

Genomics: A Key Part of Your Dairy's Blueprint

A decade ago, dairy producers were just beginning their journey with genotyping. Few—if any—would have predicted that information gleaned about domestic dairy cattle DNA would rival what we know about the human genome.

Today, however, use of genomic information on the farm is commonplace and dairy producers are as comfortable talking about genomic evaluations as they are commodity prices and the weather.

Low-cost, low-density genotyping tests have enabled wide-spread use of the technology at the grass roots level. Whether the genomic evaluation is higher than parent average, lower, or the same, dairy producers have more accurate information to predict transmitting ability and manage their herds.

Dairy producers are capitalizing on their genotyping investment not just by selling elite genetics in high-visibility sales. They are also profiting from their investment by discovering high-end genetics in cattle that were seemingly average prior to genomics and by making smarter breeding and culling decisions. Genomics has also allowed Jersey breeders to buy into some of the breed's leading cow families for a reasonable investment.

To give readers a feel for how Jersey breeders are using genomics to manage their herds, the *Jersey Journal* visited with five Jersey breeders in the roundtable that follows. Three participants own and manage their own herds. The two others grew up on Registered Jersey farms and are employed in the Jersey business as dairy supervisor for a university dairy herd and as general manager for an A.I. organization. Use their experi-

ences with genotyping to get more bang for your genotyping buck or to learn how to get started with the technology.

Roundtable Participants

Iris D. Barham, Berry College, Mount Berry, Ga.: Barham is the dairy supervisor at Berry College, where she manages the Registered Jersey herd with the help of 45 student employees. The 25-cow herd is enrolled on REAP and has a 2014 lactation average of 18,592 lbs. milk, 860 lbs. fat and 629 lbs. protein. Following the August 2015 genetic evaluations, Berry College ranks #13 in the nation for JPI with a herd average of +61. Students who are interested in breeding and marketing can participate in the school's Genetics Enterprise program. Barham's husband, Brad, the sales and genomics coordinator at River Valley Farm, Tremont, Ill., helps educate students on base and genomic changes and bull proofs and keep them abreast of industry trends. Barham grew up on Milky Way Farm, Starr, S.C., and won the National Jersey Youth Achievement Contest in 1997.



Iris Barham is dairy supervisor at Berry College, which genotypes all females and males under contract. Hair samples are collected within a week of birth to ensure genomic evaluations are available when needed.

Tyler Boyd, Hilmar, Calif.: Boyd has been the general manager of Jerseyland Sires since 2014. He oversees the daily activities of the company, procures bulls, works with breeders on contract matings and with the sire committee on bull selection and culling decisions, monitors financials, manages the new female program and works directly with the board on

long-term planning of the company. Jerseyland Sires genotypes hundreds of bulls each year. His personal experience with genotyping as a breeder began with his consignment to the 2008 National Heifer Sale, Boyd-Lee Matinee Habanero-ET, who was in the first group



Tyler Boyd is general manager for Jerseyland Sires, which genotypes hundreds of bulls every year to find those well-suited for their marketing needs. Though he has found there typically aren't large shifts between parent averages and genomic evaluations, there are exceptions.



Mark and Shannon Gardner, second and third left, Shan-Mar Jerseys, have capitalized on genotyping by marketing elite genetics from key cow families. They consigned the fourth high-selling female of the 2013 All American Jersey Sale, Shan-Mar Hilario Charley-ET.

of Jerseys to be genotyped. Boyd grew up on Boyd-Lee Jerseys, Parrottsville, Tenn., and won the National Jersey Youth Achievement Contest in 2008.

Mark and Shannon Gardner, Dayton, Pa.: The Gardners own Shan-Mar Jerseys, a 380-cow Registered Jersey herd enrolled on REAP. The Gardners get help with the operation of Shan-Mar Jerseys from five full-time and six part-time employees. Shan-Mar Jerseys has a 2014 lactation average of 18,801 lbs. milk, 913 lbs. fat and 685 lbs. protein. The herd ranks among the top 25% in the nation for JPI with a herd average of +39. Five members of the herd rank on the list of the Top 500 Females for GJPI. The Gardners have been able to capitalize on genotyping by merchandising from several key cow families. A member of their “Carissa” cow family was the fourth high-selling female of The All American Jersey Sale in 2013. The couple received the Young Jersey Breeder Award in 2006.

