

REDUCING DAIRY'S FOOTPRINT

U.S. dairy's carbon footprint per pound of milk produced has shrunk nearly 70% in six decades. It will get even smaller in the years ahead.

By Mike Van Amburgh, Judith Capper and Dale Bauman

The dairy industry has made remarkable progress over the past 50 to 60 years in supplying adequate, safe and affordable dairy products to a growing and changing population. At the same

time, the industry's structure and geographical distribution has undergone huge changes. There is also an increased emphasis on "environmentally-friendly" food production.

A recent report from the United Nations' Food and Agriculture Organization implicated livestock production as a global environmental threat, because of land erosion and production of greenhouse gases that contribute to global warming. Ruminant animals produce methane, carbon dioxide (CO₂) and nitrous oxide, all of which have significant global warming potential (GWP).

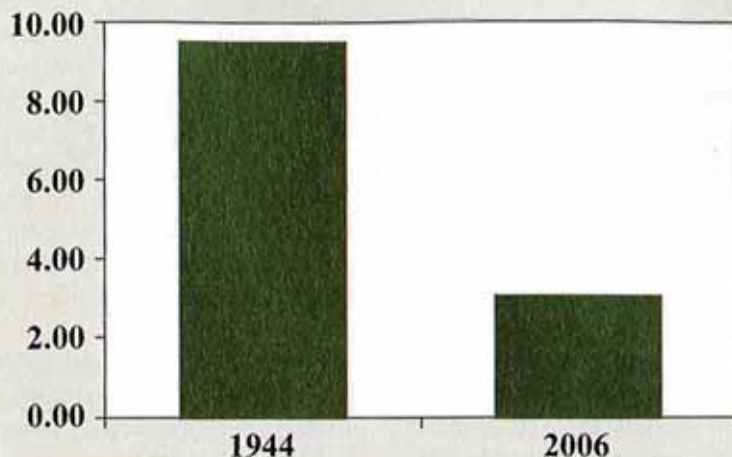
It's important to recognize that methane

is 25 times more potent as a greenhouse gas than CO₂; nitrous oxide is 298 times more potent. That means small amounts of each gas – methane and nitrous oxide – will still have significant impacts.

Giant strides

Given the media and public interest in the carbon footprint of various aspects of society, we examined the carbon footprint of dairy production as it has evolved during the past 60 years. This is an important exercise for the dairy industry, giving context to any GWP number. A snapshot of dairy produc-

Figure 1. Carbon footprint of dairy production, 1944 vs. 2006



The CO₂ equivalents required to produce 1 lb. of milk has fallen from nearly 10 lbs. in 1944 to 3 lbs. in 2006.

tion's carbon footprint might unintentionally mislead a retailer or consumer, since few values exist for comparison.

A number of reports have been issued during the past several years, primarily from the United Kingdom and European Union, regarding the carbon footprint of various production strategies. In general, they showed an average value of 1.4 lbs. of CO₂ equivalent per pound of milk produced. Many of these reports exclude the cow's CO₂ production, assuming that because cows are vegetarians and consume plant materials, their CO₂ production is recaptured and recycled.

Fewer cows, more milk

Two of the biggest changes in the dairy industry since the mid-1940s have been the dramatic increase in the amount of milk produced per cow and the dramatic decrease in the number of cows required to produce a given amount of milk. Consider:

- In the mid-1940s, approximately 25 million cows averaged about 4,500 lbs. of milk per lactation. The U.S. population was 138 million people.
- Today, about 9 million cows produce approximately 20,000 lbs. of milk per lactation. The U.S. population is more than 300 million.
- That's 2.2 times as many people, with 59% fewer cows.

What does this mean for the overall resources required to produce a given amount of milk? Our work shows that dairy production systems in 1944 required two-to-four times the amount of various resources and produced two-to-four times the amount of excreted nutrients and emissions compared to 2006. There were approximately 4.1 times as many cows producing milk for 57% fewer consumers. Those cows required 4.5 times as much land and produced 2.6 times more methane.

This is a significant change in resource allocation, and demonstrates the tremendous efficiency increase the dairy industry has made.

Bottom line footprint

The amount of CO₂ equivalents produced per pound of milk in 1944 vs. 2006 is shown in *Figure 1*. In 1944, the calculated CO₂ production was 10 lbs. per 1 lb. of milk. Compare that to 2006,

when the calculated CO₂ production was 3 lbs. per 1 lb. of milk, nearly a 70% decrease.

How have dairy producers achieved this reduction in the carbon footprint of dairy production? Most of it relates directly to all the things that have increased milk per cow: genetics and artificial insemination, forage quality, better nutrition, grouping strategies, improved heifer rearing and use of technologies such as recombinant bovine somatotropin and Rumensin. All these things have increased milk per cow and enabled production of more milk with fewer cows.

This is a remarkable achievement, but the dairy industry has opportunities to reduce its footprint even more through advances in nutritional strategies. □

FYI

• **Mike VanAmburgh** is an associate professor, **Judith Capper** is a post-doctoral research associate and **Dale Bauman** is Liberty Hyde Bailey Professor in the Department of Animal Science at Cornell University. Reach VanAmburgh via phone: 607-254-4910 or e-mail: mevl@cornell.edu. Contact Bauman via phone: 607-255-2262 or e-mail: deb6@cornell.edu.