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Local Food Wholesale Infrastructure in New York State: economic impact, policy implications and recommendations

Introduction

Across the United States there is increased interest in local foods. Private foundations, local, state, and national governments have financed and helped to implement hundreds of initiatives around the country. However, there has been little to no evaluation of such efforts. In fact, the development of rigorous methods to measure the contribution of local foods to the economic vitality and sustainability of communities has risen to the top of many research agendas (Jenson 2010; King et al. 2010; Lyson, et al. 2008; The National Research Committee on Twenty-First Century Systems Agriculture 2010). In order for policy makers to determine appropriate paths for agricultural economic development, they must have a clear understanding of the economic impacts produced by local food systems, which requires a more nuanced knowledge of 1) how local food moves throughout supply chains, 2) where bottlenecks exist to business efficiency and expansion, and 3) where and how incentives can be utilized to efficiently move product from farm-to-consumer.

Intermediated markets and local food wholesale infrastructure

Though political conversations about local food tend to focus around opportunities for direct-to-market sales (e.g. supporting new farmers' markets, roadside stands, onfarm stores, and Community Supported Agriculture), increasingly there is evidence that local food markets are dominated by farms who sell through a variety of outlets – especially intermediated markets (Bloom and Hinrichs 2011; Hand 2010; Ilbery and Maye 2005; Low and Vogel 2011; Sonnino and Marsden 2006). A 2011 United States Department of Agriculture's Economic Research Service (USDA ERS) report, for example, using restricted access 2008 Agricultural Resource

Management Survey (ARMS) data¹ found that sales through intermediated markets, defined as farmers' sales to local retail, restaurant, and regional distribution outlets, account for a much higher percentage of local food sales than direct-to-market sales. Highlights of the study include: an estimate of U.S. local food sales of over \$4.8 billion in 2008 – about four times higher than estimates based solely on direct-to-consumer sales; estimates that farms marketing their products exclusively through intermediated channels reported three times higher gross sales than farms marketing exclusively through direct-to-consumer channels; and estimates that 50-66 percent of local foods are marketed through intermediated channels (Low and Vogel 2011). Though the report is clear about the importance of intermediaries in local agricultural systems, it does not provide any insight into how the food moves through wholesale or intermediated infrastructure, where bottlenecks exist, or ensuing policy implications.

Likewise, King et al. (2010) find that intermediated supply chains are important in moving local food from farm-to-consumer. They examined differences between local food and mainstream supply chains in 15 case studies they conducted across five U.S. cities. Among other significant findings, the report found evidence that regional differences in local food sales may be explained by the availability of appropriately scaled local food wholesale infrastructure. King et al. call for further studies to examine supply chain linkages and input costs so as to develop regional multipliers for this sector.

The goals of this research are to: 1) examine the role of local food wholesale infrastructure (LFWI) in meeting the demand for locally-grown agricultural commodities; 2) gather baseline data and understand barriers to the growth and efficiency of LFWI businesses; 3) assess the economic impact of policies that support the development of LFWI; and, 4) develop policy recommendations to facilitate the growth of local food systems.

Methodology

This paper takes an innovative, mixed-methods approach to answer the research questions, combining Social Accounting Matrix modeling, primary data collection, and Structural Path Analysis. A primary contribution of this paper is the original application of the integrated methodological framework to local foods wholesale infrastructure.

Definitions

For the purpose of this paper, we define ‘local’ as agricultural products grown and sold in New York State. Local food wholesale infrastructure (LFWI) is defined in terms of persons or businesses required to obtain a “farm product dealers license” (article C license) from the New York State Department of Agriculture and Markets (NYSDAM). According to NYSDAM, this includes dealers (any person who buys or receives farm products from a producer for resale, or arranges, facilitates or brokers the sale of farm products from a producer to a dealer or any other person), Commission Merchant (any person engaged in the business of receiving farm products for sale on commission), Net-return Dealer (a dealer who solicits or receives shipments of farm products under a promise to pay for the same on the basis of current market prices on receipt or at a price bearing some specified premium above or below established market quotations), Broker (any person engaged in the business of negotiating sales and purchases of farm products for or on behalf of the vendor or purchaser), and Processor (any person who bakes, brines, bottles, cans, concentrates, dehydrates, dresses, dries, freezes, juices, packages, pickles, preserves, presses or waxes and/or encloses such stabilized farm products, or their derivative products, in any container). This definition only pertains to the purchase of NYS farm grown products, and excludes persons or businesses whose dealings do not exceed \$10,000, or farm products that are only for sale to the ultimate consumer (direct-to-market sales). Based on these definitions, the

NYS LFWI sector purchased \$807,965,000.00 worth of NYS grown agricultural products in 2010, and estimated purchases totaling \$820,498,282.00 in 2011.

