This document outlines a process for data collection, manipulation, and analysis to better understand local food structures in a region.

Food System Data Tutorial

Finding solutions to strengthen local food systems with Geographic Information Systems (GIS)

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Cornell Cooperative Extension
Jefferson County
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Foreword:

The following is based on a non-profit organization’s experience collecting food system information in Northern New York State. Using the software and materials throughout this tutorial, other organizations will be able to replicate this process of data collection and food system asset mapping. Please note, there are many strategies for gathering and/or mapping data. Use whichever systems best suit your needs, technological expertise, budget, etc.

INTRODUCTION

Producers, Cornell Cooperative Extension (CCE), and other stakeholders in New York State’s Jefferson, Lewis, Oswego, and St. Lawrence counties have been working to strengthen the local food system through technical assistance and development of markets, primarily a food hub that would serve producers in the four contiguous counties. The objective is to improve profitability of local producers and increase accessibility to local foods. The need for a comprehensive, mappable database was quickly identified. The use of Geographic Information System (GIS) technology has proven crucial in organizing data needed to find logistical solutions regarding the local food system, connecting producers to markets and technical resources, and answering questions such as:

- Who and where are the producers?
- What products are being grown and in what quantities?
- What value-added products are being produced?
- What agricultural resources currently exist?
- What infrastructure is lacking?
- What and where are the possible markets, and how do we connect them to producers?

CCE staff conducted extensive outreach visiting farms and collecting information that could then be viewed on ArcGIS mapping software. Feedback from initial field testing identified needed enhancements, resulting in a more effective and accurate dataset. In addition, the database was found to have many uses beyond its initial intent. These include broadening producers’ networks with markets and resources, introducing existing products into new markets, and serving as a critical tool for communication and fund development. This toolkit, used as replicable system of data collection, will help users better understand their local food systems.
OBJECTIVES

The purpose of this document is to provide a user-friendly model of data collection for mapping information about local food system components (producers, processing and storage facilities, roadways, markets, and other institutions/food system stakeholders). Using the process described, along with Excel document packages and other tools, a comprehensive database to better understand a region’s food structure can be developed.

APPLICATIONS

Finding local food solutions

One factor inhibiting local food from entering more markets and ultimately, consumer households, is understanding a region’s unique agricultural assets and needs. The process of identifying what agricultural products are being grown or crafted and what markets exist is the first step. Being able to then add local food data to a map contributes to understanding and solving challenges within a local food system.

Analysis of the data shows which products are being grown the most, least, in what quantities, and with what practices. Knowing these factors benefits marketing efforts. Clear lines, both figuratively and literally, connecting producers with markets and linking identified variables such as wholesale, retail, or direct to consumer sales can be drawn.

The surveys serve as a “needs-assessment” as they uncover issues that are helping or hindering producers and/or institutions from buying and selling local food.

This database will provide a rich and factual basis to conduct outreach and develop networks, offer targeted education, identify and develop infrastructure and identify needed resources. It can be a basis for identifying voids in information or gaps in product within a unique region or food system.
It is best practice to protect the privacy of those you survey. This can be done by developing and notifying those surveyed of permission policies when collecting sensitive information. Some producers and institutions may choose not to answer certain questions or wish for their information to be kept private. Let respondents know ahead of time if you plan to release survey data publicly, as this may influence participation.

Providing a standardized verbal preamble before conducting surveys and including a permission consent question within each survey (see the example below) is recommended.

Do you agree for your contact information to be used to help build a regional database for consumers interested in buying local foods?

- Yes
- No
**REQUIRED MATERIALS & RESOURCES**

The software and tools described below are those used for the Northern New York project. You should use the programs and/or tools that best fit your needs and budget.

1) **Software**
   a. ArcGIS Online
   b. Survey123
   c. Excel survey question package*
   d. Excel organizational template*

2) iPad or other mobile tablet (Recommended to include GPS and/or 3g/4g capability, but not required)

3) Computer/laptop with Internet access

4) Reliable transportation

5) List of regional producer/institution contacts

6) Technical expertise
   a. Data collector with ArcGIS experience
   b. GIS consultant (Recommended if expertise is not available on the current project team)

**Process Overview**

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- ArcGIS Online (p. 7)
- Excel survey package (p. 9)
- Survey 123 (p. 13)
- Tablet (p. 23)

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- Excel organizational template (p. 24)
- Methods of collection (p. 25)
- Potential challenges (p. 25)
- Additional tips (p. 25)

**Alternative Methods**
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- Other mapping options (p. 39)

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- Software price estimates (p. 40)
PROCEDURE

Getting to Know the Tools

This section provides a general overview of the software and tools used in collecting and mapping hard data. For alternative data collection and mapping tools, see the “alternative methods” section on page 38.

