



Methane emission from ruminants and its mitigation strategies

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Methane Emission from Dairy Cattle and Its Mitigation Strategies



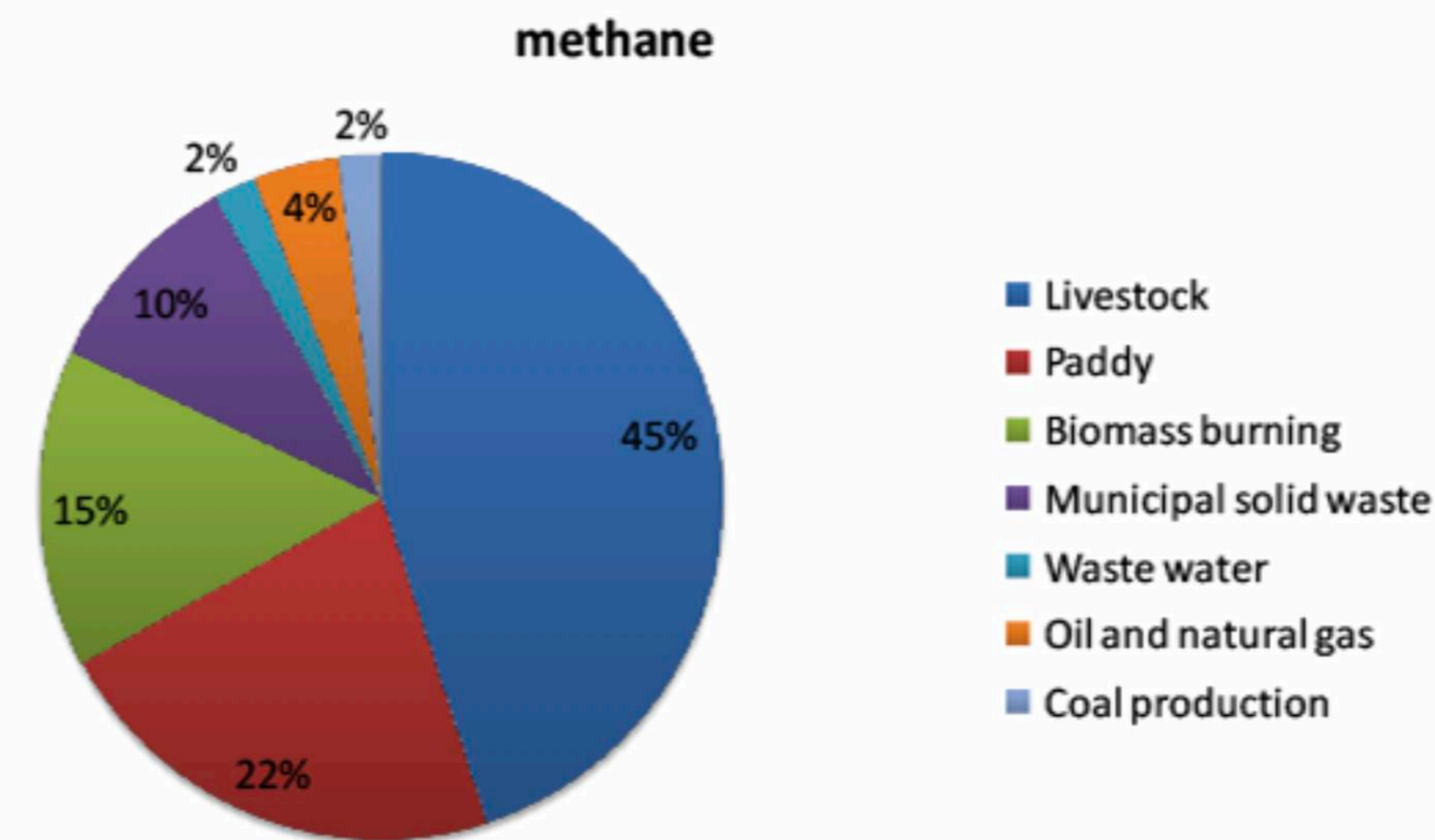
OBJECTIVE

- ▶ To impart the knowledge on methane emission from ruminants and its mitigation strategies

