

EXECUTIVE SUMMARY

IMPACT & INNOVATION:

Agbioscience in the Southern United States

The Importance of the Southern Region's Land-grant Extension Service and Experiment Station System

Performed For:

Southern Association of Agricultural Experiment Station Directors
and the Association of Southern Regional Extension Directors

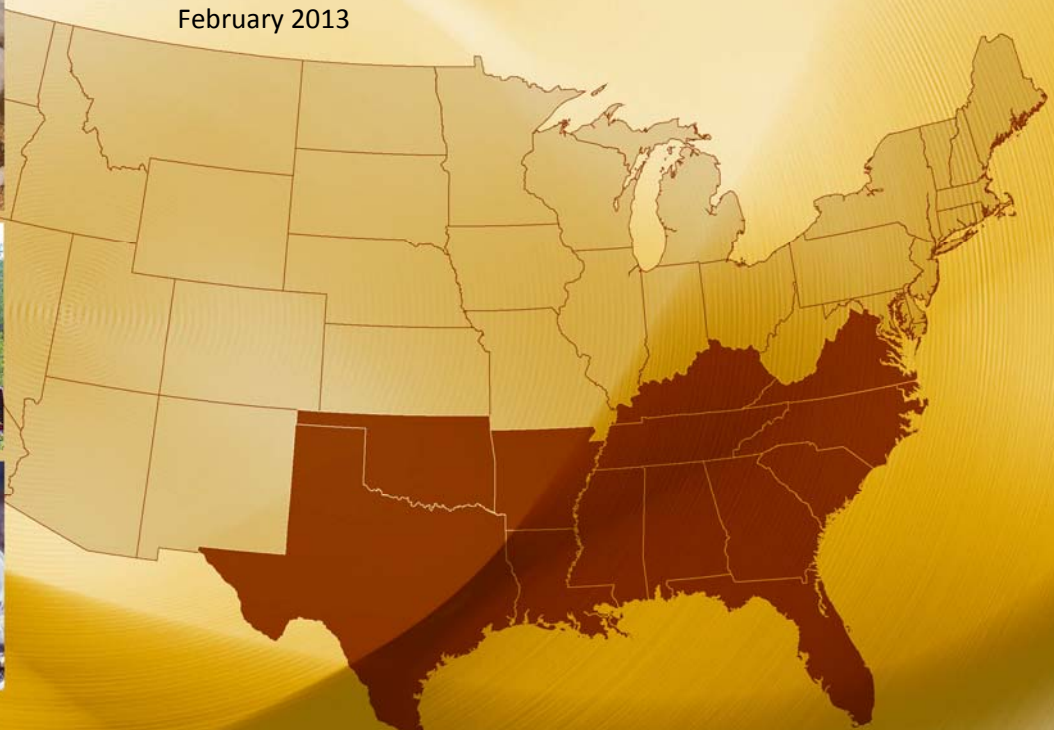
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EXECUTIVE SUMMARY

An Ideal Industry

There is an industry in this nation that is often overlooked or taken for granted. It is an industry that was foundational in the birth and growth of the United States but is just as relevant today as it has ever been. It is an industry poised for growth on the back of scientific and technological advancements that provide powerful new tools for innovation and new product development. It is an industry that uses domestic, renewable resources to produce products that are valued throughout the world, and it is an industry providing jobs and income in almost every county in the U.S. It is in many respects an ideal industry—agbiosciences.

What do we mean when we use the term “agbiosciences?” Battelle considers agbiosciences to encompass a broad continuum of activity in the development, production and value-added use of plant and animal organisms for food, health, fuel and industrial applications. As used in this report, it is a holistic term encompassing a complex chain of activity from scientific inquiry and associated R&D through to the tangible production of technologies and inputs used in production, primary agricultural, aquacultural, and forestry production itself, and the downstream processing of agriculture, aquaculture, and forest outputs into useful technologies and products. Furthermore, the agbioscience industry is supported and driven by strong communities and resilient youth and families that help to sustain this complex system.

The 21st Century has been called the “BioCentury”, a century in which rapid advancement of scientific understanding of fundamental life processes and life systems is being combined with new technological tools to generate exciting new innovations. Much attention has been paid to medical advancements stemming from modern biological sciences, but the tools and technologies of the life scientist are no less powerful in advancing plant science, animal science, and agricultural sciences. Indeed, modern agbiosciences represent perhaps the most promising arena of translational science for addressing many of the most pressing challenges facing humanity—*food security, human health, economic growth, and environmental sustainability.*

Agbiosciences provide a pathway to a sustainable global and domestic economic future. The sector produces products with assured demand, and those nations and regions that have the specialized skills, assets, knowledge and scientific

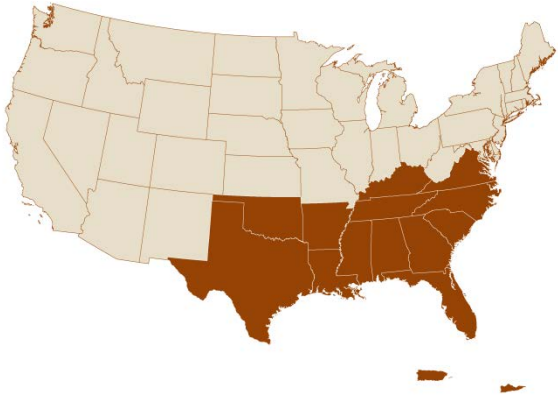
infrastructure required to produce agbioscience innovations will be particularly well positioned to realize economic growth and development from a wide range of industries.

