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**A Practitioner's Guide to Conducting  
an Economic Impact Assessment of  
Regional Food Hubs using IMPLAN:  
A Systematic Approach**

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# A Practitioner's Guide to Conducting an Economic Impact Assessment of Regional Food Hubs using IMPLAN: A Systematic Approach

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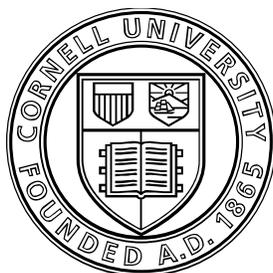
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# TABLE OF CONTENTS

<b>GLOSSARY</b>	<b>III</b>
<b>1. INTRODUCTION</b>	<b>1</b>
<b>2. DEFINING THE STUDY AREA</b>	<b>2</b>
<b>FUNCTIONAL ECONOMIC MARKET AREA</b>	<b>2</b>
<b>3. DEFINING FOOD HUB TRANSACTIONS</b>	<b>3</b>
<b>3.1 DATA COLLECTION - FOOD HUB</b>	<b>3</b>
TABLE 1. SAMPLE FOOD HUB BUSINESS EXPENDITURE PROFILE AND MAPPING TO IMPLAN CATEGORIES (2014 DATA YEAR).	5
TABLE 2. MARGIN CALCULATIONS FOR FOOD HUB EXPENDITURES.	6
TABLE 3. SUMMARY OF FOOD HUB SALES, INCLUDING MARGINING AND EXPORTS.	7
<b>3.2 DATA COLLECTION - FOOD HUB FARM</b>	<b>8</b>
TABLE 4. SAMPLE AVERAGE FOOD HUB FARM EXPENDITURE PROFILE AND MAPPING TO IMPLAN CATEGORIES (2014 DATA YEAR).	9
TABLE 5. MARGIN CALCULATIONS FOR FOOD HUB FARMS.	10
TABLE 6. SUMMARY OF AVERAGE FOOD HUB FARM SALES, INCLUDING MARGINING AND EXPORTS.	10
<b>3.3 DATA COLLECTION – FOOD HUB CUSTOMERS</b>	<b>11</b>
<b>4. CONSTRUCTING THE MODEL IN IMPLAN</b>	<b>12</b>
<b>4.1 CREATING THE MODEL AND AGGREGATION SCHEME</b>	<b>12</b>
<b>4.2 CREATING A FOOD HUB FARM SECTOR</b>	<b>12</b>
<b>4.2.1 CUSTOMIZE STUDY AREA DATA</b>	<b>12</b>
FIGURE 1. CREATING THE FOOD HUB FARM SECTOR.	14
FIGURE 2. CREATING THE OTHER FARM SECTOR.	15
<b>4.2.2 CUSTOMIZE INDUSTRY PRODUCTION</b>	<b>16</b>
TABLE 7. EDITING GROSS ABSORPTION COEFFICIENTS (GACs) FOR INDUSTRIES PURCHASING FOOD HUB FARM COMMODITY.	16
FIGURE 3. EDITED FOOD HUB FARM PRODUCTION FUNCTION.	18
FIGURE 4. EDITED RETAIL – FOOD AND BEVERAGE STORES PRODUCTION FUNCTION.	19
<b>4.2.3 CUSTOMIZE COMMODITY PRODUCTION</b>	<b>20</b>
FIGURE 5. COMMODITIES PRODUCED BY THE OTHER FARM SECTOR.	21
FIGURE 6. COMMODITIES PRODUCED BY THE FOOD HUB FARM SECTOR.	22
<b>4.2.4 CUSTOMIZE TRADE FLOWS</b>	<b>23</b>
FIGURE 7. RPCs AND DEMAND FOR OTHER FARM COMMODITIES.	25
FIGURE 8. RPCs AND DEMANDS FOR FOOD HUB FARM COMMODITY, PRIOR TO CUSTOMIZING TRADE FLOWS.	26
FIGURE 9. CORRECTED RPCs BY INDUSTRIES FOR THE FOOD HUB FARM COMMODITY.	27
FIGURE 10. CORRECTED RPCs BY FOOD HUB FARM INDUSTRY FOR RETAIL GASOLINE.	28
TABLE 8. OTHER FARM AND FOOD HUB FARM REGIONAL COMMODITY BALANCES.	29
TABLE 9. OTHER FARM AND FOOD HUB FARM REGIONAL INSTITUTIONAL DEMAND.	31
FIGURE 11. FINAL DEMANDS, SUPPLIES, AND RPCs FOR THE FOOD HUB FARM COMMODITY.	32
FIGURE 12. FINAL DEMANDS, SUPPLIES, AND RPCs FOR THE OTHER FARM COMMODITY.	33
<b>5. IMPACT ANALYSIS</b>	<b>34</b>

<b>5.1 QUANTIFYING THE DIRECT EFFECTS</b>	<b>34</b>
<b>5.2 QUANTIFYING OPPORTUNITY COSTS</b>	<b>34</b>
<b>5.3 ANALYSIS-BY-PARTS (ABP)</b>	<b>35</b>
FIGURE 13. INDUSTRY SPENDING PATTERN ACTIVITY FOR THE FOOD HUB INCREASE IN FINAL DEMAND.	37
FIGURE 14. EMPLOYEE COMPENSATION ACTIVITY FOR THE FOOD HUB INCREASE IN FINAL DEMAND.	38
FIGURE 15. PROPRIETOR INCOME ACTIVITY FOR THE FOOD HUB INCREASE IN FINAL DEMAND.	39
FIGURE 16. OPPORTUNITY COST ACTIVITY FOR THE FOOD HUB INCREASE IN FINAL DEMAND.	40
FIGURE 17. THE ANALYZE SCENARIO SCREEN AFTER SELECTING ACTIVITIES.	41
FIGURE 18. THE SCENARIO RESULTS SCREEN, SUMMARY RESULTS.	42
<b>5.4 INTERPRETING RESULTS</b>	<b>43</b>
<b>5.4.1. SUMMARY RESULTS</b>	<b>43</b>
TABLE 10. SUMMARY OF IMPACT RESULTS, WITH AND WITHOUT OPPORTUNITY COSTS.	43
<b>5.4.2 DETAILED RESULTS</b>	<b>44</b>
FIGURE 19. THE SCENARIO RESULTS SCREEN, DETAIL RESULTS FOR OUTPUT.	45
<b>6. SUMMARY</b>	<b>3</b>
<b>7. REFERENCES</b>	<b>3</b>

## GLOSSARY

The definitions below are adapted from IMPLAN's online glossary (available at <http://support.implan.com>), as well as *IMPLAN Professional, Version 2.0*, 3rd edition (2004).

**Aggregation**—the combining of detailed subgroups to form a larger group. For example, the detailed industries available from the Bureau of Economic Affairs are aggregated to summary industries and sectors for publication. Aggregation can be a useful tool in IMPLAN to aggregate industry sectors and reduce the number of industries. It does, however, introduce some aggregation bias.

**Commodity**—a product or service that may be produced by one or more industries. Commodity output represents the total output of the product or service, regardless of the industry that produced it. If an industry and the commodity produced by the industry have the same name, the commodity is considered to be the primary product of that industry.

**Final Demand**—the value of goods and services sold to institutions (or end users). These goods and services disappear from the economy and are not used to generate more product(s). Exports are included in final demand since the commodity will not be used again to create more product(s) in the local region.

**Food Hub Farm**—a farm that sells product(s) to one or more food hubs. Producers in this category need not sell products exclusively to food hubs; rather, these sales are included as part of its marketing portfolio.

**Food Hub Farm Industry** – the industry constructed, using the example Food Hub Farm data, to represent all Food Hub Farms selling to the example food hub in our study area. The representative Food Hub Farm data is scaled up to an industry level based on the number of Food Hub Farms (in our example, 50). This industry includes a portion of the default IMPLAN sectors 1-4, 6, and 10-14 (sectors 5, and 7-9 are tiny or do not exist in our study area example (New York)), and is representative of the types of farm industry firms the food hub purchases (fresh) food products from for resale. Initially aggregating these default IMPLAN sectors results in an aggregated industry we define as the Farm Industry. Subsequently, this is separated into the Food Hub Farm Industry and the Other Farm (Other Farm) Industry.

**Industry**—a group of establishments engaged in the same or similar types of economic activity.

**Manufactured Food Industry** —the industry constructed by aggregating the default IMPLAN food manufacturing industries 67-73 and 76-105, and is representative of the types of processed food industry firms the food hub purchases processed food products from for resale. It excludes the animal food and beverage manufacturing industries.

**Margins**—the value of the retail, wholesale, and transportation services provided in delivering commodities from producers' establishments to purchasers.

**Multipliers**—final demand drives input-output models. Industries respond to meet demand directly or indirectly (by supplying goods and services to industries responding directly). Each industry that produces goods and services generates demands for other goods and services and so on, round-by-round. Multipliers describe these iterations. Multipliers break the effects of stimuli on economic activity into three components: direct, indirect, and induced. Further, IMPLAN describes three types of multipliers: Type I, Type II, and Type SAM.

- **Direct effects**—changes in the industries to which a final demand change is made
- **Indirect effects**—changes in backward linked industry purchases as they respond to the new demands of the directly affected industries
- **Induced effects**—changes in spending from households as income increases or decreases due to the changes in production
- **Type I multiplier**—measures the direct and indirect effects of a change in economic activity. It captures the inter-industry effects only, i.e., industries buying from local industries.

- Type II multiplier—captures the direct, indirect, and induced effects. Whereby, the household sector is endogenous to incorporate the household spending effects.
- Type SAM multiplier—uses all information about the institutions selected to be included in the predictive 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.

**Production Function**—this function shows where an industry spends, and in what proportions, to generate each dollar of output.

**Regional Purchase Coefficient (RPC)**—represents the portion of the total demand for a commodity by all users in local economy that is supplied by producers located in that economy. For example, an RPC of 0.6 for the commodity “vegetable and melons” means that local farmers provide 60% of the demand for vegetables and melon (by other farmers, processors, vegetable wholesalers, and others). The remaining 40% of demand is satisfied by imports.

**Sector**—the institutional units that make up the total economy (including businesses, households, institutions, and general government).

**Value Added**—the difference between an industry’s total output and the cost of its intermediate inputs. Value added consists of compensation of employees (inclusive of benefits) and proprietor income (i.e., self-employment income, including salary, benefits and total contributions to Social Security/Medicare), other property type income (e.g., dividends, interest, rent, corporate profits, and capital depreciation), and taxes on production and imports less subsidies (i.e., all business taxes and fees paid to governments including sales and excise taxes).

# A Practitioner's Guide to Conducting an Economic Impact Assessment of Regional Food Hubs using IMPLAN: A Systematic Approach

## 1. INTRODUCTION

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Interest is increasing in locating funding for food hub development. These local food aggregation and distribution businesses are purported by their developers and funders to elicit substantial community economic impacts. Yet prior to Schmit, Jablonski, and Kay (2016), there had been no rigorous economic impact assessments of food hubs, nor had a replicable framework been proposed for their assessment. This practitioner's guide is complementary to Jablonski, Schmit, and Kay (2016) and provides an update to the process described there within. The guide has also been updated from its original version (Schmit, Jablonski, and Kay, 2015) to reflect improvements in the methodology that (i) better accounts for defining institutional demands of new industries created (i.e., a Food Hub Farm industry in our example), and (ii) improves allocation decisions amongst intermediate input purchases (via gross absorption coefficients) and value added components. The guide walks you through the steps of measuring the local economic impact of expanding food hub activities, either from the establishment of a new hub or the expansion of an existing hub.

The process proposed for creating a new industry requires editing model parameters from within and outside (via Microsoft ACCESS) the IMPLAN software. The process proposed for creating new industries, or disaggregating existing industries into separate segments, is relevant to any modeling exercise in IMPLAN where this approach is necessary to the research objectives. **Any users wanting to follow the recommended procedures outlined in the Practitioner's Guide for modifying the ACCESS data in IMPLAN must obtain an amended license agreement by IMPLAN.**

This guide is intended for individuals who are familiar with IMPLAN software and data. In addition to the data available for purchase from IMPLAN, the proposed approach requires primary financial data collection from the food hub, the farm and non-farm product suppliers to the food hub, and customers of the food hub. While time-consuming and costly to collect, the information can be used to better assess the impacts of food hub activities with data particular to a given hub (or hubs) and the suppliers they procure goods from for resale. In addition, using more informed estimates of purchasing and sales activities, the value of the inter-industry linkages within the local economy resulting from expanded final demand for food hub goods and services can be estimated with greater precision. We have included sample tables containing the type of data you will need to make the necessary modifications within your models.

Please note that this guide presents information about how to assess the *economic impact* of food hubs, which is different from looking at the *contribution* of food hubs to the local economy. Impact analysis examines the marginal economic impact of a change in the economy (e.g., the opening or expansion of a business). Contribution analysis examines the contribution of the business to the local economy. Given the likelihood that most readers of this guide will want to estimate the impact of funding used to develop or expand an existing hub, the economic impact assessments approach is an arguably more useful and accurate approach as it better provides for an assessment of the *net* changes in economic activity.<sup>1</sup>

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<sup>1</sup> See Watson, et al. (2007) for more information, as well as at <http://support.implan.com>.

## 2. DEFINING THE STUDY AREA

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The first step in conducting economic impact assessments is to define the appropriate study area; i.e., the boundaries of the local economy you are investigating. Determining what constitutes local can have a decisive impact on the results. It is nearly always true that the larger the definition of local, the more inter-industry linkages, and the larger the economic multiplier effects of a given change in the demand for local goods and services. To isolate the effects of an impact, make as small a study area as possible, while still including the areas necessary to capture all of the important effects. A useful section in *IMPLAN Professional, Version 2.0* (IMPLAN 2004) discusses how best to define a project area (Ch. 9, p. 107).

When defining the study area, it is useful to consider the availability of secondary data for the region of interest. The methodology described in this guide uses secondary data available from IMPLAN, which is available by zip code, Congressional district, county, and state levels, as well as the United States as a whole. It is also easy to construct tailored regional models using multiple counties or states within the IMPLAN software. Other input-output models and/or region-specific multipliers are available (e.g., RIMS II or REMI). However, IMPLAN software and data is widely used within industry, government, and academia. Though data are available at a sub-county level in IMPLAN, we advise using the concept of functional economic market areas (FEMAs) to better guide decisions about the selection of a study area. A FEMA is a semi-self-sufficient economic unit (and therefore ideal for this type of analysis). It includes the places where people live, work, and shop, and can sometimes be identified by physical or other characteristics. It is unlikely that a sub-county or even county area (particularly if rural) is likely to fit this definition, nor provide for any truly useful information when utilized in isolation in assessing impact.

One should also consider the use of the assessment when determining an appropriate study area. Why are you conducting this impact assessment? Do you want to show the economic impact of a food hub to a particular funder or government official? If your project is funded by a state agency, defining your area by state boundaries may make sense. Or, if the food hub is funded, in part, by a selection of counties, then a multiple-county region may be more appropriate. Perhaps you are trying to assess what the impact of a food hub is to participating producers. If this is the case, then defining your study area that encompasses all of the participating farms may be best. However, you should also keep in mind the residential locations of the farm and food hub employees, as their spending patterns are important to your study results.

Defining the appropriate study area is ultimately the choice of the researcher, yet it can have profound impacts on the results of the study. One way to understand how this definition affects results is to conduct the analysis for several study areas, each relying on differing assumptions and, therefore, allowing the reader to have a better understanding of the range of potential impacts. See, for example, Gunter and McFadden (2012).

### Functional Economic Market Area

Functional Economic Market Areas (FEMAs) are frequently used to define economic relationships and flows that are not necessarily reflected by administrative boundaries. They are bound together by a relatively contained and cohesive network of trade links—the buying and selling of raw materials, industrial and consumer goods and services, and labor. In the United States, most county boundaries are not reflective of contemporary economies and, as such, they very often do not capture a single FEMA.

There is no universal approach to defining FEMAs, but there are a few things important to consider. One major consideration is scale or the size of the region chosen. If the scale is too small, then an economic impact assessment will not appropriately capture the ripple effects of a shock—say a new business moving to the area. On the other hand, if the region is too large, then the effects of a shock may be partially or completely lost in the economic noise generated by other economic activity in the area. Accordingly, it makes the most sense to choose the smallest reasonable area, which is still a FEMA.

When looking for a FEMA, one should look for local and regional commuting, shopping, and supply chain patterns, since these are some of the most important trade links that will delineate a FEMA. By way of illustration, Cornell University is located in Tompkins County, NY, but to define Tompkins County as a FEMA is inappropriate on a number of levels. Cornell University, a major employer in the county, draws employees from surrounding (rural) counties who in turn spend the wages they earn in those adjacent locales. Thus, if Cornell University were to close or lay off a percentage of its labor force, it would have important economic impacts on those surrounding counties, which would not be captured if a multi-county region was not defined.

### 3. DEFINING FOOD HUB TRANSACTIONS

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The second step in an impact assessment is to define the industry (or industries) of interest and its (their) linkages with other industries. This is not a straightforward exercise in the case of food hub assessments as a food hub industry and its transactions with other industries does not exist. Accordingly, additional information must be collected to construct a food hub industry or, alternatively and as described here, to describe the nature of all of food hub's transactions and apply *analysis-by-parts* in IMPLAN. We recommend data collection from three sources: (i) the food hub(s) that you are analyzing, (ii) the farms (and potentially local processors) that sell product(s) to the food hub(s) for resale, and (iii) the customers that purchase product from the food hub(s).

#### 3.1 Data Collection - Food Hub

The approach outlined here can be applied to analyze the impact of a single food hub or multiple food hubs. You will need to collect data to understand the expenditure pattern(s) of the food hub(s) you are evaluating; i.e., to understand the input requirements (how much and where from) of the food hub for every dollar of its sales. In addition, you will need to collect sales information that describes the industries and/or institutions the food hub sells to, along with the amount of those sales that accrue within the defined study area.

To begin, ask the food hub(s) for information generally contained in their profit and loss (P&L) statement or similar financial statements. This may require a confidentiality agreement that describes use and disclosure procedures. A P&L statement summarizes the revenues and expenses incurred during a specific period. For the purpose of this assessment, it is most useful to use the most recent year of operation.

Sufficient financial detail is needed to be able to reasonably assign (or map) expenditures and sales categories to corresponding IMPLAN sectors. Keep in mind that as a general rule, the bigger the category, the more affect it will have on the results, and the more important it is to work to get it right. Currently, IMPLAN divides the economy into 536 industries, which do not always translate neatly to the ways that businesses categorize expenditures and sales. A NAICS/IMPLAN bridge table is available from IMPLAN that can assist in these mapping efforts.<sup>2</sup> In [Table 1](#), we provide an example for some common expenditure categories. Knowing what types of sellers the food hub buys products or services from is also important. For example, are fuel purchases from a retail (industry code 402) or wholesale (industry code 395) provider?

You will also need to know the percentage of expenditures for each category that was procured within your local study area (i.e., the local purchase percentage or LPP in IMPLAN language). This type of information is not generally included in typical financial statements, nor is it often easy to tabulate. You will need to work with the food hub operator to determine the LPPs. Oftentimes, it is sufficient to get a "reasonable" estimate. Numerous categories may be 'all' or 'nothing' (i.e., LPPs of 100% or 0%, respectively). A helpful format to record these items is illustrated in [Table 1](#). Note, some expenditure categories from the food hub may map to more than one IMPLAN sector depending on the specificity of the categories, or more than one food hub category may map to the same IMPLAN sector. Best judgement should be applied by the researcher in how to allocate across IMPLAN sectors or to aggregate those sectors in IMPLAN.

Purchases from retailers or wholesalers require margining, as only the margin (i.e., sales less cost of goods sold) is included in these industries within IMPLAN. How you margin depends on whether the items purchased are known (e.g., gasoline) or unknown (e.g., supplies) so that one can or cannot identify the specific production sector where these products originated. IMPLAN provides helpful guidance documents on this process when setting up activities and events within the IMPLAN software.<sup>3</sup> However, for our purposes in creating the **Food Hub Farm** sector in IMPLAN, we must compute the margin and LPP components explicitly to define the sector's production function.<sup>4</sup>

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<sup>2</sup> Go to [support.implan.com](http://support.implan.com) and look under *Resources > Downloads > 536 Sectoring Scheme > NAICS to IMPLAN 536 Bridge*.

