Selective Breeding is Helping French Dairy Farmers Manage Breeding and Herd Renewal

Genotyping supports the development of strong, healthy, and productive Montéliarde cattle herds.

Introduction

The Montbéliarde cattle breed is known for its robustness. Originating in the mountains of Eastern France, the breed has adapted to thrive in cold and hot weather, as well as produce a milk worthy of being the basis of the country's finest cheeses. Breeding these impressive animals is in Guillaume Fayolle's blood. He's from a family of Montbéliard dairy farmers and for nine years he has been the Manager of the Breeding Program for UMOTEST, an agricultural collective of 3000 partner breeders in France that specializes in Montbéliarde cattle. Fayolle advises breeders on how selective breeding can improve their herds, and the meat and cheese their animals produce.

"I come from a family of farmers who are passionate about breeding," Fayolle said. "Helping to create robust breeding plans with the genetic tools we have today is not just a job for me. It is something that I love doing."

For nearly two decades, UMOTEST has been a leader in the development and systematic use of genetics and genomics to produce and disseminate sexed semen that possesses positive breed features, such as better longevity and high-quality milk production. These programs also help in identifying and controlling genetic disease within herds. As early as 2000, UMOTEST was using marker-assisted selection to assess animals. In the last few years, advances in genomics have revolutionized what the collective can do for its members.

iCommunity spoke with Fayolle about the UMOTEST breeding program and how genotyping and selective breeding are creating strong, healthy, and productive Montbéliarde cattle herds in France and throughout the globe.

Q: Could you tell us more about the distinctive features of the Montbéliarde cattle breed?
Guillaume Fayolle (GF): The Montbéliarde is the second most popular breed of dairy cows in France and its market share is growing. In France, we have more than 400,000 cows and in the UMOTEST area, we assist 15,000 farmers who breed these animals.

Originating in the Jura Mountains, this is a breed that is very well suited to the conditions in the east of France. The Montbéliarde was bred for its ability to produce high-quality milk, as well as its ability to use the edible resources available in the mountains. It has adapted well to the intensive weather conditions in the mountains, which is why it is also popular in the east of France and in the Rhône-Alps region. We've seen significant growth in the market for the last 20 years or so.

We are also seeing strong development of this breed internationally. Our subsidiary, Coopex Montbéliarde, works with farmers from about 50 different countries. We sell over 9000 animals for export every year and more than 700,000 insemination doses are used outside of France.

France is well known for the high quality of its cheeses. This high quality, of course, is the result of centuries of experience, the know-how of breeders, of grass-grazing 'terroir', and the cheese makers themselves. The Montbéliarde breed produces rich milk for these high-quality cheese products, which are recognized in France and valued throughout the world. We are proud to be able to support the breed and these products with our services.

Q: What is the difference between how Montbéliarde breeders worked in the past and how they work now?
GF: In the past, breeding required skills that were passed down from one generation to the next. Those skills were largely based on observations, performance measures, and knowing the thousands of cows that were farmed on each farm.

Thanks to genotyping, a farmer can now have a lot less experience and still be able to perform precise breeding work that will develop animals suited to different environmental situations. Last year, we had more than 42,000 genotyped females in the area and our breeding program tested more than 2500 candidates. We estimate that about 20-25% of our members use genotyping for selective breeding to manage the renewal of their herds.

Guillaume Fayolle is Manager of the Breeding Program for UMOTEST.

We have also been genotyping embryos for two years. This technique enables us to manage mating programs, specifically with females that might carry genetic disease markers, yet are worth using in the breeding plan all the same. We need to sort out the embryos that carry anomalies so that we don't end up with unhealthy calves.

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Q: What features of the Montbéliarde breed have changed by using genotyping?
GF: One of the biggest changes that genetics has brought to the breed is a wider choice of bulls. These days, a Montbéliarde breeder can use about 50 different bulls each quarter. Traditionally, there were only 10 or so bulls available to him every year. Genotyping gives breeders a much wider genetic choice that is suited to their needs.

However, the real revolution in selective breeding is with females. Thanks to genetic assessments, we now know our females much better than we ever could with traditional breeding programs. Before, it took five years for a cow to have several lactations so that we could assess its genetic potential. Thanks to genotyping, we can select the best potential mothers at birth. Out of the 40,000 females genotyped each year, we can pick out the 130 best females for our breeding program. At our breeding center, we can produce embryos, about 30 per cow, to double our genetic progress. This enables all breeders in the area to benefit from the best female genetics in their herds.

Q: How do you determine genetic value of an embryo?
GF: Each year, we produce approximately 3000 embryos with our partner breeders. We work with 1500 breeders for the Genumo Intense program, a genetic accelerator program. With genotyping, we can assess calves after about three weeks. We also have a tool called the Embryo Station, where we produce embryos and use new tools and techniques to ascertain their genetic potential at the time they are produced. We then implant only the embryos that are most suitable for the requirements of a particular breeding program. Each year, we genotype around 700 embryos to manage genetic diseases by identifying the ones that are carrying genetic anomalies.