Travis Lehnertz, Plainview, Minn.: Lehnertz owns and operates TLJ Jerseys with his parents, Gary and Liz, brother, Tyler, wife, Heather, and their son, the newest member of the team, little man Jayce, five months. Two full-time employees lend a hand with milking and other chores. The milking herd is 100 Registered Jerseys and 200 Holsteins. Jerseys were added to the Holstein herd in 2000, when the black and whites were becoming too large for the facilities. Lehnertz liked the Jerseys so much that their numbers were doubled when a new compost barn was built in 2011. The REAP herd has a 2014 lactation average of 19,044 lbs. milk, 937 lbs. fat and 701 lbs. protein. Six heifers rank on the list of the Top 500 Heifers for GJPI or PA JPI.

Amy Maxwell, Donahue, Iowa: Maxwell and her family operate Cinnamon Ridge Dairy. Brothers John and Edwin Maxwell, along with John’s daughters, Amy and Kara, and his wife, Joan, are involved in ownership and operation of the dairy. Like any stable, successful, growing family enterprise, family members are uniquely involved according to their particular skills and interests. Animals in the Max-Lord partnership, owned by Amy and Heather Lord, are also housed at the dairy. Cinnamon Ridge Dairy milks 240 cows with four Lely robots. The REAP herd has a 2014 lactation average of 21,689 lbs. milk, 1,006 lbs. fat and 793 lbs. protein, marks that

rank sixth in the nation for milk, ninth for fat and fifth for protein among herds with 150-299 cows. The dairy ranks among the top 25% in the nation for JPI with a herd average of +34. Cinnamon Ridge Dairy was one of the virtual tours held during World Dairy Expo in 2013. The Maxwells also process cheese on the farm and operate a farm tour business.

Questions

Why do you genotype your cattle?

Barham: We believe students who participate in the Genetics Enterprise program need all available information—from genomics to proofs to pedigrees—to make sound mating and marketing decisions.

Boyd: Genotyping, for us, comes down to one word: accuracy. The more accurate the data we have, the better the matings and, hopefully, the better the resultant bulls. Genotyping a female, especially a heifer, provides more reliable data about her genetic potential as a bull mother. Likewise, genotyping provides more reliable data on genomic young sires. The more accurate the data, the better the chance a mating will create a bull who can go to a stud. We then use genomic testing to select the bulls who most closely match our criteria.

Gardner: We genotype our cattle for four reasons: (1) to make sure everyone is identified correctly; (2) to make better breeding decisions; (3) to identify heifers to sell; (4) to identify cows that should be included in our flush program.

Lehnertz: We genotype at a young age to maximize profit from the genetic base that is available and make faster genetic gains.

Maxwell: We use genomic tests as a tool to help us make herd management decisions. Knowing the genetic potential of each animal helps us build our herd with those with higher production, greater longevity and more profitability.

How many animals, or what percentage of your herd, do you genotype? Do you focus on the top animals or do you genotype most of the herd?

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Travis Lehnertz and his wife, Heather (with their son Jayce), operate TLJ Jerseys with his family. Genomics have helped them manage the herd and purchase elite genetics. After genotyping, heifers fall into one of three categories: potential donors, breeders and recipients.



The Maxwells—Kara, Amy, John, Edwin and Joan—own and operate Cinnamon Ridge Dairy. They use genomic evaluations to breed cattle specially suited to their needs, with high production and well-balanced udders that can be easily milked by their Lely robots.

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Barham: We genotype 100% of the females and all the males that are under A.I. contract. Hair samples are collected after registration and within one week of birth. This ensures information is ready and available when it's time to make mating and contract decisions.

Boyd: Every bull under consideration is genotyped and we prefer their dams be genotyped as well. We have noticed that elite bulls don't always come from cows at the top of the genomic lists. There is still a component of chance whenever chromosomes combine and some matings work better than others. Because I work with Jerseyland member herds and a large number of animals, I see how evaluations change from traditional to genomic evaluations. On average, there aren't large shifts between PTAs and GPTAs, but there are always exceptions.

