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Predicting the Processing Results of Sale Lots. Part 3: Performance of the TEAM Equations for CVH and Romaine.

By

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SUMMARY

The accuracy and precision of predicting CVH and Romaine for single sale lots was assessed using the TEAM-2 and recommended TEAM-3 equations. For TEAM-2 and TEAM-3, the accuracy of predicting CVH was –1.0% and –0.4% respectively, while the 95% confidence limit was ±0.6% for both equations. For Romaine, the accuracy of prediction was 0.8% and 0.1% respectively, with a 95% confidence limit of ±0.3% for both equations. Overall, the TEAM-3 equations performed slightly better than the TEAM-2 equations.

Most wool types were well predicted for CVH and Romaine, with only a few exceptions. For CVH, consistent significant differences were noted for the Control Pieces, Variable Length Pieces, High MFC and Low CVSS sale lots. These differences ranged in value from 1.0%, for Variable Length Pieces predicted using TEAM-3, to –5.4% for Low CVSS sale lots predicted using TEAM-2.

For Romaine, consistent significant differences were noted for the Variable Length Pieces, Variable Length Pieces with Locks, High MFC and Weak Fleece sale lots. These differences ranged in value from -1.1%, for Weak Fleece sale lots predicted using TEAM-2, to 5.0% for Variable Length Pieces with Locks predicted using TEAM-2.

The inclusion of additional parameters was assessed for their potential to improve the prediction accuracy of the TEAM-3 components. No additional parameters have been recommended for inclusion in the TEAM-3 equations.

This paper supports the recommendation to adopt the TEAM-3 equations for the prediction of CVH and Romaine for single sale lots.

The ability to predict CVH and Romaine at the sale lot level will assist buyers to more accurately assess the value of lots offered for sale. In addition, this translates into lower risk levels in blend construction thus improving the benefits of staple measured Australian wool to users of such wool.

INTRODUCTION

Revised prediction equations for CVH and Romaine were proposed in the TEAM-3 final report (2004). The inter-relationships between Hauteur, CVH and Romaine were reported by Marler et al (2004), and empirical evidence indicates that the commercial use of comb settings influence the short fibre content and/or variation of fibre length in the top. The relationship described in Marler et al (2004) shows that, for tops produced commercially, a high CVH in a top is associated with a low Romaine, and vice versa.

As implied above, the level of Romaine is expected to be directly influenced by the amount of short fibre excluded from the top, which in turn affects the economic returns of the top. Commercial pressures both from clients and topmakers will contribute to this relationship.

This paper investigates the prediction of CVH and Romaine using TEAM-2 and the recommended TEAM-3 equations, on 21 different wool types processed as single sale lots in a small scale processing line in a research facility. The effect of including potential additional parameters in these predictions was also examined by comparing the prediction precision of sale lots. Since no commercial pressure to maintain a top yield or produce a low CVH was exerted on the Non-fleece Wool Processing Trial sale lots, the effect of the additional parameters will be more related to differences in greasy wool characteristics than variations in comb settings.

METHODOLOGY

The methodology reported is almost identical to that reported in Parts 1 and 2 of this series; it is repeated here for the reader's convenience.

Three hundred and eleven (311) sale-lot display samples were sampled in compliance with IWTO-38-91 and tested at AWTA Ltd, and subsequently processed at the CSIRO, Textile and Fibre Technology Mini-mill (Smith et al, 1982). The display samples were selected from commercial sale-lots and were a minimum greasy wool weight of 4kg.

SELECTION OF SALE-LOTS

Wool types were selected to cover a full range of fleece and non-fleece types. The control wool types were of similar MFD to the selected wool types and were representative of standard sale lines, for example, Fleece or Pieces lines. The selection and measurement of the sale-lots has previously been reported (Fish et al, 2003).

MEASUREMENT OF RAW WOOL PROPERTIES

All but three of the sale-lots were purchased and assigned to the trial based on their Certified presale results. Sale lots were sampled in accordance with the IWTO regulations (Core Test Regulation, 2.2, 1994; IWTO-38) and tested in accordance with IWTO Test Methods (Test Methods IWTO-19, 12, 7 and 30).

In order to collect the data for the new parameters of Decrimped Staple Length, Ratio and CVSS, the sale lots were re-measured on two ATLAS machines using modified software (Semmel, 2003), with twice the usual number of staples being measured, but still in compliance with IWTO-30-98. A data extraction macro was developed to translate the raw ATLAS output to parameter values suitable for analysis.

