American Farmland Trust

INCREASING LOCAL MILK PROCESSING CAPACITY: BENEFITS TO PIONEER VALLEY CONSUMERS AND COMMUNITIES

American Farmland Trust
in cooperation with
Community Involved in Sustaining Agriculture

January 2011

Acknowledgements

The economic analysis contained in this report was produced by Carl Mailler, a consultant to American Farmland Trust (AFT) and the Community Involved in Sustaining Agriculture (CISA). The report was authored by Cris Coffin and Ben Bowell in AFT's New England Office and edited by AFT's Julia Freedgood and Doris Mittasch. Margaret Christie from CISA provided invaluable assistance with this project. Work on this report was supported in part with funds from USDA's Northeast Region Sustainable Agriculture Research and Education Program and the USDA Rural Development Program. The material is the result of tax-supported research and as such is not copyrightable. It may be freely reprinted with the customary crediting of the source. American Farmland Trust is an equal opportunity provider and employer.

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Introduction

The Pioneer Valley—a fertile valley encompassing three Massachusetts counties that straddle the Connecticut River—has been farmed since the 1600s. Agriculture is deeply embedded in the conscience and culture of the region. While the Valley's fertile bottomlands mainly are devoted to high-value vegetable and horticulture crops, dairy cows dot its many upland pastures and hillside farms, and are a mainstay of the region's agricultural economy and land base. Despite strong local markets and improving profitability among the Valley's farm businesses generally, many of the Valley's dairy farms are on the economic edge, selling into a volatile regional fluid milk market where milk prices often fail to cover production costs.

To improve profitability, some of the Valley's dairies have shifted, in whole or in part, from the traditional wholesale milk marketing to marketing of branded milk and dairy products. Some sell raw milk directly from their farms; several are processing their own milk (and sometimes others') on-farm into branded cheeses and yogurts; and at least one bottles and sells its own line of fluid milk products through a home delivery service. A cooperative of local dairy farms sells milk under the Our Family Farms label through retail outlets around the Valley, relying on a third-party processor for its bottling.

Marketing branded local products has proven to be a successful strategy increasing income to farmers. However, with the exception of raw milk, branding fluid milk and dairy products involves additional processing, which involves a host of additional considerations for dairy farmers: product demand and options, whether to use an existing processing facility or build a new one, ownership and labor strategies, and costs and financing.

This last consideration is the primary focus of this report. In order to assess the potential opportunities of public and private investment in new dairy processing infrastructure in the Valley, American Farmland Trust (AFT) analyzed the likely macroeconomic impact of a new dairy processing plant at two different scales of production. We evaluated potential secondary economic impacts that might be occur as a result of increased local milk processing capacity, in the form of additional local milk production. AFT also reviewed dairy farm impacts on local communities, the Valley's landscape and environment. Finally, we investigated regional and national dairy trends and conditions to consider the likelihood that dairy farms will remain viable in the Valley absent additional local milk processing infrastructure or other means of capturing a larger percent of the retail dollar for their products.

The objective of this report is to quantify the impacts that a hypothetical new milk processing plant would have on the Valley's economy and communities as a whole. To be clear, it is not to determine the feasibility of any specific type of dairy processing plant or infrastructure, or the impact of infrastructure development on local farm profitability. This analysis is part of a larger project undertaken by Community Involved in Sustaining Agriculture (CISA) to explore the benefits and challenges of investing in local food and agricultural infrastructure in the Pioneer Valley.

Work on this analysis and the larger CISA project was supported in part with funds from USDA's Northeast Region Sustainable Agriculture Research and Education Program and the USDA Rural Development Program. Results can be found in CISA's final report: *Scaling Up Local Food: Investing in the Farm and Food Systems Infrastructure in the Pioneer Valley.*

AFT is the nation's leading conservation organization dedicated to saving America's farm and ranch land, promoting environmentally sound farming practices and supporting a sustainable future for agriculture. As the vital link among farmers, conservationists and policy-makers, AFT is focused on ensuring the availability of the land that provides fresh food, a healthy environment and lasting rural landscapes. Our New England Office is located in Northampton, Massachusetts—the heart of the Pioneer Valley. AFT has a strong body of research work, including Cost of Community Services studies and county agricultural economic impact analyses. These studies and more can be found on our Web site: www.farmland.org.

I. Dairy Farms in the Pioneer Valley: A Snapshot

The Pioneer Valley serves as the vital core of the state's dairy sector. According to the Massachusetts Department of Agricultural Resources (MDAR), 77 Valley dairy farms sell milk and are inspected by the Department.[i] This represents over 40 percent of the Commonwealth's 180 remaining dairy farms.[ii] These farms are home to approximately 6,600 cows and produce approximately 295,000 pounds of milk per day.[iii] However, while this is significant volume, it only represents 15 percent of the region's milk utilization.[iv]

Economic Impact

According to the 2007 Census of Agriculture, dairy farms in the Pioneer Valley sell nearly $22 million in milk and dairy products annually and an additional $3.2 million in cattle and calves. This represents about 44 percent of all dairy farm-related sales in Massachusetts.[v] While dairy farms are only about 5 percent of the total number of farms in the Valley, they represent a larger portion of the region's farm economy, accounting for 18 percent of the region's total reported farm product sales.[vi]

The average dairy farm in the Pioneer Valley generates about $325,000 in milk and cow sales annually. This money multiplies as it moves from the dairy farm through the local economy—in taxes paid, processing and services required, jobs generated—to produce a larger economic impact. To determine just how large this impact is, AFT used IMPLAN, an input-output modeling program, to examine the broader impact of these farms and the region's dairy product processing facilities on the Valley's economy.

> *The IMPLAN model*: To build the model, AFT and CISA purchased from the Minnesota Implan Group data sets representing the total economic activity of Franklin, Hampshire and Hampden counties, along with software to run the modeling program. A single model was then created to capture all of the industrial sectors that exist in the Pioneer Valley. Data for dairy cattle and milk production, fluid milk and butter manufacturing, cheese manufacturing, dry condensed, and evaporated dairy product manufacturing, and ice cream and frozen dessert manufacturing sectors were extracted for further analysis.

As the table below indicates, the IMPLAN model showed an annual output from the Valley's dairy farms of approximately $21.4 million, dairy farm employment of 229 people and 2008 employee compensation of slightly under $1 million.[vii]

Not surprisingly, the combined economic output of the region's dairy farms and its dairy product processing facilities is much higher, accounting for $611.8 million in output, 1,170 jobs and $68.5 million in employee compensation. While the IMPLAN data does not detail the number or location of dairy processing facilities in the region, a few of the larger facilities include a Hood plant in Agawam, a Friendly's ice cream manufacturing plant in Wilbraham and a plant owned by Agri-Mark Dairy Cooperative in West Springfield that produces heavy sweet cream, condensed skim milk, skim milk, nonfat dry milk powder and butter. The combined dairy sector represents 1.3 percent of the region's total economic output.

