MISSISSIPPI STATE UNIVERSITY EXTENSION

Economic Contributions and Impacts of the Stoneville Research Complex, FY2023

The total economic contribution from the Stoneville Research Complex included an estimated economic activity of more than $747 million to the 19-county Mississippi Delta Region. This supported more than 2,500 jobs earning more than $132 million in labor income and contributed more than $49 million to total taxes.

Introduction

The Stoneville Research Complex (SRC) is located in the heart of the Mississippi Delta Region (Figure 1). This area is known for its rich soils and productive agricultural landscape. The SRC and its entities have proven to benefit the health and well-being of the entire world. Yet, the SRC is also an important economic driver to the Mississippi Delta Region. This report provides a quantitative analysis of the contributions to the overall economy, employment base, and tax base of this region and is a follow-up to previous studies. The SRC consists of eight entities and their sub-units. These entities were surveyed for information related to their operations in spring 2024. These entities are listed and described below.

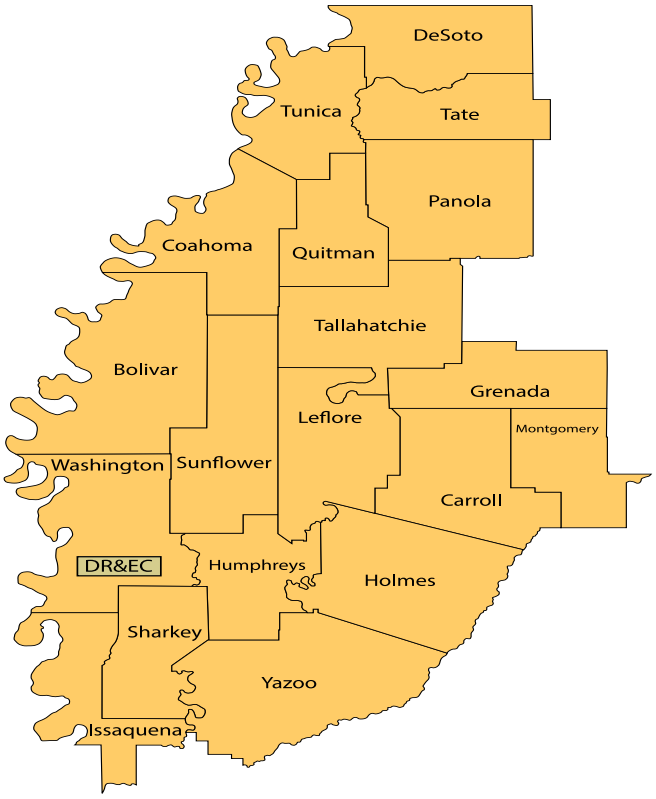

Figure 1. Mississippi Delta Region.

USDA Agricultural Research Service

The chief scientific research agency for the United States Department of Agriculture (USDA) is the Agricultural Research Service (ARS). USDA-ARS conducts research to develop and transfer solutions to agricultural problems of high national priority and provide information access and dissemination to accomplish the following:

- ensure high-quality, safe food and other agricultural products
- assess the nutritional needs of Americans
- sustain a competitive agricultural economy
- enhance the natural resource base and the environment
- provide economic opportunities for rural citizens, communities, and society as a whole

USDA-ARS facilities at Stoneville include the Biological Control of Pests Research Unit, Cotton Ginning Research Unit, Crop Genetics Research Unit, Crop Production Systems Research Unit, Genomics and Bioinformatics Research Unit, Pollinator Health in Southern Crop Ecosystems Research Unit, Southern Insect Management Research Unit, Sustainable Water Management Research Unit, and Warmwater Aquaculture Research Unit. The Stoneville location is also the administrative headquarters for the Southeast Area, which is one of five research areas within USDA-ARS.

Delta Council

Delta Council is an area economic development organization representing the 19 counties of northwest Mississippi, or the Mississippi Delta. The Delta Council was organized in 1935 to focus on three areas: (1) the promotion of agriculture, including agricultural research and legislation relating to agricultural programs of special significance to area farmers; (2) flood control and drainage; and (3) the promotion and development of transportation facilities and services with

special attention to a modern highway system throughout the Delta. Since its beginnings, Delta Council's program of work has expanded to cover all aspects of the area's economy. Delta Council's analysis includes two separate entities, Delta F.A.R.M. and Delta Wildlife, that fall under the Delta Council's governance.

