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Evaluating the economic impacts of farm-to-school procurement: An approach for primary and secondary financial data collection of producers selling to schools

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Utilization of USDA AMS Toolkit Principles

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Abstract

According to the U.S. Department of Agriculture's (USDA) Farm to School Census, during the 2013–2014 school year, 42% of all U.S. schools (5,254 districts including 42,587 schools) participated in farm-to-school activities. These programs included 23.6 million children and purchased almost US$800 million of locally procured food items (USDA Food and Nutrition Services [USDA FNS], 2015). One of the purported benefits of farm-to-school procurement is that it strengthens the local economy by providing expanded market access for local farms and ranches. Despite the claims of positive

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economic impact, there is limited research to support this. This paper presents a framework for evaluating the economic impacts of farm-to-school programs, adapting the USDA's "Local Food Economics Toolkit" for this specific context. The approach combines primary and secondary data to customize an input-output model, reflecting the complex supply chains that link producers and schools. Additionally, to illustrate the approach, we summarize the findings from two case studies of local food procurement by schools between 2016 and 2017.

Keywords
Farm-to-School, Food Systems, Economic Impact, Local Food Systems Toolkit

Introduction
Farm-to-school is broadly defined "as a school-based program that connects schools (K-12) and local farms with the objectives of serving local and healthy foods in school cafeterias or classrooms, improving student nutrition, providing health and nutrition education opportunities, and supporting small and medium-sized local and regional farmers" (Joshi, Azuma, & Feenstra, 2008, p. 230). Farm-to-school implementation differs by location, but always includes one or more of the following core elements: (1) procurement of local foods to be purchased, promoted, and/or served in the cafeteria or as a snack or taste-test; (2) education activities related to agriculture, food, health, or nutrition; and (3) school gardens (Christensen, Jablonski, Stephens, & Joshi, 2017).

The first farm-to-school programs emerged in California, Connecticut, and Florida in the late 1990s (Feenstra & Ohmart, 2012; Ohmart, 2002). The National Farm to School Network (2016) estimates that there were six programs in five states in 1997. By 2008, the number of programs had grown dramatically to more than 1,000 programs in 34 states (Kalb, 2008). Farm-to-school was officially incorporated into the federal child nutrition program through the Healthy, Hunger-Free Kids Act in 2010. According to the USDA's Farm to School Census, by the 2013–2014 school year, 42% of all U.S. schools (5,254 districts that encompass 42,587 schools) participated in farm-to-school activities. These programs reached 23.6 million children and included almost $800[1] million of locally procured food items, including milk, which accounts for 46% of local food expenditures by school districts (USDA FNS, 2015).

Some of the growth in the number of programs can likely be attributed to the proliferation of financial support and interest from private foundations and public agencies. These organizations provide funding for farm-to-school programs, at least in part due to the assumption that they contribute to positive regional economic development. Despite growing support, there has been limited research exploring the economic impact of farm-to-school activities, including whether its activities, such as local food procurement, strengthen local inter-industry linkages or expand market access for participating producers. While the authors recognize the importance of distinguishing between local and regional foods, most notably that local food is a necessary but not a sufficient component of regional food systems (Clancy & Ruhf, 2010; Palmer et al., 2017), when discussing the geographic source for school food procurement, we use the term "local" as used by the USDA. This allows for the individual school or district to define local. When discussing economic impacts, we refer to the regional impacts and present a specific geographic boundary and justification for its selection. Further discussion about the relationship between the concept of regional food systems and defining the specific geographic boundaries of economic impact assessments, and the implications this has on the results, are presented in the results section.

To promote more standardized, rigorous assessments to evaluate market and economic outcomes of localized markets and/or shorter supply chains, the USDA Agricultural Marketing Service (AMS) developed a best practice assessment methodology and a standardized replicable framework called the Local Food Economics Toolkit (henceforth 'Toolkit') (Thilmany McFadden et al., 2016). Utilizing the impact assessment approach outlined

[1] All currency in this paper is in US$.

in the Toolkit, we propose a methodology intended to expand our understanding of how school districts procure local foods and how these supply chains' structure changes the way in which participating farmers work with other businesses in their community (often referred to as inter-industry linkages) and how this impacts regional economics. We present results from two case studies, one in the Minneapolis School District and one in the state of Georgia. In both, we use a combination of primary data (collected from a limited number of producers engaged in selling to school districts) and secondary data (e.g., USDA's Farm to School Census, USDA's Agricultural Resource Management Survey, and IMPLAN) to customize an input-output model. Importantly, we consider opportunity cost, which represents the relationship between scarcity and choice. Put another way, opportunity costs are the benefits an individual or business misses out on as a result of selecting one alternative over another. Opportunity cost is often considered from the demand side. For example, if a school shifts a portion of its food purchases from a traditional wholesaler to direct purchases from a farm, the opportunity cost of that choice are the value of the displaced purchases from a traditional wholesaler. This paper contributes to the nascent literature evaluating the economic impacts of farm-to-school activities and can also be used to inform efforts to assess the economic impact of similar local food procurement programs in colleges, hospitals, and early childcare and education settings.

The program used in this and many other economic impact analyses is IMPLAN. The IMPLAN software relies on an input-output (I-O) table that reflects the flow of economic linkages, namely the monetary exchanges associated with the trade of goods and services, within a specific geographic area at a moment in time. The I-O tables are based on regional and sometimes national averages from the U.S. Department of Commerce, the U.S. Department of Labor Statistics, USDA, and other federal and state government agencies. These linkages take the form of an expenditure function, which specifies how different inputs are assembled in order to produce a unit of output. Another way to think of the expenditure function is the sector's recipe to produce goods and services (output). So, an I-O table comprises columns that represent all the purchases and final demand, while the rows consist of all industry sales and value added[2] (e.g., labor compensation, interest payments, and rental costs) for every industrial sector within a region's economy. Assume that a regional economy comprises only two industries: agriculture and manufacturing (Table 1).

In the economy represented in Table 1, the agriculture sector purchases $150 worth of goods and services from the agriculture sector and US$200 worth of goods and services from manufacturing within the study region. The sector spends $650 on payments to employees, holders of capital, and governments. The sum of entries in each column represent the total purchases by the industry. Since profits, losses, depreciation, taxes, etc., are included in the table as final payments, total purchases must equal total sales.

