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Department of Animal Sciences

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Effective Use of Genomics in Commercial Farms: I. Sire Selection

Francisco Peñagaricano

Progeny testing has been the basis of genetic selection programs in dairy cattle breeding. It has led to remarkable genetic gains in production traits; e.g., predicted transmitting ability (PTA) values of US Holsteins bulls have increased by 81 lbs. of milk per year over the last three decades. However, it is important to note that progeny testing is a very time-consuming process. For instance, at least 4.5 years are required for collecting semen of a potential elite bull, rearing his offspring, and finally predict his genetic merit based on his offspring's performance. If we decide that the bull is good enough to use in the entire population, then his first sons and daughters will be born when he is about 5.5 years of age. This long generation interval limits the rate of genetic progress. In this context, the use of genomic testing, namely the use of genetic markers across the genome to predict breeding values, allows us to identify and select animals at an early age. This drastic reduction in the generation interval has a very positive impact on the rate of genetic gain.

Dairy sire selection has dramatically changed with the arrival of genomics. Nowadays, dairy farmers have basically two main options when they make sire selection decisions: use proven (progeny-tested) bulls or use young genomic-tested bulls (i.e., young bulls with no progeny that have been evaluated using only their own genomic data). The National Association of Animal Breeders (NAAB) distinguishes these two groups of bulls as the ***active*** (**A**) bulls, progeny-tested bulls with performance information in at least 10 daughters, and the young ***genomic-tested*** (**G**) bulls, young bulls that have not yet milk-recorded offspring. It is important to remark that the number of young genomic-tested bulls currently in the market far exceeds that of progeny-tested bulls. For instance, of the 2,741 Holstein bulls available in the market in August 2016, 2,172 (79%) are young genomic-tested bulls. Similarly, in Jersey, 403 of the 534 available bulls have G status.

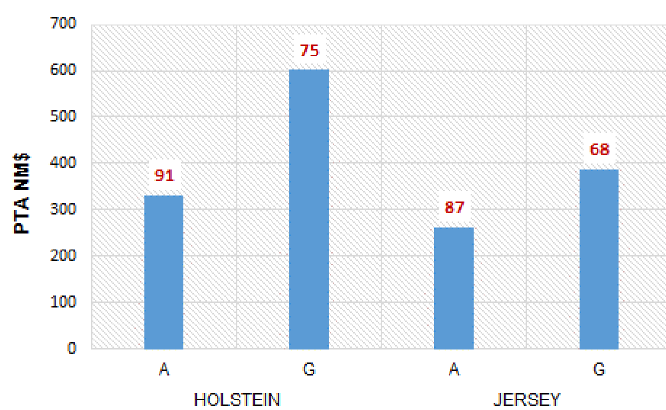

Figure 1. Average ***predicted transmitting ability*** (**PTA**) values (in the y-axis) and the corresponding ***reliability*** (**REL**) values (above the bars) for ***Lifetime Net Merit*** (**NM$**) for active (**A**) and genomic (**G**) Holstein and Jersey bulls marketed to US dairy farmers. Based on August 2016 Council on Dairy Cattle Breeding (CDCB) genetic evaluations.

The key concept regarding young genomic-tested dairy bulls is that, on average, these young bulls have greater predicted genetic merit values than the proven bulls. Figure 1 shows the average PTA value for lifetime net merit (NM$) for the group of active (A) and genomic (G) Holstein and Jersey bulls currently marketed to US dairy farmers (August 2016). The difference in the average PTA NM$ between these groups is remarkable: the net merit of young genomic-tested bulls is $270 and $124 greater than for progeny-tested bulls in Holstein and Jersey breeds, respectively. Notably, if we rank the available (A + G) bulls based on PTA NM$ values, and then we consider only the top 100, we find that 98% and 87% of these elite

Holstein and Jersey bulls, respectively, are young genomic bulls. It is worth noting that if we consider that the changes achieved through genetic selection are cumulative and permanent, then it is expected that the new generations (e.g., G bulls) have (on average) greater genetic merit than the older generations (e.g., A bulls). Now, in the case of the young genomic-tested dairy bulls, higher genetic values are accompanied by lower reliability values. Indeed, the reliability of PTA NM$ values of young bulls is 26% and 19% lower than for proven bulls in Holstein and Jersey breeds, respectively (Figure 1). This is not surprising considering that the young genomic-tested bulls do not have progeny yet.

