

Where Will Dairies Be Located in the Future?

Normand St-Pierre, Ph.D., P.A.S., Dipl. ACAN
Professor and Extension Dairy Specialist
Department of Animal Sciences, The Ohio State University,
221A Animal Science, 2029 Fyffe Road, Columbus, OH-43210.
Tel 614-292-6507; fax 614-292-1515
st-pierre.8@osu.edu

Summary

The dairy industry has shown substantial migrations over its history, and more so over the last half-century. The factors that were responsible for these migrations were primarily linked to the economics of production. This dominance of economic factors in regards to the location of dairy farms will not change in the future, but the nature of factors will likely be broadened (e.g., environmental sensitivity). Results from a large national survey indicated that many factors were important when selecting the location of a dairy. In fact, there are so many factors involved that there is probably not a single location within the United States that could be categorized as ideal. Farms looking at relocation will need to assess their strengths and weaknesses and categorize their management styles before best-matched areas can be identified. In addition, the U.S. dairy industry is becoming more dependent on foreign markets (i.e., exports). If dairy products are to be exported, U.S. dairy producers should not only be aware of the location and changes in the export markets, but should also be looking at opportunities to establish dairy production units in areas of the world that offer a competitive advantage.

What is a Dairy?

In many places around the world and in some regions of the United States a ‘dairy’ is a processing plant where milk is bottled or transformed into cheese, butter, milk powder, etc. In Western States, however, a ‘dairy’ is a farm (or ranch, or herd) where cows are milked. Considering the location of the Western Dairy Management Conference, we chose to westernize ourselves. Thus, ‘dairy’ shall mean ‘dairy farm’ in the balance of this paper.

Why Should Dairy Production Move in the Future?

The answer is simply: “it has moved in the past so why wouldn’t it keep moving in the future?” We are all well aware of the dramatic changes that have occurred in regards to the location of dairy production in the U.S. over time. In 1970, the Midwest produced 51% of the U.S. milk compared to 17% for the West and Southwest regions combined. Thirty years later, the Midwest share of the national production had dropped to 35% while the West and Southwest accounted for 42%.

The location of dairy production has not changed just for the fun of it. Many factors, primarily of economic nature, were involved. Dairy (milk) is a commodity. Milk from many dairies is comingled to make mostly undifferentiated products. Milk payments are almost exclusively based on volume and simple characteristics related to yields of products (fat and protein). Commodities – all commodities – share the following characteristic: in the long-run, net returns per unit of production are small. Thus, their production is highly sensitive to cost of production. The total cost of producing milk across regions explains the migrations of the past and will explain the migrations of the future. Beware, however, that *total* costs of production is the driving factor. Total costs include direct costs, indirect costs, and hidden costs (such as unpaid family labor, opportunity cost of equity capital, and even the ‘headache’ cost of filing the paperwork to satisfy the government bureaucracies).

Does Change in the Location of Dairy Production Implies Relocation of Dairies?

There could be substantial realignment of regional dairy production without any dairy relocation within or across regions. But this has never happened in the past. Thus based on the principle that the past is the best predictor of the future, future changes in the location of dairy production will be associated with relocation of dairies.

So Where Will Dairies Be Relocating in the Future?

Dairies will be relocating in areas that offer them a competitive advantage. The concept of ‘competitive advantage’ is far broader than the simple direct costs of production. Many factors are linked to the competitiveness of a production site. Some have a direct effect on the Profit and Loss statement; others are harder to quantify, but still have a definite ‘utility’. In economics, the term ‘utility’ is a measure of relative satisfaction. It also does a marvelous job of confusing people. Its relevance to us can be illustrated as follows. Suppose that you can locate a dairy on 2 different sites. Both sites are identical in all of their characteristics (milk price, costs of production, water availability, labor, etc.) except that site A borders friendly neighbors, whereas site B borders unfriendly neighbors (say mostly PETA members). In this instance, the utility of site A would be greater than site B for most dairy people. Here, the neighborhood’s friendliness reflects a hard to quantify ability to keep operating in the future.

