New England’s Food Hub Suitability

Introduction

Food hubs are facilities located in demand centers whose management system handles the aggregation, storage, processing, distribution and marketing of locally and regionally produced food products. By consolidating the various steps in a food production system, the number of middle men is reduced. Thus, food hubs not only assist smaller farmers in accessing a wider institutional and retail market, but also increase consumer access to fresh healthy food in areas that are often food deserts. Areas where demand is concentrated provide markets available for these farmers, but unfortunately, the lack of infrastructure is a constant challenge for many farmers and limits farmer access to demand centers.

This project aimed to create a food hub suitability map in New England as a pilot model to provide the New England Food Hub Initiative and CLF Ventures with information (with a focus on fruit and vegetables) that will improve their goals of delivering technical assistance and capital to expanding food producers, processors, storage, and transporters. Characteristics for mapping suitable food hub regions in New England included supply and demand drivers, and infrastructure service areas. Fruit and vegetable crop scape density as the supply driver was analyzed using point density. Demand drivers included institutions that may invest in locally and regionally produced food products, and demand centers based on population density by census tract. Infrastructure service areas included in this analysis were aggregation and processing facilities, existing food hubs, and road infrastructure (primary and secondary roads). Through spatial analysis of these factors, identified areas most suitable for development of a food hub in New England are possible solutions for improving small and mid-sized farmer access to demand centers and increasing consumer access to fresh, healthy food. As a pilot project, I hope for this analysis to be of use for querying potential regional food networks with the growing potential to serve as a stepping stone towards a more thorough analysis of food hub networks.

Methodology

1. Obtain necessary data sets for factors included in analysis. Supply: Crop scape raster data (cell size 30) was converted to point features to run the point density tool. Infrastructure: Aggregation, processing, and existing food hubs were geocoded (XY). Primary and secondary roads and institution data from each state were merged, respectively. Demand: Total population was joined to census tract geography to derive population density.

2. Model Builder: A network service area model was built to analyze each state’s aggregation, processing, and existing food hub data. Assigned breaks for aggregation and processing facilities were 5, 10, and 15, assigned breaks for existing food hubs were 10, 20, and 30. Service areas from step 2 were used to select crop scape points without processing, which were then run through point density.

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4. State primary and secondary roads were merged and a buffer of 1, 2, and 3 miles was created.

5. Institution data was also run through the point density tool.

6. All non-raster layers (output from step 2 and 4) were converted to rasters of cell size 30.

7. All output raster datasets were reclassified (scale of 1-5 or 1-4, with higher numbers representing high suitability. With Model Builder, a weighted overlay was run on reclassified raster datasets to create a food hub region suitability raster surface.

8. Total area of highest suitability areas (raster value = 4) was calculated in the attribute table.

Results and Conclusion

Areas of high food hub suitability were located in Maine and totaled to approximately 519,579 acres. This suitability model proposed areas with the potential for development of food hubs that would benefit farmers and consumers alike; however, one aspect it did not take into account was diversity of crops in an area. The high food hub suitability areas in Maine consisted mainly of potato and blueberry production. A food hub should also be based on the variety of locally produced food it aggregates, processes, and distributes. The number of different fruit and vegetable crops produced needs be taken into account to produce a more nuanced model. Another limitation was the inaccuracy of distribution data from Reference USA. Distribution facilities play a large role in the food system, and the exclusion of this dataset from the suitability analysis poses large validity issues with the output presented. Furthermore, lack of institution data for each state was a limitation faced as not all state GIS public databases provided data for all institution types (hospitals, schools, colleges, nursing homes, and prisons); therefore, demand center densities were most likely conservative.

Despite these limitations, as a pilot model, this analysis illustrated the potential of a weighting method to calculate the suitable areas for food hubs developed. A sensitivity model would provide case of weight changes to illustrate how lighter or heavier weighting of certain factors can influence proposed food hub facility locations; hopefully, benefiting the New England Food Hub Initiative and CLF Ventures in identifying locations to focus financial resources that will encourage small and mid-sized farmers to expand. With further research, specific locations for development of food hubs can be determined based on more nuanced factors, weighting, and a more rounded analysis.