Because a significant portion of the fluid milk being processed in the Valley is coming from outside of the region, not all of the economic output from these facilities can be ascribed to the region's dairy farms. Assuming that 15 percent of the milk utilized by these manufacturing facilities is from Valley dairy farms, as the IMPLAN model suggests, a comparable percentage—or approximately $91.7 million of the $611.8 million in economic output from these processing facilities—can reasonably be ascribed to the region's 77 dairy farms.[viii] This translates into an average per-farm economic contribution of approximately $1.2 million, or an average of $13,900 per cow.[ix]

Table 1. Economic Impact: Employment, Output and Labor Income

Description	Employment	Output * 2008 Dollars	Employee Compensation 2008 Dollars
Total (3 county economy)	343,375	47,204,011,763	15,289,920,912
Dairy cattle and milk production	229	21,377,714	910,469
Fluid milk and butter manufacturing	366	260,166,256	23,065,480
Cheese manufacturing	0	0	0
Dry, condensed, and evaporated dairy product manufacturing	19	20,891,266	1,230,155
Ice cream and frozen dessert manufacturing	557	309,415,904	43,323,740
Total (dairy cattle + manufacturing)	1,170	611,851,140	68,529,844
Percent of local economy	0.34%	1.30%	0.45%

*Output represents the value of industry production. In IMPLAN these are annual production estimates for the year of the data set and are in producer prices. For manufacturers this would be sales plus/minus change in inventory. For service sectors production = sales. For Retail and wholesale trade, output = gross margin and not gross sales.

Impact on the Landscape and Environment

Landscape

In addition to having a large economic footprint, the Valley's dairy farms have a large land footprint, or greenprint, as well. Indeed, like dairy farms across New England, dairy farms in the Pioneer Valley are considered the anchor tenants of the region's farmland base. Part of the reason for this is the diversity of land types that are part of most dairy farms, including cropland, pasture, woodlots and wetlands. On average, the typical dairy farm has over 2 acres of cropland, 2 acres of woodland, and a half acre of pastureland for each cow.[x]

The Pioneer Valley is home to about a third of the Commonwealth's land in farms, or 169,000 acres. Of this acreage, dairy farms own or rent more than 30,300 acres—including 13,500 acres of the most productive cropland. This represents 18 percent of all land in farms in the three-county region, and 22 percent of its cropland.[xi] As of November 2010, 29,966 acres of the Valley's farmland had been permanently protected by the state's Agricultural Preservation Restriction (APR) Program, including some of the cropland owned or used by dairy farms.[xii] However, most of the Valley's hay and pasture land used by dairy farms is not protected through the APR program, as the program focuses on the state's most productive farmland and soil types. In any event, with only 15 percent of the region's farmland permanently protected, the agricultural land base needed to support the dairy industry is extremely vulnerable to development.

Environment

While it is difficult to quantify the environmental benefits of the Valley's dairy farms, well-managed farmland of all types provides a number of essential ecosystem services. These include carbon sequestration, surface and ground water filtration, aquifer recharge and flood prevention. Farms also offer feeding and breeding areas for local bird populations and provide stopovers for migrating birds, while providing habitat for many other land and aquatic species. In fact, farmland provides the primary habitat to a number of the species officially listed by the Massachusetts Division of Fisheries and Wildlife as endangered, threatened or of special concern, including the Wood Turtle, Eastern Spadefoot Toad, American Bittern (bird) and Eastern Ratsnake.

In its 2003 publication *Losing Ground: At What Cost?*, Massachusetts Audubon Society estimated the economic value of non-market ecosystem services—such as climate and nutrient regulation, habitat, soil retention and formation, pollination, recreation and aesthetics—that land in Massachusetts' farms provides. The Audubon study concluded that the annual value of these services provided by cropland and pasture is $1,381 per acre; for forestland, the value is $984 per acre. Using these figures, the 30,300 acres of farmland owned or rented by dairy farmers in the Pioneer Valley provides an estimated $35 million annually in market services.

While dairy farms can create negative environmental impacts, especially due to improper management of animal waste, that impact has not been quantified in the Valley and may be minimal. Many of the Commonwealth's dairy farms, including those in the Valley, participate in farm conservation programs offered by the U.S. Department of Agriculture (USDA) and MDAR. These programs provide cost-share assistance to address environmental concerns, and manure management has traditionally been a high program

priority. There are no farms in the Valley that meet the federal definition of a Concentrated Animal Feeding Operation (CAFO).

Cows are also a source of methane, a greenhouse gas. None of the farms in the Valley are large enough to meet the size threshold for methane reporting under the 2009 federal greenhouse gas (GHG) rules.[xiii] According to UMass Extension, improved forage quality can lead to greater digestibility and reduced methane emissions in cows. It is likely that some of the Valley's farms are experimenting with dietary changes to reduce methane.[xiv] In addition, there is an initiative underway with at least three dairy farms, which is supported in part by MDAR, to build on-farm methane digesters to convert cow manure and food waste into electricity.

Impact on Local Communities

Fiscal Impact

All of the Valley's farms make important fiscal contributions to their communities' tax bases. More than 150 Cost of Community Services (COCS) studies conducted in Massachusetts and around the country have found that farm, forest and privately owned open space pay more in property taxes than they require back in local services. COCS studies use a case-study approach to determine a community's public services costs versus revenues based on current land use. Three studies conducted by AFT in 2009 in the Massachusetts' communities of Dartmouth, Deerfield and Sterling found on average, farmland required $0.30 in services per $1.00 paid in taxes while residential land required $1.12 in services per $1.00 paid.[xv] This was true even of lands taxed under the Commonwealth's current use laws (Chapters 61, 61(A), and 61(B)). While residential development can increase a community's tax base, it also imposes costs on communities—for schools, roads and services—that eclipse the added revenues. Farmland and open space contribute surplus revenues to offset the shortfalls from residential tax payers.

Nutritional Impact and Food Security

Milk is an important part of a healthy diet, especially for children. According to USDA, Americans are not consuming the amounts of milk and milk products recommended in the 2005 federal dietary guidelines. To meet those guidelines, USDA's Economic Research Service (ERS) estimates that consumption of milk and milk products would have to increase by 66 percent nationally, requiring an increase in the number of dairy cows as well as increased feed grains and, possibly, increased acreage devoted to dairy production.[xvi]

Massachusetts no longer produces enough milk to satisfy the dairy consumption needs of its residents, so it imports milk from other states and regions. The cost and energy involved in shipping this milk are significant. According to Bob Wellington, Senior Vice President for Agri-Mark Dairy Cooperative, the cost of shipping fluid milk is at least three cents per retail gallon for every 100 miles. A gallon of milk shipped to Boston from Eau Claire, Wisconsin, adds at least 39 cents to its cost; from Fresno, California, 93 cents.[xvii] With oil prices already creeping back to the $100/barrel level seen in 2008, these costs likely will increase in the near future. The carbon footprint of shipping that milk via refrigerated truck is far greater as well. In short, beyond its nutritional value, local milk helps keep Valley consumers' food costs down and carbon footprints smaller.

