

Local Food System Economies: *How Selected Specialty Crops Contribute to Mississippi's Economy*



Specialty crop production is important to Mississippi's economy. Specialty crops typically refer to fruits and vegetables, tree nuts, dried fruits, and horticulture and nursery crops, including floriculture and intense cultivation (MDAC, 2017). However, due to data limitations on some specialty crop production, this report focused only on five specialty crops, including blueberries, honey, pecans, sweet potatoes, and watermelons.

This report examines this combined cluster of economic activity using an input-output model for the state of Mississippi. Finally, this report highlights the economic implications of expanding this specialty crop cluster in Mississippi. This applied research supports the newly created Mississippi State University Extension program called Local Food System Economies (LFSE).

The LFSE program aims to unearth economic development opportunities for expanding Mississippi's local food system. It is one of several educational programs that support MSU Extension's comprehensive local food system development initiative, Local Flavor. Local Flavor is a cross-disciplinary Extension effort aimed at bringing together all Extension programs related to supporting the economic development of Mississippi's local food system. To learn more about the LFSE Extension program, visit <http://extension.msstate.edu/lfse>.

The Input-Output Modeling Framework

This report used an input-output (I/O) model to examine the economic contribution of selected specialty crops in Mississippi. An I/O model is a quantitative economic model that represents the interdependencies between different branches of a national economy or different regional (municipal or state) economies. Myles and Hood (2010) represented the basic I/O model as:

$$X = (I - A) - 1 \times Y$$

where: A = matrix of a_{ij}

a_{ij} = technical coefficients that reflect the *direct* effects of change in final demand for a certain commodity

I = identity matrix

X = vector of industry outputs

Y = vector of final demand

(I - A) - 1 is called the Leontief inverse

The equation above shows that output is equal to the Leontief inverse multiplied by final demands. This relationship is also held in the form of changes: $\Delta X = (I - A) - 1 \times \Delta Y$. Input data on production values from each specialty crop and aggregate production values were used to model the economic contribution of individual and clusters of specialty crops. Spillover contributions on sales, em-

ployment, income, and local taxes can be determined by examining revenues generated from growing these crops in the state.

The IMPLAN I/O model, developed by IMPLAN Group Inc., was used to estimate the economic contribution of specialty crops to Mississippi's economy (IMPLAN, 2014). An I/O model can be used to examine the financial linkages in a regional economy among industries, households, and institutions (Watson et al., 2007). The 2014 statewide dataset is the most recent available for Mississippi. A state-level model for Mississippi was created to assess the contribution of each crop and aggregate production values on the state's economy. Since we were interested in measuring the existing economic contribution of specialty crops to Mississippi's economy, we used a contribution analysis approach. Economic contribution refers to how economic activity cycles through a region's existing economy (Watson et al., 2007).

Measuring Economic Contribution

Several important economic contribution measures were used to report results. These measures included output, employment, labor income, value added, and tax revenues. Employment represented the number of full-time and part-time jobs affected. Labor income represented employment income, including employee compensation (wages and benefits), and proprietor income. Value-added is industry (or company) total output minus the total cost of intermediate inputs. Total output represents the value of industry production. The output, employee compensation, and value-added contributions are provided in dollars. For employment, the contribution is the number of jobs supported by these selected specialty crops.

Direct, indirect, and induced effects were also reported across each of these economic contribution analysis measures. Direct effects refer to the set of expenditures that are used in the I/O model to see how an industry or economy will respond. In this report, direct effects were solely related to the value of production for each specialty crop or the combined value of production for the specialty crop cluster. Indirect effects refer to the impact input suppliers have on the local economy by buying goods and services from other local industries. Induced effects refer to the impact household spending has on the local economy. Therefore, the total economic contribution is the sum of direct, indirect, and induced effects.

In this report, we examined the production of five specialty crops in Mississippi to highlight their contributions to the state's economy in 2016. Production estimates came from two sources: National Agricultural Statistics

Service (NASS) homepage for Mississippi (USDA-NASS, 2016) and Mississippi Agricultural, Forestry, and Natural Resources Factbook (2016). For some crops, 2015 was the most recent year for which production estimates were available at the time of this report. In those cases, we used the 2016 producer price index (PPI) for fruits and vegetables to update those values (Bureau of Labor Statistics, 2016). Production values for four of the five selected crops were updated using the PPI. **Table 1** shows each industry's value of production used in the analysis.

