

Changes in the Breed Composition of U.S. Dairy Herds

By Fiona Guinan¹

My name is Fiona Guinan. I graduated from University College Dublin in 2018, where I earned a bachelor’s degree in Agricultural Science and majored in Animal and Crop Production. I interned at the Council on Dairy Cattle Breeding (CDCB) throughout 2019, where I had the opportunity to carry out research analyzing U.S. dairy cattle genetics and management data. In January 2020, I began a master’s program at the University of Georgia in animal breeding and genetics with Dr. Daniela Lourenço.



During my time at CDCB, I worked closely with Dairy Herd Information (DHI) records. As requested by industry stakeholders, I developed additions to existing DHI management reports while also generating new statistics and reports. These reports will be available in early 2020 on the [CDCB website](#). My main research focus was examining the breed composition of DHI herds from 1990 to 2018 to determine changes in the U.S. dairy population. This research was presented in June 2019 at the Interbull annual meeting in Cincinnati, Ohio ([presentation here](#)).



The breed composition of the U.S. dairy herd has been evolving for several reasons. These include a shifting demand for dairy products, renewed interest in different traits, promotion of breeds with limited U.S. presence and the desire to capitalize on heterosis. A few reports have disclosed that the breed composition of the U.S. dairy population has changed over the last two decades, as revealed in the shift in U.S. domestic semen sales. In order to fully understand the extent of this shift, we examined the breed composition of the population based on the animals’ recorded breed code which was determined on a herd and year of calving basis. The following breeds were analyzed in this report: Ayrshire (AY), Brown Swiss (BS), Guernsey (GU),

Holstein (HO), Jersey (JE), Milking Shorthorn (MS), ‘other breeds’ and crossbreds. Animals with a breed code ‘XX’ or ‘XD’ were considered crossbred. “Other breeds” includes any not listed above.

We looked at the breed composition based on the individual cow breed and by the herd breed. To analyze the breed composition of the herd, we investigated by percentage of a given breed within the herd. The percentages used were at least one cow, 10%, 25%, 50%, 75% and 90%. For example, the figures below demonstrate the percentage of herds with at least one AY or 25% AY. The parents of crossbred animals were also analyzed to determine the background of the growing crossbred cow population (5.2% in 2018). When the dam was also a crossbred, we investigated the breed of the maternal granddam and the maternal grandsire.

Table 1 illustrates the number of cows and herds represented in the DHI national database. Although the total number of DHI herds from 1990 to 2018 has reduced 64.2%, the total number of DHI cows receiving genetic evaluations has increased 66.9%. This results in a significant increase of recorded pedigrees in the national database.

Table 2 (below) illustrates the number of DHI cows by breed in selected years (1990, 2013 and 2018). As expected, there is a large increase in the number of Holstein cows – from 2,161,579 to 3,243,490 by 2018. The number of Jerseys increased from 135,374 to 485,849 cows, and crossbred cows experienced the greatest percentage increase from 2,971 to 207,368 cows.

Table 1. Change in total number of cows and herds in the DHI national database.

| | 1990 | 2018 | Difference |
|---------------------------|-----------|-----------|------------|
| Total no. of cows | 2,386,473 | 3,983,909 | 66.9% |
| Total no. of herds | 40,196 | 14,403 | -64.2% |

Figures 1 through 8 (next pages) show the change of breed representation within individual herds since 1990. It is increasingly common to see more breeds (albeit not in large percentages) represented in a typical U.S. herd. Herds that have at least one crossbred cow increased from 2.8 to 35.5% over the 29-year period. Three other breeds (AY, HO and MS) increased by near 3 percentage points, while GU declined slightly. The other breeds (Figure 8) were primarily WW and American Linebacks.

The percentage of herds with crossbred cows increased across all thresholds. The JE breed also displayed positive growth up to a 75% threshold. In particular, the percentage of herds keeping at least one JE increased 15.7% percentage points. At a 10% threshold, this figure increased 4.6 percentage points over 29 years.