- The Delta Farmers Advocating Resource Management (Delta F.A.R.M.) is an association of growers and landowners who strive to implement recognized agricultural practices to conserve, restore, and improve the environment of the Northwest Mississippi Delta Region. Formed in October 1998, member growers and landowners agree to use the environmental program to assess their farms and to guide them in attaining the highest possible level of land and water resource stewardship to ensure a more sustainable and profitable future for agriculture.
- Delta Wildlife was founded in 1990 by 100 farmers, sportsmen, and business leaders who pledged financial support for three years to establish an organization that would dedicate itself to the conservation, enhancement, and restoration of the wildlife and natural resources of the Delta and other counties in Northwest Mississippi by developing, implementing, and monitoring science-based projects and programs that address wildlife, wildlife habitat, and natural resource concerns in the region; and by providing children, sportsmen, land managers, landowners, and the general public with information that will help them make better decisions as conservationists, hunters, fishermen, or wildlife managers.

Delta Research and Extension Center

The Delta Research and Extension Center (DREC) is one of four Mississippi State University research and Extension centers across the state. Mississippi Agricultural and Forestry Experiment Station (MAFES) scientists and Extension specialists located at DREC focus research and Extension activities on cotton, rice, soybean, corn, and catfish production.

DREC's primary goal is to increase the yields of commercial agriculture and aquaculture producers, while reducing input costs and preserving the Mississippi Delta's environment and natural resources. Scientists and Extension specialists work cooperatively with various stakeholders to solve crop and aquaculture production problems and transfer new information and technology to area producers in a timely manner.

DREC includes roughly 5,000 acres of row crops, aquaculture ponds, and hardwood forest research land. Within the DREC are three national centers and one regional center: the Thad Cochran National Warmwater Aquaculture Center, the National Center for Alluvial Aquifer Research, the Center for Pollinator Health in Southern Crop Ecosystems Research, and the Southern Regional Aquaculture Center.

- The Thad Cochran National Warmwater Aquaculture Center (NWAC) is a cooperative effort between USDA-ARS and MSU. Its mission is to provide solutions to the most pressing problems of the aquaculture industry through basic and applied research and Extension; it also houses one of four diagnostic labs in the state. NWAC scientists conduct research to solve short-term problems, as well as those that threaten the long-term viability of the industry. NWAC Extension activities focus on disseminating research-based information to the aquaculture industry as well as assisting industry adaptation to a changing regulatory environment. NWAC facilities include a 32,000-square-foot office/laboratory building, a 6,000-square-foot aquaria building, a 3,000-square-foot pathogen-free holding facility, an 8,000-square-foot nutrition laboratory, and 300 acres of experimental catfish ponds.
- The mission of the National Center for Alluvial Aquifer Research (NCAAR) is to conduct research and provide information for issues surrounding water use for agriculture and natural resources in the Lower Mississippi River Basin (LMRB). NCAAR aims to produce and communicate research directed at the conservation and sustainability of water resources for agriculture that include developing water-efficient cropping systems, improving water capture, improving water distribution systems and irrigation efficiencies, implementing the use of water-saving irrigation management options, and developing economic risk assessment tools that enable producers to identify profitable, water-efficient production options.
- The Center for Pollinator Health in Southern Crop Ecosystems Research is the newest research and Extension unit established within DREC and is a collaborative effort between USDA-ARS and MSU. Its mission is to work closely with pollinator advocates, beekeepers, and farmers in Mississippi and beyond to address pollinator health issues and share new information and technology to protect honey bees and other pollinators. The team manages more than 200 colonies and conducts both basic and applied research to develop effective, science-based solutions to improve pollinator health.
- MSU serves as the host institution for the USDA National Institute for Food and Agriculture (NIFA) Southern Regional Aquaculture Center (SRAC) located in Stoneville. SRAC provides a mechanism for assessing

needs, establishing priorities, and implementing regional research and Extension programs in aquaculture. Through SRAC programs, regional aquaculture research and Extension needs are identifiedand addressed, and results are made available to users through publications and Extension educational programs.

MSU Extension Service

The MSU Extension Service serves the following counties in the Mississippi Delta Region: Bolivar, Carroll, Coahoma, DeSoto, Grenada, Holmes, Humphreys, Issaquena, Leflore, Montgomery, Panola, Quitman, Sharkey, Sunflower, Tallahatchie, Tate, Tunica, Washington, and Yazoo. While DREC brings focus to both the short- and long-term concerns of Delta producers and other stakeholders in the region, the major purpose of county Extension activity is to provide research-based educational opportunities to local citizens to enhance the value of Mississippi agriculture, sustain the state's environment and natural resources, build vibrant communities, build the future through positive youth development, and strengthen and support local families by putting knowledge into practice.

Delta Health Alliance

The Delta Health Alliance (DHA) is Mississippi's largest community-based, nonprofit organization that aims to improve the health and educational needs of the residents of the Mississippi Delta. Based on the SRC campus, DHA currently operates 33 different health, education, and community initiatives in 26 counties in collaboration with local partners, state and local government agencies, universities and community colleges, workforce and economic agencies, hospitals, clinics, schools, grassroots organizations, and faith-based groups.