Social Accounting Matrix and IMPLAN

Local food as an economic development strategy refers to: 1) import substitution, and 2) increasing economic linkages (generally rural-urban). The goal of local food is to support rural and agricultural economic development opportunities, through increased opportunities for farmers and rural businesses. The presumed benefit of LFWI, as opposed to wholesale infrastructure, is that LFWI purchases more of their product locally (import substitution) thus circulating more money in the regional economy. In addition, LFWI may be able to generate additional linkages between rural and urban regions – including potentially tapping niche markets in order to receive a price premium (and possibly passing part of it to their farmer suppliers) for specialty products.

A Social Accounting Matrix (henceforth SAM) is essentially a data system linking the economic accounts of sectoral production, factors of productions, and institutions. These linkages capture the circular interdependence among production, the income distribution among factors of production, and the distribution of income among various categories of household groups. The explicit inclusion of income distribution – among both factors of production and household groups – is the key distinction between a SAM and its predecessor, the Leontieff input-output (IO) system (Defourny and Thorbecke 1984; Miller and Blair 1985).

A SAM is constructed based on the double entry accounting principle, which guarantees that total expenditures and receipts must balance for every account. However, in a SAM the double entries are achieved by only a single entry in a square matrix, which works because the rows of the matrix represent receipts while the columns represent expenditures. Thus, every

element of a SAM has a dual interpretation; when looked at as an entry in a row, it appears as the value of a sale, but when looked at as an entry in a column, it appears as the value of a purchase. There are two principal objectives of a SAM. The first is to provide a systematic organization of information about the structure of an economy at a particular point in time. Having organized the data in the form of a SAM, the second objective is to employ that database for the building of a model.

There has been a recent surge in studies that utilize SAM models to quantify the economic contribution of local food systems to regional economies (e.g., Cantrell et al. 2006; Gunter 2011; Kane et al. 2010; Otto and Varner 2009; Swenson 2011a, 2011b, 2006a, 2006b, 2009, 2010a, 2010b; Timmons 2006; Ulmer et al. 2005; University of Hawai Cooperative Extension 2008; University of South Carolina 2010). IMPLAN (Impact Analysis for PLANning) is the dominant source of SAM data and projection employed in these studies. IMPLAN analyses begin with the construction of an IO transaction table, which specifies inter-industry flows among all sectors and between sectors and final demand in the regional economy (Liu and Warner 2009). IMPLAN is a widely used tool for economic impact analysis due to the fact that it can measure multiplier effects, allows the user to modify and build unique industry sectors, and is available on a county-by-county basis. The total output (i.e., total sales) for the LFWI is obtained from the multiplication of the matrix of multipliers and the final demand expenditures. The key to the utility of these models lies in the assumptions that are made as the model is constructed and in the nature and extent of adaptations made to the model so as to bring it closer to actual economic activity.

The majority of these impact assessments focus on hypothetical import substitution scenarios (what is the economic impact of Georgia consuming more Georgia-grown fruits and

vegetables) without collecting any data to support their findings (Cantrell et al. 2006; Kane et al. 2010; Swenson 2006a, 2009, 2010a, 2010b, 2011b; Timmons 2006; University of Hawai Cooperative Extension 2008). Perhaps the most rigorous of these studies, and certainly the most straightforward about the assumptions, is by Swenson (2011b), who provides a useful account of the information that is needed in order to conduct his impact analysis and how he collects it. Specifically, in order to estimate demand, he calculates: per capita consumption; required acre estimates; and, the amount of local demand that can be met. However, he concludes “this report is based on sets of successive assumptions...much more research needs to be conducted concerning the industrial relationships between production and retail activity to determine if more jobs truly are required to handle, transport and distribute those goods than would otherwise exist to move the same volume of foods irrespective of the farm-to-retail configurations assumed in this report” (Swenson 2011b, p. 16).

