Sugar for dairy cows?

Simulating fodder beet supplementation to reduce environmental pollution

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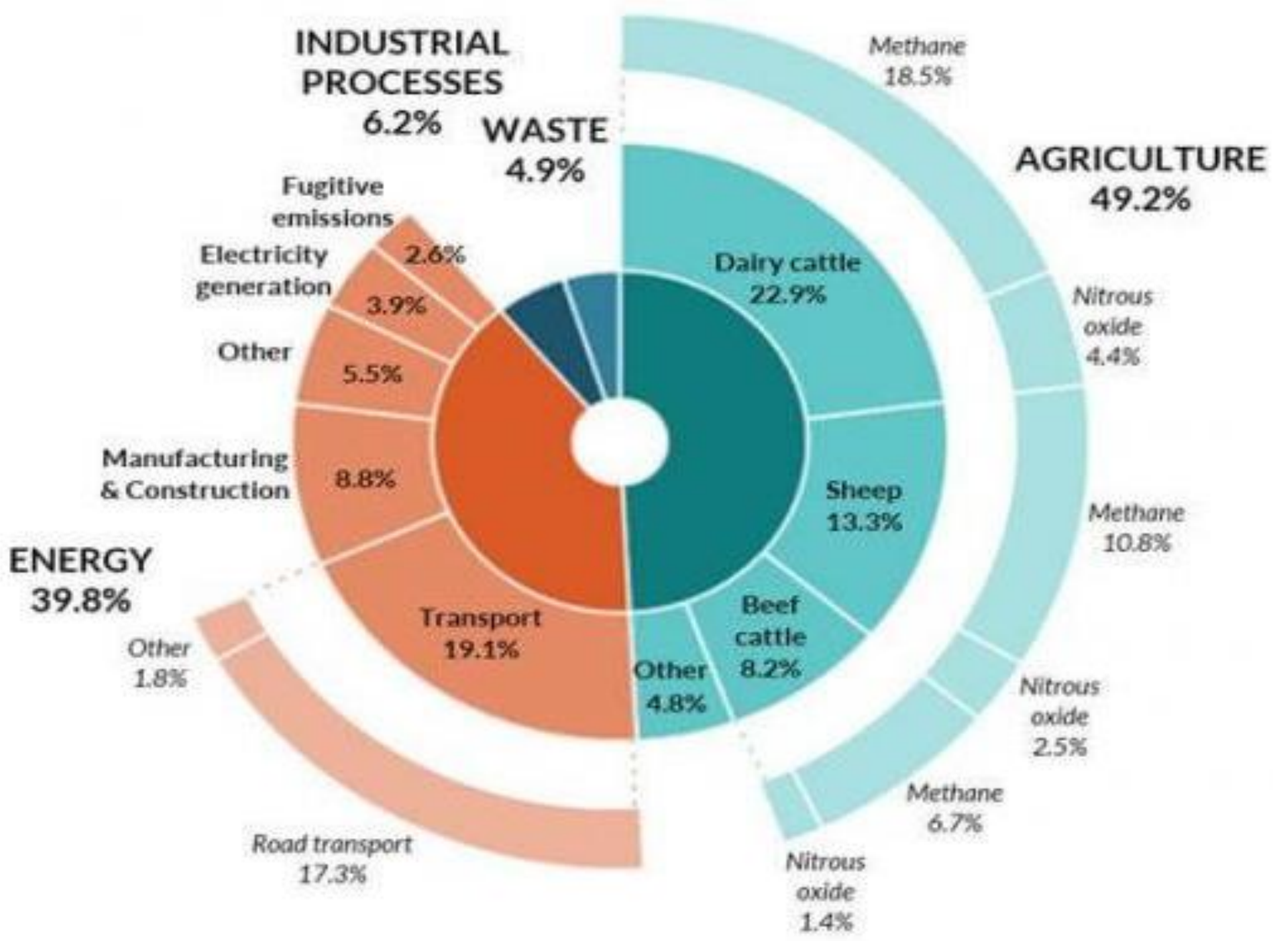
Mount Hutt