ArcGIS Online

General Overview

ArcGIS is a geographic information system (GIS) software platform developed by ESRI and used to create maps and analyze geographical data. There are many components included in the ArcGIS suite of software. This tutorial will focus on ArcGIS Online and Survey123.

There are several ArcGIS program and pricing options. Costs can be found in the budgeting section on page 40. In general, the more expensive the program, the more tools are included. For the purposes of replicating the process laid out in this tutorial, a Creator ArcGIS Online subscription will suffice.

Below is a link for purchasing an ArcGIS Online Creator subscription:


To learn more about ArcGIS Online, visit:


The ESRI account and ArcGIS Online subscription provides the ability to create and publish surveys, view survey results in tabular form, as well as on a map, and edit data. This will be described in more detail under the From Surveys to Mappable Data section on page 26.
What Can ArcGIS Do?

Once the surveys are populated, spatial relationships between food system assets (producers, markets, transportation networks, etc.) can be analyzed. Having a visual of where current infrastructure and resources, including human, natural, and artificial, lie with regard to one another provides opportunities to increase knowledge of where such resources are either lacking, need improvement, or are successful.

ArcGIS provides access to a database that continuously becomes filled as surveys are completed. Statistical information from the data, such as which areas produce more of a certain commodity or the number of producers who identify as using organic growing practices can be extrapolated. Although the ability to map the data is certainly a plus, all components of ArcGIS contribute to understanding a local food system. The tools and techniques of using ArcGIS for this purpose will be discussed further on page 35.
Excel survey package

General Overview

Included in the toolkit and available on the CCE website is a set of Excel documents that constitute the “back end” of the surveys. These are template files that will upload into Survey123. Instructions begin on page 14. There are Excel survey documents for the following categories:

- Horticulture
- Beef
- Pork
- Poultry
- Goat
- Sheep
- Exotic Meat
- Maple
- Honey
- Value-added Dairy (for cheese, yogurt, etc.)
- Eggs
- Other Value-added
- Beverage
- Institution

To view example surveys, visit:


To download the Excel survey documents, visit:

http://www.ccejefferson.org/local-foods/toolkit-for-mapping-a-food-system

Navigating the Spreadsheets

Each Excel file has four tabs along the bottom of the spreadsheet: survey, choices, settings, and types. See Figure 1a below.

![Figure 1a](image)

The “survey” tab consists of the “type” of question, such as text, select one, select multiple, integer, etc. This section also includes the “name” of the question, which is how the question appears in the database. The way the question appears in the published survey, however, is the “label.” See Figure 1b
below. For those more familiar with GIS terminology, this is akin to the relationship between a database field name and its alias.

<table>
<thead>
<tr>
<th></th>
<th>type</th>
<th>name</th>
<th>label</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>text</td>
<td>farm_name</td>
<td>Farm Name</td>
</tr>
<tr>
<td>2</td>
<td>geopoint</td>
<td>farm_loc</td>
<td>Farm Location</td>
</tr>
<tr>
<td>3</td>
<td>text</td>
<td>owner_name</td>
<td>Owners</td>
</tr>
<tr>
<td>4</td>
<td>text</td>
<td>phone</td>
<td>Phone Number</td>
</tr>
<tr>
<td>5</td>
<td>text</td>
<td>email</td>
<td>Email</td>
</tr>
<tr>
<td>6</td>
<td>text</td>
<td>st_add</td>
<td>Street Address</td>
</tr>
<tr>
<td>7</td>
<td>text</td>
<td>city</td>
<td>City</td>
</tr>
<tr>
<td>8</td>
<td>select_one county</td>
<td>county</td>
<td>County</td>
</tr>
<tr>
<td>9</td>
<td>select_one states</td>
<td>state</td>
<td>State</td>
</tr>
<tr>
<td>10</td>
<td>text</td>
<td>zip</td>
<td>Zip Code</td>
</tr>
<tr>
<td>11</td>
<td>text</td>
<td>WebURL</td>
<td>Website URL</td>
</tr>
<tr>
<td>12</td>
<td>text</td>
<td>FbURL</td>
<td>Facebook URL</td>
</tr>
<tr>
<td>13</td>
<td>text</td>
<td>cooler_storage</td>
<td>What is your cooler storage capacity (cu. Ft)</td>
</tr>
</tbody>
</table>

**Figure 1b**

Column G defines whether the question is required, while column H contains the message displayed on the survey if it is submitted without these questions answered. Otherwise, a red asterisk will designate required questions.

<table>
<thead>
<tr>
<th>C label</th>
<th>G required</th>
<th>H required_message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm Name</td>
<td>yes</td>
<td>This is a required question</td>
</tr>
<tr>
<td>Farm Location</td>
<td>yes</td>
<td>This is a required question</td>
</tr>
<tr>
<td>Owners</td>
<td>yes</td>
<td>This is a required question</td>
</tr>
</tbody>
</table>

**Figure 1c**

**Character limit:**

Column E defines the character limit, while column F contains the message displayed on the survey.