To answer where dairies will be relocating requires the identification and valuation of the attributes associated with the desirability of a location for dairy production.

Identification and Valuation of Factors Involved in Dairy Relocation

A few years ago we conducted a large national survey of factors involved in dairy relocation. We all have our own personal opinion as to what factors are important. Our interest was in finding what the opinions were across the U.S., to rank the factors and examine regional differences. The survey consisted of a total of 906 respondents (250 agribusiness professionals and 656 dairy producers) from all regions (Central: 130, Midwest: 243, Northeast: 161, Northwest: 133, Southeast: 128, and

Southwest: 111), and various herd sizes, gender, level of education, marital status, and family status. The survey instrument consisted of 110 location factors. Respondent were asked to provide a measure of importance for each factor using a 0 to 10 scale, where 0 = not important, 5 = somewhat important, and 10=critically important. In analyzing the results, factors were grouped into 13 location decision categories using standard criteria for relocation across various industries. Eleven of the 13 categories encompassed factors that were quantitative in nature and could be classified as traditional location decision factors that were related directly to business activities. The remaining 2 categories encompassed what are known as nontraditional or qualitative decision factors (i.e., community attributes and value-based community attributes). It is important to understand that respondents were NOT asked to rank the factors. The ranking that we present is based on the average importance attributed by the respondents. Although one's opinion might differ from the average importance and the ranking of factors derived from this survey, our tenet is that 906 people cannot be completely wrong... Table 1 reports the results ranked by importance of location decision categories. What are some observations that can be made from these results?

1. Overall factors associated with *cash flow* and *capital expenditures* were (as categories) the most important, followed by *tax structure and economic incentives*, and *waste management*. *Community attributes* and *infrastructure* were deemed the least important.
2. The five most important single factors were:
 - a. Availability of fresh water supply,
 - b. Availability of land on which to incorporate animal waste,
 - c. Average mailbox price of milk,
 - d. Quality of fresh water supply, and
 - e. Complexity of state and local laws governing waste handling and odor management.
3. The five least important single factors were:
 - a. Number of hoof trimmers in the local area,
 - b. Presence of established niche markets in the local area,
 - c. Proximity of an airport with commercial, scheduled services,
 - d. Proximity to cultural centers, and
 - e. Proximity to recreational areas.
4. Ninety (90) out of the 110 factors were judged to be at least somewhat important (average importance > 5). Nearly one third (36 out of 110) of the factors were deemed very important to critically important (average importance > 7).
5. Likely, there is NOT a single location within the United States that meets all 36 factors deemed very important, let alone all 90 that were deemed somewhat important. Hence, there are and will be some trade-offs across the many possible areas of production.
6. Production destined to markets sensitive to costs of production (export markets, Class IV, and portions of Class III) will occur and grow in areas with a competitive advantage,

including processing and transportation costs. The total cost for producing a storable product (cheese, butter, non-fat dried milk, milk powder, etc.) will be the primary determinant (i.e., not just the cost of producing the milk). Major non-direct costs, such as the costs to meet the often capricious environmental rules, key resources allocations (e.g., water), and various bureaucratic regulations will be increasingly important. By their own nature, these are determined by government policies that are highly unpredictable. Hence, it is impossible to identify the specific locations of long-term growth of the dairy industry in the United States. Based on the current political landscape, the central region would be best at meeting the very important factors, but this could be changed by one single vote in the U.S. Congress, or one major change in the interpretation of the current laws by one of the regulating agencies.

We Are Not Alone in This World

Within the United States, there are well-known areas of milk surpluses and deficits (Figure 1). Contrary to what is alleged by locavores, local or even regional self-sufficiency makes absolutely no economic sense. The flawed principle of local production violates an economic law as fundamental as what gravity is to the physical sciences. The national wealth is improved by increasing inter-regional trade. It doesn't make more economic sense to artificially support milk production in Florida than to encourage pineapple production in North Dakota. Therefore, the sight of a map showing large areas of milk deficit should be no more alarming than a map showing large areas of citrus deficits. Different regions possess an economic advantage at producing select goods and services and the trading of these goods and services across regions enhances the overall wealth.

