



RETHINKING CLUSTER INITIATIVES

CASE STUDY

ST. LOUIS

AGRICULTURE TECHNOLOGY

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HIGHLIGHTS

GEOGRAPHY

The St. Louis metro area is the 21st largest in the U.S., with 2.8 million residents.

CLUSTER SIZE AND GROWTH TRAJECTORY

Biosciences overall (comprised of two sub-clusters, life sciences and agtech) accounts for 700 firms (of which 300 are startups) and 15,000 jobs.¹ Agtech specifically accounts for 50 to 400 firms, depending on the definition. Bioscience jobs in the region, including those related to agtech, declined overall from 2012 to 2014, but the industry is considered to be growing on the basis of high-tech entrepreneurial activity and strong growth prospects for the industry globally.

CLUSTER TYPE

The agtech cluster is primarily skills-based (800 plant science Ph.D.s), with some technological (plant genetics) and supply chain (manufacturing, regulatory, and financial services, farmers) elements.

ORGANIZATIONAL STRUCTURE

The agtech cluster initiative is overseen by a highly collaborative partnership with BioSTL and Donald Danforth Plant Science Center as core industry organizations and the St. Louis Economic Development Partnership (regional EDO) as a key partner.

RESOURCES AND KEY ASSETS

Core elements of the ag tech cluster include a specialized research center and incubator facilities focused on supporting commercialization, several universities with a strong focus on plant sciences, abundant industry-specific startup capital and support, network-building efforts, and industry-driven skills development efforts.

¹ Biosciences is the umbrella term for two sub-clusters: life sciences and agtech. The distinction between the two is somewhat arbitrary (e.g., genetics research in the life sciences has spawned agtech firms), but they are discussed separately in this case because they have fairly distinct economic development stakeholders and interventions. (See diagram on page 5.)

BACKGROUND

Agriculture technology (agtech) has been a key industry in St. Louis since 1859, when the Missouri Botanical Garden—still a global center of plant research today—was established. But as is often the case, it took a series of economic disruptions for the region to make the agtech cluster, and the closely related life sciences cluster, an economic development priority. Among these disruptions were defense cutbacks that hit McDonnell Douglas, the loss of the city's status as a TWA hub, a series of high-profile acquisitions of major firms (including A.G. Edwards in 2007 and Anheuser-Busch in 2008), the closure of Ford and Chrysler plants in 2006 and 2009 (resulting in the loss of over 10,000 direct jobs), and the 2009 layoffs of 600 highly paid Pfizer employees. These challenged the region's economic identity and reshaped the region itself: In 1980, it had 23 Fortune 500 companies; today it has nine. In 1950, it was the eighth largest U.S. metro area; today it is the 21st.

Over time, these impacts contributed to a major shift in the region's economic development strategy, toward an emphasis on fostering local high-growth, innovation-based startups. Today, St. Louis boasts an inordinate share of high-capacity startup support organizations. This shift is bearing fruit, even as business dynamism lags nationally. St. Louis has recently been attracting nationwide attention as a bona fide startup hub. In 2014, nearly 10 percent of businesses in the St. Louis metro area were startups less than a year old, up three percentage points from 2009. In 2015, tech startups in St. Louis accounted for over 1,400 jobs, more than double the amount in 2011.

But it was a less well-known missed opportunity—not a major acquisition or sudden round of layoffs—that ultimately vaulted biosciences cluster development, and the agtech cluster specifically, to the forefront of the region's strategy for economic renewal. Rather, the genesis of those cluster efforts occurred in the late 1990s when William Danforth, then Chancellor of Washington University, watched as a professor tried unsuccessfully to start a tech firm in St. Louis—only to move to the Bay Area, launch the company, and sell it

within a year for \$350 million. In response, Danforth and a handful of leaders from other major institutions began making a series of major investments designed to translate the region's research strengths into an economic engine.

The first of these investments, in 1998, was the creation of the Donald Danforth Plant Science Center. Its initial funding was \$60 million from the Danforth Foundation (a private foundation established by the founder of Ralston Purina—also the grandfather of William Danforth), \$62 million in cash and land from Monsanto, and \$25 million in tax credits from the state. Now the world's largest independent, nonprofit plant science research center, the Danforth Center employs 200 researchers that draw millions of dollars annually in competitive federal grants and actively commercialize the resulting innovations. The second investment was a Battelle study, completed in 2000, that outlined the economic potential of plant and life sciences. It led to the 2001 creation of an industry group, known since 2011 as BioSTL, which is overseen by a coalition of leaders that continue to meet regularly and collaborate on cluster strategy.

