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Evaluating homogeneity of TMR in dependence on feed mixing times and different loads of a TMR wagon

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INTRODUCTION

Total mixed ration (TMR) homogeneity and particle size distribution are of a primary importance in dairy cow to deal with nutritional requirements and allow higher performance, and are subduced to the load of the mixing wagon.

Loading level, cutting and mixing times are essential for the uniformity of the diet released along all the feeding alley.

OBJECTIVE

The aim of the trial was to determine the influence of cutting and mixing time on homogeneity and particle size distribution of a dairy cow total mixed ration (TMR), considering different loading levels of the mixing wagon.

MATERIALS & METHODS

- Central Composite Design (CCD) in a randomized block design generated by JMP 11 Pro (SAS Institute, Cary, NC, 2015).
- Three mixing wagon loads (30%, 40, 70% of the maximum nominal load, 21m³).
- Three cutting times (4, 5, 6 min).
- Three mixing times (4, 5, 6 min).
- Diet based on corn silage (57%) and hay (14.7%).
- Samples of TMR pulled from the beginning, middle and end of the feeding alley.
- TMR particle size distribution was determined by Penn Particle Separator.
- homogeneity of the diet as variation coefficient (CV, %) of DM (% wet basis); CP (% DM); NDF (%ss).
- Principal Component Analysis PCA, (SAS Institute, Cary, NC, 2015).

RESULTS

- Cutting time was not a significant parameter
- 3D response surfaces for CV of DM, CP, and NDF on loading levels and mixing times
- From the PCA analysis, it can be inferred that the higher level of similarity of the real and the designed diet was reached with a 70% nominal loaded mixing wagon, together with 5 minutes of cutting and 5 minutes of mixing.