Crop	Millions of dollars	Year	Estimated 2016 value (\$M)
Animals			
Honey	3.28	2015	3.35
Vegetables and melons			
Sweet potatoes	121.77	2016	
Melons and watermelons	3.780	2015	3.85
Fruits and nuts			
Blueberries	8.04	2015	8.19
Pecans	1.91	2015	1.95
Total all commodities	\$139.10		

Results

Table 2 shows the combined economic contributions of the selected specialty crops as a share of the state's agricultural industry. The total output (direct and indirect) of the combined crops accounted for 3.74 percent of the state's agricultural industry output in 2016. This contributed 3.82 percent of employment statewide, almost 5.80 percent of labor income, and 4.98 percent in value-added economic activity. These data provide a perspective on the magnitude of these crops in Mississippi.

Specialty crops contributed significantly to Mississippi's economy in 2016. An economic contribution analysis revealed that blueberries, honey, pecans, sweet potatoes, and watermelons contributed \$170.5 million to the state's economy in the form of total value added, contributed \$145.9 million in labor income, and supported

	Employment	Labor income	Total value added	Output
Total contribution of selected specialty crops	1,929	\$145,864,767	\$170,442,706	\$238,030,051
As a percent of MS agriculture industry, 2016	3.82%	5.80%	4.98%	3.74%

Item	Direct effect	Indirect effect	Total effect
Output	\$139,107,651	\$98,922,400	\$238,030,051
Labor income	\$116,190,125	\$29,674,642	\$145,864,767
Value added	\$117,807,615	\$52,635,091	\$170,442,706
Employment	1,124	805	1,929

1,929 jobs. Collectively, these specialty crops contributed \$238 million to the state's total industrial output in 2016.

Table 3 shows the output that these crops contributed to Mississippi's agricultural industry in 2016. Their total contribution exceeded \$238 million during this period, which supported 1,929 jobs with \$146 million of income, and contributed more than \$170 million to total value added, a measure of how much the state's economy expanded. When considering only direct effects, the crops accounted for 1.91 percent (\$139 million) of agricultural output in the state, almost 2.23 percent (1,124) of jobs, 0.18 percent (\$116 million) of labor income, and 3.04 percent (\$117.81 million) of the value added in the state's agricultural industry in 2016.

Taxes

Table 4 shows the amount of tax revenues contributed to local, state, and federal governments from the production of these five crops in the state. This production stimulated economic activity, and the businesses and workers who benefit from this production paid federal, state, and local taxes on their receipts and earnings. These taxes included local, state, and federal income taxes on individual and business income, sales taxes, and property taxes. They also included Social Security and Medicare payroll taxes.

Tax revenues resulting from selected specialty crop production are presented in **Table 4** in three categories: local and state, federal, and total taxes. Local and state taxes generated in the state totaled more than \$9.45 million in 2016. Federal taxes exceeded \$19.57 million, bringing the total taxes generated by these crops to about \$29.03 million during this period.

Top 10 Sectors

This section shows the top 10 economic sectors benefiting from selected specialty crops in Mississippi in 2016. Recipients of these benefits purchased goods and services from these top 10 sectors, which created jobs for local residents, who spent a portion of their disposable income on goods and services in the state. The top 10 sectors impacted by selected specialty crop production are shown in **Table 5**.

Based on total contribution to output, the top 10 sectors in the state benefiting from these five crops included vegetable and melon farming; owner-occupied dwellings; fruit farming; real estate; support activities for agriculture and forestry; wholesale trade; Hospitals; all other food manufacturing; physicians' offices; and limited-service restaurants. Combined, these 10 sectors comprised more than 68.79 percent of the employment, 86.61 percent of the labor income, 83.09 percent of the total value added, and 73.58 percent of the output associated with growing these five crops in Mississippi in 2016.

When looking only at agriculture, three industries benefited more from the production of the five specialty crops in the state. Those were vegetable and

melon farming, fruit farming, and support activities for agriculture and forestry, accounting for 72.25, 4.73, and 2.67 percent, respectively, of the output among the top 10 industries in 2016. Support activities provide support services that are an essential part of agricultural and forestry production in Mississippi. These support activities may be performed by the agricultural or forestry establishment or conducted independently as an alternative source of inputs required for the production process for a given crop, animal, or forestry industry in the state.