In the United States, our future economic success is very much tied to our ability to innovate—to leverage our long-standing commitment to science and scientific advancement to produce new technologies and innovations that enhance the productivity of industry and provide new and improved products valued in the global market. Agbiosciences is one of the U.S. sectors that best leverages national science and technology assets—while at the same time leveraging the nation’s large land-mass and highly productive farms, forests and fisheries to produce food, feed, fiber, fuels, chemicals and other commodities and specialty products that are in high global demand.

The U.S. Agbioscience System: Global Leadership

The United States is the global Research & Development (R&D) and production leader in agbiosciences, and as opportunities expand for economic development built upon agbioscience platforms, the U.S. enjoys a position of considerable strength. U.S. companies, government research laboratories, and universities (especially Land-grant Universities) are recognized as global leaders in advancing agbioscience knowledge and application. An American R&D ecosystem of private, public and non-profit R&D assets positions the nation well for continued innovation in new agbioscience arenas, in areas as diverse as: advanced nutrition and functional food products; plant transformation for increased crop yields and improved functional characteristics; development of diagnostic and therapeutic products to sustain livestock agriculture and assure biosecurity; molecular-assisted breeding of improved livestock, and development of alternative biofuels, green chemicals and sustainable industrial products. In addition, significant research and extension work at Land-grant Universities is focused on maintaining and sustaining rural economies, community support systems, government capacity, leadership skills, strong families and 4-H Youth Development to help ensure the long-term viability of the economic and social systems that support agbioscience progress.

Within the United States, the Southern Region¹ is a particularly important agbioscience region with considerable diversity in its agronomic, forestry and fisheries production profile—plus a broad range of assets to further build upon.



It is also a region containing major agbioscience R&D enterprises and associated institutions. These include, for example, major Land-grant Universities in each state, plus Puerto Rico and the U.S. Virgin Islands and their Cooperative Extension Service (CES) and Agricultural Experiment Station (AES) System, herein referred to as the Extension Service and Experiment Station System, as well as R&D operations of agbioscience corporations, and major federal government laboratories with directly relevant R&D initiatives.

The Land-grant University System is of particular importance because of its presence in every state, extension coverage to every county, and dedicated research stations providing specialized coverage in diverse agronomic sub-regions. The Extension Service and Experiment Station System undertakes fundamental and applied research leading to innovation in agbioscience, and the system provides the testing, piloting and scale-up infrastructure and expertise to propel new innovations and technologies to market reality. The Extension Service and Experiment Station System also provides key support services in R&D, process improvement and the development of solutions to specific problems for industry. These institutions deliver new knowledge, techniques and tools into the field through the programming activities of the System. And, these institutions participate in the education of the scientists, engineers, Extension specialists and other skilled human capital required to sustain leadership in global agbiosciences within the U.S. and the Southern Region.

In our current BioCentury, Land-grant Universities, and their Extension Service and Experiment Station System, are on the frontline of sustaining and securing America’s leadership and competitiveness in what is, and will be, a sector of core strategic importance for the nation. As this report shows, sustaining these institutions, further investing in them, and addressing their challenges is of central importance to the economic and social fabric of the nation and the Southern Region.

¹ The Southern region includes 13 states and two U.S. territories, including: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, Puerto Rico, and the U.S. Virgin Islands.

Agbioscience in the Southern Region

As noted above, the Southern Region is a notable hub for agriculture, agbioscience R&D and associated educational activity. Agriculture production is a major industry across the Southern Region, contributing over \$107 billion to the Southern Region's economy. In a number of commodities the region holds a preeminent position—for example, the region accounts for approximately 80 percent of the nation's broilers and cotton (statistics that are particularly telling given that the U.S. is considered a global leader in the production of both broilers and cotton). In addition, the region accounts for 40 percent of the nation's egg production, 34 percent of the greenhouse/ nursery stock, and 31 percent of the cattle and calves (another area of agricultural production for which the U.S. leads the world).

In 2011, there were nearly 880,000 farms in the Southern Region—representing 40 percent of the nation's total number of farms in a land area that represents 24 percent of the United States. These farms cover nearly 272 million acres (over 50 percent) of the region's total land area.

Agricultural production in the Southern Region also contributed 24 percent of U.S. agricultural exports, or \$28.1 billion, a significant economic benefit to the region and the nation. In multiple major commodity categories, the region is highly important and productive—responsible for 89 percent of U.S. chicken meat exports, 80 percent of cotton exports, 65 percent of rice exports, and 97 percent of the nation's unmanufactured tobacco production.²

The Southern Region is a particularly important contributor to the forestry and forest industry sectors of the U.S. economy. Forty percent of the total land area of the Southern Region is forested, versus just 33 percent in the nation overall. The region contains 215 million acres of forest, of which 204 million acres is categorized by the USDA Forest Service as timber land. In terms of forest inventory, the south is a particularly productive growing environment, accounting for 49.7 percent of the nation's annual timber growth (from just 24 percent of the nation's land area).³ In terms of harvesting, the Region accounted for an even higher percentage of national forest output, accounting for 62.3 percent of the nation's production. Also important to note, that in the Southern Region forest growth exceeds removals, with 13.3 billion cubic feet of growth in 2006, 9.7 billion cubic feet in removals, and just 2.9 billion in mortality. In terms of direct economic output, Battelle's analysis of IMPLAN data show that commercial logging, forest products and timber tract production in the Southern Region totaled \$8.5 billion per year.

² USDA Economic Research Service; USDA Foreign Agricultural Service (Global Agricultural Trade System)

³ USDA Forest Service. Forest Inventory and Analysis. "U.S. Forest Resource Facts and Historical Trends." 2007 data.