PROCESSING OF SALE-LOTS

Sale-lots were processed into top at the CSIRO Mini-mill in Geelong (Smith et al, 1982). The integrity of each sale-lot was maintained throughout the top-making process. Changes were not made to the machine settings during the processing of the sale lots because there was no commercial requirement to balance Noil/Top yields, or Hauteur/CVHauteur, as may have been the case if some of these lots were being processed to meet specific commercial conditions.

Tops were measured for Hauteur, and CVH in accordance with IWTO-17-85. Noil was collected, and Romaine was calculated.

DATA ANALYSIS

The regressions reported in this paper are standard multiple linear regression (MLR), as performed using S-Plus (Insightful Corp, 2002). Additional variables have been added to the TEAM-3 variables for CVH and Romaine.

RESULTS

CVH PREDICTION USING THE TEAM-2 AND TEAM-3 FORMULAE

The TEAM-2 and TEAM-3 CVH prediction equations were applied to the dataset. The equations applied were:

TEAM-2 $CVH = 0.12L - 0.41S - 0.35D + 0.20M^* + 49.3 + MA1,$ (1)

TEAM-3 $CVH = 0.30L - 0.37S - 0.88D + 0.17M + 0.38CVL + 35.6 + MA2,$ (2)

where MA1 and MA2 were the appropriate Mill Correction factors calculated using the Control Fleece component, as calculated in Part 1 of this series.

Tables 1 and 2 compare the Residual or (A-P) CVH values (Actual CVH – Predicted TEAM CVH) by wool type, for the 285 sale lots using TEAM-2 and TEAM-3 equations, respectively. These results are also presented in Figures 1 and 2.

Table 1: The Mean Residual (A-P for TEAM-2), SD and Confidence Interval of the Residual CVH for the wool types under investigation.

Wool Category	No of Lots	Mean CVH (%)	Mean (TEAM-2) Residual (%)	Signif.	SD Residual (%)	95% Confidence Interval ±(%)
All Sale Lots	285	45.2	-1.0	**	5.3	0.6
Control Pieces	22	49.0	2.1	**	2.9	1.2
Control Bellies	17	47.8	-1.3	ns	3.9	1.8
Stretchy Bellies	23	44.0	-4.1	**	6.5	2.7
Variable Length Pieces	18	46.7	1.5	*	2.7	1.2
Variable Length Pieces with Locks	14	50.4	1.0	ns	4.6	2.4
Control Fleece	33	46.5	0.0	ns	5.4	1.8
Cotted Fleece	4	53.6	4.1	ns	3.9	3.8
Short and Strong	14	37.4	-0.6	ns	4.1	2.1
Long and Strong	7	37.9	-3.3	ns	4.1	3.0
High SS, High Midbreak %	8	40.9	-3.8	ns	5.7	3.9
High MFC	15	39.8	-4.4	*	5.8	2.9
Low MFC	16	45.9	-0.8	ns	6.3	3.1
SRS®-type	6	41.9	0.9	ns	8.8	7.0
Elite-type	6	37.6	-3.4	ns	3.6	2.9
Superfine Fleece	11	49.9	-1.1	ns	5.5	3.3
Fine Fleece	11	48.0	0.6	ns	5.8	3.4
High CVD	13	45.3	-1.2	ns	4.9	2.7
Low CVD	13	40.6	-1.3	ns	3.6	2.0
Lambs	12	40.0	-0.9	ns	4.8	2.7
Low CVSS	7	40.6	-5.4	**	3.3	2.5
Weak Fleece	15	51.6	-2.5	ns	6.0	3.0

ns= not significant, *, ** and *** indicate significance at the 95%, 99% and 99.9% levels respectively.

