The potential of replacing conventional dairy supplements with forage legume-based diets in Zimbabwe's smallholder dairy sector

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Introduction

Low quality and quantity of feed in dry season

Conventional supplements are expensive and unavailable

Low milk quality, quantity and prices

Nutrition remains major constrain to smallholder dairy viability.

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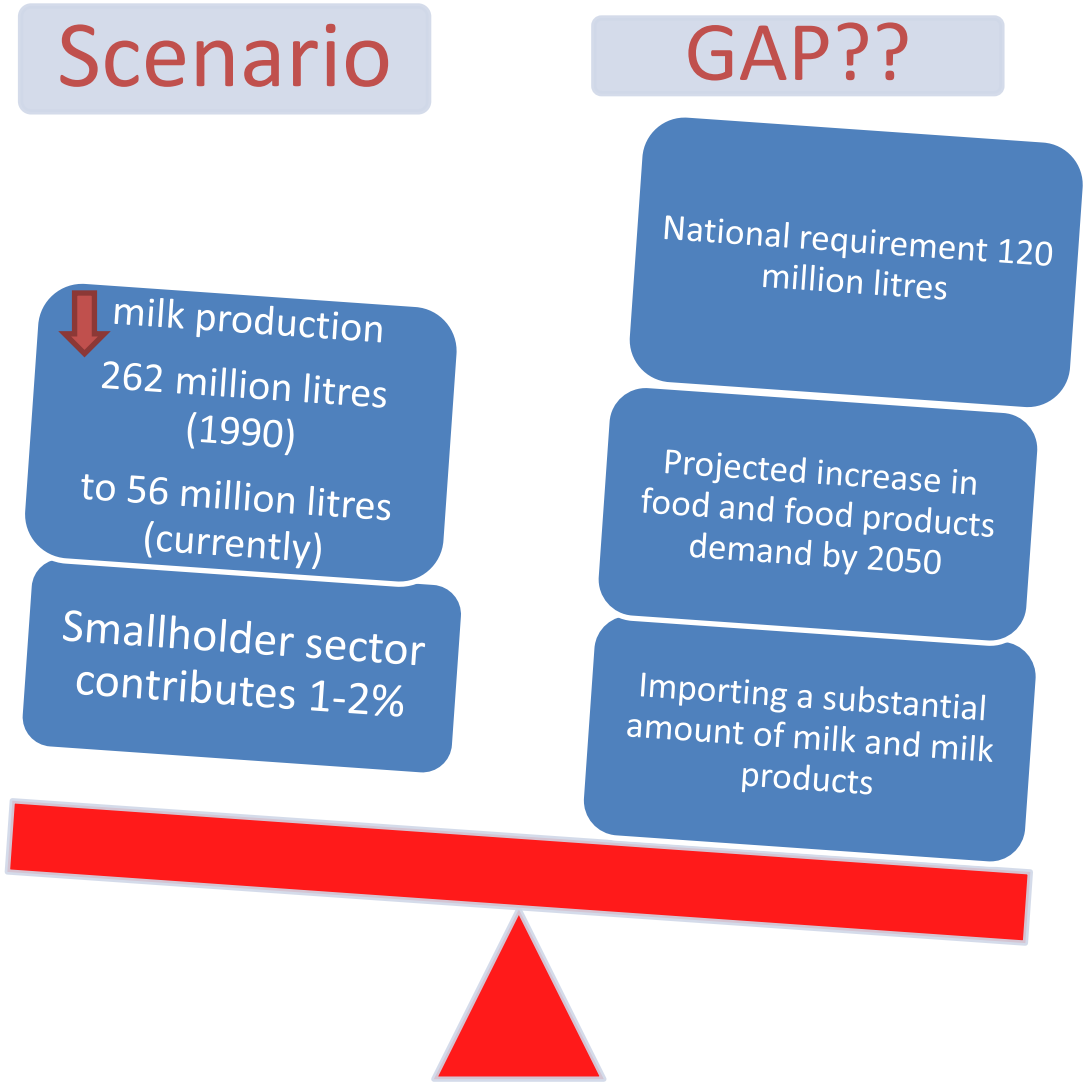
Scope