Limitations of SAM modeling and IMPLAN

Despite its widespread use as an economic modeling tool, SAM models and IMPLAN have several limitations – most importantly, they assume: constant prices; static framework; fixed-proportion production function; demand driven (i.e., ignores supply constraints); and that firms can be aggregated into broad sectors without introducing excessive bias. Swenson (2006) makes several other important observations about the difficulty compiling economic impacts, including: the absence of accurate default industrial accounts for many industries; the costs and the revenues of agricultural production are volatile; and, the difficulty attributing federal, state, and local subsidies into or out of the output values (consequently the prices received are understatement of gross receipts to a region and to investors). In addition, Holland et al. (1997) point out that economically small rural regions are difficult to model in IMPLAN because of the

problem of undisclosed data in national data collection systems.

Primary Data, SAM, and IMPLAN

Adjusting IMPLAN data with primary data collection can help to overcome some of the shortcomings of the model. “Ideally, constructing an I-O [or SAM] model requires survey-based information on sales and expenditures by industry in order to identify inter-industry flows” (Liu and Warner 2009, p. 74). However, there are few studies that go to this length.

There are many benefits to supplementing IMPLAN data with primary data. First, the regional economic impacts of any sector depend on what inputs are purchased and where. Sectors that buy a large amount of inputs and buy them locally likely have higher multiplier effects than those that buy few inputs or buy them from outside the local economy (*ceteris paribus*). Though many researchers hypothesize that regional food system actors are more likely to purchase their inputs from regional suppliers, yielding a higher multiplier, this has not been demonstrated through data-driven methods as data on the location and expenditure of inputs from regional food system actors are not readily available. Second, available IMPLAN data does not provide sectors that are disaggregated enough to look at any aspect of local food systems. Thus, data must be collected in order to disaggregate existing sectors according to appropriate characteristics.

SAM and Structural Path Analysis

The SAM is a useful tool for policymakers, planners, and economic developers to capture the circular interdependence characteristic of any economic system. The resulting multiplier analysis, however, does not reveal the network of paths through which an injection (a shock or policy) is transmitted, nor does it provide a sectoral breakdown of additional income generated by an exogenous injection (Defourny and Thorbecke 1984). When considering barriers to the

growth and efficiency of LFWI, as well as its economic impacts, and policies to support its development, it is critical to understand the network of paths through which transmission occurs.

Structural Path Analysis (henceforth SPA) captures the transmission and intensity of an ‘influence’ (i.e., monetary flows) traveling from pole i to pole j as the SAM average propensity a_{ji} . SPA does this by focusing on how multiplier effects are derived from the different linkages or ‘paths’ that connect sectors within an economy. A path is defined as a sequence of consecutive arcs, the length of which is the number of arcs between the origin and destination poles (Defourny and Thorbecke 1984; Roberts and Newlands 2010; Roberts 2005). For example, arc (i, j) is a path with a length equal to one, whereas path (i, x, y, j) has a length equal to three. An elementary path is a path that does not pass through the same pole more than once (see figure 1), while a ‘circuit’ is a path for which the starting pole of an influence is also its destination pole.

The key goals of structural path analysis are to identify: first, the important paths within an economic system; and, second, which poles or accounts in the system (individual production sectors, factors or households) are important transmitters of economics influence. This approach is based on the assumption that the average expenditure propensity flowing from account i to account j in the system, a_{ji} reflects the magnitude of influence transmitted from i to j or the intensity of arc (i, j) . Three hierarchical measures of influence can be derived between any two accounts in a SAM, i and j : the direct influence of i on j ; the total influence of i on j ; and, the global influence of i on j . A ‘direct influence’ $I_{(i \rightarrow j)p}^D$ travels through an elementary path and is defined as the change in income (or output) at j resulting from an additional one dollar generated in i (see figure 2). The ‘total influence’ $I_{(i \rightarrow j)p}^T$ is defined as the product of the direct influence and the path multipliers resulting from all the circuits connected to the path (i, \dots, j) . Finally, the ‘global influence’ $I_{(i \rightarrow j)p}^G$ is the sum of the total influences that travel through all the elementary

paths between i and j , and by construction is equal to the SAM multiplier linking the origin to the destination.

Thus SPA identifies the paths that are important conduits of influence transmission based on the contribution of each path in terms of its total influence to the SAM multiplier. In relation to structural analysis of a particular economy, it can be used to show how both the length and the nature of paths associated with a particular sector contributes to the transmission of impacts and thus provides information on integration not observable from more standard multiplier and decomposition techniques (Defourny and Thorbecke 1984; Roberts and Newlands 2010; Roberts 2005).