Gardner: When we first started genotyping five years ago, we focused on the milking herd and selected cows that had high relative values on our DHI reports. After we got a good portion of the milking herd done, we started genotyping heifers. As well, because we have a group freshening pen and occasionally use more than one bull for flushes or hard-to-breed cows, we

decided to genotype all our heifers to ensure all cattle are properly identified.

Lehnertz: We started genotyping a few select females four years ago and have been testing nearly every Jersey heifer born on the farm for the past three years. We also genotype our higher-end males. On the Holstein herd (Top-Gun Holsteins), we genotype all embryo transfer calves and about 25% of the females. I haven't been as aggressive on the Holstein side because the upfront capital to compete is a lot higher.

Maxwell: When we initially started genotyping, we tested 10 head each month, focusing mostly on heifers and calves. We have been genotyping for about 3 ½ years and have now genotyped almost our entire herd.

How do you determine which animals are genotyped?

Barham: We test all of the females; therefore we do not make decisions on which animals to sample. If we did not sample all animals, we would sample those with the highest possible parent averages.

Boyd: We test any bull whose traditional PTAs and pedigree indicate there is potential for him to go to stud. From what I have seen working with our member herds, genotyping decisions should be based on the goals of the herd. If your goal is to place bulls in stud or market elite genomic animals, then

your top traditional animals should be the focus. For general flushing and propagation of genetics from good cows, the focus can be expanded. If you plan on selling dairy culls, then genotyping provides an easy, fast way to sort out the lower genetic quality animals for marketing either as calves (to decrease raising costs), springers or cows (to reduce/maintain herd size).

Gardner: We genotype all our heifers around six months-of-age.

Lehnertz: All of registered females are genotyped unless they are from a clean-up mating. The males from contract matings are genotyped as well.

Maxwell: We genotype all our heifer calves when they are about 4-8 weeks old.

What information from the genomic evaluation do you find most useful?

Barham: The Genetics Enterprise evaluates all numbers; however, they use JUI, milk, fat, protein, health traits and JPI to make bull selections and assign service sires.

Boyd: I work closely with our sire committee to decide which bulls to bring in. Our goal is to find bulls who will sire efficient, highly-productive, problem-free cows who can succeed in a competitive environment. As a result, we focus on production traits (protein pounds in particular), health traits

(such as DPR) and udder attachments. When it comes to bull mothers, I look for well-rounded cows and heifers who have solid pedigrees. The more generations of Very Good/Excellent dams and a history of positive yield deviations, the better! This confirms that there is a phenotype that matches the genotype. I also look for interesting sire stacks in pedigrees since a daughter by a new or rarely-used bull is much rarer and therefore more valuable as a bull mother. I don't expect every cow to be perfect; the key is to find cows who have minimal faults that can be managed with corrective matings. And there are a lot of those animals on the top 1.5% list. Beyond that, it's all about volume—test as many bulls out of those good females as you can because you never know where the next elite sire will come from.

Gardner: When evaluating a genomic evaluation, we look at the strengths and weaknesses of each animal. We generally consider three categories: type, production and health. Type traits we generally evaluate are JUI, teat placement, udder depth, rear udder height, legs, foot angle and strength. Production traits we primarily watch are component pounds and percentages. Health traits we like to see positive are PL and the reproductive traits. We want SCS to be under 3.0.

Lehnertz: Milk yield, components, SCS, DPR and JUI are most useful in my mind.

Maxwell: Because our cows are milked by robots, we pay closest attention to the udder traits, primarily teat placement and length.

How important are evaluations for individual health traits? Do you use them for herd management, or do you primarily use yield traits and indexes such as GJPI and GJUI?

Barham: We do evaluate health traits with regard to herd management; however yield traits and indexes are also important. We do consider the weights of the indexes as some of the calculations don't align with our production market or breeding and marketing programs.

Boyd: GJPI and GJUI are always the first traits used for comparisons between bulls, but individual traits are extremely important when making bull decisions. Health traits are becoming an increasingly important part of evaluations as breeders strive for higher production while maintaining the fertility advantages Jerseys are known for.

