

# CHANGING THE LANDSCAPE OF AMERICA'S DAIRYLAND: THE DOMINANCE OF HOLSTEIN-FRIESIAN MILK PRODUCTS AND WHY THIS BREED NO LONGER SUPPORTS THE NEEDS OF THE PEOPLE

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*ABSTRACT: The classic dairy cow has a black and white hide: the classic appearance of the Holstein-Friesian breed. However, this breed of cattle may no longer be the most appropriate dairy cattle breed. There are over 6 different breed of milk cows used by American dairy producers; however, this research essay will only compare three breeds of milk cow (Holstein-Friesian, Brown Swiss, Jersey). The three different breeds of milk cow each have distinctly different physical characteristics as well as the composition of their milk. Today, American consumers are eating dairy products instead of drinking them. Cheese yield is directly linked to milk composition. Holstein-Friesian milk has the least fat and protein content of the three breeds of cattle, negatively impacting cheese yield. It would be beneficial to dairy farmers to switch breeds of cattle to either Brown Swiss or Jersey because of their smaller body size and higher composition of fats and proteins in their milk compared to Holstein-Friesian.*

## Introduction

The black and white cow with a swollen pink udder, pulling at green grass in front of a red barn is the traditional image of an American dairy. The milk cow associated with stocking refrigerator shelves of grocery stores with full milk jugs is only representative of one breed of cattle. American culture and business ideals value productivity. There is no exception

to the dairy industry. Even though there are 6 breeds of milk cows used by commercial dairy producers, Holstein-Friesian cows dominate American dairies, making up over 90% of dairy cows (Tyler, 10). Despite the prevalence of the Holstein-Friesian, this breed may no longer be the best breed of cow to meet the needs of the American consumer. This research essay compares three breeds of milk cows (Holstein-Friesian, Brown Swiss, and Jersey).

Table 1.  
Images of Different Breeds of Dairy Cow

Holstein-Friesian	Brown Swiss	Jersey
		
<p>Source: Agricultural Research Service, United States Department of Agriculture</p>	<p>Source: Brown Swiss Association</p>	<p>Source: image courtesy of author, April Oertle</p>

Table 2:  
Breed Comparison Information Adapted from "Dairy Cattle Science" and "Composition of the milks of dairy cattle".

Species of Cattle	Average Body Weight of Mature Cow (lbs)	Milk Production in Pounds per Cow per year (2002)	% Protein in Milk	% Fat in Milk	Average Calcium in Milk (g/L)
Holstein-Friesian	1,500	24,996	3.05	3.65	1.21
Brown Swiss	1,400	20,869	3.36	4.04	1.25
Jersey	950	17,663	3.57	4.62	1.46

**Discussion: Milk Cow Breed Comparison**

Table 1 shows the difference in body color and structure between the three breeds of cow.

Table 2 is composed of quantitative data comparing the quantity and quality of milk produced by each respective breed of cow.

Brown Swiss cattle, the oldest breed of dairy cattle, are smaller in size and weight than the Holstein, yet produce milk with higher protein content (Tyler, 8). Populations of Brown Swiss cows have been declining by 8% every year with about 15,000 Brown Swiss cows registered in 2004 (Tyler, 8). There are approximately 3.9 million Holstein dairy cows in the United States (Tyler, 10). Holstein-Friesian cows make up 90% of total dairy cow population (Tyler, 10). Jersey cows are among the smallest dairy breeds and originate from the Channel Islands off the coast of France (Tyler, 10). Their numbers have been increasing by 2% every year with 160,000 Jersey cows registered in 2004 (Tyler, 11). Therefore, each breed of cattle has distinctly different body characteristics and significant differences in the composition of their milk.

Furthermore, by changing cow breeds from Holstein-Friesian to Jersey cows, there is an increase in milk calcium (+0.25 g/L) and an increase in protein content (+0.52%). Brown Swiss compared to Holstein-Friesian will also increase protein content, fat content, and average calcium levels in milk. These values may be compared by viewing Table 2.

**Discussion: Dairy Consumption Habits**

After World War II, Americans wanted bulk milk products, and therefore, the dairy breed with the highest productivity (Holstein-Friesian) took over the industry. The percentage of American people consuming fluid milk decreased significantly after 1977 (Sebastian, 2). Currently, Americans are eating more dairy than drinking it. Since 2010, domestic per capita of cheese increased 19%; butter consumption is up 24%; and per capita yogurt is up 7% (Jerome). In 2015 alone, cheese production in the United States alone was 5,370 million kilograms; mozzarella is currently the most produced cheese (Johnson, 9953).

