

Technology and the Future of Food

Exploring the potential of IT to address food system challenges

Michelle Grant and Aimee Shreck

World Food System Center, ETH Zurich, Switzerland

Last year, at least US\$4.6 billion dollars in venture capital flowed into start-ups in the agriculture and food sectors worldwide.¹ Many of these companies try to harness information technology to address a market need, with food delivery being one application that has gained much attention. The current hype around digital disruption in the agro-food sector leads many to ask the question: how can information technology help us tackle serious and persistent food system challenges? Against this backdrop, we recently embarked on a study tour of the San Francisco Bay Area in California to seek answers to this question and to experience these developments first hand.

The study tour was designed as an educational program for a group of 20 university students from Switzerland and California. The group lived and worked together for five days, travelling over 760 km and visiting 21 different organizations. This “Field Report” provides an overview of some of the impressions we gathered during this study tour.

“ETH Meets California”

The ETH Zurich World Food System Center organized a week-long course, *Tackling Food System Challenges with IT Innovation* as part of an initiative called “ETH Meets California.”

The course took students on a tour of California’s Silicon and Central Valleys to investigate the potential for disruptive technologies to contribute to food and nutrition security in a highly complex world food system. As a university, ETH Zurich

plays an important role in building the capacity of the next generation of food system leaders. This includes preparing students to engage responsibly and appreciate the opportunities and challenges of digitalization in the agro-food sector.

For further information, please visit

www.worldfoodsystem.ethz.ch/education/study-tours.

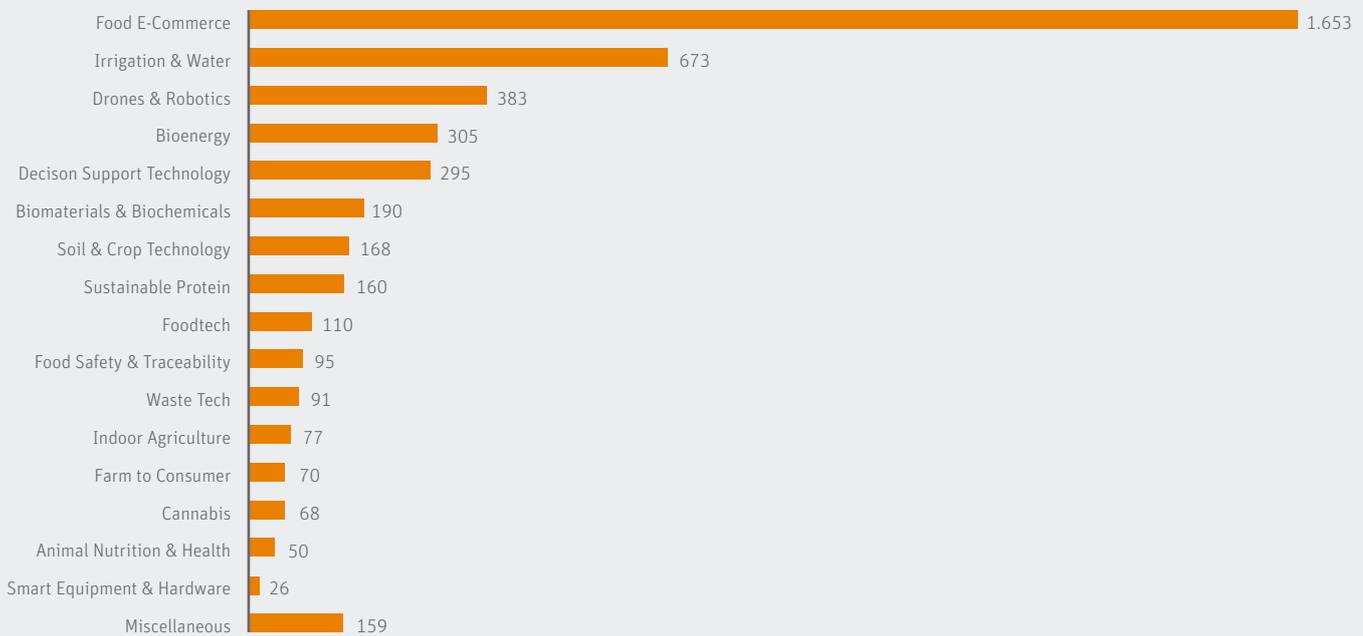
Reports from participating students may be found at www.foodsystemstories.org.