The I-O table is used to create an I-O model (Jablonski, Schmit, & Swenson, 2016). Despite the utility of the I-O model in assessing short-term economic impacts, it has several limitations including its assumption of unlimited supply, constant prices, static framework, constant returns to scale, and fixed technology. The I-O model is demand-driven, meaning that there are no supply constraints. The model assumes that there is always excess capacity in the system and that any demand will be met—at the price for which it is currently available. Particularly in

Table 1. Hypothetical Input-Output Transaction Table

	Agriculture	Manufacturing	Final demand	Total output
Agriculture	150	500	350	1,000
Manufacturing	200	100	1,700	2,000
Value added	650	1,400		2,050
Total outlays	1,000	2,000	2,050	

[2] In the economic impact field, value added is the difference between an industry's output and its inputs. More details on IMPLAN's use of the term are at https://implanhelp.zendesk.com/hc/en-us/articles/115009498847-Value-added

agriculture, where prices are extremely volatile, the assumption of constant prices can be highly problematic and serve to distort results (Swenson, 2006). The reason that constant prices are assumed is that I-O models are static, meaning that they capture a specific moment in time. Although this assumption is likely tenable in short-term analyses, it is unlikely that prices will not change in the medium- to long-term. Despite its limitations, I-O models and IMPLAN, if used thoughtfully, are a powerful tool for economic impact analysis. Accordingly, there are many studies that use I-O models and IMPLAN to quantify the economic impacts and contributions of agriculture to county, regional, statewide, and national economies.

We begin this paper with a review of previous economic impact assessments of farm-to-school procurement programs, highlighting inconsistencies in the approach and rigor, followed by the presentation of our study methods using the Toolkit as a roadmap. We then go on to present findings from our survey of producers and discuss the results of our economic impact assessment. Finally, we discuss the implications for assessments of the impacts of local food procurement by schools and suggest opportunities for future work.

Literature Review

There are a handful of studies that assess the economic impacts of farm-to-school procurement (Gunter, 2011; Kane, Kruse, Markesteyn Ratcliffe, Ananda Sobell, & Tessman, 2010; Kluson, 2012; Pesch, 2014; Roche, Becot, Kolodinsky, & Conner, 2016; Tuck, Haynes, King, & Pesch, 2010). Using the recommendations put forth in the Toolkit, we evaluated whether these studies incorporate key recommended components in their assessments (see Table 2). Specifically, we noted whether or not authors described (1) the geographic region and school district; (2) the type of study, specifically if the study is a contribution or impact assessment; (3) assumptions about how food moves from farm to school or the structure of the supply chain; (4) if or how they augmented or modified secondary data (such as that found within IMPLAN) based on interviews with farmers or other secondary data to more accurately reflect local and regional food system activities and farm expenditure patterns; and (5) if the study accounts for opportunity costs (Thilmany McFadden et al., 2016).

Schools generate economic activity through their purchases of goods and services in a regional economy, which in turn results in a series of additional purchases by the businesses from which they purchase products to supply the schools. These existing exchanges are part of a contribution assessment, while assessing whether the impact of a shift in school purchases from traditional food sources to more local sources would be an economic impact assessment.

Generally, the more businesses within a specific region purchase from one another, the stronger the inter-industry linkages and resulting multiplier. The multiplier is a numeric way of describing the secondary impacts stemming from a change in the economy. The multiplier is the sum of the direct, indirect, and induced effects divided by the direct effect. The direct effect is associated with the change in industry spending. In the case of farm-to-school procurement, the direct effect is the change in the quantity or source of food produced within the region. The direct effect results in indirect effects, or changes in backward-linked industry purchases as other industry sectors respond to the new demands of the directly affected industries. The induced effects are the changes in spending from households as labor income is converted into household spending on local goods and services. The indirect and induced effects are influenced by the structure of the supply chain. For example, if the food is purchased directly from farmers, the indirect and induced effects will be different from those associated with a purchase of locally produced products through an intermediary because of the differences in reliance on labor and input requirements.

There are three types of multipliers: output, employment, and labor income. The output multiplier is the base multiplier from which all other multipliers are derived. It describes the total output generated as a result of one additional dollar of output generated by the target economic sector. For example, if an output multiplier is 1.25, that means that every dollar of production in the specific economic sector generates an additional $0.25 in the local economy. Similarly, the employment

multiplier describes the total jobs generated as a result of one job in the target economic sector. Finally, the labor income describes the dollars of labor income generated as a result of one a dollar of labor income in the target economic sector. While some of the papers presented in Table 2 include all three multipliers, most did not, so we have limited our comparison to the output multiplier.

With the exception of Haynes (2010), Gunter and Thilmany (2012), and Roche et al. (2016), the studies reviewed do not describe how food travels from the farm to the school. Only Roche et al. (2016) include intermediate local food sales in their assessment. The structure of the supply chain can have important implications for modeling the economic impacts of procurement. For example, USDA Foods are the single largest source of ingredients for schools, and about half of those foods are diverted for processing prior to delivery (Woodward-Lopez et al., 2014). If these foods are replaced with products from local sources, the economic impact assessment must address a number of questions, such as will processing occur on the farm, at a local processor, or in the schools? What implications will changes in the processing location have on employment requirements (i.e., will lighter processing at the farm require additional labor in

Table 2. Summary of Farm-to-School Economic Impact Assessment Studies (all currency in US$)

Study	Haynes, 2010, and Tuck, Haynes, King, & Pesch, 2010	Kane, Kruse, Ratcliffe, Sobell, & Tessman, 2010	Gunter, 2011, and Gunter & Thilmany, 2012	Kluson, 2012	Pesch, 2014	Roche, Becot, Kolodinsky, & Conner, 2016
Location	Minnesota	Oregon	Colorado	Florida	Minnesota	Vermont
Model geographic scale	5-county region (5,600 mi²)	State of Oregon (98,000 mi²)	2-county region (6,500 mi²) and 6-county region (13,500 mi²)	Unspecified	12-county region (23,890 mi²)	Statewide (9,600 mi²)
Size of school district	Cass, Crow Wing, Morrison, Todd, and Wadena counties (20,840 students)	Portland Public Schools (47,000 students) and Gervais school district (1,500 students)	Weld 6 Greeley (19,500 students)	Sarasota School District (42,000 students)	68 K-12[a] schools and 396 healthcare facilities (66,900 students)	Vermont (94,000 students)
Type of study	Impact (three scenarios: one special meal, unprocessed substitution, substitute all)	Impact ($462,000)	Contribution and impact ($20,900–$39,125 in planned purchases)	Contribution ($107,000 in existing purchases)	Contribution ($33,000 worth of sales) and impact (20% of all institutional food purchases from local growers)	Contribution ($914,943 existing purchases) and impact (three scenarios: increases in purchases)
Supply chain structure	Direct	Not specified	Direct	Not specified	Not specified	Combination of direct and intermediated
Customization of IMPLAN agricultural sectors	Yes, using survey data	No	Yes, using survey and secondary data	No	No	No
Sample size	11 farmers	No farmers interviewed	14 farmers	No farmers interviewed	No farmers interviewed	No farmers interviewed
Includes opportunity costs (shift in purchases from wholesaler to food producer)	Assumes no loss to current wholesalers because they are not in the region	No	Subtracts the impact of the wholesale sector from the farming sector	No	Assumes a loss of 75% of total new sales to the wholesale sector	Margins purchases shifted from wholesale and transportation sector to direct from producers
Output multiplier	1.03–1.25	1.86	1.47–1.63	2.4	1.7–2.9	1.6

[a] K-12 refers to schools ranging from kindergarten to twelfth grade.
Note: 1 square mile (mi²) 2.6 square km
Source: Adapted from Becot, Kolodinsky, Roche, Zipparo, Berlin, Buckwalter, & McLaughlin (2017).

the school to prepare the food for student consumption)? Further, while Haynes (2010) and Tuck et al. (2010) acknowledge a decrease in demand for ingredients from more traditional sources (USDA Foods, wholesalers, etc.), they do not account for the opportunity costs because all the distributors were located outside the geographic boundary. Gunter (2011), Pesch (2014), and Roche et al. (2016) attempt to account for the lost sales to intermediaries as a result of the local food purchases.

