



Dairy production and manure management trends in the United States

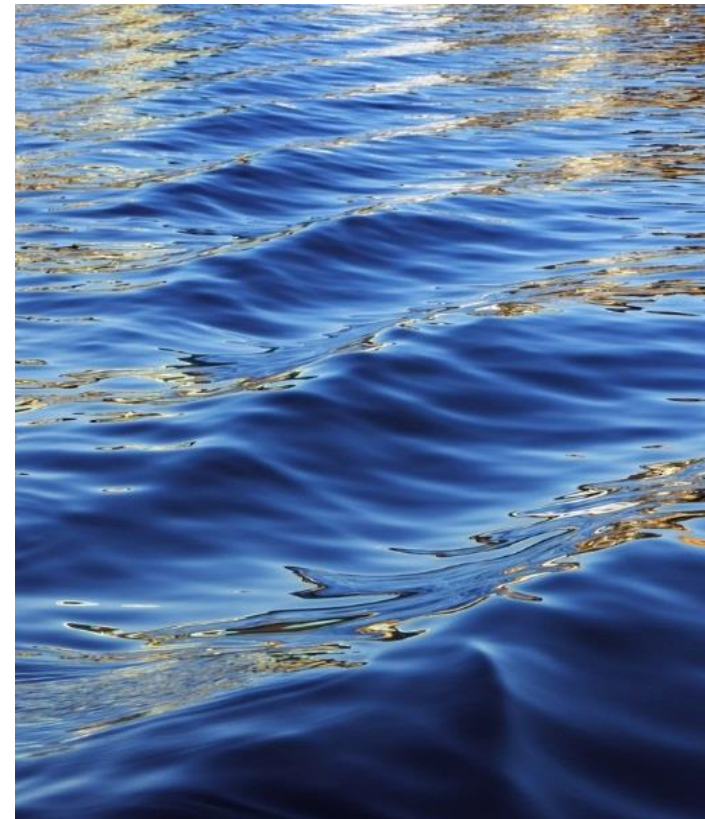
CARB Workshop

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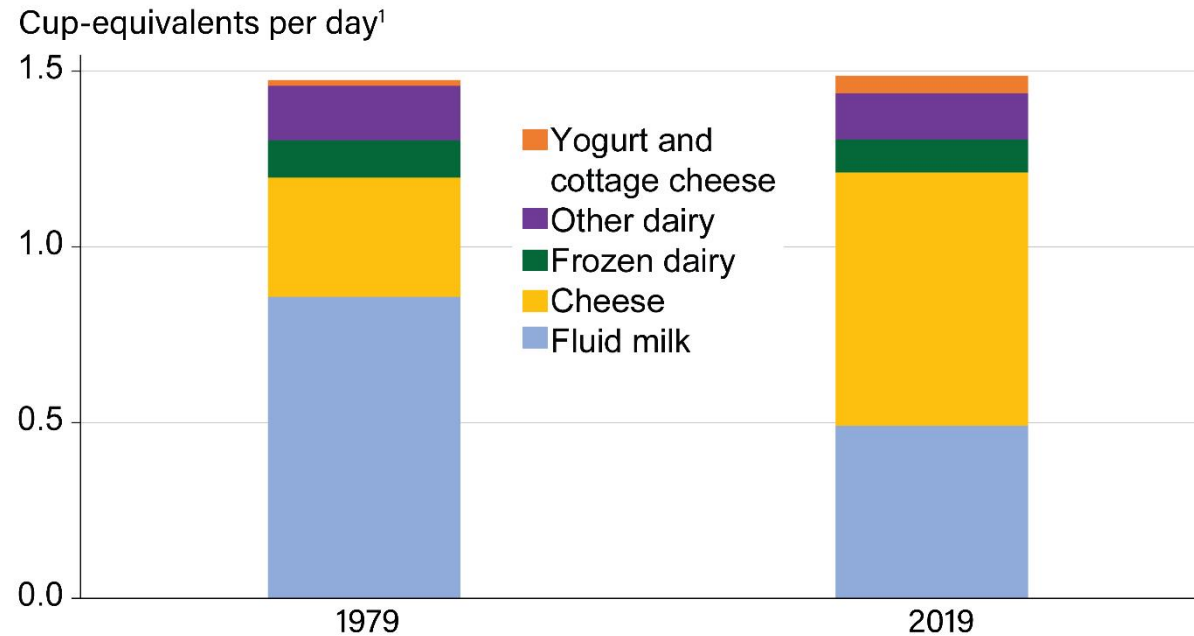
Office of Energy and Environmental Policy