Gardner: We feel health traits are very important. We focus more on improving reproductive traits because, among the current higher indexing sires, it is difficult to find good production and respectable conformation along with positive reproductive traits.

As far as health traits versus yield traits versus indexes, we try to look at them all.

Lehnertz: While GJPI and GJUI are nice for quick reference, the health traits play a big part in our management decisions. PL, DPR and SCS are used the most for management decisions. In my opinion, these are the traits needed for the most profitable cow. A female that can stand in the barn year after year, breed back easily and not have any health issues will produce the most revenue at the end of the day.

Maxwell: While all information from the evaluations can be useful, beyond udder traits, we primarily focus on yield traits and

indexes. Information gleaned from genomic evaluations is used to help us breed a herd of high-producing cows with well-balanced udders that can be easily milked by robots.

How do you use genomic evaluations for herd management? Do you use them for merchandising? Do you use them for breeding decisions? Do you use them for culling decisions?

Barham: When producers make a financial investment in genotyping, they should use the information in all aspects of management. At Berry College, we use the

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information to manage genetics, production and culling. We use genomic evaluations to select young sires, develop mating plans and select donor dams for our embryo program. We also use genomics in our marketing and culling decisions. Animals that have a history of transmitting higher genomics are kept in our breeding program so their offspring can be marketed in elite consignment sales or retained in order to develop the next generation of maternal lines. Animals with lower genomics and below average production are placed on our cull list. These animals are typically sold in our local market, where buyers are seeking animals from herds with strong health programs.

Boyd: As an A.I. stud, we use genomic evaluations to select bulls, choose service sires and bull mothers, identify bulls for use in marketing materials and cull bulls. We are always looking for additional ways to make use of genetic evaluations, whether through new traits like CCR and HCR or new or custom indexes. Genotyping is vital to our female nucleus herd. We are focusing primarily on heifers. The ability to identify heifers with specific traits that will produce offspring who are efficient and productive in our member herds is what makes

that possible. Thanks to the data and the various indexes available, we can justify the investment in IVF and flushing with these females.

Gardner: We primarily use genomic information to improve our next generation of cows, be this from better breeding decisions or marketing of our less profitable heifers.

Lehnertz: Breeding decisions are based on the genomic evaluation. Production and health traits are stressed to improve milk and fertility. GJUI is always considered, but not emphasized to the extreme. Heifers fall into one of three groups based on their genomic evaluations: potential donors; breeders with sexed semen; and recipients. Evaluations help greatly in buying and selling decisions as well. They help us identify elite animals that can spark interest in sale rings and find fun pedigrees to purchase and develop. We don't rely on genomic evaluations for culling. There is usually another reason to cull an individual regardless of her genomic profile.

Maxwell: We use genomic tests as a tool for both merchandising and breeding decisions. In breeding decisions, we focus on improving udder and yield traits. Similarly, in choosing animals to merchandise, our decisions are based on udder and yield traits. Culling decisions are made primarily upon actual performance.

Since genotyping is an added cost, how do you justify its cost? What does your genotyping investment give you?

Barham: Our herd size is small and, therefore, our overall genotyping investment is also low.

Boyd: You may only get one chance to mate an animal or one chance to cull a cow. The cost of a genomic evaluation is far outweighed by the increased accuracy it provides. At the very least, you know whether a genotyped animal is better or worse than its parent average.

Gardner: We consider it just that—an investment. We believe that, in the long run, more accurate breeding, culling and selling decisions will lead to a more profitable herd.

Lehnertz: We've been merchandising an animal here and there to justify the cost. Plus, the genomic evaluation somewhat takes out the trial and error of mating decisions and makes me more confident in the quality of the replacements coming up. As well, by considering haplotypes, we also save on semen costs with increased conception rates.

Maxwell: We see a return on our genotyping investment by merchandising animals—both bulls and heifers. The genomic test not only gives the buyer more information about the animal, but confidence in its ancestry as well through

parentage verification. We have found that buyers are willing to pay a higher price for this assurance. Knowing which cows have higher genetic potential gives us the opportunity to identify and market bulls that have stud potential as well.