Primary data collection through farmer surveys or interviews can shed light on the structure of the supply chain. Only two studies (Gunter, 2011; Haynes, 2010) collected primary data from farmers. Primary data is useful to inform and modify the expenditure functions in IMPLAN. The two studies with primary data collection were also the only two studies to customize the IMPLAN agricultural sectors. Not accounting for the different linkages associated with farms that sell to school is a significant shortcoming of the studies that did not modify IMPLAN. As noted in the Toolkit, the industry data presented in IMPLAN is a rich starting point, but the economic activities are derived from national averages, aggregated for an entire commodity or industry sector. This often limits the extent to which local food-system activities can be accurately analyzed. Changes in the expenditure function and local purchasing percentage (the percent of all economic exchanges between two sectors of the economy that occur within the geographic area of interest) can have significant impacts on the multiplier (Schmit, Jablonski, & Mansury, 2016). Aside from the relationships that exist between the producer and the consumer (schools, in the case of farm-to-school procurement), there are a host of additional, often stronger linkages that exist between farms that sell through local channels and other sectors of the regional economy. Previous research suggests that these farms spend a larger proportion of their total expenditure in the regional economy, particularly on labor, relative to more commodity-oriented producers (Bauman, Thilmany McFadden, & Jablonski, 2018; Jablonski, Schmit, & Kay, 2016; Thilmany McFadden et al., 2016). Yet finding data to reflect these linkages often adds significant time and cost to conducting the study. The approach presented and utilized in the next section provides a more standardized and efficient method for primary data collection to allow for a more accurate evaluation of the economic impacts of a school or district's shift to local food procurement.

Surveys and interviews can be used to better understand farmers' motivations or hesitation to participate in farm-to-school programs. The inclusion of farmers' perspectives is surprisingly sparse in the farm-to-school literature, despite as pointed out by Conner, King, Kolodinsky, Roche, Koliba, and Trubek (2012), "farms are by definition an indispensable component of FTS [farm-to-school]; if farmers are unable to participate or derive no benefit, the potential benefits of FTS will not be realized" (p. 322). Much of the farm-to-school literature focuses on the perspective of school foodservice operations (Vogt & Kaiser, 2008). The farm-to-school studies that include farmer surveys observe a tension between economic and non-economic forces (Berkenkamp, 2012; Conner et al., 2012; Izumi, Alaimo, & Hamm, 2010; Izumi, Wright, & Hamm 2010a; 2010b; Matts, Conner, Fisher, Tyler, & Hamm, 2016). As Izumi, Wright, and Hamm (2010a) summarize, "from a purely economic perspective, farm-to-school programs appear to be a relatively insignificant opportunity for farmers" (p. 379). Conner et al. (2012) found that an array of social and economic motivations underpin farmers' participation in farm-to-school programs. These studies helped to inform the development of our survey instrument and resulted in the inclusion of two open-ended questions concerning the non-economic motivation and impact of selling to schools.

All the studies we reviewed found that the output multiplier associated with farm-to-school procurement was greater than that associated with the existing agricultural production sector, although only modestly. As is generally the case with regional economic impact studies, studies with smaller geographic bounds show smaller economic impacts, illustrating the importance of selecting an appropriate functional economic area (Thilmany McFadden et al., 2016). All the studies used

political and/or school district boundaries to define the functional economic area. The functional economic area should cover a relatively contained and cohesive network of trade that includes the places where people live, work, and shop. The studies reported output multipliers that varied from 1.03 in a study of six counties in Minnesota (Haynes, 2010) to 2.4 in Florida with an unspecified functional economic area (Kluson, 2012).

Methods

This study roughly followed the seven modules presented in the Toolkit: (1) frame the assessment process, (2) use secondary data sources, (3) generate and use primary data, (4) engage your community process with the data, (5) analyze linkages and contribution through input-output analysis, (6) address opportunity costs, and (7) conduct an advanced IMPLAN analysis.

Module 1. Framing the assessment process

We started by framing our community economic assessment process by working collaboratively with researchers from Colorado State University (CSU) trained in economic impact assessment methods and leaders from the National Farm to School Network (NFSN). Together, we gathered resources including white papers, journal articles, and previous economic impact assessments. We also collected survey protocols from researchers across the country who surveyed farmers and school district foodservice directors about farm-to-school procurement programs. After reviewing the resources, we defined the study objectives to document the short-term economic impacts of farm-to-school sales, apply a best practice economic impact assessment methodology, and develop a standardized, replicable framework to assess the regional economic impact of a school or school district's shift to local food procurement.

As part of Module 1, framing the process, which occurred roughly between August and December 2016, we also reached out to FoodCorps to partner with individuals already embedded in school districts who could assist with data collection. Nine volunteers (from Indiana; Detroit, Michigan [MI]; Traverse City, MI; Greensboro, North Carolina [NC]; the Bay Area of California; Washington, D.C.; Greeley, Colorado [CO]; Pueblo, CO; and Newark, New Jersey [NJ]) offered to take the lead on data collection in their communities. In the beginning of December 2016, CSU provided a webinar training and practice survey to ensure consistency across enumerators.

Modules 2 and 3. Using secondary data and generating/using primary data

Modules 2 and 3 occurred simultaneously and informed one another. We used a combination of primary and secondary data to investigate farm-to-school sales and market linkages. Best-practice economic impact assessments of farm-to-school food procurement require information from producers or available and relevant secondary sources to inform model data and assumptions (Thilmany McFadden et al., 2016). Specifically, the goals of data collection were to (1) provide descriptive data about the type of farms selling to schools, including information about producer level of satisfaction with those transactions; (2) understand if or how farmers shifted their operations based on the availability of school markets (for example, did they increase production, did they shift product from one market to another); and (3) estimate an average farm expenditure profile that could be multiplied by the total number of farms in the study area selling to schools to create a new farm-to-school industry sector in IMPLAN.

