Predicting feedstuff associative effects in goats

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INTRODUCTION: Accurate prediction of nutrition requirements is necessary for optimal goat production. The chemical composition and concentration of various energy fractions are available for many feedstuffs when fed at maintenance levels of intake and in relatively simple diets. However, associative effects between feedstuffs or mixtures can occur, such as when a concentrate has a negative or positive effect on digestible nutrients from a basal forage. Therefore, a database of treatment mean observations from the literature was created to develop equations to predict associative effects in goats

Data Construction and Analysis:

- Treatment mean observations were collected from feeding studies with goats consuming forage ad libitum with or without energy and/or protein supplements.
- Essential data were forage OM digestibility (OMD) without supplementation or sufficient information for estimation, total diet OMD, supplement ingredients, OM, CP, and NDF concentrations, intake of both forage and supplement, and BW
- 24 observations were omitted due to questionable values/unlikely estimates.
- There were 110 observations in the database involving 529 animals from 24 publication between 1985 and 2018.
- ME intake was estimated using the equation of NRC (1981) assuming TDN as an indicator of OMD: ME = 15.104 MJ/kg × digested OM.
- Treatment means were weighted for the number of animals per treatment.
- Regressions were by GLM, with comparisons of R^2 and root mean square error.

OMDIGFOR = forage OM digestibility (%) without supplementation; MEIMBWSUP = supplement ME intake (MJ/kg/BW$^{0.75}$); PTCPFOR = forage CP %

Eqn.	Equations to estimate forage ME intake (abbreviations are at bottom left corner)	R^2	R.M.S.E
1	-269.6 + (10.97 × OMDIGFOR)	0.409	256.3
2	425.8 – (0.567 × MEIMBWSUP) + (10.08 × PTCPFOR)	0.446	249.4
3	-110.0 – (0.544 × MEIMBWSUP) + (10.34 × OMDIGFOR)	0.751	167.0
4	-115.0 – (0.541 × MEIMBWSUP) + (3.24 × PTCPFOR) + (9.98 × OMDIGFOR)	0.757	165.9
5	155.9 – (0.540 × MEIMBWSUP) – (41.01 × PTCPFOR) + (5.35 × OMDIGFOR) + (0.741 × PTCPFOR × OMDIGFOR)	0.767	163.2
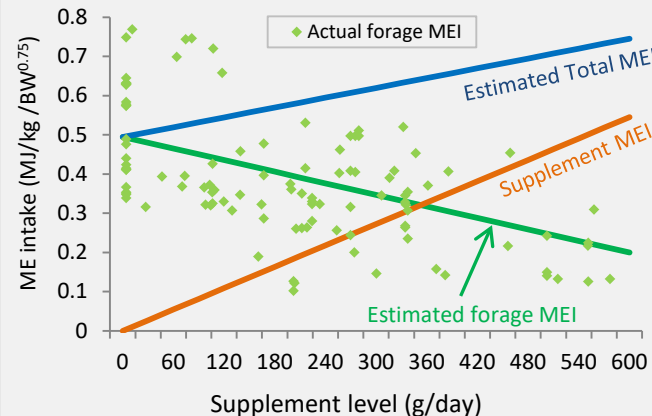
Results:

- The equation explaining most variation was Eqn. 5, with P values of 0.25, < 0.01, 0.05, 0.02, and 0.03 for the intercept, MEIMBWSUP, PTCPFOR, OMDIGFOR, and PTCPFOR×OMDIGFOR, respectively.
- The figure shows actual (♦) and estimated (—) forage ME intake estimated by Eqn. 5 with parameter means (OMDIGFOR = 59%, PTCPFOR = 8.1%, and supplement ME = 11.6 MJ/kg)

Conclusion: Equations describing associative effects can be used to predict the quantity of a particular supplement with a given forage necessary to meet nutrient requirements of goats in specific production settings.