For much of the 2000s, it was the life sciences industry that received the most attention. BioSTL created the BioGenerator accelerator in 2002, and by 2011, it had a portfolio of 30 firms almost all in the life sciences that were successfully raising money from outside the market. (It is also credited with helping the region rebound from the 2009 Pfizer downsizing by helping laid-off researchers start firms.) Meanwhile, a group of regional entities including BioSTL, Washington University, BJC Healthcare, University of Missouri-St. Louis, St. Louis University, and the Missouri Botanical Garden created the 250-acre Cortex innovation district, transforming a mostly vacant manufacturing area into a center for innovative startups that is now home to over 100 companies.

In recent years, however, the agtech cluster has emerged as an equally important focus in the region.

RETHINKING CLUSTER INITIATIVES

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The region's agtech strategy, though customized for the specific needs of the firms in the cluster, borrows from its proven approach to the life sciences. It revolves around providing capital, facilities, talent, and networks for innovative firms, coupled with robust and targeted efforts to attract foreign investment. And it draws on many of the same sources of industry leadership and patient philanthropic support that have made its life sciences strategy successful.



IDENTIFICATION

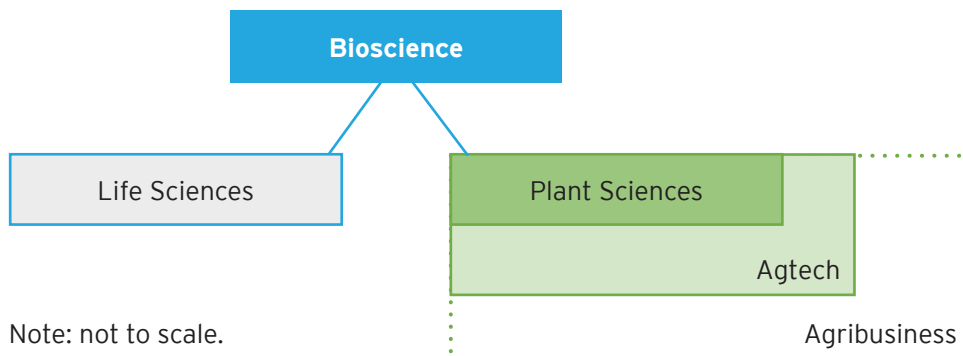
The St. Louis agtech cluster has always been principally defined by the handful of key entities at its core: multinational firms such as Monsanto and Bunge as well as institutions like the Danforth Center, the Missouri Botanical Garden, and Washington University (along with other regional universities, including the University of Missouri in Columbia). When the cluster was originally conceived, these essentially defined the entire cluster. The 2000 Battelle analysis characterized the industry as being dangerously top-heavy: dominated by “large established firms, operating generally in a closed and slow-paced fashion” and lacking a “fully developed entrepreneurial culture.” Today, the cluster has evolved from this original core, in terms of both size and composition.

There are several different definitions of the size of the cluster, since it cuts across a number of industries (as defined by NAICS codes), and there has not been a formal effort to define it since the 2000 Battelle study. As shown below, the agtech industry is often defined as part of the much broader “agribusiness” industry, which accounts for over 50,000 jobs in the region mostly in industries only indirectly related to agtech, including food processing, wholesale, and transportation. The agtech industry as a whole includes about 400 firms in the region. In 2015, a more rigorous assessment, focused just on biosciences companies and organizations involved in R&D or directly related in the value chain, found that

St. Louis had 229 biosciences “assets,” of which 49 (21 percent) were agriculture-related. (Most of these R&D-intensive firms are in the “plant sciences” core of the below diagram.)

