Western Dairy News
for the West, about the West, from the West

Sustainability, schmustainability. Why does it matter?

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Nowadays it is difficult to escape the concept of sustainability. It's a new buzzword; the hip term to apply to a restaurant, an airline or a grocery store. It's easy to dismiss sustainability as the new trend that will disappear in a couple of years. Yet for the dairy industry, it is crucial to promote sustainability in the true sense of the word – a combination of economic viability, environmental sensitivity and social acceptability.

Expert authorities suggest that the global population will reach over 9 billion people by the year 2050. That increase will not occur on a linear basis across the globe; the majority is predicted to occur within the developing world, with currently impoverished countries such as China and India predicted to have incomes per capita similar to those enjoyed in the developed world. As consumer demand for milk, meat and eggs increases in line with income, the Food and Agriculture Organization of the United Nations (FAO) has stated that food production will have to increase by 70 percent in order to fulfill the nutrient requirements of the larger, more affluent population.

Erroneous perceptions

Consumers are becoming increasingly aware of the environmental consequences of their food choices. Unfortunately, this awareness is often based on misconceptions and personal philosophies rather than science, yet growing concern over resource use and climate change cannot and should not be ignored by the dairy industry. So should the livestock industry continue to intensify and improve productivity to feed the increasing population, or return to less-productive extensive methods?

In 1800, each U.S. farm only produced enough food to feed one other family. In the wake of considerable improvements in productivity, each farmer currently produces enough food to feed an average of 125 other people. Nonetheless, popular perceptions of sustainable agriculture are often directed towards so-called "traditional" or organic systems. Many consumers therefore consider contemporary large-scale agriculture to exist in direct contrast to the sun-lit rustic image of traditional, low-input food production – a contrast further highlighted by niche marketing campaigns and documentaries such as *"Food Inc"*. Although it is widely understood that improving efficiency reduces expense, resources and waste, the consumer often appears to consider "efficiency" to have negative connotations when applied to food production.

Each animal in a dairy herd has a basic maintenance nutrient requirement that must be fulfilled before production (pregnancy, growth or lactation) can occur. This may be considered the "fixed cost" of livestock production and can be considered as a proxy for resource (feed, land, water) use and waste output (manure, greenhouse gases (GHG); see Figure 1). If the maintenance requirement can be reduced while production is maintained, environmental impact is reduced.

Within dairy production this can be achieved through two mechanisms. First, improved productivity may result in a smaller number of animals producing the same amount of dairy product. Productivity in this case may relate to milk yield (such as 100 cows each yielding 80 pounds per day to produce 8,000 pounds of milk, versus 200 cows each yielding 40 pounds per day), or to milk components (such as Jersey cows yielding 12.5 pounds of Cheddar cheese per hundredweight of milk, versus Holsteins at 10.1 pounds, due to the Jersey's increased butterfat and protein concentrations). Second, if the required quantity of dairy product can be produced from animals that have a lower body weight and thus a reduced maintenance cost, given adequate productivity total population maintenance and environmental impact may be reduced.

Bucolic past mostly an illusion

To examine the effects of improved milk yield on environmental impact, let's return to the 1940s. From an idealistic viewpoint, extensive production systems of yesteryear appear to offer intrinsically sustainable mechanisms for food production, yet sacrificing productivity gains made over the past half-century would have a negative environmental effect. To the consumer, dairy farming in the 1940s conjures bucolic images of a family farm with a red barn, green pastures and a small dairy herd. In this rural utopia, neither cows nor manure produced GHGs and the small tractor used to plow the fields used small quantities of fuel from an infinite supply. By contrast, the modern large-scale dairy farm with mechanized milking parlor, pasteurization processes, and methane digesters appears to some as a futuristic aberration.

That cows produce methane through enteric fermentation has been known for many years, yet the link between climate change and livestock production is a relatively recent notion, most famously popularized in the FAO's now-debunked claim that global livestock systems produce more GHG than transport. The perception thus exists that modern livestock production causes climate change, whereas extensive systems akin to historical management are far more environmentally-friendly.