<sup>3</sup> Go to [support.implan.com](http://support.implan.com) and search for *Margining: When the Item Being Purchased is Known* and *Margining: When the Item Being Purchased is Unknown*.

<sup>4</sup> Margins can be found in the *CommonMargins* table when opening your model in ACCESS, and within menu screens in IMPLAN (*Event Options > Edit Event Properties > Margins*). IMPLAN's SAM model values for LPPs can be found within menu screens at *Event Options > Edit Event Properties > Local Purchase Percentage*.

The computations are also necessary to apply analysis-by-parts procedure to estimate food hub impacts. The margin calculations in **Table 2** demonstrate the approach. For fuel purchases (\$75,000), we are told that 75% of those purchases were local (i.e., from local retail gasoline stations). Applying margins separates the cost for the fuel produced (sector 156) and the retail (402), wholesale (395), and relevant transportation (408-413) margins. We do not know, however, how much of the component purchases other than retail were local (i.e., the amount fuel purchases by retailers from local wholesalers, or the amount of fuel purchases by wholesalers from local refineries), but IMPLAN can estimate that for you for your study area. If fuel purchases were from a wholesaler, a similar procedure would dictate, albeit with margins apportioned between production, wholesale, and transportation only.

**Table 1. Sample Food Hub Business Expenditure Profile and Mapping to IMPLAN Categories (2014 data year).**

Food hub expenditure category	IMPLAN category	Expenditure	Local	
			Purchase Percentage	Expense Share
Food purchases for resale -nonfarm	Manufactured food, constructed by authors <sup>a</sup>	\$ 250,000	20	0.250
Food purchases for resale - farm	Food Hub Farm, constructed by authors <sup>a</sup>	\$ 150,000	90	0.150
Fuel purchases from retailers	Petroleum refineries (156) – <i>apply margins</i> <sup>b</sup>	\$ 75,000	75	0.075
Lease trucks	Automotive equipment rental and leasing (442)	\$ 30,000	100	0.030
Insurance	Insurance carriers (437)	\$ 25,000	100	0.025
Building repairs and maintenance	Main. and repair of nonresidential structures (62)	\$ 20,000	100	0.020
Utilities	Electric power transmission and distribution (49)	\$ 7,000	100	0.007
Business supplies from wholesalers	Wholesale trade (395) – <i>apply margins</i> <sup>c</sup>	\$ 3,000	50	0.003
<b>Total intermediate input purchases</b>		<b>\$ 560,000</b>		<b>0.560</b>
Wages and benefits	Employee compensation (Total employees = 4)	\$ 260,000	100	0.260
Taxes (all)	Tax on production and imports <sup>d</sup>	\$ 30,000	70	0.030
Depreciation (noncash)	Other property type income (capital consumption allowance) <sup>e</sup>	\$ 25,000	na	0.025
Interest payments	Other property type income (net interest) <sup>f</sup>	\$ 10,000	100	0.010
Net income to owner(s)	Proprietor income <sup>g</sup>	\$ 115,000	100	0.115
<b>Total Value Added</b>		<b>\$ 440,000</b>		<b>0.440</b>

<sup>a</sup> The food hub is assumed to purchase food products from food hub farms; e.g., fresh fruits and vegetables, as well as manufactured food products; e.g., processed meat products, jellies, flour. Additional explanation is included in the text.

<sup>b</sup> As these are retail purchases, margins are applied. Since the purchased items are known (i.e., fuel), we margin back to the producing sector and account for local purchasing percentages (LPP). See Table 2 for details.

<sup>c</sup> As these are wholesale purchases, margins are applied. Since the purchased items are not specific enough to be attributed to a particular producing sector, we only consider the average margin value for wholesale trade for impact. See Table 2 for details.

<sup>d</sup> All business taxes and fees paid to governments, including sales and excise taxes, net of subsidies.

<sup>e</sup> Depreciation is a noncash expenditure; however, it is usually a tax-deductible expense used by firms in determining profits. It should be allocated to other property type income (as a capital consumption allowance, usually modified to a market value basis). OPTI is not considered in estimating impacts.

<sup>f</sup> Interest payments are not included in intermediate input spending, rather net interest (business interest payments less business interest receipts) is included in other property type income. We assume no interest receipts.

<sup>g</sup> The remaining balance after computing total outputs (sales) less intermediate input expenditures and the other allocations to value added.

**Table 2. Margin Calculations for Food Hub Expenditures.<sup>a</sup>**

IMPLAN category	Margin	Expenditure	Local Purchase	
			Percentage	Expense share
<b>Fuel purchases from retailers (\$75,000)<sup>b</sup></b>				
Petroleum refineries (156)	0.6284	\$ 47,130	0.86	0.047130
Wholesale trade (395)	0.1894	\$ 14,205	94.74	0.014205
Retail gasoline stations (402)	0.1667	\$ 12,503	75.00	0.012503
Rail transportation (409)	0.0010	\$ 75	45.30	0.000075
Water transportation (410)	0.0021	\$ 158	71.93	0.000158
Truck transportation (411)	0.0076	\$ 570	51.43	0.000570
Pipeline transportation (413)	0.0048	\$ 360	17.06	0.000360
<b>Business supplies from wholesalers (\$3,000)<sup>c</sup></b>				
Wholesale trade (395)	0.1730	\$ 519	50.00	0.000519
Miscellaneous manufacturing (394)	0.8270	\$ 2,481	0.00	0.002481

<sup>a</sup> Margins and local purchase percentages (LPPs) taken from IMPLAN default estimates, except for the LPPs known from the primary data. Expense shares calculated based on \$1,000,000 output for the food hub.

<sup>b</sup> Since the specific products purchased from the retailer are known, we margin back to the producing industry.

<sup>c</sup> Since the specific products purchased from the wholesaler are unknown, we use the average wholesale trade margin in IMPLAN and the LPP from the primary data. The remaining allocation (\$2,481) is lumped into a general industry and assigned a zero LPP. This will not affect the impact results (all leakage), but is needed to complete the production function.

The more detailed the information you know about the products being purchased, the more you are able to accurately assess impact. For the fuel purchase example, 75% of the retail margin is considered in local impact, as well as 95% of the wholesale trade margin (\$14,205) and portions of the transportation and production sectors to the degree they occur locally. If all we knew was \$75,000 of purchases at retail gasoline stations, that could include fuel, but also hot dogs, air fresheners, funnels, beer, coffee, etc. Unless we know how much was in the various components, all we can reasonably count towards impact is average margin value for retail gasoline stations, or 0.1160 per IMPLAN multiplied by the LPP. Depending on the level of purchases and the extent they are local, this may or may not be of significance to your overall assessment. The unknown business supplies purchased from wholesalers (\$3,000) highlights this second case. Are the supplies purchased pencils, staples, toner, or shipping containers? Since we do not know, the best we can do is apply the average wholesale trade margin for impact. In our case 0.1730, or \$519, less the amount procured from outside the study area (50%), leaving \$260 to include for impact. While this may seem extreme, it may be entirely realistic given the study area and, more to the point in our example, the total purchases by the hub to wholesalers represented only 0.3% of total hub outlays, so very little impact from these purchases was expected to begin with.

To complete the outlays by the food hub, one must consider expenditures and allocations to various value added components; i.e., employee compensation (EC), proprietor income (PI), other property type income (OPTI), and taxes on production and imports (TOPI). EC (including benefits paid to employees) and TOPI are commonly included in a firm's financial statements and can be assigned directly. All business taxes and fees paid to governments, including sales and excise taxes net of subsidies are recorded under TOPI. **Table 1** identifies the number of jobs supported by the food hub (full- or part-time), which will become useful when computing jobs impacts. Payments to contractors or consultants who are not employees of the firm are not included in EC, but as intermediate input expenditures to a relevant service category (e.g., management consulting services, code 454).

Depreciation is a noncash expenditure (no impact); however, it is usually a tax-deductible expense used by firms in determining profits subject to income taxes. Accordingly, if depreciation is included in the financial statements, it should be allocated to OPTI, as a capital consumption allowance, usually modified to a market value basis. Dividends, rental income, and corporate profits are also be allocated to OPTI. Finally, interest payments (on debt) are not included in intermediate input spending, but rather as *net interest* (business interest payments less business interest receipts) and included in OPTI. OPTI is generally not considered in estimating impact.

In our example, the remaining balance of funds from total output (sales) is allocated to PI; i.e., payments to the self-employed owners of the food hub. Depending on the business structure of the food hub, different allocations to value added may be appropriate, e.g., (corporate) profits distributed to shareholders would be in OPTI.

The sales side is similarly constructed (Table 3), now looking forward along the supply chain. 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. 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. (Schmit and Boisvert 2014). Since we do not know exactly what products are sold to the retail and wholesale firms (i.e., farm or processed food products), we weight the relevant margins in proportion to the amounts purchased by the food hub. In our example, this results in weighted retail food and wholesale margins of 0.2885 and 0.1004, respectively.<sup>s</sup> Exports are computed as total sales less local sales.

For the hub's retail sales, the retail margin is \$72,128 (0.2885 x 250,000); with 100% of these sales to local retailers, this is the margined and final sales to retailers. The balance of the \$250,000 is allocated to households, or \$177,872 (all local, no exports) as the producer value of sales attributed to final household demand. In the case where product moves from wholesalers and then to retailers, margins must be applied in both the wholesale and retail sectors. The wholesale margin here is \$20,078 (0.1004 x 200,000); however, 50% goes to local wholesalers (\$10,039) and 50% to non-local wholesalers (\$10,039) as exports. The retail margin of these originating sales is \$57,703 (0.2885 x 200,000), assigning 50% to local retailers (\$28,851) and 50% (\$28,851) to nonlocal retailers (export).

The portion of sales allocated to households after subtracting wholesale and retail margins is \$300,092 (\$177,872 from retail and \$122,220 from wholesale), where \$239,982 is attributed local household demand (\$177,872 from retail and \$61,110 from wholesale) and the balance (\$61,110) goes to exports. Summing the individual export components yields total exports of \$187,500 (\$10,039 non-local wholesale margin + \$28,851 retail margin of non-local wholesale sales + \$61,110 household portion of non-local wholesalers + \$87,500 nonlocal manufactured food sales).

**Table 3. Summary of Food Hub Sales, including Margining and Exports.<sup>1</sup>**

Industry/Institution	Code	Percent Local	Gross Sales	Margined Sales	Final Sales
Retail trade - Food <sup>2</sup>	400	100	\$ 250,000	\$ 129,831	\$ 100,979
Wholesale trade <sup>2</sup>	395	50	\$ 200,000	\$ 20,078	\$ 10,039
Manufactured Food	Mfood	50	\$ 175,000	\$ 175,000	\$ 87,500
Full service restaurants	501	100	\$ 150,000	\$ 150,000	\$ 150,000
Elementary and secondary schools	472	100	\$ 225,000	\$ 225,000	\$ 225,000
Households	Hhld	100		\$ 300,092	\$ 238,982
Export					\$ 187,500
Total			\$1,000,000	\$1,000,000	\$1,000,000

<sup>1</sup> To avoid double counting, sales to wholesale and retail sectors are margined to reflect only the value of the services provided by these sectors in delivering commodities from producers' establishments to purchasers. 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.).

<sup>2</sup> Margins for farm and manufactured food products are, respectively, retail: 0.3027 and 0.2800; wholesale: 0.1152 and 0.0915 (2014 model year, New York State). Final retail and wholesale margins are weighted based on the relative purchase amounts from these sectors by the food hub (i.e., 0.2885 and 0.1004, respectively).

<sup>s</sup> Individually from IMPLAN, the retail trade food margin for farm products was 0.3027 and the retail trade margin for manufactured food products was 0.2880. Similarly, the wholesale trade margin for farm products was 0.1152 and the wholesale trade margin for manufactured food products was 0.0915.

### 3.2 Data Collection - Food Hub Farm

Understanding how farms that sell product to food hubs interact with other sectors of the economy is important in improving the precision of an impact assessment. While the same can be said of any input supplying sector, since purchases from farms generally represent a relatively large share of total food hub expenses and we are particularly interested in how **Food Hub Farms** are impacted by food hubs, it is important to consider the inter-industry linkages for farm suppliers. Furthermore, for most of the businesses from which food hubs purchase inputs, it is likely sufficient to assume that the expenditure patterns of individual businesses reflect that of the entire industry sector. For example, a food hub is unlikely to purchase insurance from a specialty food hub insurance provider. Rather, the food hub's insurance agency more likely funds a range of business types. As such, assuming that the food hub's insurance company has a similar expenditure profile to that of the relevant insurance industry within IMPLAN should be sufficient.

By contrast, there is growing evidence that farms participating in local food system outlets are often (but not exclusively) smaller in scale, and/or have different patterns of expenditures and labor requirements per unit of output than is reflected in IMPLAN's default agricultural sectors. For example, smaller-scale farms may utilize different proportions of labor or mechanized equipment than their larger counterparts, thus having a different impact on the labor force. Accordingly, we recommend that any food hub assessment involve primary data collection from the farms supplying the hub food. Again, as above, the larger the purchases and the more the policy/intervention is intended to support that sector, the more important it is to get it right.

Primary data collected from **Food Hub Farms** are used to come up with an average (representative) farm profile to scale up (i.e., by the total number of **Food Hub Farms** in the study area) and create the **Food Hub Farm** sector (extracted from the aggregate **Farm** sector). You will need to collect sales and expenditure information from the farms selling to the food hub(s) analogous to financial information collected from the food hub itself. Farm employees are counted based on the number of paid, full-time, part-time, or temporary positions. Unpaid labor is excluded. Direct face-to-face contact with the farms is likely the most efficient way of obtaining the information, given the complexity of information requested and the wariness of farmers to provide such information in traditional telephone, online, or mail surveys. Assurances to the farmers that farm financial information will only be presented in aggregate form, with no individual farm data identifiable, is important to communicate.

**Table 4** provides a simple example of an average **Food Hub Farm** expenditure profile (you will likely have more categories). Value added allocations follow similarly to the example for the food hub, and purchases from retail and wholesale firms are margined (**Table 5**).

**Table 6** illustrates the sales side for the **Food Hub Farms**. Margining sales and the computation of exports follows the same procedure as that for the food hub. The only difference here concerns **Food Hub Farm** sales to the food hub. Since we are not creating food hub sector in our model, we cannot allocate these sales to that sector. Instead, farm product sales to the food hub are allocated across industries and institutions in the same proportion as are the sales allocations for the food hub itself (i.e., based on the last column of **Table 3**).

**Table 4. Sample Average Food Hub Farm Expenditure Profile and Mapping to IMPLAN Categories (2014 data year).<sup>a</sup>**

Farm expenditure category	IMPLAN category	Expenditure	Local	
			Purchase Percentage	Expense Share
Purchases from other food hub farms	Food Hub Farm, constructed by authors <sup>b</sup>	\$ 10,000	100	0.100
Fuel purchases from retailers	Petroleum refineries (156) – <i>apply margins</i> <sup>c</sup>	\$ 10,000	100	0.100
Ag chemical purchases from retailers	Pest. and other ag chemical mfg (172) – <i>apply margins</i> <sup>d</sup>	\$ 5,000	100	0.050
Farm supplies from wholesalers	Wholesale trade (395) – <i>apply margins</i> <sup>e</sup>	\$ 2,000	50	0.020
Contracted freight costs	Truck transportation (411)	\$ 5,000	75	0.050
Automotive and machinery repair	Automotive repair and maintenance (504)	\$ 5,000	100	0.050
Utilities	Electric power transmission and distribution (49)	\$ 3,000	100	0.030
Insurance	Insurance carriers (437)	\$ 2,000	100	0.020
<b>Total intermediate input purchases</b>		<b>\$ 42,000</b>		<b>0.420</b>
Wages and benefits	Employee compensation (Total employees = 3)	\$ 25,000	100	0.250
Taxes (all)	Tax on production and imports <sup>f</sup>	\$ 3,000	75	0.030
Depreciation	Other property type income (capital consumption allowance) <sup>g</sup>	\$ 5,000	na	0.050
Interest payments	Other property type income (net interest) <sup>h</sup>	\$ 5,000	100	0.050
Net income to owner(s)	Proprietor income <sup>i</sup>	\$ 20,000	100	0.200
<b>Total Value Added</b>		<b>\$ 58,000</b>		<b>0.580</b>

<sup>a</sup> We assume 50 farms in the Food Hub Farm sector, with an average of 3 employees per farm. The total number of jobs for the sector is 150 (50 x 3). Average per farm expenditures are scaled similarly to create sector totals, such that total outputs (sales) equals total outlays = 5,000,000 (50 x (42,000 + 58,000)).

<sup>b</sup> We assume purchases from other farms are only from other Food Hub Farms, rather than to other non-food hub farms or a combination of both.

<sup>c</sup> As these are retail purchases, margins are applied. Since the purchased items are known (i.e., fuel), we margin back to the producing sector and account for local purchasing percentages (LPP). See Table 5 for details.

<sup>d</sup> As these are retail purchases, margins are applied. Since the purchased items are known (i.e., ag chemicals), we margin back to the producing sector and account for LPPs. See Table 5 for details.

<sup>e</sup> As these are wholesale purchases, margins are applied. Since the purchased items are not specific enough to be attributed to a particular producing sector, we only consider the average margin for the wholesale sector for impact. See Table 5 for details.

<sup>f</sup> All business taxes and fees paid to governments, including sales and excise taxes, net of subsidies.

<sup>g</sup> Depreciation is a noncash expenditure; however, it is usually a tax-deductible expense used in determining profits. It should be allocated to other property type income (as a capital consumption allowance, usually modified to a market value basis) and not considered in estimating impacts.

<sup>h</sup> Interest payments are included as net interest (interest payments less interest receipts) in OPTI. We assume no interest receipts.

<sup>i</sup> The remaining balance after computing total outputs (sales) less intermediate input expenditures and the other allocations to value added.

**Table 5. Margin Calculations for Food Hub Farms.<sup>a</sup>**

IMPLAN category	Margin	Expenditure	Local Purchase Percentage	Expense share
<b>Fuel purchases from retailers (\$10,000 average per farm)<sup>b</sup></b>				
Petroleum refineries (156)	0.6284	\$ 6,284	0.86	0.06284
Wholesale trade (395)	0.1894	\$ 1,894	94.74	0.01894
Retail gasoline stations (402)	0.1667	\$ 1,667	100.00	0.01667
Rail transportation (409)	0.0010	\$ 10	45.30	0.00010
Water transportation (410)	0.0021	\$ 21	71.93	0.00021
Truck transportation (411)	0.0076	\$ 76	51.43	0.00076
Pipeline transportation (413)	0.0048	\$ 48	17.06	0.00048
<b>Ag chemical purchases from retailers (\$5,000 average per farm)<sup>b</sup></b>				
Pesticide & other ag chemical manufacturing (172)	0.5756	\$ 2,878	47.42	0.02878
Wholesale trade (395)	0.1224	\$ 612	94.74	0.00612
Retail building mat, garden eq., & supplies (399)	0.2822	\$ 1,411	100.00	0.01411
Air transportation (408)	0.0082	\$ 41	58.43	0.00041
Rail transportation (409)	0.0010	\$ 5	45.30	0.00005
Truck transportation (411)	0.0106	\$ 53	51.43	0.00053
<b>Farm supplies from wholesalers (\$2,000 average per farm)<sup>c</sup></b>				
Wholesale trade (395)	0.1730	\$ 346	50.00	0.00346
Miscellaneous manufacturing (394)	0.8270	\$ 1,654	0.00	0.01654

<sup>a</sup> Margins and local purchase percentages (LPPs) taken from IMPLAN default estimates, except for the LPPs known from the primary data. Expense shares calculated based on \$100,000 in average output per Food Hub Farm.

<sup>b</sup> Since the specific products purchased from the retailer are known, we margin back to the producing industry.