While its exact size is somewhat debatable, what is clear is that the cluster has shifted in terms of its structure and industry mix. One manifestation of this shift is that a robust base of small firms has been established. There are close to 300 startups in the biosciences overall, and in the five years from 2010 to 2014, approximately 11 new agtech companies were founded in the region each year. Local leaders think that industry trends will continue to make the cluster increasingly entrepreneurial. According to Sam Fiorello, COO of the Danforth Center, most innovators 10 years ago were biologists focused on developing GMO technologies and de-risking them enough that one of the six major companies would acquire them. Now, says Fiorello, that only accounts for perhaps a fifth of innovation activity. Today’s industry is “almost unrecognizable” because technological shifts have opened up new paths to market. One example is non-GMO approaches, such as gene editing, which are likely to face lower regulatory hurdles and make it easier for startups to go it alone. Other examples include growing opportunities for non-biology tech applications, such as “precision ag” sensors in fields and technology related to traceability in the food chain.

One result of these falling barriers to commercialization is that the cluster is becoming





increasingly defined principally by its knowledge base, which takes the form of 800 plant science Ph.D.s (anecdotally, the highest concentration in the world). Now perhaps the most frequently cited definition of the cluster, this measure was absent in the 2000 Battelle study. This reflects a structural shift in the industry. In 2000, the cluster was dominated by manufacturing operations, and only about 10 percent of jobs (2,300 jobs) were in research laboratories. In 2015, it was estimated that the region had nearly twice as many jobs in research labs (4,500 jobs). The emphasis on the cluster's knowledge base also reflects the fact that the local industry is increasingly characterized by labor market fluidity, spinoffs from research labs, and cross-sector research. (For examples, see the "firm success stories" sidebar on page 5.)

There is also increasing recognition that the cluster branches out from its innovative core in several important ways. One is that farmers themselves (the end users of agtech products), and the grower associations that represent them, are an important part of the cluster. In this sense, the state's broader strengths in agriculture—an \$88 billion industry supporting over 350,000 jobs—are highly relevant to the cluster. (Several entities are working to connect firms with grower associations in order to create a network of farmers that would pilot local innovations.) The cluster also incorporates finance, insurance, and law firms.

As is often the case, had the region relied on

standard quantitative methodologies to identify its clusters, agtech may not have emerged at all. It was not specialized, as measured by location quotient, in 2000. Despite intense focus, that had changed little by 2014, when the region ranked 20th among metro areas for employment in ag feedstock and chemicals and 24th for employment in research labs. Further, agtech is not heavily represented among the region's largest firms—of the 20 largest, Monsanto (12th) is the only one in the bioscience sector. No other agtech firms, even headquarters operations, come close. (However, a number of key firms in adjacent industries, such as ABInbev and Nestle, pay substantial attention to agriculture and food technologies.) Even if the basic contours of the cluster had been identified through standard methods, those wouldn't have captured key characteristics of the cluster that have come to shape the region's interventions, such as its connections with the life sciences, overlap with tech fields, and its rapidly evolving entrepreneurial base.

PRIORITIZATION

The agtech cluster and biosciences overall has remained a regional economic development priority for nearly two decades despite the lack of obvious distinction or progress on measures such as size, growth, and specialization. With total biosciences employment of 15,000 of which agtech accounts for less than half and somewhere between 50 and 400 agtech firms, the industry is far smaller than other potential priorities. (The region's financial

and information services industry, for example, represents 80,000 jobs in over 6,000 firms.) But the region's leaders have continued to make the case for considerable investments in the cluster with a variety of other arguments—namely, it is a key source of innovation, offers highly paid jobs, is globally competitive, is distinct as an economic development focus, and promises to be a future growth opportunity due to global population growth. These contribute to another unquantifiable reason that the cluster has remained a priority: According to Donn Rubin, “Plant sciences has been in the vernacular ever since the Battelle study—the general public is just aware that it’s something to be proud of.”

Innovation: The innovative startups generated by the agtech industry are helping St. Louis address the concerns that Battelle raised almost 20 years ago about its top-heavy economy. The Danforth Center is the physical hub of this innovation. Its researchers are given 20 percent of their time to commercialize their research and have created 10 patents, with another 50 pending as of 2017. In addition, universities in Missouri are inordinately focused on biosciences: They spent \$845 million on related research in 2014 (of which 10 percent was for plant sciences), accounting for 83 percent of all academic research in the state (compared to a national average of 61 percent). But an equally important driver of innovation is industry scientists and executives (many from Monsanto) that start their own firms. This is injecting dynamism into the regional economy in spite of an increasingly concentrated venture capital market and a general decline in startups. The share of people working in young firms in St. Louis fell by nearly 20 percent in the past decade, mirroring national trends. In 2015, for example, St. Louis ranked 18th among metros for the number of firms (30) receiving venture capital, an increase from just 10 firms in 2010.

