

# Does it Pay to Use an Ultrasound Machine for Early Pregnancy Diagnosis in Dairy Cows?

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Pregnancy diagnosis is regarded as an important and necessary component of a complete dairy herd health program (Olternacu *et al.*, 1990). The main objective of such a comprehensive program is to make sure that healthy productive cows calve at 12-13 month intervals to optimize their life milk production. Seegers and Malher (1996) reported that every open day past 100 days in milk costs between \$2.50 and \$4.00 to dairy producers. Early pregnancy diagnosis can assist dairy-men in managing open cows and improving reproductive performance and economics of their herd (Olternacu *et al.*, 1990).

Uterine palpation per rectum has been used for more than 50 years for pregnancy diagnosis (Olternacu *et al.*, 1990), but the use of ultrasound machines as a diagnostic tool has been used only since the early eighties (Hanzen and Delsaux, 1987). Under farm conditions, ultrasound can be used as early as 21 days postbreeding (Taverne *et al.*, 1985; Pieterse *et al.*, 1990) and is more accurate than transrectal uterine palpation (Filteau and DesCôteaux, 1997). Practitioners would benefit from a diagnostic tool that offers an excellent negative predictive value for pregnancy in order to use prostaglandins on open cows (Cosson, 1996). When using ultrasound, the most frequently reported cut-off to minimize false-negatives is 27 days (Filteau and DesCôteaux, 1997; Szenci *et al.*, 1995). When ultrasound machines were used by experienced practitioners between 27 and 35 days post-breeding, this diagnostic tool resulted in less embryonic losses than early pregnancy diagnosis performed by transrectal uterine palpation (Filteau and DesCôteaux, 1997).

The objective of this study is to evaluate the economic merits of the use of an ultrasound machine (U/S) as a diagnostic tool before 33 and 35 days post-breeding compared to the evaluation of those pregnancies at a later stage during the next scheduled herd health visit in 7, 14 or 30 days.

Two simple models were structured to evaluate the annual impact of this technology in saving days open on diagnosed open cows from 100 cow dairies. The premises that were used in these models were as follows:

- 70% pregnant cows at initial pregnancy examinations, which represents an average of 1.4 pregnancy examinations per cow or 140 pregnancy examinations per 100 cow dairy farm;
- herd health visits done monthly (every 30 days), bi-monthly (every 14 days) or weekly (every 7 days);
- ultrasound pregnancy examinations performed starting at 27 days postbreeding up to 32 days in model 1 or 34 days in model 2;
- it is assumed that ultrasound pregnancy diagnosis accuracy is as good as pregnancy diagnosis done by uterine palpation past 32 days (model 1) or 34 days (model 2);
- it is assumed that ultrasound pregnancy diagnosis does not cause more early embryonic death than pregnancy diagnosis performed by transrectal uterine palpation past 32 and 34 days (Filteau and DesCôteaux, 1997);
- the proportion of cows that can be examined monthly, bi-monthly and weekly by ultrasound are 20%, 42.8% and 85.7% respectively in model 1 and 26.7%, 57.1% and 100% respectively in model 2;
- each day open past 100 days in milk is assumed to cost \$ 4.00 to dairy producers.

For each model, we calculated the break-even cost of ultrasound examinations by dividing “days open ad-

vantage x \$4.00” by the number of ultrasound examinations per year in a 100 cow dairy farm (Tables 1 and 2). Finally, pay-back evaluations were performed to determine the number of 100 cow dairies that would be necessary for a veterinarian to pay back a \$15,000.00 ultrasound machine plus annual additional cost of \$1,600.00 (interest rate, insurance and maintenance) in 2, 3 or 4 years, by doing early pregnancy diagnosis in mature cows. For this calculation, the cost of ultrasound examinations was fixed at approximatively half of the previously calculated break-even ultrasound examination cost.

**Table 1.** Evaluation of the economic merits of the ultrasound machine in 100 cow dairies as a diagnostic tool between 27 and 32 days post breeding compared to the evaluation of those pregnancies at a following herd health visit in 7, 14 or 30 days (Model 1).

