Coping With Unusual Lactation Records in the Light of the 2001 Foot and Mouth Scare in Ireland.

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Introduction

The outbreak of Foot and Mouth Disease (FMD) in the UK in February 2001 prompted the Irish Department of Agriculture, Food and Rural Development (DAFRD) to put in place stringent movement restrictions. These were aimed at preventing the spread of the disease to and within the Republic of Ireland. These restrictions led to the indefinite suspension of official milk recording in all herds. The uncertainty as to how soon milk recording will resume led to worries about what impact this was going to have on the accuracy of projected 305-day yields for cows that will not be milk recorded during the crisis.

Since December 1999, The Irish Cattle Breeding Federation (ICBF) calculates 305-day yield for all lactations with at least one test by the method of interpolation with standard lactation curves generally referred to as the standard lactation curve method (SLAC). This method utilises information from the previous lactation yield (for later parities), the last test day yield and a standard lactation curve to predict daily yields at intervals of 20 days for the missing period of a standard 305-day lactation. In Ireland, the standard curves have been derived for 2,160 contemporary group of cows depending on herd level of production, calving season , calving age and parity and separately for milk, fat and protein yields (Olori and Galesloot, 1999). Features of this method include the ability to make back predictions where the first available test occurred late in the lactation as well as make forward projections from the last available test records.

The accuracy of 305-day yields predicted by back projection by this method has not been tested in the same way as forward projections has been tested (Olori and Galesloot, 1999). This is because partial lactations to be projected usually have all tests from the beginning of lactation up to a given lactation stage. The restrictions imposed due to the FMD however, will result in unusual lactation patterns some of which will require accurate back prediction from the first test record taken after the crisis. Figure 1 shows examples of unusual lactations that could result from the absence of milk recording in a given period during the year.

The objective of this study was to test the accuracy of the SLAC method in calculating 305-day yields from unusual lactations especially those requiring accurate back projection because test day yields were not recorded until much later in lactation.

Materials and Method

Test day records were obtained from milk recording organisation in Ireland. Realise 305-day yields (RY) was calculated for all cows using all available test day records. Subsequently a test data comprising records of cows calving for the first time between January and May 2000 was extracted from the full data set. In order to mimic the effect of the FMD restrictions on milk recording, The first test data was created by deleting all test day records taken in February, March and April, 2000. This data contained records of cows calving between January and May, but with the first available test in May, 2000 or later. 305-day protein yield was calculated for all record involving back prediction based on the first available test day record.

A second test data was created by deleting all test day records taken between February and April (inclusive) as well as all tests taken after the month of August, 2000. This heavy censoring at the beginning and end of lactation was carried out to mimic the situation whereby, 305-day yields were calculated for records in progress soon after the lifting of the foot and mouth restrictions. Cows in this data set had a maximum of 5 tests per cow and required both back and forward predictions for the calculation of 305-day yields. 305-day protein yields were predicted from

lactations with no records in the early stages of lactation (PRT1) from test data 1. Equivalent values were also predicted from test data 2 comprising lactations with no test day records in the early and late stages of lactation (PRT2). The error of prediction was investigated by calculating the residual yields (RY-PRT(i), i=1-2). Analysis of variance was conducted to determine the effect of calving month and number of available test day records on the accuracy of predicted yields. Residuals from both predicted yields were subsequently plotted against the realised yield to determine the extent of bias.

Results

The standard 305-day lactation yield could not be predicted for about 18 cows because no test day records were available after the censoring carried out on both test data sets. Table 1 shows the mean (and standard deviation) of 305-day protein yield calculated from the normal and censored lactation records for the remaining cows. The correlation of realised 305-day yield with the equivalent yield calculated from the censored records were 0.97 for lactation censored in early stages only (PRT_1) and 0.91 for lactations censored in both early and late stages (PRT_2). The correlation between PRT_1 and PRT_2 was 0.95. These indicate that the SLAC method was able to calculate 305-day yields from the unusual lactations by making forward and backward predictions with a high level of accuracy. The accuracy improved as more tests became available towards the end of lactation.

Accuracy of prediction was significantly ($P<0.01$) affected by the month of calving (length of the missing period) and the number of available test day records after censoring. This shows that it is important for recording to continue till the end of lactation when restrictions were lifted. Table 2 shows the mean and standard deviation of the residuals by the month of calving. While the number of tests available affected how much real information was used to make the predictions, the calving month affected the lactation stage for which prediction was made. Both factors and there interaction had independent effect of the accuracy of predicted yields.

The residuals showed a slight positive trend for 305-day yields predicted from lactations with no tests in the early and late stages of lactation (PRT2). Correlation between the residual and realised 305-day yield was positive (0.55) across all months Figure 2 shows the association between the unadjusted residuals (RY-PRT2) and realised 305-day yields for cows calving in the month of February.

Conclusion

The SLAC method was able to predict missing test day yields by backward prediction with the same level of accuracy as forward predictions. Therefore, test day records obtained at the end the restrictions imposed due to the Foot and mouth disease, will be useful in calculating the lactations yields for cows that calved shortly before or during the restrictions and were not recorded. Lactations in progress soon after the crisis can be accurately projected but the level of accuracy will increase as lactation progressed and more tests become available.