Distance also places consumers at greater risk of supply disruptions. Natural disasters, weather events, terrorist acts, food safety scares, trucker strikes and energy shocks can cause stoppages in milk supply in a short period of time. The presence of local dairy farms is a welcome assurance there will be an available supply of milk even in the event of unexpected natural and man-made disruptions.

Quality of Life and Community Character

Perhaps the most valued attribute of the Pioneer Valley is its picturesque landscape dotted with cows and well managed cropland. While "quality of life" and "community character" are perennially hard to quantify, there is evidence that when faced with the potential loss of a local farm, Valley residents have rallied in support and voted to contribute municipal funds to help protect farmland. A Massachusetts poll conducted in 2007 by several land conservation organizations, including AFT, bears this out: When asked if they would be willing to pay at least five cents more for milk if the increase were to be used to directly support Massachusetts dairy farmers, 69 percent of respondents said yes.[xviii]

The region's farms and dairies also are important draws integral to local tourism. Its pastures and orchards, historic rural villages anchored by working farms and bountiful harvests of seasonal farm products help attract millions of annual visitors who spend more than $590 million each year in the Pioneer Valley.[xix]

II. Dairy Trends and Conditions: The Future for Pioneer Valley Dairy Farms

Just 60 years ago, Massachusetts had 5,000 dairy farms.[xx] In 2009, it had 180. Between 2003 and 2009 alone, the Commonwealth lost 50, or 22 percent, of its dairy farms, and its milk production dropped by 26 percent, or 86 million pounds.[xxi]

Globalization, milk production increases in other parts of the United States, and the rising costs of energy, feed, land, labor and environmental compliance in the Northeast all have contributed to a steady decline of Massachusetts' dairy farms. The last decade has been devastating. A "perfect storm" of milk price collapse, adverse weather and dramatic increases in production costs in 2006 led to farm milk prices of $1.12 a gallon and production costs of $1.61 per gallon. And in 2009, when the yearly average farm milk price dropped 30 percent from its 2008 level, the Northeast dairy industry had what many considered to be the worst year for dairy farming since the Great Depression.[xxii]

Sustained low milk prices over the past few years have taken their toll on even the most financially sound dairy operations. A 2010 Northeast Dairy Farm Summary compiled by Farm Credit East and based on input from 544 dairy farms paints a grim picture of the financial situation for Northeast dairy farms:

- 2009 saw the worst losses in the 39-year history of Farm Credit East's annual dairy farm summary
- Net earnings declined to a loss per cow of $386 in 2009; had it not been for government payments, this loss would have been $624 per cow
- Cash flow was not sufficient to meet all financial commitments
- Percent net worth decreased to 68 percent
- Debt per cow increased to $3,337[xxiii]

Were it not for $3.6 million in emergency dairy relief provided by the Commonwealth in 2006, and enactment of the Massachusetts Dairy Farm Preservation Act in 2008, the state's dairy farms would be in even worse financial condition. The Act established a permanent refundable income tax credit for dairy farmers based on production that kicks in every month that milk prices drop below a trigger price set by MDAR. The tax credit is capped, however, at $4 million annually, making the credit a less than adequate income safety net in years when milk prices are low and production costs are high.

The future does not look promising for dairy farmers who solely rely on wholesale milk marketing. While the price forecast for 2011 shows improvement over 2010, farmers relying on purchased feed are likely to see continued price increases.[xxiv] The long-range forecast suggests continued price volatility and extreme price swings, with milk prices dropping again in 2012.[xxv]

Congressional leaders have signaled a willingness to consider major reforms to dairy policy to improve farm income and reduce price volatility. The stage for that debate is being set by recommendations from the National Milk Producers Federation, and the national Dairy Industry Advisory Committee convened by U.S. Secretary of Agriculture Tom Vilsack.[xxvi] To date, reaction to these proposals from New England dairy leaders generally has been positive but none of the recommendations is likely to be implemented before the 2012 federal Farm Bill, and changes to these proposals may be needed to ensure an adequate safety net for New England dairies.[xxvii] The cost of potential policy changes is also a factor; calls for further cuts in farm program spending, including dairy programs, are expected from across the political spectrum in advance of and during the 2012 Farm Bill debate.[xxviii]

Absent significant near-term change in federal policy, sustained farm profitability for dairy farms in the Valley seems unlikely unless they can reduce their costs, improve milk prices through different marketing strategies, or diversify through new sources of on- or off-farm income. Additional milk and dairy processing capacity in the Valley would certainly increase the marketing options available to dairy farmers and seems one promising pathway toward the continued viability and sustainability of dairy farms in the region.

III. Dairy Processing

The marketing of branded local products is a successful strategy for returning increased income to farmers through better pricing or an increased share of the purchase price. Despite the plethora of local foods available in the Valley, this attractive option is not readily available to dairy farmers because of the challenges of processing milk products. In order to realize an increased return for a branded fluid milk product, dairy farmers must either build an on-farm processing plant or arrange for processing of their milk by an existing on- or off-farm processing plant.

Current processing options are limited and may not suit the needs of dairy farmers for a variety of reasons, including:

- Limitations on the volume of milk that can be processed at an on-farm plant;

- Inadequate bottling options, including both the range of sizes and types of packaging available;
- Lack of existing processing capacity for certain products, such as cream, half-and-half or butter, or of small quantities of any particular package size; and
- Limitations on segregation of milk from specific farms or regions, precluding source identification of the final product.

These processing challenges have deterred many Valley dairy farms from pursuing branded and value-added milk and dairy products to the extent needed to be profitable. As a consequence, the Valley's dairy farmers are unable to take full advantage of a highly engaged local consumer base that has a strong interest in buying locally branded milk and dairy products.

Consumption and Demand

Local Consumption

The USDA's ERS estimates that Americans consume 187 pounds of dairy products per person annually. Based on this national estimate, Pioneer Valley residents are consuming one-half of a pound of dairy products per person per day, for a total daily consumption of 355,000 pounds. With the 295,000 pounds of milk that they produce each day, the Valley's dairy farmers could meet an estimated 83 percent of this demand, if they were producing just for the region's milk and dairy product market.[xxix]

AFT's IMPLAN analysis shows both the proportion of demand for various milk and dairy products in the Valley that is being met by local producers and processing plants (the "Regional Purchase Coefficient") and the amount of locally produced commodity going to local demand (the "Regional Sale Coefficient"). As indicated earlier, the Valley is importing a significant amount of milk (85 percent) to meet the needs of the region's milk bottling and dairy manufacturing plants. Interestingly, the Valley is also importing processed fluid milk and butter to meet local demand, even while exporting significant product.[xxx] The IMPLAN Regional Purchase Coefficient indicates that 64 percent of the processed fluid milk and butter from the Valley's milk bottlers and dairy manufacturers is exported, as well as 89 percent of the ice cream and frozen desserts produced. However, the Regional Purchase Coefficient indicates that 30 percent of local demand for processed fluid milk and butter is being met by imports, and 15 percent of its demand for ice cream. While some of this may be a result of processor distribution patterns, it suggests that consumers may be seeking product not widely available from the region's larger processors, such as organic milk, offering a market opportunity for the Valley dairy farms. Unfortunately, IMPLAN does not break out specialty dairy products such as yogurt and cheese in a separate category, so we do not know what percent of local demand for these products is being met by the region's dairy processors.