<sup>c</sup> Since the specific products purchased from the wholesaler are unknown, we use the average wholesale trade margin in IMPLAN and the LPP from the primary data. The remaining allocation (\$1,654) is lumped into a general industry and assigned a zero LPP. This will not affect the impact results (all leakage), but is needed to complete the production function.

**Table 6. Summary of Average Food Hub Farm Sales, including Margining and Exports.<sup>1</sup>**

Industry/Institution	Code	Percent Local	Gross Sales	Margined Sales	Final Sales	Final Sales FH allocated
Food Hub Farms <sup>2</sup>	FHF	100	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000
Retail trade - Food <sup>3</sup>	400	100	\$ 15,000	\$ 9,686	\$ 8,657	\$ 8,960
Wholesale trade <sup>3</sup>	395	80	\$ 17,000	\$ 1,958	\$ 1,567	\$ 1,597
Manufactured food	Mfood	50	\$ 20,000	\$ 20,000	\$ 10,000	\$ 10,263
Full service restaurants	501	100	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,450
Households	Hhld	100	\$ 25,000	\$ 45,355	\$ 43,376	\$ 44,093
Food Hub <sup>4</sup>		100	\$ 3,000	\$ 3,000	\$ 3,000	
Elem/Secondary schools	472					\$ 675
Export					\$ 13,400	\$ 13,963
Total			\$ 100,000	\$ 100,000	\$ 100,000	\$ 100,000

<sup>1</sup> To avoid double counting, sales to wholesale and retail sectors are margined to reflect only the value of the services provided by these sectors in delivering commodities from producers' establishments to purchasers. 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.).

<sup>2</sup> Assumes all sales to Other Farms are to other Food Hub Farms.

<sup>3</sup> Retail and wholesale margins for farm products are 0.3027 and 0.1152, respectively (2014 model year, New York State).

<sup>4</sup> Since there is no food hub sector in our model, the sales to the food hub are distributed across industries in proportion to where the food hub sells its products (Table 3).

### 3.3 Data Collection – Food Hub Customers

The final data needed are from food hub customers (or potential customers) and serve two important purposes. First, the information can be used to understand the scalability of the food hub sector; i.e., what is a realistic amount of additional sales by which final demand for the food hub sector can grow? Second, it can be used to estimate demand-side opportunity costs. Opportunity cost impacts reflect what would have occurred had the increased final demand for food hub products not have happened. It is unrealistic to assume, without supporting evidence, that all purchases from food hubs represent new final demand; rather, some purchases from food hubs likely occur in concert with reduced purchases in other sectors. Including this demand-side opportunity cost component in an impact assessment is very important. In our case study of Regional Access (Jablonski, Schmit, and Kay, 2016), we found that excluding opportunity costs (i.e., reduced purchases by customers from other wholesale food providers) overestimated total impacts by over 10%. The sectors in which opportunity costs are reflected may differ depending on situation and/or study area. For example, additional purchases from food hubs may increase purchases in the retail grocery sector if customers are now more likely to cook at home (i.e., a negative opportunity cost). We recommend designing a short survey for food hub customers (or potential customers) that address the following questions:

- Is your business interested in purchasing additional items from the food hub if the food hub expanded its operations in some way (e.g., carried additional items/quantities, offered different delivery options, etc.)? (yes/no/unsure)
- If yes:
  - Quantify the dollar amount of additional purchases from the food hub on a weekly basis.
  - Based on additional purchases from the food hub, would you purchase fewer items from other local businesses? (yes/no/unsure)
  - What percentage of the additional purchases from the food hub would displace purchases from other local sources?

Based on the responses from customers, you can calculate the percentage of customers indicating that they are interested in purchasing additional items from the food hub, and the average dollar amount of these additional purchases on an annual basis. The total dollar amount of additional final demand for food hub goods and services follows by multiplying these two numbers together. However, this additional final demand does not come without a cost if some positive percentage of customers indicated that the additional food hub purchases result in fewer purchases from other firms. Accordingly, you can estimate the average decrease in purchases from other firms as a portion of the additional demand for food hub goods and services. Accordingly, the opportunity cost associated with \$1 of additional demand for food hub products can be computed by multiplying the percentage of customers and the average decrease in offsetting purchases.

## 4. CONSTRUCTING THE MODEL IN IMPLAN

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Once you have collected the requisite information from the food hubs, the Food Hub Farms, and the food hub customers you can develop your IMPLAN model.

### 4.1 Creating the Model and Aggregation Scheme

To begin, select the data file or files within IMPLAN based on the region defined by the study (i.e., county, multi-county, or state, and year). Once you have selected your data file(s), go to *File > User Preferences > Analysis* and adjust the event year. The event year should reflect the year that changes in final demand occur, i.e., the year in which the customers will increase their food hub purchases. At this time, you should also click *Advanced Modeling* in the *User Preferences* window.

Next, create an aggregation scheme. It is preferable to leave the model as disaggregated as possible, to minimize aggregation bias.<sup>6</sup> That said, for some key sectors it may be difficult to avoid some level of aggregation. As one can see from above, translating financial statement categories to appropriate IMPLAN industry sector(s) can be complex and requires informed judgments by the modeler. For our example, we create two aggregated sectors to reflect the primary food expenditure categories for food hubs; i.e., from farms and from food processors. Specifically, we aggregate sectors 1-4, 6, and 10-14 and name it the **Farm** sector. For processed food products, we aggregate sectors 67, 71-73, and 76-105 and name it the **Manufactured Food** sector.<sup>7</sup> Aggregating your model should be defined by your research objectives and data availability, noting that model results can always be aggregated after estimating impacts, if desired. Keep in mind that you will need one industry that does not have any output in your aggregated model; i.e., look under *Explore > Study Area Data* for industries with zero output (we use **Tobacco farming**). This industry will be reassigned as your **Food Hub Farm** sector. This does not imply that there is no demand for that industry's commodities within the study area, but only that there is no industry in the study area that produces them. After aggregating, reconstruct your model (i.e., *Options > Construct > Multipliers*).

### 4.2 Creating a Food Hub Farm sector

To create the **Food Hub Farm** sector, begin by saving a copy of your model following aggregation with a new name. For example, our original aggregated model is *PGUIDE NYS 2014 Aggregated*, and we saved a copy of it as *PGUIDE NYS 2014 Aggregated Food Hub Farm*. Now open the model you just saved with the new name.

#### 4.2.1 Customize Study Area Data

The **Food Hub Farm** sector is extracted from the **Farm** sector based on the **Food Hub Farm** financial information; i.e., [Tables 4-6](#). The process will involve opening and editing the model in IMPLAN and in Microsoft ACCESS through an iterative process. You will use the *Customize* menu items in IMPLAN; i.e., *Study Area Data*, *Industry Production*, *Commodity Production*, and *Trade Flows*. The order of customization is extremely important! For example, if you need to go back and edit *Industry Production* during the process, customizing *Commodity Production* and *Trade Flows* must be completed again.

You begin by adding the **Food Hub Farm** sector's employment, output, and value added (Part 1, steps 1.1-1.8) and then reducing the corresponding components from the **Farm** sector by those same amounts (Part 1, steps 1.9-1.15). The **Farm** sector will now represent the **Other Farm** sector as the **Food Hub Farm** components have been removed. In this way, the size of the total economy remains unchanged. The detailed calculations for our example are included in the companion document to this guide (PGUIDE companion.xlsx, Study Area Data worksheet). Detailed steps follow in **Part 1** and are illustrated for our example in [Figures 1 and 2](#).

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<sup>6</sup> Aggregation bias occurs from a loss of detail when aggregating sectors before generating the multipliers. In so doing, the production function of the new aggregated industry is the weighted average of the individual industry's production functions, such that the largest industries have the largest influence on the aggregated industry. That said, the nature of your data and/or research questions might make aggregation preferred and more manageable when modifications to the model are necessary.

<sup>7</sup> Individual industries excluded for the **Farm** and **Manufactured Food** sectors, include those for which there is very little or no activity in the study area (New York State), or for which the food hub is not expected to procure products from.

### Part 1: Customize Study Area Data

- 1.1 Select *Customize > Study Area Data*.
- 1.2 Highlight **Tobacco farming** from the **Industry List** and click *Rename Industry*, enter **Food Hub Farm**.
- 1.3 Make sure that *Lock* (along **Intermediate Expenditures** row) is unchecked.
- 1.4 Enter total **Employment**; i.e., employment listed in **Table 4** times the number of Food Hub Farms.
- 1.5 Under *Edit Options*, select *Edit totals then update per worker values*.
- 1.6 Enter total *Output* and each *Value Added* component (i.e., *Employee Compensation*, *Proprietor Income*, *Other Property Type Income*, and *Tax on Production and Imports*); i.e., scale numbers up from **Tables 4 and 5** by the number of Food Hub Farms (in our case, 50)
- 1.7 Click *Update* and double-check that your numbers have not changed (it sometimes happens). The number generated in **Intermediate Expenditures** should equal the total intermediate input purchases from **Tables 4 and 5** times the number of Food Hub Farms, perhaps with a small amount of rounding. If any numbers change from those entered, re-enter the correct numbers and click *Update* until it is correct.
- 1.8 Click *Save* (see **Figure 1** for illustration).
- 1.9 While still on this screen, select **Farm** from the **Industry List** and click *Rename Industry*, enter **Other Farm**.
- 1.10 Now reduce the total **Employment** by the same amount you included in the **Food Hub Farm** industry.
- 1.11 Under *Edit Options*, select *Edit totals then update per worker values*.
- 1.12 Reduce *Output* and each *Value Added* component by the amount included in the **Food Hub Farm** industry.
- 1.13 Click *Update*, double-check that your numbers have not changed (it sometimes happens), perhaps with a small amount of rounding. Re-enter your numbers as necessary and click *Update* until it's correct.
- 1.14 Click *Save*. Click *Close*. (see **Figure 2** for illustration).
- 1.15 Reconstruct model (*Options > Construct > Multipliers*). Confirm changes in *Explore > Study Area Data*.

MIG IMPLAN (Impacts for PLANning)

File Options Analyze Explore Customize Help

Current Model: PGUIDE NYS 2014 Aggregated Food Hub Farm Your model is aggregated with scheme: User Defined Custom Scheme

Tasks Edit Industry Data Rename Industry...

Model

- New Model
- Open Model
- Close Model
- Model Overview

Analyze

- Setup Activities
- Analyze Scenarios
- Scenario Results

Explore

- Study Area Data
- Social Accounts
- Industry Accounts
- Multipliers

Customize

- Study Area Data
- Industry Production
- Commodity Production
- Trade Flows

Edit an Industry

Industry List:

- 1 Other Farm
- 5 Tree nut farming
- 7 Food Hub Farm**
- 8 Cotton farming
- 9 Sugarcane and sugar beet farming
- 15 Forestry, forest products, and timber tract pr...
- 16 Commercial logging
- 17 Commercial fishing
- 18 Commercial hunting and trapping
- 19 Support activities for agriculture and forestry
- 20 Extraction of natural gas and crude petroleum
- 21 Extraction of natural gas liquids
- 22 Coal mining
- 23 Iron ore mining
- 24 Gold ore mining
- 25 Silver ore mining
- 26 Lead and zinc ore mining
- 27 Copper ore mining
- 28 Uranium-radium-vanadium ore mining
- 29 Other metal ore mining
- 30 Stone mining and quarrying
- 31 Sand and gravel mining
- 32 Other clay, ceramic, refractory minerals mining

Make the changes to the items you know, then click update totals.

Employment

Employment: Total

Output, Value Added

Edit Options

- Edit totals then update per worker values.
- Edit per worker values then update.

	Total	Per Worker	National Per Worker
<b>Output (Value of Production):</b>	\$5,000,000	\$33,333	\$93,123
<b>Value Added:</b>			
Employee Compensation:	\$1,250,000	\$8,333	\$21,963
Proprietor Income:	\$1,000,000	\$6,667	\$16,929
Other Property Type Income:	\$500,000	\$3,333	\$24,769
Tax on Production and Imports:	\$150,000	\$1,000	\$662
<b>Total Value Added</b>	<b>\$2,900,000</b>	<b>\$19,333</b>	<b>\$64,323</b>
<b>Intermediate Expenditures:</b>	<b>\$2,100,000</b>	<b>\$14,000</b>	<b>\$28,800</b>

Lock

Reset Industry Update Zero Out Industry

Save Close

Figure 1. Creating the Food Hub Farm Sector.

MIG IMPLAN (Impacts for PLANning)

File Options Analyze Explore Customize Help

Current Model: PGUIDE NYS 2014 Aggregated Your model is aggregated with scheme: User Defined Custom Scheme

Tasks Edit Industry Data Rename Industry...

Model

- New Model
- Open Model
- Close Model
- Model Overview

Analyze

- Setup Activities
- Analyze Scenarios
- Scenario Results

Explore

- Study Area Data
- Social Accounts
- Industry Accounts
- Multipliers

Customize

- Study Area Data
- Industry Production
- Commodity Production
- Trade Flows

Edit an Industry

Industry List:

- 1 Other Farm
- 5 Tree nut farming
- 7 Food Hub Farm
- 8 Cotton farming
- 9 Sugarcane and sugar beet farming
- 15 Forestry, forest products, and timber tract pr...
- 16 Commercial logging
- 17 Commercial fishing
- 18 Commercial hunting and trapping
- 19 Support activities for agriculture and forestry
- 20 Extraction of natural gas and crude petroleum
- 21 Extraction of natural gas liquids
- 22 Coal mining
- 23 Iron ore mining
- 24 Gold ore mining
- 25 Silver ore mining
- 26 Lead and zinc ore mining
- 27 Copper ore mining
- 28 Uranium-radium-vanadium ore mining
- 29 Other metal ore mining
- 30 Stone mining and quarrying
- 31 Sand and gravel mining
- 32 Other clay, ceramic, refractory, miscellaneous...

Make the changes to the items you know, then click update totals.

Employment

Employment: Total 54,308.8

Output, Value Added

Edit Options

- Edit totals then update per worker values.
- Edit per worker values then update.

	Total	Per Worker	National Per Worker
<b>Output (Value of Production):</b>	\$6,657,674,000	\$122,590	\$160,206
<b>Value Added:</b>			
Employee Compensation:	\$811,069,700	\$14,934	\$11,232
Proprietor Income:	\$1,090,414,000	\$20,078	\$32,789
Other Property Type Income:	\$2,017,985,000	\$37,158	\$44,197
Tax on Production and Imports:	\$16,990,420	\$313	(\$543)
<b>Total Value Added</b>	<b>\$3,936,459,000</b>	<b>\$72,483</b>	<b>\$87,675</b>
<b>Intermediate Expenditures:</b>	<b>\$2,721,215,000</b>	<b>\$50,107</b>	<b>\$72,530</b>

Lock

Reset Industry Update Zero Out Industry

Save Close

Figure 2. Creating the Other Farm Sector.

#### 4.2.2 Customize Industry Production

Total output and value added outlays were defined in **Part 1** and, by computation, total intermediate input purchases. Defining the production function for **Food Hub Farm** involves the individual input expenditure shares from **Tables 4 and 5**, called Gross Absorption Coefficients (GACs) in IMPLAN. GACs do not consider where the purchases originated, that is taken care of when customizing trade flows later. Since this step technically involves removing intermediate input purchases from the original **Farm** sector and allocating them to the **Food Hub Farm** sector, the GACs for the **Other Farm** sector will likely change (at this stage they are the same, relative to each other, as the original **Farm** sector). However, if the **Food Hub Farm** sector is a small proportion of the **Farm** sector, this is of little consequence to impacts and can be reasonably ignored. In our example, the **Food Hub Farm** sector is less than 0.1% of the original **Farm** sector (by output), so we ignore this technical detail. However, if the **Other Farm** sector purchases commodities from the **Food Hub Farm** sector (in our example it does not), the GACs for **Other Farm** and **Food Hub Farm** commodities will need to be modified in the **Other Farm** sector.

Even though **Tobacco farming** did not have a production function in our model originally (since there was no output), now that we have, in essence, added output to **Tobacco farming** via Part 1, IMPLAN automatically imports the default production for **Tobacco farming**.<sup>8</sup> This is NOT the production function we want! Accordingly, using **Tables 4 and 5**, individual GACs are entered that sum up to the Total Absorption Value (TAV) for **Food Hub Farm** (0.420, **Table 4**). The detailed steps follow in the first section of **Part 2** (2.1-2.10).

Based on the sales of Food Hub Farms (**Table 6**), the GACs for every local industry that purchases **Food Hub Farm** commodities must also be edited to reallocate the original GAC for **Farm** commodities into separate GACs for **Other Farm** and **Food Hub Farm** commodities. The detailed steps follow in the second section of **Part 2** (2.11-2.14), and refer to the edited GACs derived in **Table 7**.

Finally, you need to reallocate the GACs for every sector that purchase commodities produced by nonlocal firms in the same industry you are using to create the **Food Hub Farm** industry. In our example, sectors 111 (**Tobacco product manufacturing**), 456 (**Scientific research and development services**), and 12001 (**State/Local Govt NonEducation**) purchase **Tobacco** (3007). Since nearly all of these purchases are nonlocal (i.e., our example shows a small amount of *Institutional Commodity Sales* that are part of *Total Commodity Supply*), they will not affect local impacts. It is useful, however, to reallocate purchases so that the *Gross Commodity Demand* for **Food Hub Farm** commodities (3007) excludes the purchases of the original commodity. Institutional purchases are adjusted later (within ACCESS). Keep the TAV and VAC at their original values for these industries and reallocate the GAC from the original (**Tobacco**) commodity to another purchased input. For **Tobacco product manufacturing** (111), we remove the GAC for **Tobacco** (3007) and add it to **Tobacco products** (3111). For **Scientific research & development services** (456), we remove the GAC for **Tobacco** (3007) and add it to **Other Farm** (3001). The detailed steps follow in the third section of **Part 2** (2.14-2.18). Following all production function (GAC) adjustments, reconstruct your model.

**Table 7. Editing Gross Absorption Coefficients (GACs) for Industries Purchasing Food Hub Farm Commodity.**

		A	B	C	D	E	F	G
				A x B	Table 6x50	C - D	D/A	E/A
					Food Hub Farm	Other Farm	GAC Food Hub Farm	GAC Other Farm
Industry	Code	Industry Output (\$ Mill)	GAC Farm	Farm Purchase (\$ Mill)	Purchase (\$ Mill)	Purchase (\$ Mill)		
Food Hub Farms	FHF	\$ 5		\$ 0.0	\$ 0.500	\$ 0.0	0.100000	
Retail trade - Food	400	\$ 14,294	0.002173	\$ 31.1	\$ 0.445	\$ 30.6	0.000031	0.002142
Wholesale trade	395	\$101,178	0.000021	\$ 2.1	\$ 0.080	\$ 2.0	0.000001	0.000020
Manufactured food	Mfood	\$ 25,990	0.311313	\$ 8,091.1	\$ 0.513	\$ 8,090.6	0.000020	0.311293
Full serv restaurants	501	\$ 17,725	0.001312	\$ 23.2	\$ 0.523	\$ 22.7	0.000029	0.001283
EI/2nd schools	472	\$ 7,268	0.000019	\$ 0.14	\$ 0.034	\$ 0.10	0.000005	0.000014

Sources: IMPLAN default data, primary data collected. Number of Food Hub Farms assumed to be 50.

<sup>8</sup> GACs for any production sector are the same across any region for a given model year since they are based on national data.

