# HeiferHub – A decision support tool to forecast sales of beef calves and future heifer replacements

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## Abstract

Utilizing the combined breeding, calving, culling and calf data, DRMS build a web based tool called HeiferHub. HeiferHub uses the various input variables necessary to forecast the number of available dairy replacement animals approximately 34 months from breeding. Expected number of dairy replacement animals are compared against the anticipated need of replacements and informs the producer if there is a shortage. In addition, it provides an economic analysis that projects the estimated costs in semen and revenue generated from selling excess female dairy calves, dairy bull calves and dairy x beef cross calves.

Users can compare different breeding strategies but also analyze the impact on number of future replacements based on making management improvements. One example of this would be the anticipated extra revenue from selling dairy x beef cross calves if the farm builds a new calf facility and lowers calf losses.

HeiferHub provides a valuable tool that takes the guesswork out of making breeding decisions and makes a complex process much easier to manage.

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## Introduction

Historically, the process of maintaining the preferred milking and replacement herd size was relatively simple. Cows were bred exclusively to dairy semen and typically the number of female calves generated would be adequate to ensure that enough animals would be available to replace those that left the herd for either voluntary or involuntary reasons. Excess heifer inventories and dairy bull calves would be sold at market prices.

Since the introduction of breeding dairy cows with AI beef bulls and the availability of sexed semen to create more dairy replacements, the decisions surrounding the number of cows to breed to the various types of semen has become more complex. U.S. dairy farmers can sell a dairy x beef cross calf for a significantly higher price than a dairy bull calf. Producers have reported revenues for a single cross bred calf in the range of 200 to 800 dollars while dairy bull calves would typically generate less than 100 dollars. This provides a significant additional source of revenue for dairy producers, especially in times when milk prices are low. To seize on this opportunity, dairy farmers have increased the number of animals bred to AI beef sires. In addition, they have reduced the number of animals bred to conventional dairy semen and increased the number of animals bred to dairy sexed semen to ensure enough replacements are available in the future. The math can be complicated because there are many factors to consider post breeding – to include conception rates, pregnancy losses, stillbirths, heifer losses and

level of involuntary culling. Combining the impact of all these factors can dramatically impact the final number of replacements available 34 months from when the cows are bred. Dairy farmers typically track conception and pregnancy losses. But it is more complicated to obtain information about calf losses and stillbirths, for example, from on farm management software and it requires access and summarization of historic records that typically are not retained on farm. Therefore, dairy farmers make their best guess which in some cases has led to either an excess or shortage of dairy replacements. When a shortage occurs, the dairy has to find suitable replacements typically at a higher price and genetically lower quality and assume the risk of disease exposure. Current heifer purchase prices range between $2,400 and $3,500 so there is a significant economic incentive not to be short on replacements.

The financial incentive is clear, however the problem at hand for many producers is: “How do I maximize my returns while breeding the maximum number of cows to AI beef bulls while also ensuring enough replacement animals?” This paper will provide an overview of a new and exciting web based decision support tool named HeiferHub offered by DRMS that takes the guesswork out of making breeding decisions, maximizes future returns and ensure the farm has enough replacement animals.

## A new reality

Using DRMS breeding data, the annual trend for number of breedings by semen type continues to be more breedings to beef and sexed dairy semen and less breedings with conventional dairy semen. Figure 1 shows March 2024 DRMS breeding data separated by semen type. When compared to the same month in 2023, conventional dairy semen usage dropped from 45% to 40%, sexed dairy semen is up 1% and beef semen is up 4% from the prior year.

The data shown in Table 1 represents the 2023 overall breeding trend based on data from more than 9200 dairy farms. However there are significant differences between herds. Evaluating a single farm’s data can provide valuable insights about the current breeding program and adjustments that have been made over time. Figures 2 and 3