Applying information from genomic evaluations to our breeding program also nets a return in the long run because it allows us to make matings that will result in cows that are more suited to our robotic operation. Dairy farming is a risk-intensive investment and genotyping helps us to mitigate that risk by building a more profitable herd over the long run.

What is your greatest success story with genotyping?

Barham: We have been able to identify specific cow families in the herd that have proven to be consistent in transmitting high-end genetics. Our most recent success story is Berrys Academy Esperanza-ET, Excellent-92%. She has consistently transmitted high JPI numbers to her offspring. Her son, Orth-Berry Dimension Gideon-ET, GJPI +183, is ranked on the current list of G-code bulls. A daughter, Berrys Dimension Zinnia-ET, ranks among the top 1.5% genotyped cows at +127. Another daughter, Berrys Masters Euphoria, sold in the Pot O'Gold Sale in 2014. Several other daughters are standouts in the heifer pens.

Boyd: I believe our greatest success from genomic testing thus far has come in the form of overall genetic gain. Jersey breeders have always been more likely to use young sires. Now we can more easily and accurately sort the bulls who have the best chance at being the next great proven sire. I believe our greatest success from genomic testing thus far has come in the form of overall genetic gain. Jersey breeders have always been more likely to use young sires. Now we can more easily and accurately sort the bulls who have the best chance at being the next great proven sire.

Two examples of genotyping at work in our lineup are a pair of "Valentino" sons: All Lynns Valentino Marvel, GJPI +111, and Glynn Valentino Marcin, GJPI +202. "Marvel" was an elite genomic sire and "Marcin" has become one of the top proven bulls in the breed for JPI and the leader for Type. They've both made fantastic-looking, productive daughters; the reason they were selected for stud is because their genomics indicated they had that ability. We had no way of knowing for sure which bull would be the better proven sire, but were confident both would be better than other bulls with less-desirable genomics.

Gardner: When genotyping first became available, we knew that Shan-Mar Legacy Carissa-ET and her dam, Celestial Oregon

Crede, were two exceptional animals in our herd. Their index numbers were good, but not quite at the level we believed they should be. Genotyping confirmed our belief. Today, several members of the family rank among the best for genetic merit, including "Carissa's" daughter, Shan-Mar Legal Charisma, who ranks #20 among genotyped cows with a GJPI of +193. Two maternal sisters rank on the list of the Top 500 Heifers for GJPI as do three of her daughters. Two of her maternal brothers, Shan-Mar Coaching-ET, GJPI +167, and Shan-Mar Dominican Chuck-ET, GJPI +163, rank on the current list of G-code

bulls. Another daughter, Shan-Mar Hilario Charley-ET, was the fourth high selling female of the All American Jersey Sale in 2013. She appraised Very Good-86% at 2-2 for her new owners, River Valley Farm, and has a GJPI of +176.

Lehnertz: My greatest success story would have to be with the "Maid" family. When I started watching genomics, I knew I wanted to get into the Tenn Haug E Maid family. I saved up and got my chance at the Norse Star Summer Hummer Sale in 2012, where I purchased Sunset Canyon Valen I Maid 116-ET. Though I didn't have much

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luck flushing her as a heifer, I found success flushing her to “Santana-P” after she calved in December 2013. She is a beautiful heifer, appraised Very Good-85% at 2-0 and then raised to 87 points at 3-4. She has an m.e. of 23,415–1,228–882 on her first lactation and ranks among the top 1.5% genotyped cows with a GJPI of +123. Her first “Santana-P” calves dropped in March 2013. I pulled hair samples and anxiously awaited results. When June genetic evaluations were posted, one of them, TLJ Santana V Maid 2164-P-ET, landed the #1 polled spot. Within hours, my phone was ringing and I had consigned to the Arethusa Avonlea Summer Splash Sale, where she went on to become the highest selling heifer in breed history at \$53,000. Wow, that was fun! And as I watch these young bulls coming up, I don’t think I’ve hit her best mating yet. That’s what keeps this business interesting.