Agriculture contributes to nearly half of New Zealand's total GHG but also represents 11% of GDP



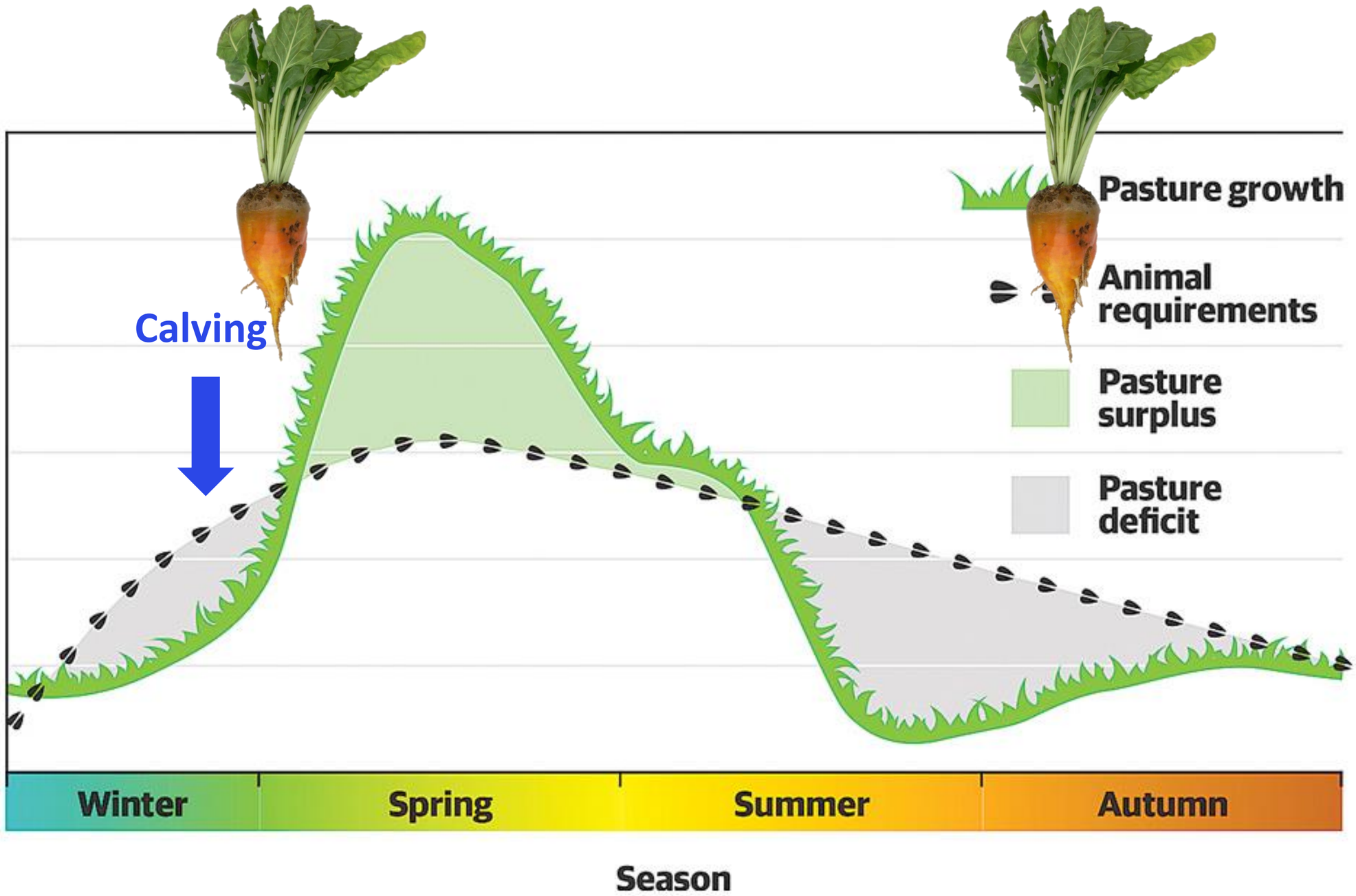
Source: Greenhouse Gas Inventory 2018

Pasture versus Fodder beet

Chemical composition % dry matter (DM)	Pasture	Fodder beet (bulb)
Water Soluble Carbohydrate	11	72.5
Crude Protein	25	7.9
Neutral Detergent Fibre	46	11.7
Acid Detergent Fibre	18	6.7

