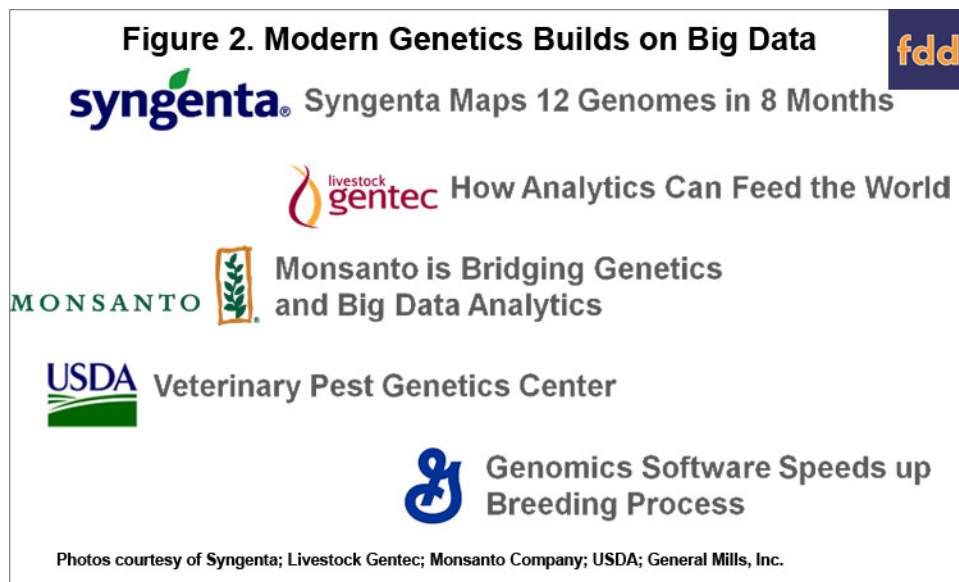
Coke Engineers its Orange Juice
– with an Algorithm

Photos courtesy of Walmart Stores, Inc.; Nestlé; The Coca-Cola Company; McDonald's; Whole Foods Market, Inc.

- While also a major food retailer, Whole Foods Market occupies a space in the retail food market that is far from that of McDonald's. However, Whole Foods similarly has an intense interest in better understanding its consumers and is utilizing Big Data to do so. As recently stressed by Whole Foods CIO, Jason Buechel, "Whole Foods Market Inc. is a grocer, but it's really in the information business." For example, "customers want to know the next level of information. Along with pricing details, that includes details like animal welfare ratings on a prime cut of meat, whether a food contains GMOs, or what farm certain produce comes from. The key for Whole Foods will be getting that information from the company's systems into the customer's hands" (Norton 2014).
- In food retailing, Walmart clearly is one of the "elephants in the room". Moving beyond tracking consumer behavior in its stores and online, Walmart recently generated considerable attention when it announced its intentions to acquire Kosmix, a startup focused on social media (Roush 2011). Walmart anticipates that better understanding consumer concerns, desires, and attention can be obtained through analysis of information available from sites such as Facebook and Twitter. "Wal-Mart executives have turned to software called Hadoop that helps businesses quickly and cheaply sift through terabytes or even petabytes of Twitter posts, Facebook updates, and other so-called unstructured data" (King 2011).
- Not confined to food retailers, the desire to understand consumers better is a critical concern of food manufacturers. Branded food companies expend lots of money to learn how to exploit online opportunities to promote their brands and products. Nestlé's Digital Acceleration Team extends those capabilities, "... to track online sentiments. Executives watch intently as California wakes up, smells the coffee – and says whether it likes it. ...By monitoring conversation about its products on social media – right down to "realtime recipe tweets" across the United States – they aim to win over a sometimes hostile world" (Thomasson 2012).
- While understanding the consumer is critical, food manufacturers also employ Big Data tools to design, produce, and consistently deliver the desired product. Coca-Cola's Simply Orange juice product is an example of such a technology-enhanced offering. "Satellite imagery, complicated data algorithms, even a juice pipeline are all part of the recipe. ...A computer model directs everything from picking schedules to the blend to maintain a consistent taste" (Stanford 2013).

It is interesting to speculate about the direction by which the motivation for change and the adoption of Big Data could occur. As illustrated by the preceding Coca-Cola example, needs identified at the consumer level can now be transmitted to affect operations at the farm level.

However, Big Data's application and the potential for strategic change exist at the beginning of the food supply chain as well as at the consumer end. Genomics is today's application of genetics. Figure 2 provides examples of the emerging role of Big Data there.