## Part 2: Customize Industry Production

- 2.1 Select *Customize > Industry Production*.
- 2.2 Highlight **Other Farm** in the industry list and select *Options > Library > Export*. Leave the name for the production function as suggested (*1 Other Farm*) and click *OK*. Since many commodities Food Hub Farms purchase are likely similar to Other Farms (albeit in different proportions), it is useful to start with the **Other Farm** production function when composing the one for **Food Hub Farm**. Since production functions in IMPLAN are national, there will be many, very small GACs.
- 2.3 Highlight **Food Hub Farm** in the industry list. The TAV and VAC follow from Part 1, but the GACs are not (in our case, they reflect **Tobacco**). Click *Options > Library > Import*, select the production function you exported in 2.2 and click *Import*. When asked to confirm the replacement, click *Yes*. The relative values of the GACs are identical to that for **Other Farm**, balanced such that their sum is equal to the TAV for **Food Hub Farm**. Note, while we can change the names of the industries (Part 1), we cannot do the same for the names of the commodities they produce
- 2.4 For the **Food Hub Farm** industry, add **Tobacco** (3007), really the **Food Hub Farm**, and enter the GAC (expense share, [Table 4](#), within-sector purchases). If this commodity was not purchased by the **Farm** sector originally (in our case, farms did not buy tobacco), you must add the commodity. Click on *Options > Add a Commodity* and select *3007 Tobacco farming*. Enter the GAC and click *Ok*. Make sure the *Fixed* box is checked.
- 2.5 Edit the GACs for the remaining commodities **Food Hub Farm** purchases ([Tables 4 and 5](#)), except for one. If the commodities are already listed, you can edit them directly, otherwise add them as above. For purchases from retailers or wholesalers enter the GAC for each margin component separately ([Table 5](#)). Combine expense shares for commodities that show up more than once; e.g., truck transportation in our example. You can list each commodity only once.
- 2.6 For any commodities that **Food Hub Farm** does not purchase, enter a zero and make sure it is set as *Fixed*. We have found that IMPLAN may crash when you remove them at this point, so we suggest entering zeros for now.
- 2.7 Go to the final non-zero commodity yet to edit (i.e., pick one from [Table 4 or 5](#)) and make sure *Fixed* is NOT checked. Click *Balance*. The GAC will be computed and should equal what you have in your calculations, with possibly some rounding error. Click *Save*. This is the production function for **Food Hub Farm**, albeit with many zero GACs.
- 2.8 Highlight all commodity rows with zero GACs and select *Options > Remove a commodity*. This is your production function for **Food Hub Farm**, now cleaned of all zero GACs. Click *Save*. See [Figure 3](#) for illustration.
- 2.9 Do NOT reconstruct yet. We want to change other industry production functions first.
- 2.10 Multiply total output for each industry **Food Hub Farm** sells to (column A, [Table 7](#)) by that industry's GAC for **Farm** commodities (column B, [Table 7](#)) to compute total purchases of **Farm** commodities (column C, [Table 7](#)). This is useful to do in a spreadsheet, see companion workbook for our example.
- 2.11 Subtract **Food Hub Farm** purchases for each industry (column D, [Table 7](#)) from total **Farm** purchases (column C, [Table 7](#)) to compute the (net) purchases of **Other Farm** commodities (column E, [Table 7](#)).
- 2.12 Compute the **Food Hub Farm** and the **Other Farm** commodity's GACs for each industry; i.e., divide purchases by total output (columns F and G, [Table 7](#)). The **Food Hub Farm** GACs in our example are all very small, except for the within-sector purchases, but this make sense give the relatively small size of our **Food Hub Farm** sector and the relatively large sizes of the corresponding industries purchasing from it.
- 2.13 For each industry in [Table 7](#), go to *Customize > Industry Production > Edit Industry Production*, edit the **Farm** commodity (really **Other Farm**) and **Food Hub Farm** commodity (in our case **Tobacco farming**) GACs to reflect the values from 2.12 ([Table 7](#)). To minimize rounding error, enter in nine or ten places to the right of the decimal point (even though only six places will show on the screen). Make sure *Fixed* is checked for each and click *Balance*. Then click *Save*. The edited production function for **Retail trade- Food** (400) from our example is shown in [Figure 4](#).
- 2.14 Reallocate the original zero-production sector commodity GAC (in our case, **Tobacco**) to another commodity for every industry that purchases it (i.e., for our case that actually purchases tobacco).
- 2.15 Select the industry from the list (*Edit Industry Production*). For **Tobacco product manufacturing** (111) in our example, the GACs are 0.028354 and 0.077018 for **Tobacco** (3007) and **Tobacco products** (3111), respectively. Enter 0 for 3007 and 0.105372 for 3111. Make sure *Fixed* is checked for each. Click *Balance*. Click *Save*. Highlight the commodity row for **Tobacco** (3007), click *Options > Remove a commodity*. Click *Balance*. Click *Save*.
- 2.16 For **Scientific research and development services** (456) in our example, the GACs are 0.000002 and 0.000872 for **Tobacco** (3007) and **Farm** (3001), respectively. Enter 0 for 3007 and 0.000874 for 3001. Make sure *Fixed* is checked for each. Click *Balance*. Click *Save*. Highlight the commodity row for **Tobacco** (3007), click *Options > Remove a commodity*. Click *Balance*. Click *Save*. Repeat for each relevant industry and then click *Close*.
- 2.17 Reconstruct model (*Options > Construct > Multipliers*).

MIG IMPLAN (Impacts for PLANning)

File Options Analyze Explore Customize Help

Current Model: PGUIDE NYS 2014 Aggregated Food Hub Farm Your model is aggregated with scheme: User Defined Custom Scheme

Tasks Edit Industry Production Options

**Model**

- New Model
- Open Model
- Close Model
- Model Overview

**Analyze**

- Setup Activities
- Analyze Scenarios
- Scenario Results

**Explore**

- Study Area Data
- Social Accounts
- Industry Accounts
- Multipliers

**Customize**

- Study Area Data
- Industry Production
- Commodity Production
- Trade Flows

1 Other Farm  
 5 Tree nut farming  
 7 Food Hub Farm  
 8 Cotton farming  
 9 Sugarcane and sugar beet farming  
 15 Forestry, forest products, and timber tract pro  
 16 Commercial logging  
 17 Commercial fishing  
 18 Commercial hunting and trapping  
 19 Support activities for agriculture and forestry  
 20 Extraction of natural gas and crude petroleum  
 21 Extraction of natural gas liquids  
 22 Coal mining  
 23 Iron ore mining  
 24 Gold ore mining  
 25 Silver ore mining  
 26 Lead and zinc ore mining  
 27 Copper ore mining  
 28 Uranium-radium-vanadium ore mining  
 29 Other metal ore mining  
 30 Stone mining and quarrying  
 31 Sand and gravel mining

Total Absorption Value: 0.420000  
 Value Added Coefficient: 0.580000  
 Total Production Function: 1.000000

Production Function Editing:  
 1. Select the commodity you want to change and make your edit change.  
 2. After you are done with your edit changes, click Balance to make the Production Function add to the total Absorption Coefficient.  
 3. Click Save to save your work.

Importing  
 1. You need to select the production function that you are replacing prior to importing.  
 2. Click Options Library then Import. Select the one you want to import. Note the sector does not have to match the sector you are importing into.

Commodity Code	Commodity Description	Coefficient	Fixed
3007	Tobacco farming	0.100000	<input type="checkbox"/>
3156	Petroleum refineries	0.062840	<input type="checkbox"/>
3411	Truck transportation	0.051290	<input type="checkbox"/>
3504	Automotive repair and maintenance, except car ...	0.050000	<input type="checkbox"/>
3049	Electric power transmission and distribution	0.030000	<input type="checkbox"/>
3172	Pesticide and other agricultural chemical manufa...	0.028780	<input type="checkbox"/>
3395	Wholesale trade	0.028520	<input type="checkbox"/>
3437	Insurance carriers	0.020000	<input type="checkbox"/>
3402	Retail - Gasoline stores	0.016670	<input type="checkbox"/>
3394	All other miscellaneous manufacturing	0.016540	<input type="checkbox"/>
3399	Retail - Building material and garden equipment a...	0.014110	<input type="checkbox"/>
3413	Pipeline transportation	0.000480	<input type="checkbox"/>
3408	Air transportation	0.000410	<input type="checkbox"/>
3410	Water transportation	0.000210	<input type="checkbox"/>
3409	Rail transportation	0.000150	<input type="checkbox"/>

Balance Save Cancel

Figure 3. Edited Food Hub Farm Production Function.

MIG IMPLAN (IMpacts for PLANning)

File Options Analyze Explore Customize Help

Current Model: PGUIDE NYS 2014 Aggregated Food Hub Farm Your model is aggregated with scheme: User Defined Custom Scheme

**Tasks** Edit Industry Production Options

**Model**

- New Model
- Open Model
- Close Model
- Model Overview

**Analyze**

- Setup Activities
- Analyze Scenarios
- Scenario Results

**Explore**

- Study Area Data
- Social Accounts
- Industry Accounts
- Multipliers

**Customize**

- Study Area Data
- Industry Production
- Commodity Production
- Trade Flows

400 Retail - Food and beverage stores

401 Retail - Health and personal care stores

402 Retail - Gasoline stores

403 Retail - Clothing and clothing accessories st

404 Retail - Sporting goods, hobby, musical instr

405 Retail - General merchandise stores

406 Retail - Miscellaneous store retailers

407 Retail - Nonstore retailers

408 Air transportation

409 Rail transportation

410 Water transportation

411 Truck transportation

412 Transit and ground passenger transportator

413 Pipeline transportation

414 Scenic and sightseeing transportation and s

415 Couriers and messengers

416 Warehousing and storage

417 Newspaper publishers

418 Periodical publishers

419 Book publishers

420 Directory, mailing list, and other publishers

421 Greeting card publishing

Total Absorption Value: 0.319851

Value Added Coefficient: 0.680150

Total Production Function: 1.000000

Production Function Editing:

1. Select the commodity you want to change and make your edit change.
2. After you are done with your edit changes, click Balance to make the Production Function add to the total Absorption Coefficient.
3. Click Save to save your work.

Importing

1. You need to select the production function that you are replacing prior to importing.
2. Click Options Library then Import. Select the one you want to import. Note the sector does not have to match the sector you are importing into.

Commodity Code	Commodity Description	Coefficient	Fixed
3001	Farm	0.002142	<input type="checkbox"/>
3007	Tobacco farming	0.000031	<input type="checkbox"/>
3017	Commercial fishing	0.001292	<input type="checkbox"/>
3020	Extraction of natural gas and crude petroleum	0.000190	<input type="checkbox"/>
3049	Electric power transmission and distribution	0.028800	<input type="checkbox"/>
3050	Natural gas distribution	0.000554	<input type="checkbox"/>
3051	Water, sewage and other systems	0.001113	<input type="checkbox"/>
3062	Maintenance and repair construction of nonresid...	0.006116	<input type="checkbox"/>
3067	Manufactured Food	0.000289	<input type="checkbox"/>
3068	Rice milling	0.000002	<input type="checkbox"/>
3069	Malt manufacturing	0.000001	<input type="checkbox"/>
3070	Wet com milling	0.000546	<input type="checkbox"/>
3120	Curtain and linen mills	0.000016	<input type="checkbox"/>
3121	Textile bag and canvas mills	0.000205	<input type="checkbox"/>
3122	Rope, cordage, twine, tire cord and tire fabric mills	0.000140	<input type="checkbox"/>
3123	Other textile product mills	0.000222	<input type="checkbox"/>
3131	Leather and hide tanning and finishing	0.000002	<input type="checkbox"/>
3133	Other leather and allied product manufacturing	0.000004	<input type="checkbox"/>
3142	Wood container and pallet manufacturing	0.002083	<input type="checkbox"/>
3144	Prefabricated wood building manufacturing	0.000014	<input type="checkbox"/>
3145	All other miscellaneous wood product manufacturi...	0.000114	<input type="checkbox"/>
3147	Paper mills	0.000136	<input type="checkbox"/>
3148	Paperboard mills	0.000180	<input type="checkbox"/>
3149	Paperboard container manufacturing	0.001437	<input type="checkbox"/>

Balance Save Cancel

Figure 4. Edited Retail – Food and Beverage Stores Production Function.

### 4.2.3 Customize Commodity Production

Customizing commodities produced by the **Food Hub Farm** sector is the next step in creating the sector. Commodities are produced by industries, some of which produce multiple commodities (generally a primary commodity and one or more byproducts). Commodity codes generally follow the same structure as for the industry codes, albeit preceded by the number 3. Commodities produced by each industry (based on national data), in proportion to the value of total output, are shown under *Customize > Commodity Production*. The commodities produced by the **Other Farm** sector in our example are illustrated in [Figure 5](#), representing the same commodities produced originally by the **Farm** sector. The **Other Farm** sector produces mostly (other) farm commodities (3001, 98.5%), along with small amounts of forestry products (3015, 0.4%), support activities for agriculture and forestry (3019, 0.9%), and other amusement and recreation (3496, 0.2%).

For our **Food Hub Farm** sector, the commodities at this stage will reflect those produced by **Tobacco farming**, as this was the original empty sector that we are populating with the **Food Hub Farm** information. Without additional data showing otherwise, we assume that the **Food Hub Farm** sector produces only its primary commodity (i.e., agricultural products) with no byproducts. As byproducts for most agricultural production sectors represent a small percentage of the total commodities sold, this will not have any material effect on the impact results, and is useful in editing trade flows that follow next. In our case, the primary commodity will be 3007 (**Tobacco**), even though we know it by now as the **Food Hub Farm** commodity. The detailed steps follow in **Part 3** below (3.1-3.4), with the result illustrated in [Figure 6](#). There are no other industries that need their commodities modified. Once you complete this part, reconstruct your model.

#### Part 3: Customize Commodity Production

- 3.1 Under *Customize > Commodity Production*, select **Food Hub Farm** from the industry list.
- 3.2 Highlight the **Tobacco farming** commodity (really the **Food Hub Farm** commodity) coefficient and enter 1. Make sure the *Fixed* box is checked and click *Balance*. The other commodity coefficients will go to zero. Click *Save*.
- 3.3 Highlight all commodity rows with zero commodity coefficients and select *Options > Remove a commodity*. Now only the **Food Hub Farm** commodity (**Tobacco farming**) is listed. Click *Balance*. Click *Save*. Click *Close*. See [Figure 6](#) for an illustration.
- 3.4 Reconstruct model (*Options > Construct > Multipliers*).

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File Options Analyze Explore Customize Help

Current Model: PGUIDE NYS 2014 Aggregated Food Hub Farm Your model is aggregated with scheme: User Defined Custom Scheme

**Tasks** Edit Commodity Production Options

**Model**

- New Model
- Open Model
- Close Model
- Model Overview

**Analyze**

- Setup Activities
- Analyze Scenarios
- Scenario Results

**Explore**

- Study Area Data
- Social Accounts
- Industry Accounts
- Multipliers

**Customize**

- Study Area Data
- Industry Production
- Commodity Production
- Trade Flows

1 Other Farm

- 5 Tree nut farming
- 7 Food Hub Farm
- 8 Cotton farming
- 9 Sugarcane and sugar beet farming
- 15 Forestry, forest products, and timber tract pro
- 16 Commercial logging
- 17 Commercial fishing
- 18 Commercial hunting and trapping
- 19 Support activities for agriculture and forestry
- 20 Extraction of natural gas and crude petroleum
- 21 Extraction of natural gas liquids
- 22 Coal mining
- 23 Iron ore mining
- 24 Gold ore mining
- 25 Silver ore mining
- 26 Lead and zinc ore mining
- 27 Copper ore mining
- 28 Uranium-radium-vanadium ore mining
- 29 Other metal ore mining
- 30 Stone mining and quarrying
- 31 Sand and gravel mining
- 32 Other clay, ceramic, refractory minerals minin
- 33 Potash, soda, and borate mineral mining
- 34 Phosphate rock mining
- 35 Other chemical and fertilizer mineral mining

Total Byproducts Value: 1.000000

Byproduct Editing:

1. Select the commodity you want to change and make your edit change.
2. After you are done with your edit changes, click Balance to make the Byproduct add to 1.
3. Click Save to save your work.

Commodity Code	Commodity Description	Coefficient	Fixed
3001	Farm	0.984611	<input type="checkbox"/>
3015	Forestry, forest products, and timber tract producti...	0.004187	<input type="checkbox"/>
3019	Support activities for agriculture and forestry	0.008586	<input type="checkbox"/>
3496	Other amusement and recreation industries	0.002615	<input type="checkbox"/>

Figure 5. Commodities Produced by the Other Farm sector.

MIG IMPLAN (IMpacts for PLANNing)

File Options Analyze Explore Customize Help

Current Model: PGUIDE NYS 2014 Aggregated Food Hub Farm Your model is aggregated with scheme: User Defined Custom Scheme

Tasks Edit Commodity Production Options

**Model**

- New Model
- Open Model
- Close Model
- Model Overview

**Analyze**

- Setup Activities
- Analyze Scenarios
- Scenario Results

**Explore**

- Study Area Data
- Social Accounts
- Industry Accounts
- Multipliers

**Customize**

- Study Area Data
- Industry Production
- Commodity Production
- Trade Flows

1 Other Farm  
 5 Tree nut farming  
**7 Food Hub Farm**  
 8 Cotton farming  
 9 Sugarcane and sugar beet farming  
 15 Forestry, forest products, and timber tract pro  
 16 Commercial logging  
 17 Commercial fishing  
 18 Commercial hunting and trapping  
 19 Support activities for agriculture and forestry  
 20 Extraction of natural gas and crude petroleum  
 21 Extraction of natural gas liquids  
 22 Coal mining  
 23 Iron ore mining  
 24 Gold ore mining  
 25 Silver ore mining  
 26 Lead and zinc ore mining  
 27 Copper ore mining  
 28 Uranium-radium-vanadium ore mining  
 29 Other metal ore mining  
 30 Stone mining and quarrying  
 31 Sand and gravel mining  
 32 Other clay, ceramic, refractory minerals mining  
 33 Potash, soda, and borate mineral mining  
 34 Phosphate rock mining  
 35 Other chemical and fertilizer mineral mining

Commodity Code	Commodity Description	Coefficient	Fixed
▶ 3007	Tobacco farming	1.000000	<input type="checkbox"/>

Total Byproducts Value: 1.000000

Byproduct Editing:  
 1. Select the commodity you want to change and make your edit change.  
 2. After you are done with your edit changes, click Balance to make the Byproduct add to 1.  
 3. Click Save to save your work.

Figure 6. Commodities Produced by the Food Hub Farm sector (Tobacco farming = Food Hub Farm).

#### 4.2.4 Customize Trade Flows

The next step within IMPLAN is to customize trade flows to reflect the percentage of commodities (intermediate inputs) purchased by the **Food Hub Farm** from within the local study area. Specifically, you will edit the regional purchase coefficients (RPCs) for each commodity that the **Food Hub Farm** sector purchases based on the LPPs in [Tables 4 and 5](#). By their very definition, RPCs are the most important parameters for assessing impact, but are often the most difficult parameters to collect. Absent collecting these in your data efforts, you are restricted to using IMPLAN's estimates or using your own judgement. It may be useful to evaluate the sensitivity of your results to changes in various RPCs. RPCs associated with the largest purchases will have the most impact on your results.

By default, RPCs are the same for all sectors (industries and institutions) that purchase that commodity. For our example, all sectors purchasing **Farm** (really **Other Farm**) commodities procure 35.4% of them locally (go to *Customize > Trade Flows > Industry/Institution RPC*, illustrated in [Figure 7](#)). In our case, **Other Farm** commodities are purchased by **Other Farms** (1), food manufacturers (67), households (10001-10009), governments (12001), and more. Similarly, the demands for the **Food Hub Farm** commodity (shown as **Tobacco farming**), prior to customizing trade flows, are shown in [Figure 8](#). Here, the average RPC is 7.4%, and is a combination of the original RPC for tobacco (near zero) and some adjustments made earlier with commodities produced and demanded. In short, it is NOT correct and needs adjustment. Each industry's demand for the **Food Hub Farm** commodity are shown under *Industry Intermediate Demand for Commodities* and reflect the level of purchases from [Tables 6 and 7](#). Since these purchases represent the actual sales by the **Food Hub Farm** industry in the study area, RPCs should equal one. The detailed steps for editing these trade flows follow in the first section of [Part 4](#) (4.1-4.2), with the result illustrated in [Figure 9](#).

Household purchases (or any other institutional purchases) need to be edited within ACCESS since institutional demands cannot be changed in IMPLAN. We will do this later, but notice in our example, that there are no purchases from households ([Figure 8](#)). This is because households did not purchase any tobacco in our original model; however, households do purchase the **Food Hub Farm** commodity. The institutional purchases that do show up here are actually purchases of tobacco by **state/local Govt NonEducation** (12001) and must be removed in ACCESS.

