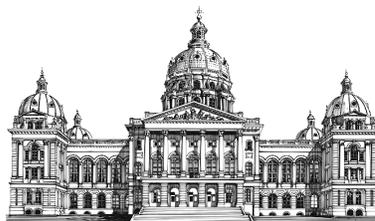

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Battelle Institute Report on Iowa's Bioeconomy

ISSUE

The Iowa Department of Economic Development recently paid the Battelle Memorial Institute \$230,000 to conduct a study to determine Iowa's core bioscience competencies and to produce a formal strategy and roadmap to drive bioscience growth in the State.

This **Issue Review** summarizes the findings and recommendations of the Battelle report.

BACKGROUND

The Battelle Memorial Institute has issued two reports that are referenced in this **Issue Review**. The first is related to bioscience activity in all 50 states and is titled "State Bioscience Initiatives 2004." The second report, most commonly referred to in this **Issue Review**, is the one commissioned by the Iowa Department of Economic Development that relates solely to Iowa and is titled "The State of Iowa Biosciences Path for Development: Economic and Core Competency Analyses."

Iowa Evaluation and Comparison to Other States

According to the Battelle Report on Iowa activity, in calendar year 2002, Iowa had 1,856 bioscience establishments that employed approximately 83,000 Iowans at an average annual salary of approximately \$39,000. The Report details Iowa's strengths according to the length of time it will take for various platforms to result in significant research and development, a strong business base, and bioscience economy. Iowa's near-term strengths include:

- Bioeconomy Platform – Using plant and animal biomass and waste streams to generate chemicals, energy, fuels, and materials for industrial and commercial applications.
- Integrated Drug Discovery, Development, Piloting, and Production Platform – Using biomedical research, drug development, and production expertise to create a pipeline of new drugs.
- Advanced Food Products Platform – Using Iowa's established strengths in plant and animal sciences, production agriculture, food sciences, nutrition, and processing technology to develop and produce functional foods and nutraceuticals.
- Integrated Post Genomic Medicine Platform – Using Iowa's genomics expertise in specific diseases and disorders to produce advances in medicine.

- Animal Systems Platform – Using bioscience expertise to establish a leadership position in the modeling of animal systems and in the development of technologies and applications for transgenic animals, chimeric animals, and cloning.
- Integrated Biosecurity Platform – Using strengths in human, animal and plant disease prevention, detection, and treatment to establish an integrated approach to securing the environment, food production systems, human health and safety.

Obstacles to Developing a Strong Bioscience Economy in Iowa

Some obstacles detailed in the Report include:

- Unequal attention to the three areas of bioscience; human, animal, and plant sciences.
- Unequal structuring at the Regents universities in the development of biosciences and commercialization of research. According to Battelle, all the universities must be structured in a manner that helps facilitate commercialization of research.
- State bioscience funding and payment to retain and attract faculty and scientists.
- Bioscience Entrepreneurship – According to Battelle, faculty at the Regents universities are confused about their role and the expectations regarding commercializing research and running their own companies. A team of commercialization experts is needed to relieve the faculty of commercializing their own research and then running their own business.
- Battelle suggests Iowa needs to build a stronger commercial base to commercialize research conducted at the universities.

Recommendations

Recommendations in the Report include, but are not limited to:

Immediate Action

- Leverage alumni associations and the State's Human Resource Recruitment Consortium using existing resources.
- Market Iowa's bioscience image and brand using existing funds.
- Lobby Congress for increased federal funding.
- Increase funding to the Regents universities for commercialization of research.
- Create an Economic Development Director position at the Board of Regents to encourage faculty entrepreneurship and commercialization.
- Create an industry-university matching grant program.
- Create a commercialization Intermediary Organization that directly reports to the Iowa Bioscience Alliance.

Short-Term Action

- Create an Iowa Bioscience Alliance staffed and funded by the Department of Economic Development to help bridge the gap between academia and industry.
- Endow research positions.
- Create a Bioscience Advocate Position.

