



Research & Policy Brief Series

The Contribution of Agriculture to the New York Economy¹

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What is the Issue?

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. These 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 the New York State (NYS) agribusiness industry, we must identify and understand the industry linkages associated with agricultural-based economic activity in the economy, and through that assess agriculture's impact.

Measuring the Economic Impact of Agriculture

One approach to assessing agriculture's impacts is through an economic contribution analysis. This type of analysis for an industry (like dairy farming) or collection of industries (like food processing) describes that portion of an economy that can be attributed to the existing industry (or industries) by identifying all backward linkages in the study area; i.e., it identifies the total direct, indirect, and induced effects. In a contribution analysis, existing total output by the industry or industries of interest provides the initial (direct) effects of the analysis. The indirect effects represent all sales by the backward-linked supply chain industries, while the induced effects represent additional industry sales due to consumption out of the labor income generated in agriculture.

In our particular application, we define agriculture as including all on-farm agricultural production, all agricultural support services, and all agricultural processing. The analysis proceeds by examining the contributions of each of these components, as

well as their contribution in aggregate. Input-output analysis is used to assess how the value of agriculturally-related production, support services, and processing permeate throughout the state's economy; i.e., their relationships to other backward-linked industries. There are several metrics in which to measure the size of an economy; here, we consider industry sales (output) and total employment. The analysis utilizes data for NYS and modeling software provided by IMPLAN, LLC (<http://implan.com>).

Direct Impacts of Agriculture

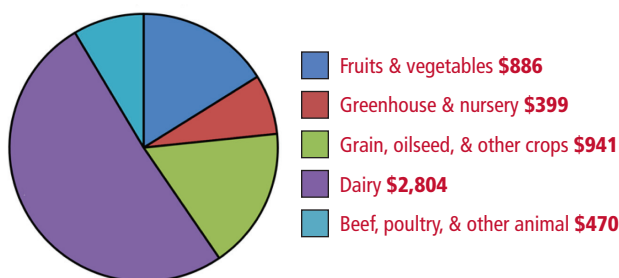
Looking towards the agricultural industries, five aggregated on-farm production sectors are considered: (i) fruit and vegetable, (ii) greenhouse and nursery, (iii) grain, oilseed, and other crops, (iv) dairy, and (v) beef, poultry, and other animal production (Figure 1). In total, on-farm agricultural production activity generated about \$5.5 billion in sales in 2011, accounting for 0.30% of total industrial sales across NYS. Agricultural production accounted for over 46 thousand jobs, representing about 0.42% of total state-level employment. Not surprisingly, on-farm dairy production contributes to roughly one half of the total on-farm agricultural output and employment.

The agricultural and forestry support services sector is included within our broad definition of agriculture to encompass its key linkages with the farm production sectors. While overall sales contributions are relatively small (\$212 million in 2011), the relatively labor-intensive nature of the sector implies relatively strong contributions to overall agricultural employment; i.e., nearly 9,000 jobs in 2011.

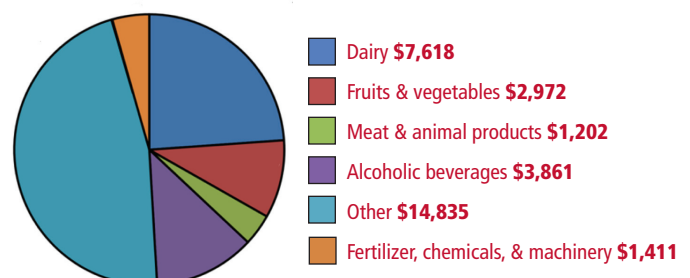
Food (including beverages) and agricultural-based (including fertilizers, chemicals, and machinery) product manufacturers are represented by nearly 40 distinct sectors in IMPLAN. For ease of exposition and to highlight key agriculturally-based manufacturing contributions, we aggregated the individual

Figure 1: New York State Agricultural Production and Manufacturing Output, by Category, 2011.

Agricultural Production (\$million)



Agricultural Manufacturing (\$million)



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sectors into six composite sectors, namely: (i) dairy, (ii) fruits and vegetables, (iii) meat and animal products, (iv) alcoholic beverages, (v) other food and beverages, and (vi) fertilizer, chemicals, and machinery manufacturing (Figure 1). In total, agriculturally-based manufacturing industries in the state directly contributed nearly \$32 billion in sales, representing about 1.8% of all sales in the state, and employment of nearly 60 thousand workers representing slightly more than 0.5% of all state-wide employment.