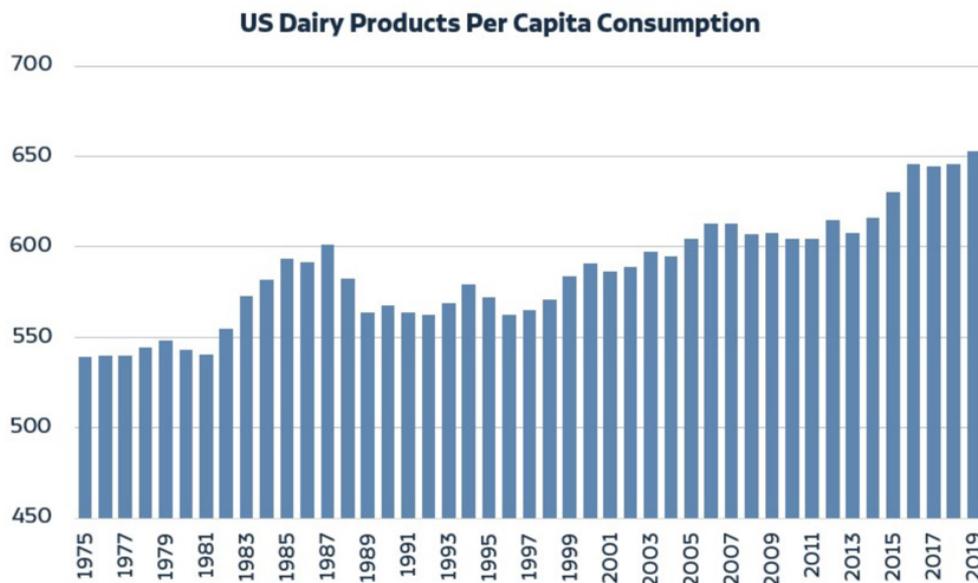
Dairy cows provide many enriching products to the American people. Cheese consumption is often part of the American diet and is an important product made from cow milk. Milk composition is directly related to cheese yield which in turn provides profit for the creamery and the dairy farmer. Cheese yield heavily depends upon the fat and protein contents of the milk (Johnson, 9957). The largest expense in cheese making today is the cost of milk (Johnson, 9953). As seen in Table 2, Holstein-Friesian cow milk has the least fat and protein content of the three breeds of cows surveyed. The Holstein-Friesian breed is no longer meeting the changing demands of the American palette. This milk therefore is not the best source of efficient and profitable cheese making. Because increasing the fat contents of milk will increase the yield of cheese, it is important to start with a richer milk. Jersey milk, however, has an entire percent higher of fat content compared to

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Holstein-Friesian (4.62% compared to 3.65%). With whole milk having a fat content of 3.25%, the difference from 3.65% to 4.62% fat content in Jersey milk is enormous.

American cheesemakers desire a wider variety of dairy breeds because of differences in their milk composition compared to the standard Holstein (Elliott). Jersey milk, with a higher fat content, can be described as tasting

creamier and smoother. Cheesemakers have been experimenting with differences in their initial milk to influence the final product. For example, a farm in California called “Bubalus Bubalis” produces a renowned mozzarella from water buffalo due to the higher butter fat content than the Holstein (Elliott). Therefore, artisanal cheesemakers believe the breed of cow can greatly affect their final product.



All Products, Pounds Per Capita, Milkfat Milk Equivalent Basis; USDA

American dairy per capita consumption across products consistently has been increasing each year, with 2019 up 6% over the past five years, 10% over the past 15 years, and 16% over the past 30 years.

Source: International Dairy Foods Association. “American Dairy Consumption Reaches All-Time High; Cheese, Butter and Yogurt Continue to Drive Growth for Dairy Industry”. September 14, 2020.

## Discussion: Composition of Milk

Fluid milk and its subsequent products are important sources of nutrients: vitamin D, calcium, magnesium, and potassium (Sebastian, 1). Vitamin B12 is also in fluid milk and is essential for normal function of the central nervous system, formation of red blood cells, and development of the brain (Liebe, et al.). All these nutrients are typically low in American diet.

While oat milks, almond milks, and other vegan milks have been increasing in supply

and availability to the consumer, it is difficult to achieve calcium nutrient requirements from foods on a strictly plant-based diet without supplements (Liebe et al.). Almond milk lacks essential B vitamins and commercial brands often add sugar to the product.