With all except four of the regions states and territories having a coastline, commercial fisheries are also an important component of the economic mix. National Oceanic and Atmospheric Administration (NOAA) Fisheries data indicate that the Southern Region had a landed catch of almost 2.4 billion in 2011, worth \$1.2 billion.⁴

The Southern Region's significant level of agricultural output and productivity, together with the discovery and application of new technologies in agbioscience, has fueled the development of agricultural processing and value-added products manufacturing industries in the region. Processing facilities add value to farm products before they leave each state; they also generate substantial local economic impact through direct expenditures and job creation.

In 2011, in addition to the nearly 880,000 farms in the region, the Southern Region contained more than 82,000 companies participating in the value-added agbioscience chain through the provision of products and services such as:

- The manufacturing and supply of agricultural inputs such as seed, fertilizer, insecticides, farm equipment, etc.
- Agriculture, aquaculture, and forestry processing services such as grain milling, oilseed crushing, and lumber milling.
- The value-added manufacturing of food, nutrition and health products.
- The production of industrial products from biomass including fuels, chemicals, materials, paper and textiles.

The Southern Region is a hub for major agbioscience-based companies that are active in R&D and technological innovation, for example:

- Eight of the top 25 U.S. and Canada food processing manufacturers have their HQ operations in the Southern Region (PepsiCo., Tyson Foods, Dean Foods, Smithfield Foods, Pilgrim's Pride, Coca-Cola, Mars, and Dr Pepper Snapple Group).⁵
- Two of the world's preeminent agricultural equipment manufacturers are based in the region (AGCO and Alamo Group).⁶

⁴ NOAA Fisheries: Office of Science and Technology. Fisheries Statistics Division. Online data service, accessed at: <http://www.st.nmfs.noaa.gov/st1/commercial/index.html>

⁵ See <http://www.foodprocessing.com/top100/index.html>

⁶ See <http://www.firstresearch.com/Industry-Research/Agricultural-Machinery-Manufacturing.html>

- Several of the world’s largest agbioscience companies, such as Syngenta, Monsanto, Bayer Crop Science and Dow Agrosiences have major subsidiaries or R&D operations in the Southern Region.
- Four of the top 10 animal health product suppliers have primary operations in the Southern Region (Pfizer Poultry Health Division, Merial, Novartis, and Virbac).

Taken together these farms and value-added industries employed nearly 2.7 million people (approximately 7.5 percent of private sector employment in the region).⁷ This represents a three percent higher level of employment concentration for the regional industry cluster than the nation—a location quotient (LQ) of 1.03.⁸ The agbioscience industry in the Southern Region is also relatively diverse with significant employment across all Battelle measured agbioscience subsectors, and has two regionally specialized industry subsectors: Agricultural Processing (LQ is 1.28); and Primary Production—Unincorporated (LQ is 1.23).

Using the IMPLAN input-output model developed for the Southern Region, Battelle measured the economic impacts of the agricultural, forestry and fisheries production sector in the Southern Region and the production contained in the downstream value-added production activities in food, fiber and biofuel products production sectors.⁹

The Battelle analysis finds that the Southern Region’s agbioscience industry and its associated impacts accounts for a major part of the overall regional economy. As shown in Table ES-1, agriculture, forestry and fisheries underpin \$240 billion in economic activity in the Southern Region and support 2.22 million jobs with labor income totaling \$62 billion. In addition, the value-added downstream processing of agriculture, forestry and fisheries output adds an additional \$1 trillion in economic output across the Southern Region’s economy, and almost 4.6 million jobs with labor income totaling over \$200 billion.

⁷ Based on Battelle analysis of U.S. Bureau of Labor Statistics; QCEW data from IMPLAN; unincorporated farm employment from U.S. Bureau of Economic Analysis

⁸ Location quotients (LQs) are a standard measure of the concentration of a particular industry in a region relative to the nation. The LQ is the share of total state or regional employment in the particular industry divided by the share of total industry employment in the nation. An LQ greater than 1.0 for a particular industry indicates that the region has a greater relative concentration, whereas an LQ less than 1.0 signifies a relative underrepresentation. An LQ greater than 1.20 denotes employment concentration significantly above the national average. In this analysis, regional specializations are defined by LQs of 1.20 or greater.

⁹ It should be noted that the downstream value-added sectors used in this analysis are limited to food and feed products manufacturing, wood products and paper manufacturing, textiles, and biofuels. Not included are biobased products such as chemicals and polymers that may be biobased but are contained within overall economic sectors largely based on petrochemical usage (and for which break-outs of the biobased output are not contained in available data).

Table ES-1: Agbioscience Economic Activity in the Southern Region

	Agriculture, Forestry and Fisheries Production (Direct, Indirect and Induced Impacts Total)	Downstream Value-Added Agbio Manufacturing (Direct, Indirect and Induced Impacts Total)
Total Economic Output	\$240 billion	\$1,000 billion
Total Employment	2.22 million	4.57 million
Total Labor Income	\$62 billion	\$205 billion

Taken together, this active system of agricultural production and advanced value-added manufacturing places the Southern Region among the global leaders in both traditional agricultural economic activity and a leader in emerging areas of the modern bioeconomy.

In the future, the Southern Region is particularly well positioned to advance economically via agbioscience. A set of positive characteristics in terms of agronomic production environments, climate, water resource availability and other land and natural assets create a resilient and flexible production base. These natural and agronomic assets are further supported by a robust infrastructure, with port facilities, railroad and river barge capacity, pipelines and other assets able to support agriculture, forest and fisheries oriented economic growth.