March 29, 2022



National Changes in the Consumption of Dairy Products

U.S. per capita loss-adjusted availability of dairy products, 1979 and 2019



¹Based on a 2,000 calorie-per-day diet. One cup-equivalent for dairy is: 1 cup milk or yogurt; 1½ ounces natural cheese or 2 ounces of processed cheese or 1/3 cup shredded cheese; 1 cup frozen yogurt or 1½ cups ice cream; 2 cups cottage cheese.

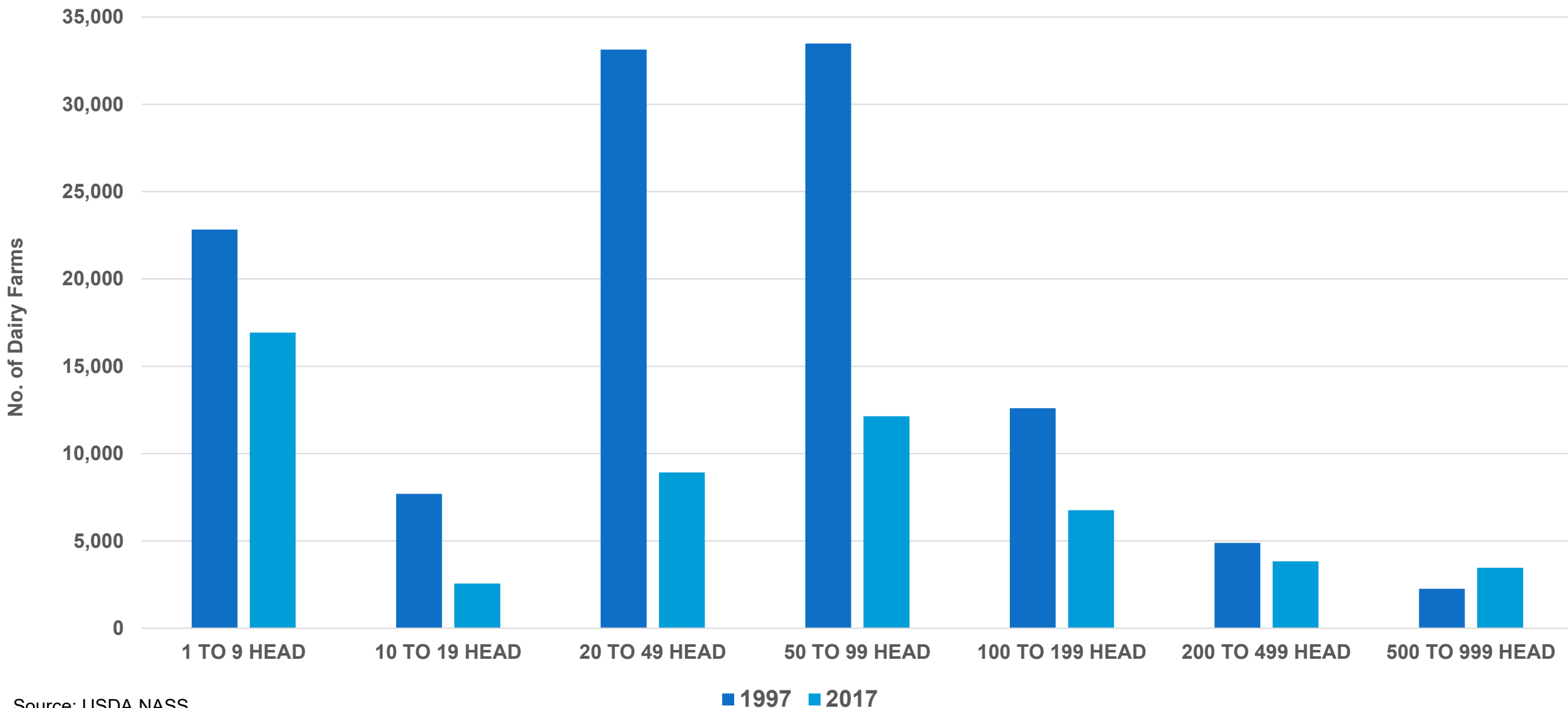
Notes: Loss-adjusted food availability data are proxies for consumption. "Other dairy" includes evaporated milk, condensed milk, dry milk products, and half and half.