SPA has been used previously to consider microlevel linkages between individual sectors or households in a single economy at a single point in time (Defourny and Thorbecke 1984), to compare the density of linkages between economies with various types of sectoral diversity (Basu and Johnson 1996) and to analyze the importance of linkages between regions (Roberts and Newlands 2010; Roberts 2005). However, we could not find any example in the literature where SPA is used in relation to assessing the impact of local food systems. This paper uses SPA to reveal the network of linkages through which an economic stimulus in local agriculture ultimately impacts the markets (the retail sector), as well as creates employment (employee compensation). As a working hypothesis, we expect the LFWI sector to figure prominently as an important vehicle of impact transmission.

Data

This research required three sources of primary and secondary data. First, during the summer of 2011, the authors conducted 19 semi-structured interviews with LFWI businesses across NYS, representing 443 NYS farm-suppliers. Informants were selected based on 1)

researcher knowledge that the LFWI worked with NYS farmers; or 2) the fact that they hold a farm product dealers licenses from NYSDAM. For the license period May 1, 2010 to April 30, 2011, there were 423 licensed businesses.^{2,3} Once a list of LFWI businesses was generated, every effort was made to interview a representative sample, including interviewing distributors: in each of the 10 regions designated by Empire State Development (New York State's Department of Economic Development, henceforth ESD); who worked with varying numbers of NYS farmers; with a range of gross sales – from under \$100,000 to over \$200,000,000; in operation from less than one year to over 100 years; and, who carried a wide range of agricultural commodities.

Informants were asked questions regarding their business function and distribution area, types and locations of suppliers from who they purchased product, how they marketed their product, their capital purchases in the last five years, and plans for expansion. As part of each interview, respondents were asked to provide information regarding where they purchased inputs and sold products – either within their ESD region, outside their region but within NYS, or outside of NYS.

In addition to the surveys, the researchers obtained copies of the farm product dealers license applications for the license period May 1, 2010 to April 30, 2011 from the NYSDAM through a Freedom of Information Act request. The applications provide important information regarding: 1) the types of businesses that are considered LFWI; 2) the total quantity (in gross dollars) of NYS grown product purchased by NYS LFWI businesses; and, 3) the types of agricultural commodities purchased by NYS LFWI businesses.

Finally, IMPLAN data was also used (and modified) to construct the SAM model. IMPLAN provides information on the average cost allocations within an industry based on a variety of regional and national sources, including: the Bureau of Economic Analysis; the Bureau

of Labor Statistics; the Census Bureau; the Department of Agriculture; and, the Geological Survey.⁴

Integrating Primary Survey Data

Using 2009 IMPLAN data for NYS in 2010 prices, we used 2 digit NAICS codes to aggregate sectors in IMPLAN. We then divided the aggregated agriculture sector into the ‘local agriculture sector’ and ‘agriculture sector’ based on agricultural commodities that were included in commodity codes for the NYS Farm Product Dealers License (see table 1). Additionally, we created a new sector called ‘local food wholesale infrastructure’.

Next we exported the SAM from IMPLAN and split the LFWI sector into two sectors: the LFWI, and the wholesale infrastructure sector. In order to divide the sector, we knew to include 100 percent of the total output contained in the intersection with the local agriculture sector row in the LFWI sector. However, otherwise, we did not have information about how to split the two sectors. Therefore, we chose to assume that 20 percent of the activities contained within the undivided LFWI belonged in the newly divided LFWI, and the other 80 percent should be included in the wholesale infrastructure sector. Based on the sectors included in the original LFWI sector, and our knowledge of the NYS agricultural economy, we believe this is a tenable assumption.

Once the two sectors were divided, we redistributed the columns total output amounts according to the fact that in 2010 informants reported that on average 63.97 percent of total output from the LFWI sector was sold in NYS. Therefore 36.03 percent left the region as exports. We thus readjusted the distribution of total output per sector, subtracting the total output amount in the local agriculture sector (which remained constant regardless of the range chosen). In order to split up the rows, we relied on our knowledge that the accounting identity is preserved when

total expenditure equals total revenue. For the LFWI sector, this implies 63.97 percent of total revenues are from local sales. To split the rows, it is assumed that the portion accruing to the local agriculture sector is equal to gross output of LFWI divided by LFWI + wholesale infrastructure. This proportion is then multiplied by the original (aggregated) values to get the disaggregated values.