<table>
<thead>
<tr>
<th>C label</th>
<th>E string-length():&gt;0 and string-length():&lt;60</th>
<th>F Please input 0 - 60 characters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Website URL</td>
<td>string-length():&gt;0 and string-length():&lt;60</td>
<td>Please input 0 - 60 characters</td>
</tr>
<tr>
<td>Facebook URL</td>
<td>string-length():&gt;0 and string-length():&lt;60</td>
<td>Please input 0 - 60 characters</td>
</tr>
<tr>
<td>What is your cooler storage capacity (cu. Ft)</td>
<td>string-length():&gt;0 and string-length():&lt;50</td>
<td>Please input 0 - 50 characters</td>
</tr>
<tr>
<td>What is your freezer storage capacity (cu. Ft)</td>
<td>string-length():&gt;0 and string-length():&lt;50</td>
<td>Please input 0 - 50 characters</td>
</tr>
<tr>
<td>What is your dry storage capacity (cu. Ft)</td>
<td>string-length():&gt;0 and string-length():&lt;50</td>
<td>Please input 0 - 50 characters</td>
</tr>
</tbody>
</table>

**Figure 1d**
Relevant question:

These are survey questions that may or may not appear based on an answer to a previous question. For example, if a participant’s answer is “Other,” a new question will appear asking them to specify the answer.

In the example highlighted in Figure 1e below, the text in column L says the following in layman’s terms: if the answer to the above question asking “Are you part of a CSA?” is “Yes,” then this question will appear: “What is the name of the CSA?” as it is only relevant if they have/are a part of one.

```
<table>
<thead>
<tr>
<th>C</th>
<th>L</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>What production cost items would you want a Food Hub to buy in bulk?</td>
<td>selected($select_cost_items, 'other')</td>
<td></td>
</tr>
<tr>
<td>Specify Other:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you have a CSA?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you part of a CSA?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What is the name of the CSA?</td>
<td>selected($select_part_of_csa, 'yes')</td>
<td></td>
</tr>
<tr>
<td>Which farmers markets do you attend?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specify Other:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

Figure 1e

The “choices” tab includes all of the possible answer options for each question of the survey. The “listname” refers directly to which question the choice belongs, as seen in column A (type) of the survey tab. Like the survey tab, the “name” is what appears in the database, while the “label” is what is seen on the published survey. See examples in Figures 1f and 1g below.

Choices for markets:

```
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>list_name</td>
<td>name</td>
</tr>
<tr>
<td>23</td>
<td>markets</td>
<td>Fulton_Hillside</td>
</tr>
<tr>
<td>24</td>
<td>markets</td>
<td>Gouverneur</td>
</tr>
<tr>
<td>25</td>
<td>markets</td>
<td>Hammond</td>
</tr>
</tbody>
</table>
```

Figure 1f

Choices for water:

Note the asterisk under “name” in column B. Asterisks are often used to represent “Other” in the database. These are seen often in the survey spreadsheets. An asterisk can also be seen in Figure 1e in creating a relevant question in column L.

