



# The State of Agrifood Technology in Boston

## IA-Boston

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## Summary

Agriculture and food technologies (agrifood tech) have large potential to help solve the challenge of sustainable food production and provision. Agrifood tech is gaining momentum worldwide, a growth certainly observed in Boston. Due to its entrepreneurial ecosystem, thriving life sciences and health sector, its high-tech development, and its early-adapter population, Boston is well on its way to become the next agrifood tech hub. While until recently Boston was mostly home to foodtech, agtech is catching up. Growth in the agrifood tech sector is however definitely at an earlier stage. Yet, the increase in investment, start-ups, and events and conferences indicate that growth has taken off. Agriculture and food, nonetheless, remain difficult sectors to disrupt, as farmers and big food producers are looking for the most promising solutions only.

## 1. Introduction

Food is a fundamental aspect of our existence, yet agriculture has always lagged behind on the application of new technologies. Today, agrifood is still the least digitalized of all industries.<sup>i</sup> At the same time, growth in the sector is needed, as today's agricultural practices are largely inefficient, with increasingly more mouths to feed. It is estimated that food production needs to increase by 70 percent over the next 40 years to satisfy increasing demand<sup>ii</sup>. This makes agrifood an industry with enormous potential for the application of new technologies. Think of big data applications for farm-related decisions, robotics and drones to make farm functions more efficient, innovative foods such as plant-based proteins, Ag Biotechnology, and eGrocery online stores which make healthy food more affordable and accessible for people. This is only a fraction of [the applicability of technology to agriculture](#) and food.<sup>iii</sup>

The industry in which technology is used for agriculture and food production is called *agrifood tech*<sup>iv</sup>. Agrifood tech includes all components as food travels from the farm to the fork, including agriculture, manufacturing, food processing, non-food processing, wholesale and logistics, foodservices, food discovery, food regulation, R&D, and financial services. Agrifood therefore essentially combines two (often regarded separate) industries: agriculture-tech (agtech)<sup>v</sup> and food tech<sup>vi</sup>.<sup>1</sup>

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<sup>1</sup> Please note: for clarification purposes, this document uses the overarching term 'agrifood tech'. There exists debate on whether to use the term *agtech* instead of *agrifood tech*, hence some research may be presented as 'agtech', while it, according to our definition, also intends to cover food tech.

## 2. Background

Agriculture is a major industry in the United States (US). In 2015, agriculture, food, and related industries contributed \$992 billion to US gross domestic product.<sup>vii</sup> Most farming is done in the Midwest, while on the coasts just one percent of the population are farmers. Still, the US West Coast has significantly more agricultural output than the East Coast does, largely due to environmental factors. The application of technology to food and agriculture therefore has a large potential in the Northeast of the US.

Similarly, and consequently, agrifood tech has not gotten as much attention on the East Coast as it has on the West Coast. Agrifood tech started to gain momentum in Silicon Valley in 2006.<sup>viii</sup> In the years following, agrifood tech spread over the country, especially to high-tech areas such as New York, Colorado, but certainly also Boston. While agrifood tech provides many opportunities for a wide array of technologies to be applied, it remains a difficult sector as commercial distribution is often challenging.<sup>ix</sup>