Demand for Locally Branded Milk

Valley consumers have a limited diversity of locally branded milk and dairy products. While multiple brands of locally sourced fluid milk are available, there are fewer options for specialty milk products, such as half-and-half, light and heavy creams, buttermilk and

flavored milks, and no options for locally sourced organic milk. The choices are extremely limited as well for locally sourced butter, sour cream and other dairy products.

Anecdotal evidence of demand for branded local milk and dairy products in the Valley abounds. The Valley's only bottled milk home delivery service is frequently asked by consumers outside its service area whether it might be willing to expand.[xxxi] The Massachusetts Farm to School Project reports that a number of Valley public schools and school districts, including Williamsburg Elementary, Mohawk Regional and Gill-Montague, have expressed interest in sourcing their milk locally, and the Project fields frequent calls from parents interested in encouraging their local school to do so as well.[xxxii] Many of the Valley's colleges have taken steps to purchase local milk and dairy products: Hampshire College serves milk and dairy products from two Valley farms, Mapleline (which processes a line of fluid milk products on-farm) and Cook Farm (which produces Cook Flayvors ice cream and other dairy products); the University of Massachusetts at Amherst sells Mapleline products in its retail stores; and Smith College has purchased milk from High Lawn Farm in neighboring Berkshire County, Massachusetts.[xxxiii] Mount Holyoke College is interested in sourcing its milk locally, as is another large Valley institution, Bay State Healthcare Systems.[xxxiv]

While demand for locally branded milk seems strong amongst institutional buyers, the price differential between milk and dairy products from large corporate regional milk processors and from small independent Valley processors continues to deter many institutions from switching to local. The cost of processing milk into containers most useful to institutions, including bags, pint and half-pint containers, is especially expensive. According to the Massachusetts Farm to School Project, private institutions in the Valley are purchasing locally branded cheese and yogurts at least occasionally, and the Project sees the opportunity for growth more readily in this arena.[xxxv]

Increasing Local Dairy Processing Capacity

Meeting the demand for local milk and dairy products at a price point that works for both the Valley's dairy farmers and Valley buyers is a significant challenge. One way to improve the competitiveness of locally sourced milk and dairy products is to encourage public and private investment in additional local dairy processing infrastructure.

To consider the impact such an investment might have, AFT developed a regional IMPLAN model to analyze the potential macroeconomic benefits that might accrue from an expansion of milk processing capacity in the region. The IMPLAN model considers changes in sales, employment, wages (employee compensation) and proprietor income to measure the effects of a specific industry or sector on a study area.

Through the IMPLAN model, AFT explored the potential impacts of a hypothetical new fluid milk processing facility at two levels of output—sales of $1 million and sales of $3 million. These output levels were chosen in collaboration with CISA, based in part on CISA's earlier dairy plant feasibility work. Assuming that such a plant might encourage additional local milk production, AFT also analyzed the macroeconomic benefits that might accrue from an annual increase of $1 million in fluid milk sales from the Valley's dairy farms.

The results showed that additional processing capacity would produce broader economic benefits. A new processing facility with sales of $1 million would have a total impact of $1,571,880 on the local economy. This includes five full-time equivalent (FTE) jobs and a labor income of $234,945. Table 2 shows the direct, indirect and induced effects of this new processing facility. On the high end, a facility with sales of $3 million would have an impact of $4,715,641 on the Valley's economy. This includes 14 FTE jobs with a labor income of $704,834. Table 3 shows the impact of a plant with $3 million in sales.

Table 2. Impact of $1 Million in Sales from New Processing Facility

Impact Type	Output	Employment	Labor Income	Total Value Added
Direct Effect	$ 1,000,000	1.3	$ 87,476	$ 139,643
Indirect Effect	$ 426,107	2.3	$ 97,948	$ 179,842
Induced Effect	$ 145,773	1.2	$ 49,521	$ 87,987
Total Effect	$ 1,571,880	4.8	$ 234,945	$ 407,471

Table 3. Impact of $3 Million in Sales from New Processing Facility

Impact Type	Output	Employment	Labor Income	Total Value Added
Direct Effect	$ 3,000,000	4.0	$ 262,428	$ 418,928
Indirect Effect	$ 1,278,322	6.8	$ 293,842	$ 539,524
Induced Effect	$ 437,318	3.5	$ 148,562	$ 263,961
Total Effect	$ 4,715,641	14.3	$ 704,834	$ 1,222,412

Assuming an expansion of local dairy processing would lead to increased local dairy production and fluid milk sales, AFT also analyzed the potential economic impact of an additional $1 million in sales by local dairy farms. Our analysis found that an additional output of $1 million in fluid milk sales would have a total impact on the regional economy of $1,315,085, while creating 12 new jobs.

Table 4. Impact of $1 Million in Additional Milk Sales by Local Dairy Farms

Impact Type	Output	Employment	Labor Income	Total Value Added
Direct Effect	$ 1,000,000	10.2	$ 42,193	$ 375,104
Indirect Effect	$ 236,075	1.8	$ 58,219	$ 127,364
Induced Effect	$ 79,010	0.6	26,834	$ 47,692
Total Effect	$ 1,315,085	12.6	$ 127,246	$ 550,161

IV. Conclusion

The region's dairy farms are significant economic engines, each contributing $1.2 million on average to the local economy. When each farm's fiscal and environmental contribution is included, that number is even higher—around $1.65 million per farm.[xxxvi] Beyond direct economic contributions, there are macroeconomic benefits associated with expanding the region's milk and dairy processing capacity. If this expansion were to occur, it would

produce additional economic impact, with dairy farms increasing milk production to take advantage of increased local processing capacity and market opportunities.

Our findings are consistent with numerous studies that have shown that buying local food keeps dollars recycling in the local economy. A study by the Minnesota-based Crossroads Research Center found that if just 5 percent of food consumed in a seven-county region of Minnesota were purchased locally, farmers would see a $15 million increase in income and the local economy would get a $40 million boost.[xxxvii] A similar study in the Central Puget Sound region of Washington State calculated that every dollar in sales of food produced locally for export generated $1.70 in local economic activity, but every dollar in sales of locally produced food to local consumers generated $2.80 in economic impact to the community.[xxxviii]

How this additional milk and dairy processing capacity is best added—whether to current facilities or new, at what scale and whether on-farm or off, whether for bottled milk or processed dairy products or both—was not within the scope of this study and requires additional analysis. Adding this capacity, however, likely would be a win-win situation for the region's dairy farms, its communities and its consumers.