Source: USDA, Economic Research Service, Loss-Adjusted Food Availability Data.

California Dairy Consumption Patterns are like rest of U.S.

- Only 10% to 15% of California milk consumed in fluid form
 - Eating more milk in the form of cheese/butter than drinking it
 - Competition from non-dairy beverages (almond/soy/oat beverages)
 - High demand for dry milk in both domestic and international markets

Dairy Cattle Farms by Size

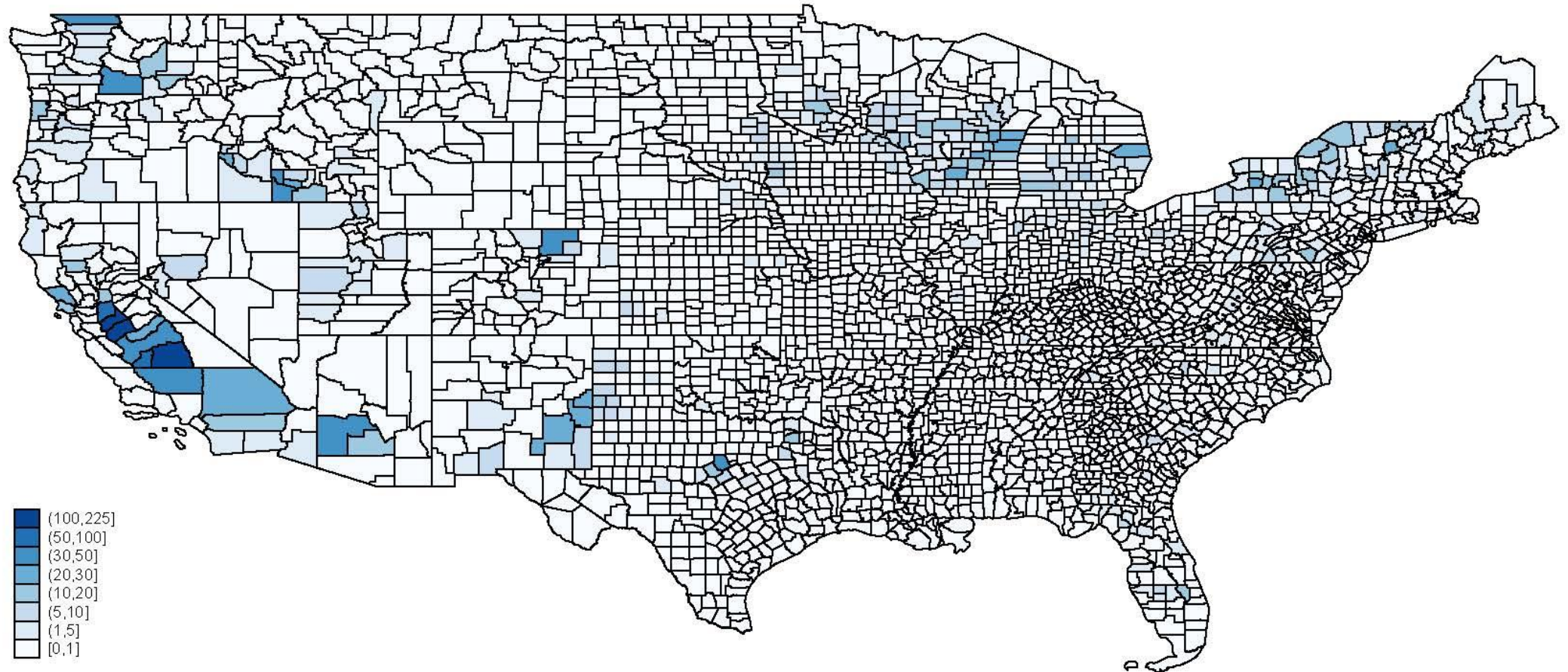


Source: USDA NASS

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Dairy Cattle Farms with 500 Head by U.S. County

