

Quantifying Livestock Diet compositions in Kenyan Smallholder Farms

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Background

- Kenya has 23 million head of cattle, 34 million goats, 25 million sheep, 4 million camels, 61 million chicken and 600 thousand pigs - kept by 4.7 million smallholder farmers.
- Livestock diet composition and quality impacts productivity and greenhouse gas emissions (GHG) in livestock systems.
- Livestock diets are influenced by the availability of feed resources (Figure 1) produced across the landscape.
- Current estimates of diet composition and quality rely heavily on expert knowledge and lack seasonal variation (Figure 2 & 3).



Figure 1: Sources of livestock feed resources in Kenya

Materials and Methods

- **Sensitivity analysis:** To test if changes in feed composition affect diet quality and methane emissions from livestock.
- **Spatial mapping:** To combine local ground data from livestock feed surveys with freely available geospatial data to map livestock feed composition.
- **Livestock emission modelling:** To assess methane emissions from livestock using improved estimates of livestock diet composition.

Results

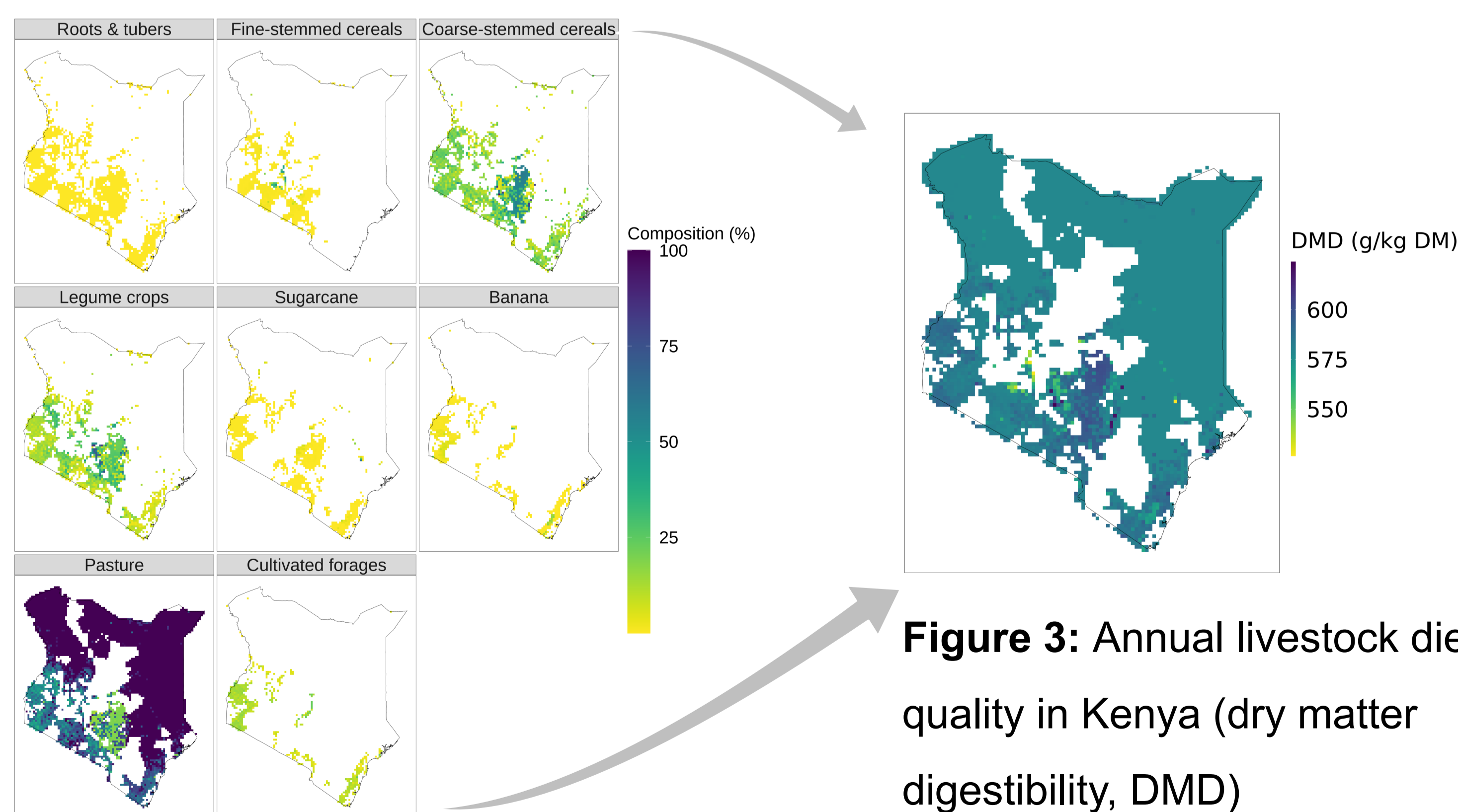


Figure 2: Composition (%) of livestock diets in Kenya

Table 1: Sensitivity of methane emissions to changes in diet composition (Animal: Adult female cow; Unit: Kg CH₄ head⁻¹ .year⁻¹)

Production system	Agro-ecological zone	Min	Max	Sd	P-value
Livestock only	Arid	37.0	39.8	0.9	0.023*
	Humid	52.4	56.2	1.1	0.101
	Temperate	49.8	55.9	1.8	0.190
Mixed rainfed	Arid	35.8	51.6	5.3	0.034*
	Humid	61.2	110.1	13.5	0.000***
	Temperate	43.4	81.5	9.7	0.000***
Mixed irrigated	Arid	49.1	81.2	9.7	0.033*
	Humid	50.0	74.4	6.9	0.000***
	Temperate	26.7	97.6	19.5	0.006**
Other	Tree based	50.4	54.2	1.2	0.472

- Mixed rainfed systems have varying levels of differences with changing diet composition (Table 1).
- Livestock only systems have relatively low differences with changing diet composition.