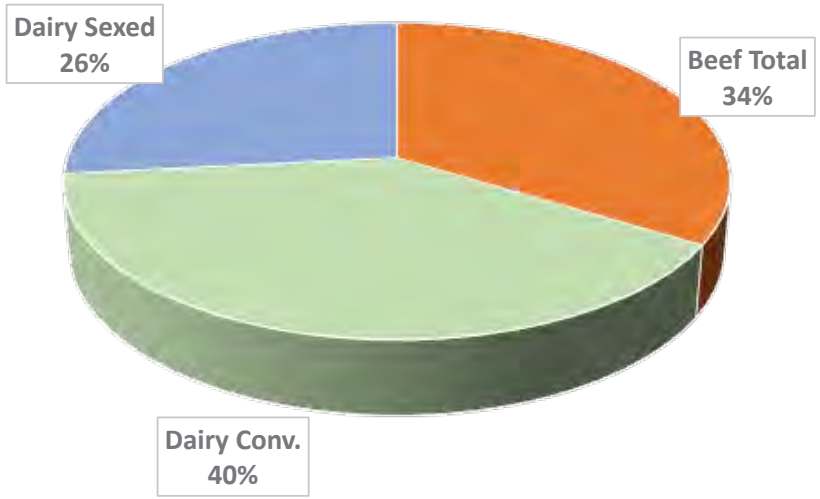


*Figure 1. DRMS March 2024 semen distribution by semen type (Source: DRMS)*

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| | Service # | % Beef | % HO Conv | % HO Sexed | % Jersey |
|---|---|---|---|---|---|
| Heifer | 1 | 3.8% | 31.3% | 63.7% | 1.2% |
| | 2 | 6.3% | 33.1% | 59.4% | 1.2% |
| | 3 | 30.5% | 37.5% | 30.7% | 1.3% |
| 1st Lact | 1 | 13.9% | 51.5% | 32.8% | 1.8% |
| | 2 | 21.9% | 52.0% | 24.7% | 1.3% |
| | 3 | 45.9% | 45.3% | 8.1% | 0.7% |
| 2nd Lact | 1 | 26.0% | 52.4% | 19.9% | 1.6% |
| | 2 | 34.4% | 51.1% | 13.6% | 1.0% |
| | 3 | 51.5% | 43.7% | 4.3% | 0.6% |
| 3+ Lact | 1 | 41.3% | 47.2% | 10.8% | 0.7% |
| | 2 | 46.3% | 45.2% | 7.8% | 0.6% |
| | 3 | 57.7% | 38.6% | 3.1% | 0.6% |
| | **Service #** | **% Beef** | **% HO Conv** | **% HO Sexed** | **% Jersey** |
| All Lact + Heifers | 1 | 22.0% | 45.7% | 31.0% | 1.3% |
| | 2 | 29.7% | 46.1% | 23.2% | 1.0% |
| | 3 | 49.6% | 41.6% | 8.2% | 0.7% |

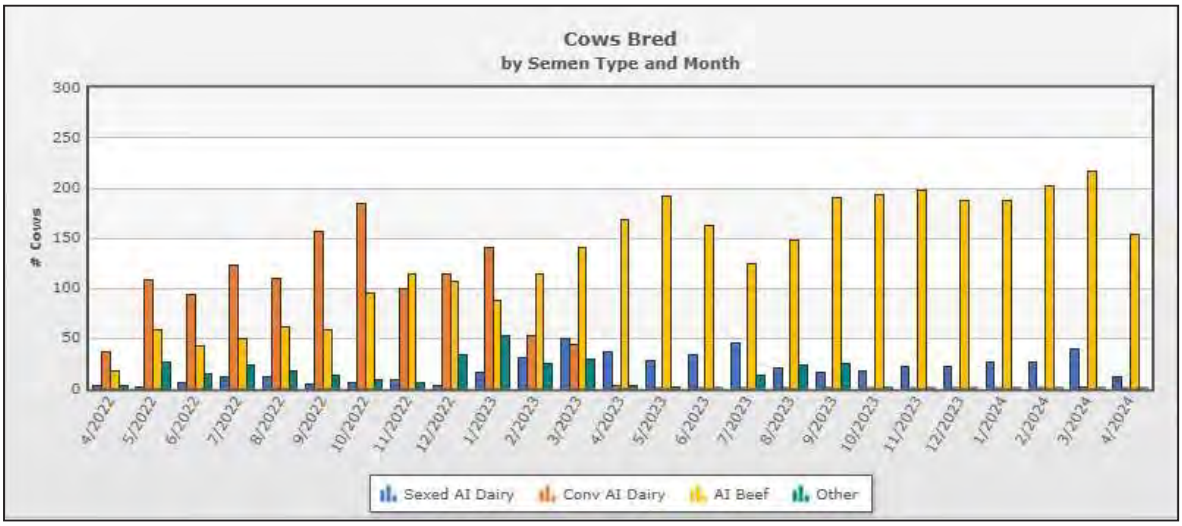


*Figure 2. Percent of cows bred by semen type and month (Source: DRMS HerdHQ)*

show a single herd's breeding trend based on semen type for the milking cows and heifers respectively.