High pay: Given the R&D emphasis of the agtech industry, and the presence of several large headquarters operations in the region, it is no surprise that jobs in the industry pay significantly more than the regional average. The 250 employees of tenants at BRDG Park, the office park adjacent to

the Danforth Center, for instance, have an average salary of \$80,000, compared to a regional average of about \$52,000. (Statewide, bioscience wages overall are approximately \$72,000 compared to state average of \$45,000.) This is an important feature for any region, but is especially important in St. Louis, given that it ranks in the bottom third of the 100 largest metros for wage growth over the past decade.

Globally competitive: The biosciences industry plays an outsized role in the region’s global trade and investment activity. The basic chemicals, pharmaceuticals, and agriculture industries ranked third through fifth in terms of exports produced in the region in 2016, together accounting for 12 percent of the region’s total. More than a third of foreign direct investment projects in St. Louis from 2011 to 2016 were in the biosciences. This investment has come from a wide range of countries and companies: from tech-based startups from Israeli tech-based startups to large services firms like Rabo Agrifinance of the Netherlands.

Distinct focus: There are few regions with a comparable agtech presence, and most are in adjacent states. According to a Kauffman study, a quarter of all agtech startups in the U.S. were in Iowa, Illinois, Indiana, Missouri, and Ohio. Of these, a smaller number have comparably serious cluster strategies, such as Indianapolis (Agrinovus), Des Moines (Cultivation Corridor), and Kansas City (Animal Health Corridor). The uniqueness of the agtech cluster provides two benefits: It makes it relatively easy to attract global investment in the industry itself, but also provides a compelling way to introduce potential investors to the region’s broader technology and innovation strengths. It functions as the “tip of the spear” in the region’s FDI attraction efforts, according to Tim Nowak of the World Trade Center St. Louis.

Growth opportunity: One of the most appealing aspects of the agtech industry is that its growth is almost assured by virtue of the fact that, per Vijay Chauhan of BioSTL: “Our agricultural industry is going to be required to do in the next 30 years what it’s never been asked to do before, which is double

the production of food on a lot less land with a lot less water and in a much more sustainable way.” Not only does the industry need to grow, but it needs to innovate along the way. Agriculture currently lags in terms of digitization, which only increases the prospects of major growth in areas like precision agriculture, plant genetics, and ag-related applications of data analytics and financial technologies.

SELECTED FIRM SUCCESS STORIES

The fact that St. Louis EDOs have not done a comprehensive cluster analysis since 2000 in part reflects the fact that local leaders can readily point to many company examples that capture the dynamics and benefits of the cluster and the importance of its support services. The following are just two examples.

New Leaf Symbiotics is commercializing a university-developed patent for symbiotic bacteria that boost crop yields. The founders, a team from New England, presented at the Ag Innovation Showcase in 2010. They were drawn to the St. Louis cluster and in 2012 moved into a “closet sized space” at BRDG Park. They then approached BioGenerator for an investment, but BioGenerator decided their technology was not yet mature enough and connected them with a retired Monsanto scientist, who was able to secure lab equipment at St. Louis Community College in BRDG Park and establish proof of concept at very low cost. They since have raised more than \$50 million in several rounds of funding, tripled their space at BRDG Park, grown to 40 employees, and filed patents in the U.S., Europe, Japan, and Canada.

Arvegenix is working on breeding pennycress, widely considered a weed but potentially a winter cover crop for millions of acres in the Midwest that would reduce erosion and produce a canolalike oil. Founded in 2013 by ex-Monsanto executives and a BioGenerator executive-in-residence, the firm was initially located in the Helix Center and used greenhouses at BRDG Park. It received a \$100,000 investment as one of the first firms in the Yield Lab accelerator. It then raised \$2.5 million in 2015 from a variety of local funders, including Monsanto Growth Ventures and St. Louis Arch Angels. Arvegenix has 12 full-time employees, some of whom it has hired from the internship program at St. Louis Community College.

