REPRODUCTION

Comparative Analysis of Automated Behavior Monitoring Systems versus Visual Observation: Impact on Reproductive Parameters and Farm Profitability in Dairy Heifers

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INTRODUCTION

In recent years, dairy farms have increasingly embraced a range of technological solutions to enhance efficiency and improve the quality of life by delivering insights that assist farmers in making decisions in reproduction, health and nutrition. Among these, Automated Behavior Monitoring Systems (ABMS) have become a popular choice in dairy farming.

OBJECTIVE

The goal was to compare the effects of utilizing an ABMS versus visual observation in heifers on key reproduction parameters, including Conception Rate (CR), Number of Semen Per Pregnancy, and Pregnancy Age.

MATERIALS AND METHODS

The study was conducted on a commercial dairy farm from Turkey with a total 8,000 dairy animals.

For this trial, the breeding heifers were randomly assigned to two groups:

- **Group 1:** Behavior monitoring group (BMG) 91 heifers
- **Group 2:** Control group (CG) 98 heifers

The BMG heifers were wearing a behavior monitoring neck tag (SenseHub™ Monitoring Neck Tag, MSD Animal Health) for helping the farmer to detect the heifers in heat. The system heat alerts were displayed in an ABMS (SenseHub™ Dairy, MSD Animal Health). The CG heifers were without wearing behavior monitoring tags. Both groups of heifers were 13 months old and were housed under identical conditions with the same feeding rations. In the BMG, insemination was solely based on the ABMS alerts, whereas the CG relied on visual observation. The BMG started insemination at 361 days old, while the CG began at 357 days old.

The implementation of Automated Behavior Monitoring Systems has demonstrated the potential to yield reproductive performance outcomes that are comparable to those achieved through visual observation. Additionally, the study observed that cows monitored with the reproduction monitoring system experienced a shorter time to pregnancy. In addition to these reproductive benefits, the study also indicated that the implementation of monitoring systems had a positive impact on the profitability and efficiency of the entire herd.

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RESULTS

- The results showed that the BMG had a higher Conception Rate (CR %) of 51.7% compared to the CG with a CR % of 42.86%. The number of artificial Inseminations per pregnancy was slightly higher in the CG heifers (2.1) compared to the BMG heifers (1.94). Additionally, the pregnancy age of the CG heifers was longer, with an average of 420 days compared to 408 days for the BMG heifers. The CG had in total 16 days later the age for first calving compared to the BMG. This indicates that the CG spent 16 more days being fed as heifers **(Table 1).**
- The financial implications of these results were also investigated. The daily feeding cost for heifers older than 12 months was found to be 53.89 TL ($2.58), while the feeding cost for pregnant heifers for more than 7 months was 61.87 TL ($2.96). The cost of semen was 1,357.85 TL ($65.00) per unit. When extrapolated to the total number of breeding heifers annually (2,114), the study estimated that the total saving per year would be 1,826,348 TL, which is equivalent to approximately $87,426 **(Table 2).**

TABLE 1. Results of key reproduction parameters were compared between two groups: the Behavior Monitoring Group (BMG) consisting of 91 heifers, and the Control Group (CG) consisting of 98 heifers.

Parameters	BMG heifers	CG heifers
Conception Rate %	51.7	42.86
Number of Artificial Inseminations per pregnancy	1.94	2.1
Pregnancy age (days)	408	420

TABLE 2. Financial evaluation of the improvement in reproduction by implementing Automated Behavior Monitoring Systems. Exchange rate Turkish Lira (TL) vs USD ($) is 20.89 TL.

Feeding cost for heifers >12 months	$2.58 (53.89 TL)
Feeding cost for heifers >Pregnant 7 months	$2.96 (61.87 TL)
Semen cost	$65.00 (1,357.85 TL)
Age difference at conception (days)	12
Average difference of # of semen per pregnancy (Units)	0.16
Feed saving per animal	$31 (646,68 TL)
Semen saving per animal	$10.40 (217,25 TL)
Total saving/head	$41.35 (863,93 TL)
Total number of annual breeding heifers	2,114
Total saving/year	$87,426 (1,826,348 TL)

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Abstract number: 1397.