With the customized SAM complete, we ran SPA. We set the output so that the smallest magnitude of total influence was equal to 0.00001 (meaning that anything less than this would not appear in our results). We ran two scenarios: the local food sector as the origin and the retail sector as the destination; and, the local food sector as the origin and the employee compensation sector as the destination.

Impact of Exogenous Shock to the LFWI Sector

In his 2012 State of the State address, NYS Governor Andrew Cuomo spoke of his support for the development of regional food hubs (an important component of LFWI) and his intention to provide capital to support their development. The Governor's intention echoes the findings of Low and Vogel (2011) and King et al. (2010) that the majority of locally-grown food moves not directly from farm-to-consumer, but through intermediaries. And further, that the best way to support the growth of NYS farms, and make more NYS grown products available to NYS customers is through direct subsidies in the LFWI sector.

Thus, we analyzed the impact of a policy that provides a direct injection into the LFWI section in NYS. We chose to hypothesize a shock of \$6,000,000 into the LFWI sector, as based on our discussions with NYSDAM and ESD, this appeared to be a reasonable estimate of the amount of funding that will become available. Utilizing the customized SAM, we ran a scenario in which \$6,000,000 was added to the LFWI sector.

Results and Discussion

Structural Path Analysis

We applied structural path analysis to the 2009 SAM data for NYS. Rows 1-7 of table 2 report the decomposition of the global effect (i.e., the SAM multiplier) on the retail sector of a dollar of injection into the local agriculture sector. The first three rows represent the most dominant paths based on the percentage of the global effect that they transmit from the origin to the destination (20.6 percent, 7.3 percent, and 6.6 percent, respectively). They show that proprietary income (36) is the most important intermediary between local agriculture and retail. This income primarily accrues to wealthy NYS households – earning over \$100,000 annually – who then spend a portion of their earning in the retail sector. It appears, therefore, that input-output linkages play a minor role in diffusing the impact of local agriculture on the retail sector. Instead, as the path analysis reveals, the primary conduits are the factors of production.

As the next four rows show (8-11), paths that go through the LFWI sector (33) individually transmit at most 0.1 percent of the global effect, and collectively contribute less than one percent (complete decomposition results not shown, but available from the authors upon request). Furthermore, in those paths where the LFWI sector appears, it does not connect retail directly to local agriculture, but indirectly through employee compensation (20). That is, the LFWI sector appears because the workers employed in that sector buy retail products, and not because of the LFWI sector's role as a distributor. As a consequence, LFWI sector-mediated paths take a longer time to reach retail destinations because they have to go through at least one other intermediate node. The path multipliers in rows 4-7 indeed are larger than those for shorter, more direct paths, indicating that the LFWI sector is a potential source of bottleneck.

A similar conclusion is obtained when one looks at the decomposition of the multiplier that links local agriculture to employee compensation. The last five rows of table 2 report the path analysis. The second most important path, interestingly, is the wholesale infrastructure (non-local agriculture) sector (34), transmitting 4.1 percent of the global effect. The last three rows show that the LFWI sector (33) plays only a minor role in job creation and wage income generation. Paths that go through the LFWI sector transmit, at most, 0.2 percent of the global effect.

To summarize, the structural path analyses reveal that the LFWI sector is neither a significant mediator that links local agriculture to the retail markets, nor an important source of job creation in NYS. We believe this to be evidence of the fact that the LFWI sector is not fully integrated into the NYS economy.

Impact of Exogenous Shock to the LFWI Sector

A \$6,000,000.00 injection into the LFWI sector has a \$6,892,846.33 total output impact on the LFWI sector, and a \$184,432.27 impact on the local agriculture sector (see table 3). Other than the LFWI sector, the biggest impact is on the wholesale infrastructure sector (\$4,418,600.45) and employee compensation (\$3,616,002.20). Overall, a \$6,000,000 injection into the LFWI sector yields a total output impact of \$30,963,729.53 distributed across the NYS economy. Though this impact is significant, the more critical question is if the impact is supporting the local agriculture sector as is the intent of the policy.

