

## **Description of AgriTech Analytics Holstein Fertility Summary**

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Achieving pregnancy in today's high-producing dairy cows is a challenge on many farms. Several factors have a large impact on reproductive efficiency, including nutrition, cow comfort, heat abatement, estrus detection, and inseminator proficiency. Therefore, developing a sound reproductive management program should be the first priority. Once this is accomplished, producers may be able to achieve an additional improvement in conception rate by using service sires that have shown superior fertility on other commercial dairies. For this reason, AgriTech Analytics provides service sire fertility rankings to its members.

The analysis was based on 1,781,694 insemination records from 838,860 cows in 484 AgriTech herds in Arizona, California, Colorado, Idaho, Maine, Minnesota, Nebraska, Nevada, New Hampshire, New Mexico, New York, North Carolina, Ohio, Oregon, Pennsylvania, South Dakota, Texas, Utah, Vermont, Washington and Wisconsin. Inseminations that occurred between November 1, 2011 and October 31, 2016 were included in the analysis.

Because the quality and completeness of these data varies between farms, several restrictions were applied to ensure the accuracy of the resulting information. Up to five inseminations per lactation were used for each cow, and each occurred between 35 and 305 days postpartum. A minimum of seven days was required between repeat inseminations, and a valid NAAB code for the service sire was required for all inseminations. Each herd was required to have a minimum of 100 inseminations, each herd-year-month contemporary group was required to have a minimum of 20 inseminations, and data from contemporary groups with an average conception rate less than 10% or greater than 60% were discarded. Insemination records from a particular service sire in a particular herd were discarded if that herd used fewer than 10 units of semen from that bull. In addition, the average conception rate for each bull in a given herd was restricted to a "believable" range of 10% to 60% to avoid potential biases due to inconsistencies in semen usage or selective reporting of results in a particular herd.

Unlike previous bull fertility rankings using data from commercial dairies, this analysis is based on confirmed pregnancies only. Each insemination record was required to have one of three outcomes reported within 75 days: 1) a subsequent breeding, 2) an "open" vet check, or 3) a "pregnant" vet check. Records from cows that were culled less than 75 days after breeding, as well as cows that were bred less than 75 days prior to the most recent herd test, were excluded. The average confirmed pregnancy rate for herds in this analysis was 33.6%. Because veterinary pregnancy check information is used, the resulting sire rankings should be more accurate and stable than rankings based on non-return rates, in which a cow is assumed to be pregnant if no additional AI breedings are reported.

Data from 6,620 Holstein service sires were included in the analysis. The data were analyzed with a "threshold model", and this accounts for the fact that inseminations have an "all-or-nothing" outcome, rather than a continuous (bell-shaped) distribution of scores. Because most AgriTech herds are rather large, it was possible to account for the effects of lactation number, peak milk yield, days in milk, and age of bull (young sire vs. proven sire) on a within-herd basis. For example, differences between herds in the grouping of cows (by age or production level), the energy balance of early vs. late lactation cows, or the pattern of young sire usage could be taken into account.

Results are available for 578 bulls that had a minimum of ten inseminations in each of ten different herds. Non-AI bulls and inactive AI bulls as of the August 2016 CDCB sire summary were excluded from publication. Bulls are grouped into quintiles, such that each bull receives a rating ranging from "five-star" (highest fertility) to "one-star" (lowest fertility).