DHA aims to carry out its mission by seeking to understand the fundamental causes of poor health in the region through comprehensive research programs and statistical analysis of relevant data; funding programs to increase access to healthcare professionals; and educating residents of the Delta in ways that encourage them to adopt healthy lifestyles.

Center for Bottomland Hardwoods Research

The U.S. Forest Service is represented at Stoneville through its Center for Bottomland Hardwoods Research (CBHR) facility housed within the Southern Hardwoods Laboratory. The mission of CBHR is to provide the scientific basis necessary to effectively manage southern bottomland hardwood and wetland forests and associated stream ecosystems for a sustained yield of forest products and other desired outcomes.

Research work units include Regeneration and Reproductive Biology; Stand Management and Forest Health; Ecology of Aquatic and Terrestrial Fauna; and Ecological Processes and Restoration.

Wildlife Mississippi

Wildlife Mississippi was formed in 1997 to conserve Mississippi's lands, waters, and natural heritage to sustain a clean environment and a healthy economy. Wildlife Mississippi has a common-sense approach to an effective conservation philosophy. It is based on five fundamental values:

- Conservation should make economic sense, and the result of conservation action helps Mississippi's economy, retains jobs, preserves property values, and promotes a healthy lifestyle.
- Conservation should include both public and private lands.
- Private property rights encourage good stewardship since private property owners have a responsibility to maintain such good stewardship on their property.
- Mississippi's natural areas are part of God's creation, and all Mississippians have a shared responsibility to conserve them for present and future generations.
- Hunting, fishing, and other forms of outdoor recreation are parts of Mississippi's natural heritage and should be used to provide a sustainable source of food and recreation, and to manage fish and wildlife based on sound science.

Yazoo Mississippi Delta Joint Water Management District

The Yazoo Mississippi Delta Joint Water Management District (YMD) was formed in 1989 as a direct result of the 1988 drought. The Mississippi Department of Environmental Quality (MDEQ) issued orders to landowners to stop irrigation withdrawals from Delta streams during the 1988 drought, which had reduced stream flows to the minimum allowed by law.

Delta leadership realized that a strictly regulatory approach to managing the Delta's water resources was undesirable, and YMD was formed to provide local, non-regulatory solutions to the Delta's water resource challenges. YMD has focused on two major water resource issues in the Delta: (1) balancing water supplies with water demand; and (2) improving and protecting surface water quality.

Economic Contributions/Impacts

To most accurately estimate the influence of the Stoneville Research Complex (SRC) on the 19 counties in the Mississippi Delta Region, researchers found it advantageous to break the analysis into three components that seem most closely

linked to the presence of the SRC and its influence on the local economy. These parts include agency/entity operations, construction of new facilities, and visitation to the center. Each of these is discussed below.

Agency/Entity Operations

Eight agencies or entities (referred to as organizations) provided information regarding their individual economic metrics on the region. These organizations reported a combined employment of 933 employees who reside in the study area region; these individuals earned salaries and wages totaling $65,397,275. In addition, the total operational budgets (including wages and salaries) for these organizations totaled $547,481,142.

Since the presence of the SRC is considered permanent and to reduce confusion from transactions within the sector, the economic contribution of the operational budgets and the organizations' payrolls were estimated. The total economic contribution of these organizations' operations is summarized in Table 1.

As shown in Table 1, the SRC employs 933.0 people who earn $65,397,275, and these entities have a combined budget of $501,847,212. These combined budgets are estimated to contribute $98,619,082 in value added to the area's economy. The economic activities of SRC entities and their employees generate an estimated additional 1,525.5 jobs that pay $62,757,887 in salaries and wages. Also, an estimated $228,748,156 in sales is generated because of the SRC's economic activities, and perhaps even more importantly, an additional $117,593,955 of value is estimated to be added to the area's economy.

This suggests that the operations component of the SRC results in a total of 2,458.6 jobs in the Mississippi Delta Region and $128,155,162 in salaries and wages. Each job at the SRC contributes to another 2.64 jobs in the 19-county region. The total level of output (sales) that results from SRC activities is $730,595,367, with $216,213,037 in value added to the area's economy.

Construction of New Facilities

Construction activities on the SRC campus also have a substantial effect on the region's economy. Over the past 12 months, SRC entities reported $6,864,012 in expenditures to construct new facilities in the 19-county area. These activities are performed by private industries[2] and contribute to the region's employment, employee compensation, value added, and output. Given that these companies are not "residents" of SRC, all industry effects are categorized as indirect effects. Also, since construction of facilities depends highly on the state of the federal and state economies and tax collections, estimates of the economic impact of these activities are presented in Table 2.