Based on the data shown in Figures 2 and 3, the farm made a significant change in March 2023. The staff stopped breeding cows to conventional dairy semen while dramatically increasing the use of beef semen to breed cows. To offset the reduction in dairy replacement animals, they increased the use of sexed dairy semen on some of the cows but more so on the dairy heifers. The number of replacement animals resulting from these decisions will not be known until calves are born and reach breeding age and subsequent calving.

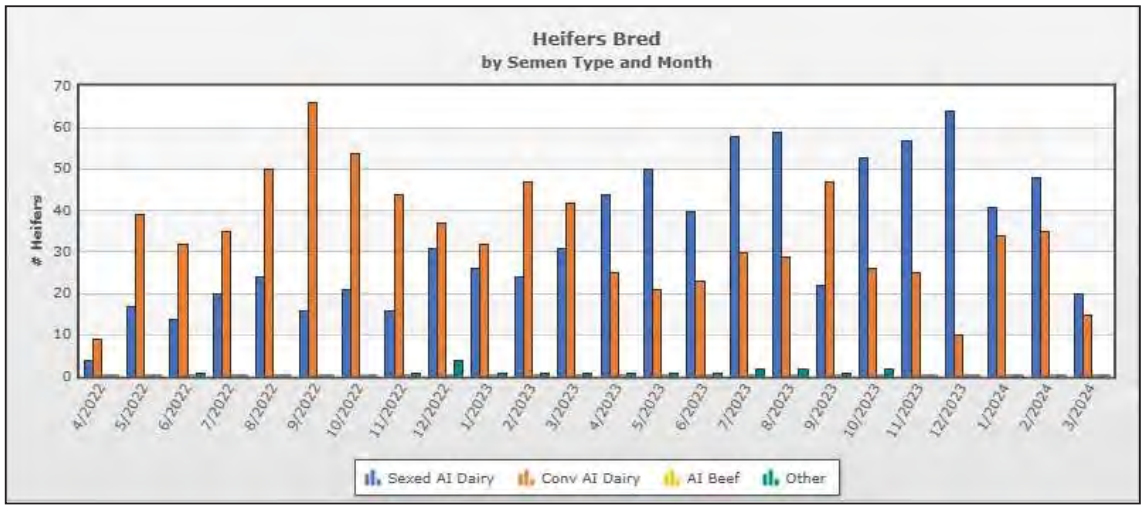


*Figure 3. Percent of heifers bred by semen type and month (Source: DRMS HerdHQ)*

In addition to the change in breeding strategy, one can also determine the variation in number of animals bred each month which in turn adds more variability to the number of available replacements in the future.

Consistency in producing the right number of replacements each month is an important consideration as well. Factors that will determine how many replacement animals are available in the future are:

- Conception Rate.
- Pregnancy loss.
- Stillbirth.
- Calf loss.
- Heifer losses (between birth to calving).
- Age at Calving.

These numbers can vary throughout the year. For example, summer heat can negatively impact conception rates and pregnancy losses while winter cold and humidity can negatively impact stillbirths and calf losses. Figure 4 shows projected calvings for the same herd over the next 8 months. Quite a lot of variation is expected in the projected number of replacement dairy calves. In May 2024, the projected number of dairy replacement calves born is more than twice as the prediction for June 2024. Typically, farmers will evaluate the projected number of replacement calves born from month to month and subsequently adjust the percentages of animals bred to each semen type. Using historic data allows the farmer to determine patterns in effects such as conception rates and pregnancy losses to enable him to proactively select the correct number of animals to breed to the various semen types.