The primary data used in this study was collected using a survey of a convenience sample of producers currently selling to schools. The survey was developed collaboratively by CSU and NFSN and included 20 questions that asked farmers about their production practices, sales, markets, overall satisfaction with selling to schools, and participation in various farm-to-school activities (see the Appendix). The instrument was explicitly designed to be as short as possible while still eliciting the information needed for customizing the model, enhancing our understanding of how to define the functional economic area based on where producers were selling their products, and calculating potential opportunity costs. It also included two questions to capture the non-economic impacts of selling to schools. The survey focused on six

general expenditure categories that account for 66% of all variable expenditures for all local farmers and ranchers with gross cash farm income up to $350,000 as estimated in the USDA's 2013 Agricultural Resource Management Survey (ARMS) (USDA Economic Research Service [USDA ERS], 2015). The ARMS is an annually conducted, nationally representative survey of approximately 30,000 farms, and includes data on gross cash farm income, marketing channels utilized, key product segments, region where operation is located, fixed and variable expenses, assets, debt, and farm and operator characteristics.

For the sake of brevity, our survey did not include questions about the local purchasing percentage (LPP)—the share of input purchases from sources within the functional economic area. We used IMPLAN coefficients as a secondary data source, which we expected to result in a more conservative multiplier, as local producers are more likely to purchase inputs locally (Jablonski, Schmit, & Kay, 2016; Pesch & Tuck, 2015). We created average expenditure functions for producers in the two case study sites using responses from the survey, which we then compared to an aggregate fruit and vegetable farming sector in IMPLAN.

We test-piloted the survey with six farm-to-school stakeholders before launch. The research was conducted in accordance with CSU's Human Research Protection Program and was deemed exempt (IRB#288-17H). NFSN staff and FoodCorps fellows and alumni conducted the producer surveys. Twenty-six producers selling to schools in nine states (Georgia, Indiana, Michigan, Minnesota, New Jersey, North Carolina, Pennsylvania, Utah, and Wisconsin) and the District of Columbia completed the survey. Descriptive statistics for all 26 producers are presented in this paper, but due to the very small sample size, only data from the two locations with the highest number of responses (Minnesota and Georgia, with five and six completed responses, respectively) were used to test the expenditure data collection tool and to demonstrate how a more generalizable, representative sample could be used to support best-practice economic impact assessments.

Module 4. Engaging your community process with data

Throughout the process of data collection, we convened the project leadership team to review the incoming data and findings. Along the way, we had to revisit the limitations of project resources balanced with the difficulties associated with data collection. Because of the limited capacity of FoodCorps volunteers, the NFSN staff took on great responsibility with data collection and targeted specific communities to ensure we had enough responses to build a model. During this time we also began to organize efforts around different avenues and approaches to present the key findings from the study to our community.

In the fall of 2017, working with our team and additional partners from USDA Agricultural Marketing Service, USDA Food and Nutrition Service, and Cornell University, we organized a webinar on the key findings from the study and other resources to support stakeholder efforts at assessing the economic impact of local food projects and initiatives. Using engaging figures, tables, and graphics helped us to communicate key findings from our study and highlight next steps for farm-to-school research across the country.[3] Over 300 people registered for the webinar, and there have been over 150 views of the recorded webinar on YouTube.

Modules 5. Analyzing the linkages and contribution through input-output analysis

One of the first steps in creating an I-O model is to properly specify the functional economic area. With our case study approach, we had to define the study area for each site. The Minneapolis Public Schools (MPLS) serves the city of Minneapolis, Minnesota. Nearly 37,000 students are enrolled in the 96 public primary and secondary schools in the district (National Center for Education Statistics [NCES], 2017). According to the 2013–2014 Farm to School Census, 63 schools within the district sourced local fruits, vegetables, milk, meat, and/or poultry for their breakfast and lunch meal programs. Products were sourced directly from producers and through intermediaries (food hubs, distributors, and food manufacturers) (USDA FNS,

[3] See a factsheet from the project at http://www.farmtoschool.org/Resources/EconomicImpacts-FactSheet.pdf

2015). During that same year, the district spent a total of $7,842,090 on food, with 13% spent on local food (excluding milk). The district defines local as within a 200-mile (322-km) radius, including 163 counties in four states, which we used as our study area. We collected survey responses from five fruit and vegetable producers selling directly to the MPLS. The five farms were widely dispersed. One producer was located on the western border of the state, and two producers were in Wisconsin. The remaining two were located just south of Minneapolis.

For this study, we estimated that there are 32 farmers selling to MPLS. This calculation was made by dividing the total local food purchases by MPLS ($1,057,880) by the average farm-to-school sales ($33,205) from the five surveyed farms.

The state of Georgia, our second case study, covers 180 public school districts, 62% of which participate in farm-to-school. According to the 2013–2014 Farm to School Census, 82 districts sourced local foods for meal programs in 615 schools serving 1,226,410 students. Seventy-three districts sourced local products through an intermediary, 32 districts sourced directly from producers, and no districts sourced through food hubs. Total food cost data was available for 61 of the 82 districts and indicate that a total of $170,622,272 was spent on all food. The 54 districts spent a total of $10,266,746 (excluding milk) on local food.

Extrapolating the school expenditure patterns to all the districts in Georgia that source local food, we assumed that the 82 districts are spending $229,361,086 on total food and $15,590,243 on local food (excluding milk). Survey data were collected from six fruit and vegetable producers within the study area. For the purposes of this study, it was estimated that there are 92 farms selling to schools in Georgia, which were calculated by dividing the total local food purchases by Georgia schools ($10,266,746) by the average farm-to-school sales ($110,407) from the six surveyed farms. The regional (and thus our study area) was defined as all 159 counties in the state.

Module 6. Addressing opportunity costs

As noted in the literature review, opportunity costs are often overlooked in economic impact assessments of farm-to-school procurement. If a school is going to increase its overall expenditures on local food, it may do so through a one-time influx of dollars (i.e., foundation award, grant, or donation), or it may decide to shift spending permanently away from something else. In general, a school is unlikely to increase its average per student expenditure (other than adjusting for inflation) based on a desire to purchase local food. So, new local purchases will almost certainly supplant non-local purchases. Understanding how local food purchases impact other school purchases is key to conducting a rigorous and accurate economic impact assessment. The degree of the changes will be influenced, at least in part, by the structure of the supply chain. If farmers and school districts choose to enter in a direct relationship, there will likely be reduced purchases through intermediaries (including businesses that might be local). Although it may be tempting to try to maximize the result or multiplier impact when conducting an economic impact assessment, rigorous research must measure net impacts. The goal should be to get as accurate an estimate as possible of how local or regional economies respond based on new or shifted economic activity. In these case studies, to account for the opportunity costs of local food purchases, new farm-to-school purchases (including direct and intermediated, margined for the intermediary mark-up) were subtracted from the total expenditure of the aggregated fruit and vegetable production sector and the wholesale sector.