Hacking food banks for healthier food

During the trip, we were exposed to a wide range of challenges and solution approaches. One of those that highlighted the potential of IT as a change enabler was a food bank that aims to help the one in five food-insecure people in the Yolo county region access a healthy meal when they need it. The visionary leader of this food bank is trying to apply a business mindset to the way he runs the charity, including a closer collaboration with the nearby university to transfer the latest knowledge and tap into skilled volunteers and collaborators.

“Students designed an app to link agricultural producers with the food bank to redirect produce that would otherwise go to waste”

This partnership recently included a hackathon where a group of students from the University of California, Davis, de-

FIGURE 1: Ag and food tech investments by subsectors

Source: Burwood-Taylor L, Leclerc R, Tilney M. AgTech Investing Report: Year in Review 2015. Published by AgFunder, February 16, 2016. Page 15.

signed an app that would link nearby agricultural producers with the food bank in order to redirect produce that would otherwise become losses on field. The director of the food bank was

quite optimistic that IT could further help them in their mission to become a nutrition-focused food bank, though exactly how that could happen had not yet been defined. He felt that the only way to tap into this potential was to create more opportunities for those familiar with the technological possibilities to sit together with people out in the field who tackle the problems on a daily basis.

A panel of experts speaking at UC Berkeley in a public lecture on “The Challenge of Making Good Food Affordable” likewise felt the potential of IT innovation has not yet been exploited for this purpose. Toward the end of the event, one of our students raised the issue of IT and its potential to address the complex challenges they had outlined. All the panelists appeared a little surprised by the question, suggesting that this discussion is yet to trickle down from fast-paced start-ups to government and community-based organizations in a meaningful way. Yet as they reflected on it, there was a realization that there could be an opportunity to increase efficacy, targeting, and impact through improved harnessing of available technology.

Apps for food delivery

The area that has seen perhaps the most concrete application of IT and the largest investments is the food e-commerce sector, which centers on (non-restaurant) food delivery services (Figure 1). The activity to date has focused on improving the health and well-being of urban professionals with disposable incomes



Visit to Yolo County Food bank to learn about how they are trying to become a nutrition-oriented food bank and helping tackle food insecurity in the region. A business-, data- and solution-driven approach is helping them overcome some of the challenges they face.



Visting IndiBio in San Francisco, the world's first synthetic biology accelerator, where biology is seen as "a technology to help solve our culture's most challenging problems."

in over 20 countries.¹ As this market gets crowded out by an overcapacity of these solutions, we are hopeful that the search for untapped markets will encourage new players to look at contributing to the challenge of getting healthy and affordable food into food deserts. These are the communities who are most in need of healthy, affordable and convenient meal options, and the technology and know-how already exists.

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The limited range of applications to address this type of challenge highlights one of the major issues facing this sector – that what nutritionists, agriculturalists, and food system professionals want to see happening is typically not where venture capitalists wish to invest, or where start-ups are putting their energy. Fortunately there are examples of motivated individuals creating new business models with social impact in mind. With time, we hope these social entrepreneurs and impact investors will help further tap the potential this technology may hold.

Synthetic food

The other field we saw receiving much attention is synthetics and food replacements – for example, meatless meat, egg-free eggs, liquid nutrition, and algae-based seafood. All of these applications, in one way or another, aim to bypass some of the serious environmental and social impacts of our current food production methods without requiring consumers to bear any of the discomfort or change their consumption patterns.

Despite the millions of dollars in capital flowing into these ideas, at the end of the day they are essentially trying to produce the same product that is already available at a much lower price. Given the extremely small margins in the food and agriculture sectors, these low prices are only possible due to a large number of externalized costs in our current food production systems. It was difficult for us to see how these start-ups will scale up economically and offer more than a “novelty” for the small number of conscious consumers with the disposable income to appreciate them. The responsibility and resources to “disrupt” the existing unsustainable systems are, however, still needed, and it is unclear if these approaches are helping us to address the root problems.