Budget Impact

In total, the Battelle recommendations require an investment of approximately \$301.5 million over a 10-year period. The Report recommends the State bond for \$169.7 million and provide General Fund support in the amount of \$131.8 million over 10 years. In doing so, according to Battelle's projections, the State will leverage \$1.5 billion in federal, private, and other funding sources. Battelle projects that the total funding will result in an increase of 16,000 jobs over 10 years, with total sales in year 10 of around \$1.4 billion.

Iowa Compared to Surrounding/Competing States

The Battelle report titled "State Bioscience Initiatives 2004" divides the bioscience industry into five categories; Agricultural Feedstock and Chemicals, Drugs and Pharmaceuticals, Medical Devices and Equipment, Research and Testing, and Academic Health Centers, Research Hospitals, and Research Institutes. The Report indicates that Iowa's strength lies in the Agricultural Feedstock and Chemicals category.

The Agricultural Feedstock and Chemicals category includes firms that seek industrial applications geared toward production agriculture, energy, industrial commodities, and specialty health products. Along with Iowa, 20 other states, mainly in the Midwest and the South, specialize in Agricultural Feedstock and Chemicals. The only Midwest states not specializing in this area are Minnesota and Wisconsin, whose strengths are in Medical Devices and Equipment. The table below provides a comparison of some surrounding/competing states using 2002 data.

State	University Bioscience R&D Expenditure per Capita	Employment in Ag. Feedstock & Chemicals (% of U.S.)	Total Bioscience Employment in four categories* (% of U.S.)	Higher Ed. Degrees in Bioscience	Total State Patents Issued FY 2002
Tennessee	\$54.37	11,301 (7.2%)	22,053 (2.5%)	1,879	1,003
North Carolina	\$111.85	10,323 (6.6%)	39,918 (4.5%)	3,544	2,140
Illinois	\$66.74	10,357 (6.6%)	52,456 (5.9%)	4,184	3,934
South Carolina	\$53.13	9,304 (5.9%)	15,394 (1.7%)	1,764	709
Virginia	\$50.62	8,969 (5.7%)	15,722 (1.8%)	2,753	1,299
Iowa	\$111.25	7,813 (5.0%)	11,957 (1.3%)	1,432	681
Missouri	\$100.84	4,741 (3.0%)	15,115 (1.7%)	2,227	963
Nebraska	\$101.18	1,900 (1.2%)	8,142 (0.9%)	891	248
South Dakota	\$27.62	679 (0.4%)	2,137 (0.2%)	501	90

*Numbers reflect data in Ag Feedstock and Chemicals, Drugs and Pharmaceuticals, Medical Devices and Equipment, Research and Testing.

Data Source: "State Bioscience Initiatives 2004" and LSA Factbook.

Unique Initiatives Pursued by Other States

Tennessee has a faculty endowment, the Chairs of Excellence Program, that supports 19 bioscience-related Chairs. The State is also working to develop regional clusters of biotechnology companies.

North Carolina has an intermediary called the North Carolina Biotechnology Center. The group is a public/private strategic planning board with a strategic plan focused mainly on recruitment and expansion of biomanufacturing operations, and start-up of biotechnology companies through commercialization of university research. The State also provides faculty recruitment grants of up to \$150,000, recently created the Life Science Revenue Bond Authority to finance biomanufacturing and laboratories, and has a public/private fund, North Carolina Bioscience Investment Fund, established with a \$10.0 million State appropriation that leveraged private funds.

Illinois has established Illinois Ventures LLC; a wholly owned commercialization company funded with special State and institutional funds and governed by a board whose majority is active venture capitalists. Staff members work with campus technology transfer officers, faculty inventors, and outside entrepreneurs to create start-up companies authorized to license university intellectual property. The State also allows a portion of employee pension funds to be allocated for venture capital investments.

South Carolina provides faculty recruitment awards and has established the South Carolina Biotechnology Incubation Program. The Program has focused on creating additional wet-lab space and attracting venture capital. In 2004, the State enacted the Life Sciences Act, providing research institutions with \$250.0 million in borrowing authority, creating a fund of funds backed by tax credits, and expanding industrial incentives to encompass biomanufacturing facilities.