Dairy manufacturing accounts for about one-quarter of all agricultural manufacturing sales and nearly 15% of all employment, relying heavily on within-state milk production from the farming sector. Other processing sectors with relatively strong reliance on in-state farm production and with strong output contributions are from fruit and vegetable, meat processing, and alcoholic beverage sectors. In addition, nearly one-half of all sales are from 'other' food and beverage manufacturing sectors. This includes relatively strong contributions from bread and bakery product operations (\$2.8 billion in output), flavoring and concentrates (\$1.4 billion in output), and soft drink and ice manufacturers (\$1.8 billion in output), but generally less reliance on raw product inputs produced in the state. The diversity of the composition of agricultural manufacturing is a reflection of both a diverse agricultural production sector and a large population base, including the New York City metropolitan area.

Agriculture's Economic Contribution

The economic contribution of agriculture, as we have defined it, on total industrial sales in 2011 was \$53.7 billion; about 3.0% of NYS's total sales (see Industry Output, All Agriculture, Table 1). The \$37.6 billion of direct contributions (total gross output) support an additional \$10.1 billion and \$6.0 billion in indirect and induced industry sales, respectively, through agriculture's inter-industry linkages. Individual agricultural component contributions (i.e., for farm production, service, and manufacturing separately) are also shown in Table 1. Note, that while the direct contributions across agriculture's segments are additive (i.e., for the direct effects, agricultural production + agricultural support services + agricultural manufacturing = all agriculture), the same is not true for the indirect and induced impacts. For example, when looking at the agricultural manufacturing sector in isolation, a portion of the \$12.7 billion in indirect effects includes backward-linkages to agricultural production sectors. Thus, when looking at the composite All Agriculture results, those agricultural production

effects are already accounted for in the direct effects. Simply summing the individual indirect and induced impacts across agriculture's three components would result in double counting.

The implied output multiplier for all agriculture in NYS (i.e., the sum of the direct, indirect, and induced effects divided by the direct effect) is 1.43, meaning that for every additional dollar generated in agriculture \$0.43 is generated in backward linked (nonagricultural) industries (Table 1). If we decompose the multiplier effect into its indirect and induced components, the indirect effect is 0.27 (from business-to-business activity) and the induced effect is 0.16 (from labor income spending). Individual component contributions and output multipliers are also shown in Table 1.

Total employment contributions in 2011 by NYS agriculture was 206,604 jobs, 115,003 through direct employment, and an additional 91,601 through indirect and induced industry effects (Table 1). This represents approximately 1.9% of total NYS employment. As with industry output, the majority of the jobs are generated by agricultural manufacturing activity. Indeed, the agricultural manufacturing employment multiplier (2.83) is well above either the agricultural production (1.45) or support services (1.12) sectors and, in part, reflects strong linkages (indirect effects) to agricultural production activity in NYS; e.g., dairy manufacturing in NYS sourcing milk from NYS dairy farms. In total, an additional job generated in agriculture supports another 0.80 jobs in backward-linked non-agricultural industry sectors.

Summary

Economic contribution analyses identify the portion of a region's economy that can be attributed to an existing industry or combination of industries through its direct, indirect and induced effects. Agriculture, incorporating agricultural production, support services, and manufacturing, represents a \$53.7 billion industry in NYS, with over 200,000 jobs when the value of inter-industry linkages is considered. While total agriculturally-related industry activity may represent a relatively small proportion of total state output (3%) and employment (2%) given the large metropolitan populations in the state, relative contributions for smaller area rural economies will vary. This exercise provides a better understanding of agriculture's total contribution to the NYS economy and demonstrates its significant ripple (multiplier) effects.

A copy of the full report is available at:

<http://www.dyson.cornell.edu/outreach/extensionpdf/2014/Cornell-Dyson-eb1404.pdf>

Table 1: Economic Contribution of Agriculture on the New York State Economy, 2011

	Direct ^a	Indirect ^b	Induced ^c	Total	Implicit Multiplier
Industry Output (\$ million)					
Agricultural Production	5,500	1,935	1,425	8,861	1.61
Agricultural Support Services	212	37	139	388	1.83
Agricultural Manufacturing	31,898	12,7000	5,086	49,684	1.56
All Agriculture	37,611	10,094	6,014	53,719	1.43
Employment					
Agricultural Production	46,180	11,092	9,898	67,171	1.45
Agricultural Support Services	8,877	142	962	9,981	1.12
Agricultural Manufacturing	59,946	73,766	35,781	169,492	2.83
All Agriculture	115,003	49,295	42,306	206,604	1.80

Source: IMPLAN (2014)

^a Direct effects represent total activity (sales, employment) by the respective industries.

^b Indirect effects represent all activity by the backward-linked supply chain industries.

^c Induced effects represent additional industry activity due to consumption out of labor income.