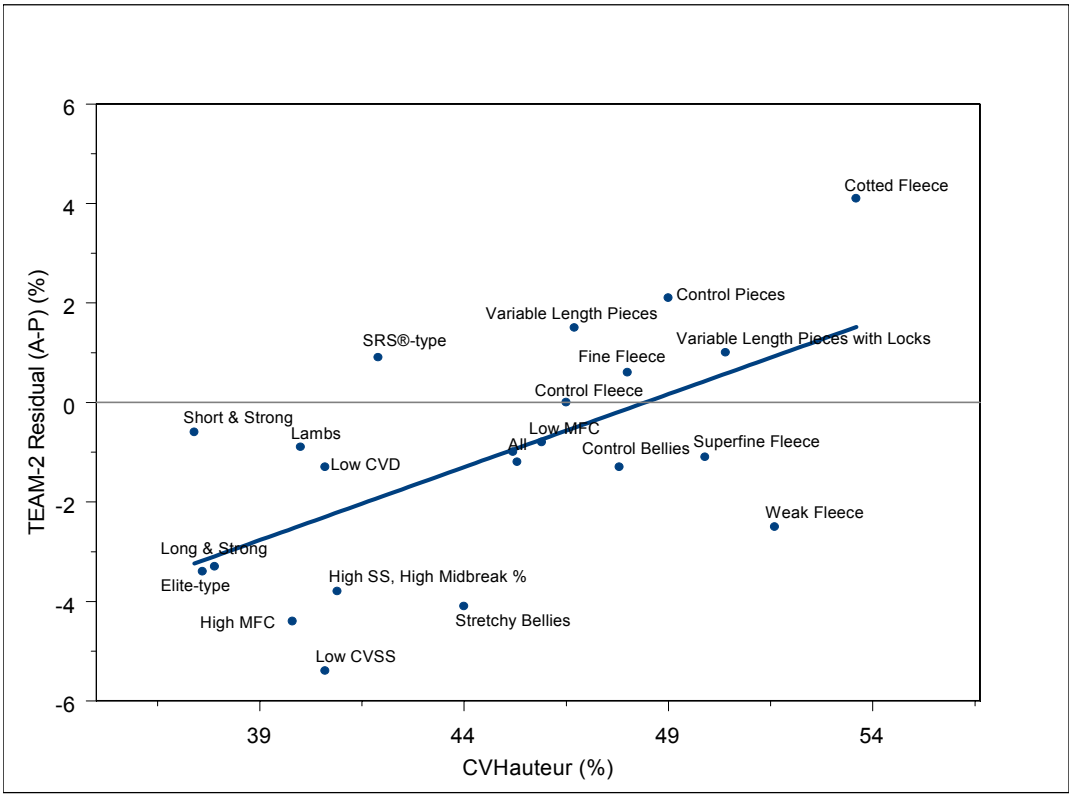

Figure 1: The Mean Residual (A-P for TEAM-2) for CVH for the wool types under investigation.

Actual CVH was, on average, 1% lower than predicted by the TEAM-2 equation and well predicted (-0.4% difference, not significant) by the TEAM-3 equation. The following six wool types had significant differences between predicted and the actual CVH; Control Pieces, Stretchy Bellies, Variable Length Pieces, High MFC, Short & Strong Fleece, and Low CVSS sale lots.

The Control Pieces and Variable Length Pieces had higher CVH values than predicted, by 2.1% and 1.5% respectively for TEAM-2, and 1.7% and 1.0% respectively for TEAM-3. In direct contrast, the Variable Length Pieces with Locks were well predicted using either the TEAM-2 or TEAM-3 equations.

The High MFC, Low CVSS, Stretchy Bellies (TEAM-2 only) and Short & Strong (TEAM-3 only) had higher CVH values than predicted by 4.4%, 5.4% and 4.1% respectively for TEAM-2, and 3.1%, 3.7% and 3.4% respectively for TEAM-3. The lower CVH for the Low CVSS may be associated with the lower variability of SS for these lots. However, it is unclear why the High MFC, Stretchy Bellies, and Short & Strong had lower than predicted values of CVH. The result for Short & Strong is the opposite of the Long and Strong, however the difference was not statistically significant in the case of the Long and Strong perhaps because there were only seven (7) sale lots of this type included in the dataset.

Table 2: The Mean Residual (TEAM-3), SD and Confidence Interval of the Residual CVH for the wool types under investigation.

Wool Category	No of Lots	Mean CVH (%)	Mean (TEAM-3) Residual (%)	Signif.	SD Residual (%)	95% Confidence Interval ±(%)
All Sale Lots	285	45.2	-0.4	ns	5.2	0.6
Control Pieces	22	49.0	1.7	*	3.3	1.4
Control Bellies	17	47.8	-1.0	ns	3.8	1.8
Stretchy Bellies	23	44.0	-2.9	ns	6.4	2.6
Variable Length Pieces	18	46.7	1.0	*	2.0	0.9
Variable Length Pieces with Locks	14	50.4	-1.1	ns	4.6	2.4
Control Fleece	33	46.5	0.0	ns	5.0	1.7
Cotted Fleece	4	53.6	2.8	ns	5.8	5.7
Short and Strong	14	37.4	3.4	*	4.8	2.5
Long and Strong	7	37.9	-3.3	ns	4.0	2.9
High SS, High Midbreak %	8	40.9	-1.7	ns	5.9	4.1
High MFC	15	39.8	-3.1	*	5.0	2.5
Low MFC	16	45.9	-0.5	ns	5.0	2.5
SRS®-type	6	41.9	1.4	ns	9.2	7.4
Elite-type	6	37.6	-3.7	ns	3.6	2.9
Superfine Fleece	11	49.9	-1.5	ns	5.8	3.4
Fine Fleece	11	48.0	1.1	ns	6.2	3.6
High CVD	13	45.3	-0.2	ns	5.4	2.9
Low CVD	13	40.6	-0.5	ns	3.7	2.0
Lambs	12	40.0	2.3	ns	4.9	2.8
Low CVSS	7	40.6	-3.7	**	2.3	1.7
Weak Fleece	15	51.6	-1.6	ns	7.0	3.5

ns= not significant, *, ** and *** indicate significance at the 95%, 99% and 99.9% levels respectively.

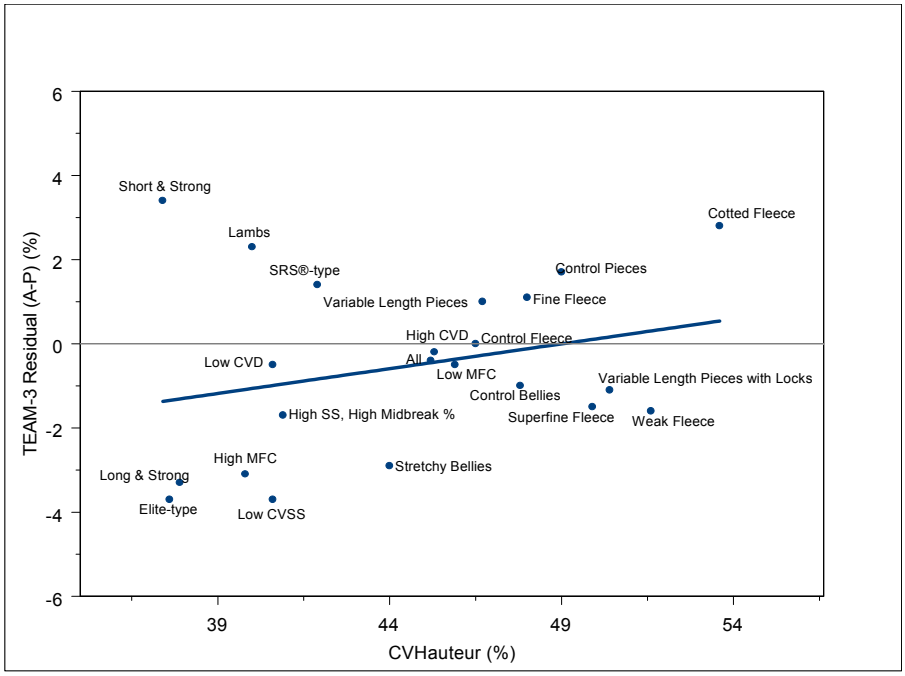

Figure 2: The Mean Residual (A-P for TEAM-3) for CVH for the wool types under investigation.

CVH PREDICTION INCLUDING ADDITIONAL PARAMETERS

Five (5) parameters were assessed for their potential to improve the prediction of CVH. These parameters were Vegetable Matter Base (V), Mean Fibre Curvature (MFC), CVSS, Decrimped Staple Length (DSL) and Decrimped Staple Length Ratio (Ratio). Ratio is defined in Fish et al (2004b), and is the ratio of Decrimped Staple Length to Staple Length (see Table 3).

Of the five (5) parameters assessed for their potential to improve the prediction of CVH, three (3) were found to provide no statistically significant improvement. MFC and Ratio were found to offer only a marginal improvement in the prediction of CVH. An F-test was performed to compare the variance between the TEAM-3 components model and the TEAM-3 components model including MFC as an additional parameter. The F-value was 1.054, indicating there was no significant difference between the two models.

Table 3: Coefficients for the regression models using the TEAM-3 components, plus additional variations of the TEAM-3 formula to predict the CVH of the Sale lots.

Model	L	S	D	M	CVL	V	MFC	Ratio	DSL	CVSS	SE	R^2
TEAM-3#	0.30	-0.37	-0.88	0.17	0.38						2.58	68%
TEAM-3	0.21	-0.35	-0.44	0.12	0.33						4.99	58%
(+ V)	0.21	-0.36	-0.43	0.12	0.34	*-0.04*					5.00	58%
(+ MFC)	0.19	-0.37	-0.90	0.12	0.29		-0.12				4.86	61%
(+ Ratio)	0.18	-0.39	-0.57	0.13	0.35			-22.08			4.92	59%
(+ DSL)	0.18	-0.35	-0.44	0.12	0.31				*0.03*		5.03	57%
(+ CVSS)	0.21	-0.33	-0.47	0.12	0.30					*0.04*	5.02	58%

The TEAM-3 results as reported in the TEAM-3 Final Report, supplied for comparison with sale lot values.
Coefficients that are underlined and in italics are non-significant.

Initial results indicate that MFC was slightly more beneficial to the prediction of CVH (R^2 of 61% compared with 58% for TEAM-3 components), however further investigation showed that a small group of HFC sale lots were exerting an overly large influence on the dataset. These sale lots were a combination of some High MFC and some Stretchy Bellies sale lots. When this small group of sale lots was removed, there was no relationship between MFC and CVH. This result was consistent with the findings of TEAM-3.

The Non-fleece Processing Trial sale lots had a Standard Error of 4.99 using the TEAM-3 components whereas a Standard Error of 2.58 was reported for TEAM-3. To compare the two one must recall that individual TEAM-3 consignments typically comprised of approximately 40 sale lots. If one assumes the variance will reduce in direct proportion to the number of lots that are combined the Standard Error of 4.99 would reduce to a Standard Error of 0.8. The lower value than TEAM-3 would indicate both good processing control throughout the trial and the absence of any between-mill variation.

ROMAINE PREDICTION USING THE TEAM-2 AND TEAM-3 FORMULAE

The TEAM-2 and TEAM-3 Romaine prediction equations were applied to the data set (Equations 3 and 4), including a MA factor based on the difference between the initial Romaine and the Control Fleece, as per the CVH MA previously described.

TEAM-2 Romaine = -0.11L – 0.14S – 0.35D + 0.94V + 27.7 + MA3, (3)

TEAM-3 Romaine = -0.13L – 0.18S – 0.63D + 0.78V + 38.6 + MA4. (4)

Tables 4 and 5 (also Figures 3 and 4) show the Romaine results for sale lots by wool type. On average, Romaine was under-predicted by TEAM-2 (0.8%), but well predicted by TEAM-3 (0.1%, but not significant). The range in Romaine values were 6.1% for both TEAM-2 and TEAM-3, but because the average Romaine for TEAM-3 was not significant, this suggests that TEAM-3 is a better predictor of Romaine than TEAM-2.

Of the twenty-one (21) wool types under investigation, only six (6) were found to perform significantly different to the TEAM-2 predicted outcome. These were Stretchy Bellies, Variable Length Pieces,

Variable Length Pieces with Locks, High MFC, Low CVSS and Weak Fleece sale lots. Similarly, eight (8) of the twenty-one (21) wool types performed significantly different to the TEAM-3 predicted outcome, these were Control Bellies, Variable Length Pieces, Variable Length Pieces with Locks, Long & Strong fleece, High MFC, Elite-type, High CVD and Weak Fleece sale lots.

It was previously reported (Fish et al, 2004a) that the TEAM-2 Hauteur prediction equation could predict the Hauteur of Variable Length Pieces and Variable Length Pieces with Locks reasonably well. The Romaine of Variable Length Pieces sale lots was higher than predicted by TEAM-2 and TEAM-3 by 2.0% and 1.3% respectively, and the Romaine of Variable Length Pieces with Locks sale lots was higher than predicted by TEAM-2 and TEAM-3 by 5.0% and 3.7% respectively.

It is hypothesised that the under prediction of Romaine for these wool types is due to the presence of very short, in some cases non-staple, fibrous material that is removed during processing. The non-staple material is not measured as part of the Standard ATLAS test and consequently the prediction of Hauteur is not effected by its presence. To improve the prediction of Romaine for these wool types would require the development of a test procedure to quantify the amount of short non-staple material present in a display sample.

Table 4: The Mean Residual (TEAM-2), SD and Confidence Interval of the Residual Romaine for the wool types under investigation.

Wool Category	No Lots	Mean Romaine (%)	Mean (TEAM-2) Residual (%)	Signif.	SD Residual (%)	95% Confidence Interval ±(%)
All Sale Lots	281	9.5	0.8	***	2.9	0.3
Control Pieces	22	12.3	0.5	ns	3.5	1.4
Control Bellies	16	12.2	-1.1	ns	2.6	1.3
Stretchy Bellies	23	13.7	1.3	*	2.8	1.1
Variable Length Pieces	18	12.7	2.0	*	3.0	1.4
Variable Length Pieces with Locks	14	16.3	5.0	***	3.7	1.9
Control Fleece	33	5.2	0.0	ns	1.7	0.6
Cotted Fleece	4	8.6	-1.1	ns	1.4	1.4
Short and Strong	13	7.3	0.3	ns	2.6	1.4
Long and Strong	7	3.4	0.9	ns	1.2	0.9
High SS, High Midbreak %	8	4.6	0.0	ns	0.7	0.5
High MFC	15	10.8	3.0	**	3.1	1.6
Low MFC	15	7.1	0.7	ns	4.3	2.2
SRS®-type	6	6.7	0.3	ns	3.0	2.4
Elite-type	6	6.7	0.2	ns	1.0	0.8
Superfine Fleece	11	11.1	1.7	ns	2.6	1.5
Fine Fleece	11	8.6	1.1	ns	2.2	1.3
High CVD	13	7.8	-0.4	ns	1.9	1.1
Low CVD	12	5.3	0.1	ns	2.1	1.2
Lambs	12	9.8	0.0	ns	2.5	1.4
Low CVSS	7	8.4	1.4	**	1.0	0.7
Weak Fleece	15	7.8	-1.1	**	1.6	0.8

ns= not significant, *, ** and *** indicate significance at the 95%, 99% and 99.9% levels respectively.

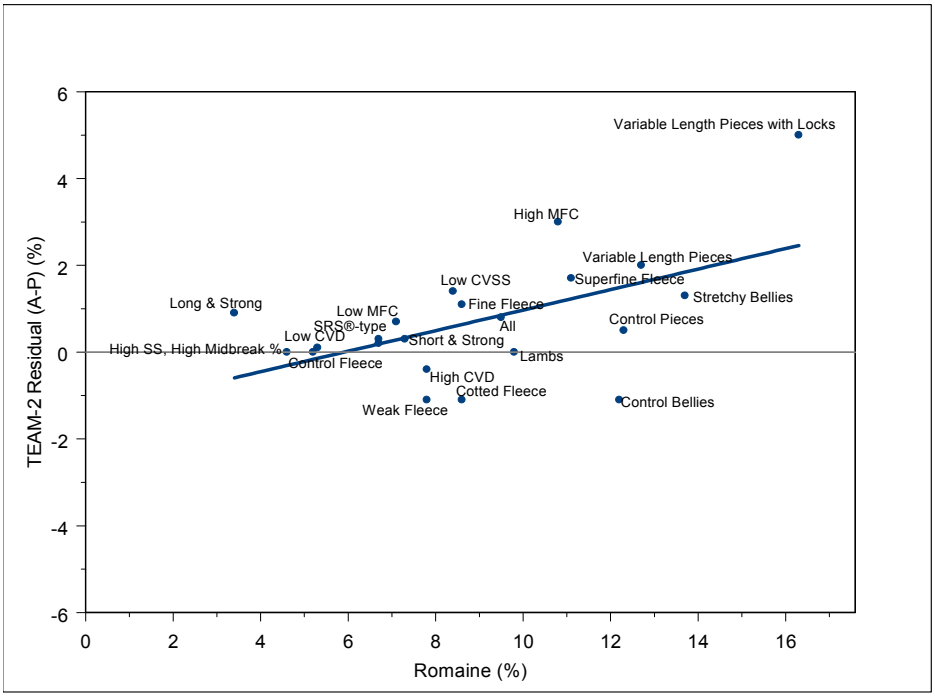

Figure 3: The Mean Residual (A-P for TEAM-2) for Romaine for the wool types under investigation.