The U.S. dairy cow population peaked in 1944

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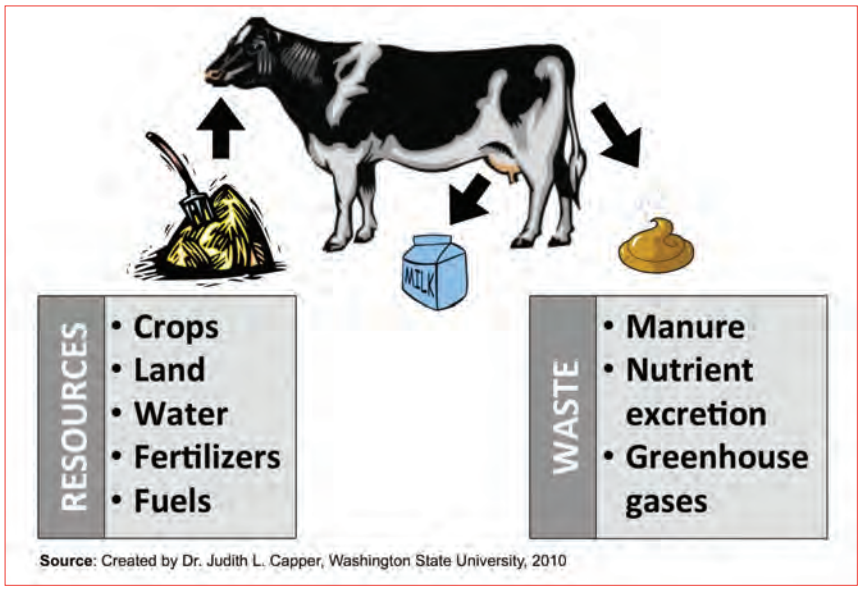

Figure 1: A cow's maintenance requirement can be considered to be a proxy for resource use and waste output.

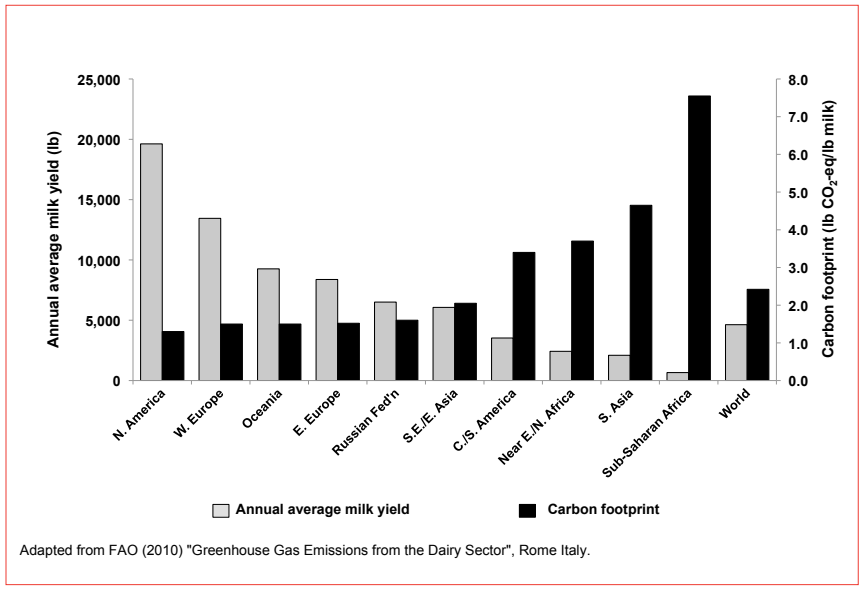

Figure 2: As milk yield increases, carbon footprint decreases per unit of milk output.

at 25.6 million head, producing 117 billion pounds of milk. Herds were small; an average of six cows were fed a pasture-based diet with occasional supplemental corn. Artificial insemination was just being developed and neither antibiotics nor supplemental hormones were available.

By contrast, the 2007 U.S. dairy herd had 9.2 million cows producing 186 billion pounds of milk. This huge increase in production was achieved through a four-fold rise in milk yield per cow due to improvements in management, nutrition and genetics. Higher production per cow means fewer lactating animals were required to produce a set quantity of milk, and the size of the supporting herd (dry cows, bulls, heifer and bull replacements) was also reduced compared to 1944.

More cows, smaller carbon footprint

Indeed, the 2007 U.S. dairy industry required only 21 percent of the dairy animal population, 23 percent of the feedstuffs, 10 percent of the land and 35 percent of the water to produce a set quantity of milk when compared to the 1944 industry. Manure output per unit of milk produced in 2007 was 24 percent of that in 1944 and the carbon footprint per unit of milk was reduced by 63 percent. Despite the increase in national milk production between 1944 and 2007, the U.S. dairy industry's total carbon footprint was reduced by 41 percent.