Land-grants and their Extension Service and Experiment Station System: Of Central Importance to Realizing Agbioscience-based Development in the Southern Region

Sustaining the Southern Region’s intensive agriculture industry, and enabling it to be able to compete in the world agricultural economy requires constant innovation, practice improvement, new technology introduction, skills enhancement, and global intelligence—exactly the competitive factors that the Land-grant Extension Service and Experiment Station System was created to enhance, develop, and support. Since the enactment of the Morrill Land-grant Act of 1862, that was enhanced by the Hatch Act of 1887 and the Smith-Lever Act of 1914, the Southern Land-grant Universities have maintained continuous operations of the Extension Service and Experiment Station System dedicated to supporting the agricultural community with research, analysis, information, and advice.

Providing a comprehensive and integrated system of education, research, and knowledge and advanced practice diffusion—the Southern Region’s Land-grant Universities provide the skilled human capital needed by the agbiosciences sector, and advance the basic and applied knowledge base that underpins

agbioscience advancement. Unlike other academic-based disciplines, the agbiosciences at Land-grant Universities are deliberately leveraged for the good of agricultural producers, industry and society through the operations of a purpose-built knowledge dissemination and adoption system. This highly pragmatic system provides science and technology development and transformational education that keep U.S. agriculture, agribusiness and associated business sectors at the forefront of innovation, productivity and competitiveness, which in turn sustains and creates jobs and contributes to a strong regional, national, and global economy.

Through a systematic pipeline of research and education, comprising Experiment Station and Extension Service programs, these institutions are leading the way in agbioscience R&D, in new knowledge dissemination, and in technology dissemination and commercialization of technologies for the agricultural production and processing sectors. Under this system, Land-grant Universities, through the Extension Service and Experiment Station System, conduct basic and applied R&D in the agricultural and agbioscience industries through their laboratories, research farms and testing facilities. From basic science in molecular biology, biochemistry and genetics through to highly applied work in plant breeding, agricultural engineering and biomaterials, this research work is helping to develop new crops, technologies, processes and value-added products for the American agricultural and agbioscience industries.

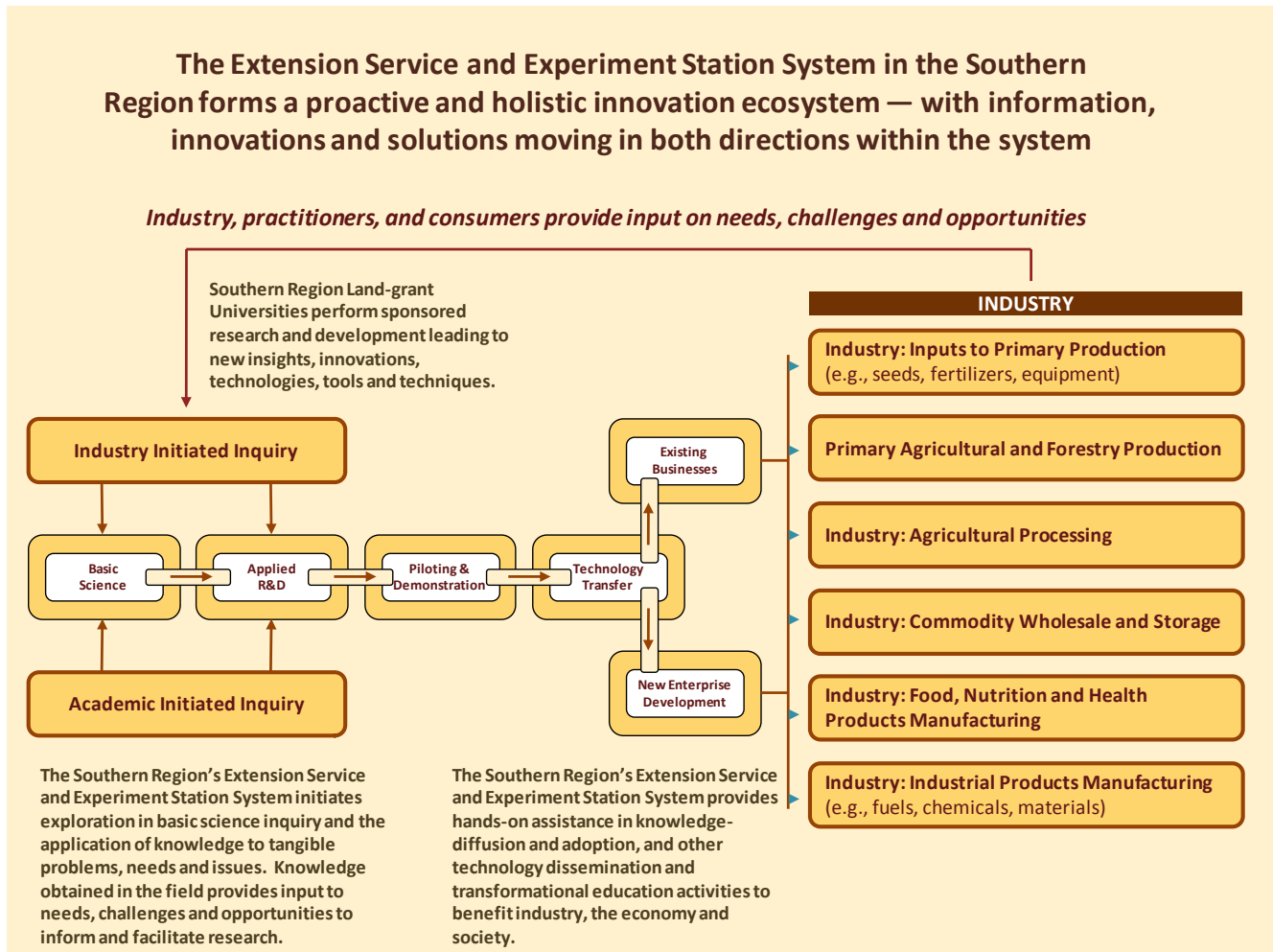
The 1862 Land-Grant

Universities in the Southern

Region include:

- *Auburn University*
- *Clemson University*
- *Louisiana State University*
- *Mississippi State University*
- *North Carolina State University*
- *Oklahoma State University*
- *Texas A&M University*
- *University of Arkansas*
- *University of Florida*
- *University of Georgia*
- *University of Kentucky*
- *University of Puerto Rico*
- *University of Tennessee*
- *University of the Virgin Islands*
- *Virginia Polytechnic Institute & State University*

Figure ES-1: Land-grant Universities and their Extension Service and Experiment Station System – A Unique System for Agbioscience Research, Development, and Innovation Diffusion



Within this Land-grant innovation ecosystem, as Figure ES-1 illustrates, research inquiries in basic and applied sciences (sponsored by federal grants, state support, foundation funding, industry sponsorship and other extramural sources) generate technologies, innovations and practice examples that are tested and piloted through the unique infrastructure contained in several different colleges, associated university departments and the experiment station system. Via licensing, new business formation, knowledge-diffusion, technology dissemination, and the adoption of best practice activities, the Land-grants proactively move innovations, technologies and practice advancements into use within the agbioscience industry value-chain. As a result of this Land-grant system, new products, enhanced products, process improvements and other advancements in agbioscience knowledge and practice are transferred into

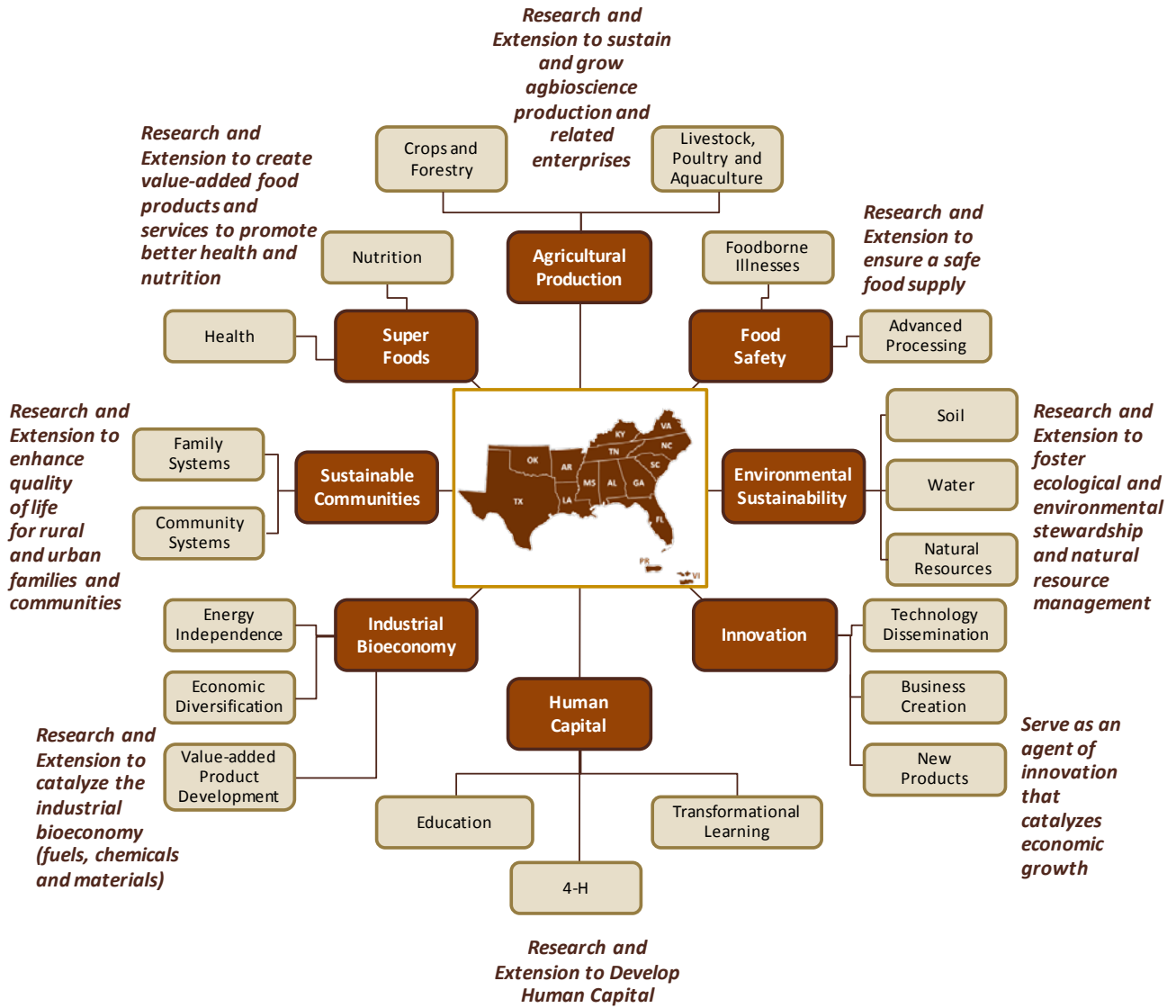
commercial sectors—keeping them competitive and helping to drive U.S. economic growth.

It is important to note that in addition to the significant support received from state and local governments, the Extension Service and Experiment Station System delivers its wide array of programs and activities in partnership with the United States Department of Agriculture (USDA), specifically the National Institute of Food and Agriculture, in addition to other federal programs, such as NOAA’s National Sea Grant College Program, which has significant relevance to the Southern Region’s coastal areas.