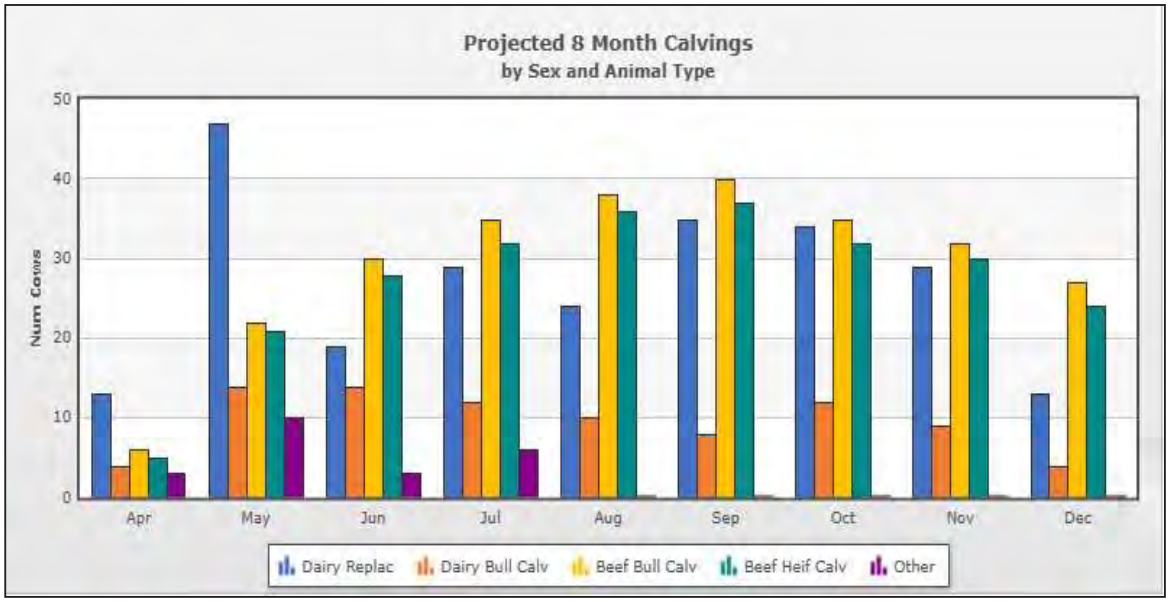


*Figure 4. Projected 8 month calvings by sex and animal type (Source: DRMS HerdHQ).*

## How can HeiferHub improve the breeding decision making process?

The primary concept of HeiferHub is to use common understandings about biological facts and apply simple math to create predictions. The starting points are

1. required number of replacements as affected by yearly voluntary and involuntary culling rates,
2. number of animals to be bred in the upcoming month or week and
3. percent of animals bred to each semen type.

The next step in the process is to project the number of pregnancies, live calves born, and calves that will become pregnant and survive to calve themselves. This step takes into account conception rates, pregnancy losses, and other factors.

The challenge for most farmers is to obtain the input parameters. When farmers are asked for their herds' stillbirth rate or percent of heifers that become pregnant and survive to calving, most will make a rough guess. Determining these numbers requires investigation using current and historic records. DRMS simplified this process by using data collected on DHIA testday or daily via Dart herd management software. Automating the process drops the guesswork of determining the input parameters used in computations. HeiferHub flexibly allows input parameters to be changed from default yearly numbers derived from data files and allows the user to adjust for variation throughout the year. For example, stillbirth rates in Midwest U.S. are usually higher in January and February. Additionally calf losses are typically higher in the winter months.

HeiferHub provides default input parameters based on the herd's history. However the user can also adjust these numbers to accommodate expected changes in management practices and to evaluate the impact on projected number of replacements.

Figure 5 shows the HeiferHub input screen. Most values are prefilled based on the data collected by DRMS. However numbers such as semen price and revenue from selling calves need to be provided by the user. HeiferHub will calculate the number of

anticipated calves based on number of animals to be bred by month or week. Setup screens can be saved so the user can easily return and make new projections.

As shown in Figure 6, results are presented in a stepwise process starting with:

1. The number of cows and heifers being bred to each semen type.
2. The number of anticipated pregnancies by type of offspring.
3. Finally, the projected number of replacements.

HeiferHub will calculate the anticipated number of replacement animals needed based on the herd's involuntary culling rates and heifer losses, and, it will show either the number of deficit replacements or the number of extra heifers that may be sold.