The picture differed for those herds having at least 25% of individual breeds and was much more consistent over time. Crossbreds and JE increased by 5.4 and 2.3 percentage points, respectively. AY, GU and all other breeds had a lower percentage of herds having 25% of their cows of their specific breed while BS, HO and MS showed little change from 1990 to 2018. Herds having over 75% of their individuals of a single breed changed even less than for the 25% level with the exception of HO which declined from 87.0% to 80.6% and GU dropping from 1.9% to 0.6%. AY, BS and MS also showed declines while crossbreds and JE each increased slightly (1.3 and 0.2%).



Data collection by DHI and the illustrations above demonstrate that from 1990 to 2018, the breed composition of the U.S. dairy herd has changed substantially. It should be noted there is a recognizable improvement in data collection and quality since 2006. Crossbred cows increased since 1990 (0.1 to 5.3%), as did the number of herds keeping at least one crossbred animal (2.7 to 36.1%). The majority of the parents of purebred cows were of the same breed ($\geq 95\%$ in most cases). The top three sire breeds of crossbred cows in 2018 were HO, JE and MO. The top three dams (and maternal grand dams) were coded as HO, JE and XX or XD. Remaining sire breeds reduced to 9.2% and all other dam breeds reduced to 0.9%.

We wish to thank the participating dairy producers for supplying pedigree and lactation data. Without cooperation by the DHI organizations and the Dairy Records Processing Centers, this data would not have been available. Thanks also to the Purebred Dairy Cattle Association members for providing pedigrees on herd-book recorded animals.

Read the full paper on the [Interbull Bulletin No. 55. at this link.](#)

Table 2. Number of DHI cows by breed frequency in selected years

| | 1990 | 2013 | 2018 |
|--------------------------------|-----------|-----------|-----------|
| Ayrshire | 16,803 | 9,167 | 6,487 |
| Brown Swiss | 25,954 | 25,319 | 20,786 |
| Dutch Belted | 0 | 693 | 1,215 |
| Guernsey | 32,375 | 7,449 | 6,169 |
| Holstein | 2,161,579 | 3,402,735 | 3,243,490 |
| Jersey | 135,374 | 367,830 | 485,849 |
| Jamaica Hope | 0 | 0 | 14 |
| American Lineback | 0 | 655 | 656 |
| Milking Devon | 0 | 9 | 0 |
| Meuse-Rhine-Yssel | 0 | 0 | 2 |
| Montbeliarde | 0 | 1,721 | 533 |
| Milking Shorthorn | 3,698 | 4,917 | 3,688 |
| Normande | 0 | 256 | 207 |
| Norwegian Red | 0 | 212 | 2,825 |
| Red Dane | 4 | 172 | 80 |
| European Red Dairy | 0 | 37 | 93 |
| Red Poll | 4 | 101 | 73 |
| Simmental/Fleckvieh | 0 | 1,002 | 1,657 |
| Swedish Red & White | 0 | 483 | 294 |
| Red and White | 7,711 | 4,193 | 2,423 |
| Crossbred | 2,971 | 146,262 | 207,368 |
| Total | 2,386,473 | 3,973,213 | 3,983,909 |

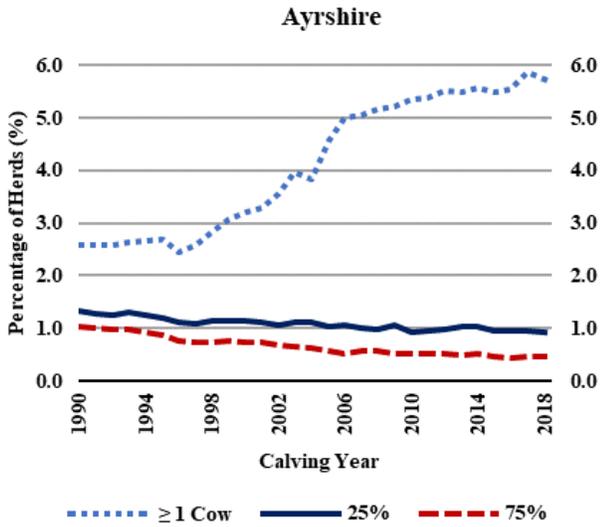


Figure 1. Percentage of herds with cows coded as Ayrshire.

