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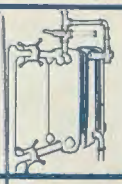
MINNESOTA DAIRY PRODUCTS PROCESSOR



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Energy issues will continue to affect the dairy industry. An overview of the current situation might help place matters in perspective.

CURRENT ENERGY USAGE

Table 1 shows percentage of energy use, both in the food system generally and as a part of the U.S. total. Processing food takes nearly twice the energy of producing it (30 percent vs. 15 percent). And the marketing bite adds up to another 10.8 percent. Total U.S. energy output for food-related matters comes to 16.5 percent. Of that amount, production requires 3 percent, processing 5 to 7 percent, and home storage and preparation, 5 percent. In proportion to its meaning to society, production and processing of food take but slivers from the U.S. energy pie.

THE PROCESSING BITE

Processing, as defined in the data presented in table 1, consists of several elements. A breakdown of some of these elements is shown in table 2. Actually the processing function per se (those things that go on inside the dairy and other food plants) consumes about 2 percent of the energy used by the United States. Energy for packaging varies by type of container but adds up to 1.2 percent. Fuel for transportation, at the time these statistics were taken, used up 1.46 percent of U.S. energy.

No doubt these figures have changed in recent years, but the implications are clear: The major areas for exercising control and implementing efficiencies are the processing function as such, and transportation. Certainly this is true for the dairy industry, where processing utilizes enormous amounts of energy for heating and cooling (or cold storage), and where transportation is both regular and frequent from farm to plant and from plant to point of sales.

But it is not enough to simply indicate that the dairy industry uses a large amount of energy to transport and process its food products. Perhaps we ought to ask what it is that we want--and get--for this energy outlay, and how dairy foods stack up against other foods. This has been shown, in a general way, from data taken from a 1963 census that provided appropriate input/outgo information. The study compares efficiency of energy utilization for calories and protein returned from a given investment of energy.

EFFICIENCY OF ENERGY USE BY FOOD GROUPS

Table 3 shows the relative efficiency of primary energy use for various groups of foods in descending order of efficiency. Energy in this case includes that used for growing, processing, transportation, wholesaling, retailing, refrigeration, and home cooking.

And it turns out this way: If it's food energy--calories--you want, then sugar, sweets, fats, and oils are your best energy buy. Flour and cereal products and fresh vegetables are also high on the list. Dairy products, potentially good sources of calories, fall midway down the column. These foods returned one Btu of food energy for every 7.5 Btus of primary energy input. The average, incidentally, was 6.4 Btus of energy input. Fish and processed fruits and vegetables, the worst of the lot, used twice the average. But note: If protein is your need, fish now leap to the top of the column. Fresh vegetables and eggs are right up there also. And again dairy products land somewhere in middle ground. The average, here, is 835 Btu of energy per gram of protein. The first six food groups on the list fall well below that. The last two run 2.5 to 3.5 times higher.

ENERGY OF PRODUCTION

The above can perhaps be considered the good news. The bad news, for livestock industries anyway, falls on the production side of agriculture. And both efficiency of production (pounds of food per acre) and energy of production figure strongly in favor of plant crops.

Professor G. H. Heichel, writing in the American Scientist (64 (1): 65-72), reports on both calories and protein production as related to amount of energy consumed. For calories, you do best with sorghum, sugarcane, or corn. For each unit of energy, these food sources return 3 to 5 calories. Wheat, oats, and soybeans run a close second at 2 to 3 calories per unit of energy. The poorest of the lot, at less than one calorie per unit of energy, includes several vegetable and fruit products.

For protein production, alfalfa and soybeans rise to the top, at 200 to 400 grams of protein per unit of energy expenditure. Coming in at 100 to 200 grams are wheat, oats, corn, and sorghum. Livestock products--chicken, beef, and pork--fall in the range of 0 to 100 grams of protein per given unit of energy. Milk as such is not treated in the discussion, but other researchers find energy needs of meat animals to exceed plant products by 50 percent.

In productivity, plant crops obviously surpass livestock animals and products. But milk production tops the list within the livestock category. Protein production from milk comes out at 90 to 110 pounds per acre, calories at 4.5 million per acre. By comparison, the soybean, in protein productive capacity, provides some 500 to 600 pounds per acre. Thus plant foods obviously have the edge, as do substitutes for meat and dairy foods derived from plant products. Of course, the situation is no different from what it has been in the past...except that the energy crunch now falls dead center of the issues involved. In future issues of this newsletter, I hope to address some of these energy considerations.

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Table 1. Energy Use in Agriculture

Food System Overall	As Percent of Food System Input
Farm Production	15.0
Processing	30.0
Marketing and distribution	10.8
Commercial eating places	17.5
Home food preparation	26.7

As Percent of U.S. Energy	Percent
Production, on farm	3
Processing	5-7
Home storage and preparation	5
Total	16.5

Table 2. Percentage of U.S. Energy Use by Various Food Processing Elements

Energy Use	Percent of U.S. Total
Food processing	1.82
Machinery	0.01
Paper packaging	0.22
Glass containers	0.28
Steel and aluminum cans	0.72
Fuel for transport	1.46
Manufacture of trucks and trailers	0.44
Total	4.95

Source: Steinhart, J. S. and C. E. Steinhart. 1974. "Energy use in the U.S. food system." Science 184: 307-316.

Table 3. Relative Efficiency of Primary Energy Use by Food Groups (descending order of efficiency)

For Food Energy	For Food Protein
sugar, sweets, fats, and oils	fish
flour and cereals	fresh vegetables
fresh vegetables	eggs
dairy products	dairy products
meat and poultry	flour and cereal
eggs	meat and poultry
fresh fruits	processed fruits and vegetables
fish	fresh fruits
processed fruits and vegetables	

Source: Adapted from Hirst, Eric. 1974. "Energy for food: from farm to home." Transactions of the ASAE 17(2):326.

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