Virginia provides an angel investor tax credit of 50.0% up to \$50,000 for individuals that invest in technology companies. Virginia also recently established a biotechnology commercialization loan fund to help universities commercialize their research. The maximum aggregate tax credits awarded is \$5.0 million.

Missouri has established the Research Alliance Missouri to attract research funding to Missouri and expedite the commercialization of research. A private, nonprofit corporation, the Missouri Technology Corporation, recently received an allocation from the State and hired a full-time executive director to help link universities and industry, create and manage a better system for commercialization of research, and increase research funding for the State universities. State funds and private donations are combined to form the Missouri State-matched Endowed Chairs and Professorship Program in which 19 of the endowed chairs are in the bioscience area. The Program receives an annual State appropriation of \$4.0 million.

Nebraska – The University of Nebraska Medical Center has a for-profit commercialization subsidiary called UneMed to handle licensing and assist in forming spin-off ventures.

South Dakota recently created a Research Office to serve as a liaison between researchers and companies, and plans to restructure Intellectual Property policies.

CONCLUSION

Many states are actively developing their bioscience industry. According to Battelle, in 2004, 19 states reported they are pursuing a bioscience strategy, with another nine reporting they are implementing technology strategic plans that would include a focus on bioscience. In addition, some states are implementing plans at the regional level rather than the state level, and some are targeting biosciences without a written plan. A total of 40 states are currently focusing on developing the bioscience industry. Considering the number of states competing in this area, and the time and resources needed to develop a strong bioscience economy, if Iowa decides to implement a strategy, literature suggests it is important that the strategy focus on a few specific strengths to utilize Iowa resources in the most efficient and effective manner possible.

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Battelle Institute Report on Iowa's Bioeconomy
<http://www.staffweb.legis.state.ia.us/lfb/ireview/ireview.htm>
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ATTACHMENT A

Iowa's Bioscience Activity Summary

Program	Description	Largest Funding Sources	Total FY 2004 Funding
University of Iowa (SU)			
Oakdale Research Park	The 189-acre Research Park leases building and laboratory space. Major tenants include:	General Fund, other income	\$593,000
	Center for Biocatalysis Bioprocessing A total of 60 faculty members and 300 researchers work with the Center in biotechnology-related academic and industrial research development, training, and technology transfer. The Center also provides fermentation purification services.	Federal funds, General Fund, sales and services	\$2.7 million
	Center for Advanced Drug Development Provides pharmaceutical research for industries.	Sales and service, General Fund	\$1.6 million
	Oakdale Medical Research A laboratory of the UI College of Medicine with established basic science programs, including cellular and molecular biology and cell physiology.	The National Institutes of Health	\$4.5 million
John PappaJohn Centers	Provides business assistance and education to Iowa entrepreneurs and small companies. There are five Centers across State	Private gifts	\$1.5 million
Iowa State University (ISU)			
Center for Crops Utilization Research	Provides services to industry including: <ul style="list-style-type: none"> • equipment rental, • technical assistance with equipment usage, • cooperative research contracts and proprietary agreements. • pilot plants to test new products and processes • analysis of products and processes. 	Federal Funds, sales & services	\$1.1 million
ISU Research Park	<ul style="list-style-type: none"> • 230-acre Research Park • 42 companies and university centers (over half of the tenants are bioscience-related) • employs more than 800 people. Tenants include:	General Fund	\$158,000
	Iowa State Innovation Systems (ISIS) <ul style="list-style-type: none"> • Technology incubator that identifies technology-based concepts and businesses at early stage development and provides an environment for their growth. • Affiliated with the incubator, is a multi-tenant building with an 8,000 square-foot wet lab. 	General Fund, sales and services	\$328,000
	John PappaJohn Centers - Provides business assistance and education to Iowa entrepreneurs and small companies. There are five Centers across State	Private gifts	\$1.5 million
	Small Business Development Centers - Provides small business counseling and training	General Fund, federal funds	\$1.5 million.
Institute for Physical Research and Technology	Assists Iowa companies in solving technical problems, creating new products, increasing productivity and quality, and launching start-up companies. The Institute also administers the Technology Commercialization Acceleration Program.	General Fund, federal funds	\$4.6 million.
	Technology Commercialization Acceleration Program The Program's goal is to increase technology transfer and to create and expand 15 start-up companies in three years.	Non-federal grants and contracts.	\$168,000
Roy J. Carver Co-Laboratory Business Incubator	Centerpiece of the Plant Science Institute's biotechnology efforts. The Innovations Development Facility, a new entity to promote economic development, will enable ISU faculty, staff, and students to commercialize their research, and start new companies in the incubator.	General Fund	\$53,000
BIOWA Development Association	Nonprofit organization governed by a nine-member board of directors with representation from various segments of industry to support and promote the growth and development of Iowa's Bioeconomy.	Non-federal grants and contracts.	\$154,000