Maxwell: The genomic test of Cinnamon Ridge Sparky Iris revealed two surprises. It showed not only that her sire had been erroneously recorded, but that she had higher genetic potential than anticipated. Taking this information into consideration, we bred her to DP Valentino Samson and got excellent results. Her son, Cinnamon Ridge Snapdragon, GJPI +168, is now in service at Accelerated Genetics. “Iris” herself is appraised Very Good-85%, has an m.e. of 27,719–1,134–925 on her first lactation and ranks among the top 1.5% genotyped cows with an index of +121. This story isn’t isolated though. Another animal who was “discovered” through genotyping is Cinnamon Ridge Plus Lanny{5}, GJPI +165, also at Accelerated Genetics. We purchased his dam, Sugar Bush Golda Lanita{4}, as an open yearling at the Vermont State Sale in 2012 for \$825. We genotyped her and bred her to Sweetie Plus Iatolas Bold. We had planned to keep “Lanny{5}” as a herd bull, but his pedigree and her numbers sparked interest from Accelerated. We genotyped him and his numbers were high enough to send to stud.

In your opinion, why should a herd owner genotype their herd?

Barham: Genomic evaluations give breeders a glimpse of the genetic make-up of an animal prior to her first breeding, while traditional evaluations require an animal to complete its first lactation. This allows producers to make strategic corrective matings early on and then breed to make genetic improvements at a faster pace. That alone should justify the small investment to genotype each animal. For larger herds that do not need to keep all their heifer replacements, it’s an affordable way

to make culling decisions based on genetic merit.

Boyd: I believe the value of genotyping lies in better herd management decisions. It allows the herd manager to choose the genetics that he or she wants to remain in the herd, the ones which will be propagated and serve as the foundation of the herd in the future, and the ones who will exit the herd. And it can be combined with genomically-tested A.I. sires to make more accurate mating decisions.

Gardner: A herd owner should genotype their animals if they’re interested in improving and making better, more informed

decisions on managing their animals.

Lehnertz: In my opinion, genotyping is an unbiased view of cattle. A heifer will test the same whether she is at your farm or mine and has nothing to do with feed, facilities or management.

Maxwell: Genotyping can help a producer confirm parentage and identify animals with high genetic potential. This information can help producers make more-informed merchandising and breeding decisions to improve herd profitability.

What advice would you give to those just

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getting a start with genotyping?

Barham: Understand it takes time to find the “needles in the haystack.” Many animals will come back with breed average numbers. However, some will exhibit undesirable numbers that allow for early culling decisions. Others will have high numbers that sort them to the top for placement in embryo transfer or in-vitro programs to increase their progeny. Genomic evaluations should be used as a tool, not as an exclusive means of evaluations. Pedigree depth, phenotype and other important reliable evaluations that have taken place for generations should also be considered.

Boyd: Genotyping is a tool. Sometimes the best cow in your herd has an excellent genotype and sometimes she doesn't. Every herd has different goals and focuses on

different areas, so use it to make informed decisions and keep breeding cows who are profitable for your herd and environment! Variation is a great thing and the different breeding goals found in the breed have been key to creating some outstanding animals. **Gardner:** Start with your younger, better (higher JPI or relative value) cows and heifers. Making better decisions on your best animals should provide you a bigger bang for the buck.

Lehnertz: Don't be afraid to ask questions. There are a lot of people out there who are willing to help you get the most out of your genotyping dollars. Every herd owner has a favorite cow family in their barn; start there and see where it takes you.

Maxwell: Set a realistic goal to test a certain number of animals each month. Monthly goals set you up for long-term success with genotyping. Getting results

each month keeps breeding and overall herd objectives in your mind. Getting outstanding results from an animal with a unique pedigree keeps your attitude positive and makes you want to continue doing it. Finally, don't get discouraged by the process. Think big picture and find a way to fit the process into your farm's monthly routine. Genotyping can be a very worthwhile investment. Past programs of *This Month in Jersey Genomics*, hosted by Cari Wolfe, director of research and genetic program development at the AJCA, are available on the USJersey website. They have a wealth of information and ideas and listening to them can be a great place to start learning about genomics.

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