In order to take a more careful look at the integration of the LFWI sector into the NYS economy as well as to better estimate the impact of the shock on the local agriculture sector, we decided to rerun the shock, changing the way that we split the LFWI and the wholesale infrastructure sectors. This time we divided the two sectors into 5 percent and 95 percent of total

output respectively (see table 3; note that we kept all of the local agriculture transactions in the LFWI sector). When run at these levels, the impact of a \$6,000,000 injection into the LFWI sector is \$6,286,540.10, and yields a higher impact in the local agriculture sector at \$526,720.09. Wholesale infrastructure and employee compensation remain the other big winners, at \$6,121,449.62 and \$3,589,219.71 respectively. Overall, a \$6,000,000 shock to the LFWI sector, assuming the revised sectoral decomposition, yields a \$32,433,984.03 total output impact distributed across the NYS economy.

Our results from introducing an exogenous shock to the LFWI sector support our conclusion drawn from the SPA that the LFWI sector is not fully integrated into the NYS economy. The fact that the overall total output impact was higher when the shock was introduced with the LFWI sector representing a smaller proportion of wholesale infrastructure implies that NYS fares worse when the share of LFWI is expanded.

Interestingly, it is not just NYS that fares worse, but farmers included in the local agriculture sector specifically. The local agriculture sector actually appears to do the worst, compared to other sectors in terms of percentage change, when the LFWI sector increases its market share. When we reduced the sector percentage from 20 percent to 5 percent in the LFWI sector before running the exogenous shock, the local agriculture sector yielded a -64.98 percent total output impact.

In hypothesizing why the local agriculture sector would fare worse as LFWI increases their share of the wholesale infrastructure market, and why it might not be fully integrated into the NYS economy, we were reminded of grocery retailers' increasing role in world markets. As Sexton (2010) writes: "Despite consolidation throughout the food market system, grocery retailers, oftentimes with international scope, have emerged as the dominant players in the food

chain in most parts of the world. These retailers through marketing contracts exercise considerable vertical market control over upstream suppliers in terms of varieties produced, inputs utilized, production schedules, etc.” (Sexton 2010, p. 1). Upon further reflection of the companies who have farm product dealers licenses, there are only a few retailers listed. Golub Corporation, owner of medium-sized chain Price Chopper Grocery Stores, does hold a license, but many NYS retailers including Wegmans Food Markets, Inc., Aldi Food, Inc., Delhaize America (owner of Food Lion, Shop ‘n Save, Hannaford Bros, Save ‘n Pack, Kash n’Karry) do not. Thus, in an era of increasing vertical integration, programs to enhance retail utilization of NYS grown products may prove more effective than direct stimulus to the LFWI sector. This supports the results from SPA, which show that the LFWI sector is a minimal contributor to the global effect of the path from the local agriculture sector to the retail sector.

Interview Results

In addition to our hypothesis that the vertical integration and consolidation of the retail industry may be a reason that the LFWI sector is not fully-integrated into the NYS economy, our interview results provide some additional insight into barriers to business efficiency and expansion.

For example, one of the challenges frequently cited by our informants to scaling up LFWI businesses is that increasingly markets are demanding that LFWI businesses work with farmers who adhere to Good Agricultural Practices (GAP). All of the LFWI businesses we interviewed with over \$10 million in gross sales require producers to be GAP certified. The GAP audit verification program, administered by the USDA, state agencies, and non profit organizations focuses on farmers and packers implementing practices to verify that they are producing, handling, and storing fruits and vegetables in the safest manner possible to minimize

risks of microbial food safety hazards (United States Department of Agriculture, Agricultural Marketing Service 2011).

Though some NYS farmers have started to implement GAP, there are challenges. In some cases, GAP implementation, and especially the requisite record keeping, can increase production costs and require a substantial amount of time. This may inhibit small-to-mid scale and diversified growers from becoming certified. Thus, LFWI businesses interested in diversifying the types of market outlets they serve (for example to include sales to other distributors, retailers, or institutions) in order to expand their business may require producers to become GAP certified.

Many of the informants working with larger numbers of small and mid-scale farms sell their products to individual household customers or at farmers' markets. Though the LFWI businesses ranked individual household/farmers' markets as the most reliable type of market outlet and the easiest point of entry, only distributors with the lowest average gross sales (under \$5 million) sold to these markets. This implies that LFWI businesses working with small and mid-scale farmers have an impediment to expansion.