Module 7. Modifying IMPLAN

The final step outlined in the USDA AMS Toolkit provides information on how to adjust the default settings in IMPLAN to create a model that is more reflective of the conditions on the ground. Using the primary and secondary data described above, we created a customized expenditure pattern for producers selling to schools in each of our case study sites. We then compared these estimated expenditure patterns, after accounting for the sale of the items minus the cost of the goods purchased from wholesalers and retailers (this is called the margined value and must be done for purchases from retail and wholesale sectors), to the secondary data from ARMS and IMPLAN to verify that they

were reasonable in comparison to aggregated fruit and vegetable expenditure function (Table 3). We then created a sales profile for producers, recognizing that farm-to-school producers often rely on a variety of markets for their products and that many of the sales to schools are in fact traveling through an intermediary. As stated in the previous section, in the MPLS region producers sold on average $33,205 to schools; 50% was sold directly to schools and 50% was sold through intermediaries. In Georgia, producers sold on average $110,407 to schools; 45% was sold directly, and 55% went through intermediaries.

We then assigned the local purchasing percentage (LPP) using IMPLAN numbers to create our customized IMPLAN model.

Using the six largest expenditure categories, we captured 68% of the Minneapolis farmers' variable costs and 73% of the Georgia farmers'. What may be most surprising, particularly in Georgia, is how similar the survey data is to the IMPLAN data, particularly labor.

Unlike other farm-to-school economic impact studies, this study tried to reflect the fact that farmers rely on a variety of markets for their products. The model thus accounted for direct-to-consumer sales, intermediated sales, and direct-to-school sales.

Once the model in IMPLAN was customized to reflect the new farm-to-school production sector, we conducted the economic impact assessment. A scenario was developed for each of the case studies to evaluate the impact that an increase in final demand for local products by schools would have on the study area. This increase in final demand is referred to as the "shock," or the direct impact. Secondary data sources including press releases, newspaper articles, the 2013–2014 USDA Farm to School Census, the National Farm to School Network website, and farm-to-school grant and funding information were reviewed to develop realistic scenarios.

Results

Farmer Survey Descriptive Statistics

Of the 26 farmers interviewed, 20 grew vegetables, 13 produced fruit, and two also raised livestock. There was substantial heterogeneity in terms of the size of the farm operations. The farms ranged in size from half an acre (0.2 ha) to 500 acres (202 ha). The average farm size was 69 acres (28 ha). The farms' total sales ranged from $9,500 per year to $8 million, with the average sales being $920,000. All the farms started selling to schools after 2005, with the majority starting after 2011.

As part of our effort to understand how farmers responded to the availability of school markets, we asked them why they started selling to schools. Their responses fell into four broad categories: (1) provided a market, (2) opportunity to educate youth, (3) approached by school, and (4) already selling to an intermediary that began to sell to a school. Ten farmers expressed that schools

Table 3. Share of Variable Costs Attributed to the Top Six Expenditure Categories

Expenditure category	ARMS local food farmers (sales up to $350,000)	ARMS farm-to-school farmers	IMPLAN MSLP fruit and vegetable farmers	MSLP farm-to-school farmers	IMPLAN Georgia fruit and vegetable farmers	Georgia farm-to-school farmers
Labor	0.12	0.29	0.41	0.47	0.27	0.27
Fertilizer and chemical inputs	0.11	0.12	0.13	0.03	0.10	0.23
Fuel and transportation	0.12	0.09	0.05	0.03	0.06	0.05
Maintenance and repair	0.14	0.11	0.05	0.06	0.06	0.05
Utilities and rent	0.09	0.09	0.04	0.04	0.05	0.05
Seeds	0.08	0.09	0.02	0.04	0.02	0.07
All other variable costs	0.34	0.22	0.31	0.31	0.43	0.26

Source: USDA ERS (2015); IMPLAN (2013). ARMS data compiled by Allie Bauman, Colorado State University.

provided a needed market for a product, which is in line with the findings from Izumi, Wright, and Hamm (2010a). One farmer explained, "We grow a lot of good keeping winter apples that harvest late and our retail business slows after the end of October, so we need a market for them." Seven farmers expressed that farm-to-school sales provided a unique opportunity to educate youth about healthy food options and agriculture, and another seven farmers stated they started selling to schools because they had been approached by someone at the school. Three farms noted that they had already been selling to an intermediary that just started selling to schools and that it was not an active decision on their part.

We asked the farmers a number of questions to better understand how farm-to-school sales fit into their overall operation and relatedly, the general structure of the supply chain linking producers and schools. In line with Joshi et al.'s (2008) findings, direct farm-to-school sales accounted for a modest portion of all farm sales, which was 13% of sales from our surveyed producers. In addition to direct sales to schools, the farms relied on a diversity of other outlets, including direct to consumer (20 farms); intermediated (e.g., supermarket or supercenter; restaurant or caterer; other retail store; local or regional food processor or food maker; or local or regional aggregator, distributor, food hub, or broker) (16 farms); wholesale marketplace for commodities not identified by source (e.g., auction, wholesale or terminal market) (10 farms); and institutions (e.g., colleges, hospitals, prisons) (5 farms). Three of the farms surveyed had no direct sales to schools, but instead sold to schools exclusively through an intermediary. Twelve farms noted that some of the product they sell to intermediaries ends up at schools. Understandably, some farmers struggled to estimate the percent of their intermediated products sold to schools; as one farmer explained, "My food hub doesn't share that information."

Direct sales from farm to school represent different inter-industry linkages within a local economy than sales from farm to intermediary to school. According to the 2013–2014 Farm to School Census, 65% of school districts buy local food through a distributor. Christensen, Jablonski, and O'Hara (2017) found that schools that purchase local products directly from farms and/or nontraditional distributors spend significantly less per student on non-milk local food purchases. The fact that intermediaries facilitate the majority of farm-to-school transactions also poses new challenges for identifying producers engaged in farm-to-school sales and measuring supply and demand for local foods in schools.

Economic Impact Assessment

Once the model in IMPLAN was customized using our primary and secondary data to reflect the new farm-to-school production sector, we conducted the contribution assessment. Results from the model, incorporating the data collected from the survey, show a gross output multiplier of 1.93 in MPLS and 2.11 in Georgia (Table 3). This indicates that for every additional dollar spent on local food procurement by schools (accounting for no opportunity cost), an additional $0.93 for related sectors is generated in the MPLS study area and $1.11 in the Georgia study area. We see that the multipliers are larger in both examples for our farm-to-school production sector compared to the average fruit and vegetable production sector, yet it should be noted that we are working with a very limited number of observations.

We created a shock for both study areas to evaluate the economic impact of an increase in final demand for local products by schools. For the MPLS case study, we modeled the impact of a $25,000 grant from the Center for Prevention at Blue Cross Blue Shield in Minnesota using an analysis-by-parts approach. We assumed that the awarded grant enabled the district to shift some of their non-local food purchases to local food purchases. The $25,000 in farm-to-school purchases follows the supply chain structure modeled using a combination of primary and secondary data. For this case study, we assumed that 50% of the sales are directly purchased from the grower, while 50% are purchased through an intermediary. Based on the default data in IMPLAN, we assumed a 17% margin for the wholesale trade sector (which includes food intermediaries).