It is estimated that these construction activities resulted in the employment of 70.1 full- and part-time employees who reside in the local area; these employees earned $2,341,856 that could be related to SRC construction. An additional $3,355,467 in sales ($10,219,479 minus $6,964,012) occurred, and a total value of $4,811,739 was added to the area's economy as a result of the construction activities.

SRC Visitation

The final analysis category estimates the economic impact of the visitors hosted by SRC. Anecdotal evidence suggests

Table 1. Economic contribution effects of SRC operations summary.

Type	Direct Effects	Indirect Effects[1]	Total Effects
Employment	933.0	1,525.5	2,458.6
Employee compensation	$65,397,275	$62,757,887	$128,155,162
Value added	$98,619,082	$117,593,955	$216,213,037
Output (sales)	$501,847,212	$228,748,156	$730,595,367

Table 2. Economic impact effects of SRC facilities construction summary.

Type	Direct Effects	Indirect Effects	Total Effects
Employment	0.0	70.1	70.1
Employee compensation	$0	$2,341,856	$2,341,856
Value added	$0	$4,811,739	$4,811,739
Output (sales)	$0	$10,219,479	$10,219,479

that the average length of a visitor's stay is three days and that the visitor will arrive the night before the official visit begins. SRC entities reported a total of 7,413 visitors over the past 12 months, which translated to 22,239 visitor days. A typical analysis of this type focuses on four distinct areas of visitor spending: meals purchased at restaurants, lodging, fuel, and miscellaneous retail purchases.[3] Initial spending by visitors is approximately $5,537,511. Since visitor spending is a result of the entities' operations and not a component of operations, all estimated industry effects are classified as indirect effects. Furthermore, since, like the construction of facilities, the number of visitors varies with the state and federal economies/budgets, the economic impact of visitor spending on the 19-county area is estimated. Table 3 shows a summary of the estimated economic impacts.

It is estimated that because of visitor spending, 56.3 full- and part-time jobs are generated in the local area and that these employees earn $1,793,888 in salaries and wages. In addition, the estimated secondary industry and household effects that will result from the initial level of visitor spending will be $1,242,965, and the total level of value added to the local economy resulting from these visitor expenditures will be $3,858,126.

Total Economic Contribution/Impact

The estimated total economic contributions/impacts can be determined by summing the contributions and impacts for operations, construction of facilities, and visitor spending. As shown in Table 4, SRC operations in the 19-county study area generate an estimated 2,585.1 jobs, earning $132,290,906. Value added totaling $224,882,901 is generated from $747,595,323 in output. Output is defined as the sum of SRC entity budgets plus additional sales in the region that occurs due to SRC activities.

Fiscal Effects

While the activities of the SRC have a substantial effect on the area's economy, these activities also have a substantial effect on local, state, and federal fiscal revenues (taxes). Taxes collected at all levels of government are used to provide goods and services to area residents that are not typically provided by the private market. These goods and services are typically known as *public goods and services*. Public goods and services include, but are not limited to, roads, education, social assistance, and business and economic development efforts. Estimates of the levels of local, state, and federal taxes collected due to SRC economic activities can be found in Table 5.

Table 3. Economic impact effects of SRC visitor spending summary.

Type	Direct Effects	Indirect Effects	Total Effects
Employment	0.0	56.4	56.4
Employee compensation	$0	$1,793,888	$1,793,888
Value added	$0	$3,858,126	$3,858,126
Output (sales)	$0	$6,780,476	$6,780,476

Table 4. Total estimated economic contribution/impact effects of SRC summary.

Type	Direct Effects	Indirect Effects	Total Effects
Employment	933.0	1,651.9	2,585.1
Employee compensation	$65,397,275	$66,893,631	$132,290,906
Value added	$98,619,082	$126,263,820	$224,882,901
Output (sales)	$501,847,212	$245,748,111	$747,595,323

Table 5. Total estimated fiscal revenues due to SRC economics and resulting taxes collected.

Type	Operations	Facilities Construction	Visitor Spending	Total Taxes
Total local taxes	$5,361,168	$102,212	$161,400	$5,624,780
Total state taxes	$11,570,054	$237,532	$307,959	$12,115,544
Total federal taxes	$30,366,714	$699,159	$467,236	$31,533,109
Total taxes collected	$47,297,936	$1,038,903	$936,594	$49,273,433

Table 6. Total estimated economic contribution/impact effects of SRC summary.