Herd Health Visit Interval	7 days	14 days	30 days
Number of ultrasound examinations per year	120	60	28
Number of ultrasound examinations influencing days open (30%)	36	18	8.4
Numbers of days open saved	252 d		
Dollars saved (\$)	\$1,008		
Break-even cost of ultrasound examinations (\$ per open cow)	\$28.00	\$56.00	\$120.00
(\$ per exam)	\$ 8.40	\$16.80	\$ 36.00
<b>Pay-back evaluations:</b>			
Cost of ultrasound examinations	\$ 5.00	\$ 8.00	\$ 15.00
Number of herds <sup>a</sup> to pay back the ultrasound machine in:			
2 years	15	19	22
3 years	11	14	16
4 years	9	11	13

<sup>a</sup> Number of herds that are necessary to pay back a \$15,000.00 ultrasound machine plus annual additional cost of approximatively \$1,600 in interest rate, insurance and maintenance.

Results are presented in Tables 1 and 2. The use of an ultrasound machine as a diagnostic tool for early detection of non pregnant cows gives an economic advantage to dairy producers in all of the evaluated scenarios from both models. The estimated break-even costs of each ultrasound examination were \$8.40, \$16.80 and

**Table 2.** Evaluation of the economic merits of the ultrasound machine in 100 cow dairies as a diagnostic tool between 27 and 34 days post breeding compared to the evaluation of those pregnancies at a following herd health visit in 7, 14 or 30 days (Model 2).

Herd Health Visit Interval	7 days	14 days	30 days
Number of ultrasound examinations per year	140	80	37
Number of ultrasound examinations influencing days open (30%)	42	24	11
Numbers of days open saved	294 d	336 d	330 d
Dollars saved (\$)	\$1,176	\$1,344	\$1,320
Break-even cost of ultrasound examinations (\$ per open cow)	\$28.00	\$56.00	\$120.00
(\$ per exam)	\$ 8.40	\$16.80	\$ 35.68
<b>Pay-back evaluations:</b>			
Cost of ultrasound examinations	\$ 5.00	\$ 8.00	\$ 15.00
Number of herds <sup>a</sup> to pay back the ultrasound machine in:			
2 years	13	15	17
3 years	10	11	12
4 years	8	9	10

<sup>a</sup> Number of herds that are necessary to pay back a \$15 000.00 ultrasound machine plus annual additional cost of approximatively \$1,600 in interest rate, insurance and maintenance.

approximatively \$36.00 when herd health visits are scheduled weekly, bi-monthly and monthly respectively. In most common situations, when herd health visits are scheduled monthly and bi-monthly, experienced dairy practitioners can easily pay-back their investment in three years when charging half of the break-even cost of ultrasound examination while servicing 15 well managed 100 cow dairies. In problem herds, when the proportion of pregnant cows at pregnancy examination decreases under 70%, the use of an ultrasound machine pays even more for both producer and veterinarian. Furthermore, dairy practitioners can make profit from any extra ultrasonographic examination like pregnancy examinations in replacement heifers, cystic ovaries, fetal sexing, teat cisterna and sphincter evaluation, etc. Finally, the ultrasound machine is an added value to the veterinary clinic by improving the diversity and quality of services given to dairy clients.

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## Abstract

### Effect of hoof characteristics on the propensity of cattle to slip

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Bovine hooves were assessed for their linear and volumetric characteristics and ranked in sets of four for hoof volume. An artificial cow was constructed with the hooves set into metal cylinders underneath a platform containing a known weight. The device was connected via a strain gauge to a pulling handle operated by two people, and the horizontal force required to move each set of hooves was determined three times. The coefficient of friction, calculated as the horizontal force divided by the fixed vertical force, was positively correlated with

hoof volume. The same exercise was repeated with the hooves ranked for toe angle, and the hooves with steep toe angles had a lower coefficient of friction than the hooves with shallow toe angles. However, since both hoof volume and toe angle were related to toe length, the relationship between friction and toe angle was believed to derive from the larger size of claws with shallow toe angles. The results indicate that young cattle that have small claws with smooth surfaces and steep toe angles are more likely to slip.