Diversity of diet composition decreases with conjoint grazing of cattle with sheep and goats

Message
The diets of cattle, sheep and goats were less diverse when they grazed in combinations than alone.
The reduction in diversity increased the quality of the diet of sheep and goats grazing with cattle but decreased the quality of the diet of cattle grazing with sheep or goats.

Introduction
Conjoint grazing can influence diet selection. Diet composition is often compared by similarity coefficients. These are limited to pairs of diets. An alternative is to compute a ‘dietary diversity’ coefficient for each single diet. Diet diversity is based on the concept of species diversity in an environment. Changes in dietary diversity can then be assessed for a range of experimental treatments.

Methods
Animals:
Cattle, sheep and goats (n > 1 per group) were grazed alone or conjointly as cattle plus sheep and cattle plus goats. Each group progressively defoliated a ryegrass/white clover pasture at an equal rate from 4000 to 1550 kg DM/ha during 40 days in summer.

Diet selection:
Oesophageal extrusa (OE) samples (n = 116) were collected from each species (2 per treatment) on most days. They were dissected into 6 botanical components: grass leaf, stem and seedhead, clover leaf/petiole and flower and dead material and the proportions expressed on a dry matter (DM) basis.

Data processing:
A dietary diversity coefficient (k) was estimated for each OE from an iterative minimisation of the sum of the squared deviations of the observed proportion of each component and the predicted proportion (P) of each component using \( P_i = 100 \cdot (1-k) R_i \), where R = the rank of each component in the observed OE composition.

Results
Estimates of dietary diversity coefficient from OE composition.
High correlations (range 0.87 to 0.99) between observed and predicted diet composition gives confidence in dietary diversity coefficients as a feature of diets selected by cattle, sheep and goats from temperate pasture. (Figure 1)

Effect of species and grazing systems on dietary diversity coefficients
Diets of all three species became significantly (p < 0.01) less diverse with mixed grazing. (High values of k = diversity, low values = less diversity). Cattle-mixed value equals the average of cattle with sheep and cattle with goats. (Figure 2)

Effect of changes in diet diversity on diet quality
With mixed grazing, the digestibility of the diet selected improved for sheep and deer but declined for cattle with mixed grazing compared to grazing alone. (Figure 3)

Conclusions:
- Diet diversity coefficients calculated from individual OE samples can be used to characterise the diet selected by grazing ruminants
- Diet diversity decreased when cattle, sheep and deer were conjointly grazed, compared with grazing alone, on a mature ryegrass/white clover pasture.
- A decrease in diet diversity can result in an increase (sheep and goats) or a decrease (cattle) in diet digestibility.
- Sheep and goats out-compete cattle for the higher digestibility components of the pasture.