ing organizations, and many organizations know where farmers' markets are located in their local area. However, one impediment to further expanding cooperation is the lack of information and coordination needed to strengthen ties in local areas. In other words, nonprofit food recovery and gleaning organizations need to know numbers and locations of farmers' markets in their local areas. Conversely, donors at farmers' markets need to know that food organizations exist in their local areas and that potential losses can be turned into useful donations. A successful relationship also depends on sufficient densities (numbers) of farmers' markets in local areas to make it worthwhile for organizations to assemble donations in quantities that are large enough to make collections worthwhile. Large numbers of markets in close proximity keep collection costs low.

This report presents information about local areas in the United States with large numbers of farmers' markets near local nonprofit food recovery and gleaning organizations. The report also addresses the information and coordination problem by providing information on farmers' markets and nonprofit food recovery and gleaning organizations in these areas.

Theoretical Construct

Efficient food recovery must take economics into account—specifically, spatial economics. Three factors are particularly relevant here. First, there must be wholesome (edible), unsold fruits and vegetables and willing donors (supply). Second, nonprofit food recovery and gleaning organizations must use fruits and vegetables in their assistance efforts (demand). Third, these supplies and demands must be separated spatially (geographically), necessitating the collection and transporting of any donations from farmers' markets. The latter factor is very important because transport costs increase with distance.

To illustrate this concept, we assume that supplies and demands exist in a local area, and the number of farmers' markets are uniformly distributed within the area. We further assume equal supplies of donations at these markets. The economic relationship between recovery cost and the volume of donations in a local area can be depicted graphically (Bressler and King, 1970). Figure 1 depicts the relationship between the quantity collected and transportation costs for two different areas with different densities (numbers) of farmers' markets.

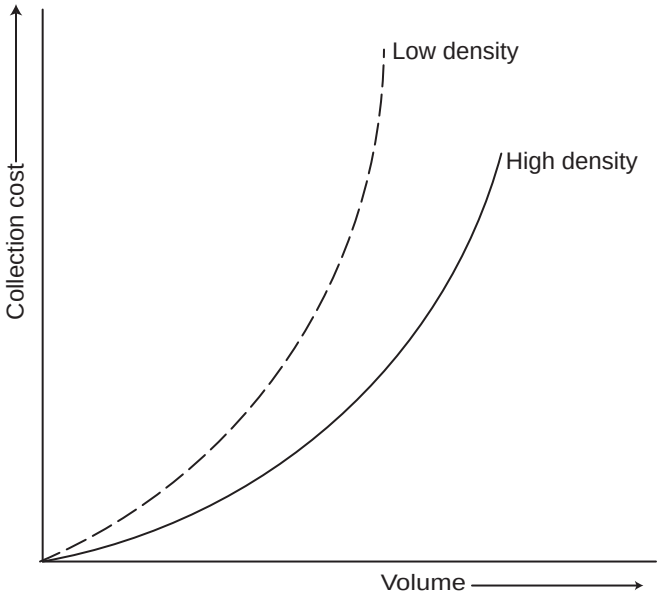
Collection costs increase as the size of the collection area around the organization increases. In other words, the farther an organization or volunteer has to travel to pick up donated food, the higher the cost. Therefore, a higher density (number) of farmers' markets in close proximity results in lower transportation costs. Conceptually, organizations will assemble donations from an area of such size or radius that transport costs would not exceed the cost of purchasing fruits and vegetables at local wholesale markets. From an economic efficiency standpoint, and at some distance and size of area, it is cheaper to purchase these products than to pay the costs to drive out to distant locations and collect donations.[1]

Based on this rationale, organizations have a collection area with a radius determined by economic cost, and costs will be lower in areas with high densities (numbers) of farmers' markets.[2] Therefore, areas with large numbers of farmers' markets in close proximity to

[1]This may not be the case if collection and transportation are donated by volunteers. In this case, fuel is an out-of-pocket cost and there is no direct cost to the organization. But from an economic efficiency standpoint, minimization of transport costs is optimal.