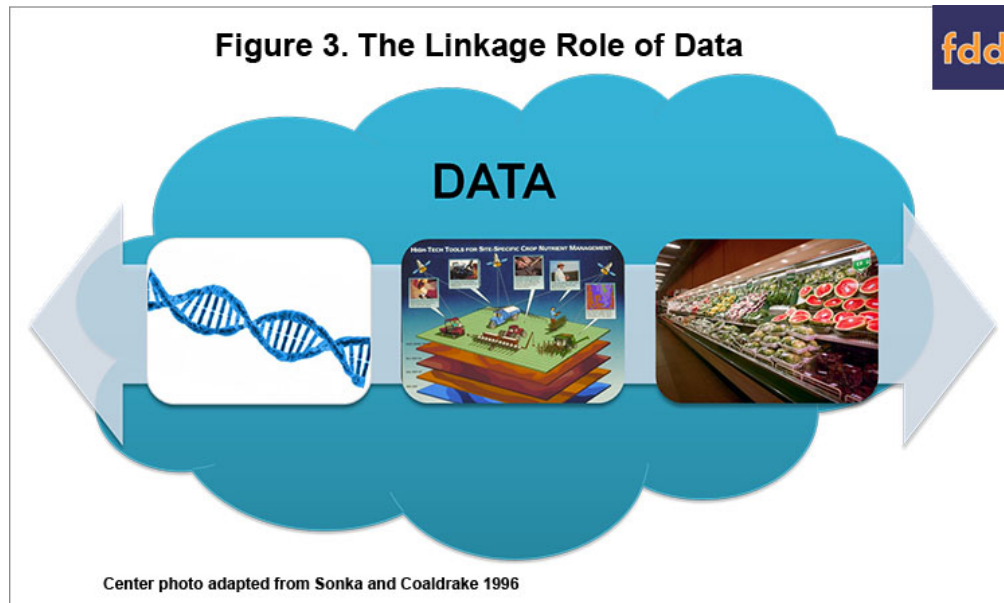
- Historically, plant breeding and genetics research were both expensive and exceedingly long-term in nature. Syngenta Crop Protection LLC (as well as numerous other ag R&D firms) is investing and collaborating with technology firms to employ leading edge analytic tools ([Morning Ag Clips 2015](#)). The goal is to accelerate research process as well as reduce the cost of bringing novel seeds to market.
- Genetic advances in livestock production offer considerable potential as well. A Canadian startup, Livestock Gentec, is focused on using analytics to drive faster genetic improvements thereby improving food production and reducing time to market ([Troy Media 2013](#)).
- Monsanto Company has achieved considerable press coverage for its moves to bring Big Data capabilities to the farm production level ([Tech-Tonics Advisors 2013](#)). However, at the R&D level, analytics has been a key enabler for a number of years. Locating genes that provide specific benefits in crops requires sorting through billions of base pairs in a genome. Indeed, the term bioinformatics was coined to describe this important capability.
- Use of analytics to advance basic genetics is not limited to firms in the private sector as government and university labs routinely employ Big Data tools in their genetic research programs. For example, the vision for the USDA's Veterinary Pest Genomics Center is to leverage Big Data solutions to evaluate risk and develop mitigations for invasive veterinary pests ([USDA 2015](#)). These efforts are particularly important today as the introduction of invasive veterinary pests is accelerated by global change, including anomalies related to climate variability.
- The name of General Mills probably is not one the list when one thinks of agricultural genetics. However, the firm has found it beneficial to employ analytics to enhance effectiveness of its sweet corn breeding program ([Hart 2014](#)). Using traditional methods, development of a sweet corn variety could be expected to take 18 years. Employing advanced analytics reduces the time required by two-thirds.

The consumer and genetic level applications shown in Figures 1 and 2 present just a small sampling of headlines documenting Big Data application in the food sector. These applications are perceived as sufficiently important that food retailers and manufacturers strive to be recognized as leaders in Big Data implementation.

Optimization of ...Farming? ...of the Food Sector?

Headlines from several media articles were listed earlier in this article. These focused on exciting potential applications of Big Data throughout the food sector.

Figure 3 emphasizes the linkage role of data. Traditionally in agriculture, data management (capture, analysis, and communication) has been relatively expensive. Commodity production and marketing systems developed to optimize performance –given that data management was costly. Advances in the range of technologies associated with Big Data, however, are markedly changing those cost/benefit relationships.



Novel technologies and their application are driving these changes in costs and benefits, not only on the farm, but also throughout the food sector. Many, and probably most, of the insights regarding consumer preferences and genetic capabilities that are discovered through use of Big Data tools will be directly employed there. Other times, maximizing value creation will require linkages with and through the farm sector. Exploiting those possibilities could provide profitable opportunities for some at the agricultural production level.

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