Stretchy Bellies produced more Romaine than predicted by TEAM-2 (1.3%) but only 0.1% higher for TEAM-3, whereas Control Bellies produced less Romaine than predicted, -1.1% for TEAM-2 and –1.4% for TEAM-3. These results are consistent and indicate that TEAM-23 is a better predictor of Romaine than TEAM-2.

Less Romaine than predicted by TEAM-2 and TEAM-3 was produced by the Weak Fleece sale lots (-1.1% and -2.4% respectively). This result suggests that Weak Fleece does not necessarily result in a higher level of Romaine than already accounted for by their low SS, and that there may be an interaction between the SL, SS and %Midbreaks that would contribute to less Romaine than predicted. More Romaine than predicted was produced by the High MFC sale lots (3.0% and 1.8% respectively), possibly due to an increased level of fibre-to-fibre interaction. This is consistent with earlier studies undertaken by CSIRO and accounts for the common understanding amongst some research workers.

More Romaine than predicted by TEAM-2 and TEAM-3 was produced by the Low CVSS sale lots (1.4% for TEAM-2 and 0.4% for TEAM-3) and Long & Strong sale lots (0.9% for TEAM-2 and 1.5% for TEAM-3). Elite-type and High CVD sale lots produced less Romaine than predicted by TEAM-3 (1.0% and 1.5% respectively). Proponents of Elite-type sale lots would have expected less Romaine than predicted due to the uniformity of fibres within the sale lot. These results indicate that a high level of uniformity amongst fibre lengths and less fibre entanglement have a potential impact on the amount of Romaine produced.

Table 5: The Mean Residual (TEAM-3), SD and Confidence Interval of the Residual Romaine for the wool types under investigation.

Wool Category	No of Lots	Mean Romaine (%)	Mean (TEAM-3) Residual (%)	Signif.	SD Residual (%)	95% Confidence Interval ±(%)
All Sale Lots	281	9.5	0.1	ns	2.7	0.3
Control Pieces	22	12.3	0.1	ns	2.7	1.1
Control Bellies	16	12.2	-1.4	*	2.4	1.2
Stretchy Bellies	23	13.7	0.1	ns	2.8	1.1
Variable Length Pieces	18	12.7	1.3	*	2.5	1.1
Variable Length Pieces with Locks	14	16.3	3.7	**	3.5	1.8
Control Fleece	33	5.2	0.0	ns	1.8	0.6
Cotted Fleece	4	8.6	-1.2	ns	1.0	1.0
Short and Strong	13	7.3	0.2	ns	2.0	1.1
Long and Strong	7	3.4	1.5	*	1.1	0.8
High SS, High Midbreak %	8	4.6	0.3	ns	0.9	0.6
High MFC	15	10.8	1.8	*	3.0	1.5
Low MFC	15	7.1	0.4	ns	4.4	2.3
SRS®-type	6	6.7	-0.9	ns	3.2	2.6
Elite-type	6	6.7	-1.0	*	0.9	0.7
Superfine Fleece	11	11.1	-0.2	ns	2.5	1.5
Fine Fleece	11	8.6	0.1	ns	2.2	1.3
High CVD	13	7.8	-1.5	*	1.8	1.0
Low CVD	12	5.3	0.2	ns	2.2	1.2
Lambs	12	9.8	-0.8	ns	2.0	1.1
Low CVSS	7	8.4	0.4	ns	0.9	0.7
Weak Fleece	15	7.8	-2.4	***	1.4	0.7

ns= not significant, *, ** and *** indicate significance at the 95%, 99% and 99.9% levels respectively.

