Linking Farms and Food Banks in Massachusetts

**Intro**
Gleaning is the act of harvesting excess food. Today farms typically grow more produce than they can sell in a season. This excess produce often goes to waste. However, organizations like Boston Area Gleaners have started gleaning initiatives in which they organize volunteers to glean the excess produce from farms near Boston and deliver it to local food pantries (bostonareagleaners.org).

Gleaning initiatives such as Boston Area Gleaners can fill an important niche which reduces food waste and delivers the excess to places in need. Both farmers and food banks/pantries in Massachusetts have expressed interest in gleaning initiatives throughout the state, leading the Massachusetts Department of Agricultural Resources to start a Massachusetts Gleaning Network.

The Massachusetts Gleaning Network aims to provide communities with resources and information to help them start their own gleaning initiatives. With rising gas prices, it is important for the gleaning initiative to be situated in a location that is both close to the farms and to food banks. The purpose of this project is to use GIS to find the most efficient connections between farms and food banks throughout Massachusetts based off travel cost.

**Results**
As driving range decreased so did area of cropland and number of agricultural fields for each food bank. Food Bank of Western Massachusetts has the largest values for both area and number of agricultural fields in all driving ranges. Within the 10 mile driving range, Greater Boston Food Bank has 100 times more acres of cropland than Project Bread, 47 times more acres of cropland than Greater Boston Food Bank, and 4.7 times more acres of cropland than Worcester County Food Bank. The disparities between cropland areas for each food bank decreases as the driving range increases. The Worcester County Food Bank has the second highest area and number of agricultural fields for all driving ranges. Greater Boston Food Bank and Project Bread has lower and very similar values.

Table 1. shows the travel cost according to the national gas mileage reimbursement for each road network (10, 20, 25, and 50 miles). The miles traveled is doubled for each road network because the van must travel out to the farm and back. The national gas mileage reimbursement set by the IRS for business travel is currently 55.5 cents/mile.

**Methods**
Data on cropland and roads was gathered from the MassGIS. Names and addresses of the four major food banks were obtained from the Internet. The data were compiled into a spreadsheet and then geocoded to display as points. We chose to focus on food banks because they are major distributors to food pantries in their area. Information for food pantries was harder to find because they are often moving and some only operate during certain times of the year.

Using ArcGIS 10.0, we created a network dataset from the Massachusetts roads data using Network Analyst. The network dataset allowed us to analyze distance between cropland and food banks by roads. Using Network Analyst Service Area we created expanding road networks with road extents of 10, 20, 25, and 50 miles from each food bank.

We created spatial joins between cropland and roads within 10, 20, 25, and 50 miles of each food bank. This allowed us to sum the cropland for each food bank within the specified radius. The Massachusetts cropland data divided cropland by field borders and their associated buildings. We used these polygons to infer number of agricultural fields.

**Discussion**
Food Bank of Western Massachusetts and Worcester County Food Bank are surrounded by the most farmland and therefore we assume that gleaners would not need to travel more than 10 miles. Within 10 miles, gleaners associated with the Food Bank of Western Massachusetts can harvest from 14,659 acres of farmland and 532 different fields. The high number of agricultural fields will theoretically provide a greater diversity of crops, assuming different fields grow a range of produce. The cost of each trip will only be $11.10. Similarly, Worcester County Food Bank has 3,206 acres of farmland and 337 different fields within the 10 mile driving range. Due to the low travel cost and high cropland availability, starting gleaning initiatives in central and western Massachusetts should be the easiest.

Gleaning initiatives in Boston will be inherently more expensive. There are less than 310 acres of farmland within a 10 mile radius of either Project Bread or Greater Boston Food Bank meaning that gleaners would have to travel at least 20 miles. However extending the driving radius from 20 to 25 miles for both Greater Boston Food Bank and Project Bread more than doubles the area of cropland while only increasing travel cost by $5.25 per trip.

**Notes**
Limitations of analysis:
- We assumed cropland was within 1000 ft. of a road.
- We don’t know what types of crops are growing at farms – not all of the cropland is used for produce, some fields may not be in use, not up to date.
- Road network may contain some errors. For example one way streets, size of vehicles, turning details.

Ways this analysis can be expanded:
- As gleaning initiatives become more prominent there will be more data available on the amount produce gleaned per farm. This data will help determine how many acres of cropland are necessary to support local food banks/pantries and determine the most cost effective driving range.
- Additionally within a smaller area, it is more practical to map local food pantries as well as food banks. In many cases it may be more effective to deliver the produce directly to the food pantry instead of just the food bank. Each gleaning initiative will need a more in depth analysis of the farms they want to glean from the food pantries/banks in the area, the amount of produce gleaned from each individual farm and the most cost effective driving range.