While in *Customize > Trade Flows > Industry/Institution RPC*, change the RPCs for each commodity that the **Food Hub Farm** industry purchases (i.e., based on the LPPs in [Tables 4 and 5](#)). For commodities listed more than once in [Tables 4 and 5](#) due to margining, compute a weighted average of the LPPs based on expenditures and enter those RPCs. [Figure 10](#) provides an illustration of the **Retail Gasoline** commodity (3402). After completing this step, close the model in IMPLAN. Detailed steps follow in the second section of [Part 4](#) (4.3-4.5).

The next set of changes for the model are made within Microsoft ACCESS. As discussed, IMPLAN does not allow you to change commodity demands by institutions within the software. With the model open in ACCESS, open the *Regional Commodity Balances* table and copy the data for the **Food Hub Farm** (3007) and **Other Farm** (3001) commodities to EXCEL. Do the same for the original model aggregated in IMPLAN but without model customization. Comparing across these models allows one to comprehensively evaluate the model values before and after creation of the **Food Hub Farm** industry. All changes in ACCESS are only made to your aggregated food hub farm model. The edits in ACCESS update variables that pertain to the institutional commodity sales and demands for **Food Hub Farm**. However, entering these changes necessarily affects levels of other variables for **Food Hub Farm** that depend on these values. Furthermore, adding household demand (or any institutional demand) for **Food Hub Farm** requires subtracting those same amounts from **Other Farm** since those values still reflect the demands for **Farm** commodities. It also means removing the institutional demands that remain for the tobacco commodity under **Food Hub Farm**. After editing, copy the data back into ACCESS. [Table 8](#) provides an illustration for our example and the companion workbook includes detailed computations and comments. Detailed steps follow in the third section of [Part 4](#) (4.6-4.9).<sup>9</sup>

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<sup>9</sup> The changes to the **Other Farm** commodity are relatively minor, but technically correct, since our **Food Hub Farm** sector is relatively small. That said, ignoring them would not likely change the impact results all that much. The point here is to document the correct process, as there may be instances for researchers where changes to sectors may be more consequential; e.g., splitting the fruit sector in New York into still sizable apple fruit and non-apple fruit sectors.

#### Part 4: Customize Trade Flows

- 4.1 Under *Customize > Trade Flows > Edit Trade Flows > Industry/Institution RPC*, select **3007 Tobacco Farming** (really the **Food Hub Farm** commodity) from the dropdown list.
- 4.2 Under *Industry Intermediate Demand for Commodities*, set the RPC for all industry sectors to one. Click *Save*. The *Gross Commodity Demands* reflect only local purchases from the **Food Hub Farm** industry ([Table 6](#), Final Sales FH Allocated column). See [Figure 9](#) for illustration. Do not reconstruct yet.
- 4.3 Select each commodity from the dropdown list that the **Food Hub Farm** sector purchases and adjust the RPC based on the LPPs in [Tables 4 and 5](#). For commodities listed more than once (due to margining), compute a weighted average LPP, based on expenditures, and enter that number as the RPC. After editing each commodity RPC, click *Save*. See [Figure 10](#) for an illustration of the **Retail Gasoline** commodity (3402).
- 4.4 Reconstruct model (*Options > Construct > Multipliers*).
- 4.5 Close the model in IMPLAN. Close IMPLAN.
- 4.6 Open the aggregated food hub farm model in Microsoft ACCESS (*PGUIDE NYS 2014 Aggregated Food Hub Farm.impdb*). Open the *Regional Commodity Balances* table and copy the data for the **Other Farm** (3001) and **Food Hub Farm** (3007) commodities into an EXCEL spreadsheet.
- 4.7 Open the original aggregated model without model customization in Microsoft ACCESS; i.e., the IMPLAN before creating the **Food Hub Farm** industry (*PGUIDE NYS 2014 Aggregated.impdb*). Open the *Regional Commodity Balances* table and copy the data for the **Other Farm** (3001) and **Tobacco** (3007) commodities into the same EXCEL spreadsheet as in 4.6.
- 4.8 In EXCEL, compute the updated variables values for the aggregated food hub farm model, beginning with institutional commodity sales (zero in our example) and demands (household sales in our example, [Table 6](#), Final Sales FH Allocated) for **Food Hub Farm**. Updating these values will affect the levels of other variables for **Food Hub Farm** that depend on them (note formulas in the companion workbook). Adding household demand (or any institutional demand) for **Food Hub Farm** also requires subtracting those same amounts from **Other Farm** since those values still reflect the demands for the **Farm** commodity. Finally, remove any institutional demands that remain for tobacco that are still included in **Food Hub Farm**. Once complete, save the changes in EXCEL.
- 4.9 Copy all updated variable values from EXCEL back into the *Regional Commodity Balances* table in ACCESS and click *Save*. Detailed computations for our example are contained in the companion workbook to this guide (PGUIDE companion.xlsx, Commodity Balances worksheet) and are summarized in [Table 8](#).
- 4.10 While still in ACCESS, open the *Regional Institution Demand* table and copy the data for the **Other Farm** (3001) and **Food Hub Farm** (3007) commodities into an EXCEL spreadsheet.
- 4.11 In EXCEL, compute the updated values for the relevant demands, RPCs, and Foreign Import Proportions for both commodities. Demand additions in **Food Hub Farm** (in our example, household demand) must be subtracted from the respective demands in **Other Farm**. We allocate total household demand ([Table 6](#)) evenly across all nine household categories. Also, remove the institutional demands for tobacco that are still reflected in **Food Hub Farm**. RPCs and Foreign import Proportions for both commodities were already computed in the revised *Regional Commodity Balances* table. Enter them again here. Once complete, save the changes in EXCEL.
- 4.12 Copy all of the updated variable values from EXCEL back into the *Regional Institution Demand* table in ACCESS and click *Save*. Detailed computations for our example are contained in the companion workbook to this guide (PGUIDE companion.xlsx, Institution Demand worksheet) and are summarized in [Table 9](#).
- 4.13 Close the model in ACCESS. Close ACCESS.
- 4.14 Reopen the model in IMPLAN (*PGUIDE NYS 2014 Aggregated Food Hub Farm.impdb*).
- 4.15 Under *Customize > Trade Flows > Edit Trade Flows > Industry/Institution RPC*, select **3007 Tobacco Farming** (really the **Food Hub Farm** commodity) from the dropdown list. The industry demands and the RPCs for them still hold from the previous edits. The institutional demands added and RPCs edited in ACCESS (for households in our case) and any deletions (the state government purchases of tobacco in our example) are now reflected correctly. The summary values at the bottom of the screen are correct and will match your calculations made earlier (*Regional Commodity Balances*). Click *Save*. No additional changes are necessary. [Figure 11](#) provides an illustration.
- 4.16 Under *Customize > Trade Flows > Edit Trade Flows > Industry/Institution RPC*, select **3001 Farm** (really the **Other Farm** commodity) from the dropdown list. The demands (industry and institutional) are already updated based on the corrections made in ACCESS, as well as the updated RPCs for institutions. The RPCs for industry demands, however, still need updating. The level of the RPCs should be the same as for the institutional demands, and follow from the average RPC you computed for *Commodity Balances*. Once you have updated the RPCs for the industry demands, all the summary numbers on the bottom of the screen should match your calculations made in EXCEL and copied into ACCESS (*Regional Commodity Balances*). Click *Save*. [Figure 12](#) provides an illustration.
- 4.17 Reconstruct model (*Options > Construct > Multipliers*).

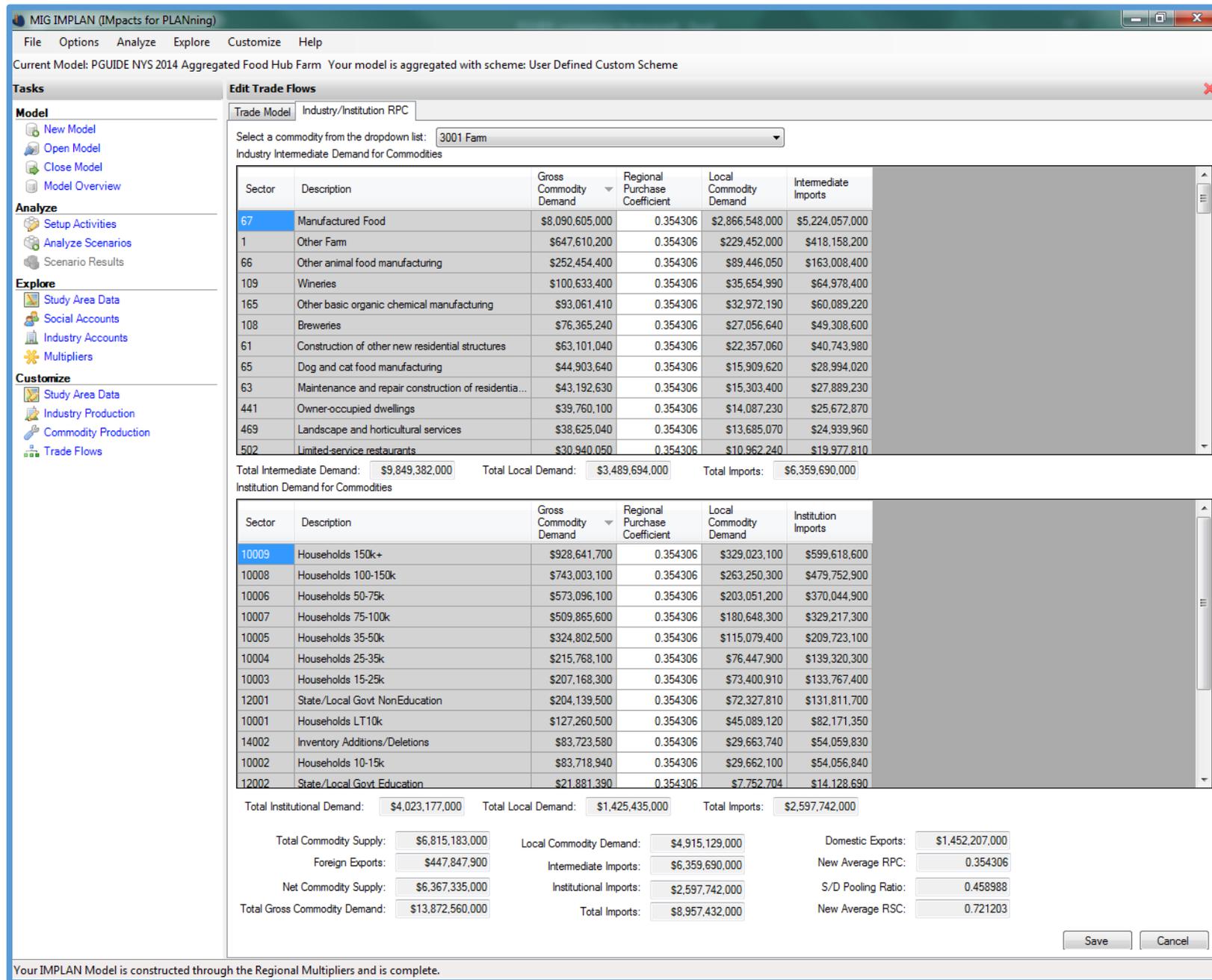


Figure 7. RPCs and Demands for Other Farm Commodity.

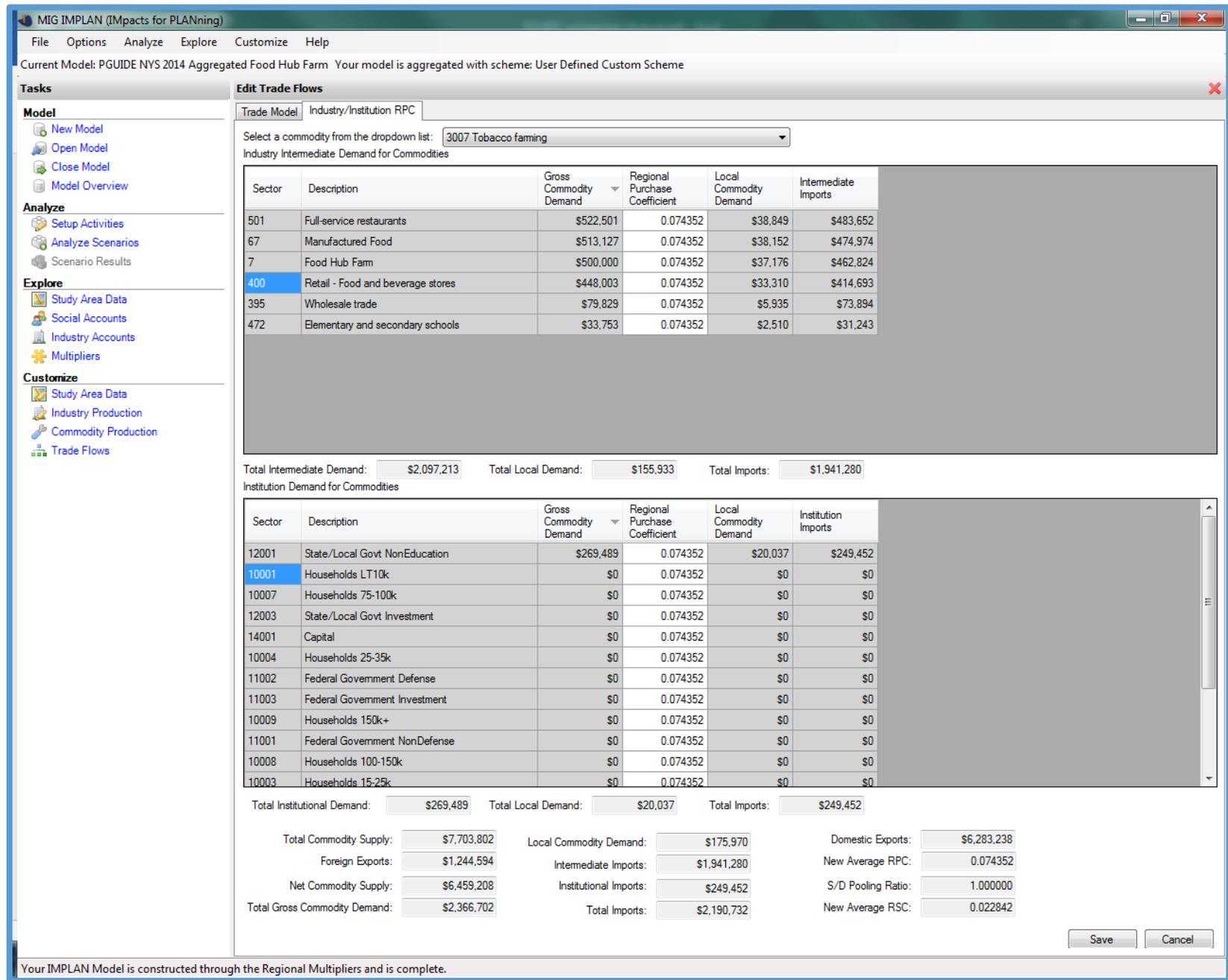


Figure 8. RPCs and Demands for Food Hub Farm Commodity, prior to Customizing Trade Flows.

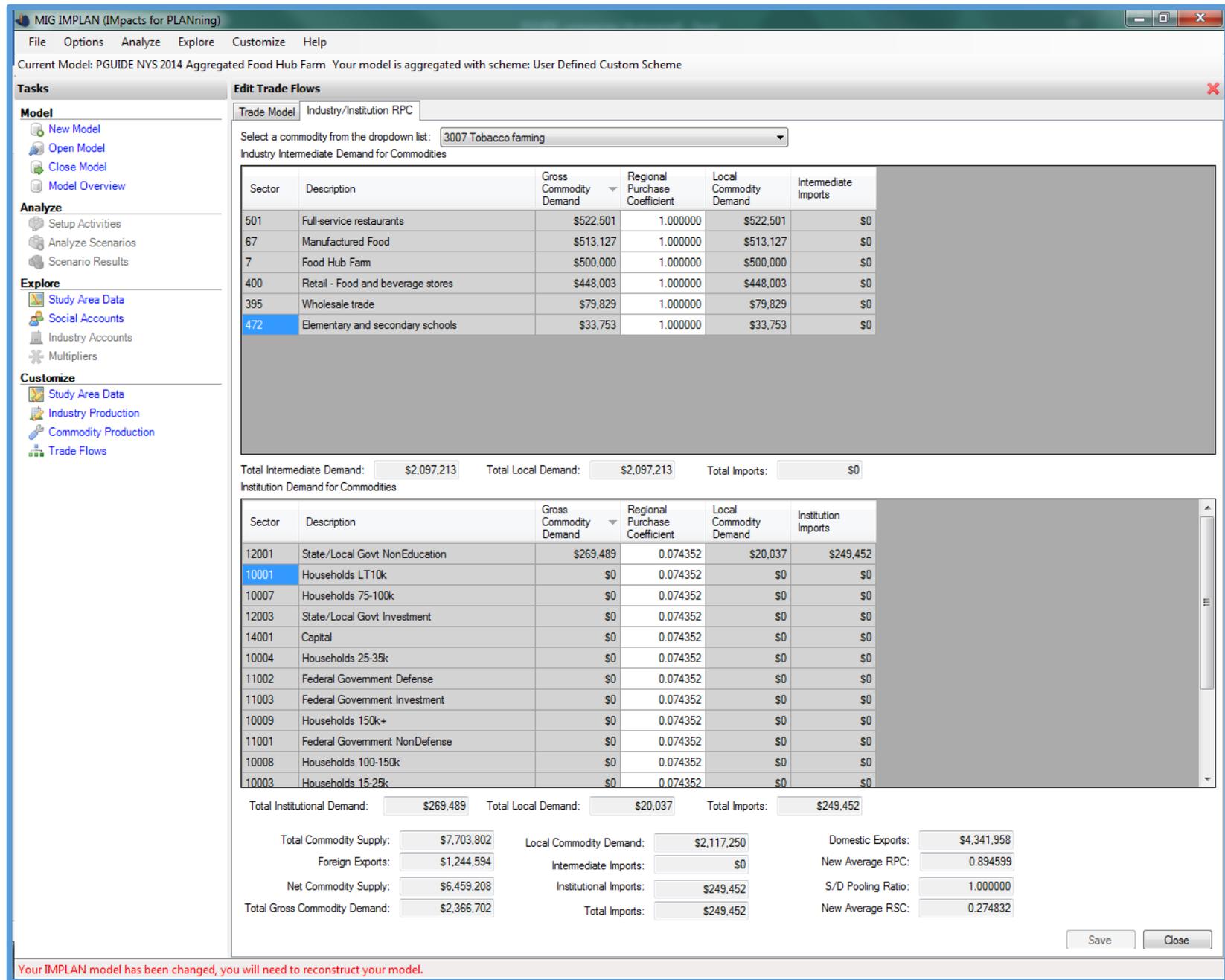


Figure 9. Corrected RPCs by Industries for the Food Hub Farm Commodity.

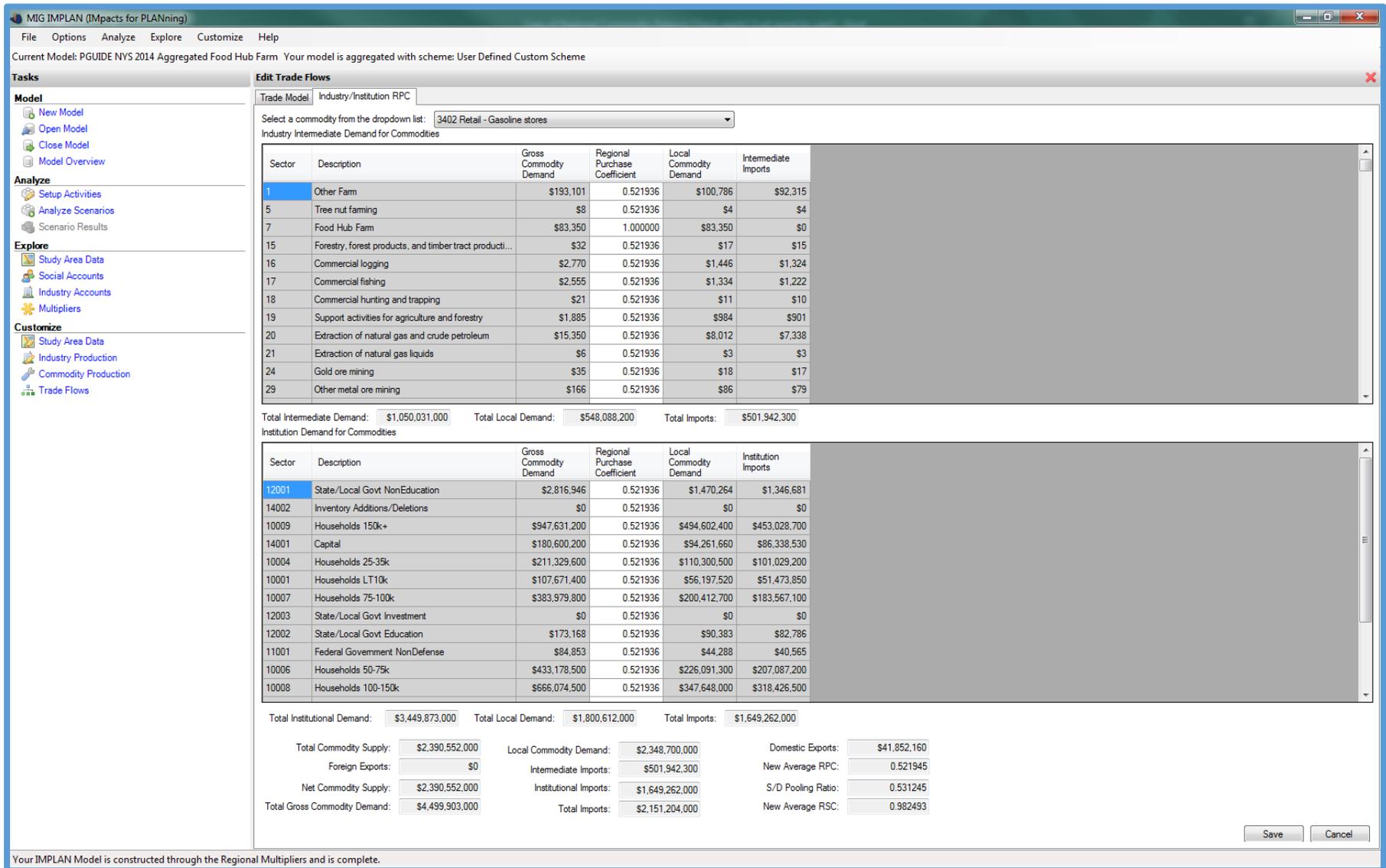


Figure 10. Corrected RPCs by Food Hub Farm Industry for Retail Gasoline.

**Table 8. Computations for Other Farm and Food Hub Farm Regional Commodity Balances.**

		Exported from ACCESS				Edited & Saved in ACCESS	
		Initial Aggregated Model		Aggregated Food Hub Farm Model		Aggregated Food Hub Farm Model	
Label	IMPLAN Variable Name	Farm	Tobacco	Other Farm	Food Hub Farm	Other Farm	Food Hub Farm
Commodity Code →		3001	3007	3001	3007	3001	3007
A	IndustryCommodityProduction	6560.1433	0.0000	6555.2210	5.0000	6555.2210	5.0000
B	InstitutionalCommoditySales	259.9622	2.7038	259.9622	2.7038	259.9622	0.0000
C=A+B	TotalCommoditySupply	6820.1055	2.7038	6815.1832	7.7038	6815.1832	5.0000
D	ForeignExports	447.8479	1.2446	447.8479	1.2446	447.8479	0.0000
E	ForeignTransshipments	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
F=C-D-E	NetCommoditySupply	6372.2576	1.4592	6367.3353	6.4592	6367.3353	5.0000
G	IntermediateCommodityDemand	9851.3814	69.5508	9849.3839	2.0972	9849.3839	2.0972
H	InstitutionalCommodityDemand	4023.1766	0.2695	4023.1766	0.2695	4020.9719	2.2047
I=G+H	TotalGrossCommodityDemand	13874.5580	69.8202	13872.5605	2.3667	13870.3558	4.3019
J	ForeignImportProportion	0.1273	0.5198	0.1273	0.5198	0.1273	0.0000
K=1-J	ForeignRPC	0.8727	0.4802	0.8727	0.4802	0.8727	1.0000
L=GxJ	ForeignIntermediateImports	1253.7806	36.1506	1253.5264	1.0901	1253.5264	0.0000
M=HxJ	ForeignInstitutionImports	512.0278	0.1401	512.0278	0.1401	511.7472	0.0000
N=L+M	ForeignImports	1765.8084	36.2907	1765.5541	1.2301	1765.2735	0.0000
O=G-L	DomesticIntermediateDemand	8597.6008	33.4001	8595.8575	1.0071	8595.8575	2.0972
P=H-M	DomesticInstitutionDemand	3511.1488	0.1294	3511.1488	0.1294	3509.2248	2.2047
Q=O+P	TotalDomesticCommodityDemand	12108.7497	33.5295	12107.0063	1.1366	12105.0823	4.3019
R	LocalSupplyToDomesticDemands	4915.1280	0.1760	4915.1280	0.1760	4910.8262	4.3019
S=R/Q	DomesticRPC	0.4059	0.0052	0.4060	0.1548	0.4057	1.0000
T=SxO	LocalSupplyToDomesticIntermediate	3489.8986	0.1753	3489.6934	0.1559	3487.1933	2.0972
U=SxP	LocalSupplyToDomesticInstitutional	1425.2294	0.0007	1425.4346	0.0200	1423.6329	2.2047
V=T+U	TotalLocalSupply	4915.1280	0.1760	4915.1280	0.1760	4910.8262	4.3019
W=O-T	DomesticIntermediateImports	5107.7022	33.2248	5106.1641	0.8512	5108.6642	0.0000
X=P-U	DomesticInstitutionImports	2085.9194	0.1287	2085.7142	0.1094	2085.5919	0.0000
Y=W+X	TotalDomesticImports	7193.6216	33.3536	7191.8783	0.9606	7194.2561	0.0000
Z=W+L	IntermediateImports	6361.4828	69.3755	6359.6905	1.9413	6362.1905	0.0000
AA=X+M	InstitutionalImports	2597.9472	0.2688	2597.7420	0.2495	2597.3391	0.0000
AB=Z+AA	TotalImports	8959.4300	69.6443	8957.4324	2.1907	8959.5296	0.0000
AC=R/I	AverageRPC	0.3543	0.0025	0.3543	0.0744	0.3541	1.0000
AD=C	TotalCommodityOutput	6820.1055	2.7038	6815.1832	7.7038	6815.1832	5.0000
AE=R/C	AverageRSC	0.7207	0.0651	0.7212	0.0228	0.7206	0.8604
AF=F-R	DomesticExports	1457.1296	1.2832	1452.2072	6.2832	1456.5091	0.6981
AG=F/I	DomesticSupply/DemandRatio	0.4593	0.0209	0.4590	1.0000	0.4591	1.0000
AH=R	TotalDomesticCommodityOutput	4915.1280	0.1760	4915.1280	0.1760	4910.8262	4.3019
AI=I/F	Demand/SupplyRatio	1.0000	1.0000	1.0000	0.3664	1.0000	0.8604
AJ=D/(D+AF)	ForeignExportProportion	0.2351	0.4924	0.2357	0.1653	0.2352	0.0000
AK=N/AB	ForeignImportToTotalImport	0.1971	0.5211	0.1971	0.5615	0.1970	0.0000

Notes: All dollar variables reported in millions of dollars. Cells shaded in yellow denote model changes made and saved in ACCESS prior to reopening the model in IMPLAN. Detailed notes on calculations are included in the EXCEL workbook as a companion to this written guide.

Updating the individual institutional sector demands follows next. To do so, copy the data for **Other Farm** (3001) and **Food Hub Farm** (3007) commodities from the *Regional Institution Demand* table in ACCESS to EXCEL. Edit the relevant demands, RPCs, and Foreign Import Proportions for both commodities, noting that demand additions in **Food Hub Farm** must be subtracted from the respective demands in **Other Farm**. Lacking additional detail for household demand for the **Food Hub Farm** commodity, we allocate total household demand (**Table 6**) evenly across all nine household categories. We also remove the institutional demands for tobacco still reflected in **Food Hub Farm** (similar to above). The RPCs and Foreign import Proportions for **Food Hub Farm** are one and zero, respectively, and follow from the calculations made for the *Regional Commodity Balances* table done previously. After editing, copy the updated values back into ACCESS. **Table 9** provides an illustration for our example and the companion workbook includes detailed computations and comments. Detailed steps follow in the fourth section of **Part 4** (4.10-4.13). At this point, save the model in ACCESS and close ACCESS.

The final set of updates to get the trade flows correct are done back in IMPLAN. At this point, the industry demands for the **Food Hub Farm** commodity (3007), as well as the RPCs for them still hold from the previous edits completed in IMPLAN. In addition, the institutional demands (households) and RPCs reflect the changes made in ACCESS. Accordingly, the summary values of supplies, demands, imports, and exports are correct and follow from the previous updates. No additional changes are necessary for the **Food Hub Farm** commodity (see **Figure 11**). However, one final set of changes are required for the **Other Farm** commodity (3001). While the demands (industry and institutional) are now updated based on the corrections in ACCESS, only the updated RPCs for institutions are reflected. The RPCs for the industry demands should match the RPCs for the institutional demands and reflect the average RPC you calculated earlier; i.e., when updating *Regional Commodity Balances*. These are updated within IMPLAN (see **Figure 12**). Detailed steps follow in the last section of **Part 4** (4.14-4.17).

At this point, the development of your model is complete and you are ready to estimate impacts! You can review the multipliers of the final sectors in your model, by going to *Explore > Multipliers*. A useful comparison is between the computed multipliers for the **Food Hub Farm** and **Other Hub Farm** industries. In our example, the output, employment, and labor income multipliers are 1.775 versus 1.516, 1.271 versus 1.412, and 1.640 versus 1.611, respectively.

**Table 9. Other Farm and Food Hub Farm Regional Institutional Demand.**

Exported from ACCESS					Edited and saved in ACCESS				
Type Code	Commodity Code	Gross Institution Demand	RPC	Foreign Import Proportion	Type Code	Commodity Code	Gross Institution Demand	RPC	Foreign Import Proportion
10003	3001	207.1683	0.3543	0.1971	10003	3001	206.9233	0.3541	0.1273
10001	3001	127.2605	0.3543	0.1971	10001	3001	127.0155	0.3541	0.1273
11003	3001	0.0000	0.3543	0.1971	11003	3001	0.0000	0.3541	0.1273
11002	3001	0.1072	0.3543	0.1971	11002	3001	0.1072	0.3541	0.1273
14002	3001	83.7236	0.3543	0.1971	14002	3001	83.7236	0.3541	0.1273
14001	3001	0.0000	0.3543	0.1971	14001	3001	0.0000	0.3541	0.1273
12002	3001	21.8814	0.3543	0.1971	12002	3001	21.8814	0.3541	0.1273
10007	3001	509.8656	0.3543	0.1971	10007	3001	509.6206	0.3541	0.1273
10004	3001	215.7681	0.3543	0.1971	10004	3001	215.5232	0.3541	0.1273
10002	3001	83.7189	0.3543	0.1971	10002	3001	83.4740	0.3541	0.1273
12003	3001	0.0000	0.3543	0.1971	12003	3001	0.0000	0.3541	0.1273
10005	3001	324.8025	0.3543	0.1971	10005	3001	324.5575	0.3541	0.1273
10006	3001	573.0961	0.3543	0.1971	10006	3001	572.8511	0.3541	0.1273
11001	3001	0.0000	0.3543	0.1971	11001	3001	0.0000	0.3541	0.1273
12001	3001	204.1395	0.3543	0.1971	12001	3001	204.1395	0.3541	0.1273
10009	3001	928.6417	0.3543	0.1971	10009	3001	928.3968	0.3541	0.1273
10008	3001	743.0031	0.3543	0.1971	10008	3001	742.7582	0.3541	0.1273
10001	3007	0.0000	0.0744	0.5615	10001	3007	0.2450	1.0000	0.0000
10007	3007	0.0000	0.0744	0.5615	10007	3007	0.2450	1.0000	0.0000
12003	3007	0.0000	0.0744	0.5615	12003	3007	0.0000	0.0000	0.0000
14001	3007	0.0000	0.0744	0.5615	14001	3007	0.0000	0.0000	0.0000
10004	3007	0.0000	0.0744	0.5615	10004	3007	0.2450	1.0000	0.0000
11002	3007	0.0000	0.0744	0.5615	11002	3007	0.0000	0.0000	0.0000
11003	3007	0.0000	0.0744	0.5615	11003	3007	0.0000	0.0000	0.0000
10009	3007	0.0000	0.0744	0.5615	10009	3007	0.2450	1.0000	0.0000
11001	3007	0.0000	0.0744	0.5615	11001	3007	0.0000	0.0000	0.0000
10008	3007	0.0000	0.0744	0.5615	10008	3007	0.2450	1.0000	0.0000
10003	3007	0.0000	0.0744	0.5615	10003	3007	0.2450	1.0000	0.0000
12001	3007	0.2695	0.0744	0.5615	12001	3007	0.0000	0.0000	0.0000
12002	3007	0.0000	0.0744	0.5615	12002	3007	0.0000	0.0000	0.0000
10005	3007	0.0000	0.0744	0.5615	10005	3007	0.2450	1.0000	0.0000
10002	3007	0.0000	0.0744	0.5615	10002	3007	0.2450	1.0000	0.0000
14002	3007	0.0000	0.0744	0.5615	14002	3007	0.0000	0.0000	0.0000
10006	3007	0.0000	0.0744	0.5615	10006	3007	0.2450	1.0000	0.0000

Notes: Demands reported in millions of dollars. Cells shaded in yellow denote model changes made and saved in ACCESS prior to reopening the model in IMPLAN. Detailed notes on calculations are included in the EXCEL workbook as a companion to this written guide.

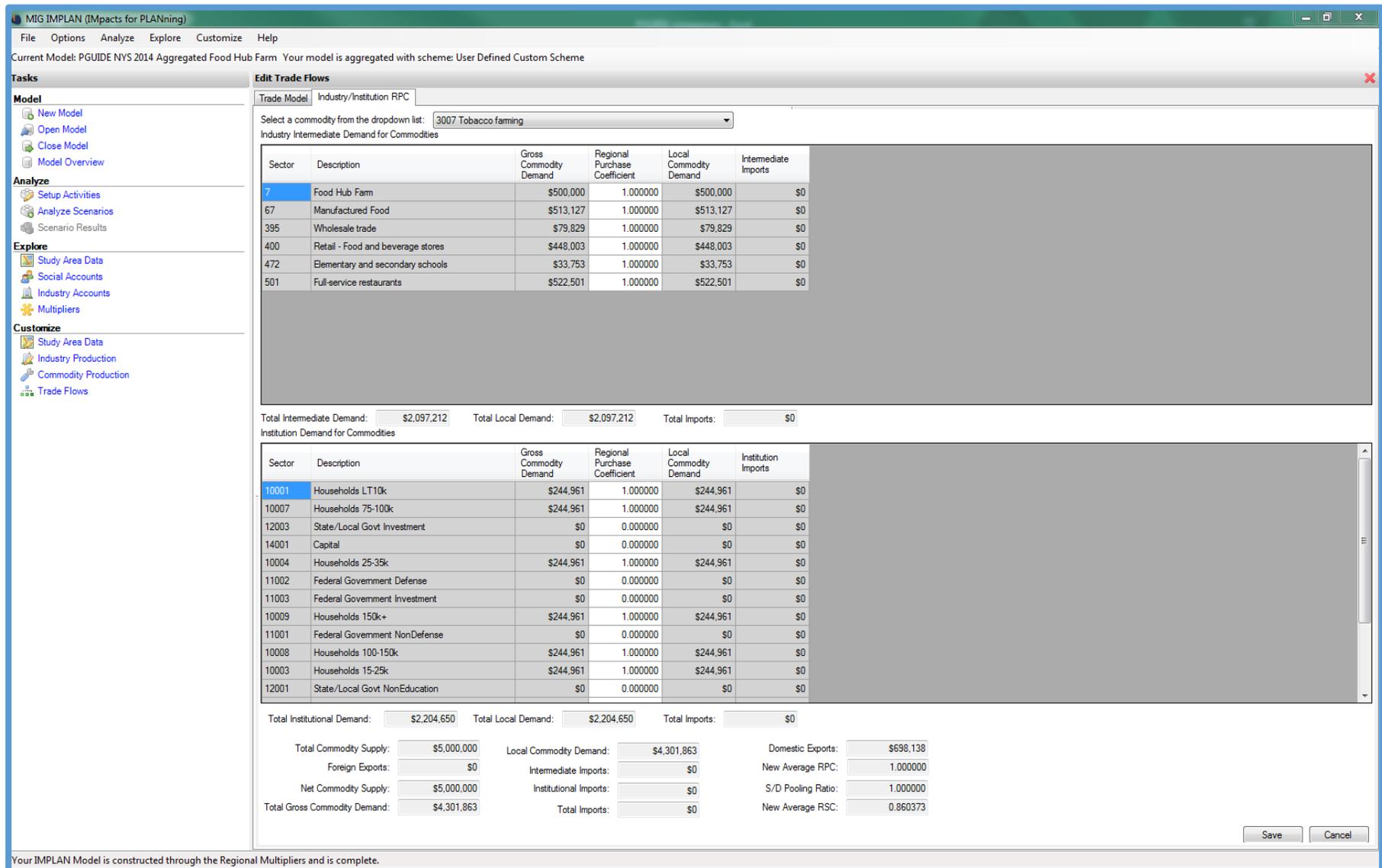


Figure 11. Final Demands, Supplies, and RPCs for the Food Hub Farm Commodity.

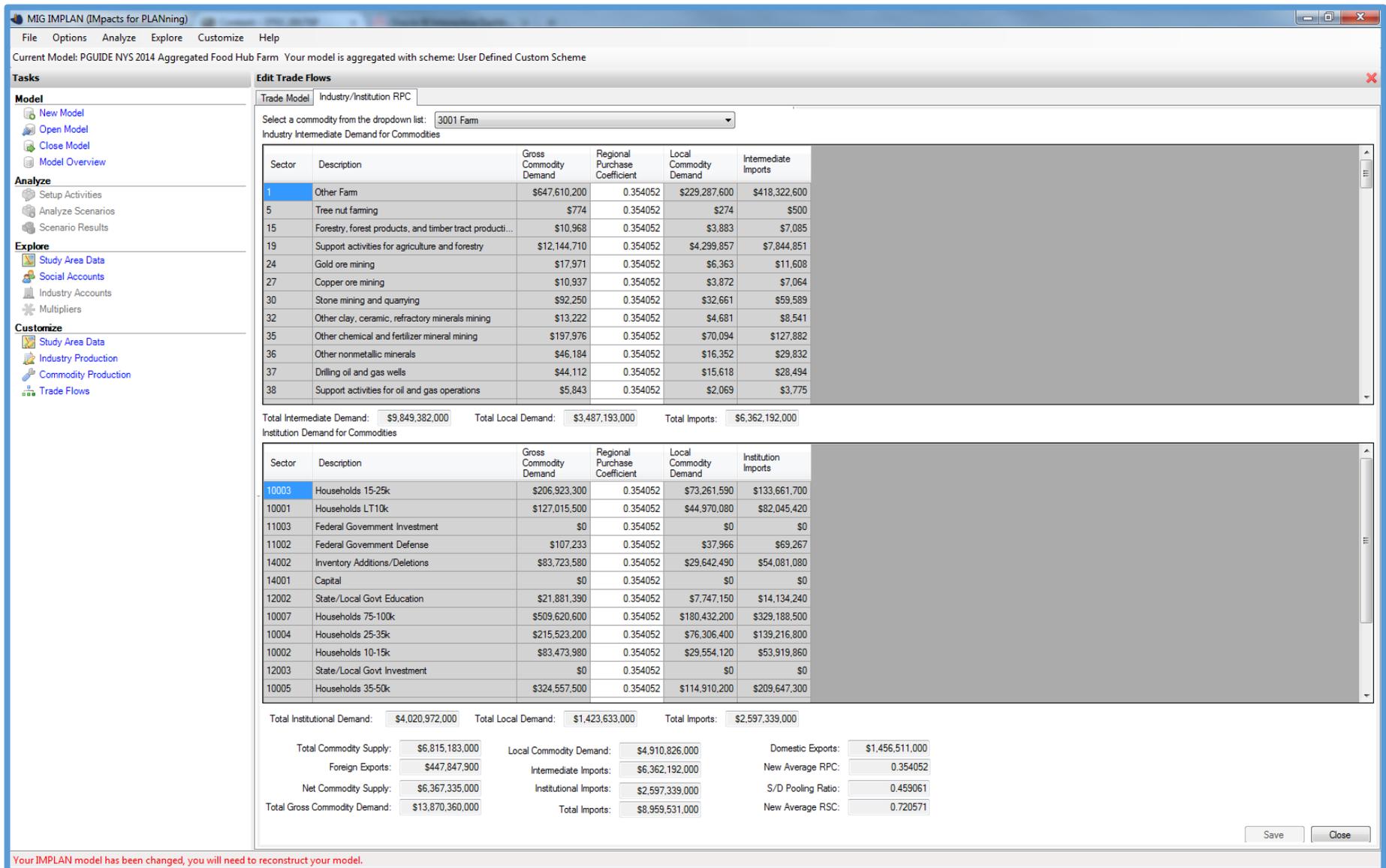


Figure 12. Final Demands, Supplies, and RPCs for the Other Farm Commodity.

