Symptoms of Expressing the Energy Value of Food

History of the Calorie in Nutrition

The calorie was not a unit of heat in the original metric system. Some histories state that a defined Calorie (modern kcal) originated with Favre and Silbermann in 1852 or Mayer in 1848. However, Nicholas Clément introduced Calories in lectures on heat engines that were given in Paris between 1819 and 1824. The Calorie was already defined in Bescherelle's 1845 Dictionary National. In 1863, the word entered the English language through translation of Ganot's popular French physics text, which defined a Calorie as the heat needed to raise the temperature of 1 kg of water from 0 to 1°C. Berthelot distinguished between g- and kg-calories by 1879.

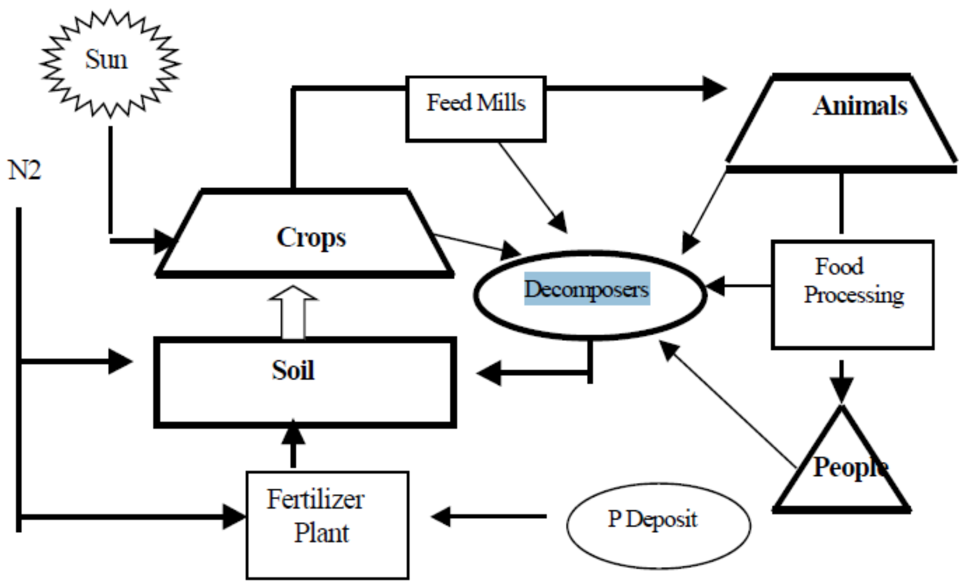

Figure 2 Remodeled Food Chain
(Based on Lanyon, 1996)

The greater parts of the energy trapped as a chemical energy within the plant itself and the animals use this energy. Thus, plants store and animals dissipate energy. The major organic components present in food are required by animals as raw materials for the synthesis of body tissues and animal products such as milk and eggs. They are also needed as sources of energy to support work done by the animal. A unifying feature of these diverse functions is that they all involve a transfer of energy, which applies equally when chemical energy is converted into mechanical or heat energy, as when nutrients are oxidised, and when chemical energy is converted from one form to another, for example when body fat is synthesised from dietary carbohydrate. The ability of a food to supply energy is therefore of great importance in determining its nutritive value.

Evaluation of Energy Value of Feed in Animal Nutrition

Definition of energy: Energy is defined as the capacity to do work. As we know, heat is measured in some units known as calories which may be defined as follows:

1- Calorie (Cal): The amount of energy as heat required to raise the temperature of 1 gram of water to 1 °C (precisely from 14.5°C to 15.5°C). One Cal. is equal to 4.184 Joule.

2- Kilocalorie (K Cal): The amount of energy as heat required to raise the temperature of 1 kg of water to 1°C (from 14.5°C to 15.5°C). Kilocalorie is equivalent to 1000 calories.

3- Megacalorie (M Cal): Equivalent to 1000 kilocalories or 1000,000 calories, formerly referred to as a thermo

4- British thermal unit (BTU): The amount of energy as heat required to raise the temperature of 1 pound of water to 1°F. It is equal to 252 calories.

5- Joule : The International Union of Nutritional Sciences and the nomenclature committee of the International Union of Physiological Sciences have suggested the Joule (J) as the unit of energy for use in nutritional, metabolism and physiological studies.

The joule, which is defined as the work done in moving a distance of 1meter against a force of 1 Newton (N).

The Joule is defined as 1 newton meter, and 1 J = 0.24 Cal.

The relationship 1 Cal = 4.184 J is known as the mechanical equivalent of heat; it emphasizes the fact that heat, like work, is a form of energy.

Kilo joule (KJ) and mega joule (MJ), are also explained similarly.

The simplest method for measuring the value of any feed is to determine the amount of digestible nutrients that is supplied to the animals. For expressing the energy value of feeds and requirements of animals, following systems are used.

The unit of energy in the International System of Units (SI) is the joule (J). A joule is the energy expended when 1 kg is moved 1 m by a force of 1 Newton. This is the accepted standard unit of energy used in human energetics and it should also be used for the expression of energy in foods. Because nutritionists and food scientists are concerned with large amounts of energy, they generally use kilojoules (kJ = 10^3 J) or mega Joules (MJ = 10^6 J). For many decades, food energy has been expressed in calories, which is not a coherent unit of thermochemical energy. Despite the recommendation of more than 30 years ago to use only joules, many scientists, non-scientists and consumers still find it difficult to abandon the use of calories. This is evident in that both joules (kJ) and calories (kcal) are used side by side in most regulatory frameworks, e.g. Thus, while the use of joules alone is recommended by international convention, values for food energy in the following sections are given in both joules and calories, with kilojoules given first and kilocalories second, within parenthesis and in a different font. In tables, values for kilocalories are given in italic type. The conversion factors for joules and calories are: 1 kJ = 0.239 kcal; and 1 kcal = 4.184 kJ.

Take samples of a range of foodstuffs and set them alight in turn. Burn food samples under a boiling tube containing a measured amount of water. Measure the temperature increase in the water. Calculate the amount of energy needed to cause that temperature increase. This gives an estimate of the amount of energy stored in the food.

It is the manufacturer's responsibility to ensure that the declared energy value accurately reflects the energy content of the product. Although one option is to determine the energy value directly through analysis, manufacturers may calculate the energy value either by the actual (un-rounded) nutrient content value for protein, fat and carbohydrate or the declared (rounded) values for these nutrients and then multiply them by the Atwater factors. When deciding whether to use the un-rounded or rounded value, the manufacturer should consider the amount of energy that will fall within the acceptable tolerances, provide the greatest consistency on the food label, and prevent any unnecessary consumer confusion. The company will be calculating the energy value of a food using un-rounded nutrient content values of protein, fat and carbohydrates as determined by laboratory testing.