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Objective

- To determine the effect of replacing commercial diets with forage legume diets on VFI, milk yield, quality and economic returns

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Research trajectory: Diets

Ingredient	Velvet bean diet		Lablab diet		Cowpea diet		Commercial diet	
	%	Cost	%	Cost	%	Cost	%	Cost
Maize grain	25	0.10	36	0.14	20	0.08	-	-
Lablab hay	-	-	43	0.06	-		-	-
Soybean meal	-	-	20	0.12	21	0.13	-	-
Velvet bean grain	44	0.11	-	-	-	-	-	-
Velvet bean pods + grain	30	0.08	-	-	-	-	-	-
Cowpea hay	-	-	-	-	50	0.12	-	-
Veld hay	-	-	-	-	5	0.03	-	-
Maize stover	-	-	-	-	4	0.03	-	-
Vitamin premix	1	0.01	1	0.01	1	0.01	-	-
NF 16% Dairy meal (Pastulak)	-	-	-	-	-	-	100	0.44
Cost per kg (US$)	0.30		0.33		0.40		0.44	
DM (%)	88.9		88		89		89	
CP (%)	16.01		16.02		15.9		16	
CF (%)	12.09		13.8		13.5		12	
ME MJ/KG (%)	12.09		12.07		12.04		12.00	

Research trajectory: Experimental design

- 2 step 3*3 Latin square
- 9 Red Dane, Guernsey and Holstein-Friesian crosses in mid-lactation (130+/19 days)
- 0.5kg diet litre-1 milk
- Silage (3kg) + maize stover (ad-libitum) offered

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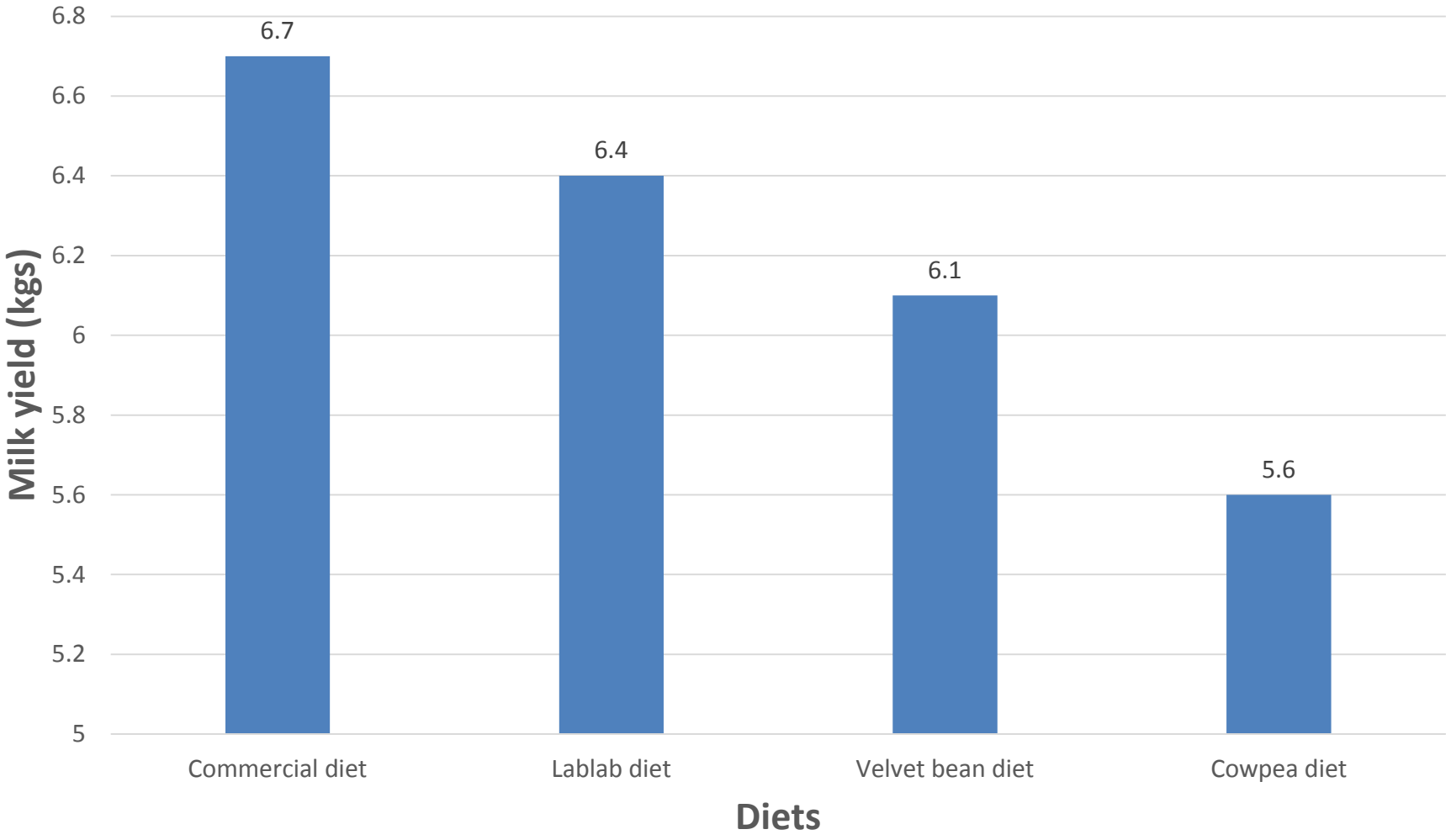
Results: Milk yield