Of course, the benefits of trading extend across a nation's boundaries. The U.S. population is currently estimated at 307 million people, or about 4.4% of the world's total population. Although the U.S. is still a dominant nation with the world's largest economy, the necessity to eat extends to every human being on this planet. Although dairy products are not considered as basic, staple foods as some plant products (wheat, rice, cassava), the demand for dairy products increases substantially as soon as a population moves above near subsistence. Hence, we can expect large changes in the world supply and demand for dairy products in the future.

Milk production occurs pretty much everywhere around the world, but on largely different scales (Figure 2). Although the U.S. production of 80 million metric tons (MT) per year is significant on a world basis, it represents only 51% of the total milk production by the countries members of the European Union (EU-27), and surprisingly only 65% of the milk production in India (albeit that the latter is predominantly not commercially traded). Milk is not necessarily produced where demand occurs (i.e., where there are people). The world map shows large areas of milk surpluses and deficits (Figure 3). The important milk surplus regions consist of the EU, the US, and Oceania (New Zealand and Australia). Deficit regions are located predominantly in the world tropical belt, the area of land located between latitude 23°N and 23°S. As a whole, dairy production does not flourish in the tropical belt. China, with its population exceeding 1.3 billion people is projected to be an area of large increase in demand for dairy products. Food import, however, has never ranked very highly as a strategic policy by the Chinese government. In short, the world demand for dairy will likely

increase, but in markets that are not traditional for the U.S., and that bear considerably more uncertainty than our domestic market.

Figure 4 shows an approximate world supply curve for milk. Contrary to what many people think, the cost of milk production in the U.S. is not particularly low compared to the rest of the world. But it represents a large portion of ‘tradable milk’, as production in most of the countries with lower costs of production is primarily of subsistence type (i.e., not traded, or very locally traded). The exceptions to this are Australia, New Zealand, and Argentina. The first two in particular export a significant proportion of their production (>50%) and will therefore likely remain first in line for exports (i.e., will basically take whatever price the world is willing to pay). In the long run, most of the milk produced in the EU is at a cost that exceeds US cost of production. Hence, as long as the US remains a significant player, the world market price for milk should be relatively near U.S. costs of production. ‘Relatively’ is an important word here, and does NOT imply that world prices will be exactly at US costs of production, and deviation of up to 20% can be expected. Therefore, although a national strategy based on increased dairy exports can support additional milk production, such a strategy does nothing in terms of price stabilization and may in fact accentuate the wild fluctuations already experienced over the last decade.

What is more important in the context of this presentation is the opportunity for US dairy producers to look at the entire world map for areas of potential expansions/relocations. The factors identified earlier in this paper apply to the world as well, but additional factors must enter the process (the political stability and ‘friendliness’ of a country being two obvious factors). With all due reservations (i.e., 15 pages of legal mumbo-jumbo warning you that I might not have the foggiest idea of what I am talking about), I see the following regions as potential areas to explore:

- Western Canada, if and when the country ever gives up on its obsolete and trade-distorting quota system. Don’t hold your breath on this one.
- South American countries, especially Argentina, Uruguay, and Southern Brazil. But you better warn Toto that these are not Kansas... Blending in with the local culture would likely require a ‘local’ partner.
- Select countries of Eastern Europe, including Russia. Here again, a local partnership might be an essential step to the entry process.
- Possibly a few select countries in the South African region (including the country of South Africa). The political instability in most of these countries makes this doubtful.
- Antarctica (if one listen too much to the global warming hyper-alarmists)...

Of course, a vast potential area would open up in the tropical belt if the problems associated with high dairy productivity in this zone would ever be resolved. This would require a different way of thinking along the lines followed by Norman Borlaug with the Green Revolution.

Table 1. Importance of location decision categories, subgroups of individual factors, and individual factors across all respondents.