Type	Local Taxes	State Taxes	Federal Taxes
Household taxes ($)	$117,971	$2,363,050	$19,319,286
Household taxes (%)	2.1%	19.5%	61.3%
Business taxes ($)	$5,506,809	$9,752,494	$12,213,823
Business taxes (%)	97.9%	80.5%	38.7%

In addition, it is vital to describe the sources of taxes (see Table 6). Businesses pay the lion's share of local and state taxes, primarily from local property taxes and, on the state level, sales taxes generated by business activity. Businesses are estimated to generate $5,120,568 in local property taxes (this equates to 91.0 percent of all local taxes paid) and $7,966,955 in state sales taxes (65.8 percent of all state taxes generated).

In addition to property taxes that accrue to local governments, Mississippi municipalities collect a "diversion" of 18.5 percent of sales taxes collected within municipal boundaries. Using fiscal year 2023 data from the Mississippi Department of Revenue, it is estimated that 84.1 percent of sales taxes are collected within municipal boundaries for municipalities in the 19-county study region. This suggests that of the estimated $7,966,955 in sales taxes collected by the state, municipalities within the region will receive approximately $1,240,060 for their general funds. County governments and special districts do not receive these funds at the time of publication.

On the federal level, taxes accrue from three primary sources. Employee contributions to social insurance is approximately $10,483,920 (33.2 percent of federal taxes paid), followed by employer contributions to social insurance ($8,873,726, or 28.1 percent, of federal taxes paid). Federal personal income tax is estimated as $8,835,366, or 28.0 percent, of federal taxes paid.

Conclusion

Several important conclusions can be drawn from this analysis that demonstrate the importance of SRC to the 19-county Mississippi Delta Region economy.

Jobs and Employee Compensation

- Entities residing on the SRC campus employ 933 people who reside within the 19-county region and earn $65,397,275 in salaries and wages. The average compensation for each job is $70,094 in an area where the average wage is $39,373.
- Activities on the SRC campus generate an estimated 1,525.5 additional full- and part-time jobs throughout the region, with employee compensation totaling $117,593,955 (an estimated average of $77,085 per job).

Value Added and Output

- SRC entities operate with a combined budget of $501,847,212 that is reported to be spent within the 19-county region. These operations result in estimated additional output (sales) of $228,748,156 by firms located in the region.
- SRC operations add approximately $98,619,082 in value to the region's economic activity, and the indirect effects add an estimated $117,593,955 in economic value to the region.

Fiscal (Tax) Revenues

The accrual of fiscal revenues by local, state, and federal governments is necessary to provide public goods and services that allow an area to achieve a comfortable standard of living and to develop in both an economic and social sense.

- Economic activity within the 19-county region that is due to SRC activities generates an estimated $5,624,780 in local taxes for the region's counties, municipalities, and special districts (i.e., school districts). In addition, municipalities receive an estimated $1,240,060 in diversions from sales taxes collected within the municipalities.[4]
- In addition, sales tax diversions accruing to municipalities within the region are approximately $1,240,060.
- The State of Mississippi will receive an estimated $10,875,484 ($12,115,544 minus $1,240,060 for municipal diversions) from SRC activities, primarily from sales taxes.
- The federal government accrues approximately $31,533,109 from SRC activities, primarily from social insurance and personal income taxes.

Noneconomic and Community Considerations

- Of the 996 SRC employees for whom a level of education was reported, 559 (56.1 percent) had a college degree and 286 (28.7 percent) had a graduate degree (either master's or doctoral degrees). Eighty-three employees (8.3 percent) possess an associate degree as their highest level of