## 5. IMPACT ANALYSIS

Once the IMPLAN model is customized to reflect a distinct **Food Hub Farm** sector, we can perform the impact analysis. Recall from our discussion earlier that a food hub sector does not exist within IMPLAN. Accordingly, we model a change in final demand for food hub goods and services based on how its revenues are allocated to component expenditures, an analytically equivalent method known as analysis-by-parts (ABP) within IMPLAN. ABP allows you to create a customized industry based on IMPLAN's pre-created spending patterns, based on your own budgetary spending pattern, or based on a combination of both. In our case, we utilize ABP to estimate impacts based on the spending pattern data collected from the food hub; i.e., from Tables 1 and 2.<sup>10</sup>

As a food hub's production ramps up due to the increase in final demand (i.e., the direct effect), its expenditures represent increasing demand for inputs from other local sectors (i.e., the indirect effect) and from imports. It is the portion of spending that occurs locally that drives the impact estimates. In other words, only a portion of input expenditures are incurred with local firms, and it is only these local expenditures that are included in the impact analysis (i.e., as first-round indirect effects). The non-local purchases represent leakage from the local economy. In general, only a portion of value added outlays are regarded as generating impact. While spending on EC and PI generate induced impacts in the local economy, outlays to OPTI and TOPI are generally excluded. Similarly, payments to government institutions (e.g., for municipal water) are excluded. This is because government policy decisions and long-term investment income do not typically follow the same re-spending patterns as other kinds of value added outlays. An example may be helpful here. Consider a \$100 increase in final demand for food hub products. To satisfy this increase in demand, the food hub spends \$60 to input sectors (e.g., products from farms and food processors, insurance and utilities costs), \$25 to EC, \$10 to PI, and \$5 on TOPI. The \$100 represents the direct output effect. If one-half of the inputs (\$30) are procured locally, the other \$30 represent leakage. The \$25 and \$10 value added components are included in assessing impact, but the \$5 in tax payments are not.

### 5.1 Quantifying the Direct Effects

To quantify a reasonable scenario for evaluating an increase in final demand for food hub products and services, we recommend collecting information from customers as discussed above. In our example, let us suppose that customers reported an interest in purchasing an additional 25% of products from the food hub, or a \$250,000 increase in demand for food hub products.<sup>11</sup> With ABP, this positive shock is allocated to the levels of intermediate input purchases and value added outlays necessary to support it, and follow from the expense shares and LPPs included in **Tables 1 and 2**. The direct effect in terms of output is the \$250,000, while the corresponding direct effects for employment, labor income, and total value added (TVA) can be computed based on each of their requirements per dollar of output (sales). For our example, based on the food hub's current production pattern (**Table 1**), 0.004 employees are required per \$1,000 in output, while \$0.375 of labor income and \$0.440 of total value added are required per dollar of output. By simple computation then, the direct effects for employment, labor income, and TVA are 1.0, \$93,750, and \$110,000, respectively.

Note that relatively large changes in final demand for food hub products are likely to change its production function profile; e.g., the food hub may increase automated for human labor operations, or change the levels and locations of where they purchase intermediate inputs. If this information is known, the new GACs, RPCs, and value added outlays should be used in estimating impact. In our case, we use the current spending patterns of the food hub in estimating impacts, even though our increase in final demand is relatively large.

### 5.2 Quantifying Opportunity Costs

In addition to the positive shock from an increase in demand for food hub products, we need to consider possible negative impacts due to decreased spending by purchasers in other sectors as a consequence of their increase in purchases of food hub products. From the customer survey results, you should have generated an estimate of how much of the increase in demand for food hub purchases involves a shift of demand away from other sectors. For

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<sup>10</sup> See IMPLAN's *Case Study: Analysis-by-Parts* or *The Basics of Analysis-by-Parts* for more information at [support.implan.com](http://support.implan.com).

<sup>11</sup> Recall, that total sales by the food hub in our example were \$1,000,000 (**Table 3**).

our analysis, we assume that these offsets would occur in the **Wholesale Trade** (3395).<sup>12</sup> Thus, in addition to the positive shock for increasing food hub goods and services, a simultaneous negative shock accounts for the offset in purchases from other sectors. Since these are wholesale purchases in our example, margins are applied. For ease of exposition, assume for our example that, on average, for every additional dollar of food hub products purchased, ten cents worth of purchases are decreased in wholesale commodities (i.e., a 10% offset). With an output (sales) increase of \$250,000 of food hub products, this implies a total negative shock of \$25,000 that is margined between the **Wholesale** (3395) and produced (**Other Farm, Manufactured Food**) commodities.<sup>13</sup>

### 5.3 Analysis-by-Parts (ABP)

You now have sufficient information to construct your impact analysis in IMPLAN using ABP. To do so requires you to set up activities that reflect the spending pattern of the food hub for intermediate inputs, value added outlays for the labor income components, and opportunity costs. In each of the activities, you define a set of events, and then define a scenario that includes your activities. Once the scenario is analyzed the results are displayed in IMPLAN.

Intermediate input purchases are entered using the *Industry Spending Pattern* type of *Activity* and where the individual events within this activity include the individual commodity levels purchased, along with their LPPs (**Tables 1 and 2**). For commodities listed more than once in **Tables 1 and 2** (due to margining), the expense shares are combined into one *Event* and a weighted average LPP assigned. The level of the *Activity* follows from the increase in final demand, \$250,000 for our example. Detailed steps follow in the first section of **Part 5** (5.1-5.2) and with the results from our example illustrated in **Figure 13**.

Outlays for EC and PI are represented with *Labor Income Change* activities. The values defined under *Events* are based on the food hub's current production pattern (**Table 1**), where the amount of EC and PI per dollar of output (\$0.260 and \$0.115, respectively, in our example) are multiplied by the increase in food hub products and services (\$250,000 in our example). LPPs assigned are based on the data collected from the food hub. Detailed steps follow in the second and third sections of **Part 5** (5.3-5.6) with the results from our example illustrated in **Figures 14 and 15**.

Opportunity costs are entered with an *Industry Spending Pattern Activity*, with the level set as the total opportunity cost value (-\$25,000 in our case). *Events* are entered with coefficients that sum to one and reflecting the margins applied, if applicable. Since the detailed nature of these reduced purchases are generally unknown (i.e., local or non-local), LPPs can be assigned by IMPLAN's *SAM Model Value*. Detailed steps follow in the fourth section of **Part 5** (5.7-5.9) with the results from our example illustrated in **Figure 16**.

The final steps involve *Analyzing Scenarios* for the *Activities* previously. A new *Scenario* is named and the relevant *Activities* selected (**Figure 17**). After clicking on *Analyze Single Region* (we do not consider multi-regional impact models in this guide), the results are computed and a screen prompts you to review the results. Detailed steps follow in the last section of **Part 5** (5.10-5.14) with the results from our example illustrated in **Figure 18**.

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<sup>12</sup> Based on Jablonski, Schmit and Kay (2016), business customers reported decreasing purchases from other food distributors, which are included in IMPLAN's wholesale trade sector (395).

<sup>13</sup> Supply-side opportunity costs may also be relevant based on the nature of the research objectives and study area conditions. For example, if the increase in demand for food hub products is met by a reallocation of acres by farmers to food hub food crops (e.g., tomatoes) and away from other crops (e.g., soybeans) the loss in soybean output should also be included.

## Part 5: Analysis-by-Parts

- 5.1 First, enter the **Industry Spending Pattern** for your food hub, along with the level of the direct output effect. To do this, select *Analyze > Setup Activities > New Activity > Industry Spending Pattern*. Name the activity **Intermediate Input Purchases**. Set the *Activity Level* to the increase in demand for the food hub's products and services; i.e., the direct output effect (in our example, \$250,000). Click *Save*.
- 5.2 Select a *New Event* for each intermediate input commodity purchased. For commodities listed more than once in **Tables 1 and 2** (due to margining), combine the expense shares into one event and compute a weighted average LPP, based on the relative levels of the expenses. Select each commodity from the *Sector* column and enter the expense share under *Coefficient*. The value in the *Local Purchase Percentage* column will be 100% by default, change as necessary based on the LPPs listed in **Tables 1 and 2**; i.e., select *Event Options > Edit Event Properties > Local Purchase Percentage > User LPC*. A screen will pop up labeled *Custom Local Percent*, enter the LPP, and click *OK*. Note that the food hub purchases the **Food Hub Farm** commodity (3007, **Tobacco farming**, in our example). Once all commodity values are entered, the *Sum of Event Values* at the bottom of the screen will equal the total intermediate input expense shares from **Table 1**. See **Figure 13** for an illustration.
- 5.3 Now define a new activity to represent the labor income change for EC. To do this, select *New Activity > Labor Income Change*. Name the activity **Employee Compensation**. Set the *Activity Level* to 1. Click *Save*.
- 5.4 Select *New Event* and select *5001 Employee Compensation*. Enter the change in EC associated with the increase in demand for food hub products and services. Based on the food hub's production pattern for our example (**Table 1**), \$0.260 of EC are required per dollar of output. Multiplying this value by the increase in demand (sales) yields a *Labor Income Value* of \$65,000 ( $\$0.260 \times \$250,000$ ). After entering this value, edit the LPP, if necessary. For our example, all employees are local. See **Figure 14** for an illustration.
- 5.5 Now define a new activity to represent the labor income change for PI. To do this, select *New Activity > Labor Income Change*. Name the activity **Proprietor Income**. Set the *Activity Level* to 1. Click *Save*.
- 5.6 Select *New Event* and select *6001 Proprietor Income*. Enter the change in PI associated with the increase in demand for food hub products and services. Based on the food hub's production pattern for our example (**Table 1**), \$0.115 of PI are required per dollar of output. Multiplying this value by the increase in demand (sales) yields a *Labor Income Value* of \$28,500 ( $\$0.115 \times \$250,000$ ). After entering this value, edit the LPP, if necessary. For our example, all proprietors are local. See **Figure 15** for an illustration.
- 5.7 Add activities for any opportunity costs. In our case, we assume a 10% offset in purchases from wholesalers. Since the reduced purchases are at the wholesale level, margins are applied. Select *New Activity > Industry Spending Pattern*, name the activity **Opportunity Cost Wholesale Trade**, and set the *Activity Level* equal to the opportunity costs (in our case, minus \$25,000). Click *Save*.
- 5.8 Select *New Event* and select **Wholesale Trade** (3395). We know from earlier (footnote 6) that the weighted average wholesale trade margin for farm and processed food products in our example is 0.1004. Enter this value under *Coefficient*. Since we do not know the nature of these reduced purchases (i.e., local or non-local), select *Event Options > Edit Event Properties > Local Purchase Percentage > Set to SAM Model Value* to use the default value in IMPLAN.
- 5.9 To account for the margin values of the farm and processed food products associated with the reduced wholesale purchases, allocate the remaining opportunity costs to these commodities. In our case, the remaining margin (\$22,490) is allocated between **Other Farm** (\$8,434, 0.33736) and **Manufactured Food** (\$14,056, 0.56224) based on the relative values of these products purchased by the food hub. Since we do not know the nature of these reduced purchases (i.e., local or non-local), select *Event Options > Edit Event Properties > Local Purchase Percentage > Set to SAM Model Value*. See **Figure 16** for an illustration.
- 5.10 The final step involves *Analyzing Scenarios* for the *Activities* defined above. Following 5.9, click *Next*.
- 5.11 You are now on the *Analyze Scenarios* screen. If this is the first *Scenario* you are creating, a screen will open asking for *The Name of Your New Scenario* and to enter the *Scenario Level*. Choose a name descriptive enough to understand the *Activities* you will include in it. For our example, we entered *Food Hub \$250K Output with Opp Cost*. Set the *Scenario Level* to 1. Click *Save*.
- 5.12 The *Activities* you set up previously show on the left side of the screen under *Available Activity(s)*. Select all *Activities* that you would like to include in your *Scenario*. In our example, all four are selected. See **Figure 17** for an illustration. If you would like to see impact results without opportunity costs, define a separate *Scenario* that excludes the *Activity* associated with it.
- 5.13 Click *Analyze Single Region* (we do not consider multi-region models in this guide).
- 5.14 A *Run Analysis* screen will pop up stating *Analysis complete. Do you want to view the results?* Click *Yes*. See **Figure 18** for an illustration of the results screen for our example.

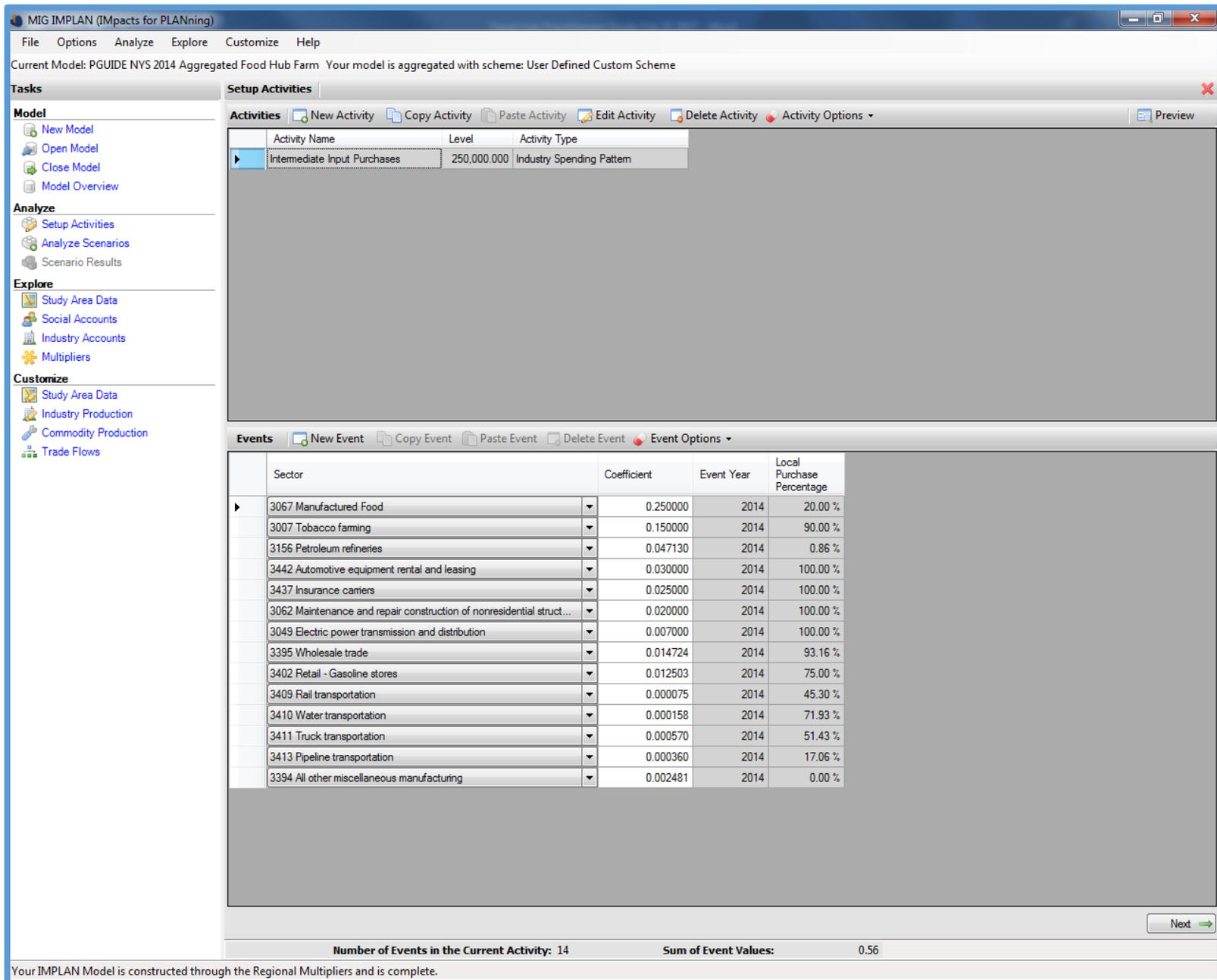


Figure 13. Industry Spending Pattern Activity for the Food Hub Increase in Final Demand.

MIG IMPLAN (IMpacts for PLANning)

File Options Analyze Explore Customize Help

Current Model: PGUIDE NYS 2014 Aggregated Food Hub Farm Your model is aggregated with scheme: User Defined Custom Scheme

**Tasks**

**Model**

- New Model
- Open Model
- Close Model
- Model Overview

**Analyze**

- Setup Activities
- Analyze Scenarios
- Scenario Results

**Explore**

- Study Area Data
- Social Accounts
- Industry Accounts
- Multipliers

**Customize**

- Study Area Data
- Industry Production
- Commodity Production
- Trade Flows

**Setup Activities**

Activities New Activity Copy Activity Paste Activity Edit Activity Delete Activity Activity Options Preview

Activity Name	Level	Activity Type
Intermediate Input Purchases	250,000.000	Industry Spending Pattern
Employee Compensation	1.000	Labor Income Change

**Events** New Event Copy Event Paste Event Delete Event Event Options

Sector	Labor Income Value	Event Year	GDP Deflator	Local Purchase Percentage
5001 Employee Compensation	\$65,000.00	2014	1.000	100.00 %

Number of Events in the Current Activity: 1      Sum of Event Values: 65,000.00

Your IMPLAN Model is constructed through the Regional Multipliers and is complete.

Figure 14. Employee Compensation Activity for the Food Hub Increase in Final Demand.

MIG IMPLAN (IMpacts for PLANning)

File Options Analyze Explore Customize Help

Current Model: PGUIDE NYS 2014 Aggregated Food Hub Farm Your model is aggregated with scheme: User Defined Custom Scheme

**Tasks**

**Model**

- New Model
- Open Model
- Close Model
- Model Overview

**Analyze**

- Setup Activities
- Analyze Scenarios
- Scenario Results

**Explore**

- Study Area Data
- Social Accounts
- Industry Accounts
- Multipliers

**Customize**

- Study Area Data
- Industry Production
- Commodity Production
- Trade Flows

**Setup Activities**

Activities

Activity Name	Level	Activity Type
Intermediate Input Purchases	250,000.000	Industry Spending Pattern
Employee Compensation	1.000	Labor Income Change
Proprietor Income	1.000	Labor Income Change

**Events**

Sector	Labor Income Value	Event Year	GDP Deflator	Local Purchase Percentage
6001 Proprietor Income	\$28,500.00	2014	1.000	100.00 %

Number of Events in the Current Activity: 1      Sum of Event Values: 28,500.00

Your IMPLAN Model is constructed through the Regional Multipliers and is complete.

Figure 15. Proprietor Income Activity for the Food Hub Increase in Final Demand.