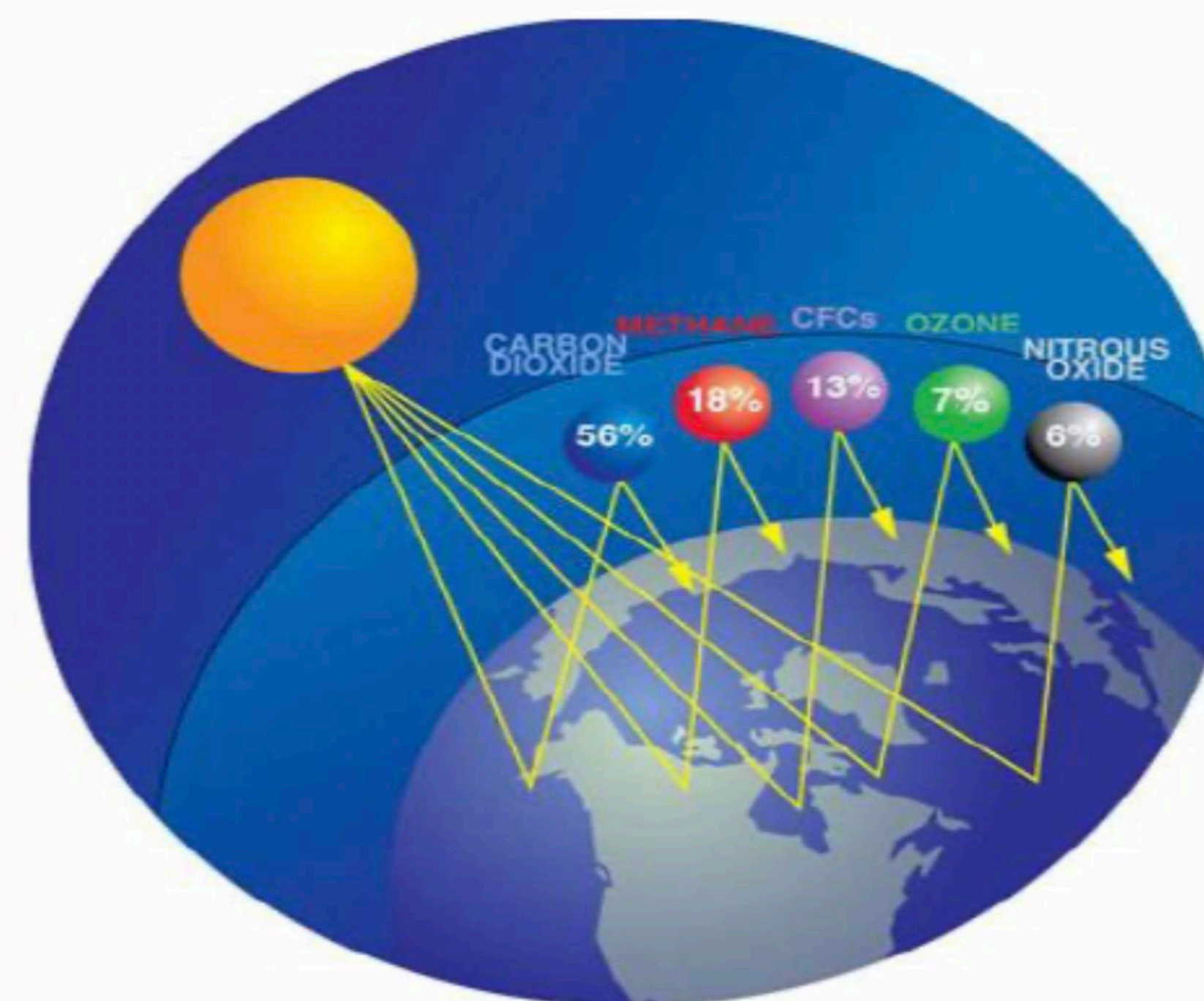
Introduction

- ▶ Ruminants produce 20-30 % global methane
- ▶ production (80 Tg of CH₄ per annum and 10 Tg in India)
- ▶ Livestock contribute 42 % of the total agriculture methane (28 % from enteric fermentation and 14 % from manure)
- ▶ CH₄ represents a loss of feed energy by 8-12 %
- ▶ leads to lower animal production