Location Decision Categories, Subgroups, and Factors¹	Mean²	SE
Overall Mean Importance of Categories	6.79	0.017
Overall Mean Importance of Individual Factors	6.33	0.039
Cash Flow	7.76^A	0.043
♦ Income-related	8.79^a	0.050
Average mailbox prices of milk (\$/cwt.)	8.79	0.050
♦ Cost-related	7.51^b	0.045
Cost of hauling milk	8.26	0.058
Cost of feeds (forage, concentrates, etc.)	8.13	0.060
Average cost of utilities (electricity, gas, etc.)	7.29	0.067
Average local hourly wage (average for both farm and non-farm sectors)	6.35	0.074
Capital Expenditures	7.74^A	0.051
Average cost of constructing new facilities	7.86	0.059
Cost of financing (cost of lending, interest, etc.)	7.83	0.068
Average price of land	7.50	0.064
Tax Structure and Economic Incentives	7.50^B	0.052
♦ Financing	7.83^a	0.068
Cost of financing (cost of lending, interest, etc.)	7.83	0.068
♦ Tax Structure	7.50^b	0.062
State and local property tax rates	7.60	0.063
State and local income tax rates	7.40	0.066
♦ Economic Incentives	7.15^c	0.077
Existence of economic incentives to locate in an area (tax abatements, grants, low interest loans, etc.)	7.15	0.077
Waste Management	7.50^B	0.044
♦ Land Availability	8.94^a	0.052
Availability of land on which to incorporate animal waste	8.94	0.052
♦ Waste Management Laws and Regulations	8.35^b	0.064
Complexity of state and local laws governing waste handling and odor management	8.35	0.064
♦ Water Characteristics	7.07^c	0.088
Proximity to perennial streams (continuously flowing)	7.18	0.093
Proximity to bodies of water (both warm-water and cold-water habitats)	6.95	0.093
♦ Land Characteristics	7.00^c	0.049
Nutrient load capacity of land	7.90	0.065
Slope of the land	6.86	0.066
Percentage of clay and sand in the soil	6.01	0.069

(Continued.)

Table 1 (Continued).

Location Decision Categories, Subgroups, and Factors ¹	Mean ²	SE
Utilities	7.17^C	0.062
♦ Cost	7.29	0.067
Average cost of utilities (electricity, gas, etc.)	7.29	0.067
♦ Availability	7.05	0.078
Availability of specialized utility services (three-phase electricity, etc.)	7.05	0.078
Natural Resources	7.01^D	0.041
♦ Water Resources	7.34^a	0.047
Availability	9.16	0.047
Availability of adequate fresh water supplies	9.16	0.047
Quality	8.41	0.061
Quality of fresh water supplies (salinity, sulfur content, hardness, potential toxins, etc.)	8.41	0.061
Proximity to Sources	7.07	0.088
Proximity to perennial streams (continuously flowing)	7.18	0.093
Proximity to bodies of water (both warm-water and cold-water habitats)	6.95	0.093
Precipitation	6.15	0.068
Average annual precipitation	6.54	0.077
Average annual snowfall	5.76	0.087
♦ Land Resources	7.26^a	0.041
Availability	8.41	0.044
Availability of land on which to incorporate animal waste	8.94	0.052
Availability of large tracts of land on which to construct and relocate	7.88	0.061
Cost	7.50	0.064
Average price of land	7.50	0.064
Characteristics	6.76	0.049
Nutrient load capacity of land	7.90	0.065
Productivity of the land	7.08	0.067
Slope of the land	6.86	0.066
Percentage of clay and sand in the soil	6.01	0.069
Percentage of organic matter in the soil	5.93	0.076
♦ Agronomic Potential	6.49^b	0.053
Desirable agronomic conditions to grow forages	7.43	0.061
Productivity of the land	7.08	0.067
Slope of the land	6.86	0.066
Average number of growing degree days (GDD)	6.76	0.075
Average annual precipitation	6.54	0.077
Percentage of clay and sand in the soil	6.01	0.061
Percentage of organic matter in the soil	5.93	0.076
Uniformity of the amount of precipitation received across seasons	5.65	0.083

(Continued.)

Table 1 (Continued).

