A Tale of Two Foodsheds: Mapping Local Food Production Capacity Relative to Local Food Requirements


ABSTRACT

Similar in concept to a watershed, a foodshed demarcates the area from which a population derives its food supply. We tested two approaches to mapping potential local foodsheds and estimating the minimum distance within which food needs could be met for the Rochester area of New York. Each relies on publicly available spatial data. The first approach uses an iterative process of buffering to arrive at the solution. The second approach uses a linear optimization model. The average distance food travels is calculated using a weighted average based on the midpoint distance of the buffer or the distance between towns in the optimization region.

For simplicity’s sake, both approaches represent “food need” as the quantity of corn grain needed to meet the caloric requirements of the population. Per capita corn grain consumption was estimated to be 326.3 kg/yr assuming energy requirements of 2,200 kcal per day (Kantor, 1999) and food system losses of 32% (Kantor et al., 1997).

3. METHODS:

Two approaches were tested for estimating the minimum distance within which food needs could be met for the Rochester area of New York (Fig. 1). Each relies on publicly available spatial data. The first approach uses an iterative process of buffering to arrive at the solution. The second approach uses a linear optimization model. The average distance food travels is calculated using a weighted average based on the midpoint distance of the buffer or the distance between towns in the optimization region.

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FIGURE 1. Simplified spatial flow diagram of two methods for mapping foodsheds and estimating distance within which food needs could be supplied.

4. RESULTS:

Food needs for the Rochester metropolitan area were estimated to be 239.7 Mg corn. According to the buffering method, the caloric requirements for Rochester could be produced within 26.6 km of the city limits (Table 1). The average distance food would travel is 17.5 km. The potential foodshed is displayed geographically in Fig. 2.

Excel Solver considered three cities simultaneously. According to the optimization approach, the caloric requirements for Batavia, Canandaigua, and Rochester could be produced in the 52 town area surrounding Rochester. The average distance within which corn could be supplied varied by size of population: Batavia = 0.3 km, Canandaigua = 2.1 km, Rochester = 10.7 km (Table 2). The potential foodsheds of these three cities are displayed in Fig. 3.

5. DISCUSSION:

Of the two methods tested, optimization is the superior approach. It allows the user to account for the food needs of multiple population centers simultaneously and delegates the job of performing iterations to a computer rather than the GIS technician. In addition, this approach for calculating minimum average distances has been applied successfully in other fields (Horner and Murray, 2003).

The differences observed in the average distance food travels is probably the result of the method used to calculate differences between towns. Distances between towns were measured from the border, rather than a center coordinate, and therefore are likely to underestimate the average distance between polygons. This will be corrected in future work in which the optimization approach will be applied to map foodsheds for a complete diet across a wider geographic area.

6. REFERENCES:


