Web advisory tools to support dairy production in Slovenian herds

B. Logar and J. Jeretina

Agricultural Institute of Slovenia, Animal Science Department, Hacquetova ulica 17, 1000 Ljubljana, Slovenia
betka.logar@kis.si (Corresponding Author)

Abstract

A good 80,000 or nearly 80% of dairy cows in Slovenia are included in the dairy recording scheme, with an average herd size of 21 dairy cows. Recording data are collected in the central database, which is the main unit of the Cattle Information System. In addition to recording and breeding data processing, a number of other tools to support farm management are included in this system. The aim of this article is to introduce advisory tools and services of the Web portal Cattle (WPC) ? which are available to farmers, professional advisers and other experts ? To help farmers manage their dairy farms. The gate to the farm advisory tools is the 'Farm Identity Card', a tool which provides summary data on the latest dairy recording of the farm. Brief information on the production, lactation and reproduction status of the herd is included, as well as information on the possible digestive disorders and excessive body reserve mobilization, based on the milk fat to protein ratio. Milk urea concentration and somatic cell count (SCC) distribution are presented in graphical form. Each section provides links to in-depth data. For example, by clicking the link for the latest milk production data, we access in-depth information on the recordings of a particular cow. The index of the SCC with values in a range from 1 to 5 was introduced to support animal health and good welfare information concerning the SCC in herds and in a particular cow. In the reproduction section of the portal Cattle, information on inseminations, expected calvings, heats and reproduction results is available. Reproduction reports for the farm can be prepared on the basis of farm management practice. To support herd-level feeding management, the system includes a tool for planning feed rations, which is based on the recording data, as well as data on the nutritional value of feed, feed analyses and feeding knowledge. With its extensive volume of available data and information, easy access and presentation, the WPC is the main advisory tool used by Slovenian breeders to manage their dairy herds.

Keywords: cattle, dairy herd, web advisory tool, Slovenia.

Introduction

Cattle breeding has an important role in animal husbandry branches in Slovenia. In the rather heterogeneous alpine agricultural regions, dairy production is characterised by farming on a limited arable farmland which is often divided into many small parcels. A good 80,000 or nearly 80% of dairy cows are currently included in the dairy recording scheme, with the average herd size of 21 cows per herd (Sadar *et al.*, 2014). In order to effectively process recording data and make it available to farmers and other clients, the Cattle Information System (CIS) based on Oracle's database platform has been introduced (Logar *et al.*, 2005). The CIS supports informational necessities of the cattle recording sector and caters for most information requirements in the cattle breeding scheme. Breeders, experts, veterinarians, advisers and other professionals can access the online central database in accordance with their needs and access rights and utilise user-specific applications. The web portal Cattle (WPC, www.cattle.si) provides applications which

support dairy herd management. The aim of this article is to introduce the WPC as an advisory tool and service for supporting management decisions in Slovenian dairy cattle breeding.

Recording Data Management

The CIS and its WPC. provide support with information for all herds in the recording scheme. Farms included in the recording scheme have the possibility to apply for electronic informing. In that system, a SMS and / or an e-mail message is sent after each processing of the recording data. The message contains summary information for the last milk recording and alerts for cows that exceed the critical value for somatic cell count (SCC) that is 200.000 SCC / ml. All further information, including recording reports, is available on the WPC. After entering the system as a farmer, different views are available and jointly named the Farm Identity Card (see Logar *et al.*, 2005).

The module provides the latest summary data on dairy recording at the farm. In the initial view, the summary data of the last milk recording are presented, i.e. data on milk yield with fat and protein contents, as well as the average SCC of the herd. On the basis of fat and protein contents, fat to protein ratio is calculated and presented in graphical form, which is useful as a tool to manage feeding on the farm. Together with the graphical presentation of milk urea concentration, it is possible to identify possible feeding disorders and nutritional deficiencies.

Lactation and reproduction statuses of the herd are also shown. In the section of feeding management and planning of cow groups, the lactation stage presents useful information. All of these views can be expanded to provide the more detailed views for deeper data inspection. In addition to the information which is instantly available via the 'Farm Identity Card' (see *www.cattle.si* - DEMO), the list of views and modules is disposed.

By selecting a particular service, the farmer can examine a great volume of information, among others a detailed pedigree data of active and culled animals. Several tools to manage and avoid inbreeding rate are available as well. We will present only some of those which are related to the SCC, reproduction and feeding management.

Somatic cells

Somatic cells count in milk is an indicator of cow health status, especially of the health status of mammary gland, the quality of milk and the suitability of farm management. The somatic cells are not problematic as long as their numbers are kept within the normal range. In order to present the issue of the SCC, we use the index of somatic cell count (ISC). The index is used to evaluate the measured SCC with regard to consecutive lactations, the quantity of milk at the recording as well as the lactation stage. With the same SCC, higher ISC has been observed with cows in early lactation, cows with higher milk yield and cows in mid lactation. Since other factors are taken into consideration along the SCC to calculate the ISC, the SCC and ISC are not truly linearly related. In practical terms this means that a cow with the highest SCC in the stable does not necessarily have the highest ISC as well. The ISC is presented with values from 1 to 5, wherein 1 means excellent health status of the mammary glands and 5 means very poor health status of the mammary glands.

The module 'Somatic cells' presents the situation at the last milk recording. On the top is a presentation of the calculated somatic cell count for the bulk tank on the recording day for the period of the last 12 months (Figure 1). When the 200,000 SCC / ml limit is exceeded, the colour of the value turns red. Below (Figure 2), there is a list of cows at the last milk recording, which includes the following data: consecutive lactation, the amount of milk on the recording day, the SCC, the bulk somatic cell count (BSCC), the ISC, the individual cow's contribution of the SCC to the bulk tank in SCC and percentages, the number of

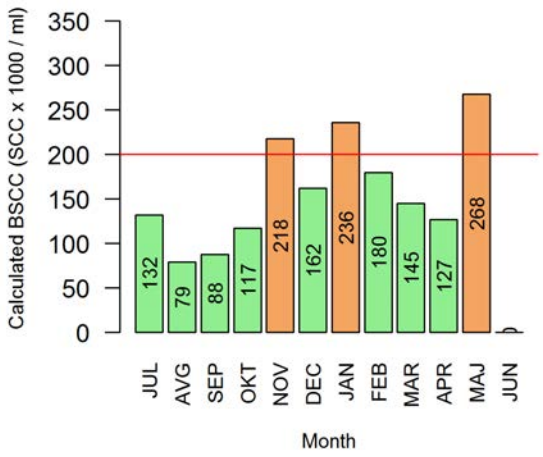


Figure 1. Bulk somatic cell count in the last 12 months.

				Milk	SCC	BSCC	ISC	PSC	Months after	Days after insem.
No.	Cow ID	Name	Lact.	kg	(x 1000)/ml			%	calving	insem.
1	SI 63632107	ANTA	4	29	1642	275	5	56,5	3	
3	SI 63267424	JASNA	6	14,5	927	132	4	16	8	82
7	SI 63825332	HANA	3	20,6	281	88	3	6,9	1	
4	SI 13541990	CULA	5	30,5	124	72	2	4,5	2	
2	SI 14034260	ANUK	1	19,4	150	64	3	3,5	10	66
11	SI 94034255	CENKA	1	14,3	178	56	2	3	13	214

Figure 2. Somatic cell count at the last milk recording per individual cow.

months after calving and the number of days after the last insemination. A review of this data shows the severity of the issue of high SCC within a herd, as well as critical cows with their contributions to the total SCC.

The scatter plot (Figure 3) presents the ISC dynamics. The presentation includes the last two milk recordings which show the transition of cows between individual ISC. The diagram consists of nine fields, wherein the desired fields are marked with green and the undesired with orange colour. The figure shows an example of the transition of a cow with a high index (ISC = 3-5) to the level of the desired index (ISC = 1-2). From a farmer's point of view, it is desirable that most of the dairy cows from the quadrant ISC = 1-2 do not transition at all. The diagram allows us to monitor whether the SCC management within the herd has been successful. If it has been unsuccessful (when compared to the previous milk recording), the cows will remain in the quadrant with high ISC. Simultaneously, we can assess the intensity and number of newly detected potential infections which result in the high ISC.

There is also module that shows the movement of ISC within the herd for the period of the last 12 months (Figure 4). The data is presented in the table, with the ISC figures shown on the coloured background. The colour of the indexes (e.g. orange and red colour represent poor indexes) help us to recognise the problematic cows, how many cows within the herd have been infected, as well as repetition and the pattern of repetition of increased SCC. Cows in which increased SCC (over 200,000) has been detected in the last three recordings are marked as problematic cows with a red triangle and an exclamation mark. The module also provides information on when the SCC has first increased above the value of 200,000, in which lactation and period after calving has this occurred and how

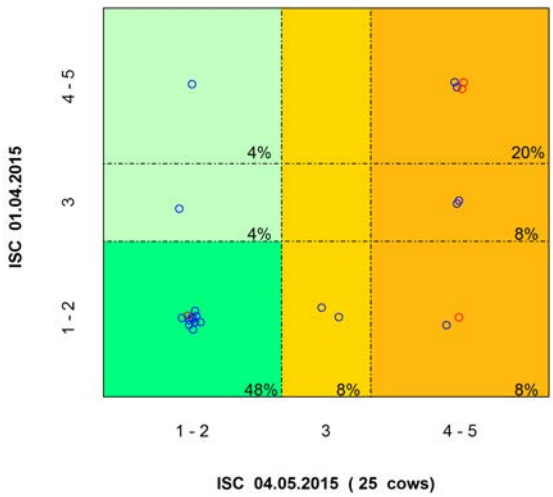


Figure 3. Index of somatic cell count (ISC) in the last two milk recordings.

		Date				SCI in last 12 months (month.year)												Curent TD			Inseminations		
No.	Cow ID	Dry-off	L	MD	L_P*	06.14	07.14	08.14	09.14	10.14	11.14	12.14	01.15	02.15	03.15	04.15	05.15	SCC	Milk	BSCC%	last	days	all
1.	SI 63632107	01.02.15	4	78	1 - 2x M1	1	1	1	2	1	1	1	1			3	5	1461	30,5	41,9	14.05.15	20	
2.	SI 14034260		1	292					1	2	1	2	1	2	2	2	2	70	20,7	1,4	27.03.15	68	9
3.	SI 63267424	31.08.14	6	238	1 - 7x M12	3	2	2			5	4	4	5	5	5	5	717	20,1	13,5	11.03.15	84	3
4.	SI 13541990	27.02.15	5	46	3 - 5x M12	2	2	2	2	3	3	2	1	3			3	193	30,1	5,5			
5.	SI 23632118	30.05.14	3	342	1 - 5x M2		2	1	1	1	1	1	2	1	1	1	1	104	16,5	1,6	11.11.14	204	2
6.	SI 53632115	01.07.13	2	661	2 - 5x M2	2	2	2	2	2	2	3	5	2	1	1	1	185	10,5	1,8	07.10.14	239	8
7.	SI 63825332	29.03.15	3	31	1 - 3x M2	2	3	2	3	4	2	4	3	3	3			876	28,1	23,1			

Figure 4. Index of somatic cell count (ISC) in the period of the last 12 months.

frequent has it been. Additional data includes the quantity of collected milk at the last test day (TD), the SCC and contribution of an individual cow to the bulk SCC, as well as data on the last insemination, days open and the number of inseminations after the last calving.

Reproduction

The 'Reproduction Calendar' module (Figure 5) enables monitoring and planning of the main reproduction events within the herd in the form of a calendar. Farmers can create calendars for the desired time period. Based on the previously entered reproduction events from various data sources, the system calculates and plans future activities (heat, insemination, checking cows for pregnancy) for the envisaged period. Entering data has been simplified - if the data is not yet in the database, the breeder enters only the date of the event in the corresponding field, except in the case of checking cows for pregnancy when the result of the check-up has to be entered as well.