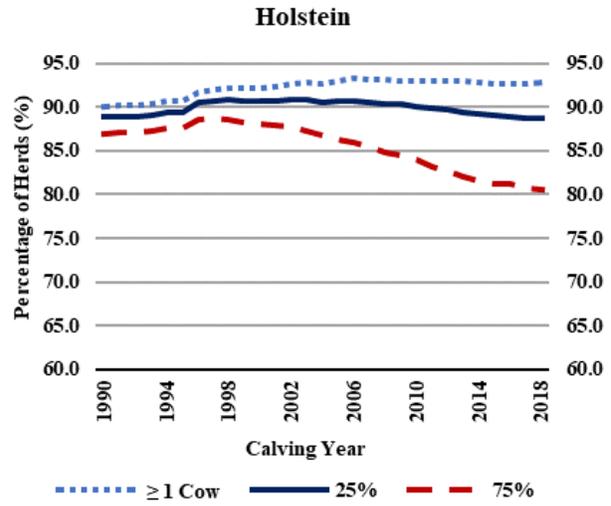


Figure 2. Percentage of herds with cows coded as Holstein.

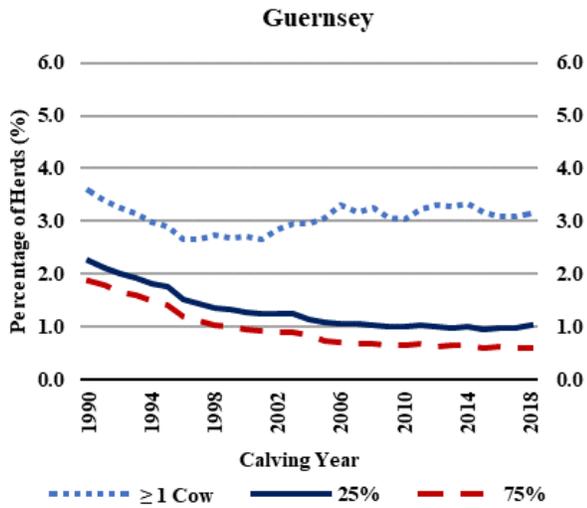


Figure 3. Percentage of herds with cows coded as Guernsey.

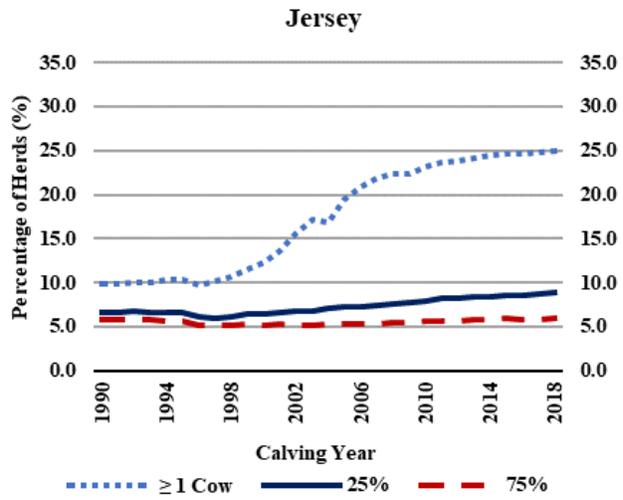


Figure 4. Percentage of herds with cows coded as Jersey.

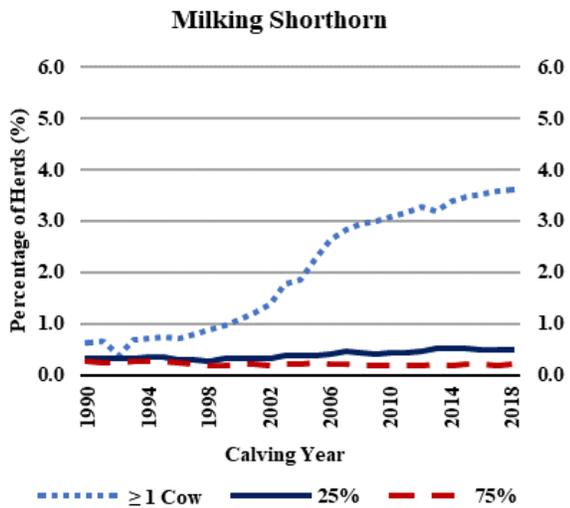


Figure 5. Percentage of herds with cows coded as Milking Shorthorn.