Location Decision Categories, Subgroups, and Factors ¹	Mean ²	SE
Natural Resources (continued)		
♦ Climate	6.37^{b,c}	0.066
Average heat/humidity index (heat stress index)	7.47	0.068
Summer high temperature	6.84	0.074
Average wind chill	6.02	0.085
Average annual snowfall	5.76	0.087
Winter low temperature	5.75	0.087
♦ Risk of Natural Disasters	6.20^c	0.094
Risk of natural disasters (earthquakes, flooding, forest fires, hurricanes, tornadoes, volcanoes, etc.)	6.20	0.094
Regulatory Environment		
	6.85^E	0.052
♦ Environmental Laws	8.35^a	0.064
Complexity of state and local laws governing waste handling and odor management	8.35	0.064
♦ Judicial Attitudes	7.90^b	0.072
Previous state and local court decisions regarding agriculture-related odor and waste management	7.90	0.072
♦ Workers Compensation Laws	6.47^c	0.078
Complexity of state laws regarding workers compensation	6.47	0.078
♦ Permitting	6.29^c	0.061
Average time required to obtain an environmental permit to construct facilities	6.71	0.072
Average time required to obtain a health permit to construct facilities	6.67	0.074
Use of public hearings for the permitting process	6.36	0.086
Current number of permitted operations within the state	5.42	0.091
Transportation		
	6.65^F	0.045
♦ Product Transportation	8.07^a	0.050
Cost of hauling milk	8.26	0.058
Proximity to milk processors and handlers (cheese plants, bottling plants, etc.)	7.87	0.060
♦ Characteristics of the Local Road Infrastructure	6.55^b	0.061
Ability of local road infrastructure to support agricultural activities (support heavy machinery, etc.)	7.08	0.069
Quality of local road systems	6.72	0.069
Average daily traffic volume on state highways in the local area	5.83	0.082
♦ Alternative Transportation	4.11^c	0.084
Proximity to an airport with commercial, scheduled services (Delta, US Airways, etc.)	4.11	0.084

Table 1 (Continued).

Location Decision Categories, Subgroups, and Factors ¹	Mean ²	SE
Value-based Community Attributes	6.21^G	0.053
♦ Public Perception State and local public perception of animal agriculture	7.95^a 7.95	0.064 0.064
♦ School System Quality of local school system	7.50^b 7.50	0.074 0.074
♦ Health Care System Quality of local health care system	7.49^b 7.49	0.067 0.067
♦ Personal Local presence of the religious denomination of your choice Proximity to family members (parents, siblings, etc.) Stability of family units within the area (divorce rates, etc.) Proximity to your current location	5.12^c 6.14 5.23 4.58 4.53	0.067 0.095 0.093 0.095 0.094
Labor	6.08^G	0.058
♦ Availability Availability of labor for skilled positions (herdsperson, AI technician, etc.) Availability of trained labor for unskilled positions (milkers, etc.) Availability of untrained labor for unskilled positions	6.74^a 7.00 6.90 6.33	0.070 0.085 0.078 0.082
♦ Workers Compensation Cost of workers compensation Complexity of state and local laws regarding workers compensation	6.61^a 6.74 6.47	0.074 0.077 0.078
♦ Cost Average local hourly wage (average for both farm and non-farm sectors)	6.35^b 6.35	0.074 0.074
♦ Employee Benefits Availability of housing for employees Cost of housing for employees	6.21^b 6.30 6.11	0.073 0.078 0.077
♦ Legal Alien Labor Availability of state and local agencies to facilitate legal alien labor Local presence of cultural resources to meet the needs of a diverse workforce	4.92^c 4.94 4.90	0.083 0.091 0.087
♦ Training Availability of local training for farm labor	4.92^c 4.92	0.088 0.088

(Continued.)

Table 1 (Continued).

