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Agriculture-Based Economic Development in New York State: Assessing the Inter-industry Linkages in the Agricultural and Food System

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1. Introduction

Structural changes in New York's farm and food industry continue as agricultural producers and agribusiness firms adapt to changing economic conditions and consumer preferences, and to technological advancements. To retain or grow their share of the consumer food dollar, agricultural producers and agribusinesses continually seek innovative methods to expand existing markets and to develop new markets for their commodities and products. Many farm growers may also increase their bottom line by diversifying into high-valued specialty crops, vertically integrating their operations, developing branded products, or cooperating with other industry partners to improve access to consumer markets. Other farm operators continue to blend commodity production with employment off the farm or in alternate business pursuits to meet family income and lifestyle objectives.

These various initiatives underscore the importance of expanding farm-to-food activities on the farm, as well as fostering greater interaction with the agribusiness industry. In order to define appropriate firm, industry, and public policy strategies to strengthen opportunities for economic development and improve the competitiveness of New York State's agribusiness industry, we must first identify and understand the linkages among agricultural production, service, manufacturing, distribution and consumer markets (both domestic and abroad).

This report is part of a larger effort to update and document the importance of New York's major agricultural industries to the State's economy. The first report in this series provides updated baseline economic information on the current status and trends in the economic activity of New York State's agricultural and food system (Schmit and Bills 2012). This report focuses on a closer inspection of inter-industry transactions to obtain a clearer picture of the structure of the NYS economy, with particular emphasis on sectors within the agricultural and food system. This is a necessary first step to estimate the importance of the State's agricultural and food system to the NYS economy, both in total and most especially at the margin as various components of the agricultural and food system expand and/or contract in response to the changing economic conditions and policy related incentives.

To provide the necessary conceptual background, we begin the remainder of this report with a discussion of input-output models and methods of economic impact analysis. We go on to discuss how the inter-industry accounts used in input-output methods can provide a clear picture of the structure economy. Next, we discuss the data and methods by which we construct an input-output model of the New York economy in which the important sectors of production agriculture and food manufacturing are identified explicitly. Through this input-output framework, we are able to describe the major differences in the patterns of sales and input

purchases of the State's major sectors of production agriculture and food manufacturing. In turn, these differences help to explain the major differences by sector in the magnitudes of the several economic multipliers for major components of the state's agricultural and food system. Through these economic multipliers, we can begin to identify the differential economic benefits and/or costs to the New York economy as various components of the agricultural and food system expand and/or contract.

2. Input-Output Methods and Economic Impact Analysis

Input-output (I-O) methods, developed in the late 1930s by W. Leontief, have, since that time, proven to be an effective tool to assess the economic effects from expenditures or the initial expansion of output in specific sectors of the economy that come about as the result of public policy or private sector initiatives at the national, state, and local levels. In this report, we concentrate our efforts on estimating the effects throughout the broader New York economy from expanding key sectors in agricultural production, support services, and manufacturing.

I-O methods are well designed for this purpose, because, in contrast to more aggregate economic analyses, I-O methods differentiate the effects of policy or private sector initiatives by important economic sectors. Conventional macroeconomic models trace changes in aggregate economic indicators such as national or regional income, gross national or regional product and employment and investment due to changes in taxes, spending, etc. These models, however, do not address the composition of these changes by production sector, nor do they trace the resultant effects throughout the economy. Since there is no reason to believe that the effects of public or private sector initiatives to stimulate sectors of the agricultural economy in New York State are distributed evenly throughout the economy, we rely on I-O methods to estimate the size of these impacts and trace these changes throughout the various sectors of the economy.

The I-O model provides an insightful way to depict and investigate the underlying processes that bind an economy together. Its strengths lie in a detailed representation of: a) the primary and intermediate input requirements by production sector, b) the distribution of sales of individual industries throughout an economy, and c) the interrelationships among these industries and other economic sectors of an economy. The methodology's analytical capacity lies in its ability to estimate the *indirect* and *induced* economic effects stemming from the *direct* expenditures that lead to additional purchases by final users in an economy.

These *indirect* and *induced* changes in economic activity result from what are now commonly known as "multiplier" or "ripple" effects throughout the various sectors in the economy. An initial expenditure of one dollar and/or the expansion of output in one sector set in motion a cascading series of impacts in the form of additional expenditures in other sectors by each business whose sales have increased; it is the cumulative impacts across all affected businesses or industries that are of most interest. Depending on the nature of the initial policy expenditures

or output expansion, these *indirect* impacts could be in the form of additional purchases of a variety of goods and services, for example: a) raw materials and primary factors of production; b) semi-finished or intermediate goods; or c) capital equipment. Moreover, the initial policy-related *direct* spending and resultant *indirect* increases in business spending are associated with changes in output or sales, changes in employment and income, and changes in payments to land, capital and other primary factors of production. Part of these *direct* and *indirect* effects is in the form of the increased labor income generated in the economy due to the increased economic activity. To the extent that part or all of this additional income is spent within the economy, there are some additional "ripple" effects that are now commonly referred to as *induced* impacts, and they also can be estimated using the I-O methodology. The magnitudes of both the *indirect* and *induced* effects differ by economic sector.

At the most basic level, I-O models require that the *direct* changes in purchases or expenditures must be specified in the form of additional sales to final users of products. Some of these *direct* effects will also be in the form of intermediate purchases by production sectors of the economy or changes in consumption patterns by households or input use by firms. There may also be changes in the composition of the imports into the state from other regions. Rather than being reflected in changes in sales to final users, these types of *direct* effects potentially change the structure of the input requirements for some sectors of the economy, as well as the proportion of inputs purchased from New York firms relative to those imported from elsewhere.

2.1 The Components of an Input-Output Model of an Economy

To understand and trace by sector these indirect and induced economic effects resulting from initial direct changes in deliveries to final demand, we first examine the input structure of the major sectors or industries within the NYS economy. Given certain assumptions about the nature of production in the economy, the information about the purchases and sales of products among these sectors can be used to define an industry's input structure. In turn, this input structure provides the analytical and empirical basis for estimating the *indirect* and *induced* impacts resulting from private business development activity or policy initiatives directed at the state's agriculturally-related sectors of the economy.[1]

To engage in business activity, the firms in various industries must purchase inputs, as well as sell their products and/or services. These firms purchase raw materials, labor, capital equipment, and intermediate inputs from firms in other industries. Some of these purchases may be from outside the state, the region, or even the country. In turn, firms in these industries sell products and/or services to firms in other industries as intermediate inputs, to governments and to final consumers. Moreover, some of these sales may also be to firms or consumers outside the state

[1] There are many standard texts on I-O methods, for example, Yan (1969), Richardson (1972), Miller et al. (1989), and Miller and Blair (2009) discuss some of the more advanced topics in I-O analysis. For the interested reader, we provide detail on the analytical structure of I-O models in Appendix A.

and beyond. These patterns of purchases and sales are conveniently summarized in the inter-industry transactions table that is defined at the major industry or sector level, and the data in the table form the basis for constructing the I-O model of an economy.

In the inter-industry transactions table, total output for any sector or industry is defined by the value of its production for a given time period, typically a year. It can be measured in either of two ways: by the total value of purchases made by intermediate users and final consumers of the industry's output, or by the sum of the industry's intermediate input purchases, payments to labor and other components of value added, and value in inputs imported from outside the state that are needed to produce its products. The data in an inter-industry transactions table for a given state or region provide a representation of the region's economy from both of these perspectives. The patterns of sales and purchases will differ across industrial sectors and it is those differences that determine the nature of the economic impacts from direct output expansion, be it from public policy-related expenditures or private initiatives.

The structure of a typical state or regional inter-industry transactions table is illustrated in Figure 1.[2] For purposes of illustration, the regional economy is aggregated into a small number of industrial sectors (agriculture, manufacturing, and retail trade).[3] As is evident from this table, the transactions reflect activity by these sectors of the economy that both produce goods (outputs) and consume goods from other industries (intermediate inputs) in the process of producing each sector's output. Thus, the transactions data measure the flows of products from each sector considered a producer to itself and other sectors of the economy as consumers.

	Intermediate Demand			Final Demand			
	Agricul-ture	Manufac-turing	Retail trade	House-holds	Govern-ment	Invest-ment	Exports
Agriculture							
Manufacturing							
Retail trade							
VA- Employee compensation[a]							
VA-Proprietor income							
VA-Other property income							
VA-Indirect business taxes							
Imports							

[a] VA = Value Added

Figure 1. An Example of an Input-Output Transactions Table

[2] This figure, as well as some of the discussion of the transactions table is adapted from Miller and Blair (2009).
[3] The sector columns and rows (shaded area) generally make up the largest area in the inter-industry transactions table. For example, IMPLAN's full inter-industry transactions table comprises 440 individual sectors.

The shaded portion of the table contains these inter-industry exchanges. For example, the cells in the first row of the shaded portion of the table contain the sales of agricultural goods to the agricultural sector itself, and to the other "downstream" sectors of the economy (the various food processing/manufacturing sectors are perhaps the best example). In addition to these sales to other industries who use agricultural goods as intermediate inputs, the elements in any row for the remaining columns in the table (labeled Final Demand) record deliveries from a production sector (or industry) to final markets for such things as personal consumption (households), government purchases of goods, capital investment, and goods exported to markets in other regions of the country or abroad.

The relative proportions of sales to intermediate and final users reflect the importance of different markets for any sector's output. These markets include firms in other sectors of the state's economy, as well as consumer markets within the state. Sales to governments at all levels may be important for some sectors, but not for others. Markets for a sector's output to be used as intermediate inputs by firms outside the state may also be important for different sectors, as are consumer markets in nearby states or across the country. The extent to which industries have access to these various markets (as measured by the share of sales) reflects the importance of these various "downstream linkages". These linkages differ across sectors, perhaps reflecting differential opportunities for certain sectors to participate in these different markets.

In contrast with the rows of the table, each column of the shaded portion of the table records the composition of intermediate inputs required by a particular industry to produce its output. For example, the cells in the shaded portion of the first column record the intermediate inputs purchased by agriculture from itself and from the other production sectors in the economy. The remaining rows, labeled value added, record purchases of labor and other non-industrial inputs needed in the production of a sector's outputs. Expenditures on these inputs include employee compensation, proprietor income, other property income (e.g., rent, interest, corporate profits, depreciation), and indirect business taxes (any taxes and fees paid to governments, including sales and excise taxes). The final row, labeled imports, accounts for both intermediate inputs and labor purchased by the sector from regions outside the local economy.[4]

The columns of the inter-industry transaction table provide evidence on the distribution of purchases ("upstream linkages") by a particular sector. Furthermore, the nature of any sector's production process is revealed by dividing the transactions within each cell by the total value of all inputs purchased by that sector (i.e., by the column sum in the transactions table). Interpreted as input requirements, these ratios provide estimates of the dollar value of inputs from the sector in the row per dollar of output for the sector in the column. Since all data in the transactions table

[4] Technically, the transactions table will include one additional row for institutional outlays; i.e., purchases of nondurable goods and services produced by governments in the study area. As these outlays are relatively small (around 2% or less of total purchases for agricultural industries), we do not include them in this conceptual discussion.

are in value terms, these ratios also provide estimates of the proportions of a sector's total input costs that are from the purchase of intermediate inputs from other sectors of the economy; are due to payments to labor or other components of value added; or are due to input purchases from outside the region.

This input structure, in turn, has much to do with the size of a sector's economic multipliers. Since all intermediate input purchases from other sectors in the economy are turned over within the economy, the multiplier effects are likely to be higher the higher is the proportion of total input costs accounted for by intermediate input purchases. While much of employee compensation also goes to additional purchases of goods and services produced in the state, some portion may also be saved or used to buy consumer goods from outside the state. To the extent that these funds are spent within the region, they will likely increase both the indirect and induced multiplier effects of direct increases in a sector's sales to final demand.

As a consequence of the effects of globalization, states and regions throughout the country have seen a rise in the proportion of inputs by many industries purchased from outside the region or the country. Monies spent on these imports are not retained locally, and they represent "leakages" outside the local economy. Since these leakages are not turned over within the economy, any increase over time in the proportion of a sector's input costs from inputs imported from outside the region is likely to reduce the *indirect* and *induced* economic impacts from output expansion in that sector. Through a careful examination of the nature of these imports, we may identify opportunities for expansion of other sectors in the economy through import substitution; i.e., providing an industry within an economy a way to reduce reliance on imports through expansion of local production of the imported input.

Finally, to avoid double counting as goods move along the supply chain, sales to wholesale and retail trade sectors are "margined" to reflect only the value of the services provided by these sectors in delivering commodities from producers' establishments to purchasers (sales less cost of goods sold). The values of the commodities (in producer prices) are apportioned to one or more deliveries to final demand, depending on the location and allocation of final deliveries (e.g., to households, exports, etc.). For example, consider a vegetable production sector with $100 of total sales, where $60 of output is sold to food processors, $35 is sold to retail groceries, and $5 is sold directly to households (e.g., through a farm stand or farmers market). The first transaction would be recorded in the I-O transactions table with a cell showing the intersection of vegetable production and food manufacturing. That cell registers a purchase of $60 of vegetables (looking down the column) by food manufacturing and a sale by that farm sector (looking across the row). For sales to the retail grocer, the producer value of the sales is attributed to final household demand (say $25) and is represented in the cell at the intersection of the vegetable production row and the (local) household demand column. The balance ($10) represents the retail margin enjoyed by the retailer and is recorded in the cell at the intersection of the vegetable

production row and the retail grocer column. Finally, the direct sales to consumers ($5) by vegetable producers are also included in the final demand deliveries to households. In the case where product moves from producers to wholesalers and then to retailers, margins would be applied in both the wholesale and the retail trade sectors.

2.2 Ranking the Effects by Sector using Traditional Economic Multipliers

From this discussion, we know that the size and distribution of the "ripple" effects experienced throughout the economy associated with the expansion or contraction of any particular sector or industry depend on the pattern of sales and input use within that sector or industry. From a policy perspective, the relative economic impacts are captured by the several economic multipliers that can be defined for each sector or industry. To conduct such a comparative economic impact analysis on a sector by sector basis, we can define three separate particularly important economic multipliers; i.e., a sales or output multiplier, an income multiplier, and an employment multiplier.

2.21 The Output or Sales Multiplier

For any individual sector, call it sector *j*, the sales or output multiplier is defined as the *direct* plus *indirect* plus *induced* sales throughout the economy resulting from a one dollar increase in sales to final demand in sector *j*. By comparing these multipliers across sectors, we identify those sectors in which a change in sales to final demand generate the largest combined *direct* plus *indirect* plus *induced* change in sales in all sectors of the economy.

2.22 The Income Multiplier

Total sales or output generated throughout the economy is only one measure of the economic impact due to a direct increase in sales to final demand in one particular sector. It is also essential to know what happens to income and employment. To develop comparable measures for income or employment multipliers, we must change the base of comparison. In the case of a sales multiplier, the natural base of comparison is in terms of the same *direct* change in output (in this case a dollar of goods or services delivered to final demand in each sector).

To construct an income multiplier, however, the natural base of comparison is in terms of a *direct* dollar change in income. As a point of departure, we must consider an increase in final demand in sector *j* by enough to generate directly a dollar of income in sector *j*. These multipliers are thus defined as the *direct* plus *indirect* plus *induced* income (*e.g.*, perhaps payrolls) effect throughout the economy due to a *direct* increase in payrolls of a dollar in sector *j*. Thus, by comparing these multipliers, one can determine which sectors generate the largest change in income economy-wide when payrolls are increased by the same amount, *ceteris paribus*, in each sector of the economy.

This transformation allows one to "level the playing field" across sectors in terms of *direct* income changes. In so doing, the size of the income multiplier varies inversely with the *direct*

income coefficient (i.e., the dollars of income needed to produce one dollar of goods in a particular sector). The smaller is the share of payments to labor in the total value of inputs, the larger is the income multiplier for that sector. This may appear counter intuitive at first blush, but it is as it should be: the smaller the *direct* income coefficient, the larger the *direct* change in output per additional dollar of income in that sector. Thus, there is a larger *direct* change in output to generate *indirect* and *induced* changes in sales and income throughout the economy.

2.23 The Employment Multiplier

The logic of changing the base of comparison for the income multiplier extends directly to the notion of an employment multiplier, which is defined as the *direct* plus *indirect* plus *induced* employment for a *direct* unit change in employment by sector *j*. As in the case of the income multiplier, the employment multiplier tends to be large when the *direct* employment coefficient (the employment per dollar of output) is small. Furthermore, since wage rates differ by sector, it is unlikely that the employment and income multipliers will be ranked the same across sectors of the economy.

3. An Input-Output Model for New York State

To examine the nature of inter-industry transactions for sectors of agricultural and food system in New York State, we must construct an I-O model for the state, including the associated transactions table. Several decades ago, many state governments invested substantial resources to maintain input-output models that could serve as the empirical basis for conducting economic impact analyses at the state level. Even at that time, it was difficult and expensive to maintain these models, and consequently, the data on which they were based became out of date rather quickly. In addition, the models usually contained a limited number of economic sectors. For this reason, it was impossible to conduct impact analyses of rather specific and disaggregate sectors, thus limiting the applicability of many results of impact analyses.

These state-level initiatives to maintain inter-industry models have been abandoned. As an alternative, these kinds of impact analyses now commonly rely on state-level I-O tables generated from commercially available data bases and software designed specifically for that purpose. In this analysis, we use the IMPLAN® economic impact assessment software system, and associated data bases to construct a New York State I-O model. The data bases included in the IMPLAN software are ideal for this purpose.[5] Using the IMPLAN data bases, it is possible to examine inter-industry transactions among 440 industrial sectors of an economy as defined by the North American Industry Classification System (NAICS), the standard used by Federal statistical agencies to classify business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy.

