

---

# 18 Transport of Agricultural Supplies and Foods

Transport is an essential component of all food systems, especially those in industrialized nations such as the United States, which have highly developed industrial complexes and intensive agricultural systems. They grow food crops in specialized regions most conducive to agricultural production (e.g., the corn belt of the United States). Industrial production sites are generally located near population centers and available power sources. Thus, harvested crops have to be transported to the cities and towns where industry is located, and machinery, fertilizers, pesticides, fuel, and other goods used in agricultural production have to be transported from urban areas to farms.

Transportation in the food system is more complex than just shipping food directly from the farm to homes. After being harvested, most food crops have to be processed and packaged, then transported to large wholesale distribution centers. From there, the packaged foods are shipped to retail stores located near population centers, where individuals purchase them and transport them home.

To account for the energy expended in this vast network, the energy inputs in transporting goods to the farm, raw agricultural products to the processors, produce to wholesale–retail markets, and food from the grocery to the home will be analyzed.

## TRANSPORT OF AGRICULTURAL SUPPLIES AND GOODS TO THE FARM

An estimated 160 million ha of cropland are cultivated annually in the United States. About 100 billion kg of goods and supplies are transported to farms for use in agricultural production each year. On average, then, about 600 kg of goods and supplies must be transported to farms for each hectare cultivated.

The energy needed to move goods by truck is estimated at 1.2 kcal/kg/km (Table 18.1). This estimate is based on the fact that trucks require about 0.143 L of diesel fuel to transport 1 t for a distance of 1 km (Thor and Kirkendall, 1982). Moving goods by rail requires an estimated 0.32 kcal/kg/km (Table 18.1), about one-fourth of the energy expended in truck transport (Table 18.1). The energy and cost to transport goods by barge is only 0.10 kcal/kg/km, or one-third that of rail transport. As expected, air transport has the highest energy cost, 6.36 kcal/kg/km (Table 18.1), more than 60 times costlier than barge transport.

As noted, 600 kg of goods and supplies are transported to each farm hectare. Available data indicate that 60% of the goods are transported by rail, 40% by truck,

**TABLE 18.1**  
**Energy Needed to Transport 1 kg for a Distance of 1 km**

Transport system	kcal/kg/km
Barge	0.10 <sup>a</sup>
Rail	0.32 <sup>a</sup>
Truck	1.20 <sup>a</sup>
Air	6.36 <sup>b</sup>

<sup>a</sup> Thor and Kirkendall (1982).

<sup>b</sup> Estimated.

and that the average distance these goods are transported is 1500 km (Smith, 1991). The energy input for the 60% of the goods transported by rail is about 173,000 kcal/ha, and the 40% transported by truck use 430,000 kcal/ha. Thus, transportation of farm goods requires a total energy input of 603,000 kcal/ha cultivated. Annually, then, an estimated  $96 \times 10^{12}$  kcal is expended to transport the 100 million tons of goods and supplies needed on U.S. farms.

## TRANSPORT OF FOOD AND FIBER PRODUCTS FROM THE FARM

About 160 million ha of cropland are harvested annually, at an average of 4000 kg/ha. Thus, an estimated 640 million tons of food and fiber products are transported from the farm to various locations for eventual consumption.

About 41% of agricultural goods are transported by truck, 40% by rail, and 19% by barge (Thor and Kirkendall, 1982). The products are transported an average distance of 1000 km (Thor and Kirkendall, 1982). Based on this information, the transport of goods from the farm to cities and towns requires  $348 \times 10^{12}$  kcal of energy per year, or 640 kcal/kg.

Based on experience, families usually shop about three times per week. With each person on average consuming 1000 kg of food per year, and with three people in the average family, 19.3 kg of food is transported from the grocery store on each trip. The average round trip to the grocery is estimated to be 7.8 km, or nearly 5 miles. The average automobile today gets about 8.4 km/L (20 miles/gal). Based on these data, it takes about 684 kcal to transport 1 kg of food home from the grocery store. This is slightly more than the amount of energy invested to transport 1 kg of food from the farm to the city or town.

## REFERENCES

- Smith, F.A. 1991. *Transportation in America: Statistical Analysis of Transportation in the United States*. Waldorf, MD: Eno Transportation Foundation, Inc.
- Thor, C. and E. Kirkendall. 1982. *Energy Conservation*. Manhattan, KS: Extension Engineering, Kansas State University.