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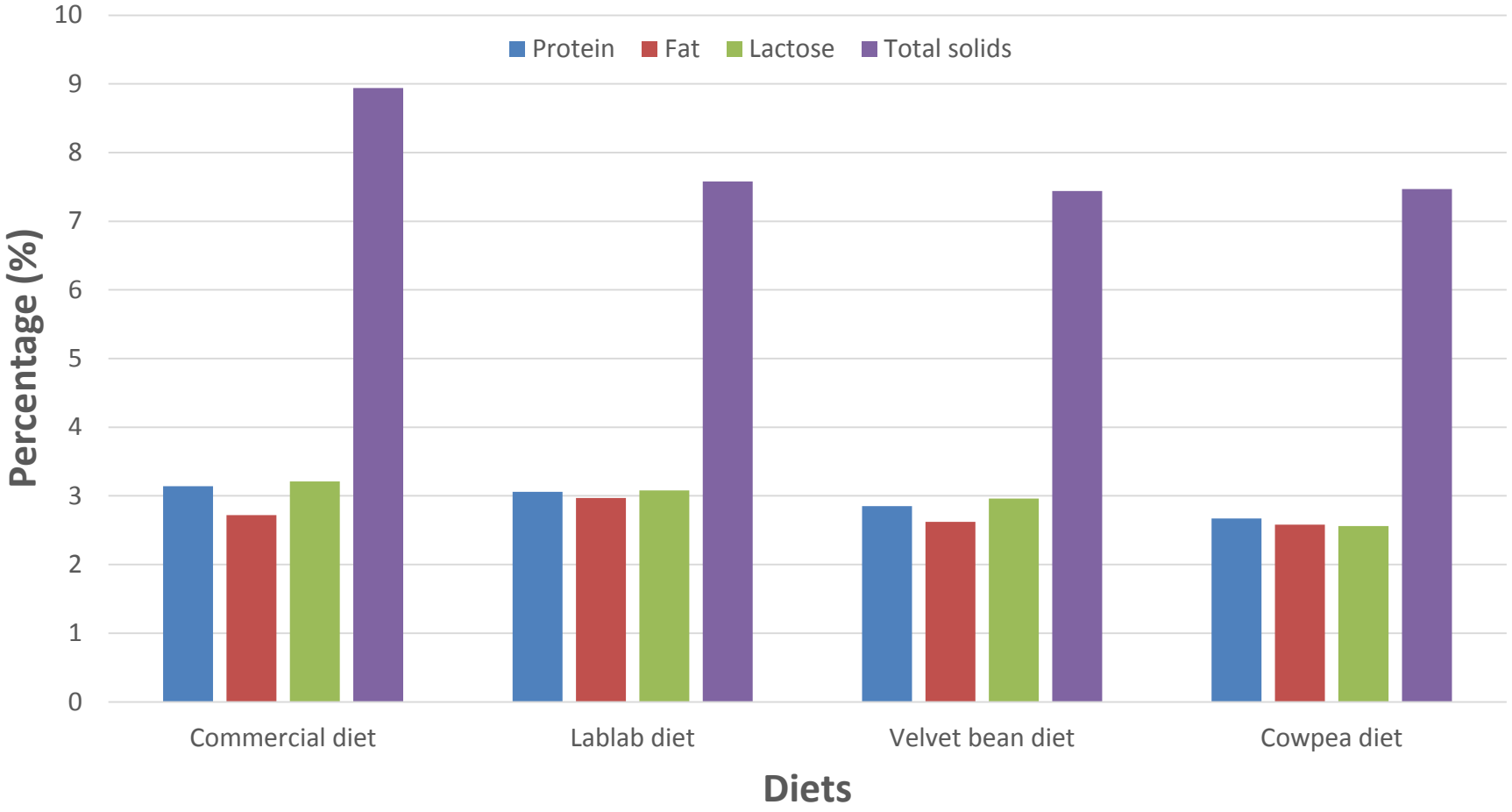
Results: Milk composition