[5] The data bases used by the IMPLAN software to construct input-output models and SAMs for multi-state, state level and sub-state regions are described in some detail in Appendix B and at www.implan.com.

3.1 A Sectoring Plan Focusing on the Agriculture and Food System

To gain a better understanding of the structure of industries within New York's agricultural and food system, we construct an I-O model for New York in which the 440 industries in the IMPLAN data base are aggregated into 32 economic sectors. In this process of aggregation, we define 20 of these industry sectors specifically aligned with the major components of the State's agricultural and food system, including agricultural production, service, manufacturing, retail trade, and food service sectors. These sectors are listed in the top section of Table 1, along with the respective IMPLAN sectors contained within them.[6] For our analysis, we consider seven agricultural production sectors, one agricultural support sector, and ten agricultural and food manufacturing sectors. To focus on important downstream sectors, we also identify sectors for: food and beverage retail trade, and food service. The other 12 economic sectors are defined by aggregating the remaining industries at the 2-digit NAICS level (Table 1).

4. The Structure of Important Sectors in the State's Agricultural and Food System

The data in Tables 2, 3 and 4 are derived from the inter-industry transactions embodied in the I-O model of New York State. Through an examination of these data, we begin to understand the structure of the sectors of the State's agricultural and food system and the differences in this structure among the various sectors.

Table 2 contains summaries of employment, output and value added for each of the important sectors of the State's agricultural and food system. From this table, we see the total value of output of the State's agricultural and food system broken down into its five major sectors as defined by Schmit and Bills (2012). Output represents the value of industry production in producer prices, generally defined as sales. For manufacturers, however, output includes changes in inventories, and, as discussed above, output for wholesale and retail sectors is calculated as a gross margin (sales minus the cost of goods sold). Value added can be calculated as the difference between an industry's total output and the cost of its intermediate inputs; thus, it is a measure of the industry's contribution to gross domestic product (GDP). The major components of value added include: employee compensation, proprietor (self-employment) income, indirect business taxes, and other property-type income (i.e., dividends, interest, rent, corporate profits, and capital depreciation).

[6] Detailed mapping information of IMPLAN default industry sectors to the New York Model sectors is shown in Appendix C.

Table 1. Economic Sectors in the Agriculture and Food System defined for New York State's Input-Output Model

Sector/industry	I-O Sector Number	Implan Sectors
AG AND FOOD SYSTEM ECONOMIC SECTORS		
Production Agriculture		
Dairy cattle and milk production	1	12
Cattle ranching and farming	2	11
Other animal production	3	13-14
Fruit and vegetable farming	4	3-5
Greenhouse and nursery	5	6
Grain and oilseed farming	6	1-2
All other crop farming	7	7-10
Ag and forestry support services	8	19
Agricultural and Food Manufacturing		
Dairy product manufacturing	9	55-58
Fruit and vegetable manufacturing	10	53-54
Bakery, confectionary, flavorings, snack food manufacturing	11	48-52, 62-68
Animal food manufacturing	12	41-42
Animal slaughter and processing	13	59-60
Milling and oilseed processing and refining	14	43-47
All other food manufacturing	15	61, 69
Alcoholic beverage manufacturing	16	71-73
Soft drink and ice manufacturing	17	70
Ag chemical and equipment manufacturing	18	130-131, 203-204
Food and beverage retail trade	19	324
Food services and drinking places	20	413
OTHER ECONOMIC SECTORS		
Forestry, Fishing, Hunting	21	15-18
Mining	22	20-30
Utilities, Transportation, Information	23	31-33, 332-353
Construction	24	34-40
Tobacco, Textile, Wood, and Paper Product Manufacturing	25	74 – 112
Chemicals & Plastics Manufacturing	26	113-129, 132-152
Stone, Clay, Glass, Metal Products Manufacturing	27	153-202
Equipment and Instrument Manufacturing	28	205-318
Wholesale and Retail (non-food) Trade	29	319,320-323, 325-331
Finance, Insurance, and Real Estate	30	354-366
Services (non-food)	31	367-412, 414-426, 433-436
Government	32	427-432, 437-440

Table 2. Measures of Economic Activity for Sectors of New York State's Agriculture and Food System, 2011.

Sector/Industry	**Employment**	**Output[1] ($ Million)**	**Value Added[1] ($ Million)**
Production Agriculture			
Dairy farming	20,874	2,804	1,018
Cattle farming	2,025	253	42
All other animal farming	2,660	217	71
Fruit and vegetable farming	4,978	886	473
Greenhouse and nursery	3,099	399	262
Grain and oilseed farming	10,668	578	201
All other crop farming	1,877	364	96
Subtotal	**46,180**	**5,500**	**2,164**
Ag and forestry support services	**8,877**	**212**	**152**
Agriculture Manufacturing			
Dairy products	8,504	7,618	998
Fruits and Vegetables	6,957	2,972	593
Bakery, confectionary, snack foods, & flavorings	26,922	8,425	2,009
Animal foods	1,630	1,877	298
Animal slaughter and processing	3,770	1,202	146
Grain and oilseed processing	1,059	1,802	177
Other foods	2,862	963	230
Alcoholic beverages	4,192	3,861	1,920
Soft drink and ice	2,458	1,766	230
Ag chemical and equipment	1,591	1,411	265
Subtotal	**59,946**	**31,898**	**6,866**
Retail Trade Food and Beverage	**222,007**	**13,513**	**9,665**
Food Services and Drinking Places	**624,379**	**39,888**	**23,942**
Total	**961,389**	**91,012**	**42,789**

Source: Implan (2012)

[1]Output represents the value of industry production in producer prices, generally defined as sales. For manufacturers, however, output includes changes in inventories. Output for wholesale and retail sectors is calculated as a gross margin (sales minus the cost of goods sold) rather than gross sales.

The total value of farm commodity production in 2011, including all crop and livestock industries, was about $5.5 billion. The $2.2 billion of value added in these industries accounts for about 40% of the value of total output, and employment is estimated at just over 46 thousand. Dairy farming, of course, continues to dominate production agriculture, accounting for 51% of the total value of output. The next three largest components of production agriculture combined - fruit and vegetables, greenhouse and nursery, and grains and oilseeds - account for another 34% of the value of production agriculture. The relative contributions of each of these components to the total employment, output and value added in production agriculture do differ somewhat.

In 2011, support services for agriculture and forestry accounted for an additional $212 million in output throughout the State. Total value added from these support services was $152 million--just over 71% of the value of total output. Employment in this support services sector in 2011 was estimated at about 8,900.

From the perspective of production agriculture, those "downstream" sectors engaged in the manufacture of food, beverage, and kindred products, as well as agricultural chemicals and equipment manufacturing, also contribute importantly to the value of output in New York's agricultural and food system. The combined value of output from the 10 industries in this sector totaled nearly $32 billion in 2011. The nearly $7.0 billion of value added in these sectors account for just over 21% of the value of total output, and employment is estimated at about nearly 60 thousand. Over 70% of the value of total output of agricultural and food manufacturing is accounted for by the top four industries in term of value of output: bakery and related products (26%), dairy products (24%), alcoholic beverages (12%), and fruits and vegetables (9%).

The two other major sectors that are even further "downstream" from production agriculture include retail food and beverage stores and the services provided by eating and drinking establishments.[7] In 2011, the total value of output (gross margin) in the retail food and beverage sector was over $13.5 billion. Not surprisingly, the nearly $9.7 billion of value added accounts for nearly three-quarters of the total value of sales of retail food and beverage firms. In 2011, the total value of the services provided by eating and drinking establishments was $39.9 billion, and this is about three times the value of output from retail food and beverage stores. The nearly $24

[7] Wholesale trade sectors related to food and beverages, agricultural equipment and nursery supplies are also important "downstream" sectors relative to production agriculture. Unfortunately, data for these individual components of wholesale trade sector are not available in the IMPLAN databases. It was, therefore, impossible to disaggregate the wholesale trade sector for purposes of constructing the New York State IO model. Schmit and Bills (2012), however, begin with total output for the wholesale trade sector in IMPLAN and estimate relative shares for the important component sectors related to agriculture and the food system from the detailed data reported in the 2007 Economic Census. In the Census, food and beverage wholesale trade includes include farm product, grocery, and alcoholic beverage merchant wholesalers, agents and brokers. Agricultural equipment, suppliers, and nursery wholesale trade included farm and garden equipment, food-processing equipment, farm supplies, and flower, nursery stock, and florists' supplies merchant wholesalers. The total value of output for these components was estimated to be around $13.1 billion in 2010.

billion of value added in these eating and drinking establishments accounts for about 60% of the total value of sales.

While these totals provide an important perspective on the relative size of the major sectors in New York State's agriculture and food system, they tell only part of the story about differences in their economic structure. The differences in this structure among the sectors are revealed through an examination of the patterns and distributions of both sales and outlays, which differ dramatically by sector and by industry within a sector. Table 3, along with Figures 2, 2A, and 2B, summarize by sector/industry the distribution of sales between intermediate and final users of a sector's output. Similarly, Table 4, along with Figures 3, 3A and 3B summarize by sector/industry the distribution of production expenses between those purchases of intermediate inputs from other sectors of New York's economy, those purchases of labor capital and other components of value added, and those purchases from out of state.

4.1 Patterns and Distribution of Industry Outputs (*Sales)*

The distribution of sales identifies the importance of various markets for a sector's or industry's products. These markets include the intermediate sales to other sectors or industries in the New York economy for use as inputs in the production of their goods and services. Most of these intermediate sales are likely to "downstream" sectors in the agricultural and food system, but some sales are also to firms in some of the other 12 aggregate sectors of the New York economy listed in Table 1. Other sales go directly to final users, which include deliveries to households within New York, as well as exports to other states or to foreign countries.[8] Recall that only the margins for wholesale and retail trade transactions would be included as sales to intermediate users, while the remaining product values (in producer prices) are reflected in one or more deliveries to final demand.

The first row in Table 3 (and Figure 2) displays the distribution of production agriculture's total output between sales to intermediate and to final demands. The nearly $3.3 billion in sales to other sectors as intermediate inputs (e.g., as intermediate inputs in food processing) account for

[8] Both domestic and foreign exports are considered final demand sectors from the perspective of the New York State economy, but these sales could be to foreign households or to households in other states. Some sales could also go to foreign firms or to firms outside the state to be used as intermediate inputs. In addition, it is worth noting that foreign exports at the state level cannot be measured directly due to unsurmountable measurement issues in untangling point of origin and point of shipment data for goods and commodities. As noted by the USDA Economic Research Service "U.S. agricultural commodity exports are often produced in inland States and pass through several marketing or processing points before arriving at a port. As the commodity passes through other States before being exported, the State-of-origin often is lost or the product commingled with similar product from other States. Frequently, the State from which the commodity last started its export journey, not necessarily the State in which the commodity was produced, is the State of origin reported by the exporter." and further "Tracking the source State is even more complicated for processed agricultural products. Processors and manufacturers may use raw materials from a number of States, and final processed products may undergo multiple processing steps in different States before reaching the port for foreign shipment." (http://www.ers.usda.gov/data-products/state-export-data/documentation.aspx#.UxpGE4XPLfg). As such, alternative methods are used to indirectly compute foreign export shares at the state level, generally allocating exports by production shares.

just over 60% of the total value of the output from production agriculture. The remaining 39% is delivered to final users, with just over 10% allocated to households within New York (either as direct sales to consumers or the producer value of product sales (i.e., cost of goods sold) to wholesale and retail trade sectors that are sold to households), and 29% of the sales to domestic and foreign export markets (either directly by producers or through intermediary handlers; e.g., wholesalers).

The distributions of sales differ substantially by individual industry within production agriculture, and it is these differences across industries that reflect the importance of different markets for each of the industry's output (See Table 3 and Figure 2A). Not unexpectedly, over 80% of the sales from dairy farming are purchased as intermediate inputs by other in-state firms -- almost exclusively milk handlers and processors. Another 18% of sales are delivered to milk handlers and processors in other states. In both cases, the milk is processed further for sale in fluid markets or in markets for manufactured dairy or other food products. In turn, the combined deliveries of the state's dairy farm products to households or to foreign markets are less than 1% of the total. The 89% of the sales from cattle farming to intermediate users underscores the importance of downstream processing industries within the state for this industry whose sales constitute a relatively small proportion of the total for the State's production agriculture sector. Nearly 80% of the sales by all other crop farms also are used as intermediate inputs, primarily by bakery operations, textiles and wood manufacturing, and dairy farming (as feed inputs). About 36% of the sales of grains and oilseeds are used as intermediate inputs by other firms within New York, primarily animal food manufacturers and grain and oilseed processors. However, about 61% of the deliveries are split between exports to other states or to foreign countries, and it is likely these deliveries also go primarily to animal food manufacturers and grain and oilseed millers and processors outside the state.

In contrast, much larger proportions of sales of fruit and vegetable operations, greenhouse and nursery operations, and other animal farming are purchased by final users, either within or outside the State. While only 30% of the total output of fruit and vegetable producers is sold as intermediate inputs, 45% is delivered to households (directly or through wholesale/retail handlers) within the State. Other animal farming and greenhouse and nursery operations also deliver relatively large proportions of their output to final users--to households within the state, but also particularly to domestic markets outside the state (i.e., domestic exports).

As expected, most of the sales of agricultural and forestry support services (56%) are utilized primarily as intermediate inputs by crop, livestock, and forestry producers. An additional 21% of the sales of these services go to domestic export markets--services provided to crop, livestock, and forestry producers in nearby states.

Table 3. Distribution of sales (output) to intermediate and final demands by sector for New York's agriculture and food system, 2011.

		Deliveries to Final Demand				
	Sales to	New York	Exports			Total
Sector/Industry	Intermediate Users	Households	Domestic	Foreign	Other[1]	Output
Production Agriculture ($ million)	$3,345	$588	$1,166	$368	$33	$5,500
Percent of Total	61%	11%	21%	7%	1%	
	----------Percent of Individual Industry Total----------					
Dairy farming	81%	<0.5%	18%	<0.5%	<0.5%	$2,804
Cattle farming	89%	1%	11%	<0.5%	<0.5%	$253
All other animal farming	19%	27%	52%	2%	1%	$217
Fruit and vegetable farming	30%	45%	10%	15%	1%	$886
Greenhouse and nursery	11%	24%	60%	3%	3%	$399
Grain and oilseed farming	36%	2%	27%	34%	1%	$578
All other crop farming	79%	3%	9%	7%	1%	$364
Ag and forestry support services ($ million)	$119	$16	$45	$9	$23	$212
Percent of Total	56%	8%	21%	4%	11%	
Agriculture Manufacturing ($ million)	$4,313	$10,415	$14,620	$1,800	$751	$31,898
Percent of Total	14%	33%	46%	6%	2%	
	----------Percent of Individual Industry Total----------					
Dairy products	20%	32%	42%	3%	3%	$7,618
Fruits and Vegetables	9%	31%	51%	7%	2%	$2,972
Bakery, confectionary, snack foods, & flavorings	10%	27%	59%	4%	1%	$8,425
Animal foods	19%	39%	37%	4%	<0.5%	$1,877
Animal slaughter and processing	10%	45%	27%	15%	3%	$1,202
Grain and oilseed processing	19%	13%	57%	10%	<0.5%	$1,802
Other foods	14%	26%	46%	12%	2%	$963
Alcoholic beverages	6%	38%	48%	7%	1%	$3,861
Soft drink and ice	9%	83%	6%	1%	<0.5%	$1,766
Ag chemical and equipment	25%	9%	34%	15%	17%	$1,411
Retail Trade Food and Beverage ($ million)	$755	$10,682	$2,044	$0	$33	$13,513
Percent of Total	6%	79%	15%	0%	<0.5%	
Food Services and Drinking Places ($ million)	$7,421	$29,242	$1,408	$55	$1,762	$39,888
Percent of Total	19%	73%	4%	<0.5%	4%	

Source: Implan (2012). Detail may not add due to rounding; zero values are < 0.5.

[1] Other includes government demands, capital allocation, and inventory adjustments.

