

Economic comparison of an ear tag automated activity monitor for estrus detection with timed-AI in Holstein heifers

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Why is this important?

The cost of raising replacement heifers is the second largest annual operating expense on dairy farms, primarily due to feed costs. As such, reducing the age at first calving (and days on feed before becoming productive) is essential to improving efficiency. The ideal age at first calving is between 23 and 25 months old, which will reduce rearing costs while optimizing fertility and future milk production. This means that heifers should be bred around 13-14 months old.

Two of the main contributors to reproductive efficiency are estrus detection rate and pregnancy per AI. A recent survey showed that 69% of farms are using visual observation for estrus, 9% are using automated activity monitoring (AAM), 7% using timed-artificial insemination and 9% using a combination of methods. Visual estrus detection has the lowest cost, but can also result in low detection rates if not done well. Timed-AI protocols require strict hormone schedules, which can be onerous for producers, while AAM requires a large up-front investment and may not be viable for all farms economically. However, for those farms with lower estrus detection rates or those interested in reducing labour required for estrus detection, switching to a timed-AI or AAM protocol may be useful.

The objective of this study was to compare the reproductive performance and net economic outcome of a modified 5-day Cosynch timed-AI protocol and an ear tag AAM protocol in Holstein heifers. The researchers

hypothesized that the high estrus detection rate of the AAM would result in improved fertility and reduced hormone costs, resulting in an overall economic benefit of switching from timed-AI to AAM.

What did we do?

The study was conducted on a commercial dairy farm (500 lactating cows) in Alberta from Sept 2019 to Nov 2020. A total of 340 heifers were enrolled in the study once they reached 13.5 months old.

Cycling heifers received either AI based on high activity alert from the ear tag AAM or based on timed-AI. Heifers in the timed-AI group were on a modified Cosynch protocol (PRID on day -8, PRID removal, PG, and GnRH on day -3, with AI 72 hours later). All heifers were given 3 opportunities to become pregnant. Pregnancy was confirmed at 30 and 45 days. A partial budget was used to compare costs and benefits.



Five additional scenarios were compared to the baseline scenario (described above). The first scenario considered only the first AI, removing the second and third. The second scenario considered outsourcing AI to a hired technician rather than using farm staff. The third scenario considered using AAM collars, rather than ear tags. The fourth scenario considered using an individual ear tag AAM for each heifer, as opposed to reusing tags. The fifth scenario considered the pregnancy per AI for the timed-AI treatment as equal to the AAM treatment. An additional scenario considered different herd sizes, from 30 to 400 heifers, as well as the breakeven point at which AAM was favoured over timed-AI.

What did we find?

Overall, there was no difference in pregnancy per AI or days to pregnancy between treatments. However, the timed-AI group had a greater number of AIs compared to the AAM group (1.67 vs. 1.46). The estimated age at first calving was 716.3 days for the timed-AI group and 721 days for the AAM group. There was no difference in pregnancy loss between 30- and 45-days post-AI.

There was an overall net gain of \$11.97 per heifer when switching from timed-AI to AAM. This was due to reduced costs of hormones, semen, and protocol labour for the AAM treatment. The breakeven point for a net gain in switching from timed-AI to AAM was a first AI conception rate of 57.3%, meaning that if the first service conception

rate for timed-AI is 57.3% or lower, there is a net gain to switch to AAM. The breakeven point for a net gain in switching from timed-AI to AAM was 64 heifers, meant that a herd size of 64 heifers or greater could gain from switching to AAM from timed-AI.

What does it mean?

Ultimately, both timed-AI and automated activity monitoring programs yielded good results. As such, producers that are struggling with visual estrus detection could adopt either program. When comparing the two protocols, there was an economic gain when AAM was used, largely due to increased pregnancy per AI. However, producers need to consider their own operation when making a decision to switch, as the use of an AI technician, cost and life expectancy of AAM tags, and herd size will all play a role.

Summary Points

- Both timed-AI and automated activity monitoring systems (using ear tags) yielded good results and may be considered by producers struggling with visual estrus detection.
- An ear tag or collar AAM system resulted in a net economic gain over a timed-AI system.
- Farms with a first service conception rate for timed-AI that is 57.3% or lower and/or smaller herds (less than 64 heifers) may not benefit from a switch to AAM.

Table 1. Comparison between baseline and alternative economic variable scenarios.

	Baseline	Scenarios ¹				
		1 st Service Only	Outsourcing AI	Collar AAM	Retained Ear Tags	Same 1 st Service P/AI
Increased Revenue	3924.96	7499.88	3924.96	3924.96	3924.96	824.98
Increased Costs	5918.25	3886.09	5918.25	5918.25	5918.25	4786.83
Decreased Revenue	2.04	3.14	2.04	2.04	2.04	2.04
Increased Costs	7806.04	7766.14	11832.17	7133.09	11205.63	10004.17
Net Gain or Loss	2035.13	3616.69	(1991.00)	2708.08	(1364.46)	(4394.40)
Net Gain or Loss/heifer	11.97	21.27	(11.71)	15.93	(8.03)	(25.85)

¹The first scenario only considered the first AI; the second considered outsourcing AI to a technician; the third considered using AAM collars instead of ear tags; the fourth considered using one ear tag per heifer; the fifth considered an increased conception rate to the first AI so the timed-AI treatment was equal to the AAM treatment.