

The objective of this study was to comprehensively analyze the economics of using beef semen under different reproductive performance, management, and market conditions. We used an improved version of the Premium Beef on Dairy tool from the University of Wisconsin-Madison (available at <http://DairyMGT.info>). A brand-new module for simulating calves and heifers was developed and connected with the existing model. Then, we simulated farms with 35% turnover ratio under 3 reproductive levels (15%, 20%, 30% 21-d pregnancy rate) to generate eligible animals for breeding at different services. Five incremental sexed semen strategies were studied including no sexed semen use to 2 services on adult cows and some combinations with top genetic animals. Beef semen utilization was restricted to the remaining adult cows and used at 5 levels (0%, 25%, 50%, 75%, and 100%). Scenarios of distinct market conditions were determined by changing calf prices and semen costs to analyze income from calves over semen costs (ICOSC). As expected, results showed that the higher beef crossbred calf price or lower the cost beef semen, the more beef semen use and higher ICOSC, but more replacement needed to maintain the herd size. Thus, the optimal semen combinations with positive replacement balance usually coupled with increased sexed semen utilization. Reproduction was still a limiting factor of farm profitability considering higher reproductive farms had higher ICOSC and more positive replacement balance, which enabled them to continue using sexed semen even if expensive. Under current Wisconsin market conditions, a medium reproductive farm could benefit from using a combination of sexed semen for first- and second-service heifers, first-service primiparous, first-service secondiparous and 20% genetically superior adult cows; conventional semen for all other heifers and 25% of other adults; and beef semen for the rest of eligible cows. This will procure enough replacements and \$2,418/mo ICOSC in a 1,000-cow farm. The updated model and the decision support tool provide a comprehensive decision-making opportunity for farms in terms of optimal ICOSC under projected replacement balance.

Key Words: income from calves over semen costs, herd simulation, semen strategy