Policy Recommendations

If the goal of a policy is to ensure more NYS grown product is made available to NYS customers, then we do not find evidence to support a financial injection into the LFWI sector. Our analysis suggests that efforts to promote local agriculture by expanding the LFWI sector could actually be counterproductive as increasing the sector's expanse appears to dampen the total output impact of local agriculture.

If policy makers are insistent in providing direct subsidies to the LFWI sector, then we recommend funding be used to find ways to more fully integrate the sector into the NYS

economy. This might be done by encouraging retailers to work more with the LFWI sector, and reducing barriers to business expansion for LFWI businesses – for example by supporting programs that encourage and assist producers to adhere to GAP. However, we caution that increasing vertical integration is not without risk. More integration could lead to significantly higher volatility: more upside during periods when the economy is good, but during a recessionary period any negative shock would also be amplified at a higher rate.

Finally, we want to caution that this analysis does not take scale or commodity type into consideration. The LFWI sector may very well be an important intermediary for small and mid-scale farms that are less likely to appear in our analysis in a profound way. Thus further research is needed to examine opportunities to expand market access for farms based on their scale of production. Likewise, this research only includes commodities carried by businesses with farm product dealers licenses. This excludes a number of NYS-grown products, the most economically important of which is dairy. Thus commodity specific research on the role of intermediaries is needed in order to more fully recommend appropriate policies to support the enhancement of NYS agriculture.

¹ ARMS data, collected by the USDA ERS and the National Agricultural Statistics Service (NASS), is the only national survey that provides observations of field-level farm practices, the economics of the farm business, and the characteristics of the American farm household (United States Department of Agriculture Economic Research Service 2009).

² Full list of licensed businesses available at: <http://www.agriculture.ny.gov/programs/apsf.html>

³ There were several small-scale distributors identified by the project work team who did not have a farm product dealers license, despite the fact that they sold over \$10,000 worth of farm products annually.

⁴ For more information, please see:

http://implan.com/V4/index.php?option=com_multicategories&view=categories&layout=blog&cid=200&Itemid=14

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Figure 1. Elementary path

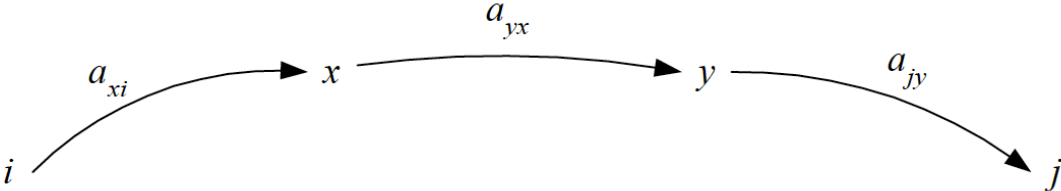


Figure 2. Elementary path including adjacent circuits

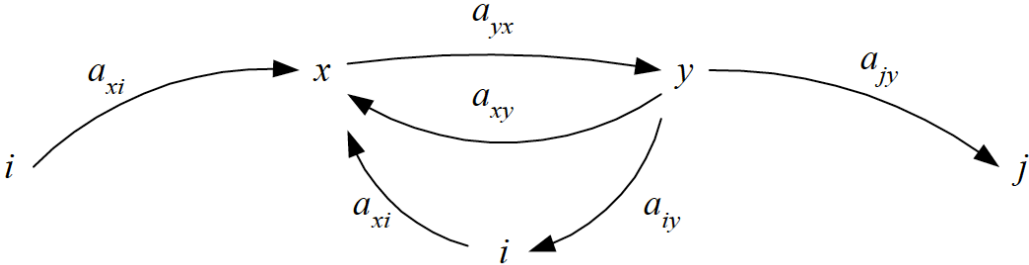


Table 1. New York State Department of Agriculture and Markets commodity/license codes and corresponding IMPLAN sectors

New/disaggregated sectors	NYSDAM Commodity/License Codes	Corresponding IMPLAN sectors
Local agriculture sector	Fruits, vegetables, fruits & vegetables, grain, hay, livestock, dry beans, horticulture, honey, maple products, rabbits, Christmas trees, straw, poultry, wool, grapes, soy beans	1, 2, 3, 4, 6, 10, 11, 13, 14, 15
Local agriculture wholesale infrastructure	Commission merchant, dealer, broker, processor, grower, feed mill, net-return dealer	41-47, 53, 54, 58-73, 75-94, 319, 335, 339, 340