The economic future for these farms is highly uncertain; without an increase in milk prices and farm income, many of the Valley's dairy farmers may be unable or unwilling to continue. Not only would this further reduce the supply of local milk, it could leave even fewer farms and the economic, environmental, recreational and community amenities they provide. While some positive changes in federal dairy policy may be on the horizon, it is unlikely and unwise, based on both history and the growing emphasis on federal deficit reduction, to assume federal policy changes alone will be sufficient to ensure a sustainable future for the region's dairy farms.

Growing the region's milk and dairy processing capacity could improve farm profitability and reverse the trend of dairy losses. As importantly, it could improve the region's, and potentially the Commonwealth's, food security and self-sufficiency at a time of growing concern over potential short- and long-term supply disruptions and the sustainability of our current food system. The region's dairy farms produce 83 percent of the fluid milk needed to meet local demand for processed milk and dairy products, based on national consumption estimates.[xxxix] However, while most of the milk produced in the region is being processed in the region, a significant portion of the processed product—both milk and dairy products—is leaving the region. Expanding local milk and dairy processing capacity, which likely would stimulate additional local milk production, could increase the Valley's—and the Commonwealth's—level of milk self-sufficiency and ability to meet its own processing needs.

Lastly, while anecdotal, the evidence of unmet demand for locally branded milk and dairy products is strong. Many of the Valley's public and private schools, colleges and universities have expressed demand for local milk and dairy products. Additional demand exists for home delivery of bottled milk in areas currently not served and for locally branded specialty dairy products. Consumer dollars that could be captured by local dairy

farms are not being captured. How much market opportunity locally branded milk and dairy products represents depends on many factors, including the cost of processing.

Public and private sector investments in local milk and dairy processing infrastructure could provide the financial impetus needed for local dairy farms to pursue locally branded milk and dairy products. Given the economic and community benefits that additional local processing capacity could provide, and the very real potential and continued loss of dairy farms in the Valley absent other means to improve farm income, such investments seem prudent and worthy of further analysis and consideration.

End Notes

[i] Conversation with Massachusetts Department of Agricultural Resources Division of Animal Health staff, 2010;
[ii] Massachusetts Dairy Farm Revitalization Task Force Report to the Legislature, Nov. 9, 2007;
[iii] Conversation with MA Department of Agricultural Resources Division of Animal Health staff, 2010;
[iv] *See* Appendix A: An Economic Analysis of the Dairy Industry in Franklin, Hampshire and Hampden Counties (IMPLAN). Milk utilization in the region represents milk consumed by the region's residents as well as milk processed in the region. Several large processing plants in the region use milk that comes from outside of the three counties, in addition to milk from the region.
[v] National Agricultural Statistics Service, *2007 Census of Agriculture*, 2007: http://www.nass.usda.gov/Census_of_Agriculture/ AND See Appendix A: An Economic Analysis of the Dairy Industry in Franklin, Hampshire and Hampden Counties (IMPLAN).
[vi] National Agricultural Statistics Service, *2007 Census of Agriculture*, 2007: http://www.nass.usda.gov/Census_of_Agriculture/
[vii] This number is almost $4 million less than the market value numbers from the 2007 Census of Agriculture. AFT is unable to explain why this number is significantly lower.
[viii] *See* Appendix A discussion of Regional Purchase Coefficient and Regional Sales Coefficient.
[ix] This calculation is in line with others that have been done. *See* Pennsylvania Center for Dairy Excellence, "Cash Cow" brochure; http://www.centerfordairyexcellence.org/tl_files/CDE/PDF/Cash%20Cow%20Brochure%20Revision%203rd%20draft.pdf. *See also* testimony of Robert Wellington, Agri-Mark VP, at the March 20, 2007 public hearing at the MA Department of Agricultural Resources; http://www.fmpc.uconn.edu/research/milk/Wellington.pdf
[x] National Agricultural Statistics Service, *2007 Census of Agriculture*, 2007: http://www.nass.usda.gov/Census_of_Agriculture/
[xi] National Agricultural Statistics Service, *2007 Census of Agriculture*, 2007:
[xii] Information provided by APR staff at the MA Department of Agricultural Resources, January 2011.
[xiii] Information provided by Karl Czymmek, Cornell Cooperative Extension during Farm Credit East Dairy Outlook webinar, January 13, 2011
[xiv] See UMass Extension bulletin, *Methane Emissions from Dairy Cattle,* reprinted from proceedings of *Mitigating Air Emissions from Animal Feeding Operations Conference*. http://www.extension.org/pages/Methane_Emissions_from_Dairy_Cattle
[xv] American Farmland Trust, Farmland Information Center, *Fact Sheet: Cost of Community Services*, 2010: http://www.farmlandinfo.org/documents/38422/COCS_08-2010.pdf
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[xvii] Wellington testimony at the March 20, 2007 public hearing at the MA Department of Agricultural Resources; http://www.fmpc.uconn.edu/research/milk/Wellington.pdf
[xviii] *Farms for the Future: Massachusetts' Investment in Farm Conservation*, American Farmland Trust, 2008
[xix] Massachusetts Office of Travel and Tourism: *The Economic Impact of Travel on Massachusetts Counties*, 2008: http://www.massvacation.com/research/ec_imp_hist08.pdf
[xx] Massachusetts Dairy Farm Revitalization Task Force Report to the Legislature, Nov. 9, 2007; http://www.massdairyfarmers.com/images/Nov_9_Task_Force_Exec_Summ.pdf