- ▶ Methane production is an unavoidable product of rumen fermentation
- ▶ Associated with decreased propionate and increased acetate production
- ▶ Possible feeding strategy reducing the methane emission

Methane emission from various sector

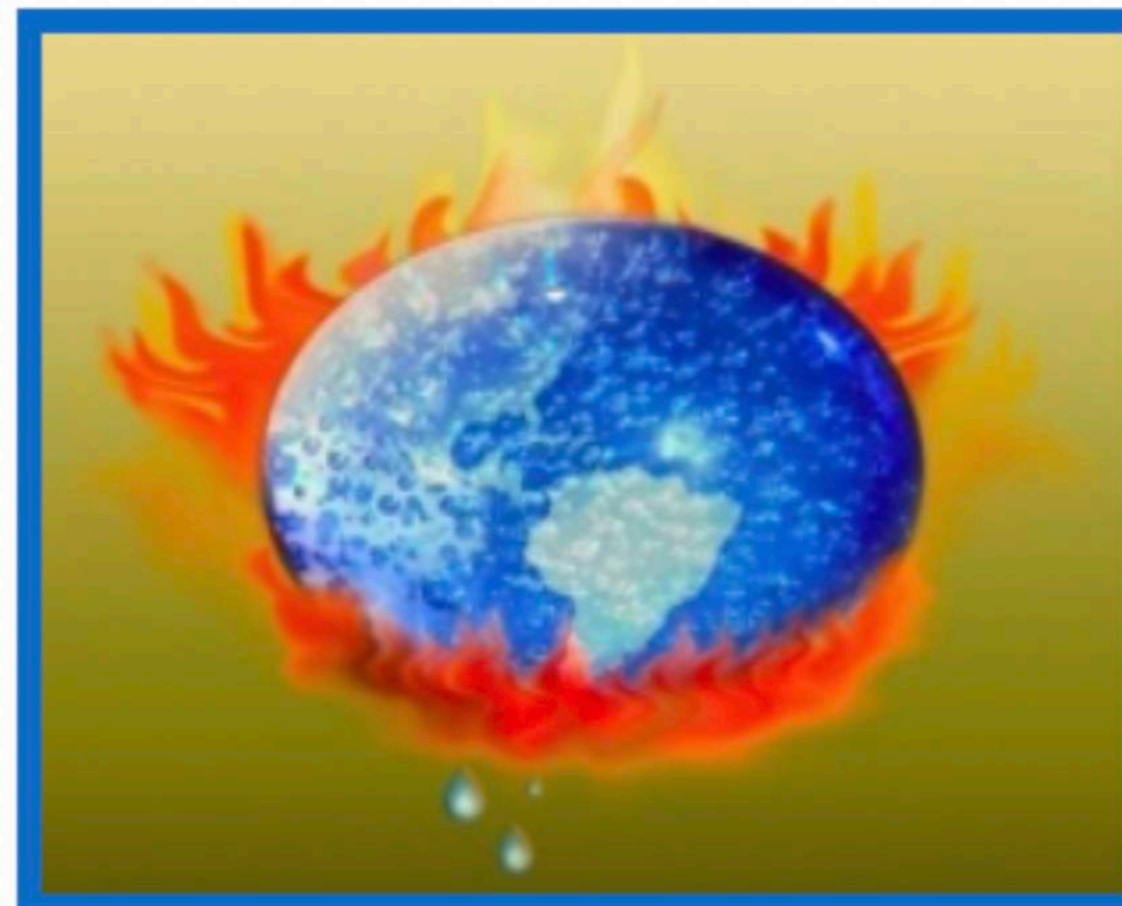


GREEN HOUSE GASES



Methane Emission Of Indian Livestock (10.07 Tg/Y)

