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Public Policy Incentives for Large-Scale Dairies in Georgia

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Declining dairy cow populations in Georgia at a time when the human population is increasing lead to changes in the milk marketing system. A public policy initiative from state government to increase the number of large-scale dairies in Georgia has the potential to increase economic activity throughout the state. Total state output impact of a 1,000-head dairy farm in Georgia is $7.854 million, including $4.256 million in indirect economic activity. Although the agricultural sector receives the greatest benefits of dairy production, other sectors have significant sales and employment from milk production. Fluid milk manufacturing is an enterprise separate from production that has a state-level output impact of $9.844 million for a dairy farm with 1,000 milk cows. Results show there are economic development incentives for states to adopt public policies which can affect milk distribution and marketing in the Southeast.

Milk production across much of the southeastern United States has been declining for more than two decades. Since the late 1980s, southeastern states have experienced average annual declines in milk production of about five percent (NASS 2005). This decline, coupled with an increasing population in the region and hence an increasing demand for milk, has sparked considerable interest in examining the causes, effects, and potential remedies for declining milk production. Several factors are likely contributors to declining production. The growth of comparatively larger dairy farms located outside the region that are capable of spreading fixed costs over higher levels of production and achieving economies of scale sufficient to overcome the additional cost of transporting milk into the Southeast are generally viewed as one significant factor (Blayney 2002). Additional factors include strong growth in the industrial and service sectors of the Southeast's economy over the past two decades, which has resulted in a proliferation of competing employment opportunities that make it increasingly difficult to keep successive generations on the farm; higher land prices, which make farmland more valuable in non-farm uses; and increased environmental pressures. Another contributing factor may be certain provisions of Federal Milk Marketing Orders, which calculate and enforce floor prices representing the minimum price that must be paid to dairy cooperatives or independent dairy farmers for milk. In recent years, such prices have been averaged across increasingly broader regions and tied to often volatile prices for manufactured dairy products such as cheese, butter, milk powder, and whey (Cox and Cropp 1999).

Declining milk production affects the region's economy on several different levels by negatively impacting the demand for inputs to milk production such as feed and forage, farm equipment, supplies, and veterinary services. As production falls below the necessary level, or "critical mass," needed to maintain these supporting industries at a local level, dairy farmers must turn to distant suppliers. Declining production reduces the amount of milk available for producing manufactured dairy products such as cheese and butter, thus limiting growth of these industries and encouraging new manufacturing facilities to locate elsewhere. In recent years, the Southeast in general and Georgia in particular has failed to produce enough milk to meet even its own demand for fluid consumption, leading to ever-increasing shipments from outside the region and raising the possibility that the state could eventually begin to realize declines in its milk-bottling industry (Mosley 2006).

Production declines in Georgia have been less than overall Southeastern declines. Georgia has lost milk-production capacity at a rate of less than one percent per year, or about 9.3 million pounds annually, over the previous decade. This decline is, however, more severe than it appears in light of the fact that more than half of the state's production goes to supply the Florida market. At the same time, Georgia's population has grown by more than 1.7 million people, or roughly 23 percent, over the previous decade. This has increased overall demand

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for milk by more than 32 million pounds per year, based on annual per-capita consumption estimates of 192.3 pounds. As a result, milk shipments into the state have increased from 62.2 million pounds in 1996 to 549.3 million pounds in 2005 (Gates 2006).

Declining milk cow populations in Georgia have occurred mostly on smaller operations with fewer than 300 cows. These operations typically realize inefficiencies from attempting to produce feed as part of the dairy operation. Larger operations are more economically viable and achieve operational efficiencies by concentrating on milk production and purchasing feed from other Georgia crop farmers. An innovative alternative for large-scale dairies is pasture-based production that can utilize ideal growing conditions in Georgia. Thus, while total milk cow numbers are decreasing, there is demonstrated potential for the emergence of a restructured industry with larger operations.

Some U.S. states shipping milk into other states have implemented initiatives aimed at stabilizing or expanding local milk production in order to maintain the critical mass necessary to maintain a viable dairy industry. These policies include financial incentives for recruiting dairies to relocate from other states and countries. Georgia does not presently have dairy-recruitment programs with financial incentives. An important step in gaining support for such initiatives is demonstrating their positive impacts on state and local economies. The following analysis estimates the impact of a 1,000-cow dairy on Georgia's economy. Attracting large-scale dairies of 1,000 head or more is an important factor in maintaining a viable dairy industry. Dairies of this size are better positioned to achieve the economies of scale needed in order to survive in the long run and sustain other supporting industries, providing long-term economic benefits.

