The Spread of Precision Livestock Farming Technology at Dairy Farms in East Hungary

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**A paper from the Proceedings of the
14th International Conference on Precision Agriculture
June 24 – June 27, 2018
Montreal, Quebec, Canada**

Abstract: *During the survey, 25 dairy farms were examined in East Hungary in Hajdú-Bihar (H-B) County between 2017 and 2018 by methodical observation and oral interviews with the farm managers, about the spread of Precision Livestock Farming (PLF) technologies. Among Holstein Friesian dairy farms in the County 60% were questioned, and the representativity was above 47 percent ins each size category. Nine precision farming equipment were examined on the farms: milking robot or robotic carousel milking parlour, cattle management software, RFID based animal identification system, individual daily milk yield recording, cow heat detection – activity measurement system, automatic selection gates, individual milk conductivity – somatic cell count measurement, individual fodder distribution for cows, calf milk feeding automat. The highest spread among PLF technologies was cattle management software with 96%, than RFID identification system and milk yield recording with 36% spread. There were no instance for robotic milking and automatic fodder distribution for cows. Comparing the distribution with farm size, there is a tendency of a higher spread in PLF technologies.*

Introduction

The main component of Precision Livestock Farming (PLF) system is the electric animal identification, which enables the individual measuring, treatment and data recording. This requires modern technical equipment to continuously gather, store and process data to support efficient management decisions. The main advantages of PLF are increased yield due to individual treatments, cost saving, less work hour need and lower possibility to human error in the production (Hostiou et al, 2017). The PLF has an effect on energy saving and animal welfare as well (Drecxmans, 2014).

The dairy farming sector for its competitiveness and productivity needs constant modernization of the buildings machines and technology, PLF is one of the most powerful developments among new and upcoming technologies (Banhazi et al, 2012).

Materials and methods

During the survey, 25 dairy farms were examined in East Hungary in Hajdú-Bihar (H-B) County between 2017 and 2018. Hajdú-Bihar County has the most dairy cow and milk production in Hungary.

Data were collected by methodical observation and oral interviews with the farm managers. The examined questions covered the technical equipment's (including PLF), the milk yield and human resource. The following 9 precision farming equipment were examined on the farms: milking robot or robotic carousel milking parlour, cattle management software, RFID based animal identification system, individual daily milk yield recording, cow heat detection – activity measurement system, automatic selection gates, individual milk conductivity – somatic cell count measurement, automatic fodder distribution for cows, calf milk feeding automat.

The representativity of the survey was examined with the help of the available statistic sources (National Statistic Office – *KSH*; Association of Hungarian Holstein-Friesian Cattle Breeders – *HfTE* and Livestock Performance Testing Ltd. – *ÁT Kft.*). The share of examined farms is indicated in Table 1. The share of the examined farms is calculated between 49 to 70 percent according to the different aspects.

Table 1. Share of examined farms compare to Hajdú-Bihar county by different aspects

Aspect	Data source	H-B county	Examined farms	Share *[%]*
Annual milk production 2016. *[thousand liter]*	KSH, and own data collection	203 053	117 991	58%
Number of performance tested dairy farms, January 2018.	ÁT Kft, and own data collection	51	25	49%
Number of performance tested dairy cows in January 2018.	ÁT Kft, and own data collection	20 875	13 310	64%
Estimated annual milk production in 2017. (number of lactations x lact. average) *[tons]*	HfTE	187 715	131 767	70%

Source: Own editing on the basis of KSH, 2017, HfTE, 2018; ÁT Kft 2018 and own data

The size distribution of dairy farms is shown in Table 2. It highlights that in all size category the representativity of the is above 47%. The accurate farm list data was provided by HfTE, 2018.

Table 1: Distribution of dairy farms by size, according year 2017

Size category [number of standard lactations]	All dairy in Hajdú-Bihar county [pcs]	Examined farms [pcs]	Share [%]
above 1 000	3	2	67%
701 to 1 000	4	2	50%
501 to 700	8	7	88%
401 to 500	5	3	60%
201 to 400	7	4	57%
51 to 200	15	7	47%
Altogether	*42*	*25*	*60%*
under 50	*6*	*-*	*-*

Source: Own editing on the basis of HfTE, 2018

The average milk yield per cow (H-B County: 25,8 litres/day – Hungary 26.5 litres/day) and the average dairy farm size (H-B County: 409 pcs – Hungary 412 pcs) are closely similar to the national average The number of dairy cows in the examined farms have a share of 7.22 percent among the Hungarian total performance tested dairy cows (ÁT Kft, 2018).

The 25 farms were separated to 3 clusters according to the cow number. The Cluster 1 contained farms with cow below 400 (11 farms), Cluster 2 contained farms between 400 and 600 (7 farms), and Cluster 3 contained farms above 600 cows (7 farms).

Results and discussion

Table 3 shows the spread of PLF technology among farms by different farm size.