S.No	Animal	CH ₄ /head/yr (kg)
1	Cross breed cattle	38.9
2	Indigenous cattle	35.9
3	Buffaloe	76.6
4	Goats	4.94
5	Sheep	3.67
6	Other livestock	8.65



Methane Production Potential of Feedstuff

S.No.	Feedstuff	Average Methane Production Potential (ml/100 mg Truly digested substrate)
1	Tree leaves	1.55
2	Succulent roughages	1.91
3	Protein supplements	1.86
4	Cereal grains	2.58
5	Concentrate feeds	2.61
6	Crop residues	4.18

Regression Equation was developed

MPP of feed (ml/100 mg Truly digested substrate)

$$= -2.738 + 0.052*OM - 0.033*EE + 0.004*NDF$$

Methane Emission from Ruminants

S.No.	Ruminants	Methane emission (g/animal/day)
1	Cattle	76.74
2	Buffalo	97.01
3	Sheep	11.63
4	Goat	10.14

Factors Influencing Methane Emission

Internal factors

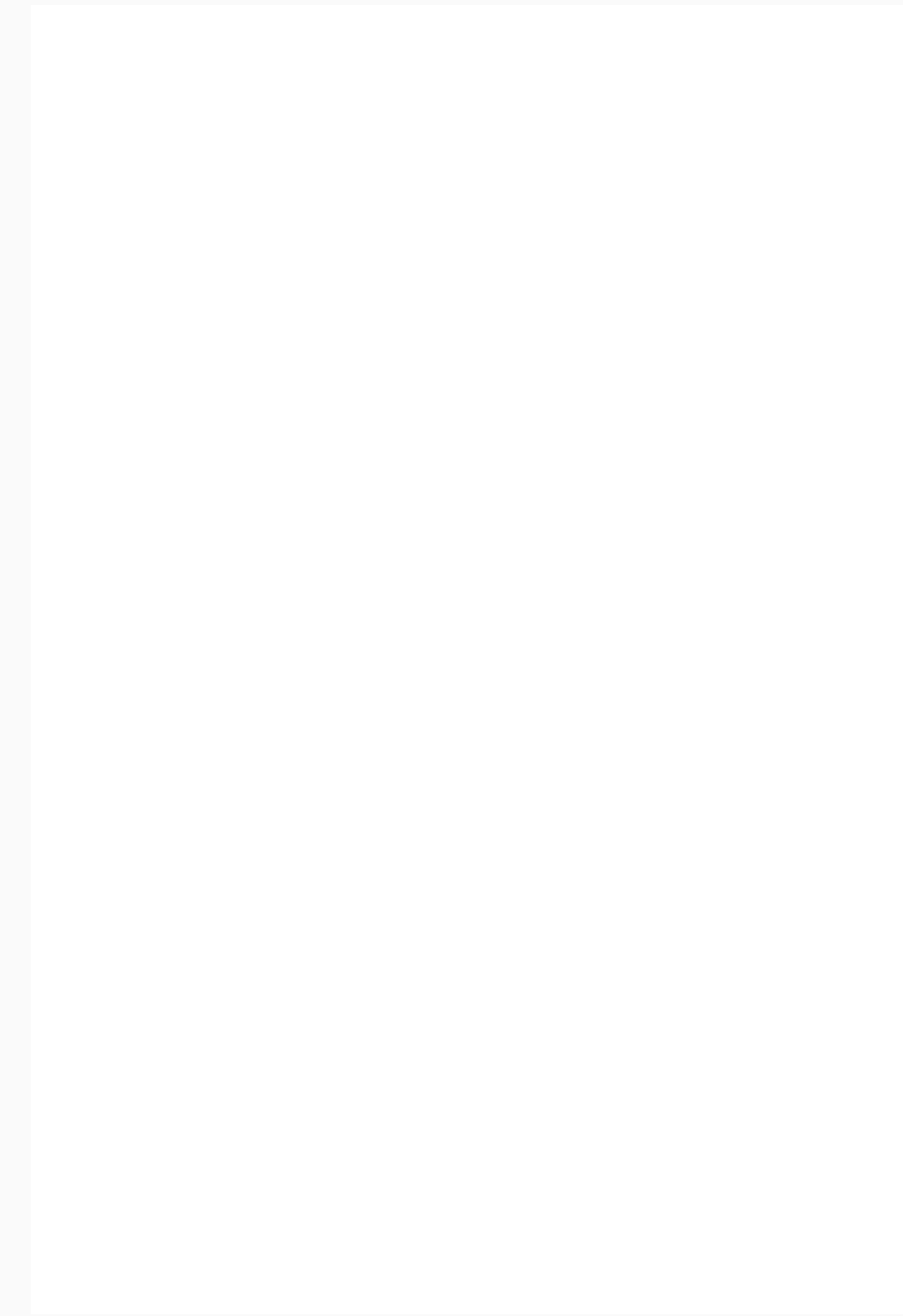
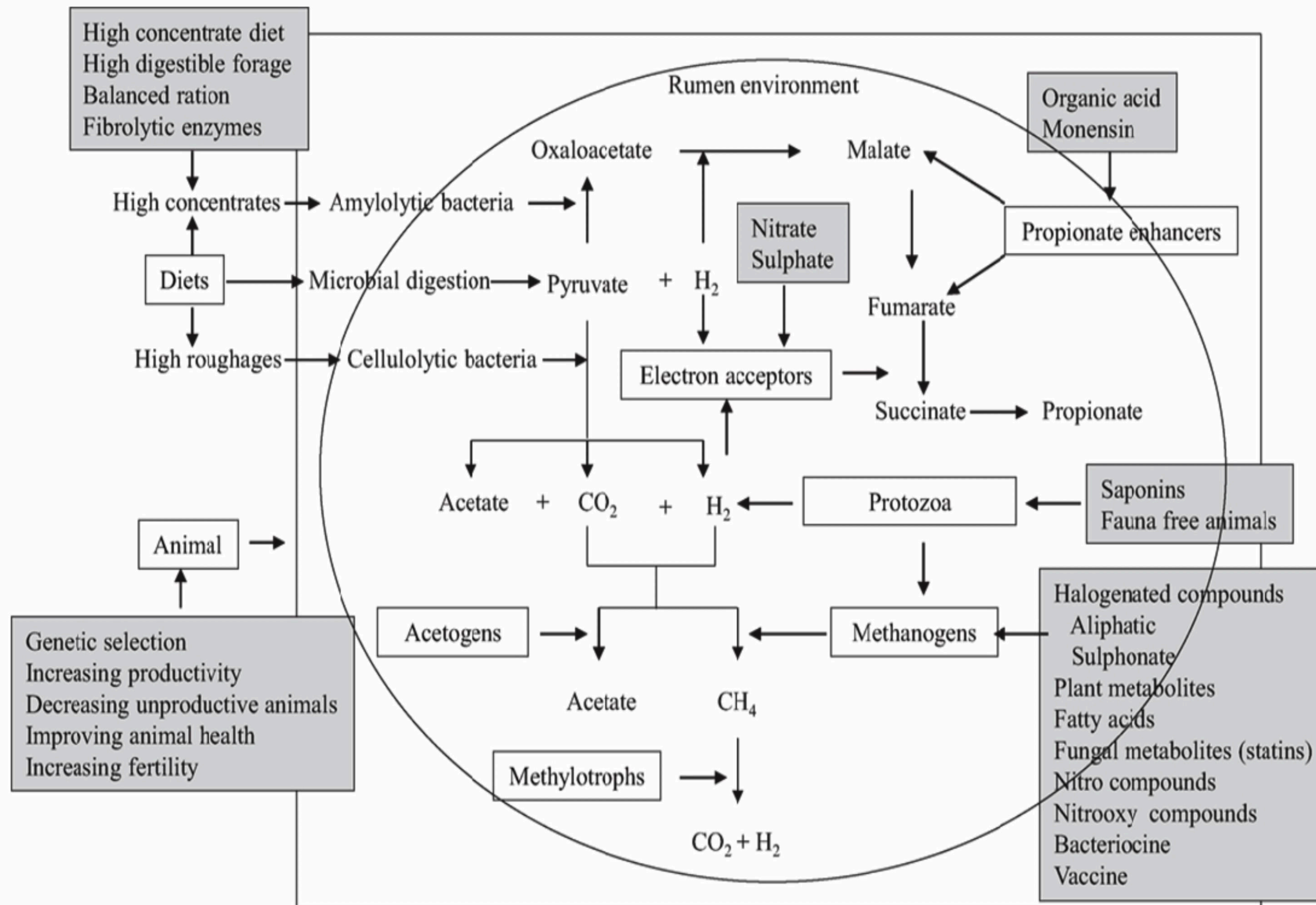
- ▶ Type of the animal (species, age, body weight and its production level), methanogens, protozoa and feed resident time