```
<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>water</td>
<td>municipal</td>
<td>Municipal</td>
</tr>
<tr>
<td>8</td>
<td>water</td>
<td>well</td>
<td>Well</td>
</tr>
<tr>
<td>9</td>
<td>water</td>
<td>surface</td>
<td>Surface</td>
</tr>
<tr>
<td>10</td>
<td>water</td>
<td>*</td>
<td>Other</td>
</tr>
</tbody>
</table>
```

Figure 1g
The “settings” tab includes the title of the survey form. This can be customized or left as is. Ignore the rest of the columns in this tab.

The “types” tab is built into the survey template by the Survey123 software and should not be changed. This page consists of the different field types in column A, such as integer, geopoint, select_one, as well as an explanation as to what each means in column B. See Figure 1h below.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Field Types</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Integer</td>
<td>Integer (i.e., whole number) input.</td>
</tr>
<tr>
<td>3</td>
<td>decimal</td>
<td>Decimal input.</td>
</tr>
<tr>
<td>4</td>
<td>text</td>
<td>Free text response.</td>
</tr>
<tr>
<td>5</td>
<td>select_one [list_name]</td>
<td>Multiple choice question; only one answer can be selected. Edit to reference the correct list name. Ignore any warnings after changing values.</td>
</tr>
<tr>
<td>6</td>
<td>select_multiple [list_name]</td>
<td>Multiple choice question; multiple answers can be selected. Edit to reference the correct list name. Ignore any warnings after changing values.</td>
</tr>
<tr>
<td>7</td>
<td>note</td>
<td>Display a note on the screen, takes no input.</td>
</tr>
<tr>
<td>8</td>
<td>geopoint</td>
<td>Collect a single GPS coordinates.</td>
</tr>
</tbody>
</table>

Figure 1h

Changing Survey Questions

Not every Excel file or the questions they contain may be relevant to every project. Questions in the documents can be tailored to meet project objectives. The files can be uploaded as they are or customized. Consider the following when making changes:

1) Keep name and location information required. This includes farm/business name, owner name, and address.

2) Some questions under the “survey” tab are project-specific. These can be changed or deleted. For example, the second to last question reads (under the label): “Did a CCE staff member assist with this survey?” This question would not make sense if your organization is not affiliated with Cornell Cooperative Extension. However, the potential answer choices may still make sense. In this case just edit the label.

3) When changing or adding a new question, change the related database “name” under column B of the survey tab. Again, use other question names as examples. It is recommended to not use spaces, but rather use underscores.

4) Depending on the project’s geographic location and which geographic information needs to be collected, some answer options for questions that are location-specific could be changed. These changes can be made under the “choices” tab under columns B and C. Below are examples of choices that may require changes:
   - States
   - Counties
   - Farmers’ Markets
   - USDA Processing Facility Names

5) To make questions required, use the first three questions as examples on how to make this change. See Figure 1c on page 10.
Survey123

General Overview

Survey 123 is a platform developed by ESRI and included with a Creator subscription to ArcGIS Online. The program has multiple uses including scientific research, statistics, and land assessment. In this case, it was applied to local food.

Survey123 Connect for ArcGIS

This is a desktop application used to upload Excel survey files to create the online surveys. First, download the application:

2) On the right side of the web page, click on the download link that fits your computer specifications.

3) Run the installation set-up.
4) Survey123 Connect for ArcGIS is ready to use.
Importing Survey Files

Follow the steps below to import the Excel survey files into Survey 123 Connect (refer to Figures 2a through 2j):

1) Open Survey123 Connect by clicking on the desktop icon.
2) Sign in with your ESRI credentials (Figure 2a).

3) Click on “New Survey” (Figure 2b).

4) A “New Survey” window will pop up. On the left side, in the list of options, select “File” on the bottom (Figure 2c).
5) Select “Browse for XLSForm...” (*Figure 2d*).

![New Survey](image)

*Figure 2d*

6) A new navigation pane will open. Navigate to the downloaded Excel survey documents. Select the desired file and click “Open” (*Figure 2e*).

![Select an existing XLSForm](image)

*Figure 2e*
7) In the “New Survey” window, the file will be inserted in the XLSForm File bar. Give the survey the same title that is under the “settings” tab of the imported Excel file. Click “Create Survey” in the lower right corner of the pane (Figure 2f).

8) A new window will open with the form preview, as well as the Excel survey file that corresponds with it. Review the survey to ensure it is correct before publishing to the web. The name of the survey can be changed under the “Settings” tab (the default will be set to “Form” followed by an integer if the name was not changed in the last step) (Figure 2g).

Form Preview Tab:
Schema Preview Tab:

The schema shows the database “name” and “type” of each question in the survey as discussed under the Navigating the Spreadsheets section on page 9 (Figure 2h). This information should be left as is.

![Schema Preview Tab](image)

Figure 2h

Settings Tab:

There are several tabs under the “Settings” section, however, only the “General” tab will need to be accessed.

To edit the name of the survey, click on “General” and change the text under “Title.” This will be the name on the published survey. The “Summary” and “Description” text boxes can be left blank (Figure 2i).

![Settings Tab](image)

Figure 2i
To change the basemap, click on “Map.” Under the “Default Map Type” drop-down menu, select the desired map type. Ignore the rest of the settings under this tab (Figure 2j).

**Figure 2j**

9) Repeat steps 3 through 8 to import other surveys.
Publishing Surveys

Once the Survey123 survey is published, it becomes much more difficult to make changes. Before publishing the surveys to the web, it is highly recommended to review each question carefully and double check for errors in the form preview. Make edits to the Excel survey files accordingly. In addition, it is useful to do an “alpha test” of the survey to ensure it is functioning correctly.