Thus, the grant of $25,000 results in $22,875 worth of purchases from the farm-to-school

production sector, with $2,125 of the grant value going toward covering the wholesale trade sector margin, which is allocated to the levels of intermediated purchases and value added outlays necessary to support the farm-to-school production sector ($8,443 is allocated to employee compensation and $2,297 to proprietor income). This approach also allows for a 10% mark-up between the price of local goods as compared to the non-local goods, as it is assumed that the district is spending $22,875 for the same amount of product that they previously purchased for $20,750, when they purchased all of the food through the wholesale trade sector.

Next, we needed to take into account the opportunity cost associated with this shift. As a result of the $22,875 increase in local food purchases, the school purchased $20,750 less of non-local food products. The loss of these sales to the aggregated fruit and vegetable sector and the wholesale sector are the opportunity costs. Because this is a regional economic impact model, this study was only concerned with the loss of sales to the fruit and vegetable producers within the functional economic area; this is calculated using IMPLAN's LPP 21% for the MPLS non–farm-to-school production sector. The shift from non–farm-to-school products to farm-to-school products would result in a loss of $4,250 in outlay to the wholesale sector. This loss is made up in part, because based on the survey findings it is assumed that 50% of the local product is still traveling through an intermediary, resulting in a net loss to the wholesale sector of $2,125.

Table 4 shows the summary of the impact with and without the opportunity cost. For every additional employee added to the Minneapolis farm-to-school production sector's payroll, an additional 0.1 jobs are generated in backward-linked industries (that is, the employment multiplier is 1.1). Because only $22,875 of the total grant amount of $25,000 is going to the farm-to-school production sector, we estimate that the new labor income increases by $11,813, including the $8,443 of the original output that went toward employment, plus an additional $3,332 in indirect and induced income. The initial $25,000 grant results in $22,875 worth of new farm-to-school sales, which in turn generates $33,204 of output impact when all indirect and induced effects are considered, resulting in an implied multiplier of 1.45.

For the Georgia study area, we took the same approach. We modeled the impact of a recent grant of $62,000 to purchase more local foods. We modeled the pathway of the $62,000 through the supply chain based on our survey results. We assumed that 55% of the sales are directly purchased from the grower, while the remaining 45% is purchased through an intermediary. Thus, the grant of $62,000 results in $57,257 worth of purchases from the farm-to-school production sector, which is allocated to the levels of intermediated purchases and value added outlays necessary to support it ($9,890 is allocated to employee compensation, and $20,498 to proprietor income). Again, to account for the opportunity cost associated with the shift in school food purchases, we assumed that the school supplanted non-local food with local food products. As a result of the $57,257 increase in local food purchases, the school purchased $51,460 less

Table 4. Summary of Impact Results for MPLS Study Area, With and Without Opportunity Costs

Impact type	Employment	Labor income	Value added	Output
With opportunity costs				
Direct effect	1.00	$8,443	$2,297	$22,875
Indirect effect	0.00	$48	($931)	$31
Induced effect	0.10	$3,322	$5,808	$10,298
Total effect	1.10	$11,813	$7,174	$33,204
Implied multiplier	1.10	1.40	3.12	1.45
Without opportunity costs				
Direct effect	1.00	$8,443	$2,297	$22,875
Indirect effect	0.10	$3,655	$4,880	$7,742
Induced effect	0.10	$4,367	$7,633	$13,534
Total effect	1.20	$16,465	$14,810	$44,151
Implied multiplier	1.20	1.95	6.45	1.93

of non-local food products. Again, we assumed the school would purchase the same quantity of food no matter the source. As this is a regional economic impact model, the study is only concerned with the loss of sales to non–farm-to-school farms within the functional economic area; this is calculated using IMPLAN's LPP 25% for Georgia's aggregated fruit and vegetable production sector. The shift from the purchase of non-local to local food products would result in a loss of $10,540 in output to the wholesale sector. This loss is made up in part, because based on survey findings, the model assumes 45% of the sales to the farm-to-school production sector still goes through an intermediary, resulting in a net loss to the wholesale sector of $5,797. Table 5 shows the summary of the impact with and without accounting for opportunity costs. As illustrated below, when accounting for the opportunity costs, for every additional employee added to the farm-to-school production sector's payroll, an additional 0.5 jobs are generated in backward-linked industries (employment multiplier of 1.5). Similar to the calculations for the grant awarded to the MPLS region, the initial $62,000 grant results in $57,275 worth of new sales to farm-to-school farms, generating over $84,581 of output impact when all indirect and induced effects are considered, resulting in an implied multiplier of 1.48.

Table 5. Summary of Impact Results for the Georgia Study Area, With and Without Opportunity Costs

Impact type	Employment	Labor income	Value added	Output
With opportunity costs				
Direct effect	1.00	$9,890	$20,498	$57,275
Indirect effect	0.20	($3,879)	($1,448)	$3,622
Induced effect	0.30	$7,739	$13,715	$23,684
Total effect	1.50	$3,860	$32,765	$84,581
Implied multiplier	1.50	0.39	1.60	1.48
Without opportunity costs				
Direct effect	1.00	$9,890	$20,498	$57,275
Indirect effect	0.20	$11,294	$16,245	$26,501
Induced effect	0.30	$12,134	$21,497	$37,124
Total effect	1.50	$23,428	$58,240	$120,900
Implied multiplier	1.50	2.37	2.84	2.11

Discussion and Conclusion

In this paper, we show how to use the approach outlined in the USDA's Local Food Economics Toolkit to estimate the regional economic impacts of local food procurement by schools by using two case studies. Using primary and secondary data to modify an input-output model, our findings have important implications for future research into the economic impact assessments of farm-to-school procurement.

We conducted a thorough review of previously conducted economic impact studies of farm-to-school local food procurement, highlighting significant differences and inconsistencies in approach and rigor. We designed a customized approach for data collection and modeling and used it to elaborate on our understanding of how school districts procure local foods using two case studies: Minneapolis Public Schools and the state of Georgia. This study illustrated an approach utilizing primary and secondary data to determine reasonable definitions of regions for analysis, the size of the farm-to-school sector, modification of the expenditure functions of farms selling to schools, and appropriate shocks. Acknowledging the limitations of our small sample sizes for both sites, the study found that the multiplier impacts for the farm-to-school farm sector are larger than the more traditional fruit and vegetable farm sectors, indicating that farm-to-school farms purchase more inputs from the local economy per unit of output, which results in positive local economic impacts. The Minneapolis and Georgia case studies had multipliers of 1.45 and 1.48, respectively, in line with previous farm-to-school economic assessments. Yet, it should be noted that shifting sales from intermediated to direct, may result in large opportunities costs that need to be accounted for.

As part of this study, we developed a widely adaptable survey protocol for future studies and illustrated how to map survey responses to IMPLAN

sector categories. As far as we know, this is the first study to more accurately characterize the farm-to-school production sector using primary data, taking into account the supply chain through which schools procure local products. The survey instrument is a valuable first step for communities, school districts, and others interested in evaluating the economic impacts of farm-to-school procurement and is available on the National Farm to School Network's website.