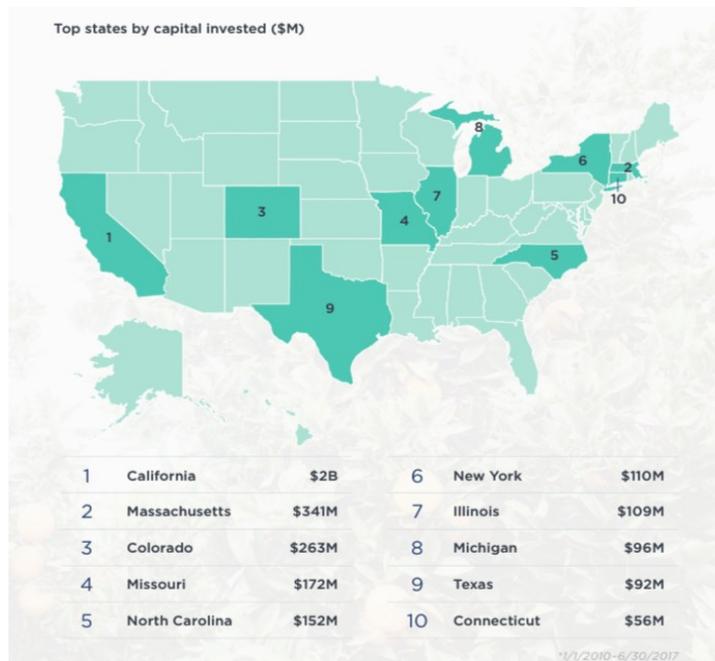


Figure 1: Top States by Capital Invested (\$M) in Agrifood Tech  
Source: [Pitchbook Platform](#)

Figure 1 highlights the top states by capital invested in agtech between January 1<sup>st</sup> 2010 and August 30<sup>th</sup> 2017. It shows that Massachusetts has been the runner up when looking at capital invested in agrifood tech in that period, far ahead of Colorado and even New York.<sup>x</sup> Boston, the most populous city and capital of the state of Massachusetts, herein plays an essential part. Yet, it is evident that California is still way ahead of both Massachusetts and Boston.

### 3. Agrifood Tech Coming to Boston

Massachusetts now ranks high in capital investments in agtech, which is not entirely surprising. The greater Boston area is home to many legendary food and beverage brands, such as Samuel Adams, Dunkin' Donuts, Fluff, Newtons, Polar, and Hood.<sup>xi</sup> Big food brands are constantly looking for innovative solutions to improve their foods and ultimately sales.

However, most importantly, Boston possesses many of the right ingredients to cook promising agrifood technologies. As agrifood is a sector in which a wide variety of technologies can be applied, the advancements in the life sciences, biotech, robotics, blockchain, and artificial intelligence make Boston a great place for agrifood start-ups. Additionally, universities such as Harvard and Massachusetts Institute of Technology are home to highly talented and entrepreneurially-minded students, as well as start-up support is widely available in Boston. As **Bevi** founder Sean Grundy notes; *“for our two businesses, Boston is really the hub for hardware innovation. I would much rather do this hardware company here than do it in California because of the talent we can recruit, the friendliness of investors and the combination of a community that’s near the top of food innovation and at the top in terms of hardware innovation. I don’t see businesses like ours coming out of other cities successfully.”*<sup>xiii</sup> In other words, Boston now has both the right social and technological environment to become a frontrunner in agrifood tech.

## 4. The Boston Agrifood Tech Ecosystem: Public, Private, Universities, and More

### 4a. Public Sector Support

#### Federal Government

In January 2018, the US Department of Agriculture (USDA) announced the [2018 Farm Bill & Legislative Principles](#). This bill includes many initiatives to improve the policy environment for food and agricultural innovation. In the past years the Federal Government stimulated agrifood tech development predominantly through funding in the form of grants. Examples are numerous, such as the National Institute of Food and Agriculture announcing grants totaling \$15.7 million for agricultural research focusing on among others genetics, genomics, and animal breeding.<sup>xiii</sup> Similarly, the USDA announced a \$5 million fund for research on the science behind agricultural implements and resources.<sup>xiv</sup> Also notable is the “Feed the Future Partnering for Innovation” program, which is a United States Agency for International Development (USAID) and [Fintrac Inc.](#) Program that focusses on finding and commercializing agrifood technologies.<sup>xv</sup> Other examples can be found [here](#).