Input-Output Models and Economic-Impact Analysis

Economic impacts are estimated with input-output models that separate the economy into various sectors, such as agriculture, construction, manufacturing, trade, and services. The input-output model then calculates how a change in one industry changes output, income, and employment in other industries. These changes, or impacts, are expressed in terms of direct, indirect, and induced effects. Direct effects represent the initial impact on the economy of some feature (i.e. construction or operations) of an enterprise. Indirect effects are changes in other industries caused by direct effects of an enterprise. Induced effects are changes in household spending due to changes in economic activity generated by both direct and indirect effects. The total economic impact is the sum of direct, indirect, and induced effects. Input-output analysis can interpret the effects of an enterprise in a number of ways including output (sales), labor income (employee compensation and proprietary income), employment (jobs), and tax revenue (MIG 2004). This research quantifies the economic impacts of a 1,000 head dairy in Georgia.

A model for application in economic-impact analysis of a firm or industry is represented by

$$(1)\quad \text{Profit } (P) = \text{Total Revenue } (TR) - \text{Variable Costs } (VC) - \text{Fixed Costs } (FC).$$

Insurance and business support services in *FC* are combined with *VC* (minus operating interest) to form operating costs *(OC)*. Payments for capital and interest (operating and capital) are wealth transfers that increase operator net equity and, along with profit, are designated as other property income *(OPI)*. With indirect business taxes *(IBT)*, the model for estimating economic impacts is

$$(2)\quad \text{Impact} = f(OC, OPI, IBT).$$

Equation 2 is applied in an input-output model (IMPLAN) developed by the Minnesota IMPLAN Group, Inc. (MIG 2004).

Economic Impacts of Dairy-Farm Construction

Economic-impact analysis of a new enterprise begins with evaluation of expenditures related to construction of facilities. Construction expenditures for milk production include the purchase and installation of facilities and associated equipment, such as barns, milking parlor, feeding and watering systems, and waste-management equipment. Construction impacts end when the dairy farm is complete and milk production begins. Construction costs are for a freestall barn with concrete floors. Milking occurs after cows are led from the barn

into a double-herringbone milking parlor. Cows are cooled by an overhead fan system. Costs of a dairy farm with 1,000 milk cows are estimated at $3.065 million. Costs include $2.755 million for buildings and facilities, $35,000 for a watering system, and $274,520 for a waste-management system (Lacy and Ely 2005).

Estimated dairy-farm construction impacts from output, labor income, employment, and state and local taxes for Georgia are presented in Table 1. Labor income is earnings of employees and proprietors impacted by the construction activity. Employment includes both full-time and part-time jobs for employees.

Direct output effects of construction are costs of construction, $3.065 million. This total represents construction costs of all buildings as well as the purchase and installation of dairy operational equipment. The infusion of $3.065 million into the state economy generates indirect output of $965,600. Indirect effects represent business-to-business purchases between construction firms and their supplying, or supporting, firms (i.e., purchasing building materials, surveying services, etc.). Induced output is caused by construction personnel and impacted employees spending their income on consumer products and services. Total output impact for construction is $5.430 million.

Output impacts lead to jobs, as well as income earned by employees and proprietors. Construction of a dairy directly involves 33 jobs and income of $1.316 million for employees and proprietors. Indirect and induced effects involve 22 additional jobs and income of $859,241. Economic activity from dairy-farm construction generates $201,360 in state and local tax revenues.

Economic Impacts of Operating a Dairy Farm in Georgia

Operation of a dairy farm leads to annual economic impacts due to purchasing of direct inputs and paying incomes to employees. The model dairy farm has 1,000 milk cows with an average lactation period of 13.3 months. This averages to 902 cows of the 1,000 total cows producing milk at any time. Producing cows yield 20,500 lbs. per year, which results in average production of 18,496 lbs. from total milk cows (rolling herd average). Selling milk at the 2005 price of $18.00/cwt. returns $3,329,323 in milk sales, and selling cull cows leads to total revenue of $3,597,111.

Estimated crop inputs per year for feed are 5,105 tons of corn for grain, 10,258 tons of silage, and 1,495 tons of hay. Applying assumed yields provides an estimate of acreage requirements for supplying the dairy farm. Corn yield of 150 bushels/acre leads to 1,215 corn acres. Silage yield of 20 tons/acre indicates 513 acres, and hay yield of 2.5 tons/acre results in 598 acres (Lacy and Ely 2005).