To push the survey to the web, follow the steps below (refer to Figures 3a through 3c):

1)  In the form preview window, click the cloud icon on the left side vertical menu (Figure 3a).

![Figure 3a](image)

2)  The new window that opens gives a final warning about publishing the survey. Click “Publish Survey” (Figure 3b).

![Figure 3b](image)
3) A new window will appear showing the status of the publication. If there are no issues, a “Publishing Completed” notification toward the bottom of the window will appear. Click “Ok.” This may take a few minutes. See Figure 3c.

![Publishing Tutorial Survey Example](image)

*Figure 3c*

4) Repeat steps 1 through 3 to publish additional surveys.
Survey123 on the Web

The published surveys can now be accessed on the Survey123 website: https://survey123.arcgis.com/

Sign in using your ESRI credentials. The “My Surveys” page (Figure 4a) will load.

Data can be viewed and analyzed (once collected), surveys can be shared with collaborators, and each survey will be given a specific URL link.

For the purposes of this tutorial, the “Open in Survey123 Connect” function will not be explored. However, the other three functions serve as valuable tools. See Figure 4b. “Collaborate” Contains each survey’s unique URL. This is useful for posting surveys on a website or sending surveys electronically to respondents. These options are discussed further in the Data Collection section on page 25.

Click on the “Collaborate” icon. The default is the “Submitter” tab on the left side menu. Notice the additional options on the upper half of the page, seen in Figure 4c on page 22. In order for anyone to submit a survey, the box titled “Everyone (Public)” must be checked. If this option is not available, there may be a permissions restriction on the active user account.
This may be the case for those working under an organization’s existing ESRI license. Contact your organization’s ArcGIS administrator to ensure access to proper survey sharing capabilities.

The two additional options allow only project collaborators to submit data to the surveys. The “Viewer” tab allows collaborators to view survey data. If additional organizations are involved, feel free to explore these secondary options. A “group” will need to be created in ArcGIS Online in order to use the “Following Groups:” function.

To learn more about creating groups, visit:


At the bottom of the page, there will be a web link as well as options for copying, scanning a QR code, or opening the survey in a new browser, seen in Figure 4d. The menu option selection below the URL can be left as is. Save the QR code icon by hovering over it and right-clicking. This can be inserted into marketing materials such as flyers, brochures, and other media.

The “View” tool provides the option to view data in both tabular form, as well as see all the location points on a map. Figure 4f shows an example. Although using Survey123 to view survey data works, ArcGIS Online serves as a more flexible tool, which will be discussed in the Online Map Viewing section on page 29.
“Analyze” gives access to view graphs and charts (including column, bar, and pie), as well as generate word clouds for questions that require a text response. There are many tools here to explore.

In addition, by clicking on the large green survey icon on the “My Surveys” page, also seen in Figure 2a, a summary of the number of surveys and respondents can be seen. This page also provides access to the “collaborate,” “analyze,” and “view” (data) tools. The survey can also be deleted from here, but all data will be lost.

**Tablet**

The easiest way to collect information in the field is by using a mobile device with the Survey123 app installed. The app does not need an Internet connection, which is often lacking in rural areas, to collect non-location data. However, a device with GPS (Global Positioning System) or 3g/4g, hotspot, WIFI, or other Internet capability is needed to input location (geopoint) data successfully (see additional tips on page 25). It is recommended to use a tablet for data collection. The larger screen allows easier data input than using a smart phone. However, either will work.

To complete the process, follow the steps below:

1) Go to the device’s application store and search for “Survey123 for ArcGIS” by ESRI.
2) Download the app.
3) Open the app and sign into your ESRI account by clicking the icon in the upper right corner of the homepage. Click “Sign in” on the menu that appears. Enter your credentials. The app will now be synced with your online account.
4) Click the icon and click “Download Surveys” at the top of the menu.
5) A list of the published surveys available for download will appear. Click the cloud icon on the right side of each survey to download them to the device.
6) The device is now ready to conduct surveys in the field.
Data Collection

The following describes useful strategies for gathering data, as well as additional tools/tips for keeping survey participant information organized.

Excel organizational template

Before collecting data, it is important to develop and maintain a list of local contacts. A spreadsheet works well for this purpose. There are several online resources to find producer and institution contacts. An institution includes any organization that would “buy” or act as a market, such as a grocery store, restaurant, hospital, or school. Local food publications and state agencies are good resources for this information. A simple Internet search can provide substantial results as well.

A template Excel document for populating survey participant contact information can be downloaded here: http://www.ccejefferson.org/local-foods/toolkit-for-mapping-a-food-system

Figure 5a shows a partial example.

![Figure 5a](image-url)
On-site visits

Both calling ahead to schedule survey appointments and dropping by a location unannounced can be effective in collecting data. In either case, begin the interaction with the potential respondent with a simple introduction of who you are, your organization, and the purpose of the survey. A business card and brochure explaining the effort demonstrates authenticity. It is helpful to speak to someone with authority, knowledge, and permission of the farm or institution as they will be able to provide the most complete and accurate answers.

Over-the-phone