However, in this study researchers encountered a significant challenge in the implementation of the survey protocol, which is worth discussing. Lead researchers sought to enroll volunteer enumerators with strong relationships with producers to allay any potential concerns about participating in the survey. But we were not able to provide financial compensation for their time in the surveying effort. Without this and/or buy-in from their supervisors, volunteers had little incentive to invest the time and effort necessary to conduct this type of primary data collection. For future studies, we recommend that enumerators be compensated for survey implementation. If not, surveys should be conducted in communities where the research team already has strong relationships with producers in order to elicit prompt and complete responses. If this barrier is appropriately addressed, farm-to-school stakeholders across the country can begin to use this survey tool to collect standardized data that would allow for comparisons across geography of both the farm-to-school farm expenditure profile as well as the percent of sales that are traveling direct from producers versus through intermediaries.

Through the primary data collection for this study, we found that in both case study areas, at least 50% of the school's local food purchases were through an intermediary. This poses new challenges for those seeking to measure the economic impact of farm-to-school procurement. The first challenge is around finding producers who sell to schools. As reported in the Farm to School Census, 65% of schools report purchasing at least some of their local food products through intermediaries, and thus producers may not know if their product is ending up in schools. This additional step in the supply chain may also reduce transparency for the schools, as encapsulated by a foodservice director's response to the 2013–2014 USDA Farm to School Census: "We have a management company, not sure who they purchase from" (USDA FNS, 2015). Furthermore, for many actors on either end of the supply chain, keeping records is onerous. As one foodservice director put it, "I don't keep separate records for local foods and couldn't imagine how I would go back to get this info. My guess isn't close to being accurate, so shouldn't be used at all. If you want this info, you should ask us to set up a system in advance" (USDA FNS, 2015). Some regions are considering developing their own inventory management tools so that schools have a better sense of the total value of their local food purchases as well as their different sources. There are also discussions underway for including questions related to the changing structure of the farm-to-school supply chain in the next Farm to School Census.

It is important to note that although implementing local food procurement programs in schools may create new market opportunities for some farms, it also displaces non–farm-to-school product purchases by schools, potentially negatively impacting other producers as well as intermediaries. These opportunity costs need to be accounted for in rigorous economic impact assessments. Further, the opportunity costs may have important consequences when considering the stated goals of farm-to-school programs. If, for example, the goal of farm-to-school procurement is to strengthen local and regional economies, then the findings herein could suggest that there is an advantage to sourcing through intermediaries. However, if the goal of farm-to-school procurement is to increase the economic viability of small and medium-sized producers, further investigation is needed into the relationship between farm profitability and supply-chain structure.

Economic impact data is valuable in engaging new and diverse stakeholders in farm-to-school initiatives, but may not be appropriate in all settings. The expansion of local and regional food markets has brought with it an increased interest in quantifying the extent to which these programs, including

farm-to-school, contribute to economic development (O'Hara & Pirog, 2013). Community and economic developers often employ multipliers to quickly and succinctly communicate the impact of these programs, but the emphasis on brevity may oversimplify the complexity of these systems. Further, advocates for local food systems may be tempted to present larger-than-accurate multipliers to overstate the economic impact of local foods systems. Those using the tools presented in this paper should, as Deller et al. (2017) suggest, proceed with caution. Collecting sufficient data to conduct credible modification of IMPLAN and adequately account for potential opportunity costs are difficult (Conner et al., 2016; Deller et al., 2017).

Growing evidence on the potential positive community economic impacts resulting from farm-to-school procurement creates an opportunity to increase the engagement of farmers and farm-focused organizations. Economic data is also valuable in speaking to federal, state, and local agencies, as well as private investors and philanthropic entities. Positive economic outcomes offer justification and support for investment in local food purchasing and infrastructure that facilitates increased spending on local food. Both community-level infrastructure (e.g., aggregation and processing facilities, transportation) and school- or district-level infrastructure (e.g., equipment and capacity for processing and production) must be in place for local procurement to be feasible and sustainable. Both public and private investments in infrastructure are vital for local procurement opportunities to grow to scale and achieve the economic impact and viability demonstrated in the two case studies highlighted in this paper.

The economic impacts of farm-to-school procurement will continue to be a topic of interest for researchers, farm-to-school stakeholders, and policy-makers, and the authors hope that this study has sparked a deeper understanding of their challenges and opportunities. The preliminary results from the two case studies strengthen the call for those farm-to-school stakeholders with strong relationships to local producers to use the USDA Toolkit to conduct additional assessments evaluating the economic impacts of farm-to-school procurement, so that we may compare case studies in different locations, involving different commodities, scales, and numbers of producers, and relying on different supply chains. The survey protocol and methodology can support more rigorous and comparable economic impact assessments of farm-to-school procurement moving forward, and thus fill an important gap in knowledge and open new opportunities for farm-to-school implementation and advocacy.

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Appendix. Farmer Survey Protocol

Q1.1 Survey enumerator name: _____

Q1.2 The National Farm School Network (NFSN) is collaborating with researchers from Colorado State University (CSU) to conduct a study of the economic impact of farm to school programs. The research aims to understand how selling to the school food market impacts farm sales and profitability. During this survey, we will ask you questions to better understand the nature of your business and any changes you might have made since selling to schools. We do not anticipate any risks from participating in this research. No farm specific information will be shared with anyone outside of the Colorado State University-led research team without your permission. We will hold all information about your farm in strict confidence. The information will only be released in an aggregated format where individual farm information cannot be identified. We may quote your responses to open-ended questions, but your identity will not be associated with any quotes. Please be assured that we are committed to the strictest standards of confidentiality. If you have any questions, please feel free to call or email the Principal Investigator or Project Manager at any time.

If you have any questions or concerns regarding your rights as a subject in this study, you may contact the Institutional Review Board (IRB) for Human Participants at 970-491-1553 or access their website at https://vprnet.research.colostate.edu/RICRO/irb/.

Q1.3 If you agree to participate in the study, please provide your name, farm name, telephone, email below and zip code where your primary farm is located.

- Name (1)
- Farm (2)
- Phone (3)
- Email (4)
- Zip code where your primary farm is located (5)

Q2.1 Why did you/your farm decide to sell product to schools?

Q2.2 What impact(s) has selling to schools had on your business?

Q3.1 What is the name of the school district(s) to which you sell products? Please include city and state.

- District 1 (1)
- District 2 (2)
- District 3 (3)
- District 4 (4)
- District 5 (5)
- District 6 (6)
- District 7 (7)

Q3.2 In what year did you start selling to schools (e.g., k-12, preschool, early care and education facility, etc.)?

- Year (1)

Q3.3 In 2016, which of the following products did you produce on your farm? Please check all that apply.