Table 2 shows the direct costs, employee compensation, and other property income for applying an input/output model to a dairy farm. Employee compensation includes wages and benefits that total $548,700 for 16 full-time employees. Salaries and benefits include a total of $166,500 for one owner and one manager. Wages and benefits total $382,200 for employees hired for herd health and maintenance (2), feeding (2), milking (6), raising replacements (3), and maintaining facilities and equipment (1). Employee wages and benefits are calculated for each employee working 2,600 hours per year. Other property income includes capital payments, interest

Table 1. Dairy Construction: One-Time Impact, Georgia.[1]

	Direct effect	Indirect effect	Induced effect	Total effect
Output ($)	3,064,520	965,600	1,400,207	5,430,327
Labor income ($)	1,316,450	389,418	469,823	2,175,692
Employment	33	8	14	55
State/local tax ($)	NA	NA	NA	201,360

[1]Totals may not sum due to rounding.

paid, and net returns to the farm (MIG 2004). With net returns included in other property income, all items listed in Table 2 are equal to the total output value for the farm.

Total revenue of $3,597,811 is dairy-farm output and total input costs in Table 2 represent the first round of impacts due to production. This leads to subsequent rounds of indirect spending that are caused by the dairy farm purchasing inputs in Table 2. IMPLAN includes a regional purchase coefficient (RPC) for each industrial sector corresponding to input costs. An RPC represents the percentage of demand that is satisfied by production within Georgia. An assumption of the model is that dairy farms provide markets for Georgia crop production, and RPCs are set to 100 percent for grain, silage, and hay.

Table 3 shows output, labor income, employment, and tax impacts due to dairy production in Georgia. Output value of $3.598 million leads to total output impacts of $7.854 million. Indirect output caused by business to business spending is $3.095 million, and induced output caused by the spending of income earned is $1.161 million. Direct labor income from a dairy is $548,700 for 16 jobs. Indirect and induced impacts lead to a total of 92 jobs and total income of $2.306 million for employees and proprietors.

Output multipliers for dairy production are calculated by dividing the total output effect by the output (value of sales) of the dairy. Total output of $7.854 million from $3.598 in direct sales results in an output multiplier of 2.18 for a Georgia dairy farm. Thus every dollar in sales by the dairy farm

Table 2. Input-Output Data for Dairy Production.[1]

Input	Dollars
Hauling milk	184,962
Assessment & fees	64,340
Vet & medical	102,000
Dairy supplies	103,759
Repairs	55,161
Insurance	27,929
Utilities	65,000
Insemination	32,842
Medical BST	36,800
Waste management	15,000
Custom hire	10,000
Miscellaneous	8,000
Grain	929,515
Silage	333,399
Hay	97,219
Minerals	63,875
By-products	123,496
Milk replacer	14,653
Employee compensation	548,700
Indirect business taxes	3,929
Other property income	777,231
Output	3,597,811

[1]Total may not sum to output due to rounding.

generates another $1.18 of economic activity for the state. Output for a large dairy farm generates $228,199 in tax revenues for state and local governments.

Impacts among major industrial sectors in Table 4 indicate that while agriculture receives the greatest benefit, other sectors are significantly impacted by operation of a dairy farm. High utilization of crops for feed causes large impacts in the agricultural sector. Impact results are predicated upon an assumption that all crops for feed come from within Georgia. Input-output theory implies that utilized crops are from new acreage planted in the region. A change in crop marketing from current outlets to dairy production does not cause net economic impacts related to crop production. Output in general services, including financial, insurance, and real estate services, totals $1.247 million. Activities in services generate $472,562 in income and 14 jobs.

Economic Impacts of Fluid Milk Manufacturing

Milk produced in Georgia may move to a fluid milk manufacturing plant for further processing in the state. As value is added to raw milk, economic impacts caused by production of the dairy farm occur in the manufacturing sector. Estimated output value of fluid milk manufactured is $6.659 million from the $3.329 million of raw milk produced

Table 3. Dairy Production: Annual Impact, Georgia.[1]

	Direct effect	Indirect effect	Induced effect	Total effect
Output ($)	3,597,811	3,095,382	1,161,093	7,854,287
Labor income ($)	548,700	1,367,347	389,589	2,305,636
Employment	16	64	11	92
State/local tax ($)	NA	NA	NA	228,199

[1]Totals may not sum due to rounding.