Southern Region Extension Service and Experiment Station Impacts

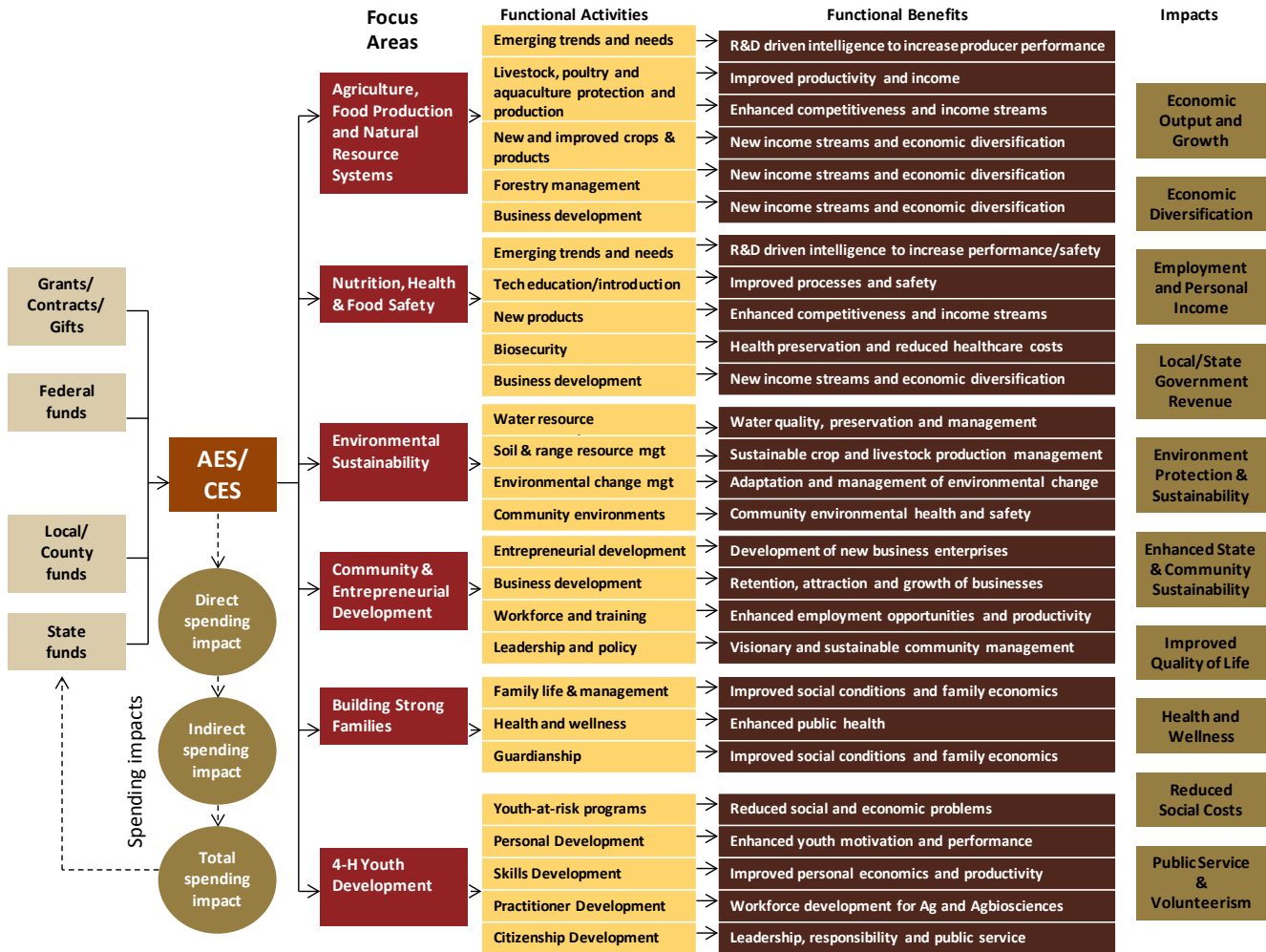
Within the Southern Region, thousands of projects and programs are undertaken annually by the 15 Land-grant Universities, and it would be impossible to illustrate the impacts of each and every one. Figure ES-2 classifies the many core categories of impacts generated by this unique system—illustrating the broad suite of impact categories addressed by the Land-grant Extension Service and Experiment Station System.

Figure ES-2: Core Categories of Functional Research and Extension Impact Areas in Agbiosciences at Southern Land-grant Universities



The operation of the Extension Service and Experiment Station System across the Southern Region provides impacts through the functional research and extension activities of the system, as well as through the expenditures of the system itself. The system exists to produce the types of positive impacts for the Southern Region illustrated in Figure ES-3.

Figure ES-3: Scope of the Southern Region’s Land-grant Extension Service and Experiment Station System’s Impacts



The expenditures of the system generate direct and indirect impacts in the regional economy irrespective of the science and diffusion aspects of the system’s work. Using regional input/output analysis, Battelle found that just the impacts of institutional expenditures alone are significant. In total, the combined expenditures of the Extension Service and Experiment Station System in the Southern Region generated a direct and indirect economic impact totaling \$5.4 billion in 2011. The operation of these organizations generates nearly 63,000 jobs in the region (36,166 direct jobs and an additional 26,817 indirect and induced jobs) and generated over \$2.55 billion in wages and benefits.

Again, it must be noted that these impacts are only the impacts generated by the expenditures of the Extension Service and Experiment Station System and their flow through the Southern Region's economy—they do not include the far more significant impacts actually generated as a result of their functional activities (their mission).