Program	Description	Largest Funding Sources	Total FY 2004 Funding
University of Northern Iowa (UNI)			
Ag-based Industrial Lubricants Program (ABIL)	Conducts research and testing, assists in developing soy products, and works to commercialize technology through the introduction of new products in the marketplace.	Federal funds	\$1.7 million
John PappaJohn Centers	Provides business assistance and education to Iowa entrepreneurs and small companies. There are five Centers across State	Private gifts	\$1.5 million
Department of Economic Development			
Advanced Research & Commercialization Program	Provides financial assistance to established Iowa businesses with research projects that involve value-added agriculture, advanced technology, or biotechnology and: <ul style="list-style-type: none"> • Are close to commercialization. • Will advance the State's technological expertise. • Provide high wage jobs. 	Rebuild Iowa Infrastructure Fund (RIIF) appropriation carry-forward	\$1.1 million
University-Based Research Utilization Program	Provides tax credits for university employees and the universities for each technology that is commercialized.	Tax credits	N/A
Value-Added Agricultural Products and Processes Financial Assistance Program (VAAPFAP)	Provides financial assistance for the development of new agri-products and processing technologies. Many VAAPFAP projects are biotechnology-based.	Loan Repayments	\$800,000
Venture Capital Component of the Community Economic Betterment Account Program (CEBA)	Provides equity-like investment to early-stage, start-up companies or existing businesses developing new products or technologies. The companies are then allowed a longer performance period.	Loan repayments	\$3.0 million (entire CEBA program)
Entrepreneurial Venture Assistance (EVA)	Provides financial assistance to early stage technology companies that meet certain criteria and have participated or are participating in training from a John Pappajohn Center.	Loan repayments	N/A
Federal Economic Stimulus and Jobs Holding Fund	Provided direct assistance to Bioscience-related companies, including Trans Ova Genetics (\$9.0 million), Integrated DNA Technologies (\$5.0 million), New Link Genetics (\$6.0 million), Phytodyne (\$3.5 million), and Fort Dodge Animal Health (\$3.5 million). The Fund also provided financial assistance to the Regents Universities (SUI - \$4.0 million; ISU - \$4.0 million; UNI - \$2.0 million) for the following: <ul style="list-style-type: none"> • Multi-use goods manufacturing processes approved by the FDA. • Protein purification facilities for plant, animal, and chemical manufactured proteins. • Crop and animal livestock facilities for growing transgenic crops and livestock. • Advanced Laboratory Space. 	Federal Funds	\$37.0 million (bioscience-related funds)
Iowa Capital Investment Corporation (ICIC), Iowa Capital Investment Board, and the Fund of Funds	Private, nonprofit corporation created to encourage private capital investment in Iowa and manage the Fund of Funds. The Fund of Funds, a private for-profit limited partnership will invest in private venture capital funds that consider equity investments in Iowa businesses and maintain a physical presence in Iowa. Investments are partially guaranteed by contingent tax credits. Investors receive tax credits if the rate of return on the Fund of Funds is below a certain specified level. The Iowa Capital Investment Board will determine criteria for awarding tax credits to investors and will assist in identifying tax credits available to promote private venture capital investments in Iowa.	Contingent tax credits	\$100.0 million
Iowa Agricultural Finance Corporation	Established with a \$25.0 million interest-free loan from the State, the Corporation invests in Iowa-based, value-added agricultural businesses, as well as biotechnology businesses.	State loan and private capital	\$34.8 million