In total, universities in the New England area received millions of dollars in funding from the USDA and National Science Foundation (NSF) in 2016. This is the reason most agrifood tech research and development is taking place in the public schools. For example, The University of Rhode Island has been developing an artificial rice funded by the Basic Research to Enable Agricultural Development (BREAD) grant from the National Science Foundation. The University of New Hampshire (UNH) conducted research regarding pollinator health and plant breeding, funded by the USDA and the state of New Hampshire.<sup>xvi</sup> Likewise, The University of Maine received \$388K to fund potato-breeding research.<sup>xvii</sup> Agrifood initiatives at universities in Massachusetts are discussed later in more detail.

## Massachusetts State

There also exist numerous state level initiatives to support agrifood tech development. One example is [The Agricultural Energy Grant Program](#), a program that funds agricultural energy projects to improve energy efficiency for Massachusetts farms. The complete list of support programs can be found [here](#).

## City of Boston

Support from the City of Boston has largely focused on urban farming. In December 2013, the City of Boston passed a new article to support urban agriculture in the city.<sup>xviii</sup> [The Boston Urban Ag Visioning](#) is a 5-year program which aims to improve collaboration between the public, private, and non-profit sectors.

## 4b. Private Sector

### Corporate Trends

Agrifood is a difficult market to disrupt given the traditional nature of agriculture, as well as cultural elements that make change sometimes undesired. This partly explains why the bigger and more traditional companies continue to dominate the space. However, due to the growing pressure for these companies to become more sustainable, the slump in commodity prices, and the consequent need for cost efficiency, agricultural giants are increasingly looking for ways to keep up with the external changes.<sup>xix</sup> This often happens through mergers, some on a larger scale than others. 2017 was a year of many large-scale mergers, such as that of Bayer and Monsanto, and Dow and DuPont.<sup>xx</sup> This phenomenon has given agrifood start-ups the opportunity to flourish, though they are now also on a large scale recruited by the food giants such as [Cargill](#) and [Monsanto](#).

### Start-ups

Boston is home to a diverse group of agriculture and food technology start-ups. As agrifood is a difficult sector, ideally, start-ups in this field tackle multiple agrifood challenges at the same time. A famous example of which is [Indigo](#), a company that treats seeds with naturally occurring microbes for crop protection and endurance to improve yields in difficult weather circumstances. Indigo has raised over \$400 million, and now gives valuates at \$1.4 billion.<sup>xxi</sup> Another example is [Freightfarms](#), which develops hydroponic farming systems and a platform to run farms remotely. An extensive list of start-ups in the Greater Boston area can be found in appendix [A](#).

## 4c. Universities

Many universities in the Greater Boston area are researching and developing agrifood tech, although some do so to a larger extent than others. [The Massachusetts Institute of Technology \(MIT\)](#) is increasingly looking at agtech, which is signified by the initiation of a course for agricultural professionals called “Innovation and Technology in Agriculture and the Environment”.<sup>xxii</sup> [The MIT Media Lab Open Agriculture Initiative \(OpenAg\)](#) is working on all sort of Food Computers, that control environments in urban areas for food production. Also, they work on computer vision and machine learning to bridge the current gap between controlled environment agriculture and the fields of robotics and AI. [MIT’s Food and Agriculture Club \(FAC\)](#) is a student-run community which connects MIT community members in order to facilitate dialogue about food and agriculture. They have partnered with Rabobank to create the [Rabobank-MIT Food and Agribusiness Innovation Prize](#), a business-plan competition for

university and graduate students with a focus on food and agribusiness. Increasingly more agriculture and food innovation research is conducted at **Harvard**.<sup>xxiii</sup> Also, Harvard's Innovation Labs (i-labs) have previously had agrifood related projects, such as [Bloom](#), an in-home growing unit and social platform for sharing knowledge on healthy and delicious food. In collaborative effort with Harvard's University Center for the Environments, i-labs started '[Harvard Food Better](#)' last year, which focuses on the food system and how to improve it.