The question is how we proceed in this scenario, i.e., we should use young genomic-tested bulls because they have greater PTA values, or instead, we should use proven bulls because they have more reliable PTA estimates. At this point, it is important to remark that sire selection decisions should be always based on PTA values. As such, we should not select or exclude sires based only on reliability; however, we should use the value of reliability as a guide to decide how intense we want to use a bull. Therefore, when we consider the dilemma young genomic vs. proven dairy bulls, the best strategy is to use a group or team of young genomic-tested bulls. Table 1 shows how the reliability of the genetic merit of the team (calculated simply as the average genetic merit) increases as we include more young bulls in the team. For instance, if the REL values of individual young genomic-tested bulls is 70%, then REL of the average genetic merit for a team of three young bulls is about 90%, and if we increase the group size to six or even twelve young bulls, we achieve REL values for the group average between 95% and 98%.

Overall, genomic selection has transformed dairy cattle breeding programs. Nowadays, young genomic-tested bulls represent the majority of semen available in the market. Notably, these genomic bulls have on average greater genetic merit than proven bulls. Therefore, commercial dairy farmers have now a unique opportunity to capture the greatest benefits of genomics. Now, these G bulls have REL values about 70%, and hence, dairy farmers should manage the risk associated with imprecision in PTA estimates by using a group of young bulls, rather than focusing too heavily on individual animals.

Table 1. Change in the reliability of the group genetic merit (calculated as the average genetic merit of the group) as function of the number of young genomic-tested bulls in the group.

No. of genomic-tested bulls in the group	Reliability of the group genetic merit
1	70
3	90
6	95
12	98

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Is Florida Losing its Mailbox Price Advantage?

Albert De Vries

One of the reasons many dairy farmers started dairying in Florida was the higher Mailbox milk price compared to the rest of the country. Milk prices paid in Florida are based, in part, on the high Class I (fluid milk) utilization and farmers' ability to obtain over-order premiums. These higher Mailbox prices have been needed to (partly) offset the greater cost of producing milk in the state. It appears, however, that the Mailbox price received in Florida is losing some of its advantage compared to the rest of the country.

In figure 1, I plotted the Mailbox prices for Florida, Wisconsin, California and the Federal average as reported by USDA, from January 2010 to June 2016. All these prices can be found on http://future.aae.wisc.edu/tab/prices.html. This website reports also Mailbox prices for other regions. For all 78 months reported, the Florida Mailbox price was greater than the prices reported for Wisconsin, California and the Federal average. The only exception is March 2016 when the Florida and Wisconsin prices were the same ($15.68/cwt). On average, the Florida Mailbox price was $2.53/cwt greater than the Wisconsin Mailbox price. Average differences with California and the Federal average were $$4.74/cwt and $2.73/cwt.

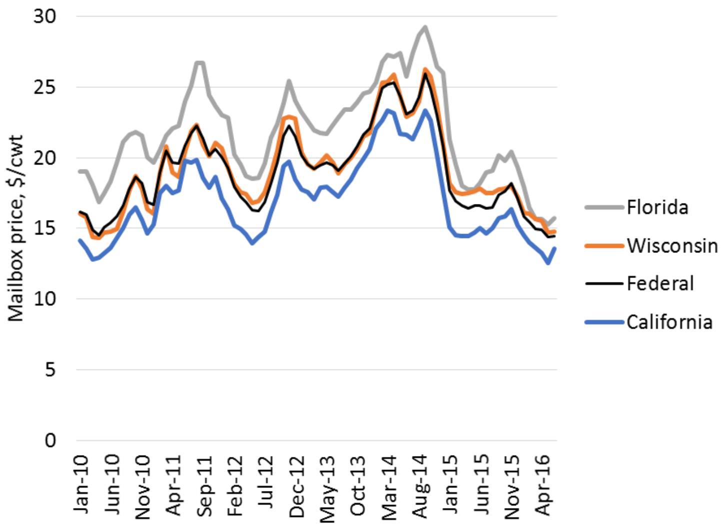

Figure 1. Mailbox prices for Florida, Wisconsin, California and the Federal average as reported by USDA, from January 2010 to June 2016.

