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REDUCTION OF MILK RECORDS PER LACTATION IN SHEEP

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Abstract: Milk recording on sheep in Slovenia was started in the beginning of nineties. It is done in one month interval. Seasonal recording in flock starts when the first animals are weaned twenty-eight days. The recording in flock is continuing to the end of lactation of last animal, approximately nine mounts. The method is accurate but expensive. Lactation yields of milk, fat, proteins and lactose, calculated from reduced number of milk records were compared with officially estimated milk yields. The reductions were: records in first thee (3M), first four (4M), first five (5M) and first six (6M) months of lactation and two reductions on two records in six months. In first case the recording starts within first month after weaning (3U) and in second case in second month after weaning (3P). Yields are mostly overestimated. In some cases are overestimations yields very high. The correlations for milk yield were between 0.883 and 0,915, for fat yield between 0.784 and 0.831, for proteins yield 0.822 and 0.866, and for lactose yield between 0.835 and 0.873. The lowest correlations were found in 3M, then in 3U and 3P followed by 4M, 5M and 6M. The gain from 5M to 6M is not very impressive. I some cases will led simple reduction of milk records per lactation to very incorrect results. Reduced number of milk records demands more sophisticated estimation of milk and milk ingredients yields per lactation.

Key words: sheep, milk recording, reduced number of records, simulation

Introduction

Data recording is an important and expensive part of selection of farm animals. Collection of milk production data, i.e. milk recording of is expensive. Different methods for milk recording are used. The A4 method measures 24 hours milk yield and composition in time interval of 28 to 34 days done by official recorder *(International agreement, 2009)*. The method is too expensive for sheep and goat milk recording because of low productivity per animal. The AT or alternate method is done in the same time interval alternating once in the morning

and next time at evening by official recorder *(International agreement, 2009)*. The AT method was widely studied by many authors *(Othomane et al., 2006, 2007; Macciotta et al., 2005; Basdagianni et al., 2005; Gonzalo et al., 2002)*. The accuracy of the method is lower, but the effect on rankig of animals is minimal. The method was also tested in Slovenia *(Drobnič et al., 2000.* It is used since year 2002. The AT method is still expensive and often not very practical. On the summer alpine pasture are both methods (A4 and AT) still to expensive and unfeasible. *Astruc and Barillet (2005)* proposed some methods for less expensive milk recording in small ruminants: recording of milk yield in first years of selection without recording of milk composition, analysis of milk components (fat, proteins) only in the middle of lactation and sampling of milk in only of part of animals in flock.

The aim of this study was to find out, if the reduced number of AT milk recordings per lactation will influence the estimated production of milk and milk ingredients per lactation and how much will change the rank of animals.

Materials and Methods

The data, included in this study originate from regular milk recording of Bovec sheep since year 1994. Before year 2002 were data recorded according to A4 and then according to AT method. The first record in lactation is done to day 30 after weaning. The latter records are done in regular intervals between 28 to 34 days after last measurement so long, that all animals in flock are dry. The quantity of milk, milked per lactation is calculated for animals with at least three regular records with following formula:

$$milk = \frac{\left(I_0 M_1 + I_1 \frac{M_1 + M_2}{2} + \ldots + I_n M_n\right)}{1000} [kg]$$

Where I_0 is the interval between weaning and the first data recording, I_1 between first and second data recording and I_n interval between last (n) and n-1 recording. The M_1 is milk quantity in grams per day for first record and M_n is the daily milk quantity for last record. The quantities of proteins, fat and lactose, produced per lactation after weaning were calculated within the same time intervals as the milk quantity with the same, but modified formula.

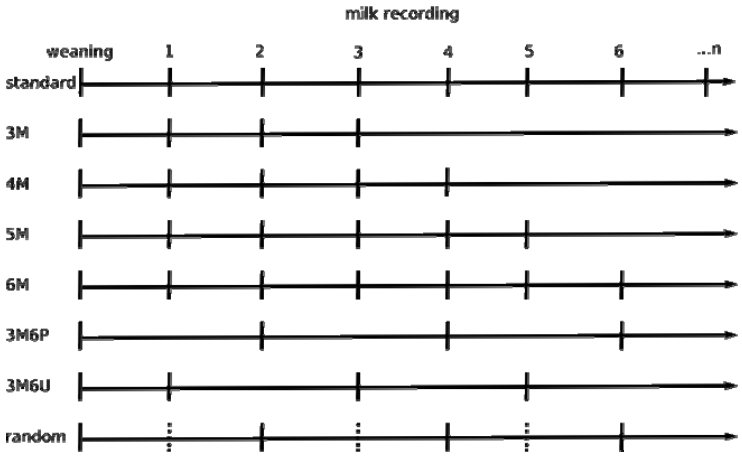
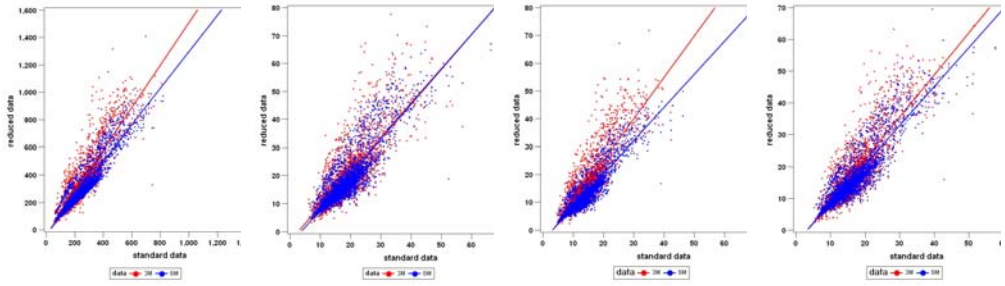


Figure 1. Milk recordings, included in standard data set and in simulation of reduced data sets

The estimated quantities milk and milk ingredients from ordinary data set were compared with quantities, estimated reduced data sets. Reduced data sets were composed from different combinations of available measurements and are presented in the Figure 1. The five random data sets were composed from half of even (1, 3, 5) and half of odd (2, 4, 6) measurements with randomly chosen animals. Beside averages and standard errors were estimated Pearson product-moment correlation and Spearman's rank. The estimations were done with SAS/BASIC procedure Means and SAS/STAT procedure CORR.

Results and Discussion

The results of data evaluation are presented in the Table 1. Estimated quantities of milk and milk ingredients according to standard method on axis X two reduced number records (3M and 6M) on y axis are presented on the Figure 1.



A B C D

Figure 2. Estimated quantity of milk (A), fat (B), proteins (C) and lactose (D) according to standard method (x axis) and reduced records: 3M (y axis, red), 6M ((y axis, blue)

The quantity of milk, estimated according to standard method was 240 ± 107 kg. The value was the lowest estimated value among all estimated quantities of milk. The milk quantity estimated from first three milk records (3M) overestimated milk quantity for forty percent and from six measurements (6M) for nineteen percent. The estimations from first four and first five records lie between 3M and 6M estimations. Three measurements in two months intervals are overestimating average quantity of milk for seventeen (3N6P) or twenty three percent/3N6U). Random sets are overestimating average milkiness for approximately twenty percent. An unproportional increase of variability was also observed. Standard deviation increased for fifty to seventy percent. The quantities of fat and proteins milked in lactation were estimated much more exactly. The overestimation lay between 0 and six percent. The standard deviations from reduced data sets were much higher then from standard data sets- approximately for fifty percent. The quantity of lactose produced per lactation was an exception. Only 3M and 4M reduced data sets overestimated the quantity of produced lactose. All other reduction caused the underestimation of produced lactose. The estimated variability was, with exception of 3M and 4M reductions, less influenced as in other cases.

Both correlation shows different pattern as average values. In case of Pearson's correlations coefficient, the 6M method showed the best results and the 3M method the worst. Spearman's correlations are higher in case 3M and 4M reductions as in case of larger time intervals (3N6P, 3N6U, random samples). The differences between both extremes can be easily seen on Figure 1. The dispersion of 3M measurements is much larger as the dispersion of 6M.

All correlations are relatively high and the differences between extremes are not very large. The 6M correlation between standard estimation of produced milk and 6M estimation is 0.925 and between standard estimation and 3M estimation 0.889 (difference 0.036). The other correlations between standard estimations and 6M are 0.907 for lactose, 0.896 for proteins and 0.869 for fat and corresponding differences to lower correlations are 0.048 for lactose, 0.037 for proteins and 0.064 for fat.

Although are correlations between estimated quantities of milk, fat, proteins and lactose with standard data sets and reduced data sets quite high, are reduced data sets only restricted applicable. Some estimations from reduced data sets highly overestimate produced quantities very strongly. Descendants of such parents will not give appropriate productions results. Such estimations will also incorrectly increase breeding values of its relatives.

Table 1. Estimated produced quantities of milk, fat, proteins and lactose in lactation (Mean±SD) according to standard and reduced number of measurements and Pearson's an Spearman's rank correlations coefficients between quantities of milk and milk components, estimated from standard and reduced number of milk records

	milk	fat	proteins	lactose
average				
standard	240±107	18.32±6.61	16.22±6.15	13.75±5.30
3M	333±186	19.43±10.02	17.39±9.44	15.84±9.14
4M	309±183	18.88±10.22	16.54±9.50	14.30±8.53
5M	296±161	18.69±9.75	16.28±8.50	13.44±7.30
6M	286±154	18.50±9.45	16.11±8.38	12.86±6.93
3N6P	281±160	18.84±10.02	16.28±8.82	12.70±7.31
3N6U	295±160	19.03±10.01	16.52±8.50	13.21±7.20
random 1	288±159	18.88±9.92	16.40±8.63	12.97±7.24
random 2	289±161	18.97±10.10	16.42±8.72	12.98±7.32
random 3	288±159	18.91±9.96	16.38±8.62	12.94±7.23
random 4	289±162	18.91±10.05	16.43±8.77	12.98±7.33
random 5	287±159	18.92±10.06	16.35±8.67	12.92±7.27
Pearson correlation				
3M	0.889	0.805	0.859	0.859
4M	0.890	0.841	0.868	0.874
5M	0.917	0.858	0.888	0.900
6M	0.925	0.869	0.896	0.907
3N6P	0.901	0.840	0.872	0.870
3N6U	0.912	0.829	0.874	0.885
random 1	0.906	0.834	0.874	0.878
random 2	0.907	0.836	0.871	0.877
random 3	0.907	0.831	0.871	0.877
random 4	0.909	0.843	0.878	0.879
random 5	0.908	0.832	0.870	0.878
random average	0.907	0.835	0.873	0.878
Spearman correlation				
3M	0.884	0.802	0.839	0.849
4M	0.893	0.836	0.850	0.861
5M	0.900	0.835	0.856	0.872
6M	0.914	0.845	0.866	0.878
3N6P	0.879	0.802	0.829	0.832
3N6U	0.888	0.794	0.839	0.857
random 1	0.880	0.800	0.836	0.843
random 2	0.883	0.797	0.834	0.846
random 3	0.885	0.800	0.836	0.847
random 4	0.884	0.802	0.839	0.845
random 5	0.879	0.793	0.828	0.837
random average	0.882	0.798	0.835	0.843

Conclusion

The milk recording in dairy sheep is comparing to milk recording in dairy cow relatively expensive because of productivity per animal. Reducing of number of data records number without loss of information is therefore the aim of every breeding program. This study shows that the reduction of records lead to overestimation of average milk and milk ingredients produced per lactation. Person's and Spearman's correlations are pretty high in all cases, but in some cases reduced number of data records lead to overestimation produced quantities of milk and milk ingredients per lactation. Because of highly increased variability and relatively low correlations with standard method ise simple reduction of data records per lactation is not recommendable method.

Redukcija podataka mlečnosti po laktaciji kod ovaca

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Rezime

Zbog troškova prikupljanja podataka redukcija broja podataka o mlečnosti po laktaciji, bez preteranih gubitaka informacija, je tražena od svih selekcijskih organizaciija. Selekcija mlečnih ovaca niske produktivnosti je veoma skupa po jedinici proizvedenog mleka.. Zbog toga je AT metoda u širokoj upotrebi umesto klasične A4 metode. Obe metode se zasnivaju na evidenciji proizvodnje mleka i komponenata mleka u regularnim mesečnim intervalima.

Cilj ovih istraživanja je da se pronađe korelacija između količine mleka i sastava mleka proizvedenog u periodu laktacije po standardnoj metodi koje se baziraju na smanjenom broju podataka. Rezultati su formirani na sledeći način: 3M (prva tri podatka o mleku), 4M (prva četiri podatka o mleku), 5M (prvih pet podataka o mleku), 6M (prvih šest podataka o mleku), 3N6P (postojeći podaci jedan, tri, pet), 3N6U (postojeći rezultati dva, četiri, šest) i prvih pet grupa podataka formirano je tako što je za merenje, polovina životinja slučajno birana iz grupe 3N6P, a polovina iz grupe 3N6U. Procena količine mleka i sastav mleka, produkcija po laktaciji rađena je sa redukovanim brojem podataka. Više podataka generalno povećava tačnost procene. Korelacije, Pirsonove i Spermanove korelacije ranga su prilično visoke – između 0,794 i 0,925. Neke individualne procene iz smanjenog broja podataka visoko su procenili proizvedenu količinu mleka, masti, proteina i laktoze po laktaciji. Visoka procena produktivnosti po životinji može da utiče na ocenu sopstvenih odgajivačkih vrednosti i odgajivačkih vrednosti srodnika. Zbog toga, smanjenje podataka u evidenciji po laktaciji nije

preporučljiva mera. Pre nego što se smanji broj podataka po laktaciji u evidenciji, mora biti pronađena neka složenija metoda za procenu produkcije i sastava mleka.

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