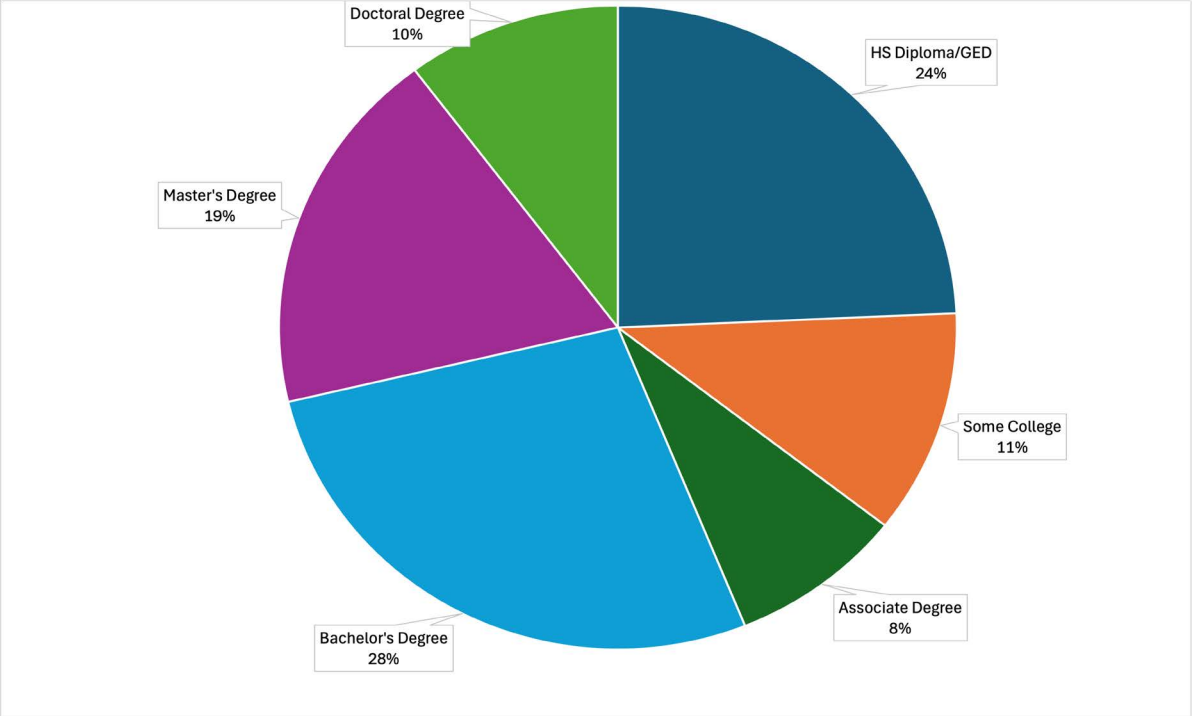

Figure 2. SRC educational attainment.

education (Figure 2). These types of educated employees add to the social capital of the region by civic involvement, strengthening local schools through parental involvement crime rate reduction, etc.

- No SRC employees had less than a high school diploma/GED, and 24.3 percent had a high school diploma/GED.
- The SRC boasts a diversified workforce that further contributes to the social fabric of the region. Of the 848 administrative, professional, and staff employees for whom a gender or race was reported, 613 (72.3 percent) were female and 521 (61.4 percent) represented minorities.
- There are undoubtedly other effects of both an economic and noneconomic nature that have not been mentioned. The SRC's presence in this region likely adds to the presence and desired location of several private industry research facilities that focus on row crop and aquaculture research efforts. These private industries also have payrolls and employee education levels that are much above the state average. Thus, their presence in the region provides additional economic contributions.

Economic Impacts of Educational and Research Programming

There are likely many impacts to the end users of the SRC's tenant entities that are beyond the scope of this study to estimate. A representative sample of these impacts might include:

- MSU Extension's 4-H youth development and family and consumer sciences educational programming focus on life skills that impact children for the rest of their lives.
- DHA outreach activities teach residents suffering from chronic health conditions (i.e., diabetes, heart disease, and hypertension) how to better manage these conditions and attain a higher quality of life.
- DREC and USDA-ARS research activities include the development of seed varieties and planting/harvesting techniques that have changed the way farms operate. Increased efficiency is a major component to addressing issues of world hunger and food safety.
- YMD activities focus on the conservation and wise use of water, one of the world's most scarce and valuable resources.
- U.S. Forest Service research and outreach activities focus on the wise use of bottomland hardwoods and wetland forests as well as conservation of their associated ecosystems. The goal of these efforts is to provide a safer environment for populations to reside.
- Delta Council activities include economic development activities focused on creating and attracting businesses to the region that are key factors in addressing and reducing the region's poverty levels by providing jobs and higher incomes.

It is likely that the magnitude of these impacts (and many more) are many times the investments of resources made to achieve them.

Appendix: Methodology

Input-Output Methodology and IMPLAN

Public policymakers, elected officials, and decision-makers at the local level frequently assess the priority of potential and ongoing projects. These projects often take the form of either a new industry locating in an area or the expansion of an existing industry. In either case, there is often an expectation that a new project will expand the labor market through increased demand for employment and local services. As new jobs are added, total income increases and local unemployment decreases. Demographic aspects of the economy, such as population and commuting patterns, also change. New businesses are created to support expansion and provide locally available inputs to production. Increased income stimulates the growth of retail and service sectors. These changes to the economic and fiscal landscape of a local area or region have implications on further economic development, as well as on tax policy and the provision of public services, such as education and public safety.

Input-output analysis was developed in the 1930s by Wassily Leontief, who won the Nobel Prize in 1973 for his contributions to economics. Since then it has become one of the best-known and most widely used techniques for assessing regional economic impacts. It excels at analyzing the economic relationships or linkages among major sectors of the economy. Input-output analysis is based on the fact that an initial change (increase or decrease in sales) in one sector of the economy can affect other sectors of the economy.

