Forage botanical and chemical composition on dairy farms with different grassland systems and production systems

Steffen Adler and Håvard Steinshamn

Norwegian Institute for Agricultural and Environmental Research

Thirty-two dairy farms in Middle-Norway

with different grassland systems (S: short-term grassland <4 years, L: long-term grassland >7 years) and different production systems (O: organic, C: conventional) were compared in a field study in 2007 (Figure 1). A principal component analysis was used to explore the correlation between forage botanical composition and forage chemical composition.

Material and methods

Forage botanical composition was estimated before first cut in 2007 by using the dry-weight-rank method. Preserved forage samples collected in 2007 were analysed for chemical composition. These data were together with data about harvesting time at first cut and field altitude analysed in a principal component analysis (PCA).

Figure 1. Typical grassland aspects of the four dairy farm systems. Photo S. Adler

Results

The principal component 1 explained 32% of the total variation and distinguished most SO-farms from LO-farms and most SC-farms from LC-farms (Figure 2). One SC-farm and one LC-farm were outliers possibly due to relatively extensive grassland management. Principal component 2 explained 19% of the total variation and divided most O-farms from C-farms.

O-farms had lower proportion of *Poaceae* and higher proportion of dicotyledons than C-farms in their grassland. On SO-farms the dicotyledon proportion was dominated by *Fabaceae* and on LO-farms by other dicotyledon families. The non-*Fabaceae* dicotyledon families were positively correlated with species diversity, cutting time at first cut and non-fibrous carbohydrates

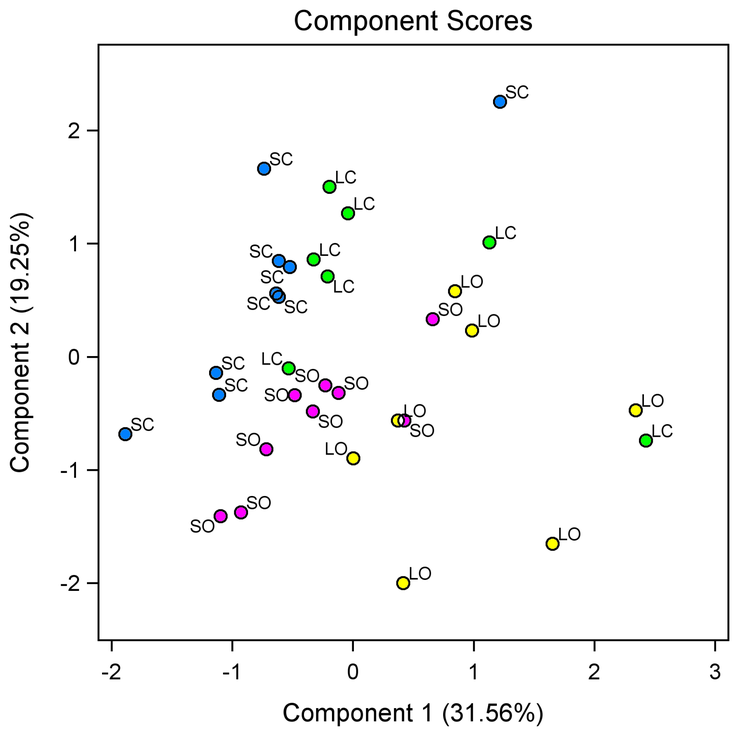

Figure 2. Component scores of principal component analysis of thirty-two farms with short-term (S) or long-term (L) grassland system and organic (O) or conventional (C) production system.

and were negatively correlated with *Poaceae* (Figure 3). *Poaceae* proportion was posetively correlated with forage crude protein, indicating that both Poaceae proportion and N concentration increased with N-fertilisation on C-farms compared to O-farms.

Fabaceae were negatively correlated with crude protein, crude fat, in vitro true digestibility alpha-linolenic acid.

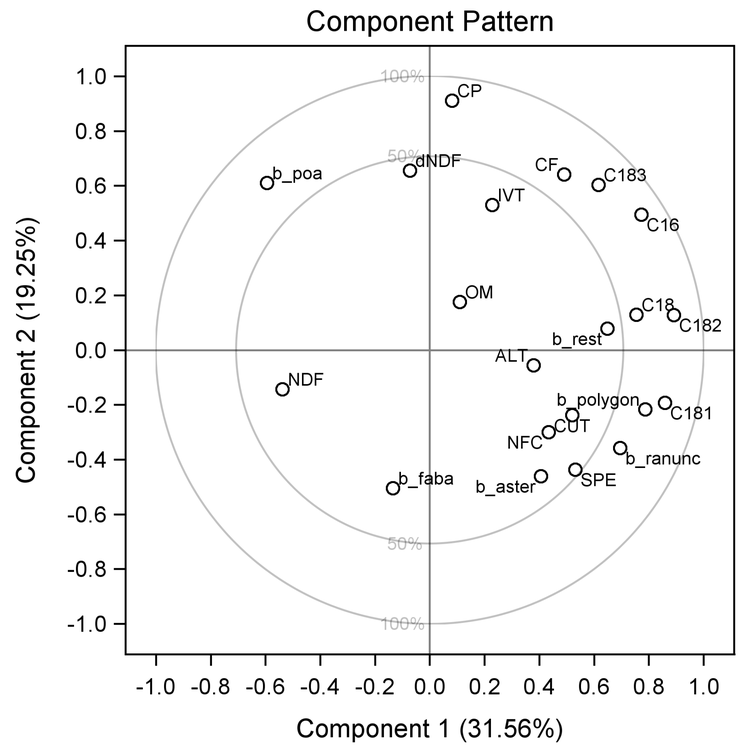

Figure 3. Score plot of principal component analysis

b_poa	*Poaceae*
b_faba	*Fabaceae*
b_polygon	*Polygonaceae*
b_aster	*Asteraceae*
b_ranunc	*Ranunculaceae*
b_rest	Other plant families
SPE	Number of plant species
CUT	Harvesting time at first cut
ALT	Field altitude
CP	Crude protein
CF	Crude fat
NDF	NDF
NFC	Non-fibrous carbohydrates
OM	Organic matter
IVT	In vitro true digestibility
dNDF	NDF digestibility
C16	Palmitic acid
C18	Stearic acid
C181	Oleic acid
C182	Linoleic acid
C183	Alpha-linolenic acid

Conclusions

Forage samples from dairy farms in Middle Norway differing in grassland system and production system showed differences in forage chemical composition. These differences may have impact on milk quality.