Q: Are there criteria that are specific to the Montbéliarde breed?
GF: The Montbéliarde breed is popular because of its sturdiness. It is a cow that has a very healthy udder, is very good at reproduction, and can live a long time. All three are the profitability criteria that are important for breeders. Using genotyping, we can identify these functional features that were difficult to pick out in traditional breeding programs. With selective breeding based on genotyping data, we have an unrivaled degree of reliability in ensuring that these features are present in the animals we breed in our program. Genotyping has doubled our knowledge of these breeding criteria and allowed us to make much faster progress. We select females with particularly high health scores, especially in terms of fertility and longevity, so that breeders can receive a high return on investment (ROI).

Q: What is the ROI for UMOTEST and Montbéliarde farmers?
GF: With 10 years of genotyping behind us, we are beginning to see the ROI. The main return is the number of bulls that we have in our semen production centers each year. With progeny testing, we had to wait five years to have proof of progeny. With genetic testing, we are able to keep far fewer bulls and optimize the production of semen. Our ROI in terms of genetic creation can be easily calculated. For example, we've doubled the genetic progress of our donor station. We are starting to reap the benefits of that now.

Our breeders have everything to gain from using genotyping. It makes it easier to manage the renewal of their herd and select the females that are best suited to their farm. Genetic requirements vary from one farm to the next. Thanks to selective breeding, farmers can accurately select the females they need. By combining genetic assessment with the use of sexed semen, their ROI is even faster.

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Q: How does genotyping help you manage genetic diseases within the herd?
GF: Genetic assessment enables us to know which version of the genes an animal carries, particularly genetic anomalies that may be of interest. By genotyping a female, we can know what anomalies she might be carrying. That's useful when we choose a mate for her. We need to choose a suitable bull to make sure that we aren't passing down a disease like a mitochondriopathy.

Q: What is MyUMO?
GF: For the past two years, we have provided breeders who genotype their animals with a website called MyUMO. It can be accessed through an app on their smartphones and provides them with access to their genetic assessment results as soon as they are available after genotyping. Breeders can use this site to look up the results, optimize mating by choosing the most suitable bull for a genotyped female, and access other information to help them manage genetic anomalies.

Q: How can selective breeding practices increase herd diversity?
GF: Managing genetic variability in dairy cows is a shared concern for all breeding programs. It is particularly true for a breed like the Montbéliarde, where we have always been careful to manage genetic diversity to avoid inbreeding. Genotyping has enabled us to retain breeding lines that could have died out within the breed, giving them a place within our population to avoid an increase in inbreeding. Genotyping and selective breeding have enabled us to reintroduce some genetic diversity, which is an important element of genetic progress.

Q: What impact does UMOTEST have on cheese production?
GF: We pay attention to the well-being of the animals used in our breeding program. Healthy animals are productive animals. Ultimately, our goal is to give consumers a product that meets or exceeds their expectations. The Montbéliarde breed is popular with cheese makers because it produces high-quality milk that can be used in controlled origin label cheeses like Le Comté, Le Bleu de Gex, Le Cantal, or cheeses from Massif Central. Our genotyping services assist farmers in obtaining a good return on milk production by producing very high-quality milk that, in turn, gives consumers high-quality cheese products.

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Q: Did the farmers initially resist selective breeding?
GF: We were lucky to have members who were very interested in this innovation. They became the leaders in the use of genotyping and sexed semen in France. That said, we did work a lot on educating people and making information about genotyping understandable. To promote genotyping, we let users see the ROI they would make. The success that genotyping has brought to our members shows just how worthwhile and profitable the technology is.

Q: How do you envision the future of selective breeding at UMOTEST and for Montbéliarde breeders?
GF: Genetic assessment methods are constantly improving. Thanks to the large reference population of females that we've built, we will be able to make genetic assessments that are precise and provide information about new traits related to the health of the animals, the quality of the products, and resistance to diseases. As a result of climate change, we will need animals that are more efficient in terms of feeding. It will also be important to continue efforts to develop genetic diversity within the breed. Selective breeding will enable us to meet these new challenges.

For the farmer, it's always about greater economic efficiencies. We would like to reach even more breeders and make the use of genotyping more widespread so that we can offer those efficiencies.

Watch how the UMOTEST breeding program is producing gains for dairy cattle herds:

www.illumina.com/company/video-hub/deQZ4kNnTU0.html

Read how genetic selection enables a Montbéliard farmer to improve his herd:

GAEC des Culards iCommunity article, www.illumina.com/science/customer-stories/icommunity-customer-interviews-case-studies/decher-montbeliard-interview-ag.html

Learn more about Illumina genotyping products and systems:

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