**Exploring the Energetics of Food**

**Class activity for Chapter 8**

***Food, Farms and Community***

**Material Requirements: None**

**Time Requirement: 45-60 minutes**

This is a two-part activity that will test students’ ability to use arithmetic to explore the energetics of food. It will introduce the idea of using dimensional analysis to perform simple calculations. For this exercise, students should be broken into small groups, and offered a set of problems to work on that involve using dimensional analysis. These problems will all require various conversion factors, which can be provided to students or looked up on the internet.

The first question is: We often measure the edible energy value of food in calories. In reality this is a bit of a misnomer, as the “calories” listed on the nutrition label of food are actually kilocalories, or 1,000 calories. A calorie is simply a unit of heat (though not temperature, which is a different property of matter). The energy in any material that carries energy in its chemical bonds can be measured in calories, including common industrial fuels like gasoline and diesel whose heat contents are most often measured in BTUs or joules. How many kilocalories, or nutritional calories, are there in one gallon of gasoline? An example of dimensional analysis on the board can get students started on this. The correct answer is about 31,000 kcals.

The second question is: It is easy to look up the calorie content (actually the kilocalorie content) of the foods we eat. Have students choose three foods they commonly eat (a Big Mac, for instance, or a pint of Ben & Jerry’s ice cream) and estimate how many servings of these foods it would take to equal, calorically, the energy carried in one gallon of gasoline. The answer to this will vary depending on what foods they choose, but the quantities required will likely surprise students. It is necessary for them to be able to calculate the number of kilocalories in one gallon of gasoline correctly in order for them to do this second calculation.

The third question is: For many small farms, labor costs represent a substantial cost of doing business, and one reason why agricultural machinery is used is to substitute for human labor. Knowing that one gallon of diesel fuel contains about 33,000 kilocalories and costs about (look up the price of diesel in your area), what would a farmer have to pay their laborers in terms of an hourly wage to make human labor, in the basis of calories burned, as cheap as fossil fuel labor? For this question, it’s useful to know that an average person burns 2,000 kilocalories or more per day, or about 80-85 kilocalories per hour. Depending on the cost of diesel, the answer to this question will likely be between 0.5-1 cents per hour.