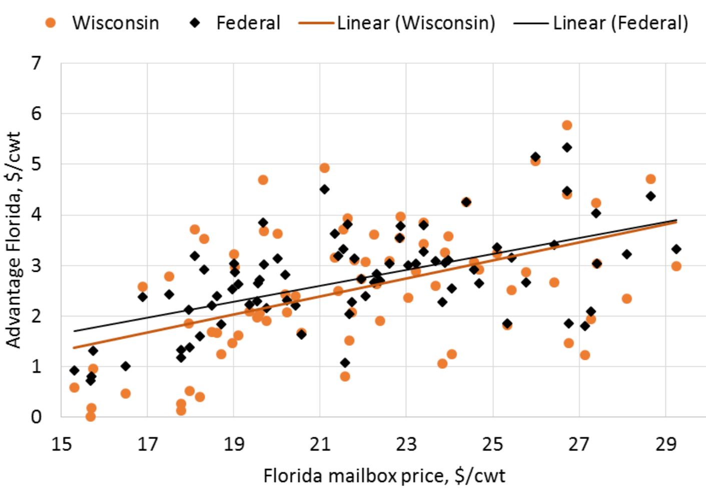

Figure 2. The Florida Mailbox price advantage compared to Wisconsin and the Federal average depends on the Florida Mailbox price.

Figure 2 shows that the Florida Mailbox price advantage depends on the milk price. When Florida Mailbox prices were higher, so was the difference between the Florida Mailbox price and the Mailbox prices reported for Wisconsin and California.

In figure 2, the Florida Mailbox price advantage is calculated as the difference with Wisconsin and the Federal average, in $/cwt. Expressed another way, for every 1 dollar received for milk in Florida, the Wisconsin price was $0.89 and the Federal average price was $0.88. Figure 3 also shows that the Florida Mailbox price advantage expressed per dollar is greater when milk prices are higher.

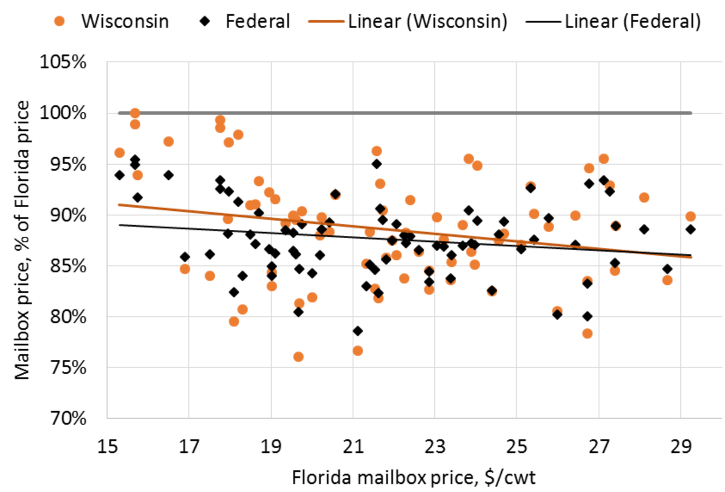

Figure 3. The Florida Mailbox price advantage compared to Wisconsin and the Federal average, expressed per dollar, is greater when the Florida Mailbox price is higher.

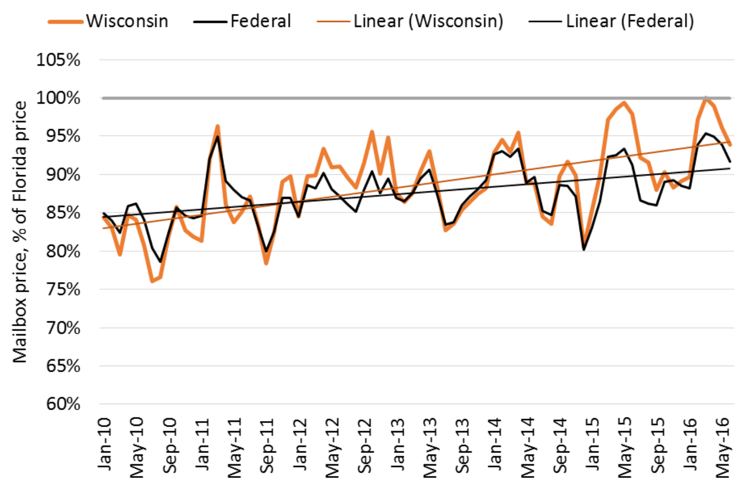

Figure 4. The Florida Mailbox price advantage compared to Wisconsin and the Federal average, expressed per dollar, from January 2010 to June 2016.