An additional feature of HeiferHub is that it will calculate the anticipated revenues from selling dairy replacement calves, dairy bull calves and Dairy x Beef crossbred calves

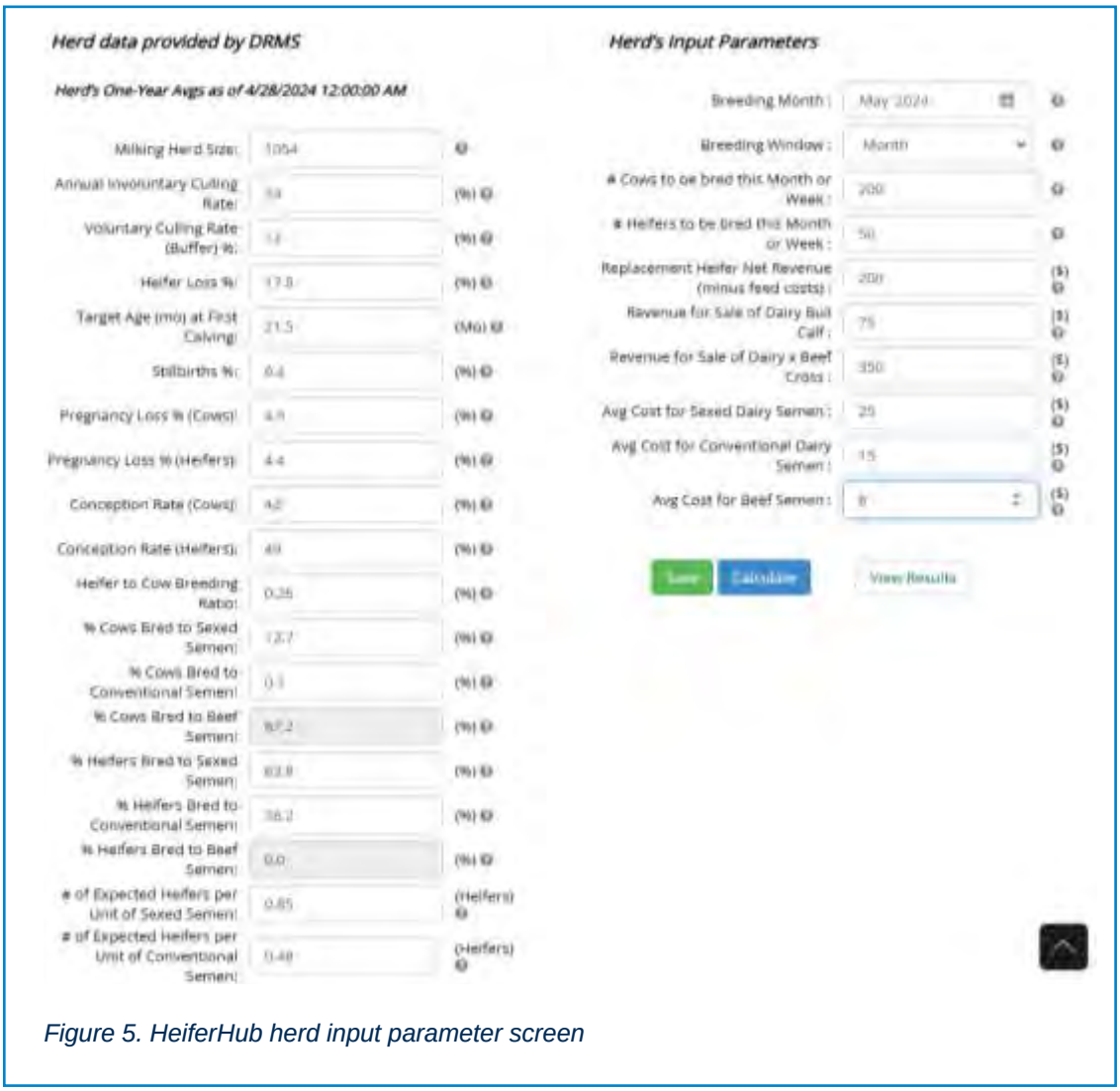


*Figure 5. HeiferHub herd input parameter screen*

| | 4/2024 | 3/2024 | 2/2024 | 04/22/2024 | 04/15/2024 | 04/08/2024 |
|---|---|---|---|---|---|---|
| # Cows Bred | 252 | 260 | 230 | 48 | 64 | 62 |
| # Bred to sexed semen | 21 | 40 | 27 | 8 | 3 | 3 |
| # Bred to Conv semen | 0 | 2 | 0 | 0 | 0 | 0 |
| # Bred to Beef semen | 231 | 218 | 203 | 40 | 61 | 59 |
| # Heifers Bred | 37 | 78 | 83 | 0 | 14 | 13 |
| # Bred to sexed semen | 22 | 49 | 48 | 0 | 6 | 9 |
| # Bred to Conv semen | 14 | 29 | 35 | 0 | 7 | 4 |
| # Bred to Beef semen | 1 | 0 | 0 | 0 | 1 | 0 |
| Cows | | | | | | |
| % Bred to sexed | 8.33 | 15.38 | 11.74 | 16.67 | 4.69 | 4.84 |
| % Bred to Conventional | 0 | 0.77 | 0 | 0 | 0 | 0 |
| % Bred to Beef | 91.67 | 83.85 | 88.26 | 83.33 | 95.31 | 95.16 |
| Heifers | | | | | | |
| % Bred to sexed | 59.46 | 62.82 | 57.83 | 0 | 42.86 | 69.23 |
| % Bred to Conventional | 37.84 | 37.18 | 42.17 | 0 | 50.0 | 30.77 |
| % Bred to Beef | 2.70 | 0 | 0 | 0 | 7.14 | 0 |

*Figure 6. Results Screen for HeiferHub.*

minus semen costs. The user can adjust the numbers and determine which scenario provides the greatest return from selling animals while still meeting required numbers of replacement animals.

## Conclusions

HeiferHub uses the past year's breeding events to determine the percent of animals that were bred to each semen type. However, often producers will adjust their actions from month to month. Therefore, it became valuable to add a summary for the both the recent three months and recent three weeks - showing number of animals bred to each semen type. Figure 7 shows an example of this summary.

