



FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative



Balancing rations for productivity and profitability

Barry Bradford, Kansas State University

Photo: A. Davey via Wikimedia



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LIVESTOCK: GETTING THE LEFTOVERS

- In Ethiopia, as in many other countries, livestock survive primarily on crop residues and grazing of uncultivated land
- This makes livestock (ruminants especially) a key component of an efficient food system

Area	Feed utilization, %					
	Natural pasture	Crop residue	Improved feed	Hay	By-products	Other sources
Ethiopia	58.56	29.37	0.27	6.54	0.98	4.16
Amhara Region	69.62	23.14	0.35	2.24	1.06	3.57
Oromiya Region	66.62	25.12	0.21	2.65	1.15	4.2
SNNP Region	41.05	39.09	0.27	13.94	0.63	4.68
Tigray Region	37.74	42.34	0.31	14.47	1.03	4.08

Livestock and Livestock Characteristics. Rep. Vol. II. Addis Ababa: Federal Democratic Republic of Ethiopia, 2012.



SMART SUPPLEMENTATION

Supplements formulated to address nutrient deficiencies can generate incredible responses

- Prevention of deficiency-induced health problems
- Enhanced post-absorptive nutrient utilization
- Positive associative effects on digestion of the base diet





EXAMPLE: DORMANT/RESIDUAL FIBER

- In most temperate climates around the world, the dormant season presents a challenge for maintaining grazing livestock
- Dormant forages can be >75% fiber, with metabolizable energy content of < 2 kcal/g
- Response: supplemental energy?



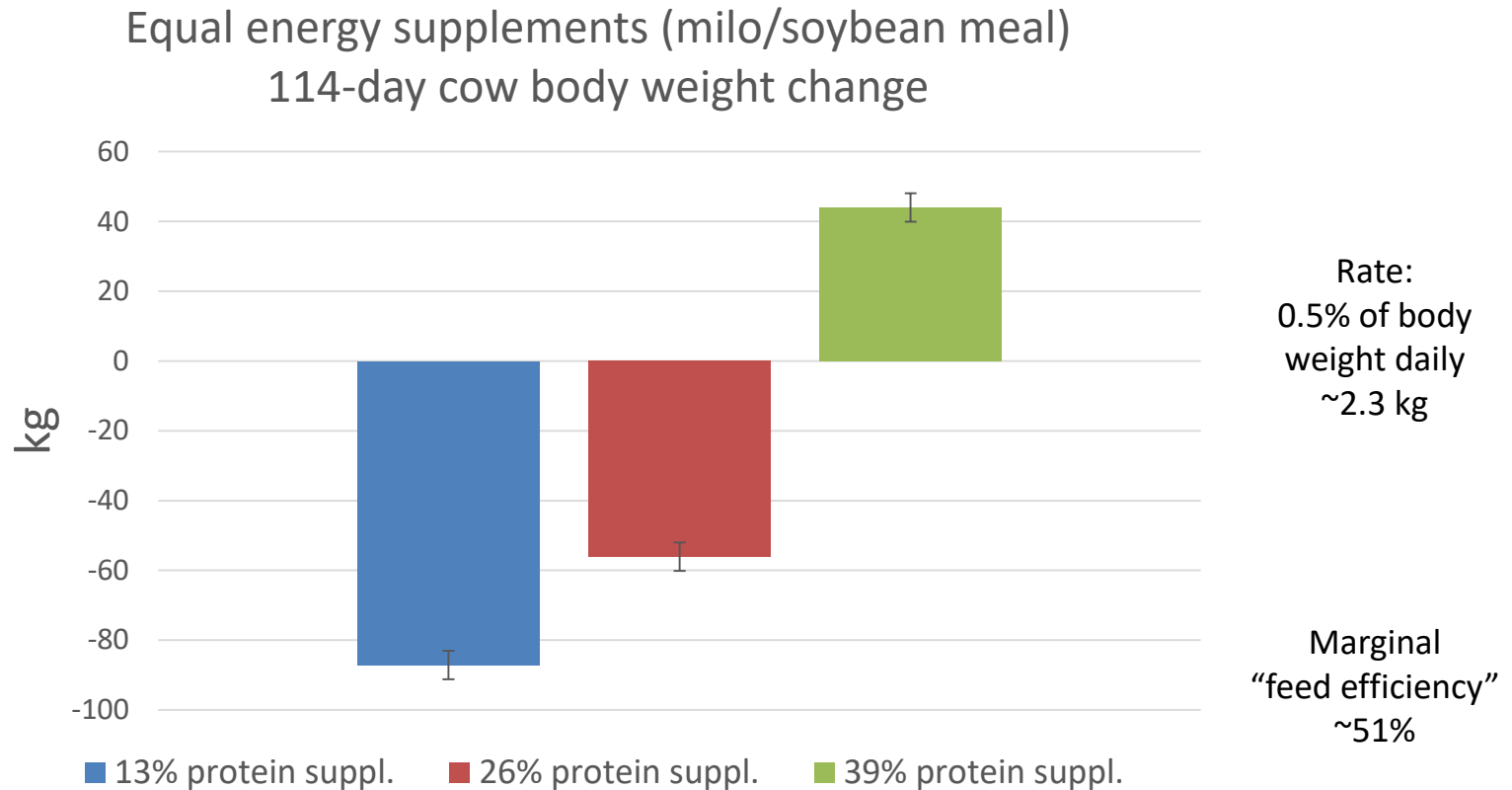
Photo: BEEF Magazine



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EXAMPLE: DORMANT/RESIDUAL FIBER