Another way to collect information is via phone. Have the survey ready on either a tablet or computer. If someone answers the phone, ask for the producer/owner/manager of the farm operation or business. Proceed as described above for on-site visits with an introduction and permission to do the survey.

Online

An additional strategy for getting surveys completed is to post them online—on your organization/company’s website for example—or sending web links via email. The Northern New York project received the least amount of surveys using the online option. The in person and phone options provide a better opportunity to explain the project in more detail, as well as develop professional relationships with individuals participating in the project.

Potential Challenges

Anticipate potential complications such as difficulty connecting with busy producers and business owners, lack of access to technology in the field, suspicious respondents, and difficulty with follow-up. Clear accountability such as a typed message/letter explaining the project presented with a business card may help reassure potential participants. When doing on-site visits, keep the tablet fully charged. (It is recommended to bring an extra charger.) Bring hard copies of the surveys in case of a hardware failure. The information can be entered electronically later.

Additional Tips

While it is important to gather accurate information, allow participants to answer only those questions they are comfortable with. The location question is required by default and includes an embedded map. This directly relates to the “geopoint” question type under column A of the “survey” tab in the Excel survey files. It is important to add the survey participant’s correct location here! Changing the location to the correct address later can be challenging. The proper location can be added by clicking the map and either typing the address in the address bar or dragging and dropping the pin, if not correctly placed by the device’s current location. As mentioned on page 23, a GPS or Internet connection is required to answer this question. If the device cannot access GPS or Internet while in the field, complete all other questions and save the survey as a draft by clicking the ‘X’ in the upper left corner of the survey screen and select “Save this survey in Drafts.” The location can then be entered once Internet is available. To submit a survey, click the check mark in the bottom right corner of the survey screen. Click “Send Now” if Internet is currently available, or “Send Later” to submit the survey once a connection is made. Surveys being sent later can be found in the survey Outbox. To submit surveys in the Outbox, click “Send” in the lower right corner of the Outbox screen.
From Surveys to Mappable Data

This section covers methods to view data and analyze relationships between survey participants by introducing common GIS tools.

Viewing data

General Overview

The recommended method to view the data is to use ArcGIS Online. The online mapping software allows data to be viewed and edited in both tabular form and on the map. Survey results can also be exported into Excel. In addition, ArcGIS Online allows the flexibility for real-time data acquisition. In other words, when a survey is completed, it is immediately pushed onto the web.

Navigating ArcGIS Online

To begin viewing survey results, visit ArcGIS Online using the link below:

https://www.arcgis.com/home/index.html

(For best results, use Google Chrome or Microsoft Edge as the Internet browser.)

Sign in using your ESRI credentials (Figure 6a).

![Figure 6a](image)

Once signed in, the homepage with a menu along the top (Figure 6b) will appear.

![Figure 6b](image)

Next, click “Content” and a page will appear, similar to the example below (Figure 6c).

![Figure 6c](image)
A list of published surveys will be in the center of the page. Select “All My Content” in the left side menu. Each survey has both a “paper” icon as well as a yellow/red “map” icon (Figure 6d).

This tutorial focuses on the yellow/red map icon. This is where data can be seen and edited.

**Tabular Viewing**

To view survey results, click on the map icon for any survey in the list. In the top horizontal menu on the “Overview” page (similar to the one shown below), click “Data” (Figure 6e).
The “Data” tab will show a table of survey results, similar to the example below in Figure 6f.

![Figure 6f](image)

Sort each column by ascending or descending order by left-clicking the column header (question label) and selecting either option. This will sort either alphabetically in the case of text responses or numerically in the case of quantitative data.

The table name has a similar title to that of the survey, but with underscores where spaces should be. The name of the table can be changed by navigating to “Overview.” Under “Layers,” along the left side of the page, edit the name of the table. Be sure to hit save! See Figures 6g and 6h below.

![Figure 6h](image)

![Figure 6h](image)
Map Viewing

Viewing data on the map is one strategy for analyzing correlations between survey participants and the resources surrounding them. Specific examples will be discussed in further detail in the Spatial Relationships section.

To open survey results in a map using ArcGIS Online, return to the “Overview” tab for the selected survey. Click on “Open in Map Viewer” along the right side menu. See Figure 7a. A large world map with points representing the locations indicated in the survey will show on the screen—these may appear clustered because the points are zoomed so far out. From this point on, this map area will be referred to as the map window (Figure 7b). Notice a vertical panel along the left side of the screen. This will be referred to as the contents panel (Figure 7c). Along the top of the contents panel and map window are the left toolbar and right toolbar, respectively (Figure 7d).
The map can be manipulated in the map window. Drag the map with a computer mouse, zoom in and out using the mouse's scroll wheel, or zoom in and out by using the plus or minus symbols in the upper left corner. The basemap can also be changed by using the left toolbar. See Figures 7e and 7f below.

View the survey data by selecting (left-clicking) a feature, or data point, on the map. The window that appears will include the same information as viewing in tabular form (Figure 7g).