Location Decision Categories, Subgroups, and Factors ¹	Mean ²	SE
Markets	6.07^G	0.055
♦ Product Price	8.79^a	0.050
Average mailbox price of milk (\$/cwt.)	8.79	0.050
♦ Market Proximity	8.00^b	0.062
Proximity to large fluid milk markets (Class 1, quota milk, etc.)	8.00	0.062
♦ Federal Milk Marketing Orders	5.47^c	0.078
Presence of a Federal Milk Marketing Order	5.89	0.089
Absence of a Federal Milk Marketing Order	5.09	0.100
♦ Unique Marketing Opportunities	4.36^d	0.086
Opportunity to export milk (export fluid milk to Asia, Canada, Mexico, etc.)	4.60	0.099
Presence of established niche markets in the local area (organic, etc.)	4.14	0.096
Community Attributes	5.85^H	0.044
♦ Health Care	7.47^a	0.065
Proximity to a hospital with the capability to handle major traumas	7.47	0.065
♦ Living Costs	7.29^b	0.056
State and local property tax rates	7.60	0.063
State and local income tax rates	7.40	0.066
Local average cost of living	6.90	0.067
♦ Population	6.64^c	0.062
Local rate of increase in urban development	7.52	0.070
Local population density	6.59	0.077
Proximity to a community with a population greater than 15,000	5.80	0.089
♦ Crime Rate	6.58^c	0.079
Local crime rate	6.58	0.079
♦ Influence of Agriculture	6.51^c	0.056
Significant of agriculture to the local economy	7.03	0.068
Proportion of land in agricultural use	6.91	0.067
Local density of dairy farms	5.59	0.074
♦ Housing Availability	6.18^d	0.071
Local availability of housing	6.18	0.071
♦ Domestic Goods	6.09^d	0.064
Proximity to a grocery store	6.98	0.069
Proximity to a hardware store	6.95	0.068
Proximity to a retail store (WalMart, Kmart, etc.)	5.92	0.082
Proximity to a shopping mall	4.52	0.085
♦ Job Opportunities	5.10^e	0.092
Presence of job opportunities for a spouse or significant other	5.10	0.092

Table 1 (Continued).

Location Decision Categories, Subgroups, and Factors ¹	Mean ²	SE
Community Attributes (continued)		
♦ Higher Education	4.33^f	0.086
Proximity to a college or university	4.33	0.086
♦ Extracurricular Activities	4.16^f	0.062
Accessibility to civic groups and community organizations for youth and adults (4-H, Rotary Club, etc.)	5.34	0.080
Proximity to restaurants and entertainment (movies, theaters, etc.)	4.69	0.082
Proximity to cultural centers (museums, concert halls, etc.)	3.36	0.078
Proximity to recreational areas (ski resorts, boating, hiking, etc.)	3.24	0.081
Infrastructure		
	5.82^H	0.050
♦ Milk Processors and Handlers	7.41^a	0.062
Proximity to milk processors and handlers (cheese plants, bottling plants, etc.)	7.87	0.060
Number of milk processors and handlers (cheese plants, bottling plants, etc.) in the local area	6.95	0.076
♦ By-product Outlets	7.04^b	0.069
Outlets for cull cows and bull cows	7.04	0.069
♦ Feed Supplies	6.73^c	0.055
Supply of locally grown forages	7.78	0.065
Supply of by-product feeds	6.83	0.076
Supply of locally grown grains	6.19	0.081
Proximity to feed mills or feed mixing facilities	6.12	0.080
♦ Veterinarians	6.62^c	0.073
Proximity to veterinarians	7.27	0.073
Number of veterinarians in the local area	5.98	0.084
♦ Milk Equipment	6.59^c	0.066
Proximity to milk equipment dealers and service providers	7.09	0.066
Number of milk equipment dealers and service providers in the local area	6.10	0.078
♦ Contractors	6.33^d	0.074
Proximity to building contractors that have experience in constructing dairies	6.73	0.077
Number of building contractors in the local area that have experience in constructing dairies	5.93	0.080
♦ Extension	5.47^e	0.086
Quality of the state and local (county or parish) Extension program	5.47	0.086
♦ Record Keeping Services	5.21^f	0.097
Availability of production record keeping services (DHI, etc.)	5.21	0.097

Table 1 (Continued).