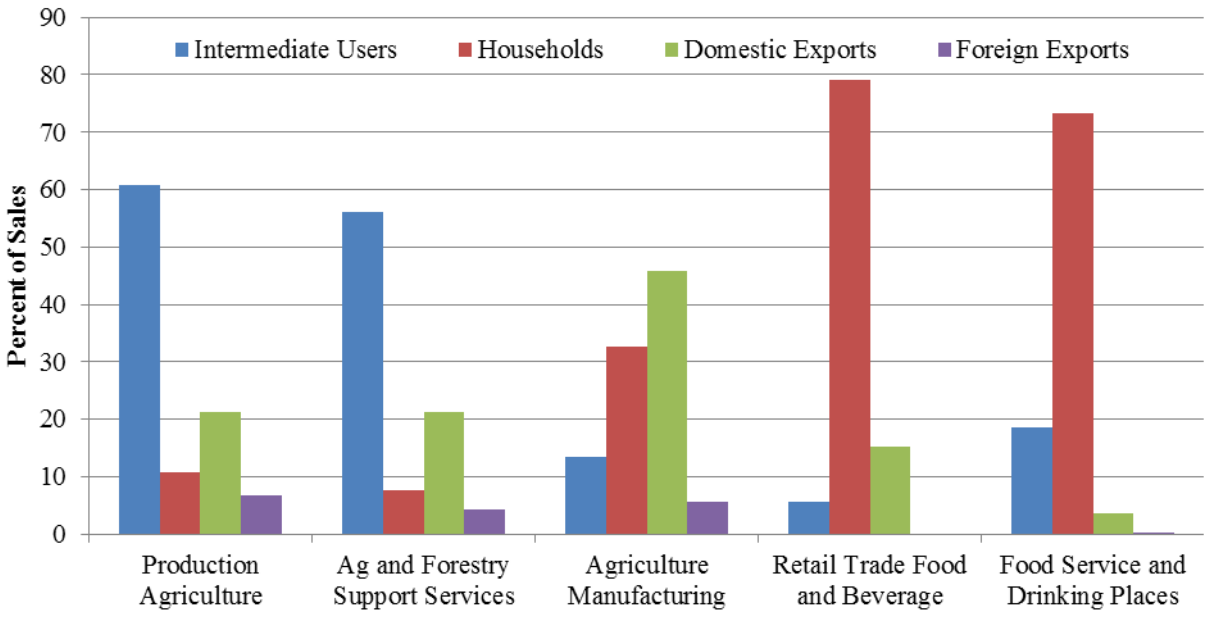

Figure 2. Distribution of Sales for Sectors of New York's Agricultural and Food System, 2011

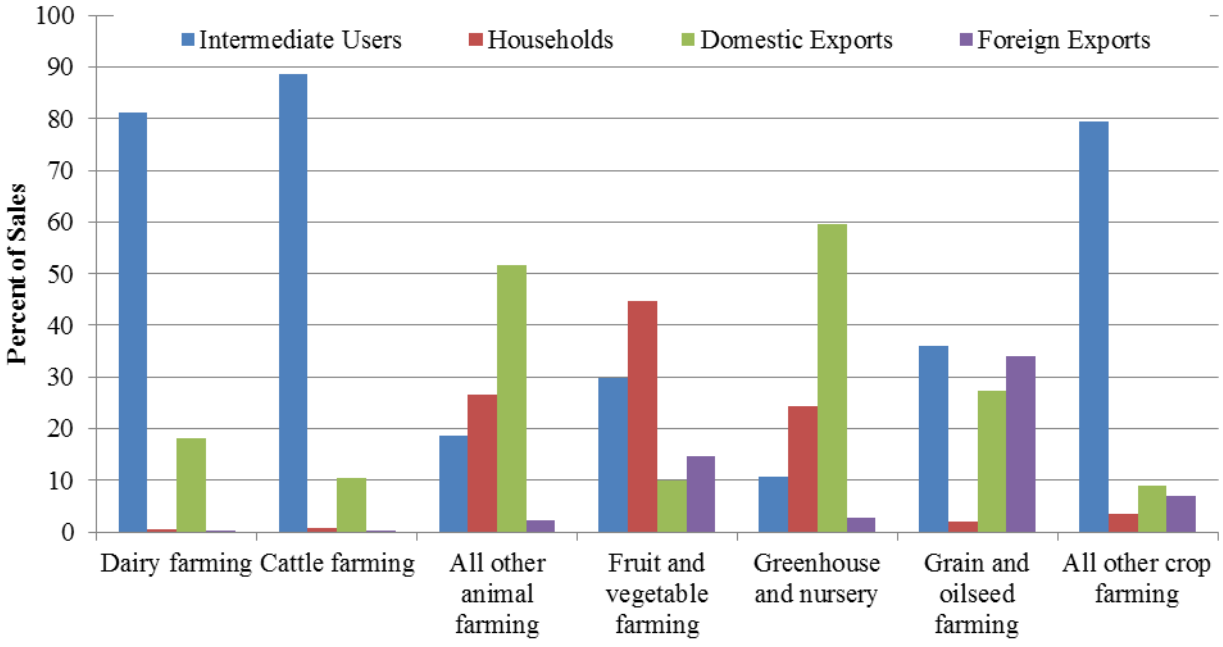

Figure 2A. Distribution of Sales for Production Agriculture in New York, 2011

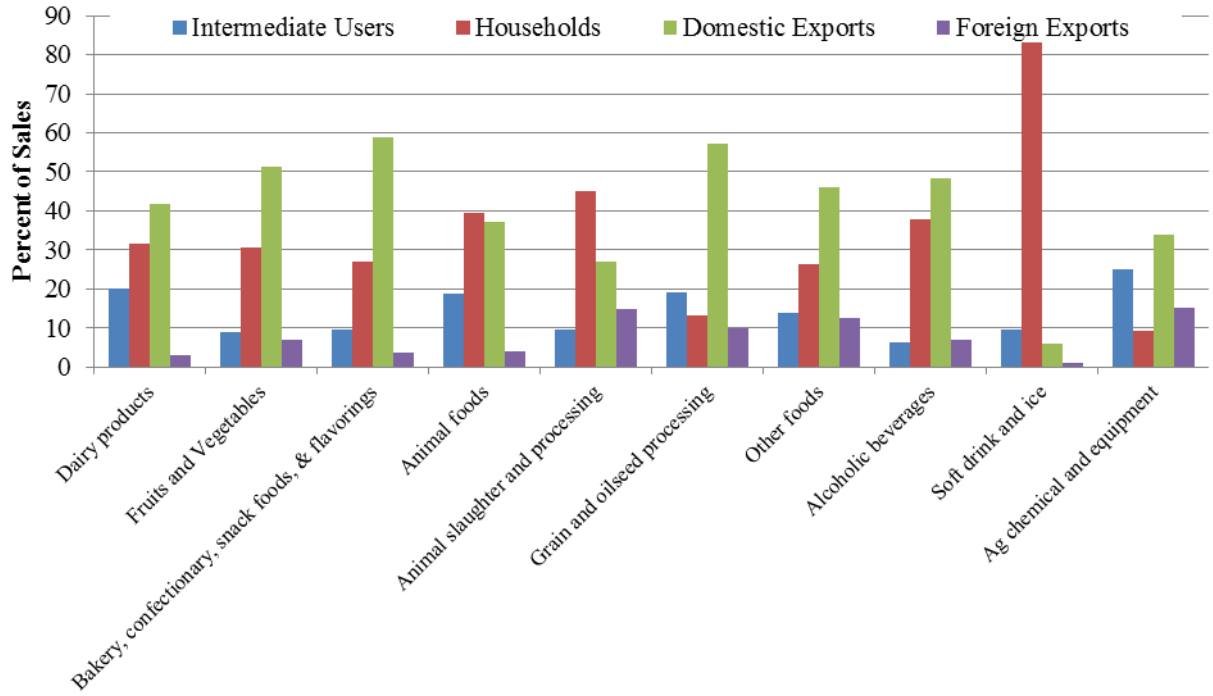

Figure 2B. Distribution of Sales for Agricultural Manufacturing in New York, 2011

The 10 industries in the agricultural and food manufacturing sector of the New York economy are "downstream" from the industries in production agriculture. While the industries in this sector still produce goods and services used as intermediate inputs by other sectors of the economy, they also produce many finished food products that are delivered to households (either directly or through wholesale/retail sectors). Therefore, it should come as no surprise that for the sector as a whole only 14% of sales in 2011 were used by other firms as intermediate inputs. In contrast, the remaining 86% of the total sales were delivered to final users-- 33% to New York households and 46% to households and other final users in neighboring states or other regions of the country. Only 6% of deliveries are to foreign markets (See Table 3 and figure 2B.)

The distribution of sales between intermediate and final users for industries within the agricultural and food manufacturing sector, however, does differ substantially around these sector-wide averages. About one-quarter of the output of agricultural chemicals and equipment is sold to other industries as intermediate inputs (e.g., fertilizers and pesticides as farm inputs), as is about 19% of the output from grain and oilseed processing which is used as input in numerous bakery and snack food products. Similarly 20% of manufactured dairy products, much of which (e.g., fluid milk, milk components, etc.) is used as intermediate inputs by other firms within the same industry (e.g. yogurt, cheese, etc.) or also used as intermediate inputs in bakery goods and related products. In contrast, about 83% of soft drink and ice production is delivered to households (predominantly through wholesale and retail trade outlets). About 45% of the value of products from animal slaughter and processing are ultimately delivered to New York households, as are 39% of animal foods (pet foods, etc.) and 38% of alcoholic beverages.

It is perhaps somewhat surprising that only about one-third of manufactured dairy products are consumed by households within the state. This is in part explained by the importance of domestic markets outside the state for six of the industries within the manufacturing sector, including manufactured dairy products. For these six industries, over 40% of the output is sold in domestic consumer markets and/or to firms that are beyond the state's borders. The percentages are highest for bakery goods and related products (59%) and processed grains and oilseeds (57%) followed in rank order by fruits and vegetables (51%), alcoholic beverages (48%), other manufactured foods (46%), and dairy products (42%).

When viewed from a sales perspective, the two sectors that are furthest "downstream" from production agriculture are made up of retail firms in food and beverages and food service establishments and drinking places (Table 3 and Figure 2). Since the food and beverage retail trade sector includes grocery stores of all kinds; meat, fish, vegetable and fruit markets; bakeries, etc., the fact that nearly 79% of the value of total sales are to consumers within the state is not unexpected. Because the food service sector includes food service contractors and caterers in addition to bars and restaurants of all kinds, a lower level of deliveries are made to final consumers (73%), while 19% of the sales serve as intermediate inputs to other firms. Any sales to domestic markets outside of New York (15% and 4% for retail trade and food services, respectively) are likely to be in neighboring states and follow similar patterns between final sales and intermediate sales as we see in the New York markets.

The heterogeneous sales allocations across agricultural production and manufacturing sectors highlight the need for differential marketing strategies employed by firms in the different sectors. Understanding these differences can help guide marketing development programs for firms and highlight market segments to target, including important opportunities beyond state domestic markets.

4.2 Patterns and Distribution of Industry Outlays (*Inputs*)

The distribution of sales to intermediate and final markets provides one perspective (a "downstream" perspective if you will) on the structure of industries within New York's agricultural and food system. The "upstream" perspective gives an alternative, but equally important, view the structure of the state's agricultural and food system. From this perspective, we delineate the distribution of purchases of inputs needed by a particular sector in the production of its goods and services. As discussed above, the columns of the inter-industry transaction table provide this "upstream" perspective on the distribution of inputs purchases by each sector in the agricultural and food system.[9] In addition to providing this second important

[9] Most purchases of intermediate inputs by sectors in New York's agricultural and food system are likely to be from "downstream" sectors in the agricultural and food system, but some of the other sectors in New York's economy (listed in Table 1) also sell intermediate inputs to sectors in New York's agricultural and food system.

view of the structure of the agricultural and food system, this “upstream” distribution of expenditures on productive input, particularly among intermediate inputs, the several components of value added, and those inputs purchased from outside the state, have much to do with the differential magnitudes of the economic multipliers across sectors.

For the industries in the state’s agricultural and food system, these patterns of input purchases are detailed in Table 4 and Figures 3, 3A, and 3B. For the production agriculture sector as a whole, expenditures are distributed rather evenly among the three primary categories: 27% of total expenditures are for intermediate inputs, 39% are payments to labor and the other components of value added, and 33% are for intermediate inputs purchased from outside the state (Table 4 and Figure 3). The breakdown differs substantially across the seven industries within the sector (Table 4 and Figure 3A).

The distribution of expenditures in dairy farming mirrors that for the entire sector, with 28%, 36%, and 35% going to intermediate inputs, value added, and intermediate imports, respectively. The labor and capital intensive nature of fruit and vegetable farming and greenhouses and nurseries is evidenced by the fact that 53% and 66% of production expenses, respectively, are payments to value added—most of which are in the form of employee compensation and proprietor income. In percentage terms, intermediate input purchases in fruit and vegetable production (23%) are twice as large as for greenhouses and nurseries (11%). Intermediate input purchases are highest in percentage for cattle farming (39%), grains and oilseeds (32%) and other crop farming (35%). Of the seven industries within production agriculture, fruit and vegetable farming and greenhouses and nurseries spend the least in percentage terms (21-22%) on intermediate inputs from outside the state. This is in contrast to the other crop and livestock farming industries, where between 31% and 44% of input costs are for intermediate inputs from outside the state.

When taken as a whole, the distribution of payments for agricultural and food manufacturing differ somewhat from that for production agriculture sector (Table 4 and Figure 3). Purchases of intermediate inputs as a percent of the total expenditures (37%) is slightly higher for agricultural and food manufacturing, but the payments to value added account for only 22% of total expenditures. About 41% of total production expenditures are for inputs purchased from out-of-state.

The distribution of production expenditures differs considerably across industries within the agricultural and food manufacturing sector (Table 4 and Figure 3B). At one extreme, for example, dairy manufacturing expenditures on intermediate inputs from within the state accounts for 59% of its total input costs. This is hardly a surprising result since a large portion of its inputs can be purchased from the local dairy producers. This also means that dairy products manufacturers are able to rely less on firms from outside the state—spending only 27% of the

Table 4. Distribution of purchases (outlays) by sector for New York's agriculture and food system, 2011.

Sector/Industry	Purchase Intermediate Inputs	Payments to Value Added: Total	Employee Compensation	Proprietor Income	Other Property Income[1]	Indirect Business Taxes	Intermediate Imports	Institutional Purchases[2]	Total
Production Agriculture ($ million)	$1,487	$2,164	$644	$874	$684	-$38	$1,788	$61	$5,500
Percent of Total	27%	39%	12%	16%	12%	-1%	33%	1%	
	----------Percent of Individual Industry Total----------								
Dairy farming	28%	36%	7%	1%	29%	-1%	35%	1%	$2,804
Cattle farming	39%	17%	10%	0%	8%	-1%	44%	0%	$253
All other animal farming	25%	33%	16%	6%	11%	-1%	42%	1%	$217
Fruit and vegetable farming	23%	53%	17%	49%	-12%	-1%	21%	2%	$886
Greenhouse and nursery	11%	66%	43%	56%	-32%	0%	22%	1%	$399
Grain and oilseed farming	32%	35%	4%	18%	13%	0%	31%	1%	$578
All other crop farming	35%	26%	12%	22%	-5%	-2%	37%	2%	$364
Ag and forestry support services ($ million)	$24	$152	$142	$45	-$41	$4	$36	$0	$212
Percent of Total	11%	71%	67%	21%	-19%	2%	17%	0%	
Agriculture Manufacturing ($ million)	$11,715	$6,866	$2,834	$283	$2,353	$1,395	$13,088	$229	$31,898
Percent of Total	37%	22%	9%	1%	7%	4%	41%	1%	
	----------Percent of Individual Industry Total----------								
Dairy products	59%	13%	6%	0%	6%	0%	27%	0%	$7,618
Fruits and Vegetables	32%	20%	12%	1%	8%	0%	47%	1%	$2,972
Bakery, confectionary, snack foods, & flavorings	31%	24%	12%	1%	11%	0%	44%	1%	$8,425
Animal foods	31%	16%	5%	0%	10%	0%	53%	1%	$1,877
Animal slaughter and processing	33%	12%	14%	1%	-2%	0%	54%	1%	$1,202
Grain and oilseed processing	32%	10%	4%	0%	5%	0%	57%	1%	$1,802
Other foods	30%	24%	16%	1%	7%	0%	45%	1%	$963
Alcoholic beverages	20%	50%	6%	3%	7%	34%	30%	1%	$3,861
Soft drink and ice	30%	13%	8%	2%	2%	0%	57%	1%	$1,766
Ag chemical and equipment	32%	19%	7%	1%	11%	0%	49%	1%	$1,411
Retail Trade Food and Beverage ($ million)	$2,995	$9,665	$5,746	$1,564	$301	$2,053	$769	$83	$13,513
Percent of Total	22%	72%	43%	12%	2%	15%	6%	1%	
Food Services and Drinking Places ($ million)	$9,740	$23,942	$15,206	$1,464	$4,252	$3,021	$5,960	$246	$39,888
Percent of Total	24%	60%	38%	4%	11%	8%	15%	1%	

Source: Implan (2012). Detail may not add due to rounding; zero values are < 0.5.

[1] Other property type income includes dividends, interest, rent, corporate profits, and depreciation.

[2] Institutional purchases include purchases from inventories, government, and households.