Table 4. Selected specialty crops' tax contributions to the Mississippi economy, 2016.

Specialty crop	Federal taxes (\$)	State and local taxes (\$)	Total taxes (\$)
Blueberries	1,206,675	600,820	1,807,495
Honey	199,608	123,596	323,204
Pecans	286,976	137,649	424,625
Sweet potatoes	17,334,040	8,328,305	25,662,345
Watermelons	548,187	263,382	811,569
Total	\$19,575,486	\$9,453,752	\$29,029,238

Table 5. Top 10 Industries Affected by Specialty Crops Cluster in Mississippi, 2016

Sector description	Employment	Labor income (\$)	Total value added (\$)	Output (\$)
Vegetable and melon farming	935	109,339,113	109,992,636	126,548,058
Owner-occupied dwellings	0	0	8,028,204	12,348,335
Fruit farming	153	7,133,951	7,694,046	8,292,543
Real estate	27	477,204	3,529,837	5,120,803
Support activities for agriculture and forestry	85	3,204,245	3,587,858	4,683,515
Wholesale trade	19	1,259,021	2,590,444	4,201,796
Hospitals	30	1,739,442	2,121,666	4,201,179
All other food manufacturing	11	413,664	563,604	3,371,066
Physicians' offices	23	2,060,849	2,011,681	3,214,421
Limited-service restaurants	44	709,099	1,505,395	3,169,104

Table 6. Multipliers for selected specialty crops cluster in Mississippi, 2016.

Item	Total multiplier
Output	1.71
Labor income	1.26
Value added	1.45
Employment	1.72

Multipliers

Economic activities associated with selected specialty crops grown in Mississippi produced a ripple effect, which can be summed up with a multiplier. **Table 6** contains the impact multipliers associated with these crops in the state. The total multiplier is an aggregate of the direct, indirect, and induced effects in the model. The ripple effect arises from the interactions among producers of goods and services in different sectors of the agriculture industry and economy.

In 2016, the average output multiplier for the five crops was 1.71, which suggests that, for every \$100 spent, an additional \$71 was generated indirectly by other sectors in the economy. Similarly, the employment multiplier of 1.72 suggested that, for every 100 jobs created, an additional 72 jobs were generated in other areas of the state's economy. Multipliers for the five specialty crops ranged from 1.26 for labor income to 1.72 for employment.

Growing the Specialty Crops Cluster

In a future report, we will focus on identifying economic leakages and/or growth opportunities among specialty crops grown in Mississippi (Barnes and Myles, 2017). However, this report can be used to explore growth opportunities and their associated effects. For example, if we assume a 10, 15, or 25 percent increase in production or decrease in imports of these crops in the state, these changes would contribute significantly to the economic well being of the agricultural industry and the state's economy.

Table 7 shows the economic contributions of expanding production of or decreasing import levels of the five selected specialty crops in Mississippi and the resulting ripple effects on key economic variables. Increasing specialty crops production by 10 percent in the state would contribute an additional \$23.8 million to output. This increase would ripple throughout the agriculture industry and economy and increase employment by 193 jobs, labor income by almost \$14.6 million, and total value added by \$17.04 million.

Table 7. Mississippi specialty crops cluster growth and economic contributions, 2016.

Item	Base model	Scenario: 10%	Scenario: 15%	Scenario: 25%
Output	238,030,051	261,833,056	273,734,559	297,537,564
Labor income	145,864,767	160,451,244	167,744,482	182,330,959
Value added	170,442,706	187,486,976	196,009,111	213,053,382
Employment	1,929	2,122	2,219	2,412
State taxes	9,453,752	10,399,127	10,871,815	11,817,190

Note: All values in dollars except for employment.

Increasing the production of these specialty crops would also contribute to local, state, and federal taxes. These *additional* benefits would increase economic activity and enhance economic development. For example, a 10 percent increase in production would contribute almost \$24.75 million (scenario minus baseline results) in combined output and tax revenues to the agricultural industry and the state's economy. Similar analyses can be made for the 15 percent and 25 percent scenarios.