Table 2. Results of exogenous shock to the LFWI sector

Sector	Impact of Shock – LFWI sector at 5 percent	Impact of Shock – LFWI sector at 20 percent	percent Change
11 Agriculture	\$31,561.02	\$13,871.59	-56.05
21 Mining	\$9,815.93	\$9,648.05	-1.71
22 Utilities	\$320,289.57	\$317,036.27	-1.02
23 Construction	\$73,468.43	\$72,685.51	-1.07
31-33 Manufacturing	\$303,126.25	\$301,043.86	-0.69
44-45 Retail trade	\$541,603.14	\$540,237.79	-0.25
48-49 Trans. & Warehouse	\$185,148.67	\$187,507.23	1.27
51 Information	\$374,219.64	\$377,391.19	0.85
52 Finance & insurance	\$1,043,922.14	\$1,038,373.10	-0.53
53 Real estate & rental	\$1,689,815.46	\$1,670,216.67	-1.16
54 Prof.- sci. & tech services	\$751,450.61	\$762,442.73	1.46
55 Manage. of companies	\$274,136.47	\$281,214.05	2.58
56 Admin. & waste services	\$426,864.36	\$433,967.40	1.66
61 Educational services	\$189,366.21	\$187,822.80	-0.82
62 Health & social services	\$1,129,768.01	\$1,127,202.94	-0.23
71 Arts- ent. & recreation	\$111,387.61	\$111,337.47	-0.05
72 Accom. & food services	\$306,613.69	\$306,670.94	0.02
81 Other services	\$304,346.07	\$305,177.53	0.27

92 Govt. & non NAICs	\$237,804.17	\$239,414.42	0.68
Employee compensation	\$3,589,219.71	\$3,616,002.20	0.75
Enterprises (corporations)	\$515,547.04	\$521,857.57	1.22
Households 100-150k	\$847,945.45	\$844,982.75	-0.35
Households 10-15k	\$28,558.90	\$28,685.61	0.44
Households 150k+	\$1,563,231.36	\$1,544,747.39	-1.18
Households 15-25k	\$121,813.72	\$122,386.46	0.47
Households 25-35k	\$208,753.92	\$209,575.05	0.39
Households 35-50k	\$416,867.16	\$418,178.97	0.31
Households 50-75k	\$815,981.38	\$818,750.42	0.34
Households 75-100k	\$668,223.02	\$669,131.85	0.14
Households LT10k	\$27,659.54	\$27,892.00	0.84
Inventory addit./delet.	\$13,894.54	\$14,313.73	3.02
Local agriculture sector	\$526,720.09	\$184,432.27	-64.98
LFWI	\$6,286,540.10	\$6,892,846.33	9.64
Wholesale infrastructure	\$6,121,449.62	\$4,418,600.45	-27.82
Other prop. type income	\$1,828,161.96	\$1,850,578.73	1.23
Proprietor Income	\$548,709.08	\$497,506.20	-9.33
Total	\$32,433,984.03	\$30,963,729.53	-4.53

Table 3. Results from SPA

(note: paths whose contributions are less than 0.00001 percent of the global multiplier effects are not included in table; key: 1 = agriculture, 2 = retail; 20 = employee compensation; 22-30 = household groups; 32 = local agriculture; 33 = LFWI; 34 = wholesale infrastructure; 36 = proprietary)

Path	Global Effect	Direct Effect	Path Multiplier	Total Effect	percent of Global
32, 36, 24, 6	0.096	0.005	3.654	0.020	20.6 percent
32, 36, 22, 6	0.096	0.002	3.486	0.007	7.3 percent
32, 20, 24, 6	0.096	0.001	4.314	0.006	6.6 percent
32, 33, 20, 22, 6	0.096	0.000	4.688	0.000	0.1 percent
32, 33, 20, 24, 6	0.096	0.000	4.906	0.000	0.1 percent
32, 33, 20, 28, 6	0.096	0.000	4.673	0.000	0.1 percent
32, 33, 20, 29, 6	0.096	0.000	4.663	0.000	0.1 percent
32, 20	0.484	0.126	2.086	0.262	54.2 percent
32, 34, 20	0.484	0.006	3.540	0.020	4.1 percent
32, 1, 33, 20	0.484	0.000	3.823	0.000	0.1 percent
32, 34, 33, 20	0.484	0.000	3.903	0.001	0.2 percent
32, 36, 24, 33, 20	0.484	0.000	2.583	0.000	0.1 percent