(Dalley et al., 2017)

New Zealand pastoral supply is seasonal



Objective

Identify feeding strategies involving a combination of fodder beet and ryegrass to improve milk production, animal welfare and reduce environmental pollutants.

Minimum Total Discomfort

$$= \sqrt{\sum_{j=1}^{i} wj \left[\left(\frac{oj - cj}{oj}\right)\right]^2}$$

Momentary optimal feed

I. Rumen Ammonia

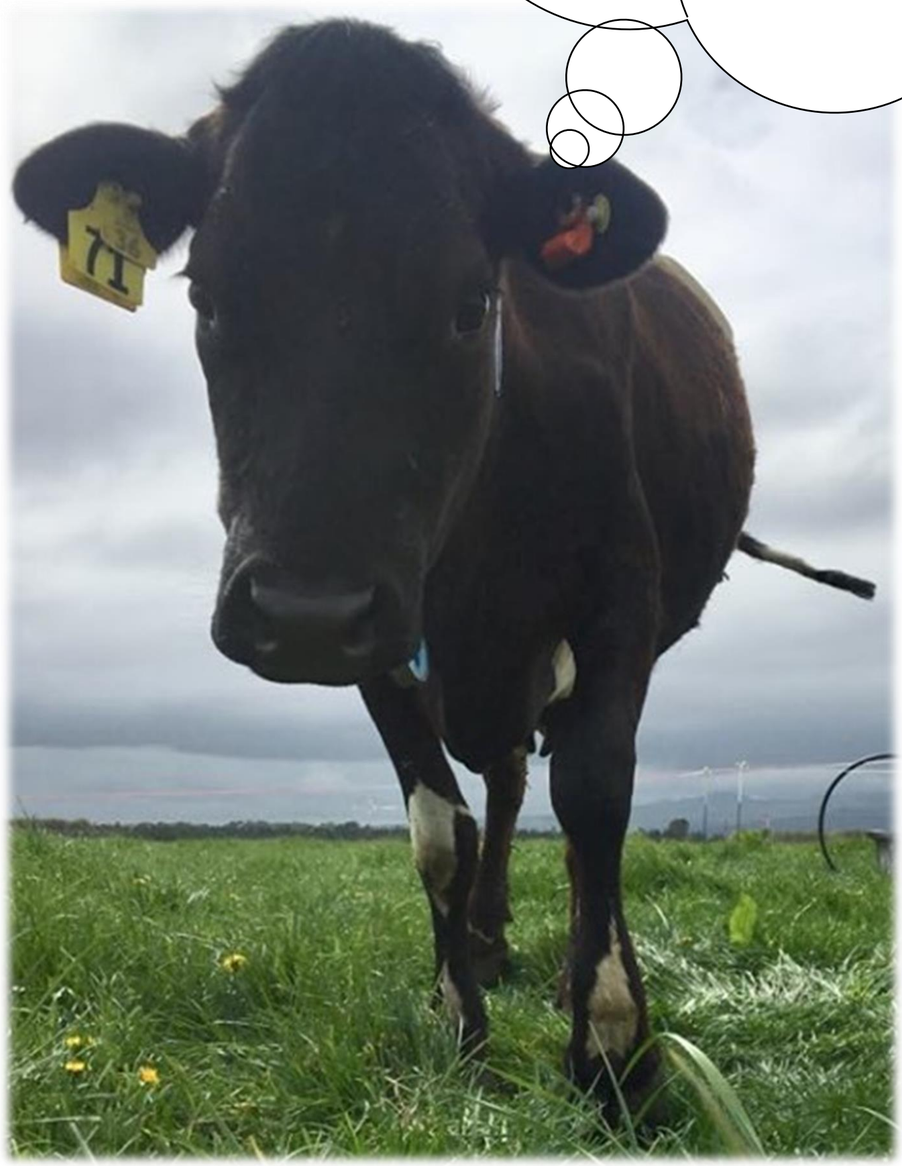
II. Rumen pH

III. Rumen NDF (rumen fill)

IV. ME

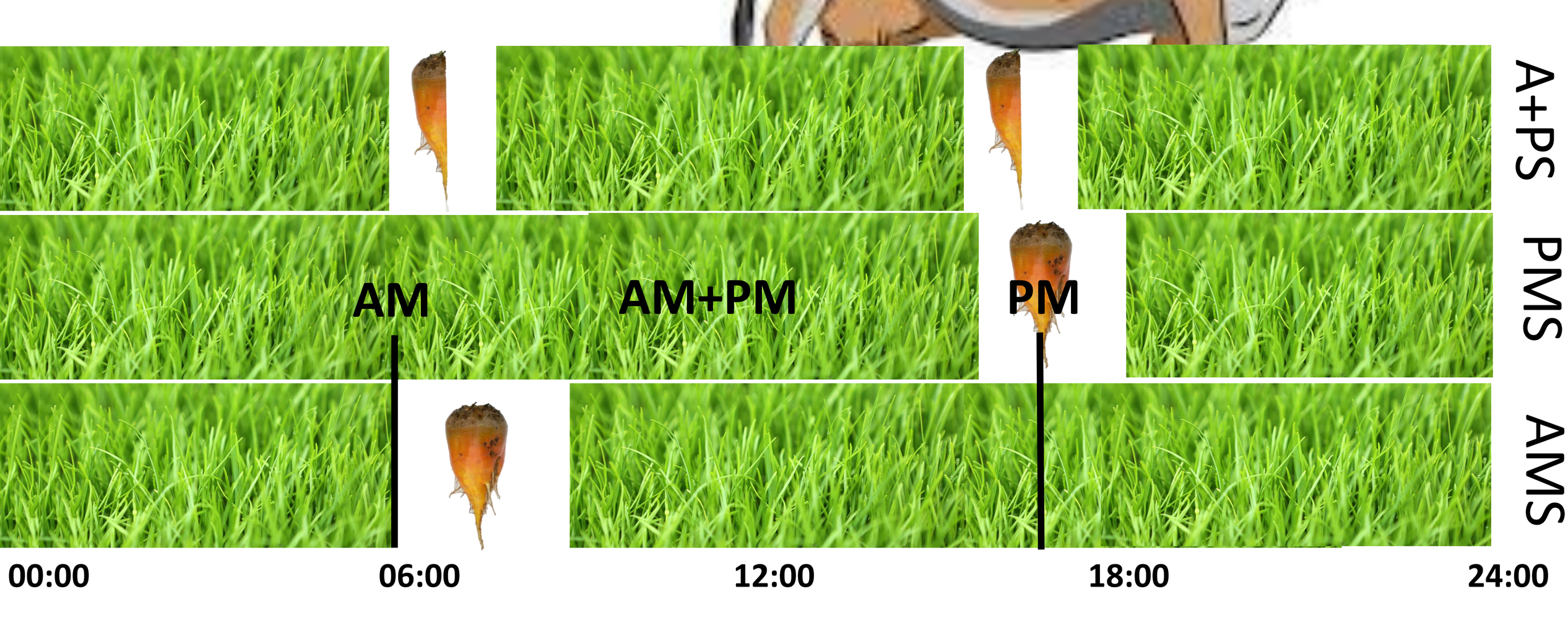
V. Hunger

Additive post-ingestive feedbacks

