PENNSTATE
College of Agricultural Sciences
DAIRY & ANIMAL SCIENCE
E-I-E-I-O
From Dairy and Animal Science at Penn State

(Continued from Page E2)

two are suitable only for production of pasture and forage.

The movement back to pasture systems in the dairy industry has caused us to refocus on the efficient production of human food from pastureland. In some of our Penn State grazing research, we found that cows produced 13,000 pounds of milk/acre during a six-month grazing season, with a stocking rate of 1.3 cows/acre. This was more than 400 pounds of milk protein per acre, the majority of which came from pasture. In comparison, a 100-bushel-per-acre corn crop provides only about 120 pounds of protein for human consumption, and the biological value (protein quality) of corn is inferior to that of milk.

Only 20 percent of the solar energy transformed into chemical energy by plants is used directly by humans. Dairy cows can convert the other 80 percent into high-quality foods.

We can use our 100 bushel/acre corn crop as an example. One acre of corn produces 12,000 pounds of dry matter: 6,000 pounds of corn grain and 6,000 pounds of stalks, leaves, and cobs. Not all of the 6,000 pounds of grain would be available for human consumption, since 3,000 to 4,000 pounds may be inferior kernels and mill feeds. Thus, this single acre of corn can provide 2,000 to 3,000 pounds of human food but 9,000 to 10,000 pounds of animal feed.

A dairy cow could consume (as corn silage) the entire 12,000 pounds of the dry matter from this acre of corn and with minimal supplementation produce 12,000 to 14,000 pounds of milk (and more than 400 pounds of milk protein). Alternatively, the land could be used as pasture to produce the same amount of milk protein at an even lower cost or for other forage crops.

The dairy cow's ability to convert cellulose from forage and by-products to food energy also must be considered. The hypothetical acres' 100 bushels of corn grain contains about 4,000 megacalories of energy, but only about 1,500 to 2,000 megacalories are directly available for human use. The milk produced from this same acre, however, contains more than 4,000 megacalories of energy available for human use.

What does this mean? A dairy cow can use the entire corn crop produced on one acre of arable land to produce more protein and energy for human consumption than would be available if humans were to consume the corn grain directly. She can use the 75 to 80 percent of the crop not available to humans and produce food to complement the protein and energy consumed directly by humans.

Is the dairy cow really competing with humans for our food supply? No! Remember that the total pasture land area worldwide suited only for use by ruminants is twice that of the total arable land area. And this is only part of the story. In recent years, we have begun feeding more waste and by-products — from the rendering and grain processing industries; feedstuffs such as brewers grain, distillers grain, animal protein, and wheat mids; and candy and bakery waste. Not only is the dairy cow efficient, but she is also good for the environment because the by-products fed to her don't end up in a landfill. Furthermore, the animal waste can be returned to the soil to enhance soil fertility.

The unique ability of the dairy cow to transform nonedible material into high-quality edible human food with a relatively high efficiency enables her to make valuable contributions to human welfare, including:

- Adding to the amount of available food
- Raising the quality of the food
- Improving human health by supplying high-quality protein products
- Using products which cannot be used by humans
- Using material that would have been sent to landfills
- Using feed from land not appropriate for growing crops for human consumption.

Plant and animal cultures are complementary. A viable agriculture to feed the increasing world population will require efficient use of all plant and animal resources.

The dairy cow, with her unique ability to transform otherwise useless plant material and waste products into high-quality human food, is truly nature's "high-tech animal."