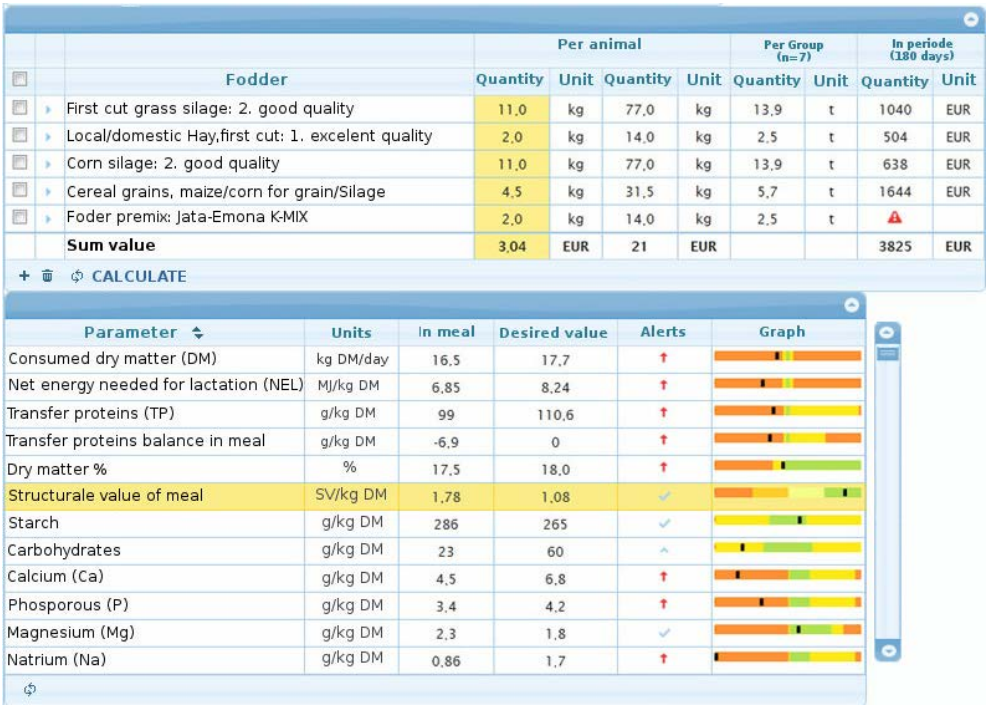
Feed Ration Planning

Dairy nutrition is essentially as simple as understanding the nutrient requirements of dairy cows at various stages of lactation and combining various feed ingredients to meet those needs in a cost-effective manner. However, many dynamic factors influence both nutrient requirements and nutrient availability from feeds. In addition, successful feeding

No.	Animal ID	Name	Calving date	Days after calving	No. of services	Last insem.	Insem. date	Pregnancy check	Remark	Heat check
1	SI62958484	STELA	17.05.15	8	0		27.05 - 01.06			
2	SI03199044	GINA	07.09.14	260	3	02.03.15	25.05 - 28.05	25.05		
3	SI53199049	RIŽA	13.09.14	254	2	03.03.15	25.05 - 29.05	25.05 - 26.05		
4	SI53390051	SAVA	03.10.14	234	1	08.12.14	25.05 - 28.05			
5	SI93390057	SONJA	09.11.14	197	0		27.05 - 01.06			
22	SI54043336	CIKA	25.04.15	30	0		26.05 - 01.06			
23	SI54230101				1	18.04.15	27.05 - 01.06			
24	SI44230102				1	17.04.15	26.05 - 01.06			

Save Back Insert Print

Figure 5. Reproduction calendar module.



Fodder	Per animal Quantity	Unit	Quantity	Unit	Per Group (n=7) Quantity	Unit	In periode (180 days) Quantity	Unit
First cut grass silage: 2. good quality	11,0	kg	77,0	kg	13,9	t	1040	EUR
Local/domestic Hay,first cut: 1. excelent quality	2,0	kg	14,0	kg	2,5	t	504	EUR
Corn silage: 2. good quality	11,0	kg	77,0	kg	13,9	t	638	EUR
Cereal grains, maize/corn for grain/Silage	4,5	kg	31,5	kg	5,7	t	1644	EUR
Foder premix: Jata-Emona K-MIX	2,0	kg	14,0	kg	2,5	t		
Sum value	3,04	EUR	21	EUR			3825	EUR