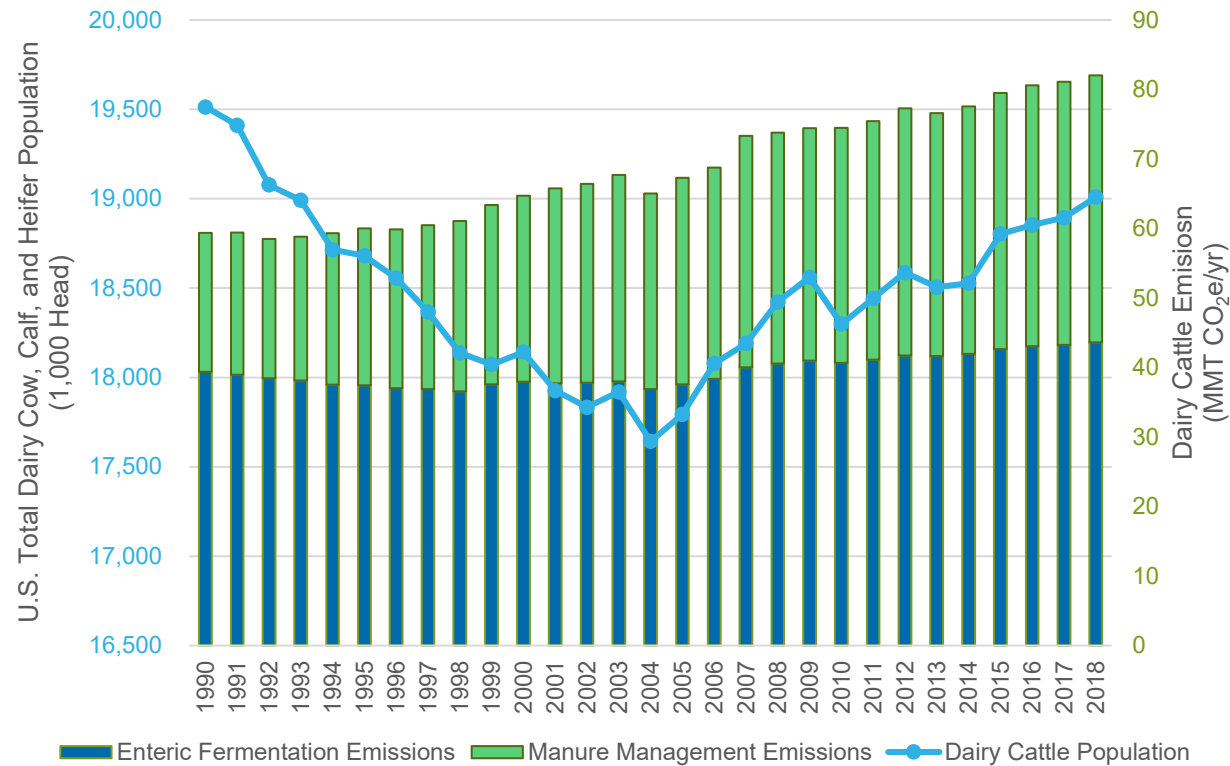
No. of Large Dairy Farms -- 2017
by county



California Dairy Production Trends Also Similar to National Trends

- From 1990 to 2021:
 - Decline from 4,500 dairies to 1,195 dairies
 - Average size increased from 252 cows/farm to 1,438 cows/farm
 - Per-cow productivity increased 32%
 - Pasture-based dairies likely declined
- Pasture dairies that remained (north of SF) convert to organic
 - In Jan. 2022, 4% of fluid milk pooled in CA was organic