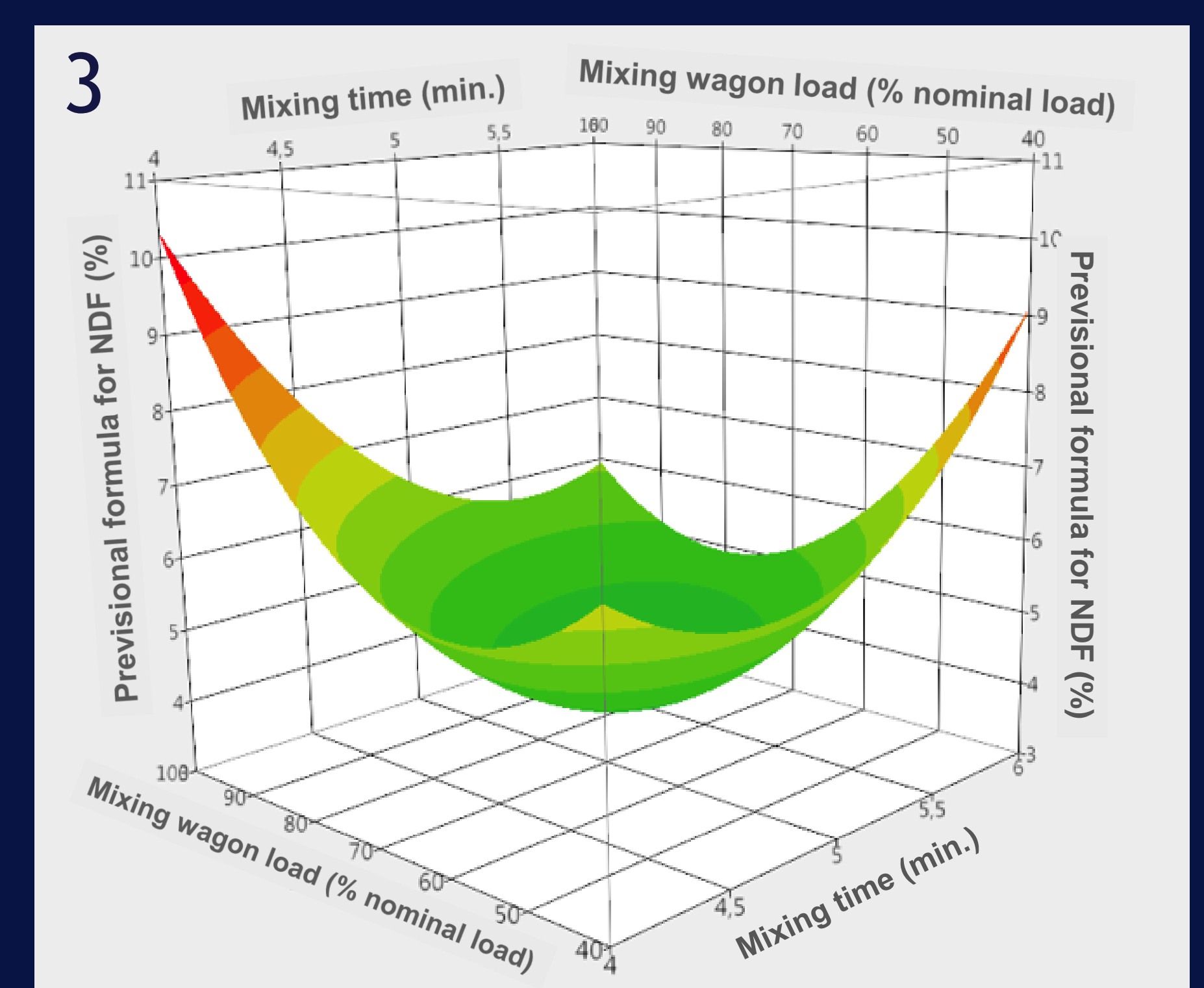
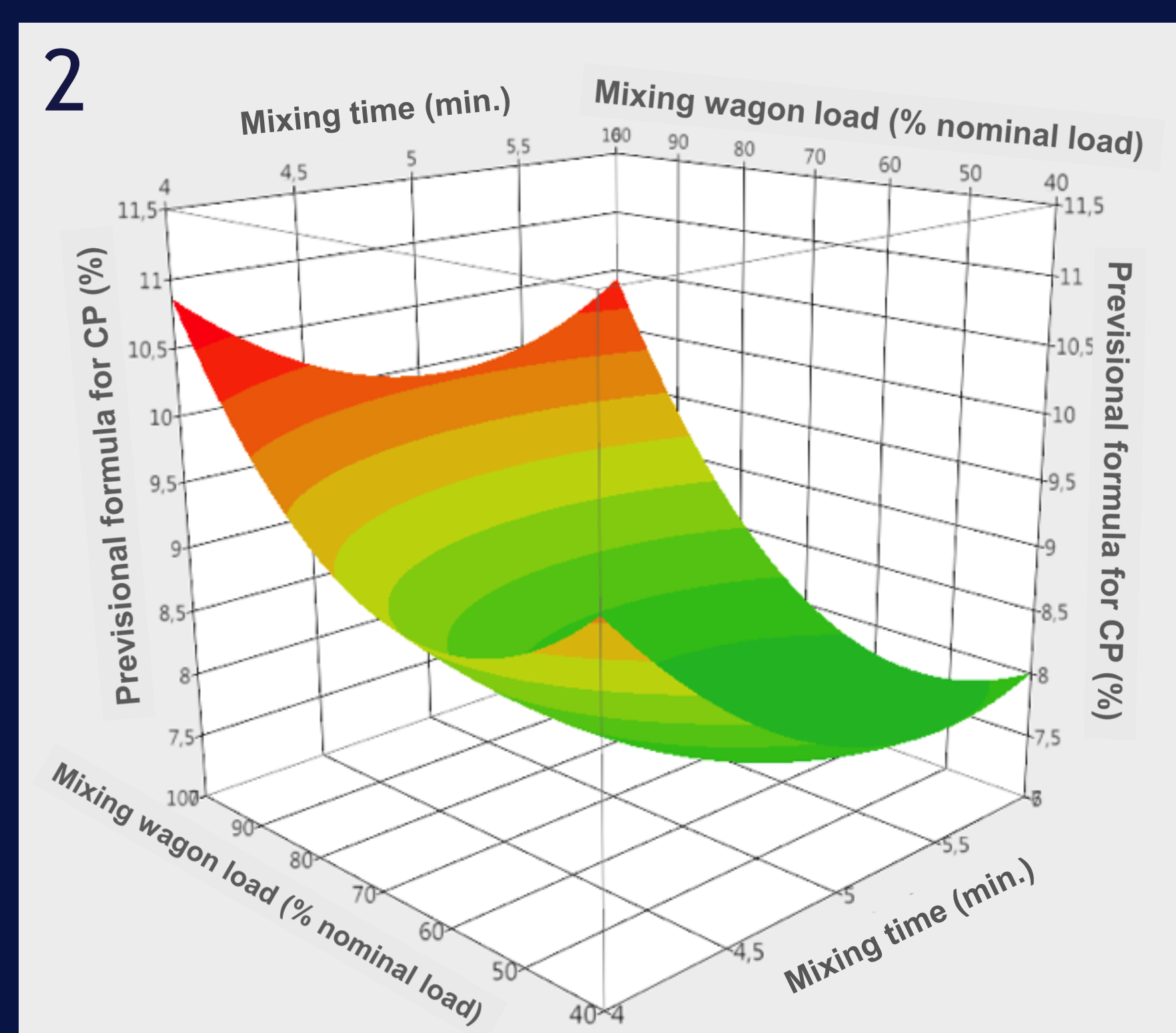
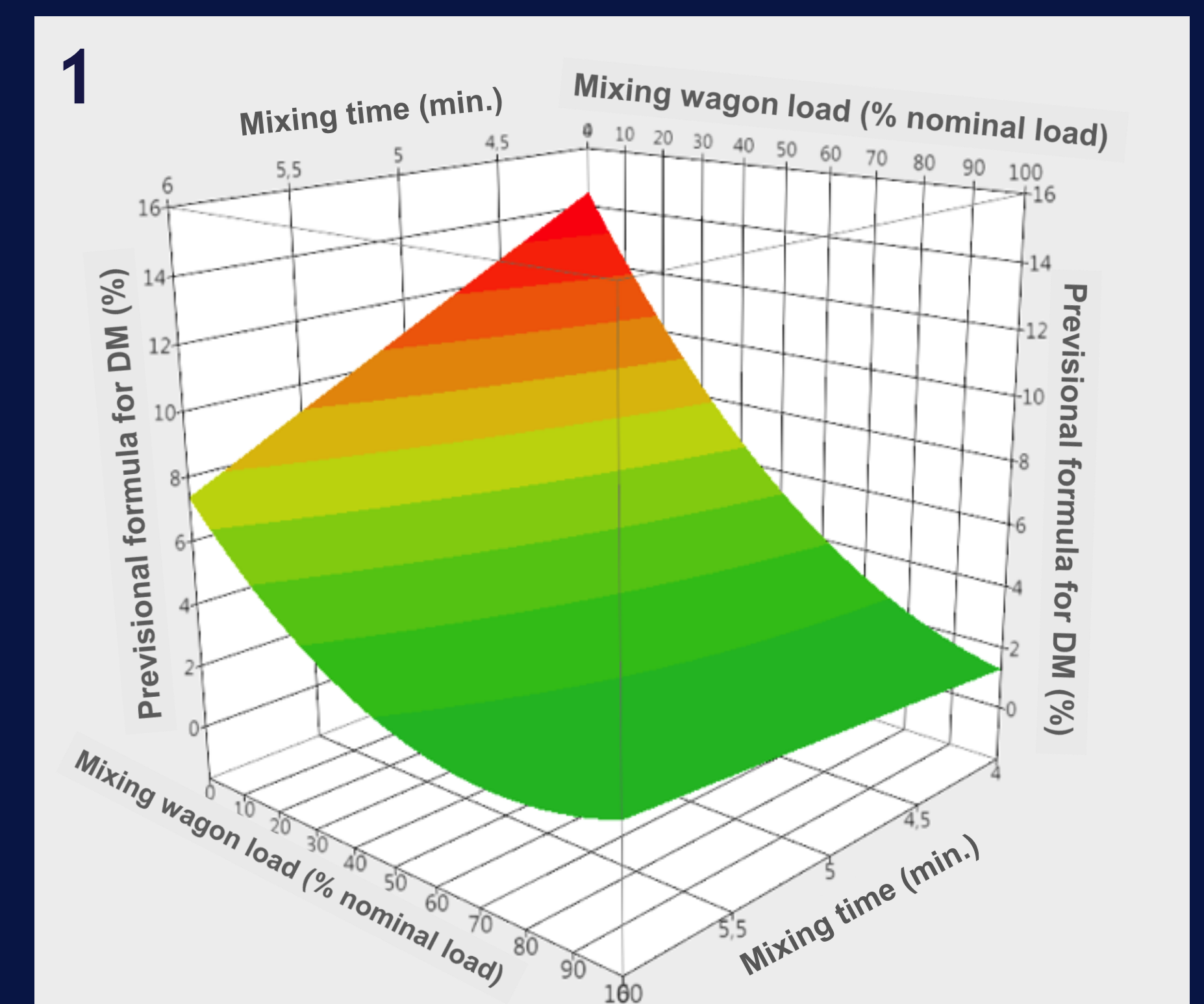
CONCLUSIONS

This trial highlighted the necessity to follow the correct feed loading in the TMR wagon, cutting and mixing times to guarantee an optimal uniformity of the diet. This aspect lead to a good ruminal status and production level for the whole dairy herd.

Table1. TMR particle size distribution Penn Particle Separator

Mixing wagon load level (% nominal load)	Sieve (%)			
	Upper	Middle	Lower	Bottom
40	20.34	32.26	30.36	17.04
70	17.44	32.92	30.34	19.30
100	21.25	31.95	30.90	16.45

Pictures 1,2,3. Variation coefficient (VC) response surface for Dry matter (DM,1), Crude protein (CP, 2), and Neutral Detergent Fibre (NDF,3)



Picture 4. Principal Component Analysis (PCA) of TMR