Figure 4 is a plot of the Florida Mailbox price advantage expressed per dollar compared with Wisconsin and the Federal average over time since January 2010. Per dollar received in Florida, the Wisconsin and Federal average prices clearly have been improving over time. In other words, Florida appears to be losing its Mailbox price advantage. The question then is if Florida dairy farmers are able to make up for this smaller advantage by being more competitive when it comes to the cost of milk production.

Contact Albert De Vries at devries@ufl.edu.

Prediction of the Future Florida Mailbox Price and Future All Milk and Feed Prices: October 2016 - September 2017

Table 1. Forecast of the future Florida Mailbox Price and Future All Milk and Feed Prices: October 2016 – September 2017

		2014 Farm bill formulas	
Month	Forecast FL mailbox price ($/cwt milk)	Forecast All-Milk price ($/cwt milk)	Forecast feed cost ($/cwt milk)
Oct-16	19.47	16.27	7.44
Nov-16	19.71	16.56	7.56
Dec-16	19.86	16.68	7.69
Jan-17	19.34	16.79	7.73
Feb-17	19.62	17.05	7.77
Mar-17	19.87	17.27	7.82
Apr-17	19.25	16.98	7.86
May-17	19.43	17.15	7.90
Jun-17	19.67	17.39	7.95
Jul-17	21.27	17.63	7.99
Aug-17	21.44	17.78	8.03
Sep-17	21.57	17.91	8.06

Based on futures prices of October 17, 2016.

The forecast All-Milk price and the forecast feed cost have been added to the table since the Fall 2014 issue of Dairy Update (see http//dairy.ifas.ufl.edu/dairyupdate). These forecast are based on the formulas in the 2014 Farm Bill. Daily updated Florida mailbox price forecasts are found at http://future.aae.wisc.edu/predicted_mailbox/?state=Florida Feed costs are found at http://future.aae.wisc.edu/tab/costs.html#94.

For more information, contact Albert de Vries at devries@ufl.edu or (352) 392 5594 ext. 227.

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Dairy Extension Agenda

- **November 16-17**, 2016. **Southeast Quality Milk Initiative (SQMI) Meeting**. Location: UGA Tifton Campus Conference Center, Tifton, GA. Take I-75, Exit 64. SQMI is a research and Extension project from six universities in the Southeast to help dairy farmers improve milk quality. The meeting in Tifton focuses on practical take-home messages to improve milk quality on the farm. This year's meeting is co-organized by the University of Georgia and the University of Florida. The project is primarily funded by USDA but also receives industry support. Registration and info: http://sequalitymilk.com/4th-annual-meeting-nov-16-17-2016-tifton-ga/. More information: Steve Nickerson, UGA, 706-542-0658, scn@uga.edu, or Albert De Vries, UFL, 352-392-5594 ext. 227, devries@ufl.edu
- Wednesday **December 7**, 2016. **Genetics and Genomics workshop**. Location: Okeechobee Extension office, 458 Highway 98 North. 10 AM to 2 PM, free lunch included. The workshop presents case studies on how dairy farmers can use genomics to improve the genetics of their herds, increase fertility, and how to make genomic testing the most cost-effective. This workshop is offered across the country. The workshops are primarily funded by USDA but also receive industry support. More information to follow. UF contacts: Colleen Larson, 863-763-6469, cclarson@ufl.edu, or Albert De Vries, 352-392-5594 ext. 227, devries@ufl.edu
- February 6-8, 2017. **Florida Ruminant Nutrition Symposium**, Gainesville, Florida. http://dairy.ifas.ufl.edu/rns/info.shtml More information to follow.

Dairy Update is published quarterly by the Department of Animal Sciences, Institute of Food and Agricultural Sciences, University of Florida. Please address any comments to Albert De Vries, Editor, Dairy Update, PO Box 110910, Gainesville, FL 32611-0910. Phone: (352) 392-5594 ext. 227. E-mail: devries@ufl.edu. Past issues are posted on the UF/IFAS Florida Dairy Extension website at http://dairy.ifas.ufl.edu. This issue was published on **October 19, 2016.**