The initial motivation for the region's investments in the agtech cluster—ensuring that the region offered the necessary support to enable entrepreneurs to stay in St. Louis and create firms based on corporate and institutional innovation—remains the main rationale for investments being made today. The gaps that the region has identified mirror those that exist in other regions: insufficient early-stage capital, facilities, talent, and networks. And, as most regions also find, there are information gaps among global firms unaware of St. Louis' strengths relative to well-known clusters on the coasts.

Capital: Though St. Louis has held its own in recent years in terms of the number of firms receiving venture capital, it ranked just 32nd among U.S. metro areas for average annual venture capital investment from 2010 to 2015 below high-performing mid-sized metros like Pittsburgh, Austin, and Denver, but also less high-performing metros (Cleveland) and smaller ones (Provo). This general shortage of funding likely understates the challenges that agtech companies specifically face. Like life sciences firms, plant sciences firms face high regulatory hurdles (it can cost \$100 million to get a GMO crop registered). And whereas large firms used to fund early-stage research or buy promising but unproven startups, they are now increasingly relying on major acquisitions of small firms that have “de-risked” technologies. Yet, even as startups are expected to carry their products further through the development process, there is relatively little seed or venture capital funding for the plant sciences. This is explained in part by the fact that the industry has been dominated by big multinationals that don't need such funding. And agtech firms face challenges in appealing to funders located in coastal areas where agriculture is not a key sector according to a Kauffman study, investors “often don't understand agriculture, its thinner margins, and its importance to the domestic and (especially) global economy.”

The region's initial, and still most robust, response is BioGenerator, the investment arm of BioSTL. Originally envisioned as a “virtual incubator” that would provide one-time seed investment and basic strategic guidance, it has since recognized that “investing once at seed stage isn't likely to provide a thriving innovation ecosystem,” and as a result has evolved to provide a wider range of investments, grants, and business coaching. It gets involved with firms before they are ready for investment and can invest multiple times in a company, from seed to final “bridging” rounds that help firms access major institutional capital. (Its pre-seed investments start as low as \$25,000, but the best firms in its portfolio have received as many as six separate investments and \$1 million in funding.) Several other local organizations and firms notably the Yield Lab Accelerator, Prolog, RiverVest, and the St. Louis Economic Development Partnership's Helix Fund were created later and collaborate with BioGenerator.

Building the cluster will ultimately require connections to larger sources of funding. One method of doing so is to draw outside funders into the region (some of the network-building activities described later play a role). But, per Eric Gulve, president of BioGenerator, “We would need to bring in 100 firms to meet demand”—clearly an unrealistic prospect. Therefore, the main approach revolves around building competitive firms that will draw interest from outside the region: “At the end of the day, if our companies can't compete for institutional capital, most of which is outside St. Louis, we haven't done our job.” (Three-quarters of the \$510 million its firms have raised to date came from outside the region).

Facilities: One key barrier to the growth of young, science-based firms is the lack of space with affordable, specialized lab equipment. The creators of the Danforth Center foresaw this need and set aside an adjacent space in its original design for what in 2009 became Bio-Research and Development Growth (BRDG) Park. BRDG is focused on “post incubator

firms,” with most having had a successful A-round investment. According to Sam Fiorello, the goal is to provide specialized equipment and expertise that can “make an early stage company that’s raised less than \$1 million dollars look more like an A round or B round company.” The Danforth Center has invested in tens of millions of dollars worth of specialized equipment and facilities like research-grade greenhouses, microscopy equipment, and powerful computers for bioinformatics. Crucially, there are also experts that run the equipment, available on a fee-for-service, just-in-time basis, so firms can easily scale up their space, engage with experts, and establish proof of concept. Access to inexpensive space and equipment is even more important given that, as described above, startups are increasingly expected to carry technologies further before being acquired or receiving investments.

Other organizations have stepped in over time to add additional space to meet demand. In 2012, the St. Louis Economic Development Partnership opened the Helix Center Biotech Incubator to fill a gap between the Danforth Center and the post-incubator space at BRDG Park. With close proximity to BRDG park, it offers similar amenities, but as a nonprofit, its focus is on “offering critical cash savings” to earlier stage firms, according to Ginger Imster of the Economic Development Partnership. It was fully occupied with 24 tenants within two years of opening. BioGenerator operates an 18,000-square-foot wet lab space in the Cortex district (occupied by 50 entities both established companies and university researchers exploring startup opportunities) and is partnering with the Economic Development Partnership to pilot a similar agtech focused space at the Helix Center.