**The University of Massachusetts (UMass)** is advancing in agrifood tech, with multiple research and practical initiatives. The [UMass Extension Vegetable Program](#) and [Ethnic Crops Program](#), as well as the [6 UMass Research Farms](#) are examples of agtech innovation developed on a farm itself by talented scientists across various departments of the university. Furthermore, UMass has a food science program in which microbiology and genomics are central topics. UMass Amherst, for example, in January this year reported to have developed a new rapid and low-cost method for detecting bacteria in water and food.<sup>xxiv</sup>

**Boston College** has launched an initiative on [Innovation in Urban Science Education](#), which facilitates engagement of STEM students with social justice topics. The initiative is largely focused on hydroponics through Urban Hydrofarmers Projects, in which the students engage with farmers and green energy technology for sustainable energy development in cities.

Joined holistic projects on agrifood tech are also initiated by universities in the area, such as [The Nutrition Innovation Lab](#) by **Tufts University**, USAID, the Harvard School of Public Health, Purdue University, Johns Hopkins University, and Tuskegee University. [Cambridge Crops](#) is an initiative alike, which is a company consisting of a team from MIT and Tufts University that has developed an innovative biofilm that can extend shelf life of food perishables like fruits and vegetables.<sup>xxv</sup>

#### **4d. Organizations, Accelerators/Incubators, and Co-Working Spaces:**

*all of which are to a small or large extent affiliated with agrifood tech.*

##### **Organizations**

- [The Urban Farming Institute of Boston](#): promotes urban farming as a commercial sector that creates jobs for residents in Roxbury, Dorchester, and Mattapan by engaging urban communities.
- [Food + Future coLAB](#): a collaboration between Target, MIT's Media Lab, and global design firm IDEO. It will soon kick-off a major research project that will map global conversations related to food, trends and how food will be grown in the next 15 years. Also, the Food + Future coLAB in Cambridge will be launched. This will be a multi-year collaboration to explore city farming.
- [ArtScience Culture Lab & Café](#): a café and culture lab committed to combine great drinks and dining with food science, to express the dining of the future.
- [Venture Café](#): Organizes weekly networking events, often with a specific theme. It has organized food related events before, such as [FoodBev Connect](#) and an [agtech roundtable](#).

- [Slow Food Boston](#): Slow Food Boston is a local chapter of the international food movement [Slow Food](#). It builds communities around food initiatives to improve people’s understanding and awareness on the global food system.

### Co-Working Spaces

- [The Food Loft](#): a co-working space dedicated to being at the intersection of food, technology, media and entrepreneurship.
- [Branchfood](#): located in the Cambridge Innovation Center, Branchfood seeks to promote entrepreneurship and support the community of founders launching and scaling transformative foodtech and agtech businesses.
- [Cambridge Innovation Center](#): houses more than 1,000 companies across 8 locations, offering premium office and co-working space.

### Accelerators/Incubators

- [MassChallenge](#): is a global non-profit start-up accelerator and competition with a focus on high-impact, early-stage entrepreneurs.
- [Techstars](#): a start-up accelerator, also see their [Farm to Fork Accelerator](#) for agrifood tech start-ups.
- [Food-X](#): a food innovation accelerator for international agrifood start-ups.
- [The Engine](#): MIT’s new multi-faceted initiative for fostering “tough tech” start-ups
- [MIT Solve](#): an initiative by MIT to solve global challenges, among which health and agricultural ones.
- [Greentown Labs](#): the largest cleantech start-up incubator in the US, with about 10% agrifood tech companies currently at its facilities.
- [MassRobotics](#): a robotics focused incubator located in Boston’s seaport.

A list with all Boston accelerators, incubators, and support programs can be found through this [link](#). All nation-wide agtech accelerator programs can be found [here](#).