Location Decision Component and Factor	Mean	SE
Infrastructure (continued)		
♦ Nutritional Advisers	4.94^g	0.080
Proximity to nutritionists or nutritional advisers	5.42	0.084
Number of nutritionists or nutrition advisers in the local area	4.45	0.084
♦ Heifers	4.70^h	0.080
Local availability of replacement heifers	5.05	0.086
Local availability of custom heifer growers	4.34	0.088
♦ Hoof Trimmers	4.68^h	0.079
Proximity to hoof trimmers	5.05	0.081
Number of hoof trimmers in the local area	4.31	0.082
♦ Financial Service Providers	4.67^h	0.077
Proximity to lenders	4.87	0.088
Availability of financial advisers (accountants, brokers, insurance agents, etc.)	4.60	0.083
Number of lenders in the local area	4.55	0.086
♦ State Dairy Producers Organization	4.50^h	0.089
Existence of a state or local dairy producers organization	4.50	0.089

¹ Table is defined as follows: Location decision category (e.g. Cash Flow); Subgroup of location decision factors (e.g. Income-related); and Individual location decision factor (e.g. Average mailbox price of milk (\$/cwt)).

² 0 = Not important; 5 = Somewhat important; and 10 = Critically important.

A, B, C, D, E, F, G, H Means of categories with different superscripts are different ($P < 0.05$).

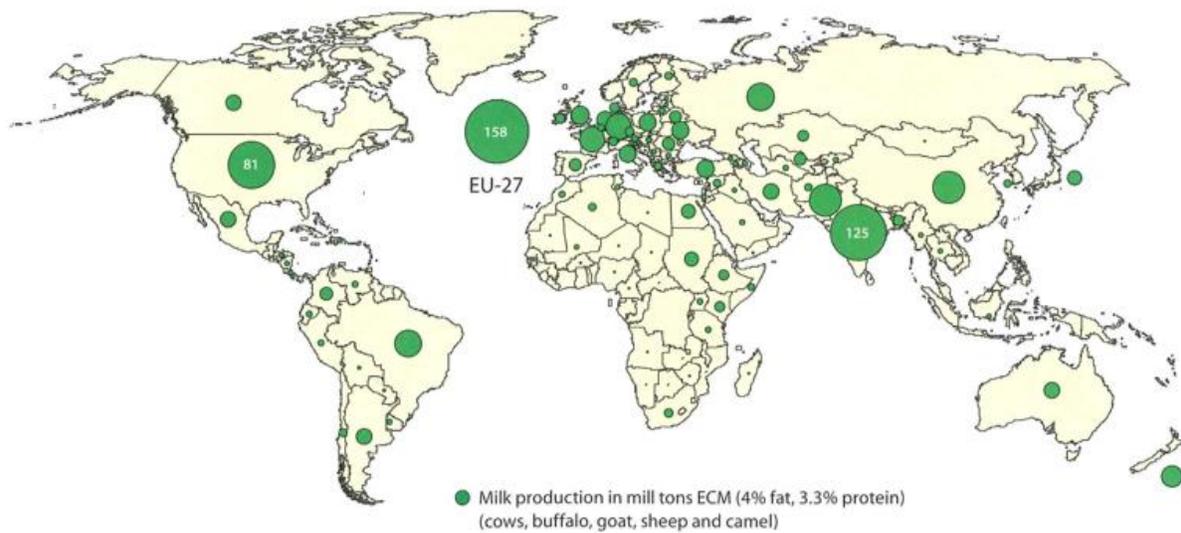
^{a,b,c,d} Means within a category with different superscripts are different ($P < 0.05$).