Understanding the number of animals bred to each semen type for the past months (or weeks) will provide a more recent perspective of the breeding decisions made. These numbers can be used to adjust the annual percentages on the input parameter screen.

| | 4/2024 | 3/2024 | 2/2024 | 04/22/2024 | 04/15/2024 | 04/08/2024 |
|---|---|---|---|---|---|---|
| # Cows Bred | 252 | 260 | 230 | 48 | 64 | 62 |
| # Bred to sexed semen | 21 | 40 | 27 | 8 | 3 | 3 |
| # Bred to Conv semen | 0 | 2 | 0 | 0 | 0 | 0 |
| # Bred to Beef semen | 231 | 218 | 203 | 40 | 61 | 59 |
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| # Bred to Beef semen | 1 | 0 | 0 | 0 | 1 | 0 |
| Cows | | | | | | |
| % Bred to sexed | 8.33 | 15.38 | 11.74 | 16.67 | 4.69 | 4.84 |
| % Bred to Conventional | 0 | 0.77 | 0 | 0 | 0 | 0 |
| % Bred to Beef | 91.67 | 83.85 | 88.26 | 83.33 | 95.31 | 95.16 |
| Heifers | | | | | | |
| % Bred to sexed | 59.46 | 62.82 | 57.83 | 0 | 42.86 | 69.23 |
| % Bred to Conventional | 37.84 | 37.18 | 42.17 | 0 | 50.0 | 30.77 |
| % Bred to Beef | 2.70 | 0 | 0 | 0 | 7.14 | 0 |

*Figure 7. Breeding History from HeiferHub.*

HeiferHub is an easy-to-use web tool that allows producers to make quick and-well informed breeding decisions to ensure maintenance of replacement needs while also capitalizing on potential revenue from the sale of crossbred calves. HeiferHub can be used by both producers and consultants that have permission to access herd data. HeiferHub can use either DHIA testday data or up-to-the-minute data from herds enrolled on the Dart herd management software and the DRMS on-farm and web synchrony system DartSync.

HeiferHub does not select individual service sires to use in a mating program. Nor does it provide mating recommendations for individual cows. Producers can work with their AI company to match their cows with the appropriate service sire.