Table 4. Dairy Production: Annual Impact to Major Sectors, Georgia.[1]

	Output ($)	Labor income ($)	Employment
Agriculture	5,240,274	1,443,768	68
Mining, construction	20,339	8,368	0
Utilities	122,134	25,467	0
Manufacturing	288,299	48,559	1
Transportation, warehousing	297,341	115,235	3
Trade	363,047	162,526	5
Finance, insurance, real estate	417,619	108,377	3
Services	828,985	364,185	11
Government	276,250	29,152	1
Total	7,854,287	2,305,636	92

[1]Totals may not sum due to rounding.

(AMS 2005; USGAO 2004). Total output value of fluid milk manufacturing does not include impacts of milk production presented in Table 3. Georgia has several existing fluid milk processing facilities with capacity for additional milk production. Economic impacts of the $6.659 million value for processed milk are estimated by utilizing the fluid milk manufacturing sector of IMPLAN. Table 5 shows the total output impact is $9.843 million for fluid milk manufacturing. This output generates $1.604 million of income for employees and proprietors involved in 36 jobs. Fluid milk processing and associated activities generate $235,877 in state and local taxes.

Table 6 signifies the widespread impact that milk production has in the state economy. Fluid milk manufacturing has the greatest impact in the manufacturing sector, while Table 4 shows that production impacts are concentrated in the agricultural sector. Similar to production, milk manufacturing has significant impacts in the service sectors.

Impacts in Table 5 for milk processed from production in Table 3 can be summed in order to determine the total Georgia impacts due to production and processing from one dairy farm with 1,000 cows. Policy initiatives directed at the milk industry have public costs which can be compared to tax revenues created from milk produced and processed in Georgia. Summation of tax revenues due to production ($228,199) and processing ($235,877) totals $464,076 from one dairy farm in annual tax revenues for state and local governments. These an-

Table 5. Fluid Milk Manufacturing: Annual Impact, Georgia.[1]

	Direct effect	Indirect effect	Induced effect	Total effect
Output ($)	6,658,646	2,165,152	1,020,028	9,843,826
Labor income ($)	594,217	667,828	342,752	1,604,797
Employment	12	13	10	36
State/local tax ($)	NA	NA	NA	235,877

[1]Totals may not sum due to rounding.

Table 6. Fluid Milk Manufacturing: Annual Impact to Major Sectors, Georgia.[1]

	Output ($)	Labor income ($)	Employment
Agriculture	10,981	4,903	0
Mining, construction	32,799	13,779	0
Utilities	118,115	23,938	0
Manufacturing	7,375,274	701,178	14
Transportation, warehousing	174,915	77,344	2
Trade	496,509	217,290	5
Finance, insurance, real estate	428,287	114,595	2
Services	1,051,716	441,349	12
Government	155,231	10,421	0
Total	9,843,826	1,604,797	36

[1]Totals may not sum due to rounding.

nual revenues are in addition to any one-time taxes derived from construction activity. Tax revenues generated provide policy makers with information for comparing tax costs of dairy policies with tax benefits.

Summary

Declining dairy cow populations in Georgia at a time when the human population is increasing lead to changes in the milk marketing system. Federal programs influence milk distribution and create economic conditions that impact dairy producers. Increased dairy production in Georgia has the potential to increase economic activity throughout the state. In addition to creating general business activity in support of dairy operations, feed-input requirements create demand for agricultural products. State impacts of a dairy farm in Georgia include $4.256 million in indirect economic activity, for a total state output impact of $7.854 million. Although the agricultural sector receives the greatest benefits of dairy production, other sectors have significant sales and employment as a result of dairy production. Fluid milk manufacturing is an enterprise separate from production that has a state-level impact of $9.844 million for a dairy farm with 1,000 milk cows. A 1,000 head dairy farm creates $464,076 in state and local tax revenues throughout Georgia.

Economic impacts from milk production provide incentives for state government to become involved with establishing conditions beneficial for large-scale dairy operations. Georgia could follow precedents set by other states in providing financial incentives for recruiting dairies to relocate in Georgia from other states and countries. Results from this research could serve as a benchmark for comparing public benefits to the costs of providing these financial incentives. Existing Georgia dairies are capable of complying with waste-water regulations utilizing current technology. However, assistance and streamlining of the permitting process would make Georgia an attractive alternative for dairies desiring to relocate. Georgia has ample capacity for increasing crop production to supply grain, silage, and hay, which allows large-scale dairies to achieve efficiencies by contracting feed production to local producers. The milk production and distribution situation in Georgia is typical of other Southeastern states. Improving conditions for milk production and distribution in the region depends greatly on policy developments at the Federal level. This research shows the benefits of state governments adopting public policy that creates incentives for large-scale dairy operations. Results indicate that there are economic development incentives for states to adopt public policies which can affect milk distribution and marketing in the Southeast.

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