## 5. Finances

Investments in agrifood tech have significantly risen since the start of this decade. Investors are increasingly looking beyond economic returns, now also considering social and environmental

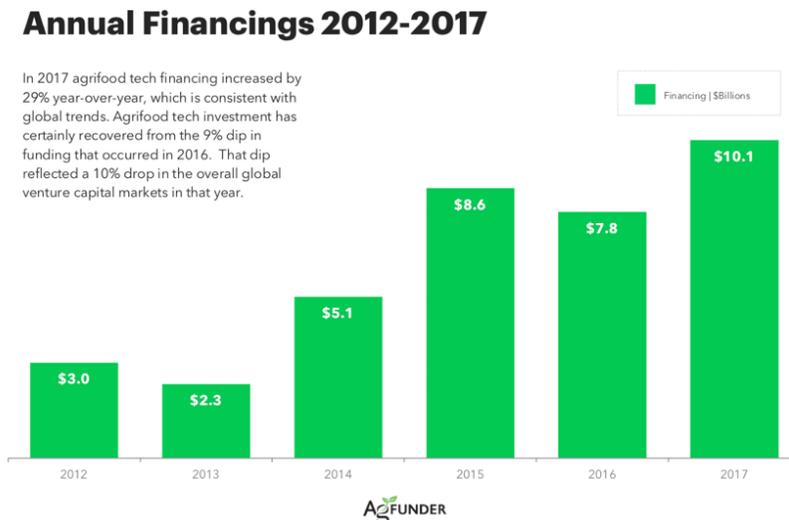


Figure 2: Global Annual Financings in Agrifood Tech 2012-2017

Source: [\*AgFunder Annual Report\*](#)

returns.<sup>xxvi</sup> Consulting figure 2, global annual financing has tripled in the period between 2012-2017. In 2017, financing totaled 10.1 billion, spread over 994 deals, and 1487 unique investors.<sup>xxvii</sup> Although deal growth declined with 17%, investment growth increased with 29%, with \$1bn being the largest 2017 agrifood tech deal.<sup>xxviii</sup>

In 2017, there were a greater amount of deals at the later stage. This shows that the sector is maturing. Also, corporate venture capital activity has expanded, with now over 30 active funds.<sup>xxix</sup> Increasingly more non-traditional investors entered the agrifood space in 2017, such as Google Ventures in Farmers Business Network, and Amazon.<sup>xxx</sup> The opening of the US headquarters of the Dutch investment firm Anterra Capital in Boston signifies the growing interest investors have in the Boston area.<sup>xxxi</sup> With other VC's such as [Branch Venture Group](#), and [Edible Ventures](#), Boston continues to grow as an attractive area for start-ups to look for capital. Appendix B includes an overview of active agrifood investors in the Greater Boston area.

## 6. Meet-ups, Events, and Conferences

Despite start-up activity, increasing involvement of the universities in the space, and the growing amount of agrifood tech related organizations in the Greater Boston area, there are not yet a lot of events and meetups to attend. This section highlights the major meetups, event organizers, and conferences in Boston.

### Meetups

- [Agtech New England Meetup](#): organized by a Boston-based VC, the Agtech New England Meetup connects people from all over New England to bring entrepreneurial expertise, relationships, and experience in Agtech together.
- [Branchfood Meet-up](#): monthly community table in which eaters, entrepreneurs, and students of food can connect and exchange ideas.

### Events

- [Branchfood](#): organizes a lot of different events every month, which can be found [here](#).
- [MIT Food and Agriculture Club](#): organizes lectures, panel discussions, and many other types of events.

### Conferences in Boston

- [GAI: AgTech Nexus \(June 6-7, 2018\)](#): a conference heavily focused on emerging tech and innovative start-ups in the agrifood space.
- [Global Summit on Agriculture, Food Science and Technology \(October 26-27, 2018\)](#): it is themed 'sustainable agriculture technology to eliminate global food shortage'.
- [Food Edge Summit 2018](#): food edge is a first-of-its-kind summit that brings together the food industry's largest brands, alongside dynamic start-ups and disruptive leaders, to explore food innovation.