The initial change is often referred to as an impact, or a direct effect. The direct effect is measured in terms of sales to final demand, and it is the economic variable that drives an input-output model. The initial impact requires increased production by secondary industries, the suppliers of goods and services to the primary industry. Increased production by secondary industries is referred to collectively as indirect effects. Additionally, induced effects arise due to the spending of the new income by households. Through careful examination of the relationships among industries themselves and between industries and households, the total effect (the sum of the direct, indirect, and induced effects) can be estimated.

IMPLAN is a commercial software product from IMPLAN, Inc., located in Huntersville, North Carolina. Its popularity is due to its geographic and model formulation flexibility and the provision of extensive economic information. IMPLAN, developed originally for use by the U.S. Forest Service, has been in use since 1979 and is capable of developing input-output models for any county, state, or group of counties or states in the U.S.

The data is assembled to create a large table that provides information on all transactions that occur between industries, households, and governments. The basis of the industry accounts (or input-output matrix, which enables the building of *multipliers* for input-output analysis) allows for estimations of how changes in the target industry's production will result in additional production in the economy on the basis of business-to-business purchases. The addition of the social accounts also allows examination of changes in the economy that result from *labor income* spending (all forms of paid employee-based income including benefits). The result is a model that allows users to estimate, based on actual collected federal data, how an increase or decrease in production of an industry or industries in a local economy might affect the remaining industries.

To illustrate in a simplified fashion, let's say that demand for windows increased by $10 million in Washington County, Minnesota. In IMPLAN, it is shown how this increase in production will affect the rest of the economy of Washington County. In this example, the appropriate sector is 99. (The sector defines the type of industry that experiences the change in production.) The *event* (or transaction) can be created that describes an increase in sales for Sector 99 and then the value of $10 million entered into the *industry sales* field. Based on the relationships for the region (derived from the accounts described above), there is an established annual relationship of production to total employment and to total labor payments, tax collection, and profits.

From these annual relationships, IMPLAN can estimate the *employment* in Sector 99 associated with those sales, as well as estimated labor payments associated with this increase in production. If the *employment* and *income* values are known, these can also be entered into IMPLAN, overwriting the underlying regional data for just that one firm. Then based on what that industry purchases to make its products (basically a list of all the goods and services needed to produce a product; in this example, windows) and the underlying data, which can be used to determine how much locally produced supply can be used to meet demand, the software estimates what additional production will be required in the local economy to meet this increase in production (*indirect effects*) and the additional production required from the local economy to meet the spending associated with the increase in labor payments (*induced effects*).

Modeling Sector Selection

Given the sector-based modeling approach used in IMPLAN and the inherent differences between the goals and cost structures of governmental versus nongovernmental entities, it is necessary to allocate the local portions of total expenditures, payroll, and employees to sectors that closely represent the activities performed at the SRC. These decisions were made based on entity expenditure data provided by SRC administration as a result of the FY 2023 economic environment survey.

As a result, a set of IMPLAN industry change sectors and institutional spending patterns were chosen to model these activities:

- The number of government employees residing in the local area for each entity was estimated based on information provided by the entities responding to an employment and budgetary survey. Six IMPLAN industry sectors were used to report the induced effects of employees and payroll: *Sector 543 – Employment and payroll of federal government, non-military* and *Sector 536 – Employment and payroll of state government, education*.
- For entities that were classified as a part of either the federal or state government, estimates of the expenditures above the level of payroll for each employee group were performed by calculating the proportion of payroll estimated for each group by the level of "excess" expenditures. The IMPLAN tools used to report the indirect and induced effect of these excess expenditures were spending patterns, *11001 - Federal Government Nondefense* and *12002 – State/Local Government Education*.
- *Sector 420 – Business and professional associations* was chosen to represent the activities of Delta Council.
- *Sector 463 – Environmental and other technical consulting services* was chosen to represent the activities of Wildlife Mississippi.
- *Sector 52 – Construction of new manufacturing structures* was chosen to represent the construction of facilities activities performed by the various entities on the SRC campus throughout the fiscal year. While SRC entities are not engaged in building manufacturing plants, the authors maintain that the process of constructing laboratory facilities can be likened to that type of construction. It is assumed that the construction work is contracted out to firms whose employment counts are not included in the economic environment survey, so employee and payroll estimates were estimated through the IMPLAN Social Accounting Matrix.
- The economic impact of visitor expenditures were estimated using four separate sectors. These included: *Sector 409 – Retail-Gasoline stores; Sector 412 – Retail-General merchandise stores; Sector 504 – Hotels and motels, including casino hotels;* and *Sector 506 – Full-service restaurants*.
- The Delta Health Alliance presented an unusual challenge to the analysis given its breadth of activities. To address this, four sectors were aggregated to create a single "Delta Health Alliance" sector that could be used in the analysis. These sectors (with unaggregated IMPLAN sectors noted) included *Sector 461 – Other computer related services, including facilities management; Sector 482 – Other educational services; Sector 486 – Outpatient care centers;* and *Sector 489 – Other ambulatory health care services*.
  - Note: For future analyses, this aggregation created a new IMPLAN Sector 1 – Delta Health Alliance, and the previous four sectors are no longer separated within the model.
  - Note: The IMPLAN sector numbering scheme used in this analysis would not match a model numbering scheme if that model did not have aggregation. While it is possible that some aggregation bias was introduced into the analysis, the possibility of analytical detriments due to this bias was outweighed by the benefits of being able to more fully capture the full scope of DHA activities.