Case Study - Meru County, Kenya

- Long wet season occurs in March, April and May (MAM).
- Short wet season, occurs in November and December (OND).

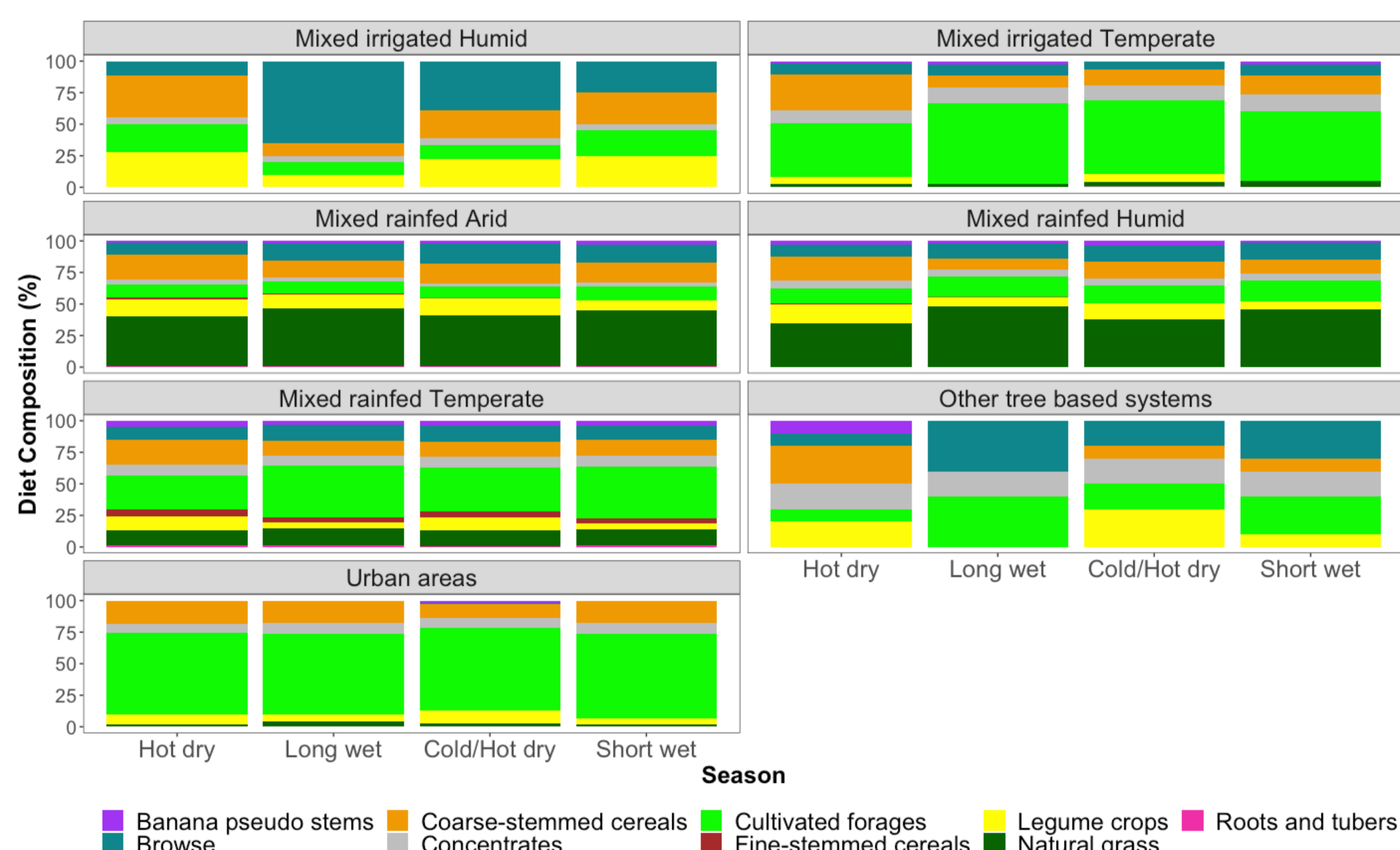


Figure 4. Diet composition for adult female cattle across production systems and seasons.

- High diversity of diet composition across production systems and seasons (Figure 4).
- Natural grass is the primary component of the diet in mixed rainfed arid and humid systems.
- Crop residue (e.g., Maize and Sorghum) feeding is much higher in the hot dry and hot/cold dry seasons.
- Cultivated forages form the main component of the diet in mixed rainfed temperate systems.

Next steps

- Compare survey-based estimates with estimates derived from earth observation (EO) data.
- Utilize survey-based estimates to enhance EO-derived estimates.
- Estimate methane emissions using improved diet composition data.