Improving milk yield per cow also reduces the carbon footprint of dairy production on a global basis. Major milk-producing regions such as the U.S., Canada, New Zealand and Europe have all improved milk yield per cow since the 1960s, although the rate of improvement has varied considerably, ranging from 284 and 258 pounds per year for the U.S. and Canada, respectively, to 170 and 50 pounds per year for Europe and New Zealand. A recent study from the FAO demonstrated that as the focus shifts from regions with intensive dairy production systems (such as North America with a milk yield greater than 18,000 pounds per cow) toward regions in which extensive dairy production dominates (such as Sub-Saharan Africa with an annual average milk yield of approximately 550 pounds per cow), the carbon footprint increases dramatically (Figure 2) from 1.3 pounds of CO_2-equivalents per pound of milk to 7.6 pounds of CO_2-equivalents per pound.

Results of the aforementioned FAO study could provoke the conclusion that all regions should adopt North American and Western European-style production systems, or dairying should be focused in these areas and be discouraged in less productive areas such as Sub-Saharan Africa and South Asia. However, the significant social implications (both in terms of social status and nutritional supply) and economic value of dairying in less-developed areas must not be underestimated.

The social component is more difficult to address, and this may be the biggest challenge faced by dairy production in the developed world. As consumers are exposed to an ever-increasing quantity of factual and non-factual information about food production from a variety of sources, concern over the way in which food is produced may lead to loss of the "social license" to operate and a need to either modify production systems and practices to appease the consumer, or a serious decline in dairy production.

The organic food industry has gained market share over the past decade within the U.S., with consumers attributing perceived positive characteristics to organic food including "chemical-free", "healthier" and "earth-friendly." These perceptions may be debated.

For example, a considerable body of knowledge indicates that organic dairy products may have minor increases in specific fatty acids, but these are a consequence of the increase in pasture-feeding in organic systems versus total mixed rations in conventional systems, and are present in such small quantities that they are unlikely to have measurable human health effects.

Organic productivity much lower

Productivity in organic dairy systems is lower than that in conventional production, with peer-reviewed papers citing decreases in milk yield ranging from 14 percent to 40 percent. This is not necessarily a function of the production system per se, but is primarily affected by the requirement for pasture in organic systems.

As previously discussed, decreased milk yield means the dairy herd needs to be considerably larger in order to maintain total production. If we project out to the year 2040 when the U.S. population is predicted to plateau at 340 million people, supplying the entire population with its USDA-recommended three 8-ounce glasses of low-fat milk (or its equivalent) per day via organic production would require 3.5 million more animals to be added to the national herd, land use to increase by 7.7 million acres (a 30 percent increase), and the carbon footprint to increase by 13 percent per unit of milk compared to conventional production.

The livestock industry faces a clear challenge in producing sufficient animal protein to supply the needs of the growing global population, while reducing environmental impact. So how does contemporary agriculture overcome the perception of being environmentally unfavorable compared to more extensive systems? Advances in productivity garnered through improved management and technology use reduce the carbon footprint per unit of food, yet the animal science industry needs to find ways to share this data and educate consumers, retailers and mainstream media.

Demonization of specific sectors in favor of niche markets that intuitively seem to have a smaller carbon footprint further propagate the idea that conventional production systems are undesirable. In a region where food is readily available, consumers are afforded the luxury of making choices according to production system or technology use, yet many developing regions exist where the simple need for food negates such concerns.

Cattle grazing on pasture certainly fulfill an idealistic image of a traditional production system that has an inherent appeal for the consumer, yet it should be reassuring to the conventional dairy industry that when faced with choices at the grocery store, 94 percent of consumers buy food on the basis of three factors: taste, price and nutrition, with only a minority (4 percent) focusing on specific production systems (such as organic or local). A small proportion of consumers (less than 2 percent) are actively opposed to technology use in agriculture, yet they have a disproportionately loud voice and influence via non-governmental organizations and activist groups.

The challenge for the industry is to communicate the rationale behind differences in production systems using language and concepts that the majority of consumers understand, without denigrating other segments of the industry.

Western Dairy News is published as a service to people interested in the health and welfare of the Western dairy industry. Archives of this publication may be found at:
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