These assets are now being physically tied together by 39 North (named for the 39th parallel that connects the world’s most fertile agriculture lands), a planned 600-acre district that will function as the plant sciences parallel to Cortex. This effort will link Monsanto, the Danforth Center, BRDG Park, and the Helix Center together and create a dense, walkable area, in part by redesigning a highway interchange and adding parks and connections to a regional trail

system. The long-term vision involves adding 400 residential units in addition to lab, office, and retail space.

Talent: Ph.D. scientists and post-doctoral researchers are the core of the agtech cluster, but scientists with advanced degrees account for only a small share of overall jobs in the cluster. The industry also relies heavily on a range of other skills, from lab technicians to regulatory experts, economists, and experienced CEOs. And workforce demands are constantly shifting. Monsanto, for instance, is increasingly defining itself as a data science company. In response, the region is building a talent development system around the industry that addresses the full range of in-demand skills.

Programs aimed at middle-skill workers are perhaps the most unique. BRDG Park brought St. Louis Community College in as one of its first tenants to offers an on-site biotechnician training program that provides two-year post-high school graduate certificate degrees, as well as a one-year certificate for four-year undergraduate science majors that lack technical experience running lab experiments. It is one of the only research parks in the country to have an on-site biotech workforce training program.

The region is now working to ensure that it offers programs that keep up with the evolving needs of the industry. According to Sam Fiorello, “In addition to being able to pipette, you need to understand data analytics, but that offering has been lagging.” In response, BRDG Park partnered with Saint Louis University to create a five-year masters in bioinformatics program that focuses primarily on statistics and computer science and secondarily on biology.

Other talent-related programs respond to other gaps in the talent supply chain:

- ▶ Experienced “serial entrepreneurs” are in short supply in the region, which inhibits startup growth and contributes to the region’s shortage of venture capital, according to Donn Rubin. BioGenerator’s

executive-in-residence program tries to leverage the executive talent that does exist in the region. It grew from one to 13 participating executives from 2011 to 2013.

- ▶ Through an NSF-funded program at the Danforth Center, about 15 first-year graduate students from local universities do short “rotation” projects through different labs to learn about plant sciences research opportunities. 40 percent have gone on to pursue plant sciences careers.
- ▶ 39 North is motivated in part by a desire to retain talent, given preferences, especially among recent college graduates, for an urban, amenity-rich working environment.

Networks: Inherent in the concept of a cluster are robust linkages between researchers, firms (both large and small), funders, and talent. In the strongest clusters, these linkages go beyond the region—for example, funders and talent know the cluster and are drawn to it. Rarely does either form of linkage emerge organically—they require some intervention by industry groups or EDOs.

The primary vehicles for network building are the annual Ag Innovation Showcase—a joint effort of the Danforth Center, BRDG Park, and the Larta Institute that began in 2009—and the annual InfoAg Conference. The three-day Ag Innovation Showcase “brings together innovators, researchers, government agencies, corporations, investors and others to promote investment in cutting-edge technology to meet the world’s growing food supply needs.” According to Sam Fiorello, “It helps to put us in the center of the global network, and burnish the brand we’re trying to create.” It is designed to be somewhat smaller (about 300 attendees) than other major conferences, like BIO, to enable more targeted networking. One primary goal is to make the event a “first touchpoint” with agtech firms from outside the region. An equally important goal is to bring St. Louis to the attention of funders. It includes a juried business plan competition in which 15 to 20 entrepreneurs (out of an applicant pool of 80 or more) present to venture capital firms. The InfoAg Conference, which has been held in St. Louis since

2014, brings together 1,300 attendees with a focus on precision agriculture.

Other entrepreneurship groups are building networks between the agtech cluster and the region’s other tech industries. ITEN, founded in 2008 to be the hub of the region’s tech ecosystem, launched a corporate engagement program in 2015 that includes “reverse pitches,” in which the corporations pitch their ideas and needs to startups. Monsanto was among the first five corporate partners in the program.