U.S. Total Dairy Cow Population and Associated Emissions

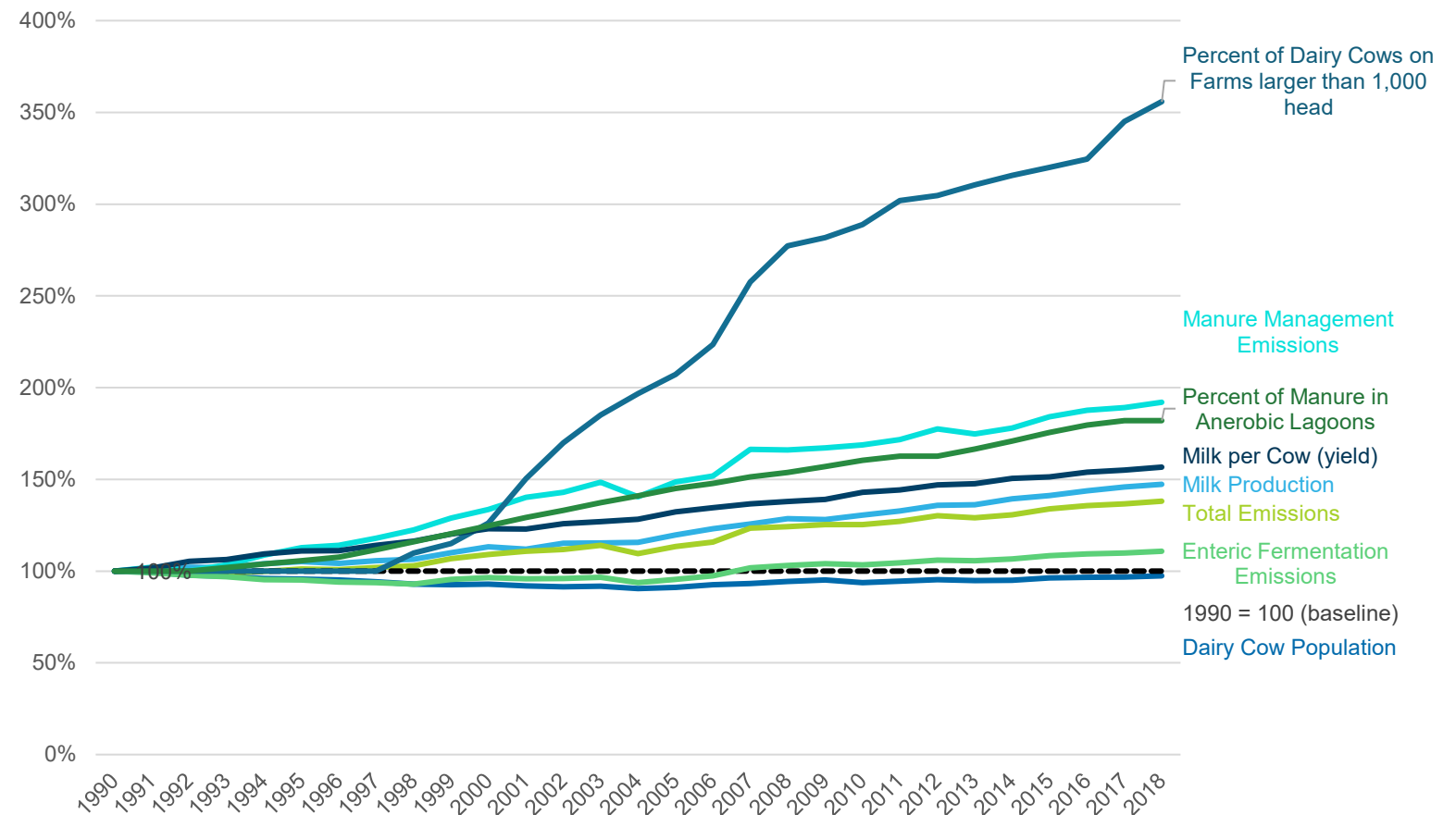


- Manure management and enteric fermentation emissions from dairy cattle have both increased since 1990
 - Impacted by population, manure management practice, animal diet, and geographic location

Milk Production

- Milk production has increased by 47% and milk yield increased by 57% since 1990
- Compared to 1990, more milk is produced today on large farms (more than 1,000 head) than small farms.
 - Large farms are more likely to use liquid manure management systems which increases methane emissions and are more likely to have better herd management which increases milk yields.