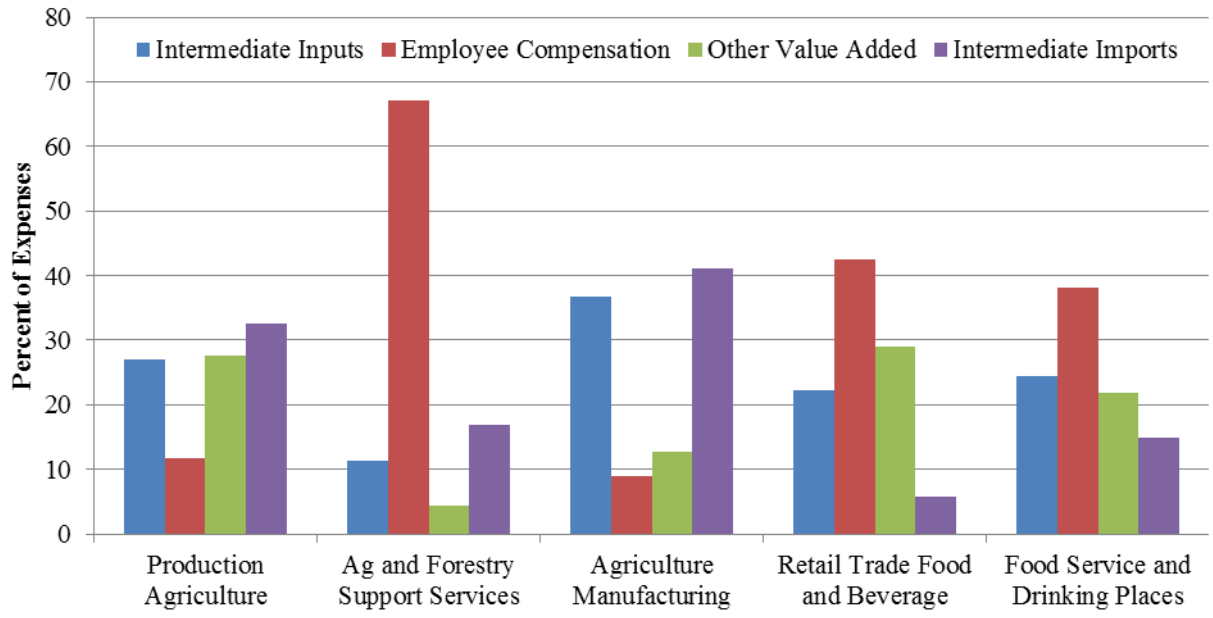

Figure 3. Distribution of Expenses for Sectors of New York's Agricultural and Food System, 2011

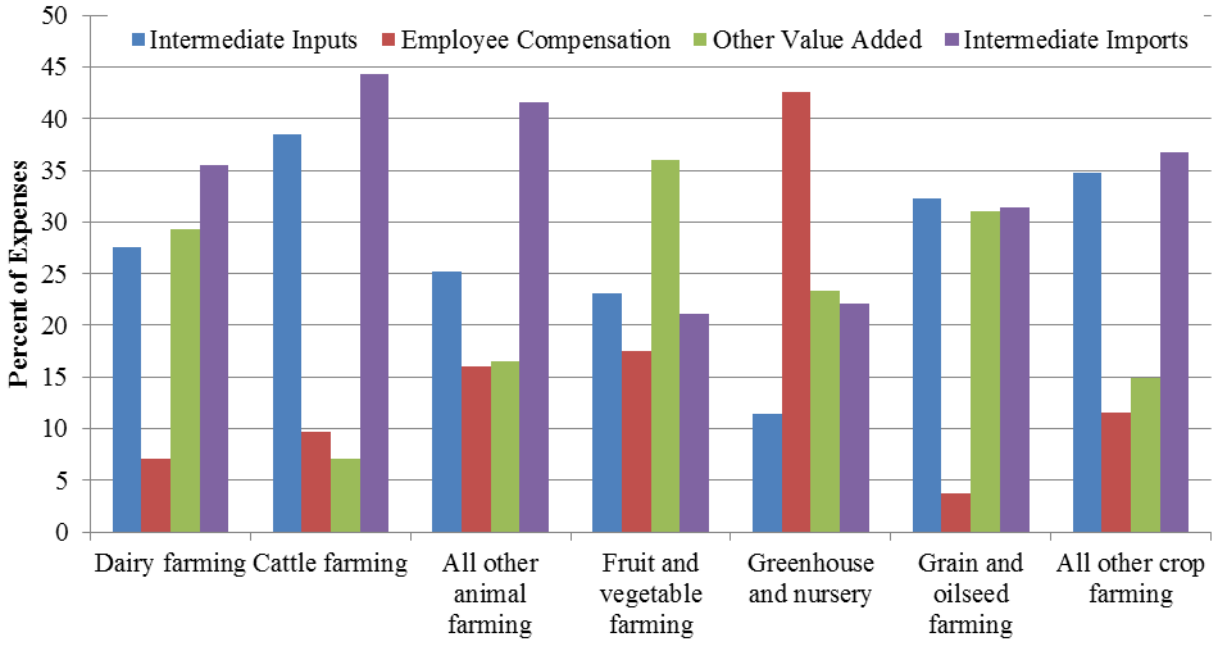

Figure 3A. Distribution of Expenses for Production Agriculture in New York, 2011

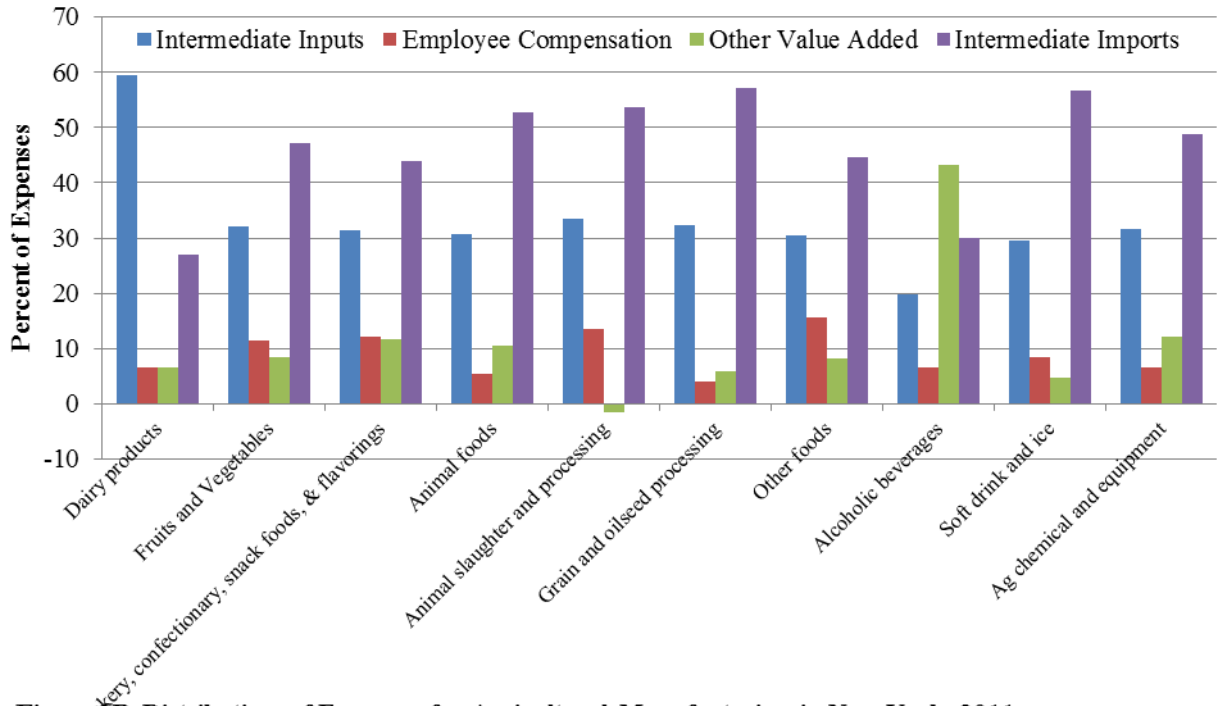

Figure 3B. Distribution of Expenses for Agricultural Manufacturing in New York, 2011

value of their inputs as intermediate imports. At the other extreme, alcoholic beverage processing expenditures on intermediate inputs from the state account for only 20% of its total input costs. Wineries (representing around 20% of total output in the industry) rely more heavily on inputs from New York vineyards; however, breweries and distilleries (making up around 50% and 30% of total output in the industry, respectively) source fewer inputs locally. Even still, intermediate imports in this sector remain a relatively low proportion of total expenditures (30%). The remaining industries within this sector have spending on intermediate inputs that account for around one-third total production expenditures, and intermediate imports at or above 44%.

The proportions of production costs accounted for by payments to value added are highest for alcoholic beverages (50%) and reflective of relatively large payments for indirect business taxes. Other value added proportions range between 12% and 24%, and generally ranked consistently with relative expenditures on labor income components.

Because the other three sectors listed in Table 4 (and Figure 3) are service sectors, it is expected that payments in the form of employee compensation and proprietor income account for a larger share of their total expenditures. The agricultural and forestry service sector is the most labor intensive of the three, as measured by these combined expenditures (88%). The retail food and beverage sector ranks second, with 55% of its expenditures going to employee and proprietors, while these two categories of expenditures account for only 42% of total costs from food service and drinking places. Purchases of intermediate input from other sectors in the New York economy account for 22% and 24% of production expenditures in the retail food and beverages

and food service sectors, respectively. Only 11% of total production expenditures are for intermediate inputs from other New York firms in the agricultural and forestry services. Intermediate imports account for no more than 17% of total production expenditures in these three service sectors.

As discussed above, a better understanding of the distribution of outlays by agricultural and food system sector is useful in identifying the importance of local intermediate input suppliers and potential opportunities for import substitution to increase local multiplier or ripple effects. A better understanding of outlays to labor income accounts also provides useful information on the relative labor intensive nature of various industries in the agricultural and food system. Both types of information are useful in understanding economic impacts of the various industry sectors – an area we turn to next.

5. Economic Impact Analysis

The use of I-O models for regional policy analysis dates back at least to the 1950's. These models contain the analytical capacity to estimate the total effects that an initial change in economic activity has on a regional economy. The initial change involves a change in final demand such as a new construction project, an increase in government purchases, or an increase in exports.

The state-wide economic impact from the expansion or contraction of a particular industry's output, be it due to changing economic conditions, private investments, or policy-related expenditures, are captured in the economic multipliers that trace out the interrelationships among these "upstream" industries. These interrelationships are the transactions among business firms to acquire the inputs needed to deliver additional product or service to a final user. That is, these economic multipliers quantify the cumulative (direct, indirect, and induced) effect of an initial change in final demand plus the resulting series of successive rounds of spending that "ripple" throughout the local economy. Thus, the multipliers provide estimates of the ratio between these combined direct, indirect, and induced expenditures and the initial change in final demand (or the associated change in income or employment). The magnitudes of these economic multipliers differ by industry, and these differences depend on the patterns of input purchases, especially on how dependent a particular industry is on purchases of inputs from "upstream" firms within the state vs. from purchases of similar inputs from firms beyond the state's borders. By reducing the transactions among firms within the state, the purchases of these intermediate inputs from firms outside the state constitute "leakages" and dampen the "ripple" effects throughout the New York economy that would otherwise occur if the inputs were purchased from firms within the state. The size of the multipliers is also affected by the labor and capital intensity of production. [10]

[10] Because of the importance of economic linkages between economic regions across the country, it may well be that the size of these multiplier effects for New York State may also depend on the extent to which these inter-regional influences are taken into account. Therefore, as part of this research, we did conduct a two-region economic impact analysis that incorporated New York's five contiguous states as an additional region. In this way, we were able to

Despite the widespread use of an economic multiplier as a tool in economic impact analysis, they are typically based on a yearly "snapshot" of a regional economy. This means that over time these multipliers can become dated as local economies evolve as businesses adopt new technology, and make decisions based on changes in the relative prices of outputs and inputs, often resulting in changes in regional trade patterns. For these reasons, the best use of these multipliers is in the study of the economic impacts of policies that lead to rather small, marginal changes in relatively few sectors in a local economy.

As mentioned above, multipliers can be defined to focus on different measures of economic activity, and for our purposes, we focus on three such measures: output, labor income, and employment multipliers. Throughout the discussion, we report what are known as SAM multipliers, which are derived from a Social Accounting Matrix (SAM), rather than a standard I-O model. The SAM has an input-output model at its core, but because the SAM distinguishes household purchasing patterns by income group, the multipliers based on the SAM reflect the ripple-effects throughout the economy with somewhat greater precision than do those based in an I-O model (Miller and Blair, 2009, chapter 11). Because the IMPLAN data and software contain the data needed to construct a SAM, we present these SAM multipliers for the major industries in New York's agriculture and food industry.

5.1 SAM Multipliers, Direct, and Total Effects

Consider first the SAM multipliers for New York's production agriculture and support services industries in Table 5. Output multipliers for 2011 range from 1.54 (animal production except cattle, poultry, and eggs) to 1.90 (fruit farming). Consistent with Table 4, relatively higher output multipliers are reflective of industries with higher intermediate input purchases (implying larger indirect effects) and/or higher payments to labor income (implying larger induced effects), and lower imports from outside of New York State. Indeed, the industries with the lowest levels of imports (fruit and vegetable farming and greenhouse and nursery production), have the largest output multipliers, while other animal production has the highest level of imports and the lowest output multiplier. In terms of their interpretation, consider the case of dairy farming's 1.61 output multiplier – for a $1 dollar change in output in dairy farming to final demand (the direct effect), an additional $0.61 is generated in output in backward linked industries to support that initial change.

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track how an impact (e.g., an increase in sales to final demand) in New York State affects the production of commodities in other sectors in those states contiguous to New York and vice versa. Consistent with past efforts to measure these multi-regional impacts (see Miller and Blair 2009, pp. 84-85), we found that any increases in indirect and induced effects in New York State by including this second region in our analysis were modest indeed--averaging less than a 2% gain regardless of the particular agricultural production or food manufacturing industry being examined. For this reason, and because the data on interregional transactions among industries are among the most unreliable data collected for use in IMPLAN, we focus exclusively on the economic impacts based on the single region model of the New York State economy.

Table 5. 2011 SAM Economic Multipliers for New York's Production Agriculture and Support Services

Sector/Industry	Output	Labor Income	Employment
Dairy farming	1.61	3.34	1.44
Cattle farming	1.66	2.88	1.52
All other animal farming			
poultry and egg production	1.82	2.16	3.08
animal production, except cattle, poultry, & eggs	1.54	1.71	1.13
Fruit and vegetable farming			
vegetable and melon farming	1.87	1.54	2.20
fruit farming	1.90	1.52	2.16
Greenhouse and nursery	1.89	1.38	1.79
Grain and oilseed farming			
oilseed farming	1.62	1.87	1.30
grain farming	1.74	2.30	1.23
All other crop farming	1.83	1.93	2.12
Ag & Forestry Support Services	1.83	1.36	1.12

Source: Implan (2012)

Given the different labor and capital intensities of these industries, the labor income (payrolls) and employment (jobs) SAM multipliers are ranked differently from the sales (output) multipliers. For example, the output multiplier for dairy farming is one of the lowest, but it has the highest labor income multiplier and its employment multiplier is about in the middle. As described above, these differences are best understood through a closer inspection of the relative sizes of the direct labor income coefficients and direct employment coefficients in these sectors.

The direct and total effects for the production agriculture and agricultural service sectors are given in Appendix D, Tables D1 and D2. As discussed above, the labor income multipliers (Table 5) are inversely proportional to the direct labor income effects (Table D1).[11] For labor income, the direct effects represent direct payments to labor (employees and proprietors) per dollar of output in the associated industry. The smaller labor requirements per dollar of output, say for dairy or cattle farming relative to fruit or vegetable farming or greenhouse and nursery production, lead to higher labor income multipliers for the former relative to the latter. The intuition is straight forward. Since the labor income multiplier represents the total labor income generated in all industries for an additional dollar of labor generated in the particular industry, when the direct payments to labor per dollar of output are smaller, the larger is the direct change

[11] To recover the multipliers in Table 5, we need only divide the total effects in table D2 by the respective direct effects in Table D1.

in output per additional dollar of income, so there is a larger direct change in output to generate the indirect and induced changes in income throughout the economy.

A similar exercise helps explain the sizes of the employment multipliers in Table 5. The larger direct employment effects (i.e., larger employment requirements per $1 million of output) are associated with smaller employment multipliers. The larger the direct employment effect, the smaller is the direct change in output per additional job created in that sector. Therefore, there is a smaller direct change in output to generate the indirect and induced changes in jobs throughout the economy. For example, the smallest direct employment effect is in poultry and egg production industry (a highly mechanized industry); as such, the direct change in output per additional employee is largest in this industry, and it tends to generate larger indirect and induced changes in employment throughout the economy. At the other extreme, employee compensation accounts for a high proportion of the production costs in agricultural and forestry support services industry. For these reasons, the direct change in output in this industry per additional employee hired is small, and this leads to relatively smaller indirect and induced effects from other sectors of the economy. Thus, the income and employment multipliers for this sector are among the smallest.

SAM multipliers for New York's agricultural manufacturing sectors, food retail trade, and food service are provided in Table 6, with the underlying direct and total effects in Appendix D, Tables D3 and D4. For agriculture manufacturing, output multipliers are highest for the dairy product manufacturing industries, reflecting higher local intermediate input purchases (i.e., from dairy producers) and less imports. Lower reliance on labor inputs (per dollar of output) also translates into relatively strong labor income and employment multipliers for these industries. Overall the fats and oils refining and blending industry has the highest labor income and employment multipliers across all agriculture manufacturing industries.

Retail trade in food and beverage and the food service sectors have output multipliers in the middle to upper range relative to manufacturing – a consequence of somewhat lower intermediate input purchases from local sources, but higher local employee compensation. Labor income multipliers average about 1.6 and employment multipliers about 1.3.

For comparison with non-agricultural related sectors, the multipliers for the remaining aggregated sectors of New York's economy are shown in Tables 7. The direct effects and total effects are shown in Appendix D, Tables D5 and D6, respectively.