External factors

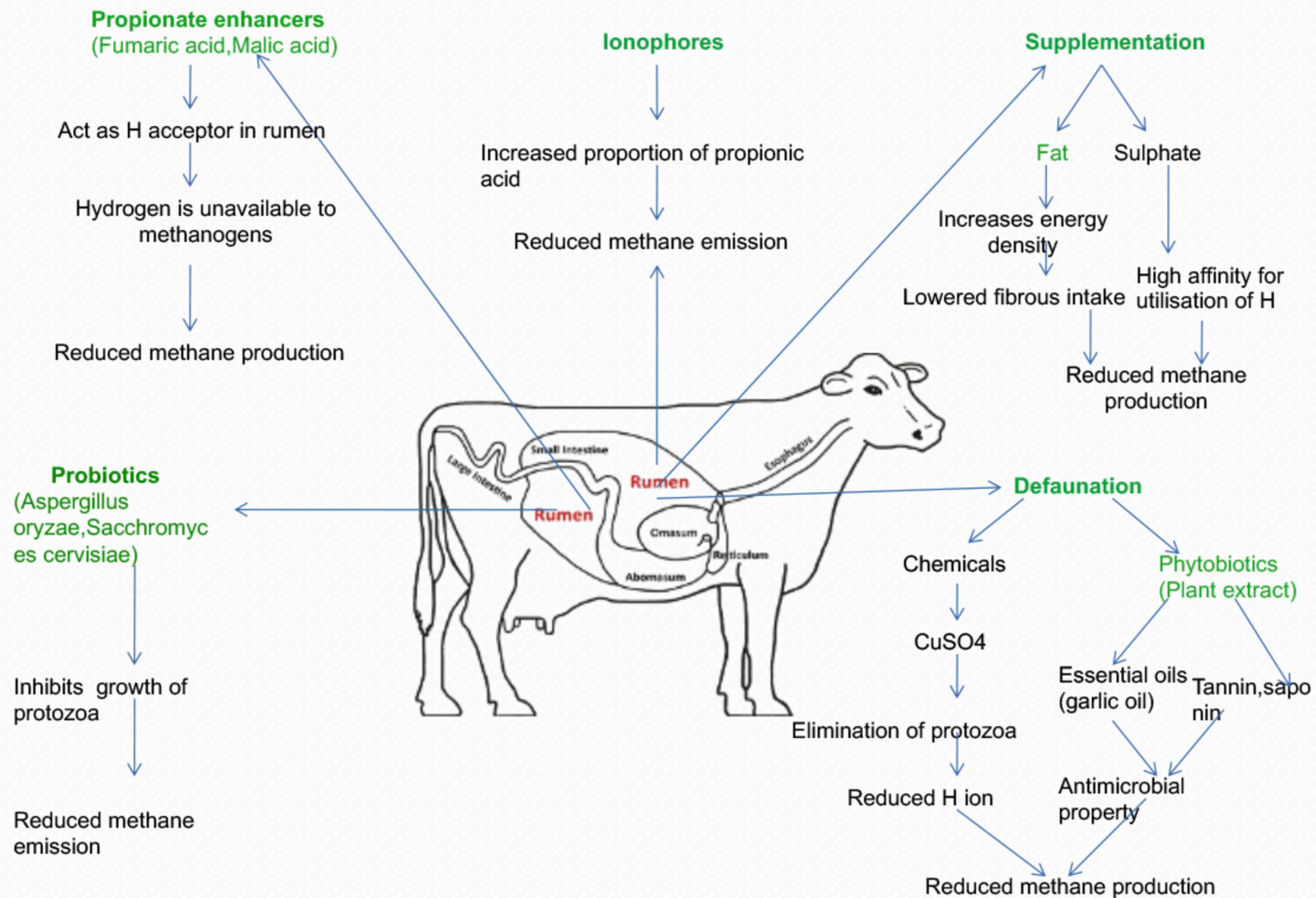
- ▶ The amount and type of feed, addition of supplements, feed additives, daily feed intake, digestibility and feeding frequency and environment etc
- ▶ Low intake of highly digestible carbohydrates produce high methane production, but at high intake of highly digestible diet leads to low production of methane.
- ▶ Forage species, forage processing, the proportion of forage in the ration and the source of grain also influence methane production
- ▶ Protein and fibre content of feed