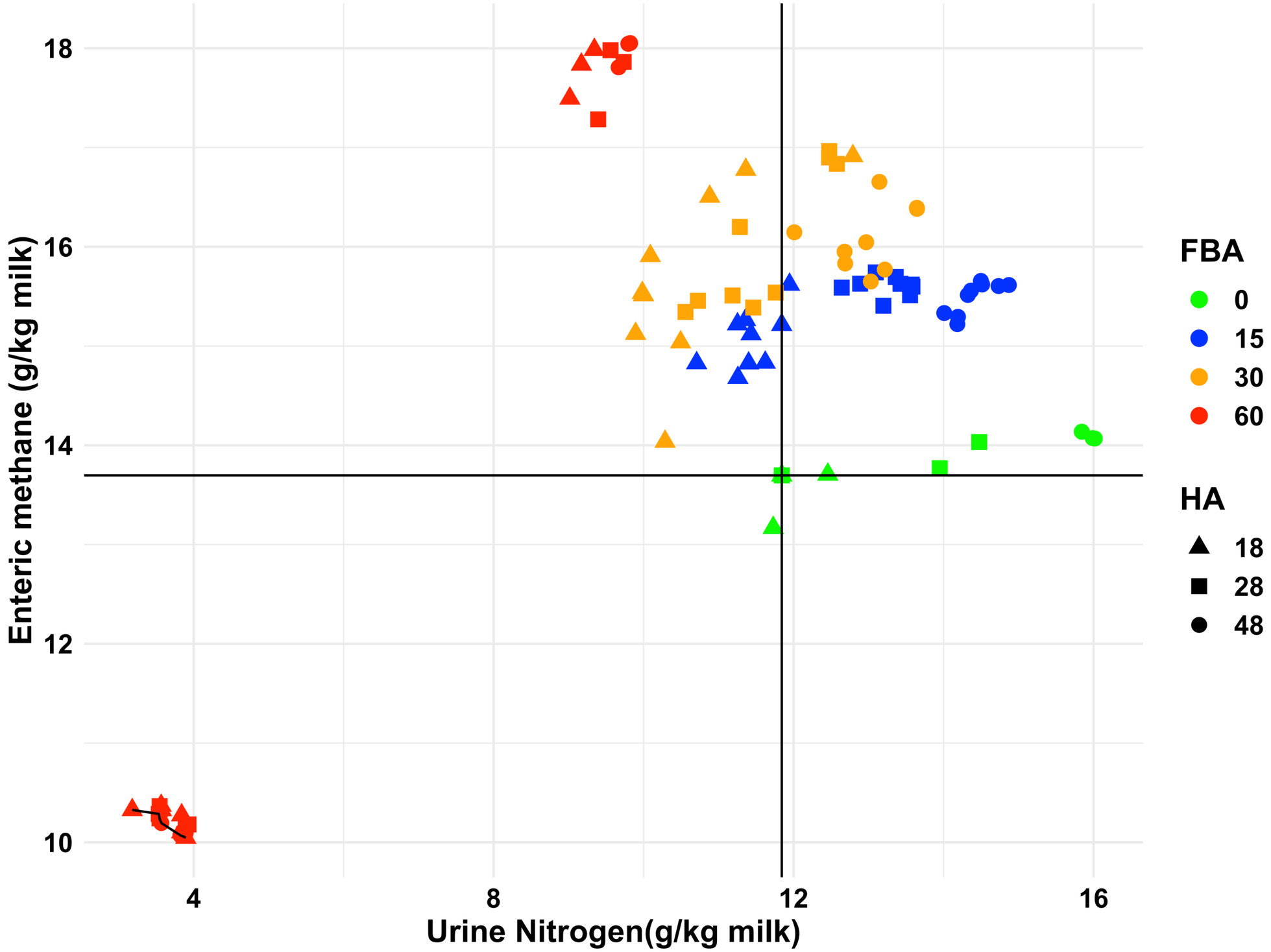


MINDY – model of a grazing ruminant

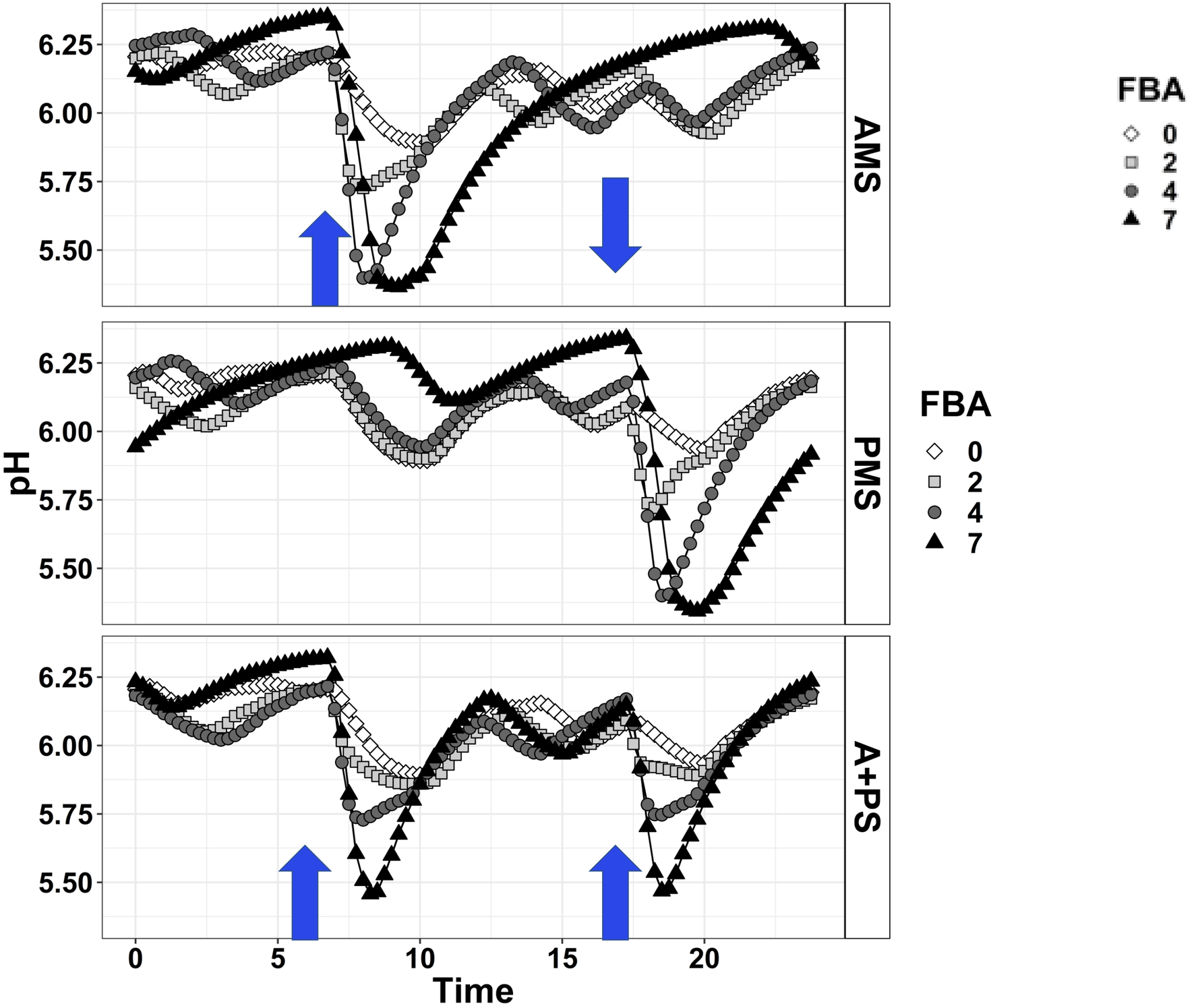
FB (% intake)	HA (kg DM)
0%	18
15%	28
30%	48
60%	