Table 6. 2011 SAM Economic Multipliers for New York's Agriculture Manufacturing, Food Retail Trade, and Food Service

Sector/Industry	Output	Labor Income	Employment
Dairy products			
fluid milk and butter manufacturing	2.07	4.94	7.66
cheese manufacturing	2.06	5.08	6.11
dry, condensed, & evaporated dairy product manufacturing	1.98	4.17	5.52
ice cream and frozen dessert manufacturing	1.85	3.19	2.72
Fruit and vegetables			
frozen food manufacturing	1.68	2.89	2.39
fruit and vegetable canning, pickling, and drying	1.60	3.08	2.80
Bakery, confectionary, snack foods, & flavor			
bread, cookie, snack food	1.69	2.67	1.93
coffee, syrup, seasoning mfg	1.52	3.76	4.12
Animal foods			
dog and cat food manufacturing	1.52	4.54	5.26
other animal food manufacturing	1.65	4.73	5.29
Animal slaughter and processing			
animal (non-poultry) slaughtering, rendering, & processing	1.65	2.23	2.44
poultry processing	1.53	3.58	2.23
Grain and oilseed processing			
flour milling and malt manufacturing	1.77	5.33	7.37
soybean and other oilseed processing	1.30	8.19	5.03
fats and oils refining and blending	1.35	10.62	8.97
Other foods			
seafood product preparation and packaging	1.60	2.27	2.87
all other food manufacturing	1.60	2.71	2.38
Alcoholic beverages			
breweries	1.42	2.75	4.20
wineries	1.63	3.20	2.36
distilleries	1.19	1.91	4.55
Soft drink and ice manufacturing	1.55	2.88	3.14
Ag chemical and equipment manufacturing			
fertilizer manufacturing	1.75	6.68	5.52
pesticide and other agricultural chemical manufacturing	1.51	4.72	5.69
farm machinery and equipment manufacturing	1.50	2.50	2.80
lawn and garden equipment manufacturing	1.47	2.28	2.16
Retail Trade Food & Beverage	1.76	1.58	1.29
Food Services & Drinking Places	1.70	1.68	1.28

Source: Implan (2012)

Table 7. 2011 SAM Economic Multipliers for Remaining Sectors of New York's Economy

Sector/Industry	Output	Labor Income	Employment
Forestry, fishing, and hunting	1.56	2.26	1.32
Mining	1.73	3.38	2.19
Utilities, transportation, information	1.69	1.85	2.21
Construction	1.68	1.53	1.56
Tobacco, textile, wood, and paper product mfg.	1.46	1.96	2.11
Chemicals and plastics mfg.	1.40	2.12	2.39
Stone, clay, glass, metal products mfg.	1.67	2.35	2.34
Equipment and instrument mfg.	1.55	2.16	2.60
Wholesale and retail (nonfood) trade	1.63	1.60	1.47
Finance, insurance, and real estate	1.60	1.82	2.24
Services (nonfood)	1.77	1.57	1.54
Government	1.71	1.36	1.44

Source: Implan (2012)

5.2 Time Series of SAM Multipliers

To view these estimates of economic multipliers from a somewhat broader perspective, it is important to reemphasize that they are based on the inter-industry transactions in one particular year, and that the estimates of the multipliers will vary from year to year with changes in the value of transactions among sectors. Since trade among sectors in an input-output model are denominated in dollar terms, differences in agricultural prices, as well as in quantities produced, over time will affected sizes of the estimated multipliers. Labor income multipliers, for example, have been especially volatile in recent years. This volatility is due in large measure to the considerable variability in agricultural product prices, combined with wage rates that have been much more stable. In this case of rising prices, the direct labor income requirements per dollar of output fall—thus, ceteris paribus, having a positive effect on the size of the labor income multiplier.

For these reasons, we can also expect the impact of policy decisions whose effects persist over time will be sensitive to the year-to year changes in these multipliers. Therefore, to provide this broader perspective on the economic impacts, we provide estimates of the of SAM multipliers for the years 2007 through 2011, along with the 5-year averages in Appendix E, Tables E1 through E9. In these tables, we report output, labor income, and employment multipliers for production agriculture, agricultural manufacturing, and other aggregated sectors. These average multipliers may well provide a somewhat longer-term perspective on the economic impacts from direct changes in these sectors due to policy initiatives or changes in private investment.

6. Conclusions

This report is part of a larger effort to update and document the importance of New York's major agricultural industries to the State's economy. The first report provided updated baseline information on the current status and trends in the economic activity of New York State's agricultural and food system (Schmit and Bills 2012). In this report, we focus on a closer inspection of inter-industry transactions to obtain a clearer picture of the structure of agricultural and food sectors in the New York State. We then go on to estimate the importance of the State's agricultural and food system to the NYS economy, both in total and most especially at the margin as various components of the agricultural and food system expand and/or contract in response to the changing economic conditions and policy related incentives. We conduct the analysis based on the 2011 inter-industry transactions data included in the IMPLAN software.

The distributions of sales were shown to differ substantially across markets by individual industry within production agriculture and agricultural manufacturing sectors, highlighting the relative importance of various markets (i.e., as sales to intermediate users, households, or export markets) and the need for differential marketing strategies employed by firms in the different ag-based sectors. The distributions of purchases for intermediate inputs, value added expenditures, and imports were also shown to differ substantially across ag-based industries, providing important information in deciphering the differential magnitudes of the economic multipliers across industries.

Ag-based industry multipliers compare favorably with those in the aggregate non-ag-based sectors. Relatively higher output multipliers within production agriculture were evident for the fruit and vegetable, greenhouse and nursery, and poultry and egg industries; these industries have relatively higher intermediate input purchases, higher payments to labor income, and lower imports from outside of NYS. Given the large dairy farming industry in NYS, and the utilization of the industry's outputs by local dairy manufacturers, it is expected to find the highest output multipliers in agricultural manufacturing from the dairy product processing industries.

Furthermore, if policy foci center on targeting industry expansion efforts in industries with larger generative effects on income and/or jobs, attention to production industries with higher labor income (dairy and cattle farming) and employment (poultry and egg, and fruit and vegetable production) multipliers may be desirable. For agricultural manufacturing, labor income and employment multipliers are highest in dairy processing, animal foods manufacturing (including livestock feeds), and grain and oilseed processing.

While these may be desirable sectors to target for expansion from a policy perspective, it is important to emphasize that the sizes of these multipliers says nothing about the likelihood or means by which they will/can be expanded. The likelihood of expansion of the sectors depends

on where markets may be expanding and the extent to which these are the ones in which the multipliers are large. The extent to which public policy can help in expanding opportunities is also important.

Throughout this report we have examined the several multiplier effects associated with the various ag-based economic sectors in NYS. In closing, however, it is important to re-emphasize that it is most appropriate to use these multipliers to examine the impact of marginal (rather small) changes in any particular industry. Relatively large changes in an industry are most likely to be accompanied by structural changes in the nature of the economy's inter-industry transactions. Under these conditions, it may be more problematic to base estimates of the economic impacts on current estimates of economic multipliers.

7. References

Implan Group, LLC . 2012. Data and Software. http://www.implan.com.

King, B.B., 1985. "What is a SAM?" in G. Pyatt and J. Round, eds., *Social Accounting Matrices: A Basis for Planning*. Washington: The World Bank, 17-51.

Miller, R. and P. Blair. 2009. *Input-Output Analysis: Foundations and Extensions*, 2nd edition. Cambridge, England: Cambridge University Press.

Miller, R.E., K.R. Polenske, and A.Z. Rose (eds.). 1989. *Frontiers of Input-Output Analysis*. New York: Oxford University Press.

Pyatt, G., and Round, J.I., eds. 1985. *Social Accounting Matrices: A Basis for Planning*. Washington: The World Bank.

Richardson, H.W. 1972. *Input-Output and Regional Economics*. New York: Wiley.

Schmit, T.M. and N.L. Bills. 2012. "Agriculture-Based Economic Development in NYS: Trends and Prospects." EB 2012-11, Charles H. Dyson School of Applied Economics and Management, Cornell University. September.

Yan, C-S. 1969. *Introduction to Input-Output Economics*. New York: Holt, Rhinehart and Winston.

APPENDIX A: THE INPUT-OUTPUT METHODOLOGY

To understand the analytical capacity of the Input-Output (I-O) methodology, one must first examine the purchases and sales of products among various sectors of an economy. To engage in production, industries must purchase inputs and sell output. They purchase raw materials, labor, capital equipment, and intermediate inputs from other sectors. Some of these purchases are from outside a state, region, or even the country. In turn, the industries sell products to governments, to other industries as intermediate inputs, and to final consumers. Moreover, some of these sales can also be to firms or consumers outside a state, region, or even the country. These patterns of purchases and sales are conveniently summarized in the inter-industry transactions table. [12]

There are n sectors in the economy that produce goods for sale as intermediate inputs by other sectors or to consumers, governments, or other final users of the products. Define:

Y_{ij} = sales of sector i to sector j
Y_i = gross sales of sector i;
D_i = consumers' final demand for sector i's output;
G_i = combined government, investment, export, and any other exogenous final demand for sector i's output;
W_i = total wage bill paid by sector i;
V_i = total payments to other components of value added by sector i;
E_i = total employment of sector i; and
M_i = the value of inputs purchased from outside the region by sector i.

Using these definitions, one can write for each of the n sectors in the economy:

(1) $Y_i = \sum_{j=1,n} [Y_{ij}] + D_i + G_i \quad (i = 1,\ldots,n)$

Each of these equations, one for each represented sector, is a single row of the inter-industry transactions table. For each sector i, the rows records the intermediate sales to other sectors plus sales to final demand. The columns record the purchases by any sector j from itself and all other sectors. The sectors also purchase labor (payments include wages, salaries, and proprietor's income) and other primary factors (the remaining components of value added in the sector, including returns to land and capital). These purchases are often reported in the transactions table, along with the value of imports from abroad and from other regions of the country.

Labor income is given by:

[12] There are many standard texts on input-output methods, for example, Yan (1969), Richardson (1978), Miller, et al., (1989) discuss some of the more advanced topics in I-O analysis.

(2) $\sum_{i=1,n} [W_i] + W_D + W_G$.

The payments to the other components of value added are recorded as:

(3) $\sum_{i=1,n} [V_i] + V_D + V_G$.

The value of imports is given by:

(4) $\sum_{i=1,n} [M_i] + M_D + M_G$.

Finally, although not found in an I-O transactions table, one can also report total employment as:

(5) $\sum_{i=1,n} [E_i] + E_D + E_G$.

In equations (2) through (5), the labor income, value added, imports, and employment associated directly with the consumer final demand and other exogenous final demand are indicated with the subscripts *D* and *G*, respectively.

By assuming that: a) the production of a good requires all inputs in fixed proportions and b) production is subject to constant returns to scale, the input requirements are calculated as:

(6) $a_{ij} = Y_{ij}/Y_j$ = purchases from sector *i* per dollar of sector *j*'s output (the *direct* intermediate input requirements);

(7) $w_i = W_i/Y_i$ = payments to labor per dollar of sector *i*'s output;

(8) $v_i = V_i/Y_i$ = other value added per dollar of sector *i*'s output; and

(9) $m_i = M_i/Y_i$ = value of imports per dollar of sector *i*'s output.

Finally, the employment requirements for output by sector are:

(10) $e_i = E_i/Y_i$ = employment per dollar of sector *i*'s output.

By rearranging equation (6), one can write the transactions between sector *i* and sector *j* as:

(11) $Y_{ij} = a_{ij} Y_j$,

and, in turn, substitute equation (11) into equation (1) to obtain:

(12) $Y_i = \sum_{j=1,n} a_{ij} Y_j + D_i + G_i \;\; (i = 1,\ldots,n)$.

Thus, the value of a sector's output is expressed in terms of final demand ($D_i + G_i$), the output levels from the other sectors (Y_j), and the input requirement coefficients (a_{ij}). In matrix notation, one can write the equations in (12) as:

(13) $Y = AY + D + G$,

where Y is an (nx1) vector of Y_i's; A is an (nxn) matrix of a_{ij}'s; and D and G are (nx1) vectors of D_i's and G_i's, respectively. Subtracting AY from both sides yields:

(14) $Y - AY = (I\text{-}A)Y = D + G$;

This highlights the fact that gross output in each sector (Y) minus intermediate demand (AY) equals final demand ($D + G$). Multiplying both sides of (14) by $(I\text{-}A)^{-1}$, yields:

(15) $Y = (I\text{-}A)^{-1} [D + G]$.

Equation (15) is used to calculate output levels in an economy from each sector to meet both intermediate demands (AY) and final demands [$D + G$]. It is this equation, involving the Leontief Inverse, $(I\text{-}A)^{-1}$, that underpins much of the policy impact analysis performed using an inter-industry model. Letting h_{ij} = the i,j^{th} element of $(I\text{-}A)^{-1}$, h_{ij} = *direct* plus *indirect* dollars of gross output of sector i needed to deliver one dollar of output of sector j to final demand. Thus, it is the effects of the "multiplier" rounds that are captured by the individual elements of the Leontief Inverse.

By defining W, V, and E as (1xn) row vectors of *direct* wage (including proprietor income), other value added, and employment requirements per dollar of output i, respectively, one can calculate the *direct* plus *indirect* payments to labor, other value added, and employment by sector to meet given levels of final demand by the equations:

(16) $W^{DI} = W\,(I\text{-}A)^{-1} [D + G] = W\,Y$;

(17) $V^{DI} = V\,(I\text{-}A)^{-1} [D + G] = V\,Y$; and

(18) $E^{DI} = E\,(I\text{-}A)^{-1} [D + G] = E\,Y$.

The expressions on the right-hand side of the second equals sign in equations (16) through (18) are obtained by substituting equation (15) into the expressions in between the two equals signs.

Closing the Economy With Respect to Households

To close the economy with respect to households, the household sector is treated as an additional sector of the economy—sector n+1. Accordingly, the payments from the other sectors in the economy to households are already captured in total by equation (2) above, and on a per dollar of output basis by equation (7). Total final purchases by households by each sector are given by the elements of the vector D (e.g., D_i). To put these purchases on a per unit basis, one must divide consumption by sector by total payments to households that are given in equation (2). That is, one can define the input-output coefficients for this new n+1 sector as:

(19) $a_{i,n+1} = D_i / Y_{n+1}$ = the input or consumption requirements from each sector per dollar of household income, where $Y_{n+1} = [\sum_{i=1,n+1} (W_i) + W_D + W_G]$.

To make the notation consistent, one can redefine the *direct* labor income requirements as:

(20) $a_{n+1,j} = W_j / Y_j$, (for $j = 1 \ldots n+1$).

The intuition for closing the economy in this way is straightforward. As with any other sector, the household sector produces an output, in this case, the output is labor services. As with the other sectors, the household sector purchases inputs from the other sectors, but in this case, the inputs are goods for final consumption. Accordingly, the average, and in this case also the marginal, propensities to consume out of income by sector are given by the individual $a_{i,n+1}$'s, and the overall marginal propensity to consume locally (*MPC*) out of income is given by:

(21) $MPC = \sum_{i=1,n+1} [a_{i,n+1}] < 1$.

The income that is not spent locally (e.g., within New York) for consumption is either saved (in which case it remains in the economy but is not re-circulated through the economy), or it is used to purchase goods and services outside the local economy.

One can now describe the transactions in this economy that is closed with respect to households by an expression similar to equation (12) above:

(22) $Y_i = \sum_{j=1,n+1} [a_{i\,j}\, Y_j] + G_i \;\; (i = 1,\ldots,n+1)$.

There are now $n+1$ sectors in the economy. In matrix notation, one can write:

(23) $Y^* = A^* Y^* + G^*$,

where Y^* is an (n+1x1) column vector of Y_i^*'s; A^* is an (n+1xn+1) matrix of a_{ij}'s; and G^* now representing the only exogenous final demand in the economy, is an (n+1x1) column vector of G_i's.
Again, subtracting A^*Y^* from both sides, we obtain:

(24) $(I-A^*)Y^* = G^*$.

Gross output in each of the n+1 sectors minus intermediate demand equals final demand; output in each sector to meet any given level of exogenous final demand is given by:

(25) $Y^* = (I-A^*)^{-1}[G^*]$.

The interpretation of the elements of $(I-A^*)^{-1}$, call them k_{ij}, is similar to that of h_{ij} from above. In this case,

(26) k_{ij} = the *direct* plus *indirect* plus *induced* output of sector *i*, needed to deliver one dollar of output *j* to final demand.

The elements $k_{n+1,j}$ have a special interpretation:

(27) $k_{n+1,j}$ = the *direct* plus *indirect* plus *induced* income (payments to labor plus proprietary income) per dollar of output *j* to final demand.

Thus, to calculate the *direct* plus *indirect* plus *induced* payments to households for any given level of exogenous final demand (similar expression to equation (16)), it can be seen that:

(28) $W^{GI} = K_{n+1}[G^*]$, where K_{n+1} = the n+1 row of $(I-A^*)^{-1}$.

If the vector [G*] contains only one non-zero element, and this element is unity in the j^{th} row, then equation (28) gives the *direct* plus *indirect* plus *induced* payments to households per dollar increase in, for example, sector *j*'s sales to other states (e.g. domestic exports) or to foreign destinations (e.g. foreign exports). If one divides the expression in equation (28) by the direct income requirements per dollar of output in sector *j* (from equation (7)), we obtain an expression for the income multiplier discussed in the text above in the section entitled *Ranking the Effects by Sector using Traditional Economic Multipliers.* Similar logic is used to derive employment and value added multipliers.

Appendix B: IMPLAN and the IMPLAN Databases

Initially developed by the US Forest Service, the IMPLAN® economic impact modeling system has been maintained since 1993 by IMPLAN Group LLC (formerly the Minnesota IMPLAN Group).[13] One of several generally available economic impact modeling systems, IMPLAN combines several advantageous features that, in combination, explain its widespread use by government, academia, and economics consultants, at reasonable costs. These features include:

1. The use of consistent, integrated data sets for every county and region in the United States;
2. A high level of disaggregation of more than 400 industry sectors;
3. The flexibility to build state, regional, or local economic models that can be used for any number of analytical or policy applications; and
4. An open architecture that enables model improvement where local economic data are more accurate than standard state and federal data sources.