The results presented here are for first lactation cows calving shortly before or during restrictions. This represents the worst scenario possible in terms of lactation projection. The SLAC method utilises information from previous lactation records if available and would therefore make predictions with a higher level of accuracy for later parities.

Reference

Olori, V. E. & Galesloot, P. 1999. Projection of partial lactation records and calculation of 305-day yields in the Republic of Ireland. *Interbull Bulletin 22,* 149-154.

Table 1. Means and standard deviation of 305-day Protein yields from complete and unusual lactation records.

Trait	Mean	Standard deviation	Correlation with realised
All records			
PRT_all	181	33	
PRT_1	178	31	0.97
PRT_2	178	28	0.91

PRT_all 305-day protein yield calculated from all available test day records
PRT_1 305-day protein yields calculated from records censored in the beginning
PRT_2 305-day protein yields calculated from records censored in the beginning and end of lactation

Table 2. Residual means and standard deviation by month of calving

	Back prediction only (PRT1)		Back and forward prediction (PRT2)	
Month of calving	Mean	SD	Mean	SD
Jan	5.78	12.1	6.23	14.6
Feb	2.83	8.9	3.13	13.3
Mar	4.49	6.77	3.0	13.5
April	-0.44	4.1	-1.58	14.4

Figure 1. Different patterns of lactations records that could result from the restriction imposed on milk recording due to the current FMD crisis at the of lactation.

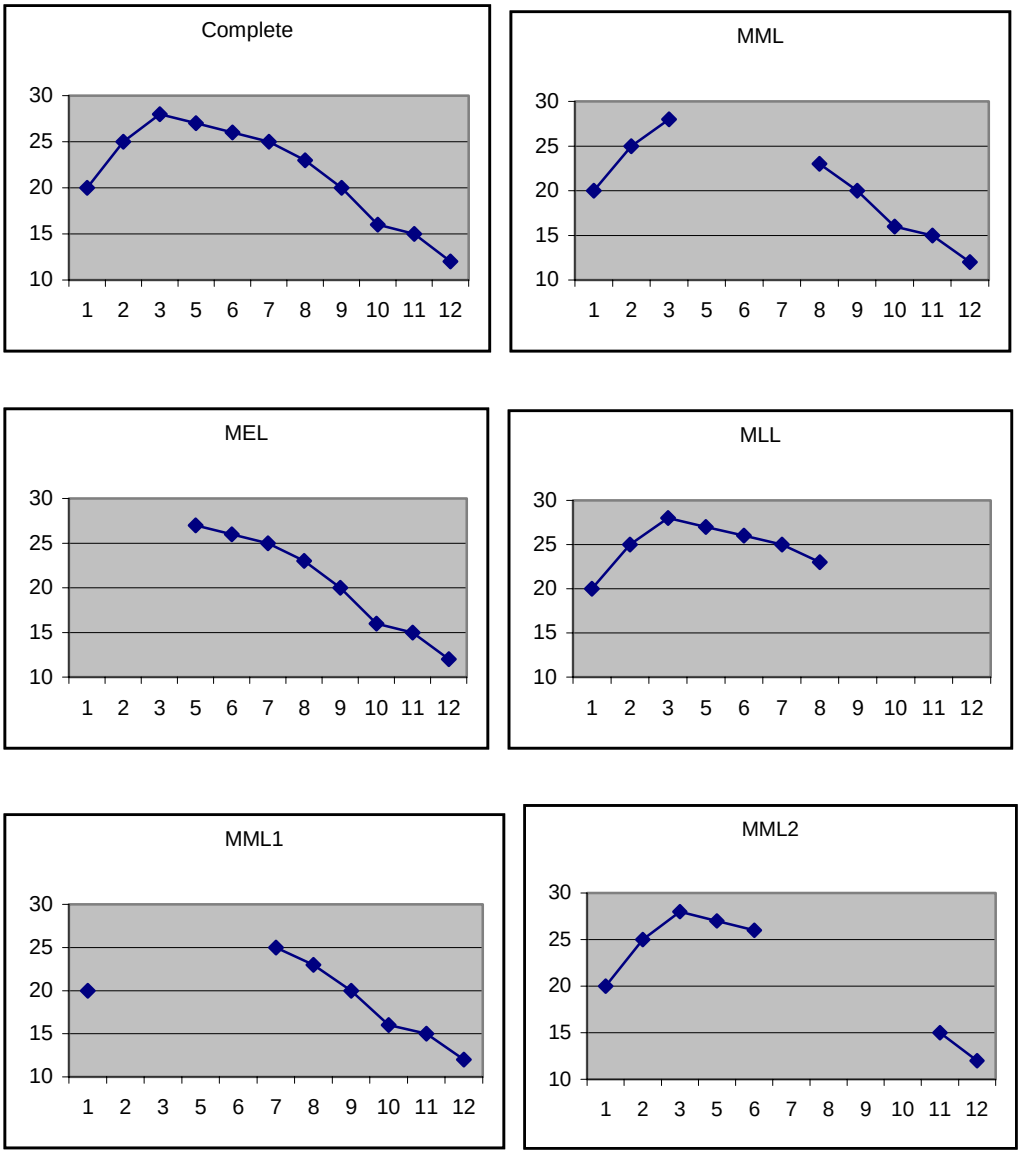

Figure 2. Association between residual protein yield predicted lactations with no tests in early and late stages of lactation by realised yield.