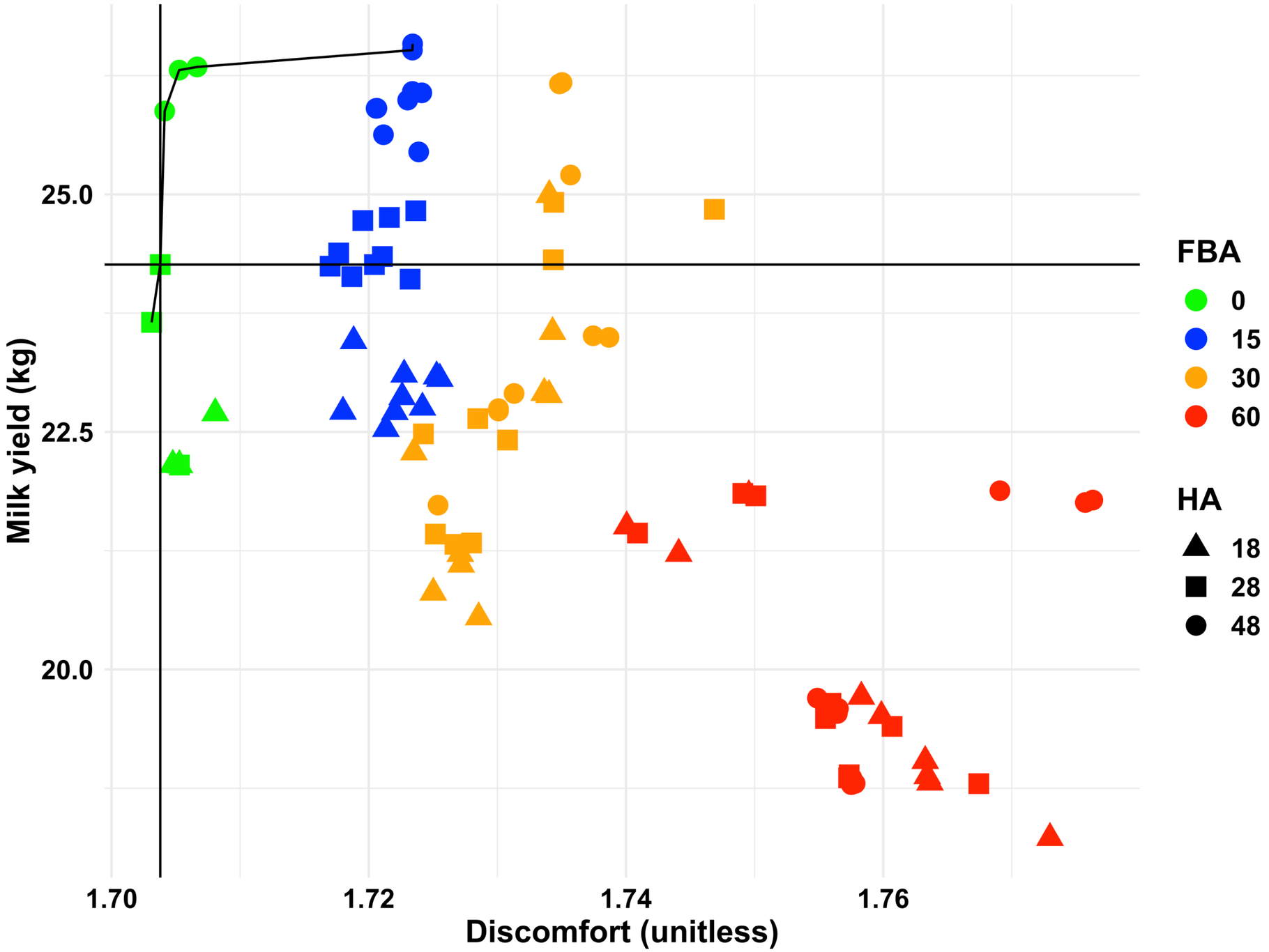
Fodder beet did not reduce nitrogen or methane pollution



Rumen pH declined with increased allocation of FB



FB increased total discomfort and reduced milk yield



Use of FB to reduce environmental impact of agriculture is limited

Intake of FB needs to exceed 30% of daily intake to reduce enteric methane and urinary nitrogen excretion

BUT at this level rumen pH was sub optimal

Total discomfort was greater

AND milk production declined

Alternative supplements may be less costly and improve animal performance