CALCULATE

Parameter	Units	In meal	Desired value	Alerts	Graph
Consumed dry matter (DM)	kg DM/day	16,5	17,7		
Net energy needed for lactation (NEL)	MJ/kg DM	6,85	8,24		
Transfer proteins (TP)	g/kg DM	99	110,6		
Transfer proteins balance in meal	g/kg DM	-6,9	0		
Dry matter %	%	17,5	18,0		
Structurale value of meal	SV/kg DM	1,78	1,08		
Starch	g/kg DM	286	265		
Carbohydrates	g/kg DM	23	60		
Calcium (Ca)	g/kg DM	4,5	6,8		
Phosporous (P)	g/kg DM	3,4	4,2		
Magnesium (Mg)	g/kg DM	2,3	1,8		
Natrium (Na)	g/kg DM	0,86	1,7		

Figure 6. Feed ration calculation tool.

of dairy cows requires accurate mixing and delivery of rations so that the diet fed is the same as the diet formulated. The tool named 'KOKRA' is aimed at calculating feed rations for different cow production groups within the herd (Figure 6). When feed rations are calculated, it is important to take into consideration the physiological characteristics of ruminant animals, as well as knowledge on their nutritional needs. The software enables integration of different sources of data, i.e. feed and analytical data of agrochemical laboratories, data on the composition of concentrates per individual producer and milk recording data. When it comes to feed ration planning, you have to firstly define the feed basis which is available at the farm, as well as the production price of feed. Secondly, choose and name the groups for which you want to calculate feed rations (Figure 6 - Category). The groups have been pre-set with regard to their lactation stages (1-3 months, 4-6 months, more than 6 months after calving, all cows) and the dry period (cows in the last 4-6 weeks and cows 3 weeks before calving). Having chosen the appropriate group,

the software provides a selection of cows (Figure 6 - List of animals). This can be changed according to your needs until you have created the desired list of cows within an individual group.

The segment "Information about the animals and feeding" (Figure 6) contains the average data for a selected group of animals. You can make certain changes to the proposed data. For example, you can change the target milk yield in standard lactation with regard to the predicted standard lactation curve for milk yield per individual group, the average mass of cows, the frequency of feedstuffs intake, as well as certain other parameters on which the feed ration calculations depends. In the segment below, you enter feedingstuffs and forage ("Fodder") with the envisaged daily feed rations per animal. When entering these quantities, you will get an approximate idea of the needed quantities of individual feedingstuffs, as well as information on the price of feed rations. Below the composition of nutritional value parameters is calculated in a timely manner. A graphical presentation shows how close the feed ration is to the optimal value. Until the parameter is within the appropriate range, you will get professional advice by clicking the "Alerts" button. Feed rations can be corrected by adding and reducing the amount of feedingstuffs until you get a balanced feed ration. Users can create several feed rations and save them in their archive for possible later use.

Conclusion

All farms in the Slovenian recording scheme have access to the WPC which offers a wide range of tools. In this article, we have presented only some of the tools which are closely related to management support. With its extensive volume of available data and information, easy access and presentation, the WPC is the main advisory tool for supporting dairy management in Slovenian herds. More and more farms regularly monitor recording results and other data. For example, in January 2015 a quarter of the farms with nearly 40% of Slovenian cows in the recording scheme visited WPC. This provides new challenges for future development of the WPC.

List of references

Logar B., Podgorsek P., Jeretina J., Ivanovic B., Perpar T. 2005. Online-available milk-recording data for efficient support of farm management. In: Knowledge transfer in cattle husbandry. Publication-European Association for Animal Production. Wageningen, Wageningen Academic Publishers Wageningen, The Netherlands, p. 227-230

Sadar M., Jenko J., Jeretina J., Logar B., Perpar T., Podgoršek P. 2014. Rezultati kontrole mleka in mesa 2013 (Results of animal recording), Slovenia 2013. Agricultural Institute of Slovenia, Ljubljana, Slovenia 89 pp.