Economic analysis

	Commercial diet	Lablab diet	Velvet bean diet	Cowpea diet
Milk yield/day (kg)	6.7	6.4	6.1	5.6
Milk income/day (US$)	2.81	2.69	2.56	2.35
Calculated feed/day (kg)	3.35	3.20	3.05	2.80
Feed cost/day	1.41	1.06	0.92	1.12
Gross income/day (US$)	1.40	1.63	1.64	1.23
Gross income/30 days (US$)	42.00	48.90	49.20	36.90
Cost to produce a litre of milk	0.21	0.16	0.15	0.20

Discussion: Voluntary feed intake

- Intake – No significant differences
  - ✓ Intake affected by form, ANFs and CP level
  - ✓ polyphenols, tannins, phytic acid, saponins, hydrogen cyanide, lectins and L-Dopa
- Dietary inclusion of less than 2kg/day and in dried form reduces toxic effect (Topps and Oliver, 1983 and Madzimure *et al.,* 2011)

Discussion: Milk yield

- Milk Yield – Significant differences
  - ✓ Commercial > Lablab > velvet bean > cowpea
  - ✓ Affected by ANFS
- Velvet bean has higher condensed and hydrolysable tannin level than lablab
- Velvet bean is comparable source of fermentable N for rumen microbes hence outperformed cowpeas

Discussion: Composition

- Milk composition - significant differences
  - ✓ Affected by ANF levels in the forages
- Forage inclusion depresses protein and increases fat (Hular and Brand, 1993)
  - ✓ Fat: lablab > commercial > velvet bean > cowpea
- Grain suppresses fat due to acetate:propionate ratio (Jenkins and McGuire, 2006)

Discussion: Economic returns

- Gross income higher for forage based diets
  - ✓ Velvet bean and lablab > commercial by 17% and 16.5%
- Cost to produce a litre of milk less for forage diets
  - ✓ Velvet bean and lablab < commercial by 28% and 23%

Conclusion

- Use of low cost farm produced forages as alternative feed enhances smallholder dairy viability

Thank you

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ILRI is a member of the CGIAR Consortium

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