To develop state or regional inter-industry models, the IMPLAN system draws upon and integrates a large number of basic data sets from a variety of sources. Local or regional employment data constitute one of the most critical components of the IMPLAN system, and these data are drawn from three standard published data series: the Bureau of Economic Analysis (BEA) Regional Economic Information System (REIS), County Business Patterns, and the Bureau of Labor Statistics' ES-202 annual employment data series. Data for value added (employee compensation, proprietor income, other property type income, and excise and sales taxes) are reconciled with totals from the National Income and Product Accounts, and are based on ES-202, REIS, and the BEA's Gross State Product series. Output data are estimated from different sources for different industries, including the Censuses of Agriculture and Manufacturing and a number of similar sources. Measures of institutional demand (by household, government, other institutions) also are derived from multiple sources, such as the national Consumer Expenditure Survey and data for government spending from the Federal Procurement Data Center. Some local estimates must be based on relationship established in state or national data, and when needed these estimates are typically calculated from observed ratios between state and national variables with key locally observable variables. IMPLAN gives priority to observed values, but all values are cross-referenced to ensure that they are consistent or "add-up" to observed totals across the county, state, and national levels.

IMPLAN's data are organized in the form of a full social accounting matrix, or SAM (Miller et al., 1989 and Pyatt and Round, 1985). Originally conceived by British economist Richard Stone, the objective of a SAM is to organize information about the economic and social structure of an economy in a particular year. It is nothing more than a book keeping system, where for each of a

[13] See www.implan.com for more information about the software and databases.

series of accounts, the incomings and outgoings (or income and expenditures in most cases) must balance. In this respect, the SAM resembles traditional national accounts, but embodies much more (King, 1985). Within the SAM, the flows of inputs and outputs between industries constitute the traditional (inter-industry) input-output model. These inter-industry data are supplemented in the SAM with data on the multiple and complete set of flows of funds among all significant economic sectors and institutions, including not only industry but also households, business owners, government, capital formation and inventory, and exports.

The heart of the IMPLAN inter-industry model is found in the technical coefficients, or a_{ij}' s as defined above. In reflecting the value of inputs required to produce a dollar's worth of each industry's output, they also reflect the existing mix of production technologies employed within the industry. IMPLAN bases the a_{ij}'s in all sub-national (regional) models on the BEA's national benchmark input-output accounts. The benchmark accounts are based on detailed data from the economic censuses that are conducted every five years by the Bureau of the Census, with the most recently available data dating from 2007. The national a_{ij}'s are adjusted to the region, state, or county level using regionally or locally weighted estimates of: the proportion of industry purchases that are made locally, and the split between industry payments to other industries and industry payments to value added.

Appendix C: Mapping of IMPLAN Sectors to Sectors of the New York Model

New York Model Sector No.	New York Model Sector Name	Implan Sector No.	Implan Sector Name
1	Dairy farming	12	Dairy cattle and milk production
2	Cattle farming	11	Cattle ranching and farming
3	All other animal farming	13	Poultry and egg production
		14	Animal production, except cattle and poultry and eggs
4	Fruit and vegetable farming	3	Vegetable and melon farming
		4	Fruit farming
		5	Tree nut farming
5	Greenhouse and nursery	6	Greenhouse, nursery, and floriculture production
6	Grain and oilseed farming	1	Oilseed farming
		2	Grain farming
7	All other crop farming	7	Tobacco farming
		8	Cotton farming
		9	Sugarcane and sugar beet farming
		10	All other crop farming
8	Ag and forestry support services	19	Support activities for agriculture and forestry
9	Dairy product mfg	55	Fluid milk and butter manufacturing
		56	Cheese manufacturing
		57	Dry, condensed, and evaporated dairy product manufacturing
		58	Ice cream and frozen dessert manufacturing
10	Fruit and vegetable mfg	53	Frozen food manufacturing
		54	Fruit and vegetable canning, pickling, and drying
11	Bakery, confectionary, snack foods, and flavorings	48	Sugar cane mills and refining
		49	Beet sugar manufacturing
		50	Chocolate and confectionery manufacturing from cacao beans
		51	Confectionery manufacturing from purchased chocolate
		52	Nonchocolate confectionery manufacturing
		62	Bread and bakery product manufacturing
		63	Cookie, cracker, and pasta manufacturing
		64	Tortilla manufacturing
		65	Snack food manufacturing
		66	Coffee and tea manufacturing
		67	Flavoring syrup and concentrate manufacturing
		68	Seasoning and dressing manufacturing
12	Animal food mfg	41	Dog and cat food manufacturing
		42	Other animal food manufacturing
13	Animal slaughter and processing	59	Animal (except poultry) slaughtering, rendering, and proc.
		60	Poultry processing
14	Grain and oilseed processing	43	Flour milling and malt manufacturing
		44	Wet corn milling
		45	Soybean and other oilseed processing
		46	Fats and oils refining and blending
		47	Breakfast cereal manufacturing
15	All other food mfg	61	Seafood product preparation and packaging
		69	All other food manufacturing
16	Alcoholic beverage	71	Breweries
		72	Wineries

	manufacturing	73	Distilleries
17	Soft drink and ice mfg	70	Soft drink and ice manufacturing
18	Ag chemical and equipment mfg	130	Fertilizer manufacturing
		131	Pesticide and other agricultural chemical manufacturing
		203	Farm machinery and equipment manufacturing
		204	Lawn and garden equipment manufacturing
19	Retail Trade Food and Beverage	324	Retail Stores - Food and beverage
20	Food services and drinking places	413	Food services and drinking places
21	Forestry, fishing, and hunting	15	Forestry, forest products, and timber tract production
		16	Commercial logging
		17	Commercial Fishing
		18	Commercial hunting and trapping
22	Mining	20	Extraction of oil and natural gas
		21	Mining coal
		22	Mining iron ore
		23	Mining copper, nickel, lead, and zinc
		24	Mining gold, silver, and other metal ore
		25	Mining and quarrying stone
		26	Mining and quarrying sand, gravel, clay, and ceramic and refractory minerals
		27	Mining and quarrying other nonmetallic minerals
		28	Drilling oil and gas wells
		29	Support activities for oil and gas operations
		30	Support activities for other mining
23	Utilities, Transportation, information	31	Electric power generation, transmission, and distribution
		32	Natural gas distribution
		33	Water, sewage and other treatment and delivery systems
		332	Transport by air
		333	Transport by rail
		334	Transport by water
		335	Transport by truck
		336	Transit and ground passenger transportation
		337	Transport by pipeline
		338	Scenic and sightseeing transportation and support activities for transportation
		339	Couriers and messengers
		340	Warehousing and storage
		341	Newspaper publishers
		342	Periodical publishers
		343	Book publishers
		344	Directory, mailing list, and other publishers
		345	Software publishers
		346	Motion picture and video industries
		347	Sound recording industries
		348	Radio and television broadcasting
		349	Cable and other subscription programming
		350	Internet publishing and broadcasting
		351	Telecommunications
		352	Data processing, hosting, ISP, web search portals and related services
		353	Other information services
24	Construction	34	Construction of new nonresidential commercial and health care structures

		35	Construction of new nonresidential manufacturing structures
		36	Construction of other new nonresidential structures
		37	Construction of new residential permanent site single- and multi-family structures
		38	Construction of other new residential structures
		39	Maintenance and repair construction of nonresidential structures
		40	Maintenance and repair construction of residential structures
25	Tobacco, textile, wood, and paper product mfg	74	Tobacco product manufacturing
		75	Fiber, yarn, and thread mills
		76	Broadwoven fabric mills
		77	Narrow fabric mills and schiffli machine embroidery
		78	Nonwoven fabric mills
		79	Knit fabric mills
		80	Textile and fabric finishing mills
		81	Fabric coating mills
		82	Carpet and rug mills
		83	Curtain and linen mills
		84	Textile bag and canvas mills
		85	All other textile product mills
		86	Apparel knitting mills
		87	Cut and sew apparel contractors
		88	Men's and boys' cut and sew apparel manufacturing
		89	Women's and girls' cut and sew apparel manufacturing
		90	Other cut and sew apparel manufacturing
		91	Apparel accessories and other apparel manufacturing
		92	Leather and hide tanning and finishing
		93	Footwear manufacturing
		94	Other leather and allied product manufacturing
		95	Sawmills and wood preservation
		96	Veneer and plywood manufacturing
		97	Engineered wood member and truss manufacturing
		98	Reconstituted wood product manufacturing
		99	Wood windows and doors and millwork manufacturing
		100	Wood container and pallet manufacturing
		101	Manufactured home (mobile home) manufacturing
		102	Prefabricated wood building manufacturing
		103	All other miscellaneous wood product manufacturing
		104	Pulp mills
		105	Paper mills
		106	Paperboard Mills
		107	Paperboard container manufacturing
		108	Coated and laminated paper, packaging paper and plastics film manufacturing
		109	All other paper bag and coated and treated paper manufacturing
		110	Stationery product manufacturing
		111	Sanitary paper product manufacturing
		112	All other converted paper product manufacturing
26	Chemicals and plastics mfg	113	Printing
		114	Support activities for printing
		115	Petroleum refineries
		116	Asphalt paving mixture and block manufacturing
		117	Asphalt shingle and coating materials manufacturing
		118	Petroleum lubricating oil and grease manufacturing
		119	All other petroleum and coal products manufacturing
		120	Petrochemical manufacturing
		121	Industrial gas manufacturing

		122	Synthetic dye and pigment manufacturing
		123	Alkalies and chlorine manufacturing
		124	Carbon black manufacturing
		125	All other basic inorganic chemical manufacturing
		126	Other basic organic chemical manufacturing
		127	Plastics material and resin manufacturing
		128	Synthetic rubber manufacturing
		129	Artificial and synthetic fibers and filaments manufacturing
		132	Medicinal and botanical manufacturing
		133	Pharmaceutical preparation manufacturing
		134	In-vitro diagnostic substance manufacturing
		135	Biological product (except diagnostic) manufacturing
		136	Paint and coating manufacturing
		137	Adhesive manufacturing
		138	Soap and cleaning compound manufacturing
		139	Toilet preparation manufacturing
		140	Printing ink manufacturing
		141	All other chemical product and preparation manufacturing
		142	Plastics packaging materials and unlaminated film and sheet manufacturing
		143	Unlaminated plastics profile shape manufacturing
		144	Plastics pipe and pipe fitting manufacturing
		145	Laminated plastics plate, sheet (except packaging), and shape manufacturing
		146	Polystyrene foam product manufacturing
		147	Urethane and other foam product (except polystyrene) manufacturing
		148	Plastics bottle manufacturing
		149	Other plastics product manufacturing
		150	Tire manufacturing
		151	Rubber and plastics hoses and belting manufacturing
		152	Other rubber product manufacturing
27	Stone, clay, glass, metal products mfg	153	Pottery, ceramics, and plumbing fixture manufacturing
		154	Brick, tile, and other structural clay product manufacturing
		155	Clay and nonclay refractory manufacturing
		156	Flat glass manufacturing
		157	Other pressed and blown glass and glassware manufacturing
		158	Glass container manufacturing
		159	Glass product manufacturing made of purchased glass
		160	Cement manufacturing
		161	Ready-mix concrete manufacturing
		162	Concrete pipe, brick, and block manufacturing
		163	Other concrete product manufacturing
		164	Lime and gypsum product manufacturing
		165	Abrasive product manufacturing
		166	Cut stone and stone product manufacturing
		167	Ground or treated mineral and earth manufacturing
		168	Mineral wool manufacturing
		169	Miscellaneous nonmetallic mineral product manufacturing
		170	Iron and steel mills and ferroalloy manufacturing
		171	Steel product manufacturing from purchased steel
		172	Alumina refining and primary aluminum production
		173	Secondary smelting and alloying of aluminum
		174	Aluminum product manufacturing from purchased aluminum
		175	Primary smelting and refining of copper
		176	Primary smelting and refining of nonferrous metal (except copper

			and aluminum)
		177	Copper rolling, drawing, extruding and alloying
		178	Nonferrous metal (except copper and aluminum) rolling, drawing, extruding and alloying
		179	Ferrous metal foundries
		180	Nonferrous metal foundries
		181	All other forging, stamping, and sintering
		182	Custom roll forming
		183	Crown and closure manufacturing and metal stamping
		184	Cutlery, utensil, pot, and pan manufacturing
		185	Handtool manufacturing
		186	Plate work and fabricated structural product manufacturing
		187	Ornamental and architectural metal products manufacturing
		188	Power boiler and heat exchanger manufacturing
		189	Metal tank (heavy gauge) manufacturing
		190	Metal can, box, and other metal container (light gauge) manufacturing
		191	Ammunition manufacturing
		192	Arms, ordnance, and accessories manufacturing
		193	Hardware manufacturing
		194	Spring and wire product manufacturing
		195	Machine shops
		196	Turned product and screw, nut, and bolt manufacturing
		197	Coating, engraving, heat treating and allied activities
		198	Valve and fittings other than plumbing manufacturing
		199	Plumbing fixture fitting and trim manufacturing
		200	Ball and roller bearing manufacturing
		201	Fabricated pipe and pipe fitting manufacturing
		202	Other fabricated metal manufacturing
28	Equipment and instrument mfg	205	Construction machinery manufacturing
		206	Mining and oil and gas field machinery manufacturing
		207	Other industrial machinery manufacturing
		208	Plastics and rubber industry machinery manufacturing
		209	Semiconductor machinery manufacturing
		210	Vending, commercial, industrial, and office machinery manufacturing
		211	Optical instrument and lens manufacturing
		212	Photographic and photocopying equipment manufacturing
		213	Other commercial and service industry machinery manufacturing
		214	Air purification and ventilation equipment manufacturing
		215	Heating equipment (except warm air furnaces) manufacturing
		216	Air conditioning, refrigeration, and warm air heating equipment manufacturing
		217	Industrial mold manufacturing
		218	Metal cutting and forming machine tool manufacturing
		219	Special tool, die, jig, and fixture manufacturing
		220	Cutting tool and machine tool accessory manufacturing
		221	Rolling mill and other metalworking machinery manufacturing
		222	Turbine and turbine generator set units manufacturing
		223	Speed changer, industrial high-speed drive, and gear manufacturing
		224	Mechanical power transmission equipment manufacturing
		225	Other engine equipment manufacturing
		226	Pump and pumping equipment manufacturing
		227	Air and gas compressor manufacturing
		228	Material handling equipment manufacturing
		229	Power-driven handtool manufacturing

230	Other general purpose machinery manufacturing
231	Packaging machinery manufacturing
232	Industrial process furnace and oven manufacturing
233	Fluid power process machinery manufacturing
234	Electronic computer manufacturing
235	Computer storage device manufacturing
236	Computer terminals and other computer peripheral equipment manufacturing
237	Telephone apparatus manufacturing
238	Broadcast and wireless communications equipment manufacturing
239	Other communications equipment manufacturing
240	Audio and video equipment manufacturing
241	Electron tube manufacturing
242	Bare printed circuit board manufacturing
243	Semiconductor and related device manufacturing
244	Electronic capacitor, resistor, coil, transformer, and other inductor manufacturing
245	Electronic connector manufacturing
246	Printed circuit assembly (electronic assembly) manufacturing
247	Other electronic component manufacturing
248	Electromedical and electrotherapeutic apparatus manufacturing
249	Search, detection, and navigation instruments manufacturing
250	Automatic environmental control manufacturing
251	Industrial process variable instruments manufacturing
252	Totalizing fluid meters and counting devices manufacturing
253	Electricity and signal testing instruments manufacturing
254	Analytical laboratory instrument manufacturing
255	Irradiation apparatus manufacturing
256	Watch, clock, and other measuring and controlling device manufacturing
257	Software, audio, and video media for reproduction
258	Magnetic and optical recording media manufacturing
259	Electric lamp bulb and part manufacturing
260	Lighting fixture manufacturing
261	Small electrical appliance manufacturing
262	Household cooking appliance manufacturing
263	Household refrigerator and home freezer manufacturing
264	Household laundry equipment manufacturing
265	Other major household appliance manufacturing
266	Power, distribution, and specialty transformer manufacturing
267	Motor and generator manufacturing
268	Switchgear and switchboard apparatus manufacturing
269	Relay and industrial control manufacturing
270	Storage battery manufacturing
271	Primary battery manufacturing
272	Communication and energy wire and cable manufacturing
273	Wiring device manufacturing
274	Carbon and graphite product manufacturing
275	All other miscellaneous electrical equipment and component manufacturing
276	Automobile manufacturing
277	Light truck and utility vehicle manufacturing
278	Heavy duty truck manufacturing
279	Motor vehicle body manufacturing
280	Truck trailer manufacturing
281	Motor home manufacturing