Table 3: The distribution of PLF technology in examined farms

Precision technology	Cluster 1		Cluster 2		Cluster 3		Total	
Number of farms *(pcs)*	11		7		7		25	
Average size of farms *(cows)*	138		428		805		406	
Share of technology	*[%]*	*[pcs]*	*[%]*	*[pcs]*	*[%]*	*[pcs]*	*[%]*	*[pcs]*
Milking robot or robotic carousel milking parlour	0%	0	0%	0	0%	0	**0%**	**0**
Automatic fodder distribution for cows	0%	0	0%	0	0%	0	**0%**	**0**
Calf milk feeding automat	9%	1	0%	0	0%	0	**4%**	**1**
Cattle management software	91%	10	100%	7	100%	7	**96%**	**24**
RFID based animal identification system	9%	1	57%	4	57%	4	**36%**	**9**
Individual daily milk yield recording	9%	1	57%	4	57%	4	**36%**	**9**
Cow heat detection – activity measurement system	9%	1	57%	4	43%	3	**32%**	**8**
Automatic selection gates	9%	1	43%	3	26%	2	**23%**	**6**
Individual milk conductivity – somatic cell count measurement	0%	0	0%	0	43%	3	**12%**	**3**

There were no farms using robotic milking technology, this is very rare in Hungary (less than 5 farms in the country), mainly because of the relative low labor cost it is barely profitable. However in one of the examined farms, a new stable was built with the option to upgrade with robotic milking in the future, therefore the arrangement and the utilities were constructed accordingly. During the survey individual automatic feeding solutions were found in the

examined farms – this is partly connected to robotic milking because individual automatic feeding is a frequent feature of milking robots, however can be installed separately as well.

Regarding milking technology, some non-Precision Livestock Farming solution in important to increase productivity. Automatic take-off of milking devices was widely spread (92% of examined farms) even it is not, is an important. Crowd gate before milking parlour war used in 9 (36%) farms, at Cluster 2 and 3.

Cattle management system were used at 24 of 25 examined farms (96%). Even a secondary cattle management system is used at multiple farms; in such cases the primary software is used for breeding purposes, while the secondary software belongs to the milking system or the activity measurement unit.

Cow identification and individual milk yield recording have been used at 9 farms, in medium and larger production units (Cluster 2 and 3).

Cow heat detection for activity measurement have been utilised at 8 (32%)farms. The system was completely set up at all of the 8 farms, namely a sufficient amount of activity measurement units has been available for the monitoring of every cow which have not been proven pregnant yet.

Automatic selection gates have been utilised at 6 farms (25%), for the selection of cows leaving the milking parlour with health and reproductive biology reasons. Cows to be released to the treatment room by the selection gate can be indicated within the cattle management system.

Individual milk conductivity measurement for the detection of subclinical mastitis has been applied at 3 farms only among large dairies (Cluster 3).

Calf milk feeding automat were used only in 1 instances among examined farms. The dairies rather favor individual calf cubicles and upgrades their labour productivity and feed quality by purchasing milk taxi for calf feeding. Milk taxi were used at 20% of farms in this survey.

Conclusion and Summary

The highest spread among PLF technologies was cattle management software with 96%, than RFID identification system and milk yield recording with 36% spread. There were no instance for robotic milking and automatic fodder distribution for cows.

Comparing the distribution with farm size, there is a tendency of a higher spread in PLF technologies in Cluster 2 and 3, compared to Cluster 1.

References

1. Állattenyésztési Teljesítményvizsgáló Kft (ÁT Kft).: (2018): Partnertájékoztató Hírlevél, 2018, Volume 1, January ISSN: HU-2063-3491
2. Banhazi T M, Lehr H, Black J L, Crabtree H, Schofield P, Tscharke M, et al. Precision Livestock Farming: An international review of scientific and commercial aspects. Int J Agric & Biol Eng, 2012; 5(3): 1－9.
3. D. Berckmans (2014) Precision livestock farming technologies for welfare management in intensive livestock systems; Rev. sci. tech. Off. int. Epiz., 2014, 33 (1), 189-196
4. HfTE: 2018. Rankings of Holstein -Friesian dairies by standard lactation production 2017.01.01-2017.12.31, http://www.holstein.hu/teb/orsz/megyei_50_2017.pdf, downloaded 20th April .2018.
5. Hostiou N, Fagon J, Chauvat S, Turlot A, Kling F, Boivin X, Clément Allain C (2017) Impact of precision livestock farming on work and humananimal interactions on dairy farms. A review, Biotechnol. Agron. Soc. Environ. 2017 21(4), 268-275
6. KSH: 2017. Cattle Statistics, 1st December (2000–2016) STADAT table 6.4.1.19. http://www.ksh.hu/docs/hun/xstadat/xstadat_eves/i_oma004.html, downloaded 20th April 2018.