Possible Strategies to Reduce Methane Emission



Feeding Strategies on Reduction of Methane Emission

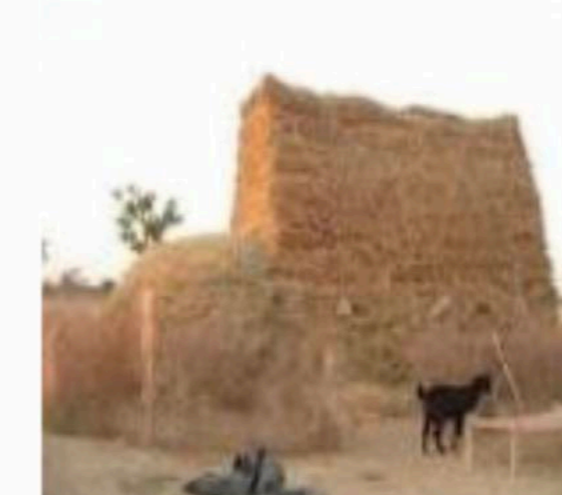




Feeding Strategies to Reduce Methane Emission for Dairy Cattle

- ▶ In India, livestock are fed with low quality crop residues and they tend to produce more methane because of
 - *high cell wall contents and*
 - *low digestibility*

- ▶ Fermentation of cell wall carbohydrates produce more methane than starch and leads to greater loss of feed energy
 - Supplementation of concentrate along with crop residues improves the fibre digestion and reduces methane emission from ruminants
 - Protein supplementation in the diets increased the nutrient digestibility and decreased methane production in rumen
 - Complete feed block, Urea molasses mineral block (UMMB) enhances fermentation thereby reduces methane generation in the rumen





Enhancing The Level of Feed Intake

- High feed intake results in increased passage rate,
- The extent of the microbial access to dry matter is decreased,
- which in turn reduces the rate and extent of fermentation and decrease Methane production



Changing The Feeding Frequency

- ▶ Low frequency feeding tends to reduce methanogens and protozoal population in the rumen which leads to
 - ▶ low methane generation and more propionate production
- ▶ Low frequency feeding increases fluctuations in rumen pH that can be inhibitory to methanogens
- ▶ Feeding of animals twice a day can help in reducing methane emission from dairy animals





Processing of Forages

- ▶ **Grinding and pelleting of forages to enhance the efficiency of nutrient utilization tends to decrease methane emission from the rumen by about 20 - 40%**