To add additional survey layers to the same map, follow the process below:

In the left toolbar, click “Add” and then click “Search for Layers” in the drop-down menu (*Figure 7h*). In the contents pane, select “My Content.” As many surveys as desired can be added to the map window. Click the “plus” icon for each survey or click the large survey icon and at the bottom of the new panel that appears, click “Add to Map.” See *Figure 7i* below.

*Figure 7h*

When survey data is added, all the features look identical; they have the same *symbology*. Go to “Details” located on the left toolbar. In the contents pane, click “Legend” to see the list of surveys that have been added to the map window—all with the same symbol. This can get quite confusing.

To change the symbology of the data points, go back to “Content” under details. A series of icons under the survey name will show. Click the icon with three colored shapes—this is the “Change Style” tool. See *Figure 7j* below.

*Figure 7j*

After clicking the “Change Style” tool, a panel will appear. Leave the Step 1 dropdown menu choice as is—only showing the location. For Step 2, under the “Location (Single Symbol)” drawing style choice, select “Options” (*Figure 7k*). This function adjusts shape, size, color, and transparency of the features by clicking “Symbols” (*Figure 7l*). There are many options to experiment with in this tool.
Exporting Data to Excel

Depending on the project, there could be many purposes for exporting data to an Excel spreadsheet, such as creating graphs and charts or generating a go-to contact list of producers. Whatever the reason, exporting to Excel is a relatively simple process and convenient tool.

Return to the “Overview” page of one of the surveys. Along the left menu, click on “Export Data.” On the dropdown menu that appears, click on “Export to Excel.” See Figure 8a. In the box that appears (Figure 8b), the title will be defaulted to the name of the survey. Add a unique “tag” in the second text box. For example, write the name of the survey followed by the date it is being exported. Select a folder to save the exported item. Click “Export.”
After a few seconds, a new web page will load. Click “Download” on the left menu (Figure 8c).

The data will be downloaded as an Excel file. Depending on the computer and web browser, a download notification may appear on the bottom left corner of the screen. The file can be opened to view the data immediately or saved.

Editing data

Why Edit Data?

Editing should only occur in very specific and controlled circumstances. Examples include updating contact information, adding new certifications, changing growing practices, etc. Only data that is certain to be outdated or incorrect should be edited.

Edited data can be more consistent. For example, contact information data may appear “cleaner” if all entries are written with correct postal codes and phone numbers in the same format. Editing also allows spelling errors to be fixed.

Editing Tabular Data

To edit data in a table, go to the tabular data view as outlined on page 27. An entry can be changed by double clicking the text or answer in a given table cell. See Figure 9a. Clicking anywhere else on the page will automatically save the change. This serves as a very convenient function. However, be careful not to delete or change an answer accidentally.
Deleting Survey Entries

To delete a survey entry, return to the map viewer of the survey as discussed on page 29. In the left toolbar options, select “Edit” (Figure 9b).

Select the feature to delete. Scroll to the bottom of the data window, find the “Delete” option (Figure 9c). Keep in mind that once a survey entry is deleted, it cannot be recovered.
Spatial relationships

General Overview

The advantage of mapping data is having a visual representation of where producers, infrastructure, and other agricultural assets lie in relation to one another, local institutions, and surrounding resources. As the Applications section on page 3 discussed, there are numerous opportunities for utilizing the spatial concepts created by analyzing geographical relationships, from travel logistics and market demographics to connecting a small farm to a neighborhood eatery, and everything in between.

Measuring Tool

One tool that seems simple, yet proves extremely beneficial in evaluating physical geographic relationships, is the Measuring Tool found in the map viewer, as discussed on page 29. To access the tool, click the “Measure” icon found in the right toolbar above the map window. Once selected, a drop-down will appear with measurement options including area, length (or distance), and location, as well as units of measurement (Figure 10a).

The example below (Figure 10b) utilizes the length measuring tool. This can analyze the approximate distance between mapped assets. First, select the “length” icon in the drop down menu. Choose the units. Then, select (left-click) an area to begin the measurement; this can be a feature, a metropolitan center, a farm market—anything! Left-click again on the next destination. Additional measurements can be added by left-clicking additional locations or double-clicking to complete the measurement. The results will be displayed in the measuring tool drop-down menu.
Applying Filters

Filters provide ways to sort features based on common attributes. An attribute is any non-geographical (locational) information or aspect of a feature. For example, in the case of horticulture producers, those who grow bell peppers share a common attribute.

In other words, applying filters allows for a visual representation of survey participants on the map who share similar characteristics. For those accustomed to other GIS terminology, this is essentially the same process as writing a definition query. To use this tool, click the “Filter” icon found in the content panel located directly to the right of the “Change Style” icon mentioned on page 31. See Figure 11a.

Once selected, a window will appear, shown in the example below (Figure 11b). It will display three drop-down menus under “Display features in the layer that match the following expression.” The first drop-down provides the option to choose any question for the survey currently selected. The third drop-down relays potential answers for the selected question. Depending on the question selected, the menu option selection may have to be changed to “unique.”