## 7. Trends and Opportunities

Agrifood is currently considered to be in the ‘1995 of the internet’ stage, meaning it needs a whole bunch of technological development before it can fully advance.<sup>xxxii</sup> Trends such as consumer demand for transparency, but also the 2018 Farm Bill\*, are expected to incentivize innovation in agrifood.<sup>xxxiii</sup> Experts have said 2018 to be a record-breaking year for agrifood investment, through the rise of mega funds and continuous entrance of non-traditional entrants. Especially automation and biology-based solutions will become central in agrifood tech.<sup>xxxiv</sup> Importantly, government policies and regulations will play an important role in shaping the future of agrifood tech, as they could either stall or stimulate entrepreneurial activity in the sector.

## 8. Conclusion

Agrifood tech is growing in popularity worldwide, driven by the need for modernization of agriculture to meet the demand for food in the future. In Boston, food tech has been leading, though agtech has recently been catching up. The universities in the area are launching initiatives to innovate in agriculture and food production, big food companies are looking at start-ups to supply the technologies to keep up with consumer demand, and the 2018 Farm Bill\*<sup>xxxvxxxvi</sup> will likely incentivize many others to start thinking about the innovation of our food system. When compared to California, however, Boston’s agrifood tech ecosystem is still at an early stage. Some do believe Boston to be the next agrifood-hub, which may become apparent if the recent progress in the agrifood sector extends into the future.

## 9. Staying Up-to-date on Agrifood Tech

### Newsletters

- [Food + Tech Connect Bytes](#)
- [Global AgInvesting Mailing List](#)
- [MIT Food & Agriculture Club](#)
- [Oilseed & Grain Trade Mailing List](#)
- [MIT OpenAg Newsletter](#)

### Websites

- [Agfunder News](#)
- [Agfunder](#)
- [Food + Tech Connect](#)
- [Fooddive](#)
- [CB Insights Food Research](#)
- [The Spoon](#)

### **\*2018 Farm Bill**

In the US, the farm bill is typically enacted every four to five years. It is the primary food and agriculture policy tool of the federal government that steers development in the agriculture and food sectors. In January 2018, the new farm bill was announced. The 2018 farm bill’s focus area is large. Important for agrifood tech is the focus on research, education and economics within the bill. It outlines goals such as investing in high priority innovation, technology, and education networks, but also stresses the importance of developing and applying advancement in technology. The bill is, however, currently still in a markup process. Nevertheless, it is expected to be radically different from previous bills, which makes it likely to be a disruptive one.

**Appendix A – Agrifood Tech Start-ups in the Greater Boston Area<sup>xxxviiixxxviii</sup>**

Map of Food Tech Companies in Boston:

[https://www.scribblemaps.com/maps/view/Food\\_Tech\\_Boston/foodtechboston](https://www.scribblemaps.com/maps/view/Food_Tech_Boston/foodtechboston)

Company	Description
<a href="#">Bevi</a>	The smart water cooler—bringing flavors, fizz, and eco-friendly fun to your workplace.
<a href="#">Beantrust</a>	Beantrust brings a taste of coffee's rich history and culture to some of Boston's most innovative technology hubs. In striving to provide a service-level of excellence, beantrust is energizing and engaging the workplace community in a unique way.
<a href="#">Cabbige</a>	Cabbige is online software designed to help small, diversified farms manage their business.
<a href="#">CiBO Technologies</a>	CiBO Technologies created an engagement model by using software products that unify big data and advancement analytics with a scientific understanding of agriculture.
<a href="#">Cambrian</a>	On-site wastewater treatment systems.
<a href="#">City Growers</a>	City Growers transforms vacant lots in Boston into intensive urban farms that are economically and environmentally sustainable.
<a href="#">Fooda</a>	Office food scheduling from local restaurants — platform for restaurants to provide popup events and catering to nearby offices.
<a href="#">ClimaCell</a>	Military-grade forecast precision for weather sensitive industries
<a href="#">ezCater</a>	Catering services marketplace for businesses.
<a href="#">Gomango</a>	Gomango is building a network of modular, intelligent refrigerated boxes to transport perishable goods using any existing truck or train. An on-demand network of low-cost refrigerated boxes will distribute the benefits of refrigerated transport widely.
<a href="#">Greensight Agronomics</a>	Greensight Agronomics captures detailed plant health data, process it, and deliver you alerts and