As previously highlighted, the Southern Region's Extension Service and Experiment Station System provides an integrated system to research, develop, pilot, demonstrate, disseminate and assist in the adoption of new innovations to benefit practitioners, industry, and regional communities. This system is providing innovative systems for improving the profitability of agbioscience producers and processors, creating new businesses and new economic opportunity, protecting food sources from toxins and pathogens, and ensuring the sustainability of the environment for the next generation and beyond. With combined budgets totaling nearly \$2.2 billion, it would be an almost impossible task to illustrate all of the programs and initiatives of the Extension Service and Experiment Station System and their impacts on individual communities, home states, the region and the nation. Rather than attempt this, the Battelle/BioDimensions project team undertook a series of narrative discussions and case studies (contained in the full report) which serve to illustrate many of the high-impact programs generated by the system in:

- **Sustaining and growing agbioscience production and related business enterprises**
- **Creating value-added food products and services to promote better health and nutrition**
- **Ensuring a safe food supply**
- **Fostering ecological and environmental stewardship and natural resource management**
- **Serving as an agent of innovation that catalyzes economic growth**
- **Catalyzing the industrial bioeconomy (fuels, chemicals, materials) to foster economic diversification, value-added product development, and energy independence**
- **Building stronger, healthier, economically sustainable communities**
- **Developing human capital.**

A System at Risk

While agriculture and agbioscience have great relevance to human health, economic and social progress, and environmental sustainability in the 21st Century, the Extension Service and Experiment Station System faces considerable challenges.

Table ES-2 highlights some of the diverse challenges and issues facing the Extension Service and Experiment Station System, and it is evident that the challenges come from multiple quarters. Fundamentally, the importance of agbiosciences is expanding due to its relevance to global needs and challenges— BUT, this is occurring at a time of budget crises within federal, state and local funding agencies and within private industry. There is, therefore, a fundamental tension between meeting expanding needs and opportunities while attempting to operate within a budget crisis environment.

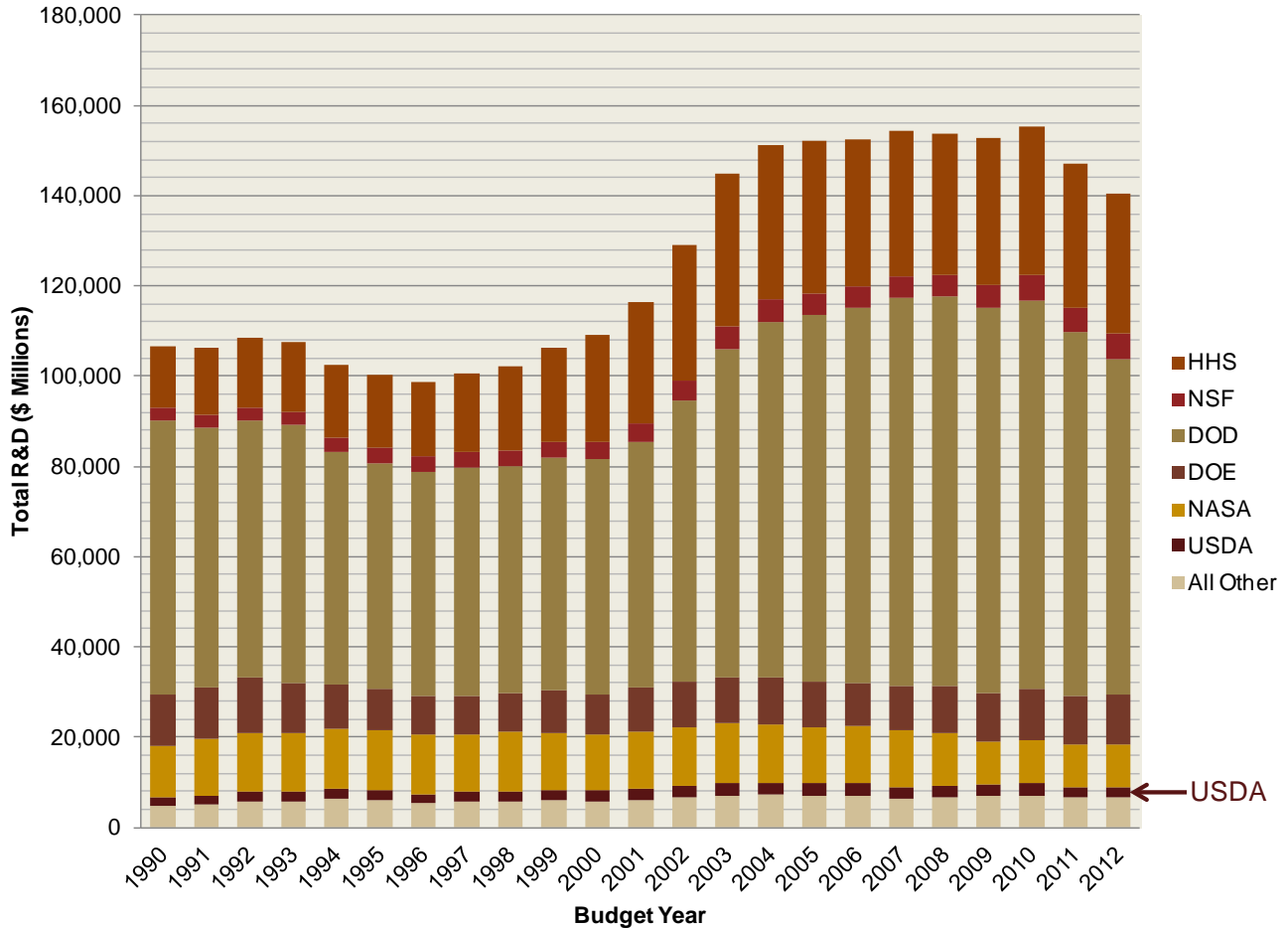
Table ES-2: Challenges to Extension Service and Experiment Station System in the Current Environment