[xxi] National Agricultural Statistical Service, *2007 Census of Agriculture*, http://www.nass.usda.gov/Census_of_Agriculture
[xxii] *2009 Northeast Dairy Farm Summary*, Farm Credit East, May 2010
[xxiii] Ibid
[xxiv] According to predictions made by dairy economist Ed Gallagher as part of Farm Credit East's 2011 Dairy Outlook webinar, 2011 average net margins are likely to be 0 to positive for the region's dairy farmers, with milk prices below but approaching 2008 levels.
[xxv] An analysis of several dairy policy options done in September 2010 by dairy economists Drs. Mark Stephenson and Chuck Nicholson includes a baseline projection of all milk prices absent any federal policy changes. The analysis shows wide price swings, with milk price dropping to $13 in 2012 and again in 2015. *See* Milk Producers Council newsletter, September 24, 2010, *Economic Modeling/Analysis Report Published This Week.*
[xxvi] *See* Shields, Dennis, *Previewing Dairy Policy Options for the Next Farm Bill*, Congressional Research Service, December 17, 2010. *See also*
[xxvii] *See Agri-Mark's Position on National Dairy Policy Reform;* http://www.agrimark.net/PDFs/AMINDPR1.pdf
[xxviii] *See* Farm Policy newsletter, January 17, 2011, farmpolicy@list.farmlpolilcy.com
[xxix] NOTE: Dairy consumption is based upon aggregate food availability data and is adjusted for food spoilage and other losses; 2009 estimated population for the three Pioneer Valley counties is 698,903. USDA/Economic Research Service: *Loss-Adjusted Food Availability*, February, 2010: http://www.ers.usda.gov/Data/FoodConsumption/FoodGuideSpreadsheets.htm AND Massachusetts Department of Agricultural Resources, Division of Animal Health, 2010 AND US Census Bureau, *State and County Quick Facts*, 2010: http://quickfacts.census.gov/qfd/states/25/25013.html.
[xxx] *See* Appendix A discussion of Regional Purchase Coefficient and Regional Sales Coefficient. Imports account for 30% of local demand.
[xxxi] Conversation with Margaret Christie at Community Involved in Sustaining Agriculture (CISA)
[xxxii] Correspondence with Kelly Erwin, Director of the MA Farm to School Project
[xxxiii] Ibid
[xxxiv] Ibid
[xxxv] Ibid
[xxxvi] The Mass Audubon Society estimate of the economic value of non-market ecosystem services per farm is approximately $455,000. Based on the three COCS studies recently done in Massachusetts, and assuming each dairy farm owns or rents approximately 390 acres, the Valley's dairy farms contribute $273 more in property taxes each year than they require in services.
[xxxvii] Ken Meter and Jon Rosales: *Finding Food in Farm Country*, 2001: http://www.crcworks.org/ff.pdf
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[xxxix] *See* endnote xxix

Appendix

An Economic Analysis of the Dairy Industry in Franklin, Hampshire and Hampden County, Massachusetts [IMPLAN]

Prepared by Carl Mailler for American Farmland Trust and Community Involved in Sustaining Agriculture, September 2010

Contents

Work on this document was supported in part with funds from USDA's Northeast Region Sustainable Agriculture Research and Education Program and the USDA Rural Development Program.

Introduction

Input-output analysis using the Minnesota Implan Group (MIG) modeling software IMPLAN (IMpact analysis for PLANning) was used to analyze the impact of dairy farming and related food manufacturing industries on a three-county region and to derive their economic multipliers. The database provided by MIG contained 322 different sectors in Franklin, Hampshire and Hampden counties in western Massachusetts. This information was then used to analyze the additional economic impacts of a new dairy processing facility with $1.8 million in output for the study area. The economic impact of an additional $1 million of dairy farm production was also evaluated.

The dairy farming industry (on farm production) and related food processing sectors (fluid milk, cheese, and ice cream) were selected to model the impact of these activities on the local economy. The total cash receipt value from sales was used as an input level to calculate multipliers to estimate the economic contribution of the industry on total output, employment, and labor income. The direct, indirect, and induced impacts for sectors are measured in millions of dollars. Results for output and labor income effects are in 2008 dollars. The impact of employment is measured in total jobs, both full time and part time.

Key Findings

- The combined output of the dairy farming, fluid milk processing, dry milk, and ice cream manufacturing sectors was $611.8 million or 1.3 percent of the regional economy.
- These industries also contributed $120.3 million of value added to the local economy.
- The output from these industries has a multiplier effect on the local economy. In total, the dairy cattle and milk production sector generates an additional $1.31 for each dollar produced. The fluid milk and butter manufacturing sector generates an additional $1.57 for each dollar produced.
- A new fluid milk processing facility with sales between one and three million dollars would have a total economic effect on the three-county region ranging from $1.3 to $4.7 million. For every million dollars of sales this total effect would provide 4.8 new jobs, labor income of $234,945, and value added of $407,471.
- An additional output of $1 million in regional dairy farm production would have a total effect on the three-county region of $1,315,085. This total effect includes 12.6 new jobs, labor income of $127, 246 and value added of $550,161.

Industry Baseline

Summary of Regional Economic Impact

Data sets representing the total economic activity of Franklin, Hampshire and Hampden counties were purchased from the Minnesota IMPLAN group along with software to run the modeling program. A single model was then created that captured the all industrial sectors that exist in the three-county region. The generated data was then exported into Excel worksheets. Table 1 provides an overview of the IMPLAN model information including the details of the gross regional product.

Table 1. IMPLAN Regional Model Information

Model Information			
Model Year: 2008 Gross Regional Product: $25.017 billion Total Personal Income: $25.7 billion Total Employment: 343,375 Number of Industries: 322		Areas in the Model: Franklin, Hampshire, Hampden County. Land Area (square miles): 1,850 Population: 687,558 Total Households: 269,323 Average Household Income: $95,565	
Gross Regional Product			
Value Added		**Final Demand**	
Employee Compensation	$15,289,920,000	Households	$21,869,040,000
Proprietor Income	$1,408,226,000	State/Local Government	$3,078,776,000
Other Property Type Income	$6,631,599,000	Federal Government	$817,152,600
Indirect Business Tax	$1,688,039,000	Capital	$3,302,695,000
		Exports	$19,017,860,000
		Imports	($22,037,490,000)
		Institutional Sales	($1,030,250,000)
Total Value Added	$25,017,780,000	Total Final Demand	$25,017,780,000

The Dairy Industry

Data for the dairy cattle and production, fluid milk and butter manufacturing, cheese manufacturing, dry condensed, and evaporated dairy product manufacturing, and ice cream and frozen dessert manufacturing sectors were extracted from the worksheets for further analysis. Industries are defined and assigned individual codes and separate lines within a matrix of the entire economy laid out in IMPLAN. The assignment of codes is based on standard industrial classification categories used by the federal government. All agricultural sector codes in IMPLAN reports are 1-19, with dairy cattle and milk being assigned a code of 12. Food processing and manufacturing industries contained in codes 40 through 60 with fluid milk and butter assigned to 55, while ice cream and frozen dessert is number 58. Therefore, dairy cattle and production is on-farm production while fluid milk and butter are food processing industries. Table 2 summarizes the annual economic impact of dairy farming and related food processing on the local economy. It shows the number of employees in each sector and the dollar contribution of dairy farms and dairy product manufacturing facilities in the three counties. The total impact of the dairy industry from direct, indirect and induced effects is $611.9 million which represents the cash receipts received by dairy farmers and food processors for their products.

Table 2. Employment, output and labor income for the dairy industry			
Description	Employment	Output * 2008 dollars	Employee Compensation 2008 Dollars
Total (3 county economy)	343,375	47,204,011,763	15,289,920,912
Dairy cattle and milk production	229	21,377,714	910,469
Fluid milk and butter manufacturing	366	260,166,256	23,065,480
Cheese manufacturing	0	0	0
Dry, condensed, and evaporated dairy product manufacturing	19	20,891,266	1,230,155
Ice cream and frozen dessert manufacturing	557	309,415,904	43,323,740
Total (dairy cattle + manufacturing)	1,170	611,851,140	68,529,844
percent of local economy	0.34%	1.30%	0.45%
*Output represents the value of industry production. In IMPLAN these are annual production estimates for the year of the data set and are in producer prices. For manufacturers this would be sales plus/minus change in inventory. For service sectors production = sales. For Retail and wholesale trade, output = gross margin and not gross sales.			