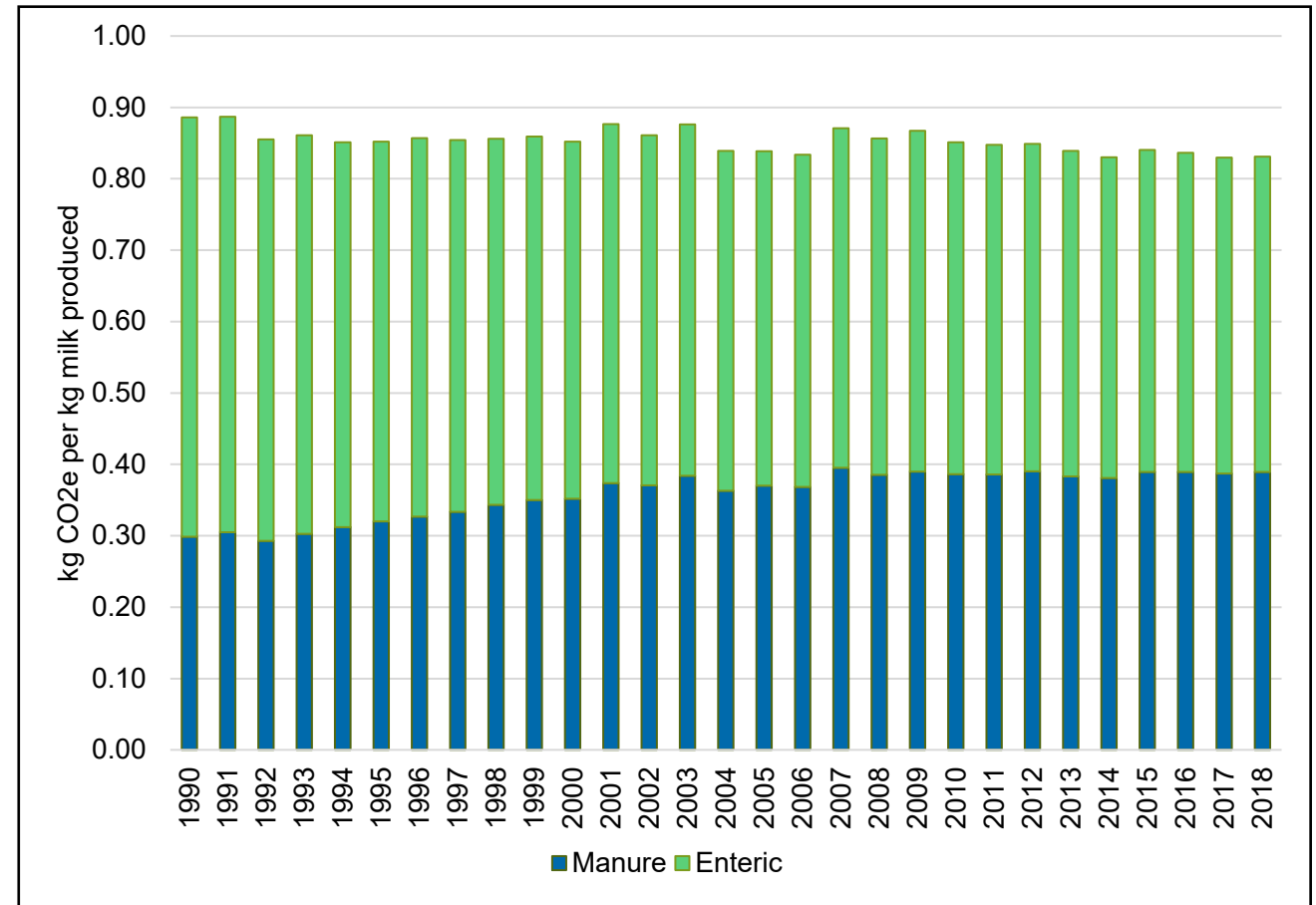
Index Graph
Milk Production GHG Intensity Trends