Technology, labor, and livelihoods

Another major externality in the food system that was front and center during this study tour was labor. At many different stops we were told about a “labor problem in California,” and that it was becoming increasingly difficult to secure workers to plant, harvest, process, prepare, or distribute food. This was seemingly one of the major factors – along with the additional potential to improve precision and efficiency – driving the interest in automation and mechanization and the associated applications of robots and drones.

For us, this was a good example of how solutions are linked to how problems are framed. During our short tour, we saw only a few examples where people were asking deeper questions around the ethics of our current food system, which relies on millions of poorly paid laborers to carry out difficult work, often under trying conditions. Meanwhile, many of the workers whose labor supports the food system are simultaneously food-insecure, and they themselves experience some form of malnutrition. It is thus impossible to be concerned about malnutrition and not be concerned about labor conditions and livelihoods.

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As the tour came to a close, we wondered if these complex questions were being reduced to a problem that could be solved through a shift to automation and increased mechanization. These developments certainly offer great potential, however it is important that challenges around labor in the food system are not dehumanized at the same time. We couldn't help but think what could happen if we took the same enthusiasm, creativity, and funding that is currently being applied to robotics and drones and also applied it to answering the underlying question of how can we build a food system that ensures value creation and sustainable livelihoods for all?

Potentials and selective optimism

Our experience suggests to us that there is great potential for IT to help address food system challenges in the areas of precision agriculture, food waste reduction, food safety, resource efficiency, personalized nutrition and convenience. These data-intensive fields can greatly benefit from the improved processing and analytics capacity IT offers today and can support solutions for these aspects of our food system.

Due to the limited time we had during our study tour, we only managed to scratch the surface of this huge space. Although we didn't see it first-hand, we heard about many other examples, such as how robotics and downscaled precision agriculture concepts are helping small-scale farmers maintain diverse cropping systems in a cost-effective way. Or how, for example, low-cost

“smart tractor” systems are allowing farmers to engage in a sharing economy to access state-of-the-art farm machinery in Nigeria. The breadth and potential of these technologies and their applications certainly left us hungry to learn more.

Perhaps not unexpectedly, we also saw that IT alone is no silver bullet to address the myriad complex issues we are facing today. It is most definitely an enabler of change in some sectors, but its potential will lie in our capacity to resist the seduction and current hype of the technology itself and to keep clear what the key needs, drivers and levers are for creating appropriate and effective solutions. We believe this will require greater exchange across disciplines and sectors, taking the entrepreneurial mindset and technological potentials and talking with people who deeply understand the issues in order to come up with meaningful applications.

If we can create an ethos around this sector that is based on an understanding of our most pressing societal challenges and a commitment to harness technology for the greater good, then this is certainly a powerful tool in our global toolkit. This is particularly important as we look to expand these approaches beyond wealthy urban areas and their neighboring agricultural lands and into more remote parts of the world, with the most vulnerable populations.

“Would an increased reliance on technology to address our critical food system challenges leave us more or less resilient to shocks?”

At the end of our tour, we were bemused as we watched a group of IT professionals huddle around a laptop trying to get a presentation to work. For all the talk about harnessing information technology, it still leaves even the brightest among us at times at a complete loss to even get a PowerPoint presentation to play. And so we wonder, would an increased reliance on technology to address our critical food system challenges leave us more or less resilient in a future prone to shocks?

Correspondence: *Michelle Grant*, Executive Director, World Food System Center, ETH Zurich, Auf der Mauer 2, ADM B4, 8092 Zurich, Switzerland
Email: mgrant@ethz.ch

References

1. Burwood-Taylor L, Leclerc R, Tilney M. AgTech Investing Report: Year in Review 2015. AgFunder, 2016. www.agfunder.com.



Visiting a large-scale strawberry farm to learn about the challenges and opportunities of mechanization, productivity and labor conditions