MIG IMPLAN (IMpacts for PLANning)

File Options Analyze Explore Customize Help

Current Model: PGUIDE NYS 2014 Aggregated Food Hub Farm Your model is aggregated with scheme: User Defined Custom Scheme

**Tasks**

**Model**

- New Model
- Open Model
- Close Model
- Model Overview

**Analyze**

- Setup Activities
- Analyze Scenarios
- Scenario Results

**Explore**

- Study Area Data
- Social Accounts
- Industry Accounts
- Multipliers

**Customize**

- Study Area Data
- Industry Production
- Commodity Production
- Trade Flows

**Setup Activities**

Activities

Activity Name	Level	Activity Type
Intermediate Input Purchases	250,000.000	Industry Spending Pattern
Employee Compensation	1.000	Labor Income Change
Proprietor Income	1.000	Labor Income Change
▶ Opportunity Cost Wholesale Trade	-25,000.000	Industry Spending Pattern

**Events**

Sector	Coefficient	Event Year	Local Purchase Percentage
3395 Wholesale trade	0.100400	2014	95.11 %
3001 Farm	0.337360	2014	35.41 %
▶ 3067 Manufactured Food	0.562240	2014	20.06 %

Number of Events in the Current Activity: 3      Sum of Event Values: 1.00

Next →

Your IMPLAN Model is constructed through the Regional Multipliers and is complete.

Figure 16. Opportunity Cost Activity for the Food Hub Increase in Final Demand.

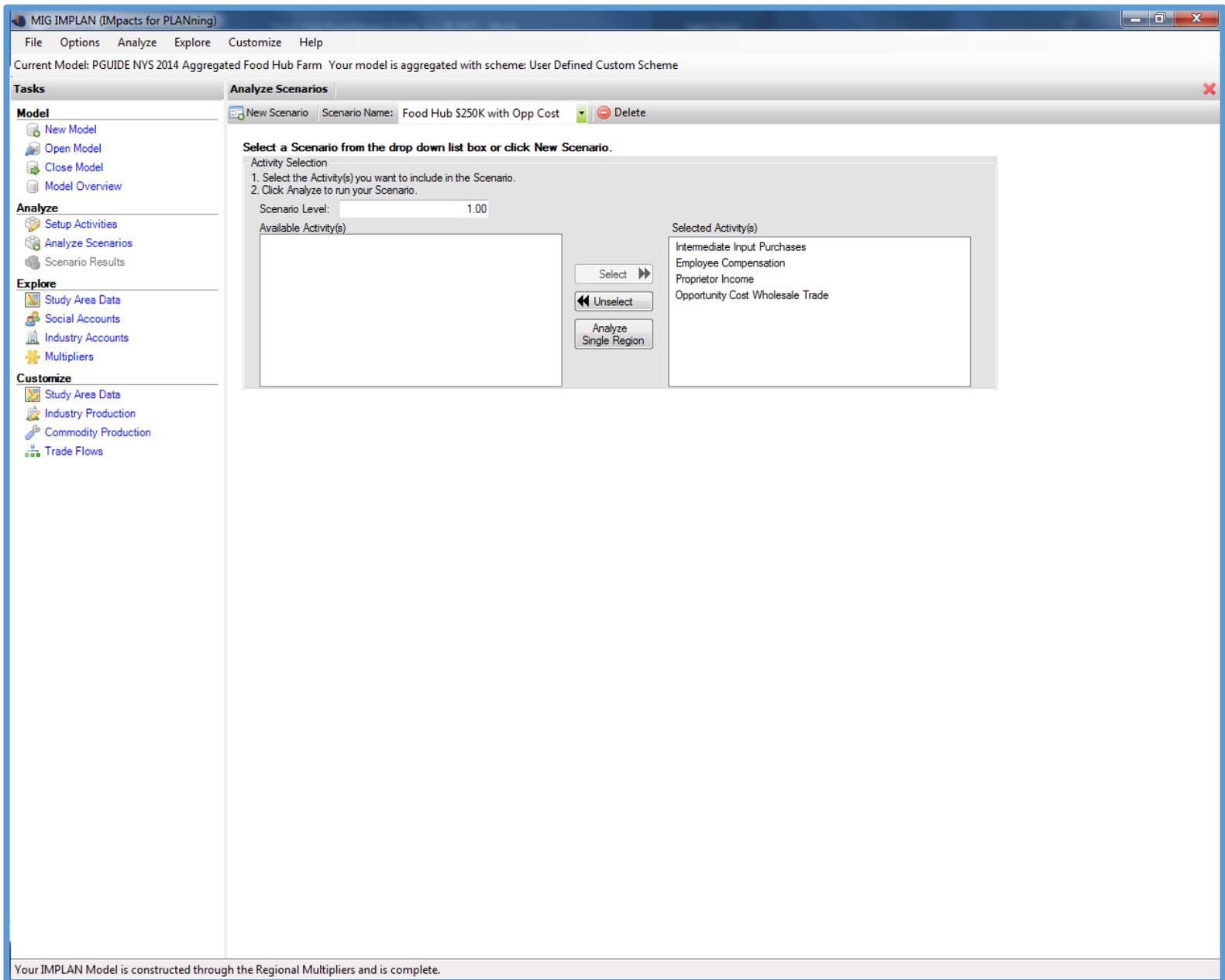


Figure 17. The Analyze Scenario Screen after Selecting Activities.

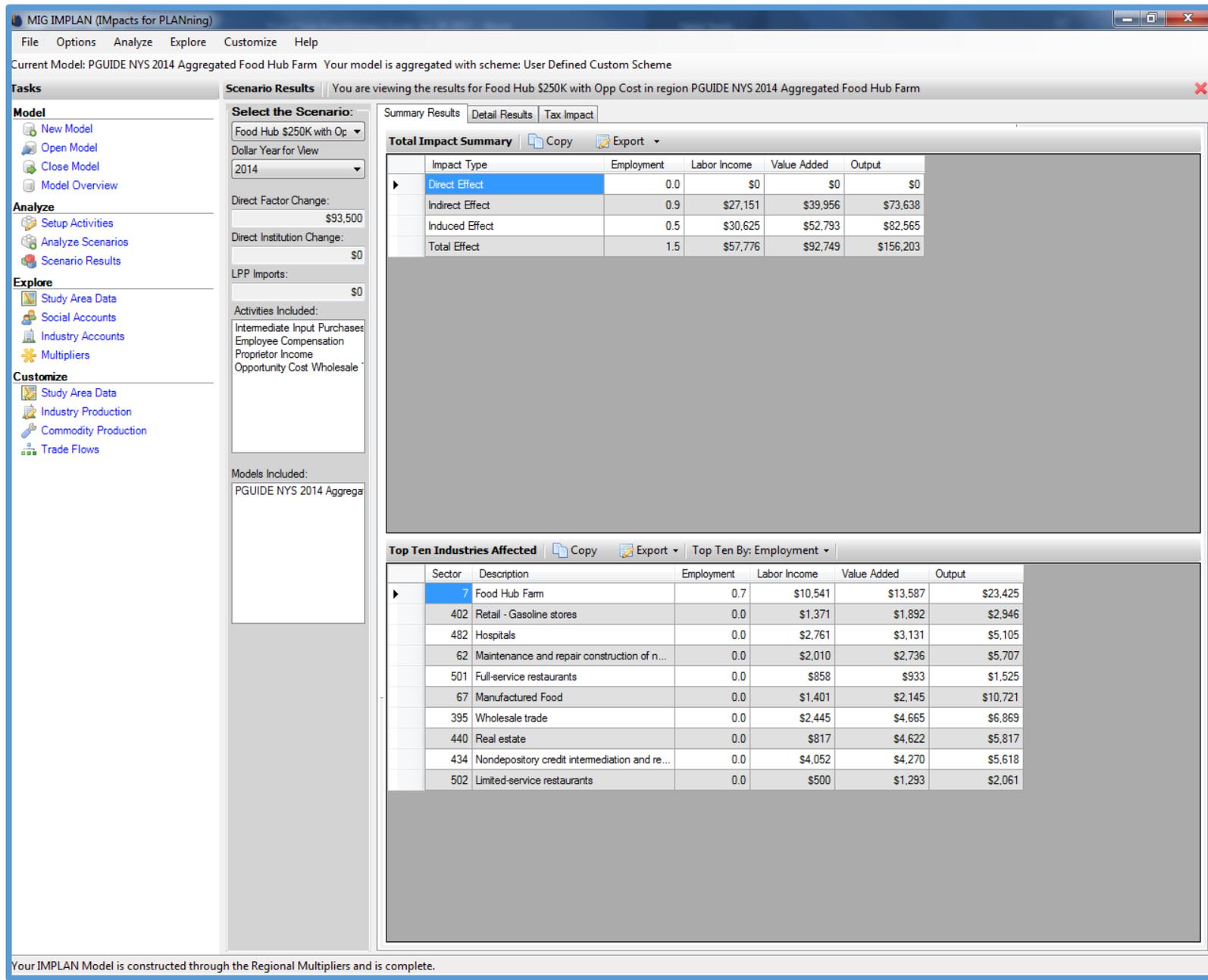


Figure 18. The Scenario Results Screen, Summary Results.

## 5.4 Interpreting Results

Congratulations! You have made it to the fun part - interpreting your results. IMPLAN displays the impact results in a number of ways; i.e., a summary report that covers the total economic impacts, detailed results by type of impact (i.e., employment, output, labor income, and combined and individual value added components), and a tax impact report. Under ABP, IMPLAN does not show any direct effects (see [Figure 17](#) for our example) since you defined them through their allocations of outlays (i.e., industry spending and labor income components). In other words, by using ABPs, you have essentially provided the first round of indirect effects through the industry spending patterns and of induced effects through the labor income changes.

The food hub for our example sells food products purchased for resale (i.e., **Food Hub Farm** and **Manufactured Food** commodities) like a traditional wholesale distributor, as well as services (e.g., freight/trucking services). In IMPLAN, service sector output is the value of the hired services and does not require margining. If the food hub was defined as two separate industries by type of output (i.e., one each for the wholesale and service components), this would require margining on the former, but not on the latter. By using ABPs, where the complete spending pattern is defined, we avoid this complication. However, since the value of the cost of goods sold are included in the food hub's spending pattern (normally excluded from a wholesale margin) and, therefore, is included in the direct effect for output, this implies that the farm and processed food purchase components represent expanded production from the underlying production sectors. This is appropriate in the context of the analysis presented here.

### 5.4.1. Summary Results

The generative impacts of the increase in final demand for food hub products and services for our example are displayed in the top section of [Table 10](#), along with the direct effects (computed earlier) and the implied multiplier for each component (total effect divided by direct effect).<sup>14</sup> As illustrated, for every additional employee added to the food hub's payrolls, an additional 1.46 jobs are generated in backward-linked industries (employment multiplier = 2.46). Here, the employment multiplier effects are relatively strong, particularly contributing from the linkages to the **Food Hub Farm** sector (see detailed results). Similarly, the initial \$250,000 of direct final demand output generates a total of over \$406,000 of output impact when all indirect and induced effects are considered, resulting in an implied output multiplier of 1.62.

It may be useful to compare your multiplier results with other industries in your study area. However, since the multipliers computed above include opportunity costs, direct comparisons are problematic. To compute the implied multipliers without opportunity costs, simply create a new scenario in IMPLAN that excludes the opportunity cost activity. The summary results for this scenario are shown in the bottom section of [Table 10](#).

**Table 10. Summary of Impact Results, with and without Opportunity Costs.**

<b>Impact Type</b>	<b>Employment</b>	<b>Labor Income</b>	<b>Value Added</b>	<b>Output</b>
<b>With Opportunity Costs</b>				
Direct Effect	1.00	\$93,750	\$110,000	\$250,000
Indirect Effect	0.92	\$27,151	\$39,956	\$73,638
Induced Effect	0.54	\$30,625	\$52,793	\$82,565
<b>Total Effect</b>	<b>2.46</b>	<b>\$151,526</b>	<b>\$202,749</b>	<b>\$406,203</b>
<b>Implied Multiplier</b>	<b>2.46</b>	<b>1.62</b>	<b>1.84</b>	<b>1.62</b>
<b>Without Opportunity Costs</b>				
Direct Effect	1.00	\$93,750	\$110,000	\$250,000
Indirect Effect	1.00	\$30,168	\$45,449	\$84,498
Induced Effect	0.60	\$31,389	\$54,111	\$84,627
<b>Total Effect</b>	<b>2.60</b>	<b>\$155,307</b>	<b>\$209,560</b>	<b>\$419,125</b>
<b>Implied Multiplier</b>	<b>2.60</b>	<b>1.66</b>	<b>1.91</b>	<b>1.68</b>

<sup>14</sup> Computations for our example are included in the companion workbook to this guide (PGUIDE companion.xlsx, Impact Summary worksheet).

## 5.4.2 Detailed Results

Given the objectives of your study, it may be useful to examine the industries primarily affected by the food hub demand expansion; i.e., through the distribution of indirect and induced effects. **Figure 19** illustrates the first page of detailed results for output (considering opportunity costs) in our example, with the industry sectors sorted by total effect (indirect + induced). Not surprisingly, of the total indirect and induced effects (\$156,203), the top two affected industries are the **Food Hub Farm** (\$23,425) and **Manufactured Food** (\$10,721) sectors, almost entirely from indirect effects and from where the food hub's primary purchases accrue. Note that the positive indirect effect from the food hub demand expansion for **Manufactured Food** is moderated, in part, by the negative margin component effect from the portion of opportunity costs allocated to this sector.

The effects on the **Insurance carrier** sector (437) is the next largest, following from a relatively large food hub expenditure category, but also due to the addition of induced effects reflecting spending out of labor income changes by households for insurance products. Effects on the **Owner-occupied dwellings** sector (441) is the next largest, accruing entirely from induced effects and reflecting spending out of labor income changes by households for the costs of home ownership.<sup>15</sup>

The effects on **Wholesale trade** (395) follow next and are a combination of the positive impacts from the food hub demand expansion (indirect), the negative effects of the opportunity costs (indirect), and the related effects from spending out of the labor income changes (induced). The combined effect in our example is a positive \$6,869. While not shown in **Figure 19**, some industry effects are negative (on net), reflecting the opportunity costs activity included in this example. Specifically, negative industry effects accrue on net to **Other Farm** (sector 1, -\$1,652), **Support activities for agriculture and food** (sector 19, -\$47), **Other animal food manufacturing** (sector 66, -\$30), and **Farm machinery and equipment manufacturing** (sector 262, -\$1). In other words, from the negative shock applied to the **Other Farm** sector initially (for the opportunity costs), and the backward linked sectors from which **Other Farm** purchases inputs. Given the relatively large number of industries in your disaggregate model (467 with positive output in our example), you will likely want to aggregate some sectors when summarizing your impact results, perhaps at the two- or three-digit NAICS level.<sup>16</sup>

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<sup>15</sup> Specifically, this sector represents the imputed rental activity for owner-occupied dwellings; i.e., what owner occupants would pay in rent if they rented rather than owned their homes. In other words, IMPLAN creates an industry out of owning a home, where its production function represents repair and maintenance of that home. Output for the sector is ownership and is purchased entirely from the household sector. More details are included in *Special Sector Definitions* at support.implan.com.

<sup>16</sup> Detailed information for the two and three digit NAICS aggregation schemes for the 536 IMPLAN sectors is available at support.implan.com and included within the IMPLAN software (*Options > Aggregation*).

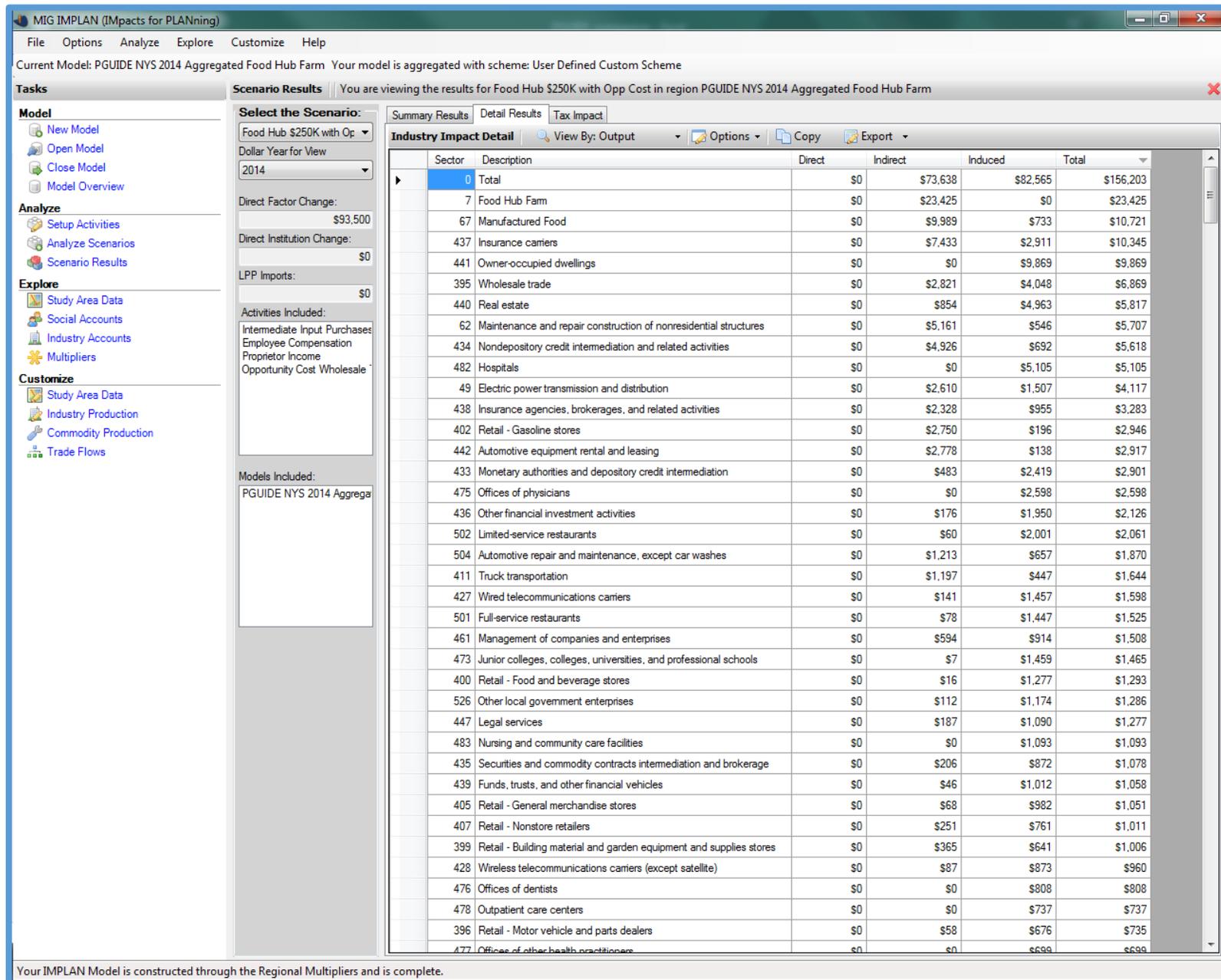


Figure 19. The Scenario Results Screen, Detail Results for Output.

## 6. SUMMARY

Congratulations! If you have made it this far, you have now completed an economic impact assessment for a food hub (real or planned) using the IMPLAN software, with a combination of default/secondary data from IMPLAN and your own primary data collection efforts. The guide provides you with a systematic approach to follow and includes revising your model from both within and outside (via ACCESS) the IMPLAN software. The guide is limited to a single region analysis, but includes advice on transforming food hub and farm financial data to appropriate IMPLAN sectors, where and how margining is applied, and detailed instructions along the way. The guide is also useful beyond the food hub focus to any researcher creating a new sector in IMPLAN or, as done here, separating an existing sector (e.g., **Farm**) into two sectors (e.g., **Food Hub Farm** and **Other Farm**).

If you have additional clarifying questions for the example provided here, or for your own impact analysis, feel free to contact the authors. In addition, the IMPLAN Forums and other information at [support.implan.com](http://support.implan.com) provide excellent resources and advice for modeling efforts with the software.

Good luck and happy modeling!



## 7. REFERENCES

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