Global investment: The region’s efforts to attract additional investment into the cluster in the form of foreign firms are motivated in part by the desire to grow the cluster more quickly and in different ways than entrepreneurship can—but also because firms currently in the cluster welcome the additional investment. The region’s large firms want St. Louis to be known as a global center for agtech, primarily because it makes it easier to attract talent. This is evident in the story of KWS, a German seed company (the third or fourth largest globally). Monsanto actively helped the region with its efforts to attract the firm’s American R&D center (its first U.S. investment, expected to create 75 jobs). Ultimately St. Louis won out over Research Triangle and the Bay Area, but only after state and local leaders made extraordinary efforts to convince the firm that St. Louis had an ecosystem that extended beyond the Danforth Center and Monsanto. (KWS also received \$2 million in incentives, mostly from the state.)

The attraction of KWS was one of the first major success stories of the region’s agtech FDI attraction efforts. Now, those efforts have been formalized as a collaboration of the Economic Development Partnership, BioSTL’s GlobalSTL program, the St. Louis Regional Chamber, and the Missouri Partnership. (The region’s reliance on agtech as a key global differentiator is formally captured in the region’s FDI plan produced as part of the Global Cities Initiative with the Brookings Institution.) In addition to strategically reacting to opportunities like KWS, the region’s FDI efforts have focused on attracting investment from Israeli startups and bringing an agtech focus to its trade missions.

ORGANIZATIONAL STRUCTURE

Overall, the cluster effort is fairly unstructured, highly collaborative, and responsive to industry needs. BioSTL, which was formerly named the Coalition for Plant and Life Sciences, continues to convene that coalition of approximately 50 leaders on a quarterly basis. This serves as the primary venue for setting the strategic vision of the cluster and fosters the “collaborative, trustful environment” that, according to Donn Rubin, distinguishes the cluster and reduces the need for a highly formalized, hierarchical structure. He explains, “we can do in a phone call what it takes other people 6 months to do,

because everyone shares the same vision if there’s a federal grant opportunity, we can call the leaders of all universities and they don’t need a bunch of meetings to get on board.” Though the composition of the coalition has remained stable over its 17 years, there have been a few important changes. Originally an entirely private sector group, it now includes several public sector representatives, including the mayor and other local government representatives. It has also shifted from primarily involving CEOs to including more VP-level staff of key companies.



A key component of the effort's structure is that the organizations at its core BioSTL and Danforth are very close to researchers and firms. They set the direction and the priorities for the cluster based on their knowledge of industry dynamics. According to Donn Rubin, "One thing that distinguishes BioSTL and that's been key to our success is that people on our team come from industry they have corporate and entrepreneurial experience."

With these industry-oriented organizations taking the lead on reinforcing the importance of the cluster to the regional economy and advocating for its specific needs, EDOs have been able to step in and ensure that their broader set of economic development services are deployed in support of the cluster. The St. Louis Economic Development Partnership has, for example, filled critical gaps in terms of long-term

planning (39 North), early-stage funding (Helix fund), nonprofit facilities (Helix Center), and FDI attraction (leading trade missions in which the presence of government representatives can be critical). The Economic Development Partnership also plays a lead role in cultivating growth across a range of industries that are relevant to agtech (i.e., the tech industry overall) but fall outside the purview of groups like BioSTL and Danforth.

The Missouri Technology Corporation, the state's innovation entity, has been an important supporter, providing funding for greenhouses at the Danforth Center as well as incentives for company recruitment. However, its ongoing role may be limited: Its funding is an annual appropriation, and in the current administration has dropped to \$4 million from \$25 million under the previous governor.

IMPLEMENTATION AND PROGRESS

The implementation of the agtech cluster effort is distinguished by the fact that the region took a broad approach from the very beginning, with parallel strategies focused on every major area of need: capital, talent, facilities, and networks. As Eric Gulve of BioGenerator says, “You can’t build anything quickly, and it didn’t all get executed brilliantly right away,” but the region has nevertheless made significant progress on each front over the past 15 years, in large part because it had “comprehensive approach and patient support including philanthropic capital.”