Value Added

Value added is the difference between an industry or an establishments total output and the cost of its intermediate inputs. With IMPLAN modeling, value added equals employee compensation plus proprietor income plus other property type income plus indirect business taxes. Table 3 shows value added for each industry in this analysis.

Table 3. Value Added					
Description	Employee Compensation	Proprietor Income (1)	Other Property Type Income (2)	Indirect Business Tax (3)	Total Value Added
Total (3 county economy)	15,289,920,912	1,408,225,850	6,631,599,034	1,688,038,484	25,017,784,281
Dairy cattle and milk production	910,469	1,473	6,917,988	277,330	8,107,259
Fluid milk and butter manufacturing	23,065,480	0	13,203,855	551,316	36,820,651
Dry, condensed, and evaporated dairy product manufacturing	1,230,155	21,756	1,006,118	30,009	2,288,037
Ice cream and frozen dessert manufacturing	43,323,740	0	29,105,476	664,393	73,093,609
Total (dairy cattle + processing)	68,529,844	23,229	50,233,436	1,523,048	120,309,557
% of local economy	0.45%	0.00%	0.76%	0.09%	0.48%

(1) Proprietor income consists of payments received by self-employed individuals and unincorporated business owners. This income also includes the capital consumption allowance and is recorded on Federal Tax form 1040C.

(2) Other property type income is profits for the most part.

(3) Includes taxes on sales, property, and production, but it excludes employer contributions for social insurance and taxes on income.

Multipliers

IMPLAN modeling allows an analyst to choose from multipliers that capture only direct and indirect effects (Type I), multipliers that capture all three effects noted above (Type II), and multipliers that capture the three effects noted above and further account for commuting, social security and income taxes, and savings by households (Type SAM). Total effects multipliers usually range in size from 1.5 to 2.5 and are interpreted as indicated below:

- *Output multipliers* relate the changes in sales to final demand by one industry to total changes in output (gross sales) by all industries within the local area. An industry output multiplier of 1.65 would indicate that a change in sales to final demand of $1.00 by the industry in question would result in a total change in local output of $1.65.
- *Income and employment multipliers* relate the change in direct income to changes in total income within the local economy. For example, an income multiplier for a direct industry change of 1.75 indicates that a $1.00 change in income in the direct industry will produce a total income change of $1.75 in the local economy. Similarly, an employment multiplier of 1.75 indicates that the creation of one new direct job will result in a total of 1.75 jobs in the local economy.
- *Value added multipliers* are interpreted the same as income and employment multipliers. They relate changes in value added in the industry experiencing the direct effect to total changes in value added for the local economy.

The resulting multipliers are measures of a change in the industry. The output and labor income multipliers measure direct, indirect, and induced change per dollar of change in the industry's output. The employment multipliers measure direct, indirect, and induced employment effects from the production of an additional one million dollars of output. Table 4 shows the output multipliers for the dairy industry.

Table 4. Output Multipliers

Industry	Multipliers			
	Direct	Indirect	Induced	Total Impact
Dairy cattle and milk production	1.000000	0.237146	0.079456	1.316602
Fluid milk and butter manufacturing	1.000000	0.427084	0.146952	1.574036
Cheese manufacturing	0.000000	0.000000	0.000000	0.000000
Dry, condensed, and evaporated dairy product manufacturing	1.000000	0.452746	0.131675	1.584421
Ice cream and frozen dessert manufacturing	1.000000	0.526162	0.215190	1.741352

The total output multiplier indicates how many dollars worth of indirect plus induced effects are generated for each additional dollar produced by the dairy sector. For example, for each additional dollar produced by the dairy cattle and milk production, $0.24 worth of indirect output is generated by other industries. These industries are local businesses supplying farms with feed, milking equipment, machinery, auto parts, construction, and other crop-producing farms, but also engineering services, veterinary services, power-generating businesses, insurance carriers, wholesalers, warehouses, etc. An additional $0.08 worth of induced output is generated by increased household spending due to dairy industry activities. The induced impact includes restaurants, health clinics and hospitals, food and beverage stores, real estate and legal services, telecommunications, etc. In total, the dairy cattle and milk production sector generates an additional $1.31 for each dollar produced. The output multipliers can be used to gauge the interdependence of sectors. The larger the output multiplier, the greater the interdependence of the sector or industry on the rest of the local economy.

Table 5 depicts changes in employment due to changes in output in the industry. These changes are measured in number of jobs, both full time and part time, per million dollars change in output. For example, with each $1 million dollar output increase in dairy cattle and milk production, 13 jobs would be created in the local economy. A $1 million increase in fluid milk and butter manufacturing would create 5 new jobs.

Table 5. Employment Multipliers				
Industry	Multipliers			
	Direct	Indirect	Induced	Total Impact
Dairy cattle and milk production	10.709412	1.903458	0.672505	13.285374
Fluid milk and butter manufacturing	1.405323	2.380885	1.243448	5.029656
Cheese manufacturing	0.000000	0.000000	0.000000	0.000000
Dry, condensed, and evaporated dairy product manufacturing	0.911651	2.317650	1.114314	4.343614
Ice cream and frozen dessert manufacturing	1.799204	2.362147	1.820780	5.982131
The Direct, Indirect, Induced and Total Effects are Per Million Dollars of Output				

The labor income multipliers in Table 6 show the direct, indirect, and induced labor income for both employee compensation and proprietor income, generated per dollar of output. They receive $0.13 in labor income per dollar of income in the dairy cattle and milk production industry.

Table 6. Labor Income Multipliers				
Industry	Multipliers			
	Direct	Indirect	Induced	Total Impact
Dairy cattle and milk production	0.042659	0.058860	0.027130	0.128649
Fluid milk and butter manufacturing	0.088657	0.099269	0.050189	0.238115
Cheese manufacturing	0.000000	0.000000	0.000000	0.000000
Dry, condensed, and evaporated dairy product manufacturing	0.059925	0.108392	0.044966	0.213284
Ice cream and frozen dessert manufacturing	0.140018	0.135206	0.073498	0.348721
The Direct, Indirect, Induced and Total Effects are Per Million Dollars of Output				

As stated earlier, value added is the difference between an industry or an establishments total output and the cost of its intermediate inputs. Table 7 shows the value added multipliers for the dairy industry sectors in the region.