[2]There is an exception to this argument. One farmers' market in a local area conceivably could be large enough to supply sufficient donations to a local private food organization. To date, we have not isolated an example where this is the case.

Figure 1
Effect of volume and density on collection costs



food recovery and gleaning organizations have the highest potential for successful recovery relationships. We concentrate on these local areas in this study.

Methodology

Numbers and locations of farmers' markets and nonprofit food recovery and gleaning organizations were determined from several sources, including USDA publications and Internet web pages (see references). We identified over 2,812 farmers' markets (Johnson and others, 1998) and 440 nonprofit food recovery and gleaning organizations (USDA, 1999) across the United States (table 1). These numbers may not include all farmers' markets and nonprofit food recovery and gleaning organizations because farmers' markets continually enter and exit markets and local areas. Also, while larger nonprofit food recovery and gleaning organizations were included in this analysis, other types were excluded. Tens of thousands of food pantries and hot meals programs that distribute food to individual families or neighborhoods were not included.

This study focuses on the larger nonprofit food recovery and gleaning organizations that collect and distribute excess food on a citywide, countywide, multicounty, or statewide basis (table 1). Spatial analysis of these data allowed us to identify areas where densities (numbers) of farmers' markets were highest relative to local organizations. We assumed that nonprofit food recovery and gleaning organizations have collection areas within a 30-mile radius (2,826 square miles). However, no specific information exists about the size of collection areas. We selected 30 miles based on telephone conversations with a few recovery and gleaning organizations.

ArcView Geographical Information System (GIS) software was used to conduct a spatial analysis of the locations of farmers' markets and nonprofit food recovery and gleaning organizations. ArcView organizes spatial attribute data (data concerning specific locations and geography) and presents it graphically. The software contains boundary data points for State, county, zip code, and study area boundaries, as well as latitudinal and longitudinal reference points for locations of nonprofit food recovery and gleaning organizations and farmers' markets. Actual addresses were not used in this analysis. Zip code centroids (geographic centers) were used as the mapping reference point for all food assistance organizations and farmers' markets contained in each zip code.

Table 1—Numbers and locations of farmers' markets and food organizations in the United States[1]

State	Farmers' markets	Food organizations
	Number	
Alabama (AL)	15	9
Alaska (AK)	4	5
Arizona (AZ)	13	12
Arkansas (AR)	28	10
California (CA)	301	51
Colorado (CO)	35	7
Connecticut (CT)	53	7
Delaware (DE)	2	2
District of Columbia (DC)	10	2
Florida (FL)	43	21
Georgia (GA)	9	9
Idaho (ID)	23	1
Iowa (IA)	121	6
Illinois (IL)	149	11
Indiana (IN)	61	13
Kansas (KS)	65	3
Kentucky (KY)	83	4
Louisiana (LA)	14	7
Maine (ME)	48	1
Maryland (MD)	66	10
Massachusetts (MA)	104	8
Michigan (MI)	68	15
Minnesota (MN)	48	7
Missouri (MO)	92	8
Mississippi (MS)	53	3
Montana (MT)	7	2
North Carolina (NC)	61	11
North Dakota (ND)	27	2
Nebraska (NE)	36	5
Nevada (NV)	4	3
New Hampshire (NH)	28	1
New Jersey (NJ)	47	5
New Mexico (NM)	27	7
New York (NY)	264	17
Ohio (OH)	76	18
Oklahoma (OK)	27	2
Oregon (OR)	31	22
Pennsylvania (PA)	172	25
Rhode Island (RI)	12	1
South Carolina (SC)	33	8
South Dakota (SD)	22	2
Tennessee (TN)	62	7
Texas (TX)	56	26
Utah (UT)	3	2
Vermont (VT)	35	2
Virginia (VA)	57	10
Washington (WA)	67	20
West Virginia (WV)	21	3
Wisconsin (WI)	123	5
Wyoming (WY)	6	2
Total	2,812	440

[1]Excludes Hawaii and Puerto Rico.