		282	Travel trailer and camper manufacturing
		283	Motor vehicle parts manufacturing
		284	Aircraft manufacturing
		285	Aircraft engine and engine parts manufacturing
		286	Other aircraft parts and auxiliary equipment manufacturing
		287	Guided missile and space vehicle manufacturing
		288	Propulsion units and parts for space vehicles and guided missiles manufacturing
		289	Railroad rolling stock manufacturing
		290	Ship building and repairing
		291	Boat building
		292	Motorcycle, bicycle, and parts manufacturing
		293	Military armored vehicle, tank, and tank component manufacturing
		294	All other transportation equipment manufacturing
		295	Wood kitchen cabinet and countertop manufacturing
		296	Upholstered household furniture manufacturing
		297	Nonupholstered wood household furniture manufacturing
		298	Metal and other household furniture (except wood) manufacturing
		299	Institutional furniture manufacturing
		300	Wood television, radio, and sewing machine cabinet manufacturing
		301	Office furniture and custom architectural woodwork and millwork manufacturing
		302	Showcase, partition, shelving, and locker manufacturing
		303	Mattress manufacturing
		304	Blind and shade manufacturing
		305	Surgical and medical instrument, laboratory and medical instrument manufacturing
		306	Surgical appliance and supplies manufacturing
		307	Dental equipment and supplies manufacturing
		308	Ophthalmic goods manufacturing
		309	Dental laboratories manufacturing
		310	Jewelry and silverware manufacturing
		311	Sporting and athletic goods manufacturing
		312	Doll, toy, and game manufacturing
		313	Office supplies (except paper) manufacturing
		314	Sign manufacturing
		315	Gasket, packing, and sealing device manufacturing
		316	Musical instrument manufacturing
		317	All other miscellaneous manufacturing
		318	Broom, brush, and mop manufacturing
29	Wholesale and retail (nonfood) trade	319	Wholesale trade businesses
		320	Retail Stores - Motor vehicle and parts
		321	Retail Stores - Furniture and home furnishings
		322	Retail Stores - Electronics and appliances
		323	Retail Stores - Building material and garden supply
		325	Retail Stores - Health and personal care
		326	Retail Stores - Gasoline stations
		327	Retail Stores - Clothing and clothing accessories
		328	Retail Stores - Sporting goods, hobby, book and music
		329	Retail Stores - General merchandise
		330	Retail Stores - Miscellaneous
		331	Retail Nonstores - Direct and electronic sales
30	Finace, Insurance and Real estate	354	Monetary authorities and depository credit intermediation activities
		355	Nondepository credit intermediation and related activities
		356	Securities, commodity contracts, investments, and related activities
		357	Insurance carriers

		358	Insurance agencies, brokerages, and related activities
		359	Funds, trusts, and other financial vehicles
		360	Real estate establishments
		361	Imputed rental activity for owner-occupied dwellings
		362	Automotive equipment rental and leasing
		363	General and consumer goods rental except video tapes and discs
		364	Video tape and disc rental
		365	Commercial and industrial machinery and equipment rental and leasing
		366	Lessors of nonfinancial intangible assets
31	Services (nonfood)	367	Legal services
		368	Accounting, tax preparation, bookkeeping, and payroll services
		369	Architectural, engineering, and related services
		370	Specialized design services
		371	Custom computer programming services
		372	Computer systems design services
		373	Other computer related services, including facilities management
		374	Management, scientific, and technical consulting services
		375	Environmental and other technical consulting services
		376	Scientific research and development services
		377	Advertising and related services
		378	Photographic services
		379	Veterinary services
		380	All other miscellaneous professional, scientific, and technical services
		381	Management of companies and enterprises
		382	Employment services
		383	Travel arrangement and reservation services
		384	Office administrative services
		385	Facilities support services
		386	Business support services
		387	Investigation and security services
		388	Services to buildings and dwellings
		389	Other support services
		390	Waste management and remediation services
		391	Private elementary and secondary schools
		392	Private junior colleges, colleges, universities, and professional schools
		393	Other private educational services
		394	Offices of physicians, dentists, and other health practitioners
		395	Home health care services
		396	Medical and diagnostic labs and outpatient and other ambulatory care services
		397	Private hospitals
		398	Nursing and residential care facilities
		399	Child day care services
		400	Individual and family services
		401	Community food, housing, and other relief services, including rehabilitation services
		402	Performing arts companies
		403	Spectator sports companies
		404	Promoters of performing arts and sports and agents for public figures
		405	Independent artists, writers, and performers
		406	Museums, historical sites, zoos, and parks
		407	Fitness and recreational sports centers
		408	Bowling centers

		409	Amusement parks, arcades, and gambling industries
		410	Other amusement and recreation industries
		411	Hotels and motels, including casino hotels
		412	Other accommodations
		414	Automotive repair and maintenance, except car washes
		415	Car washes
		416	Electronic and precision equipment repair and maintenance
		417	Commercial and industrial machinery and equipment repair and maintenance
		418	Personal and household goods repair and maintenance
		419	Personal care services
		420	Death care services
		421	Dry-cleaning and laundry services
		422	Other personal services
		423	Religious organizations
		424	Grantmaking, giving, and social advocacy organizations
		425	Civic, social, professional, and similar organizations
		426	Private household operations
		433	* Not an industry (Used and secondhand goods)
		434	* Not an industry (Scrap)
		435	* Not an industry (Rest of the world adjustment)
		436	* Not an industry (Noncomparable foreign imports)
32	Government	427	US Postal Service
		428	Federal electric utilities
		429	Other Federal Government enterprises
		430	State and local government passenger transit
		431	State and local government electric utilities
		432	Other state and local government enterprises
		437	* Employment and payroll only (state & local govt, non-education)
		438	* Employment and payroll only (state & local govt, education)
		439	* Employment and payroll only (federal govt, non-military)
		440	* Employment and payroll only (federal govt, military)

Appendix D: SAM Economic Direct and Total Effects by Industry

Table D1. 2011 SAM Economic Direct Effects for New York's Production Agriculture and Support Services

Sector/Industry	Labor Income	Employment
Dairy farming	0.08	7.44
Cattle farming	0.10	8.00
All other animal farming		
poultry and egg production	0.19	1.96
animal production, except cattle, poultry and eggs	0.26	26.53
Fruit and vegetable farming		
vegetable and melon farming	0.64	5.29
fruit farming	0.70	6.14
Greenhouse and nursery	0.98	7.77
Grain and oilseed farming		
oilseed farming	0.26	13.35
grain farming	0.20	20.33
All other crop farming	0.34	5.16
Ag & Forestry Support Services	0.88	41.79

Source: Implan (2012).
Note: For labor income, it is the direct payments to labor (including proprietors) per dollar of output in the associated sector or industry. For employment, it is the direct employment per $1 million of output in the associated sector or industry.

Table D2. 2011 SAM Economic Total Effects for New York's Production Agriculture and Support Services

Sector/Industry	Output	Labor Income	Employment
Dairy farming	1.61	0.26	10.71
Cattle farming	1.66	0.29	12.13
All other animal farming			
poultry and egg production	1.82	0.42	6.03
animal production, except cattle, poultry, & eggs	1.54	0.45	30.04
Fruit and vegetable farming			
vegetable and melon farming	1.87	0.99	11.63
fruit farming	1.90	1.07	13.28
Greenhouse and nursery	1.89	1.36	13.90
Grain and oilseed farming			
oilseed farming	1.62	0.49	17.36
grain farming	1.74	0.47	25.10
All other crop farming	1.83	0.65	10.92
Ag & Forestry Support Services	1.83	1.21	46.92

Source: Implan (2012).

Note: These total effects are the direct plus indirect plus induced increases in value of output and labor income per dollar of output delivered to final demand in the associated sector or industry. For employment, the total effect is the direct plus indirect plus induced increase in jobs per $1 million of output delivered to final demand in the associated sector or industry.

Table D3. 2011 SAM Economic Direct Effects for New York's Agriculture Manufacturing, Food Retail Trade, and Food Service

Sector/Industry	Labor Income	Employment
Dairy products		
fluid milk and butter manufacturing	0.07	0.95
cheese manufacturing	0.06	1.21
dry, condensed, & evaporated dairy product manufacturing	0.08	1.27
ice cream and frozen dessert manufacturing	0.12	2.72
Fruit and vegetables		
frozen food manufacturing	0.14	3.13
fruit and vegetable canning, pickling, and drying	0.11	1.98
Bakery, confectionary, snack foods, & flavor		
bread, cookie, snack food	0.16	4.68
coffee, syrup, seasoning mfg	0.07	1.00
Animal foods		
dog and cat food manufacturing	0.06	0.82
other animal food manufacturing	0.06	0.92
Animal slaughter and processing		
animal (non-poultry) slaughtering, rendering, & processing	0.16	3.26
poultry processing	0.09	2.74
Grain and oilseed processing		
flour milling and malt manufacturing	0.07	0.87
soybean and other oilseed processing	0.02	0.61
fats and oils refining and blending	0.01	0.25
Other foods		
seafood product preparation and packaging	0.19	2.47
all other food manufacturing	0.16	3.08
Alcoholic beverages		
breweries	0.09	0.79
wineries	0.12	2.93
distilleries	0.08	0.32
Soft drink and ice manufacturing	0.10	1.39
Ag chemical and equipment manufacturing		
fertilizer manufacturing	0.05	0.82
pesticide and other agricultural chemical manufacturing	0.06	0.70
farm machinery and equipment manufacturing	0.13	1.70
lawn and garden equipment manufacturing	0.14	2.41
Retail Trade Food & Beverage	0.54	16.43
Food Services & Drinking Places	0.42	15.65

Source: Implan (2012).

Note: For labor income, it is the direct payments to labor (including proprietors) per dollar of output in the associated sector or industry. For employment, it is the direct employment per $1 million of output in the associated sector or industry.

Table D4. 2011 SAM Economic Total Effects for New York's Agriculture Manufacturing, Food Retail Trade, and Food Service

Sector/Industry	Output	Labor Income	Employment
Dairy products			
fluid milk and butter manufacturing	2.07	0.33	7.26
cheese manufacturing	2.06	0.31	7.40
dry, condensed, & evaporated dairy product mfg.	1.98	0.33	7.03
ice cream and frozen dessert manufacturing	1.85	0.39	7.38
Fruit and vegetables			
frozen food manufacturing	1.68	0.41	7.49
fruit and vegetable canning, pickling, and drying	1.60	0.34	5.54
Bakery, confectionary, snack foods, & flavor			
bread, cookie, snack food	1.69	0.44	9.02
coffee, syrup, seasoning mfg	1.52	0.28	4.13
Animal foods			
dog and cat food manufacturing	1.52	0.26	4.32
other animal food manufacturing	1.65	0.27	4.86
Animal slaughter and processing		0.00	0.00
animal (non-poultry) slaughter, render, & process	1.65	0.36	7.95
poultry processing	1.53	0.30	6.12
Grain and oilseed processing			
flour milling and malt manufacturing	1.77	0.37	6.41
soybean and other oilseed processing	1.30	0.12	3.05
fats and oils refining and blending	1.35	0.13	2.28
Other foods		0.00	0.00
seafood product preparation and packaging	1.60	0.44	7.11
all other food manufacturing	1.60	0.43	7.33
Alcoholic beverages			
breweries	1.42	0.25	3.30
wineries	1.63	0.38	6.92
distilleries	1.19	0.15	1.45
Soft drink and ice manufacturing	1.55	0.29	4.37
Ag chemical and equipment manufacturing			
fertilizer manufacturing	1.75	0.30	4.52
pesticide & other agricultural chemical manufacturing	1.51	0.26	3.98
farm machinery and equipment manufacturing	1.50	0.33	4.77
lawn and garden equipment manufacturing	1.47	0.32	5.21
Retail Trade Food & Beverage	1.76	0.85	21.21
Food Services & Drinking Places	1.70	0.70	20.07

Source: Implan (2012).

Note: These total effects are the direct plus indirect plus induced increases in value of output and labor income per dollar of output delivered to final demand in the associated sector or industry. For employment, the total effect is the direct plus indirect plus induced increase in jobs per $1 million of output delivered to final demand in the associated sector or industry.

Table D5. 2011 SAM Economic Direct Effects for Remaining Sectors of New York's Economy

Sector/Industry	Labor Income	Employment
Forestry, fishing, and hunting	0.19	17.03
Mining	0.13	3.72
Utilities, transportation, information	0.34	3.59
Construction	0.52	7.97
Tobacco, textile, wood, and paper product mfg.	0.19	2.53
Chemicals and plastics mfg.	0.14	1.75
Stone, clay, glass, metal products mfg.	0.20	3.10
Equipment and instrument mfg.	0.19	2.14
Wholesale and retail (nonfood) trade	0.44	8.58
Finance, insurance, and real estate	0.29	2.79
Services (nonfood)	0.57	9.18
Government	0.83	10.59

Source: Implan (2012).
Note: For labor income, it is the direct payments to labor (including proprietors) per dollar of output in the associated sector or industry. For employment, it is the direct employment per $1 million of output in the associated sector or industry.

Table D6. 2011 SAM Economic Total Effects for Remaining Sectors of New York's Economy

Sector/Industry	Output	Labor Income	Employment
Forestry, fishing, and hunting	1.56	0.43	22.51
Mining	1.73	0.42	8.15
Utilities, transportation, information	1.69	0.62	7.92
Construction	1.68	0.80	12.42
Tobacco, textile, wood, and paper product mfg.	1.46	0.36	5.35
Chemicals and plastics mfg.	1.40	0.29	4.18
Stone, clay, glass, metal products mfg.	1.67	0.47	7.23
Equipment and instrument mfg.	1.55	0.41	5.58
Wholesale and retail (nonfood) trade	1.63	0.70	12.64
Finance, insurance, and real estate	1.60	0.52	6.23
Services (nonfood)	1.77	0.89	14.16
Government	1.71	1.13	15.27

Source: Implan (2012).

Note: These total effects are the direct plus indirect plus induced increases in value of output and labor income per dollar of output delivered to final demand in the associated sector or industry. For employment, the total effect is the direct plus indirect plus induced increase in jobs per $1 million of output delivered to final demand in the associated sector or industry.

Appendix E: Time Series of SAM Multipliers

Table E1. Time Series of SAM Output Multipliers for New York's Production Agriculture and Support Services

Sector/Industry	2011	2010	2009	2008	2007	Mean	Max.	Min.	% Diff. Max. & Min.
Dairy farming	1.61	1.68	1.81	1.62	1.62	1.67	1.81	1.61	**13%**
Cattle farming	1.66	1.73	1.73	1.62	1.63	1.68	1.73	1.62	**7%**
All other animal farming									
poultry and egg production	1.82	1.74	1.81	1.76	1.87	1.80	1.87	1.74	**7%**
animal production, except cattle, poultry & eggs	1.54	1.63	1.72	1.52	1.57	1.60	1.72	1.52	**14%**
Fruit and vegetable farming									
vegetable and melon farming	1.87	1.96	2.25	1.99	1.76	1.97	2.25	1.76	**28%**
fruit farming	1.90	1.95	2.30	2.03	1.81	2.00	2.30	1.81	**27%**
Greenhouse and nursery	1.89	1.94	2.00	1.87	1.64	1.87	2.00	1.64	**22%**
Grain and oilseed farming									
oilseed farming	1.62	1.73	1.79	1.72	1.65	1.70	1.79	1.62	**11%**
grain farming	1.74	2.02	1.87	1.63	1.77	1.81	2.02	1.63	**24%**
All other crop farming	1.83	1.97	2.06	1.90	1.82	1.91	2.06	1.82	**13%**
Ag & Forestry Support Services	1.83	2.00	2.08	2.16	1.84	1.98	2.16	1.83	**18%**

Source: Implan (2012)

Table E2. Time Series of SAM Income Multipliers for New York's Production Agriculture and Support Services

Sector/Industry	2011	2010	2009	2008	2007	Mean	Max.	Min.	% Diff. Max. & Min.
Dairy farming	3.34	3.67	3.89	4.43	4.60	3.99	4.60	3.34	**37%**
Cattle farming	2.88	3.30	3.31	3.89	3.94	3.46	3.94	2.88	**37%**
All other animal farming									
poultry and egg production	2.16	2.66	2.19	2.42	3.63	2.61	3.63	2.16	**68%**
animal production, except cattle, poultry and eggs	1.71	2.05	1.96	2.53	2.34	2.12	2.53	1.71	**48%**
Fruit and vegetable farming									
vegetable and melon farming	1.54	2.01	1.75	2.15	1.89	1.87	2.15	1.54	**39%**
fruit farming	1.52	2.03	1.65	2.11	1.94	1.85	2.11	1.52	**39%**
Greenhouse and nursery	1.38	1.57	1.45	1.61	1.56	1.51	1.61	1.38	**17%**
Grain and oilseed farming									
oilseed farming	1.87	4.31	2.42	3.01	2.81	2.88	4.31	1.87	**130%**
grain farming	2.30	5.02	2.54	2.93	2.92	3.14	5.02	2.30	**118%**
All other crop farming	1.93	2.74	2.33	2.68	2.50	2.44	2.74	1.93	**42%**
Ag & Forestry Support Services	1.36	1.48	1.45	1.42	1.32	1.41	1.48	1.32	**12%**

Source: Implan (2012)

Table E3. Time Series of SAM Employment Multipliers for New York's Production Agriculture and Support Services

Sector/Industry	2011	2010	2009	2008	2007	Mean	Max.	Min.	% Diff. Max. & Min.
Dairy farming	1.44	1.41	1.45	1.30	1.36	1.39	1.45	1.30	**11%**
Cattle farming	1.52	1.46	1.41	1.32	1.38	1.42	1.52	1.32	**15%**
All other animal farming									
poultry and egg production	3.08	2.55	2.48	2.43	3.15	2.74	3.15	2.43	**30%**
animal production, except cattle, poultry and eggs	1.13	1.13	1.13	1.10	1.14	1.13	1.14	1.10	**4%**
Fruit and vegetable farming									
vegetable and melon farming	2.20	2.02	2.11	2.01	1.76	2.02	2.20	1.76	**25%**
fruit farming	2.16	1.92	2.10	1.55	1.54	1.86	2.16	1.54	**40%**
Greenhouse and nursery	1.79	1.64	1.57	1.50	1.42	1.58	1.79	1.42	**26%**
Grain and oilseed farming									
oilseed farming	1.30	1.30	1.29	1.34	1.28	1.30	1.34	1.28	**5%**
grain farming	1.23	1.26	1.21	1.23	1.23	1.23	1.26	1.21	**4%**
All other crop farming	2.12	2.05	2.00	1.98	1.85	2.00	2.12	1.85	**14%**
Ag & Forestry Support Services	1.12	1.25	1.18	1.18	1.13	1.17	1.25	1.12	**11%**

Source: Implan (2012)

Table E4. Time Series of SAM Output Multipliers for New York's Agriculture Manufacturing, Food Retail Trade, and Food Service

Sector/Industry	2011	2010	2009	2008	2007	Mean	Max.	Min.	% Diff. Max. & Min.
Dairy products									
fluid milk and butter manufacturing	2.07	2.18	2.17	2.16	2.19	2.15	2.19	2.07	**6%**
cheese manufacturing	2.06	2.17	2.16	2.13	2.16	2.14	2.17	2.06	**5%**
dry, condensed, & evaporated dairy product manuf.	1.98	2.04	2.03	2.05	2.11	2.04	2.11	1.98	**7%**
ice cream and frozen dessert manufacturing	1.85	1.90	1.93	1.94	1.97	1.92	1.97	1.85	**7%**
Fruit and vegetables									
frozen food manufacturing	1.68	1.76	1.83	1.81	1.75	1.77	1.83	1.68	**9%**
fruit and vegetable canning, pickling, and drying	1.60	1.68	1.76	1.77	1.73	1.71	1.77	1.60	**11%**
Bakery, confectionary, snack foods, & flavor									
bread, cookie, snack food	1.69	1.78	1.82	1.82	1.81	1.78	1.82	1.69	**8%**
coffee, syrup, seasoning mfg	1.52	1.65	1.70	1.70	1.69	1.65	1.70	1.52	**12%**
Animal foods									
dog and cat food manufacturing	1.52	1.53	1.57	1.56	1.57	1.55	1.57	1.52	**3%**
other animal food manufacturing	1.65	1.63	1.63	1.61	1.62	1.63	1.65	1.61	**2%**
Animal slaughter and processing									
animal (non-poultry) slaughter, render & process	1.65	1.67	1.68	1.64	1.55	1.64	1.68	1.55	**8%**
poultry processing	1.53	1.53	1.56	1.55	1.52	1.54	1.56	1.52	**3%**
Grain and oilseed processing									
flour milling and malt manufacturing	1.77	1.88	1.94	1.93	1.91	1.88	1.94	1.77	**9%**
soybean and other oilseed processing	1.30	1.55	1.65	1.50	1.45	1.49	1.65	1.30	**27%**
fats and oils refining and blending	1.35	1.45	1.41	1.37	1.36	1.39	1.45	1.35	**7%**
Other foods									
seafood product preparation and packaging	1.60	1.75	1.86	1.86	1.79	1.77	1.86	1.60	**16%**
all other food manufacturing	1.60	1.79	1.85	1.89	1.87	1.80	1.89	1.60	**18%**
Alcoholic beverages									
breweries	1.42	1.49	1.53	1.61	1.59	1.53	1.61	1.42	**14%**
wineries	1.63	1.78	1.77	1.85	1.77	1.76	1.85	1.63	**14%**
distilleries	1.19	1.31	1.36	1.54	1.45	1.37	1.54	1.19	**29%**
Soft drink and ice manufacturing	1.55	1.68	1.71	1.74	1.67	1.67	1.74	1.55	**12%**
Ag chemical and equipment manufacturing									
fertilizer manufacturing	1.75	2.05	2.05	1.80	1.89	1.90	2.05	1.75	**18%**
pesticide & other ag. chemical manufacturing	1.51	1.66	1.74	1.61	1.60	1.62	1.74	1.51	**15%**
farm machinery and equipment manufacturing	1.50	1.58	1.60	1.65	1.55	1.58	1.65	1.50	**10%**
lawn and garden equipment manufacturing	1.47	1.49	1.55	1.58	1.54	1.53	1.58	1.47	**8%**
Retail Trade Food & Beverage	1.76	1.86	1.92	1.92	1.80	1.85	1.92	1.76	**9%**
Food Services & Drinking Places	1.70	1.84	1.89	1.87	1.80	1.82	1.89	1.70	**11%**

Source: Implan (2012)

Table E5. Time Series of SAM Income Multipliers for New York's Agriculture Manufacturing, Food Retail Trade, and Food Service

Sector/Industry	2011	2010	2009	2008	2007	Mean	Max.	Min.	% Diff. Max. & Min.
Dairy products									
fluid milk and butter manufacturing	4.94	3.54	4.43	4.43	3.53	4.17	4.94	3.53	**40%**
cheese manufacturing	5.08	4.91	6.62	6.62	4.74	5.60	6.62	4.74	**40%**
dry, condensed, & evaporated dairy product manuf.	4.17	5.14	5.78	5.78	4.43	5.06	5.78	4.17	**39%**
ice cream and frozen dessert manufacturing	3.19	3.47	3.94	3.94	4.19	3.75	4.19	3.19	**31%**
Fruit and vegetables									
frozen food manufacturing	2.89	2.88	2.97	2.60	1.68	2.60	2.97	1.68	**77%**
fruit and vegetable canning, pickling, and drying	3.08	3.07	3.45	3.44	4.14	3.44	4.14	3.07	**35%**
Bakery, confectionary, snack foods, & flavor									
bread, cookie, snack food	2.67	2.73	2.76	2.65	2.59	2.68	2.76	2.59	**7%**
coffee, syrup, seasoning mfg	3.76	3.75	3.95	3.72	4.07	3.85	4.07	3.72	**10%**
Animal foods									
dog and cat food manufacturing	4.54	4.32	4.47	3.81	4.16	4.26	4.54	3.81	**19%**
other animal food manufacturing	4.73	4.91	4.83	3.87	3.49	4.37	4.91	3.49	**41%**
Animal slaughter and processing									
animal (non-poultry) slaughter, render & process	2.23	2.86	3.03	2.84	2.64	2.72	3.03	2.23	**36%**
poultry processing	3.58	2.47	2.42	2.26	2.23	2.59	3.58	2.23	**61%**
Grain and oilseed processing									
flour milling and malt manufacturing	5.33	5.71	6.37	5.57	4.54	5.50	6.37	4.54	**41%**
soybean and other oilseed processing	8.19	25.08	18.73	20.58	17.79	18.07	25.08	8.19	**206%**
fats and oils refining and blending	10.62	4.74	6.56	5.00	4.42	6.27	10.62	4.42	**140%**
Other foods									
seafood product preparation and packaging	2.27	2.47	2.61	2.76	2.50	2.52	2.76	2.27	**21%**
all other food manufacturing	2.71	3.00	3.21	2.98	3.06	2.99	3.21	2.71	**18%**
Alcoholic beverages									
breweries	2.75	2.84	2.98	4.21	2.64	3.08	4.21	2.64	**59%**
wineries	3.20	3.81	3.50	4.08	2.56	3.43	4.08	2.56	**60%**
distilleries	1.91	2.30	2.38	2.65	2.99	2.45	2.99	1.91	**56%**
Soft drink and ice manufacturing	2.88	2.89	2.95	2.70	2.64	2.81	2.95	2.64	**12%**
Ag chemical and equipment manufacturing									
fertilizer manufacturing	6.68	8.17	10.35	5.91	5.52	7.33	10.35	5.52	**87%**
pesticide & other ag. chemical manufacturing	4.72	5.63	6.51	5.08	4.83	5.35	6.51	4.72	**38%**
farm machinery and equipment manufacturing	2.50	2.90	3.14	3.43	1.88	2.77	3.43	1.88	**83%**
lawn and garden equipment manufacturing	2.28	2.59	2.68	2.63	2.76	2.59	2.76	2.28	**21%**
Retail Trade Food & Beverage	1.58	1.68	1.54	1.85	1.68	1.66	1.85	1.54	**20%**
Food Services & Drinking Places	1.68	1.86	1.85	1.88	1.82	1.82	1.88	1.68	**12%**

Source: Implan (2012)

Table E6. Time Series of SAM Employment Multipliers for New York's Agriculture Manufacturing, Food Retail Trade, and Food Service

Sector/Industry	2011	2010	2009	2008	2007	Mean	Max.	Min.	% Diff. Max. & Min.
Dairy products									
fluid milk and butter manufacturing	7.66	5.84	6.66	6.50	6.25	6.584	7.66	5.84	**31%**
cheese manufacturing	6.11	6.78	8.09	7.38	6.94	7.060	8.09	6.11	**32%**
dry, condensed, & evaporated dairy product manuf.	5.52	8.22	8.47	8.27	7.07	7.512	8.47	5.52	**53%**
ice cream and frozen dessert manufacturing	2.72	3.12	3.29	3.56	3.78	3.293	3.78	2.72	**39%**
Fruit and vegetables									
frozen food manufacturing	2.39	2.61	2.74	2.58	1.73	2.411	2.74	1.73	**58%**
fruit and vegetable canning, pickling, and drying	2.80	3.14	3.30	3.23	3.81	3.254	3.81	2.80	**36%**
Bakery, confectionary, snack foods, & flavor									
bread, cookie, snack food	1.93	2.05	2.08	1.98	1.99	2.004	2.08	1.93	**8%**
coffee, syrup, seasoning mfg	4.12	4.31	4.41	4.40	4.57	4.360	4.57	4.12	**11%**
Animal foods									
dog and cat food manufacturing	5.26	5.25	5.46	4.33	4.74	5.008	5.46	4.33	**26%**
other animal food manufacturing	5.29	5.59	5.51	4.15	3.73	4.857	5.59	3.73	**50%**
Animal slaughter and processing									
animal (non-poultry) slaughter, render & process	2.44	3.20	3.23	3.05	2.76	2.936	3.23	2.44	**32%**
poultry processing	2.23	1.77	1.78	1.69	1.70	1.834	2.23	1.69	**32%**
Grain and oilseed processing									
flour milling and malt manufacturing	7.37	9.23	9.76	7.57	6.14	8.016	9.76	6.14	**59%**
soybean and other oilseed processing	5.03	19.56	23.60	12.63	9.37	14.038	23.60	5.03	**369%**
fats and oils refining and blending	8.97	5.07	5.74	4.18	3.65	5.522	8.97	3.65	**146%**
Other foods									
seafood product preparation and packaging	2.87	3.09	3.06	2.99	2.95	2.994	3.09	2.87	**7%**
all other food manufacturing	2.38	2.63	2.76	2.58	2.51	2.572	2.76	2.38	**16%**
Alcoholic beverages									
breweries	4.20	4.46	4.64	6.53	4.81	4.926	6.53	4.20	**56%**
wineries	2.36	2.84	2.60	3.45	3.03	2.856	3.45	2.36	**46%**
distilleries	4.55	5.64	6.62	6.49	5.55	5.770	6.62	4.55	**46%**
Soft drink and ice manufacturing	3.14	3.60	3.66	3.49	3.30	3.439	3.66	3.14	**17%**
Ag chemical and equipment manufacturing									
fertilizer manufacturing	5.52	7.48	9.34	5.06	5.30	6.541	9.34	5.06	**85%**
pesticide & other ag. chemical manufacturing	5.69	6.79	8.66	6.93	6.51	6.916	8.66	5.69	**52%**
farm machinery and equipment manufacturing	2.80	2.59	2.69	2.90	1.71	2.538	2.90	1.71	**70%**
lawn and garden equipment manufacturing	2.16	2.11	2.27	2.32	2.34	2.242	2.34	2.11	**11%**
Retail Trade Food & Beverage	1.29	1.30	1.25	1.35	1.29	1.297	1.35	1.25	**8%**
Food Services & Drinking Places	1.28	1.33	1.36	1.32	1.31	1.320	1.36	1.28	**6%**

Source: Implan (2012)

Table E7. Time Series of SAM Output Multipliers for Remaining Sectors of New York's Economy

Sector/Industry	2011	2010	2009	2008	2007	Mean	Max.	Min.	% Diff. Max. & Min.
Forestry, fishing, and hunting	1.56	1.72	1.75	1.68	1.42	1.63	1.75	1.42	**23%**
Mining	1.73	1.69	1.61	1.64	1.64	1.66	1.73	1.61	**7%**
Utilities, transportation, information	1.69	1.75	1.75	1.89	1.79	1.77	1.89	1.69	**12%**
Construction	1.68	1.84	1.85	1.88	1.77	1.80	1.88	1.68	**12%**
Tobacco, textile, wood, and paper product mfg.	1.46	1.57	1.64	1.66	1.65	1.60	1.66	1.46	**14%**
Chemicals and plastics mfg.	1.40	1.55	1.60	1.53	1.52	1.52	1.60	1.40	**15%**
Stone, clay, glass, metal products mfg.	1.67	1.77	1.74	1.79	1.71	1.74	1.79	1.67	**7%**
Equipment and instrument mfg.	1.55	1.62	1.63	1.72	1.65	1.63	1.72	1.55	**11%**
Wholesale and retail (nonfood) trade	1.63	1.82	1.78	1.84	1.74	1.76	1.84	1.63	**13%**
Finance, insurance, and real estate	1.60	1.69	1.72	1.81	1.87	1.74	1.87	1.60	**17%**
Services (nonfood)	1.77	2.00	2.00	1.99	1.87	1.92	2.00	1.77	**13%**
Government	1.71	1.90	1.96	1.90	1.64	1.82	1.96	1.64	**19%**

Source: Implan (2012)

Table E8. Time Series of SAM Income Multipliers for Remaining Sectors of New York's Economy

Sector/Industry	2011	2010	2009	2008	2007	Mean	Max.	Min.	% Diff. Max. & Min.
Forestry, fishing, and hunting	2.26	2.08	2.18	2.70	1.97	2.24	2.70	1.97	**37%**
Mining	3.38	1.73	1.96	1.98	1.93	2.20	3.38	1.73	**95%**
Utilities, transportation, information	1.85	2.04	1.97	2.17	2.02	2.01	2.17	1.85	**17%**
Construction	1.53	1.82	1.77	1.82	1.79	1.75	1.82	1.53	**19%**
Tobacco, textile, wood, and paper product mfg.	1.96	2.31	2.31	2.23	2.24	2.21	2.31	1.96	**18%**
Chemicals and plastics mfg.	2.12	2.42	2.59	2.14	1.97	2.25	2.59	1.97	**31%**
Stone, clay, glass, metal products mfg.	2.35	2.27	2.36	2.44	2.33	2.35	2.44	2.27	**8%**
Equipment and instrument mfg.	2.16	2.10	2.12	2.28	1.93	2.12	2.28	1.93	**19%**
Wholesale and retail (nonfood) trade	1.60	1.74	1.71	1.85	1.75	1.73	1.85	1.60	**16%**
Finance, insurance, and real estate	1.82	1.97	2.04	1.94	1.88	1.93	2.04	1.82	**12%**
Services (nonfood)	1.57	1.70	1.72	1.76	1.67	1.69	1.76	1.57	**12%**
Government	1.36	1.45	1.47	1.44	1.31	1.40	1.47	1.31	**12%**

Source: Implan (2012)

Table E9. Time Series of SAM Employment Multipliers for Remaining Sectors of New York's Economy

Sector/Industry	2011	2010	2009	2008	2007	Mean	Max.	Min.	% Diff. Max. & Min.
Forestry, fishing, and hunting	1.32	1.49	1.63	1.85	1.47	1.55	1.85	1.32	**40%**
Mining	2.19	2.60	2.60	4.02	3.35	2.95	4.02	2.19	**84%**
Utilities, transportation, information	2.21	2.25	2.36	2.67	2.49	2.39	2.67	2.21	**21%**
Construction	1.56	1.80	1.75	1.75	1.74	1.72	1.80	1.56	**16%**
Tobacco, textile, wood, and paper product mfg.	2.11	2.56	2.46	2.45	2.48	2.41	2.56	2.11	**21%**
Chemicals and plastics mfg.	2.39	3.01	3.18	2.70	2.41	2.74	3.18	2.39	**33%**
Stone, clay, glass, metal products mfg.	2.34	2.32	2.41	2.48	2.36	2.38	2.48	2.32	**7%**
Equipment and instrument mfg.	2.60	2.50	2.52	2.73	2.27	2.52	2.73	2.27	**21%**
Wholesale and retail (nonfood) trade	1.47	1.58	1.58	1.62	1.56	1.56	1.62	1.47	**10%**
Finance, insurance, and real estate	2.24	2.46	2.54	2.84	2.71	2.56	2.84	2.24	**27%**
Services (nonfood)	1.54	1.68	1.68	1.65	1.57	1.62	1.68	1.54	**9%**
Government	1.44	1.53	1.54	1.46	1.33	1.46	1.54	1.33	**16%**

Source: Implan (2012)

OTHER A.E.M. EXTENSION BULLETINS

EB No	Title	Fee (if applicable)	Author(s)
2014-02	Dairy Replacement Programs: Cost & Analysis 3rd Quarter 2012		Karszes, J.
2014-01	Cost of establishment and production of V. vinifera grapes in the Finger Lakes region of New York - 2013		Gomez, M.
2013-17	New York Economic Handbook, 2014		Extension Faculty and Staff
2013-16	Dairy Farm Business Summary, Northern New York Region, 2012	($12.00)	Knoblauch, W., Conneman, G., Dymond, C., Karszes, J., Howland, B., Buxton, S., Kiraly, M., and K. Shoen
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2013-14	Eastern Broccoli Crop Budgets		Atallah, S. and M. Gómez
2013-13	Dairy Farm Business Summary, New York Small Herd Farms, 120 Cows or Fewer, 2012	($16.00)	Knoblauch, W., Dymond, C., Karszes, J. and M. Kiraly
2013-12	Dairy Farm Business Summary, Western New York Region, 2012	($12.00)	Knoblauch, W., Dymond, C., Karszes, J., Hanchar, J., Grace, J., Carlberg, V. and J. Petzen
2013-11	Dairy Farm Business Summary, New York Large Herd Farms, 300 Cows or Larger, 2012	($16.00)	Karszes, J., Knoblauch, W. and C. Dymond
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