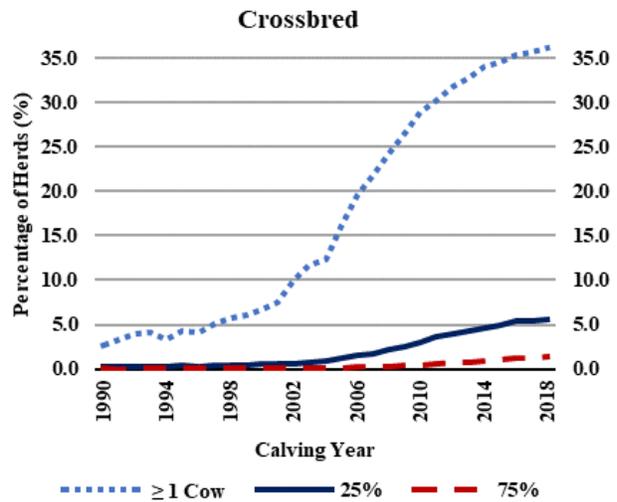


Figure 6. Percentage of herds with cows coded as crossbred.

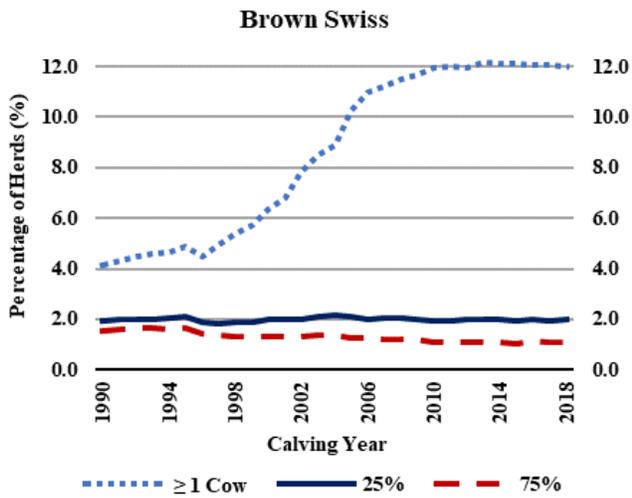


Figure 7. Percentage of herds with cows coded as Brown Swiss.

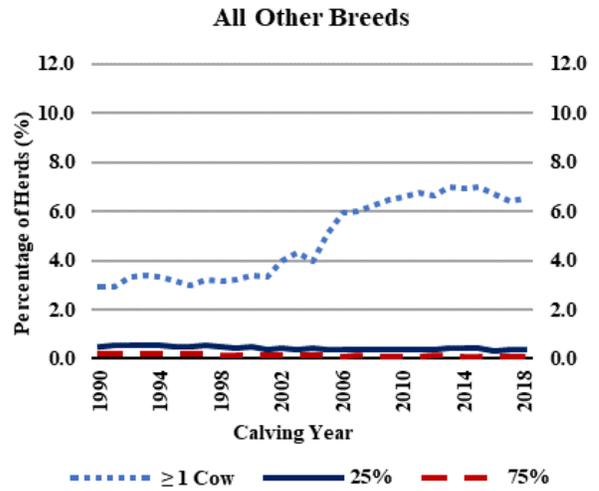


Figure 8. Percentage of herds with cows coded as any other breed.

¹Fiona Guinan was a Student Intern through 2019 at the Council on Dairy Cattle Breeding (CDCB), Bowie, Md. Guinan is currently working in a master's program in animal breeding and genetics at the University of Georgia with Dr. Daniela Lourenço .