Conclusion

The results of this report are important to discussions of how to expand specialty crops' role as a major player in the state's agricultural industry and economy. Selected specialty crops' contribution to the state's total industrial output equaled almost \$238 million in 2016. More than \$170 million was estimated as total value added to the state's economy. In addition, these crops directly and indirectly supported 1,929 jobs in the state and \$146 million in labor income.

In relative terms, these selected specialty crops contributed about 3.89 percent of this industry's total employment (50,491 jobs), about 5.80 percent of labor income (almost \$2.52 billion), 3.74 percent of output (more than \$6.372 billion), and 3.22 percent of local and state taxes (\$2.93 billion) generated by the agricultural industry in 2016.

Numerous businesses in many sectors of Mississippi's economy are linked together as suppliers and purchasers of goods and services and benefit from agriculture, and specialty crop production in particular. More than 83.09 percent of the total value-added impacts were concentrated in the top 10 sectors of the state's economy. Combined, these 10 sectors contributed \$141.62 million of the total value added. According to our analysis, increasing the output of selected specialty crops by 10 percent (about \$14 million) could contribute about 193 jobs, \$24 million in total economic output, and about \$17 million in gross regional product to the Mississippi economy.

This highlights an important economic development question: *Which strategies could be used to grow this particular set of specialty crops as a cluster of economic activity within Mississippi's local food system?*

Future research should examine alternative approaches to develop this important cluster of economic activity within Mississippi's agricultural food system.

Identifying new locations for farmers' markets, expanding sales at existing farmers' markets, and identifying opportunities for producers to sell specialty crops to new value-added markets could be among possible growth strategies. As a result, the next step in the Local Food System Economies (LFSE) program is to examine the local food systems in all of Mississippi's counties to understand existing local production and consumption patterns (Wells and Barnes, 2017).

References

- Barnes, J. and A. Myles. 2017. Local Food Economies: Alternative Approaches for Estimating County-Level Food Supply and Demand. Department of Agricultural Economics, Mississippi State University Extension Service, Extension Working Paper.
- IMPLAN Group, LLC. 2014. IMPLAN Version 3.0 User's Guide. IMPLAN Group, LLC. Huntersville, North Carolina.
- Mississippi Agricultural, Forestry, and Natural Resources Factbook. 2016. Available at: <http://www.dafvm.ms-state.edu/factbook.pdf>.
- Mississippi Department of Agriculture and Commerce (MDAC), Specialty Crops Definition. Available at: <https://www.mdac.ms.gov/bureaus-departments/market-development/specialty-crop-block-grant-program/definition-specialty-crops/>.
- Myles, A. and K. Hood. 2010. Economic Impact of Farmers' Markets in Mississippi. Mississippi State University Extension Service, Publication 2582.
- United States Department of Agriculture, National Agricultural Statistics Service. Available at: <https://quickstats.nass.usda.gov/#98357DF3-ADEA-3919-B2B9-B16E2EAA1493>.
- United States Department of Labor, Bureau of Labor Statistics. Producer Price Index: Fruits and Vegetables. Available at: <https://www.bls.gov/ppi/>.
- Watson, P., J. Wilson, D. Thilmany, and S. Winter. 2007. Determining Economic Contributions and Impacts: What Is the Difference and Why Do We Care? *Journal of Regional Analysis & Policy*, 140–46.
- Wells, K. and J. Barnes. Mississippi Local Farms and Food Profiles. Mississippi State University Extension, *Forthcoming*.

Publication 3157 (POD-10-17)

By James Barnes, PhD, Associate Extension Professor and Extension Economist, and Albert Myles, PhD, Professor Emeritus, Agricultural Economics.



Copyright 2017 by Mississippi State University. All rights reserved. This publication may be copied and distributed without alteration for nonprofit educational purposes provided that credit is given to the Mississippi State University Extension Service.

Produced by Agricultural Communications.

We are an equal opportunity employer, and all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, disability status, protected veteran status, or any other characteristic protected by law.

Extension Service of Mississippi State University, cooperating with U.S. Department of Agriculture. Published in furtherance of Acts of Congress, May 8 and June 30, 1914. GARY B. JACKSON, Director