Economic Contribution

It is important to note that an economic contribution technique within the input-output methodology was used in this analysis as opposed to the economic impact technique. As mentioned in a previous section, economic contribution is the technique that should be used when analyzing the economic activity of a set of existing industries/institutions as opposed to new economic activity (the additional economic activity, either positive or negative, that results either from new industries/institutions being initiated in the study area economy or from the closure of industries/institutions in the study area economy).

The magnitude of the variance between an erroneous economic impact analysis and a correct economic contribution analysis is quite large in this case ($836,176,393 vs. $747,595,323; this is a difference of $88,581,070, or 11.8 percent), so this distinction is very important. To implement this technique, a number of modifications were required for the IMPLAN modeling structure. The modifications are described in IMPLAN's Multi-Industry Contribution Analysis brief.

Definitions and Relationships

The following provides definitions of the input-output methodology (IMPLAN-specific terms) used in the analysis. These definitions were taken directly from *Principles of Impact Analysis and IMPLAN Applications*.

Term	Definition and Relationships
Local Use Ratio/Regional Purchasing Coefficient	Determines the proportion of sales, employment, or labor compensation that will be applied to the multipliers inherent in the model. Generally, only local production is specified by industry sales; therefore, the Local Use Ratio should be set to a value of "1," or 100 percent. When this value is set to less than 1, the excess of demand over the specified proportion is assumed to go to producers outside of the region and is therefore classified as leakage.
Direct Effects	Comprised of the initial expenditures, or production, made by the industry or sector experiencing the economic change.
Indirect Effects	The effects of local inter-industry spending through the backward linkages.
Induced Effects	The results of local spending of employees' salaries and wages for both employees of the directly affected industry and the employees of the indirectly affected industries.
Total Effects	The sum of the direct, indirect, and induced effects. **Total Effects = Direct Effects + Indirect Effects + Induced Effects**
Labor Income	Defines the total value paid to local workers within a region. Labor Income is the income source for induced household spending estimations. **Labor Income = Employee Compensation + Proprietor Income**
Value Added	Comprised of Labor Income, Indirect Business Taxes, and Other Type Property Income. Value Added demonstrates an industry's value of production over the cost of purchasing the goods and services required to make its products. Value Added is often referred to as Gross Regional Product. **Value Added = Labor Income + Indirect Business Taxes + Other Property Type Income**
Final Demand	The demand for the final use of finished goods and services by the households and governments in a region. These demands include capital, imports and exports, and sales made by governments and other non-corporate entities (institutions).
Intermediate Inputs	The goods and services produced by one industry that will be incorporated in the production of another industry. Intermediate inputs are the materials and services (other than employment) required by an industry to create its products.
Output	The total value of an industry's production, comprised of the value of the Intermediate Inputs and Value Added. This is typically viewed as the value of a change in sales or the value of increased production. However, annual production is not always equal to annual sales. If production levels are higher than sales, surpluses become inventory. Because inventory does not drive additional impacts in the year it was produced, in IMPLAN, Direct Industry Sales equals Direct Output. **Output = Intermediate Inputs + Value Added**

Endnotes

[1] In the report, "indirect effects" include both indirect industry effects and induced household effects.

[2] Since the construction that occurs on the SRC campus is typically the construction of laboratory facilities, IMPLAN Sector 52 (construction of new manufacturing facilities) was used to estimate the economic impact of facility construction.

[3] The following IMPLAN sectors are used to account for visitor spending in the study area: Lodging – Sector 504 (Hotels and motels, including casino hotels; Meals – Sector 506 (Full-service restaurants); Fuel – Sector 409 (Retail – Gasoline stores); and Miscellaneous Retail – Sector 412 (Retail – General merchandise stores).

[4] Local taxes are comprised of these components: County Taxes – $2,204,925; Municipal Taxes – $1,087,316; and Special District Taxes – $2,332,539.

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By **Steven W. Martin**, PhD, Extension Professor, Agricultural Economics and Delta Research and Extension Center, and **Alan Barefield**, PhD, Special Projects Coordinator, Agricultural Economics.

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