Table 7. Value Added Multipliers				
Industry	Multipliers			
	Direct	Indirect	Induced	Total Impact
Dairy cattle and milk production	0.379239	0.128768	0.048218	0.556225
Fluid milk and butter manufacturing	0.141527	0.182268	0.089175	0.412971
Cheese manufacturing	0.000000	0.000000	0.000000	0.000000
Dry, condensed, and evaporated dairy product manufacturing	0.109521	0.191421	0.079905	0.380847
Ice cream and frozen dessert manufacturing	0.236231	0.215592	0.130583	0.582406
The Direct, Indirect, Induced and Total Effects are Per Million Dollars of Output				

Regional Purchase Coefficient

A Regional Purchase Coefficient (RPC) is the proportion of the total demand for a commodity by all users in the Study Area that is supplied by producers located within the Study Area. For example, if the RPC for the commodity ''fish'' is 0.8, then 80 percent of the demand by local fish processors, fish wholesalers, and other fish consumers are met by local fish producers. Conversely, 20 percent of the demand for fish is satisfied by imports. (IMPLAN)

The average regional purchase coefficients for the industries studied are as follows:

- Dairy cattle and milk products: .15374 (85 percent of total demand is met by imports)
- Processed fluid milk and butter: .70038 (30 percent is met by imports)
- Processed dry milk, condensed and evaporated milk: .59920 (40 percent is met by imports)
- Ice cream and frozen desserts: .84659 (15 percent is met by imports)

Regional Sales Coefficient (or local use demand)

The average regional sales coefficient is the amount of the locally produced commodity going to local demand. The regional sales coefficients for the industries studied are as follows:

- Dairy Cattle and milk products: .90155 (9 percent is available for export)
- Processed fluid milk and butter: .35963 (64 percent is available for export)
- Processed dry milk, condensed and evaporated milk: .80368 (20 percent is available for export)
- Ice cream and frozen desserts: .10761 (89 percent is available for export)

Impact of a New Milk Processing Facility

The regional model developed for this IMPLAN analysis was also used to identify the impact of potential changes in the local dairy industry. IMPLAN Industry Activity Type is the most fundamental and commonly used impact type. Changes in sales, employment, wages (employee compensation), and proprietor income can all be used to measure the effects a specific industry or sector has on a study area. The following industry activities were run through the model:

1) A new fluid milk processing facility with a final output ranging from $1 to $3 million of output; and
2) An increase of $1 million in sales in the local dairy farm sector.

New Fluid Milk Processing Facility Producing Between $1 and $3 Million Dollars in Sales

To assess the regional impacts of a new fluid milk processing facility an expected low and high sales range was selected. At the high end, with sales of $3 million, the facility would have a total effect on the three-county region of $4,715,641. This total effect includes 14.3 new jobs, labor income of $704,834 and value added of $1,222,412. Table 8 shows the direct, indirect and induced effect of this new processing facility. On the lower end, with sales of $1 million, the new facility would have a total effect on the three-county region of $1,571,880. This total effect includes 4.8 new jobs, labor income of 234,945, and value added of $407,471. Table 9 shows the direct, indirect and induced effect of this new processing facility.

Table 8. Impact of $3Million in Sales from New Processing Facility

Impact Type	Output	Employment	Labor Income	Total Value Added
Direct Effect	$ 3,000,000	4.0	$ 262,428	$ 418,928
Indirect Effect	$ 1,278,322	6.8	$ 293,842	$ 539,524
Induced Effect	$ 437,318	3.5	$ 148,562	$ 263,961
Total Effect	$ 4,715,641	14.3	$ 704,834	$ 1,222,412

Table 9. Impact of $1 Million in Sales from New Processing Facility

Impact Type	Output	Employment	Labor Income	Total Value Added
Direct Effect	$ 1,000,000	1.3	$ 87,476	$ 139,643
Indirect Effect	$ 426,107	2.3	$ 97,948	$ 179,842
Induced Effect	$ 145,773	1.2	$ 49,521	$ 87,987
Total Effect	$ 1,571,880	4.8	$ 234,945	$ 407,471

An Increase of $1 Million in Sales in the Local Dairy Farm Sector.

While using IMPLAN modeling software and regional data, we wanted to see what the economic impact of an additional $1 million in sales by local dairy farms would be if markets improved and dairy operations expanded. An additional output of $1 million of on farm dairy products would have a total effect on the three-county region of $1,315,085. This total effect includes 12.6 new jobs, labor income of 127, 246 and value added of $550,161. Table 10 shows the direct, indirect and induced effect from this increase in local sales by dairy farms.

Table 10. Impact of $1 Million in Additional Milk Sales by Local Dairy Farms

Impact Type	Output	Employment	Labor Income	Total Value Added
Direct Effect	$ 1,000,000	10.2	$ 42,193	$ 375,104
Indirect Effect	$ 236,075	1.8	$ 58,219	$ 127,364
Induced Effect	$ 79,010	0.6	$ 26,834	$ 47,692
Total Effect	$ 1,315,085	12.6	$ 127,246	$ 550,161

Definitions

For a particular producing industry, multipliers estimate three components of total change within the local area:

- *Direct effects* represent the initial change in the industry in question.
- *Indirect effects* are changes in inter-industry transactions as supplying industries respond to increased demands from the directly affected industries.
- *Induced effects* reflect changes in local spending that result from income changes in the directly and indirectly affected industry sectors.

Proprietor Income

Proprietor income consists of payments received by self-employed individuals and unincorporated business owners. This income also includes the capital consumption allowance and is recorded on Federal Tax form 1040C.

Indirect business taxes (IBT)

Prior to the 2003 comprehensive NIPA revision, IBT was the name of one of the three components of value added. It consists of tax and nontax liabilities that are chargeable to business expenses when calculating profit-type incomes and of certain other business liabilities to government agencies that are treated like taxes. Thus, IBT includes taxes on sales, property, and production, but it excludes employer contributions for social insurance and taxes on income. As part of the NIPA revision, this component was modified and termed "taxes on production and imports less subsidies." The major differences between the two are attributable to the treatments of subsidies and non-taxes. (BEA)

Employment multipliers

I-O multipliers used to estimate the total number of jobs (both full-time and part-time) throughout the economy that are needed, directly and indirectly, to deliver $1 million of final demand for a specific commodity. (BEA)

Indirect effects

The impact of local industries buying goods and services from other local industries. The cycle of spending works its way backward through the supply chain until all money leaks from the local economy, either through imports or by payments to value added. The impacts are calculated by applying Direct Effects to the Type I Multipliers.

Indirect requirements coefficients

Ratios that show the production required of an industry and of all other industries to meet that industry's initial demand for production. The coefficient can be calculated as the total requirements matrix less the identity matrix less the direct requirements matrix. (BEA)

Induced effects

The response by an economy to an initial change (direct effect) that occurs through re-spending of income received by a component of value added. IMPLAN's default multiplier recognizes that labor income (employee compensation and proprietor income components of value added) is not a leakage to the regional economy. This money is recirculated through the household spending patterns causing further local economic activity.

Industry

A group of establishments engaged in the same or similar types of economic activity. (BEA)