Figure 1. Milk surplus and deficit in the United States, 2008.¹



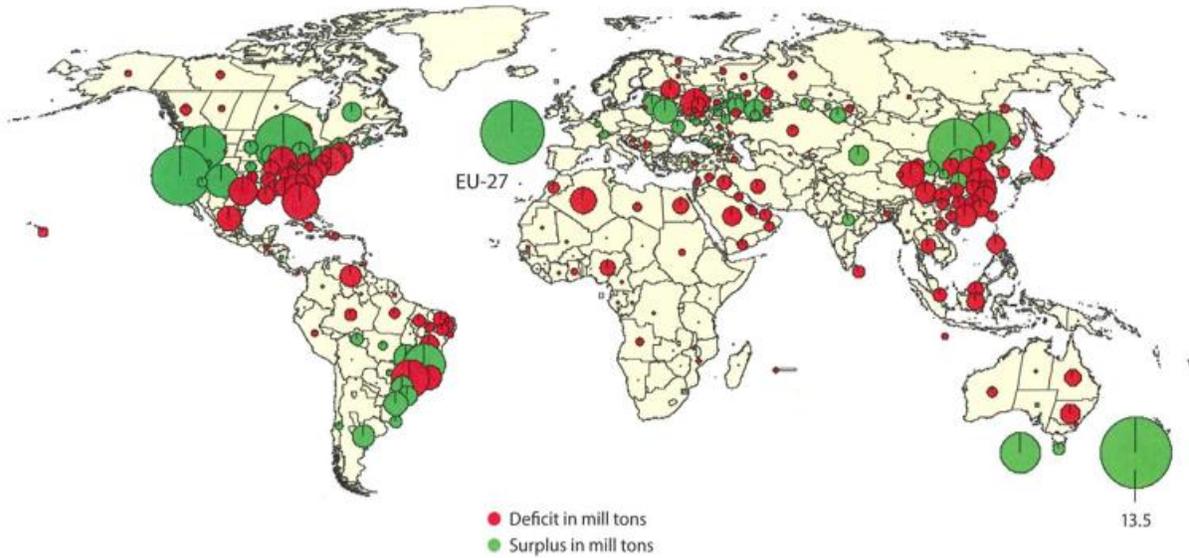
¹ Data are for 2008 in natural fat and protein content. Source: International Farm Comparison Network, Dairy Report. 2009.

Figure 2. Milk production worldwide in 2008.¹



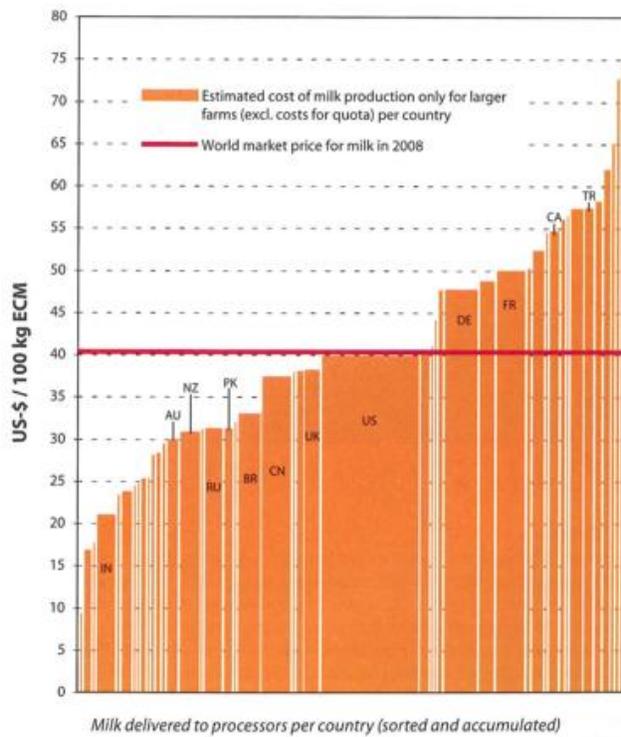
¹ Data from national statistics, FAOSTAT, and for some countries are expert estimates. Source: International Farm Comparison Network, Dairy Report. 2009.

Figure 3. Milk surplus and deficit worldwide, 2008.¹



¹ Data from national statistics and IFCN calculations. Calculations of surplus/deficit per country (or region) based on milk production minus milk demand. Source: International Farm Comparison Network, Dairy Report. 2009.

Figure 4. World milk supply curve, 2008.¹



¹ Based on the larger, typical dairy farms analyzed and milk delivered. Source: International Farm Comparison Network, Dairy Report. 2009.