Challenges and Issues	
Federal	<ul style="list-style-type: none"> • Decline of federal funding, reducing capacity of Extension Service and Experiment Station System • Potentially significant cuts to research and extension funding due to federal fiscal conditions • A need to increase funding for agbioscience related research and extension, via NIFA, if Land-grants are to fully address the major issues and opportunities
State/Local	<ul style="list-style-type: none"> • Rising tide of state fiscal crises limiting support to state universities, including Extension Service and Experiment Station System • Fiscal problems for local counties limiting traditional local support for Extension Service
General Public	<ul style="list-style-type: none"> • Lack of understanding regarding the growing importance of agbioscience global issues and development opportunities • Need for those benefiting from programs to voice the System’s impact and value with key decision makers • Need to communicate the “public value” of programs • Need to better connect the message of <i>agriculture = food and economic security= nutrition=health</i>
Operational	<ul style="list-style-type: none"> • Increased institutional operating costs • Increased federal/state regulations • Increased competition for funding from social programs

Perhaps chief among the challenges faced is an uncertain funding environment for agbioscience research and extension activities. Pressure on the federal government to reduce spending, in combination with economic challenges at the state and local levels, generates an uncertain environment. This problem is further exacerbated when it is understood that the agbiosciences receive comparatively low levels of funding attention at the national level. Figure 18

illustrates this funding situation, showing the level of R&D funding provided via USDA versus other agencies.

Figure ES-4: Federal Funding by Major Agency – 1990 through 2012 (in 2012 constant dollars)



(Source: American Association for the Advancement of Science - Accessed online at <http://www.aaas.org/spp/rd/guihist.shtml>)

Ideally, recognition of the large-scale market opportunities in the agbioscience space should spur increased investment in USDA funding for the Extension Service and Experiment Station System and related R&D funding. Without such expanded investment, it will be difficult to sustain U.S. leadership in the sector, realize economic development gains from the development of R&D based agbioscience innovations to meet growing market needs, and reap the strategic benefits of a sustainable domestic biobased economy.

While the current level of federal research and extension funding represents an issue, it is not the only financial challenge facing the Extension Service and Experiment Station System. Historically, federal funding has been highly leveraged by state and local (county) partners. Current budgetary challenges are

impacting these additional sources of funds. With each of these three legs of the funding stool facing significant constraints, the Extension Service and Experiment Station System is being faced by what some term the “perfect storm”.

In addition, general budget crises in many states are leading state governors and legislatures to consider substantial cuts to funding of what they see as “discretionary programs” such as agricultural research and extension (even though these are actually core drivers of future economic growth potential).

The risk of not having agbioscience as a priority for the nation and states is potentially an erosion of financial support for the Land-grant Extension Service and Experiment Station System and, therefore, a reduction in the nation’s ability to compete effectively in global agriculture and agbioscience that in the long-term can impede the nation’s ability to feed itself, which in turn damages national food security. The federal government and individual states are clearly in an era of budget crises and many programs appear to be at risk for funding cut-backs. Work performed by Land-grant Universities in agbioscience though can provide a high return for funders—giving back to the government more than is received. Independent research performed by Battelle in Nebraska and in Oklahoma found that the Land-grant agbioscience complex in these states generated between a 15 to 1 and 25 to 1 return on investment for state resources¹⁰.

The United States is not alone in the pursuit of agbioscience as a driver of economic and societal development. Traditional competitors in Europe are being joined by fast developing economies such as India, China and Singapore that see the benefits of investing in scientific research and applied development projects—including agbioscience projects. Other developed nations, are making major investments in their agbioscience infrastructure and attracting investment from US industry because of their expanding agbioscience R&D capabilities.

The National Academies¹¹ has sounded warning bells regarding U.S. funding for science and the preparedness of our education system to sustain a leadership position. With funding challenges coming across multiple fronts we have a system at risk—a system in which the U.S. currently has a leading position and tremendous potential opportunities, but one that can be rapidly eroded by

¹⁰ Battelle Technology Partnership Practice research reports:

“The Oklahoma State University Division of Agricultural Sciences and Natural Resources Agbiosciences Activities Deliver Positive Economic Benefits for Oklahoma”. March 2007

“The University of Nebraska Institute of Agriculture and Natural Resources: A Generator of Positive Economic Impacts for Nebraska”. February 2007.

¹¹ National Academies. July 2008. “Rising Above the Gathering Storm, Revisited: Rapidly Approaching a Category Five.” National Academies Press.

foreign competitors if the U.S. fails to support the system and its key institutions.

Conclusion

The Southern Land-grant Extension Service and Experiment Station System has been, is, and will continue to be a primary engine for economic and social sustainability and growth. Ultimately, the System is focused on improving and sustaining the Southern Region of the United States—improving its economy, preserving its environment, growing a skilled workforce, and contributing to continued social sustainability and responsibility. As clearly indicated throughout this report, the 15 Land-grant Universities are positively impacting not only the region as a whole, but their individual states and localities in significant ways through both their diverse array of activities, as well as their close partnerships with producers and community stakeholders.

Taken together, it is evident that the Southern Land-grant Extension Service and Experiment Station System is having powerful impacts on the region’s economic growth and on economic and social sustainability. The impact of the System’s programs and expenditures represent a significant return on investment for federal, state, and local funding sources. As a result, **these institutions should be considered priorities for further strategic investment and development given their importance in realizing the intrinsic growth potential of agbiosciences for the U.S. and regional economies.**