	maps on specific threats and conditions.
<a href="#">Grove</a>	Grove partners with leading appliance and kitchen brands to offer customers compelling indoor growing experiences and gardening services.
<a href="#">Harvest Automation</a>	Harvest automation creates mobile robots for industrial productivity.
Lazoka	A platform that cuts out the middle men, letting consumers order produce directly from local farmers
<a href="#">LeanBox</a>	Fresh food vending machines to improve company culture.
<a href="#">LocalTable</a>	Networking and personal branding platform for chefs.
<a href="#">Raptor Maps</a>	Uses aerial images to help farmers track their harvest and estimate crop yields.
<a href="#">Ricult</a>	Provides an online service to farms in developing nations to help them get resources that will grow their businesses, including connections with consumers, cheap credit, soil testing and free delivery.
Scout ( <a href="#">American Robotics</a> )	American Robotics has introduced Scout, the world's first fully-automated drone system for farmers.
<a href="#">Six Foods (Chirps)</a>	Six Foods makes healthy, delicious, and sustainable foods with insects. It uses crickets milled into a flour to make high protein tortilla chips (Chirps) that are familiar to Americans.
<a href="#">Smart Lunches</a>	Kid-favorite lunches prepared fresh each day by professional local caterers and delivered directly to your child at school.
<a href="#">Soft Robotics</a>	Produces and designs industrial robots focused on manufacturing, food and baker automation.
<a href="#">SproutsIO</a>	SproutsIO makes an Indoor 'micro-garden' that allows urban dwellers to grow produce and vegetables year-round, controlled by a mobile app.
<a href="#">Spoiler Alert!</a>	Spoiler Alert's B2B technology helps businesses manage wasted food through discounted food sales, food donations, and organic waste opportunities.

<a href="#">Spyce</a>	Original restaurant concept with a robotic kitchen.
<a href="#">Suvie</a>	The Suvie appliance is a smart oven that uses water to independently cook each of your meals perfectly. It goes paired with a meal plan, which are healthy meals that complement the Suvie appliance.
<a href="#">TellusLabs</a>	TellusLabs combines satellite imagery with machine learning to answer critical economic and environmental questions.
<a href="#">Tertill (Franklin Robotics)</a>	Franklin Robotics makes Tertill, an autonomous garden robot that cuts down weeds.
<a href="#">Toast</a>	A cloud-based restaurant software company.
<a href="#">Upstream</a>	Upstream combines over a dozen satellite sources into one “Satellite Ensemble,” supplementing one satellite’s weakness with another’s strengths, allowing you to analyze large geospatial regions at high temporal and spatial resolutions with the click of a button.

### Appendix B – Agrifood Investors in the Greater Boston Area

<b>Name</b>	<b>Description</b>
<a href="#">Anterra Capital</a>	Invests in companies that are transforming the safety, security and sustainability of global food
<a href="#">Branch Venture Group</a>	Provides support to high-growth, innovative food ventures through network, capital and expertise.
<a href="#">Hancock Agricultural Investment Group</a>	Provides investors with diversified farmland portfolios tailored to client risk and return objectives.
<a href="#">Flagship Pioneering</a>	Focusses on health and sustainability needs.
<a href="#">Fresh Source Capital</a>	Provides investment solutions to rebuild local food and agriculture systems.
<a href="#">Edible Ventures</a>	Invests in high growth food and beverage companies.
<a href="#">Raptor Group</a>	Private investment company with a wide portfolio.
<a href="#">Tabard Venture Capital</a>	Backs technical entrepreneurs pursuing the global disruption it refers to as AgTech 2.0.

## Appendix C: Sources

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