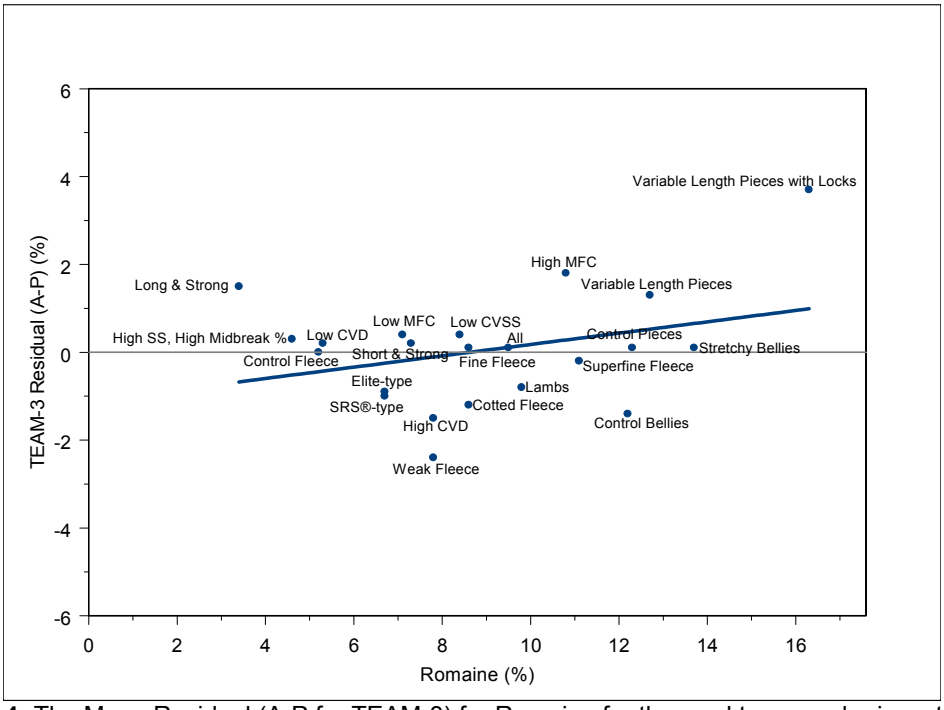

Figure 4: The Mean Residual (A-P for TEAM-3) for Romaine for the wool types under investigation.

PREDICTION OF ROMAINE USING ADDITIONAL PARAMETERS

Six (6) additional parameters were added to the TEAM-3 Romaine components in order to determine which, if any, could be used to increase the accuracy of prediction of Romaine (Table 6). Three of the six parameters were found to be non-significant when used in the regression with the TEAM-3 Romaine components.

Table 6: Coefficients for the regression models using the TEAM-3 components, plus additional variations of the TEAM-3 formula to predict the CVH of the Sale lots.

Model	L	S	D	V	M	CVL	MFC	CVSS	Ratio	DSL	SE	R^2
TEAM-3#	-0.13	-0.18	-0.63	0.78							1.31	77%
TEAM-3	-0.13	-0.13	-0.73	0.65							2.62	66%
(+ M)	-0.13	-0.13	-0.73	0.65	*0.004*						2.63	66%
(+ CVL)	-0.11	-0.11	-0.76	0.56		0.17					2.55	68%
(+ MFC)	-0.12	-0.13	-0.52	0.66			0.05				2.57	67%
(+ CVSS)	-0.12	-0.11	-0.77	0.63				*0.03*			2.62	66%
(+ Ratio)	-0.12	-0.12	-0.66	0.60					11.08		2.58	67%
(+ DSL)	-0.18	-0.12	-0.74	0.64						*0.05*	2.62	66%

The TEAM-3 results as reported in the TEAM-3 Final Report.
Coefficients that are underlined and in italics are non-significant.

The largest improvement in the SE was achieved when CVL was included in the regression with the TEAM-3 parameters. Including CVL improved the SE for Romaine by 0.07, with an F-value of 1.056, which was not statistically significant. This result is consistent with the findings of TEAM-3 (TEAM-3, 2004).

The Non-fleece Processing Trial sale lots had a Standard Error of 2.62 using the TEAM-3 components whereas a Standard Error of 1.31 was reported for TEAM-3. Using the same technique that was used for CVH the Romaine Standard Error of 2.62 would reduce to a Standard Error of 0.4. Once again indicating there was both good processing control throughout the trial and the absence of any between-mill variation.

CONCLUSION

The 285 sale lots were accurately predicted for CVH and Romaine using the TEAM-2 and TEAM-3 equations. TEAM-3 was found to be a slightly better predictor of both CVH and Romaine than TEAM-2. The introduction of additional parameters into the regressions offered no improvement in the prediction of either CVH or Romaine.

Sale Lots of Variable Length Pieces with Locks were found to produce more Romaine than predicted by either the TEAM-2 or TEAM-3 Romaine prediction equations. This is expected due to the larger amount of fibrous, non-staple material included in these sale lots (Couchman, 1992). While this has no impact on the prediction of Hauteur by TEAM-2 or TEAM-3 (Fish et al., 2004a), it does limit the ability to predict the Romaine for these wool types.

This paper supports the conclusions of the TEAM-3 final report, and indicates that the prediction equations devised in the TEAM-3 trial are applicable to the prediction of single sale lots.

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