The second drop-down provides options to choose features that either have that answer (option “is”) or do not (option “is not”). Ignore the other options in this menu. In most cases, it is easier to leave the second drop-down as “is” (set by default). Once the desired options are selected, click “Apply Filter.”
In this example, a filter was added that expresses which horticulture producers sell product online. Figure 11c shows the same map before and after the filter was added.

**Before filter:**

**After filter:**

![Figure 11c](image)

Multiple filters can be added for any survey added to the map window. To delete filters, return to the tools window by clicking on the filter icon for the appropriate survey. From here, click on the “View” tab and click “Remove Filter” (Figure 11d).

![Figure 11d](image)
Alternative Methods

This section discusses approaches other than ArcGIS for food system data collection and mapping. It is important to note that the methods described below will not yield the same “automatic” process of integrating survey data and mapping. However, these are still viable options that are potentially less expensive or free to use, but may require extra steps to achieve similar objectives.

Other data collection software

The software examples below provide a user-friendly interface for building or replicating the surveys found on Cornell Cooperative Extension of Jefferson County’s website: http://ccejefferson.org/local-foods/ny-food-hub/data-collection-and-asset-mapping

This is by no means an exhaustive list.

Google Forms

Google Forms is an app included with Google Drive. It is completely free and accessible to anyone who has an account. Google Forms provides a platform to analyze and summarize survey results, as well as open data in Google Sheets (Google’s spreadsheet platform) or export to Excel. In addition, this platform allows collaboration with others; Google Drive allows sharing with unlimited Google accounts.

For more information about Google Forms, visit: https://www.google.com/forms/about/

SurveyMonkey

SurveyMonkey is a survey software that, depending on how in-depth the surveys are, can be free to use or cost several hundred dollars per month. The free version is restricted to ten questions and one hundred responses per survey. The paid version allows access to build an unlimited amount of surveys, receive an unlimited amount of responses, and have two user accounts.

For more information regarding SurveyMonkey, visit: https://www.surveymonkey.com/

Qualtrics

Qualtrics is another electronic survey system which also provides data analysis tools. Some institutions of higher learning have a Qualtrics subscription for research purposes.

To learn more about Qualtrics, visit: https://www.qualtrics.com/
Manual Surveys

An alternative to all of the software mentioned above is to create fillable forms using Microsoft Office software such as Word and Publisher, or a program such as Adobe. Surveys can be sent electronically via email, posted online, or filled out on paper copies.

These options require the data to be manually input into a spreadsheet or other data compilation software.

Other mapping options

Using alternative survey methods will not provide easy integration of location data and a map. This is where additional steps are needed. Location data will need to be manually added to alternative mapping software, or even a physical map. There are several free options for mapping survey results.

Google My Maps

Perhaps more familiar, Google Maps is a popular GIS tool utilized by many smartphones, computers, and GPS devices. “My Maps” is an intuitive application that was developed to allow users to create and manage their own maps. Excel or Google Sheets files containing survey information can be uploaded to the map.

My Maps also offers simple measuring tools and editing once data is imported to the map. Because it belongs to the same suite of software as Google Forms, they pair easily.

For more information about Google My Maps, visit: https://www.google.com/maps/about/mymaps/

For tutorials, please visit: https://sites.google.com/mrpiercey.com/resources/geo/my-maps

Example created using Google My Maps:
QGIS

QGIS is a free GIS desktop application that offers many tools. Its interface is similar to other professional GIS software and has many in-depth viewing, editing, and analysis capabilities.

To download QGIS, please visit: https://qgis.org/en/site/

For a training materials, visit:

Manual Mapping

Finally, there is the option of physical mapping with either pen and paper or thumbtack and board. This will be—together with the hard-copy survey option—the most time-consuming method of producing maps. However, some may prefer working with a potentially larger and tangible map.

Budgeting

Below are approximate costs.

Mapping Software Options

- ArcGIS Online Creator (includes Survey123): $500.00/year
- Google My Maps: Free
- QGIS: Free

Survey Software Options

- Survey123: Free with ArcGIS Online Creator subscription
- Google Forms: Free
- Qualtrics: Varies, at least $5000/year for a basic package
- SurveyMonkey: Varies, $384/year or $37/month for an appropriate plan

Tablet

If not currently owned, a basic tablet can be purchased for about $300.00. Additional GPS and/or remote Internet access capabilities (3G/4G) may cost more.

Transportation

If survey data is collected through field visits, transportation costs will vary depending on total distance traveled and fuel efficiency.
There are many reasons to gain a better understanding of local food systems through data collection and mapping. Before embarking on the path, it is helpful to consider three essential questions:

- What are the goals of collecting this information?
- What data should be collected?
- What will be done with the data after it is collected?

Armed with the answers to these questions and the tools in this toolkit, local food system stakeholders can make informed decisions, positively impact change, and spur growth.

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For technical support regarding survey uploading and navigation of Survey123 and ArcGIS Online, contact Garrett Darrah, *Cornell Cooperative Extension of Jefferson County*, at 315-788-8450. For questions regarding ESRI subscriptions, software, and other technical assistance, call 1-888-377-4575.