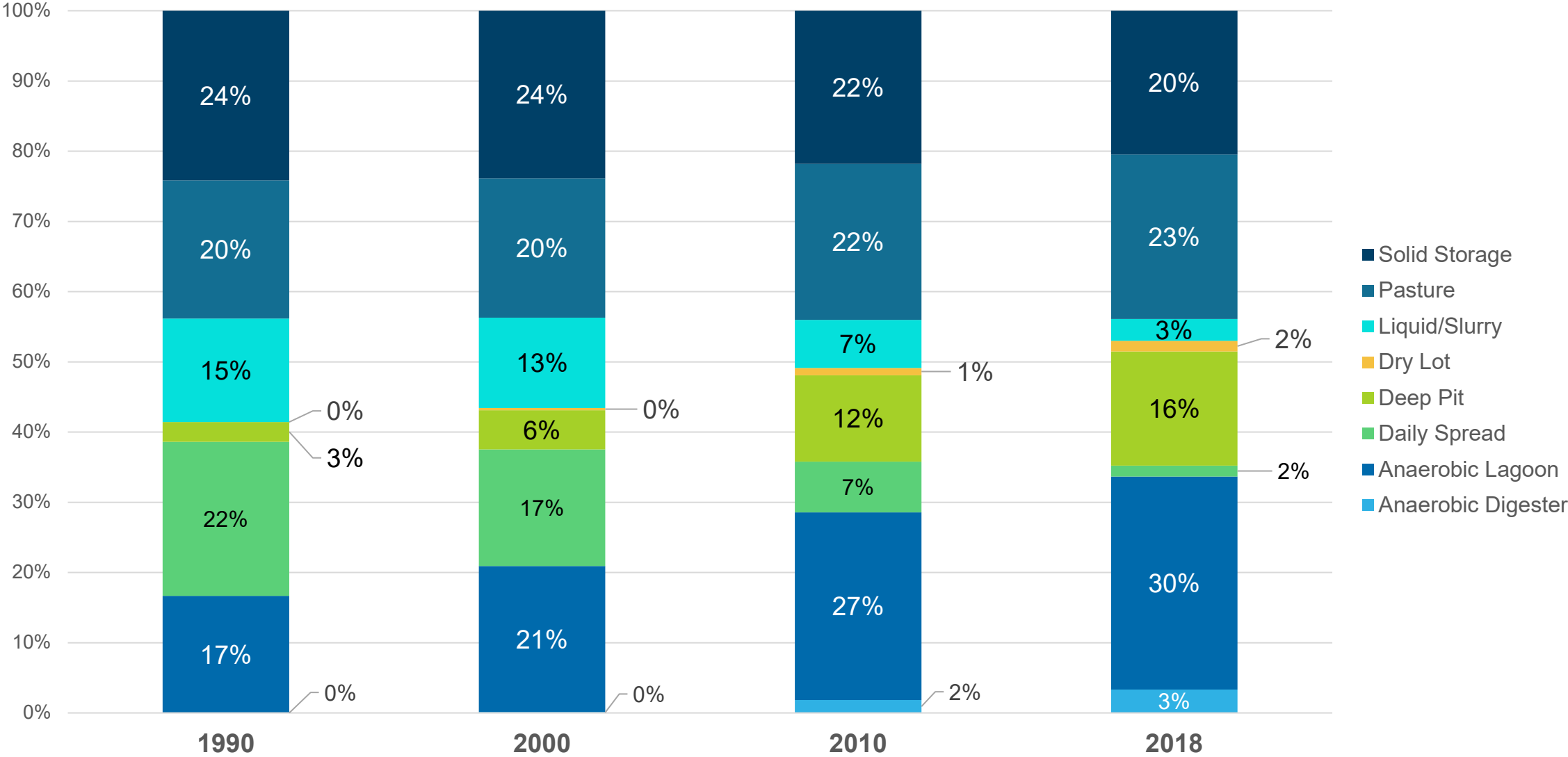
Intensity Metrics - Milk

- Enteric fermentation intensity decreased because of the improvements in herd management resulting a decrease in the total number of dairy cows, relative to yield.
- Manure management intensity increased due to increased usage of liquid manure management systems, such as anaerobic lagoons.

Kilograms CO₂e Intensity of Milk
(kg CO₂e produced per kg of Milk)



U.S. Average Percent of Dairy Manure Handled by Manure Management System



Average Percent of Dairy Manure Handled in California by Manure Management System