## Discussion: Dairies' Environmental Impact

While dairy farms are instrumental in providing essential nutrients, they can be harmful to the environment by the production of greenhouse gases which contribute to global climate change. In a study by Liebe, et al

found (where GHGE refers to greenhouse gas emissions):

...investigations into the impacts and alternatives when removing dairy cows from US production agriculture suggest that GHGE changes would be minor, equivalent to 0.7% of total US GHGE. Emissions increase under scenarios that reallocate arable land for production of more carbon-intensive crops, such as fruits and vegetables in LU-2, to improve the nutrient supply to the US population. At the same time, supplies of some limiting essential nutrients for the human population would decline under all dairy removal scenarios. Essential nutrient production decreased under all reallocation scenarios that decreased GHGE, making the dairy removal scenarios suboptimal for feeding the US population.

Smaller farms will also impact the environment less dramatically. A mature lactating cow will usually consume 2.3% of her body weight each day (Rasby). A Holstein cow who on average weighs 680 kg will consume almost 16 kg of feed per day. Jersey cows who on average weighs 431 kg, will consume only 10 kg of feed. Therefore, Jersey cows consume 2,152 kg less than a Holstein cow per year. Therefore, it is more environmentally conscious to have herds of Jersey cows than Holstein-Friesian. Dairy farms, with smaller herds of cattle, can be more profitable. Therefore, the farm manager should

consider changing the breed of cattle they milk from Holstein-Friesian to Jersey or Brown Swiss.

For example, Cherry Valley Dairy in Duvall, Washington operates with purebred Jersey cows. Jersey cows were intentionally selected due to being the most environmentally friendly breed of dairy cattle. With the associated high fat content in Jersey milk, their creamery produces multiple types of soft cheeses and butters. In 2021, a gallon of whole milk sells for \$32. Their most popular product is their gray salt butter which sells for \$14 a pound. Consumers are willing to pay a premium for small-scale dairy products. Operating with ~23 lactating cows and a total herd size of ~60 head, Cherry Valley Dairy can reduce their environmental impact while still producing high quality dairy products: quality being emphasized over quantity. The Jersey dairy farmer can have less cows and provide the same quantities of milk fat to therefore make the desired cheese products. Other dairy farms should follow Cherry Valley Dairy’s example and maintain herds of Jersey cows.

According to Dairy Farmers of Wisconsin, Wisconsin has over 7,000 registered dairy farms averaging a herd size of 150 cows. In the last 40 years there have been major environmental stewardship progress in Wisconsin dairy farms: producing the same amount of milk with a 79% herd reduction, 35% of the water, and 10% of the land (Dairy Farmers of Wisconsin). Dairy

Table 3:  
*Head of Cattle Comparison to Achieve Similar Fat Content for 1 Holstein-Friesian Cow*

Breed of Cattle	Average Liters of Milk Produced Per Day <small>Source: Norman, USDA</small>	Average % Fat in Milk	Average Liters of Milk Fat Produced Per Day	Head of Cattle Needed to produce 10 liters of milk fat per day
Holstein-Friesian	34	3.65	1.24	8.1
Brown Swiss	26	4.04	1.05	9.5
Jersey	23	4.62	1.06	9.4

Table 3

*Has statistical averages that show Brown Swiss cows and Jersey cows can keep up with the demand that Holstein-Friesians have created. The fat content of milk differs based on time of the year, with winter months having less fat, nutrition, and the individual cow’s genetics.*

farms and their management are not stagnant, especially when it comes to environmental considerations.

A 2018 article, "Life cycle assessment of California unsweetened almond milk", published in the *International Journal of Life Cycle Assessment*, found that almond milk was the most sold plant-based milk. In California, 11% of irrigated farmland nurtures almond groves. This same study noted that 1.42 L of unsweetened almond milk consumed 175 kg of freshwater; water is a scarce resource in arid California. However, to produce an equivalent volume of dairy milk (1.42 L), there is an estimate freshwater consumption of 307 L. However, water consumption in arid California is more dramatic and environmentally harmful than water consumed in water abundant regions of the United States, such as the Great Lakes region (Winans et al.). This region of the United States is home to many American dairy farms.

## Conclusion

Bulk dairy products are desired less than quality dairy products. Instead, both consumers and cheesemakers desire a higher quality product. By selecting, breeding, and milking from dairy cows with naturally higher fat contents in milk, the American dairy farmer can return more profit and the impact to the environment will be less. With Americans drinking less fluid milk, the Holstein-Friesian breed as the dominant dairy breed in America needs to be reevaluated. Dairy farmers can provide higher fat content milk from smaller breeds of cattle which will require less feed and less space, decreasing internal farm expenses and thereby increasing the profit margins of the farm. Smaller breeds of cattle will impact the environment less. Jersey cows should replace large Holstein cows in American dairy farms.

Further research should be undertaken to predict how smaller dairy farms may meet the demands of the American people. Thus, there is a need for quantitative assessments on the cost and sustainability of smaller dairy farms.

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