- ☐ Fruit (1)
- ☐ Vegetable (2)
- ☐ Dairy (3)
- ☐ Grain (4)
- ☐ Beef (5)
- ☐ Hogs, pigs, sheep, goats, other livestock (meat or dairy), honey (6)
- ☐ Chickens, broilers, turkey, duck, and eggs (7)
- ☐ Other (8) _____

Q3.4 In 2016, did your farm utilize any season extension techniques (e.g., greenhouse, high-tunnels, hoop-house, etc.)?

- ○ Yes (1) _____
- ○ No (2) _____

Display This Question [Q3.5]:
If "yes" is selected.

Q3.5 Do you sell these products to schools? In other words, did participation in farm to school stimulate interest in or ability to utilize season extension techniques?

- ○ Yes (1) _____
- ○ No (2) _____

Q3.6 How many acres did you cultivate:

- When you started selling to schools: (1)
- In 2016: (2)

Q3.7 Did participation in farm to school stimulate changes in the amount of cultivated acreage?

- ○ Yes (1) _____
- ○ No (2) _____

Q3.8 Which of the following farm to school activities did you engage in during 2016?

- ☐ Sold locally produced foods to be served in the cafeteria. (1)
- ☐ Participated in farmer in the classroom sessions/cooking demonstrations of locally produced foods in the cafeteria, classroom or other school-related setting (2)
- ☐ Hosted student field trips to your farm/business (3)
- ☐ Provided school with marketing/promotional materials about your farm (4)
- ☐ Donated product to school for sample or tasting for free or at a reduced price (5)
- ☐ Worked with school/district staff to develop a specific food product using local foods (6)
- ☐ Were there any I did not mention (please specify): (7) _____

Display This Question [Q3.9]:
If "Participated in farmer in the classroom sessions/cooking demonstrations of locally produced foods in the cafeteria, classroom or other school-related setting" "Hosted student field trips to your farm/business" is selected

Q3.9 Which (if any) of the below themes did you cover with the students as part of your classroom and/or field trip engagement?

- ☐ Life on a farm (1)
- ☐ Lessons on specific produce (what is this? why is it good for me?) (2)
- ☐ How food gets from the farm to the plate (3)
- ☐ The importance of farms to the environment (4)
- ☐ Were there any I did not mention (please specify): (5) _____

Q4.1 What percent of your 2016 farm sales came from each of the sales channels listed below? (total must equal 100)

_____ Direct to farm to school (including k-12 and pre-k/early care and education sites) (1)

_____ Direct to individual consumer (e.g., farmers' market; on-farm store or farm stand; CSA; online market place; pick your own) (2)

_____ Intermediated market (e.g., supermarket or super center; restaurant or caterer; other retail store; local or regional food processor or food maker; or local or regional aggregator, distributor, food hub, or broker) (3)

_____ Institution (e.g., college or university; hospital) (4)

_____ Wholesale marketplace for commodities not identified by source (auction, wholesale or terminal market, etc). (5)

Q4.2 Specifically, which of the following markets did your farm or ranch use in 2016? (please check all that apply)

- ☐ Direct to k-12 schools (1)
- ☐ Direct to preschool or early care and education facilities (2)
- ☐ Farmers' markets (3)
- ☐ On-farm store or farm stands (4)
- ☐ Community Supported Agriculture (CSA) (5)
- ☐ Online market place (6)
- ☐ Pick Your Own (7)
- ☐ Supermarkets or supercenters (8)
- ☐ Restaurants or caterers (9)
- ☐ Other retail stores (independently owned grocery store, food cooperative, small food store, corner store, etc.) (10)
- ☐ Local or regional food processors or food manufacturers (11)
- ☐ Distributors (12)
- ☐ Food buying cooperatives (13)
- ☐ Food hubs (14)
- ☐ Food service management companies (15)

- ☐ DoD Fresh Program Vendors (16)
- ☐ USDA Foods (17)
- ☐ State farm to school program office (18)
- ☐ Colleges or universities (19)
- ☐ Hospitals (20)
- ☐ Other institutions (corporate cafeteria, prison, food bank, senior care facility, etc.) (21)
- ☐ Wholesale marketplaces for commodities not identified by source (auction, wholesale or terminal market, etc). (22)

Q4.3 Does any of the product you sell through intermediaries end up at schools? If yes, what percent of your total intermediated sales goes to schools?

- ○ Yes (1) _____
- ○ No (2) _____
- ○ Don't know (3) _____

Q4.4 Please tell us a bit more about your 2015 sales.

- TOTAL 2015 Sales (including all sales) (1)
- 2015 sales to schools (k-12 or pre-school) (2)

Q4.5 What was your level of satisfaction (very unsatisfied, unsatisfied, neutral, satisfied, or very satisfied) with the following aspects of your farm to school sales?

	very unsatisfied (1)	unsatisfied (2)	neutral (3)	satisfied (4)	very satisfied (5)
Prices paid (1)	○	○	○	○	○
Volume of sales (2)	○	○	○	○	○
Ordering reliability (3)	○	○	○	○	○
Time commitment (4)	○	○	○	○	○
Delivery requirements (6)	○	○	○	○	○
Delivery logistics (5)	○	○	○	○	○
Reliable payment (7)	○	○	○	○	○
Ease of communication with schools (9)	○	○	○	○	○
Overall profitability (8)	○	○	○	○	○

Q4.6 When your farm started to sell to schools, how did it affect your production for and/or sales to other markets? (please check all that apply)

- ☐ We increased production to accommodate school sales (1)
- ☐ We decreased sales to one or multiple direct markets (e.g., farmers' markets, CSA, farm stand, etc.) (2)
- ☐ We lacked adequate market access for our firsts (e.g., highest quality products) before selling to schools (3)
- ☐ We lacked adequate market access for our seconds (e.g., farm to school create an opportunity to sell our seconds/imperfect products) before selling to schools (4)
- ☐ We were a new/beginning farm without pre-existing markets when we started selling to schools (5)
- ☐ We started selling at schools so long ago that I can't remember (6)
- ☐ Other (7) _____

Q4.7 Do you plan to continue selling to schools in the future?

- ○ Yes (1) _____
- ○ Maybe/Unsure (2) _____
- ○ No (3) _____

Q5.1 What were your total farm product sales and operating expenses for 2016 (January 1-December 31).

- Total farm product sales (1)
- Total farm operating expenses (2)

Q5.2 In 2016, approximately what percent of your farm or ranch's total expenditures were devoted to the following categories? (the sum of these expenses should not equal more than 100%)

_____ Labor (according to the USDA the average labor expenses were 12% of total expenses) (1)

_____ Fertilizers and chemicals (average expenses were 11%) (2)

_____ Maintenance and repair (average expenses were 14%) (3)

_____ Fuel and oil (average expenses were 12%) (4)

_____ Rent and utilities (average expenses were 9%) (5)

_____ Seeds and plants (average expenses were 8%) (6)

Q6.1 Thank you for your participation in this research!