Capital: In total, BioGenerator has invested \$19 million in 73 firms to date. Agtech makes up 20 percent of its portfolio (most of its agtech investments have occurred in the last five years). Around 2011, when BioGenerator had developed a portfolio of 25 to 30 successful companies, its momentum encouraged other organizations to join in. The St. Louis Economic Development Partnership became another key source of capital in 2010 with the creation of its \$3 million Helix Fund (funded with St. Louis County Port Authority revenue) that co-invests with BioGenerator and other local funds. It makes mostly early-stage investments of \$50,000 on average, but also up to \$250,000. Arch Grants, a nonprofit, has also given \$50,000 equity-free grants to six agtech companies.

There has also been progress on the private side. Several former agtech executives partnered with Cultivation Capital, a local venture capital firm, in 2014 to create Yield Lab, an accelerator that invests \$100,000 in early-stage agtech firms and offers a nine-month curriculum. It now has 17 portfolio companies that have raised over \$50 million in equity funding. TechAccel, a Kansas City-based venture capital firm, partnered with the Danforth Center in 2016 to offer its researchers \$250,000 proof-of-concept and commercial feasibility grants (TechAccel and Danforth Center will share the returns). Another firm, Lewis & Clark ventures, has a \$25 million agtech fund.

Facilities: The region’s agtech facilities and equipment continue to be heavily used, and numerous expansions have recently been completed or are ongoing. The Helix Center opened in 2012 and is fully occupied with 24 firms. Despite being some of the most expensive real estate in the county (rents are not subsidized), BRDG Park is at 92 percent capacity with 15 companies seven of which came from outside the region that employ 250 people. The Danforth Center opened a \$45 million, 80,000-square-foot expansion in 2016. The 39 North innovation district master plan was completed in 2016 and has attracted more than \$6 million for infrastructure improvements, programming, and marketing.



Talent: St. Louis Community College's plant science technician program has a 95 percent placement rate. Besides serving the needs of firms for skilled workers, the program helps to build bridges into good middle-class jobs, according to the Danforth Center's Karla Roeber, by enabling "young people from disadvantaged communities in north St. Louis to come out making \$45,000 per year or more with a two-year associates degree." Going forward, more data science programs will be a priority, with goals to create a two-year analog to the new five-year bioinformatics program at Saint Louis University.

Foreign investment: The region's agtech-related FDI efforts had, until recently, focused largely on Israel. These efforts bore fruit in the form of five small Israeli firms moving to the region in the past several years. JP Morgan

awarded the World Trade Center St. Louis (part of the Economic Development Partnership) a \$100,000 grant to support its FDI efforts in St. Louis. The U.S. Commercial Service, the federal government's lead trade promotion agency, is opening an office in the Helix Center in 2018.

Federal grants: The region has been highly successful in winning a series of competitive federal grants to support all of the above work. In 2010, a group of regional partners won a \$1 million EDA i6 challenge grant. In 2011, the region won a \$1.8 million Jobs and Innovation Accelerator Challenge grant. In 2014, BioSTL won another EDA i6 grant. In 2016, the region won a \$500,000 EDA grant through the EDA's Regional Innovation Strategies program to support 39 North master planning (St. Louis was one of 12 recipients). And in 2017, BioSTL won yet another RIS grant for \$300,000.

CONCLUSION

There are two key characteristics that differentiate the agtech cluster effort in St. Louis. One is that much of the work is being done by organizations that have considerable industry expertise. According to Eric Gulve of BioGenerator, “A lot of regions approach cluster development with great intentions but little industry expertise, technical expertise, business expertise, or investor expertise—we’ve been able to focus on the most important question, which is how to build strong companies.” The second key characteristic is the region’s persistent, patient, long-term commitment to building the cluster. The industry has, to varying degrees, been a focus in the region for nearly 20 years. This is despite the fact that the industry as a whole has not posted major job growth numbers

to which economic development organizations are typically attracted. And perhaps even more impressively, the region’s leaders recognize that the work is only beginning. Sam Fiorello of the Danforth Center underscores this point: “For at least twenty years, any science-based cluster effort is going to have to be subsidized by community leaders you just absolutely have to have patient, civic-minded money. Eventually the industry will survive on its own, but we’re not there yet.” With the Danforth Foundation having closed its doors in 2011, and the federal commitment to local economic development in question, a key challenge for the region going forward will be tapping into new sources of funding to help the cluster realize its potential.



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