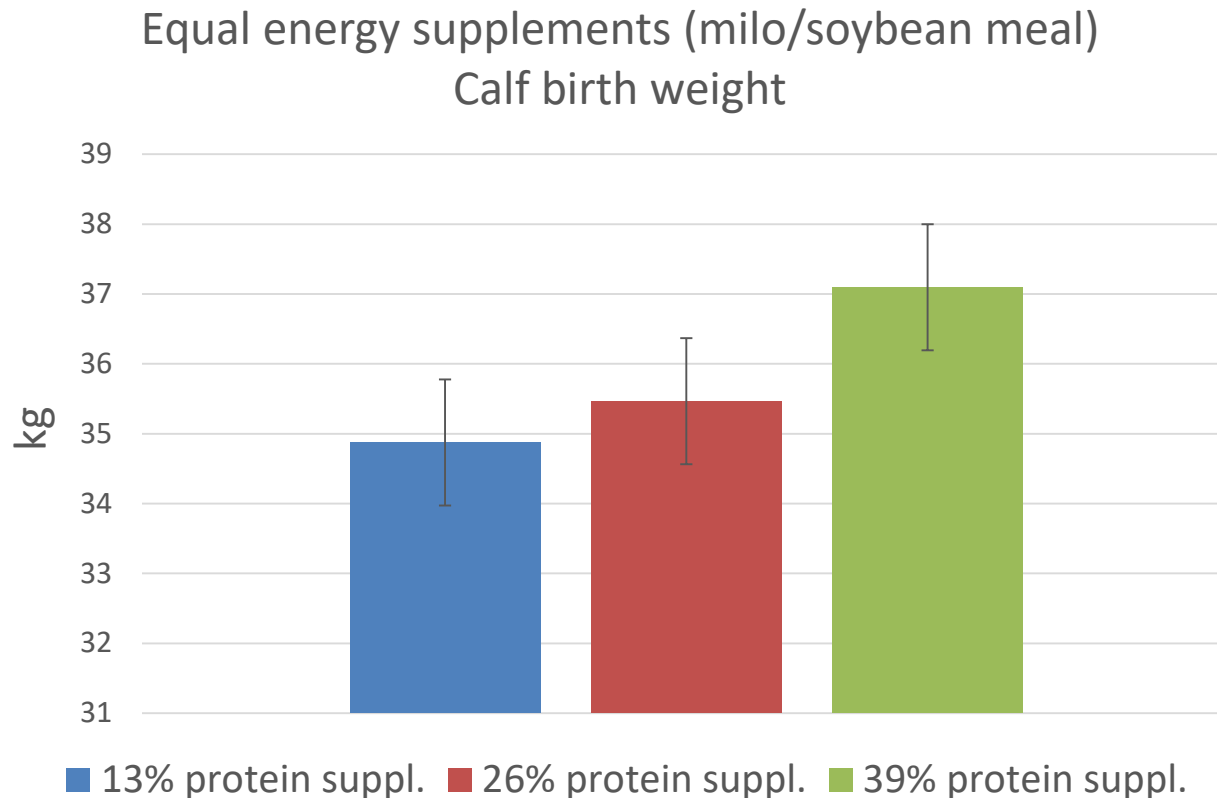




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EXAMPLE: DORMANT/RESIDUAL FIBER



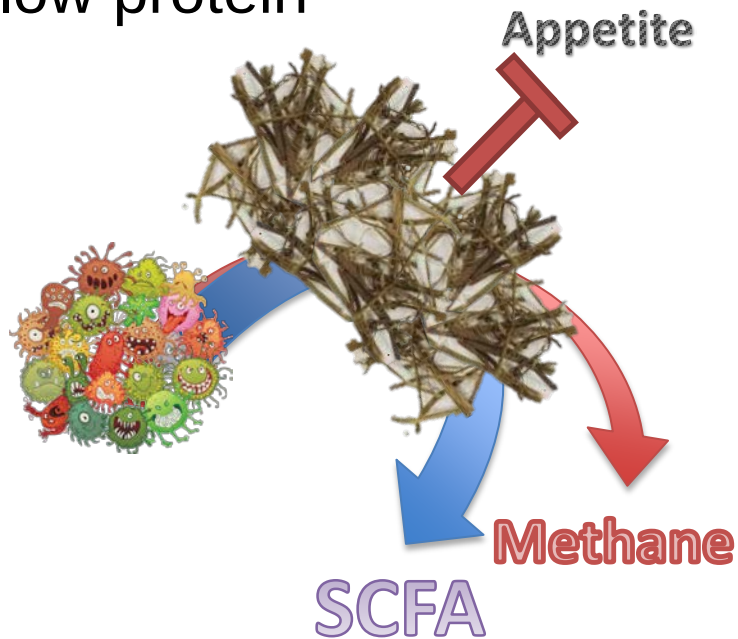


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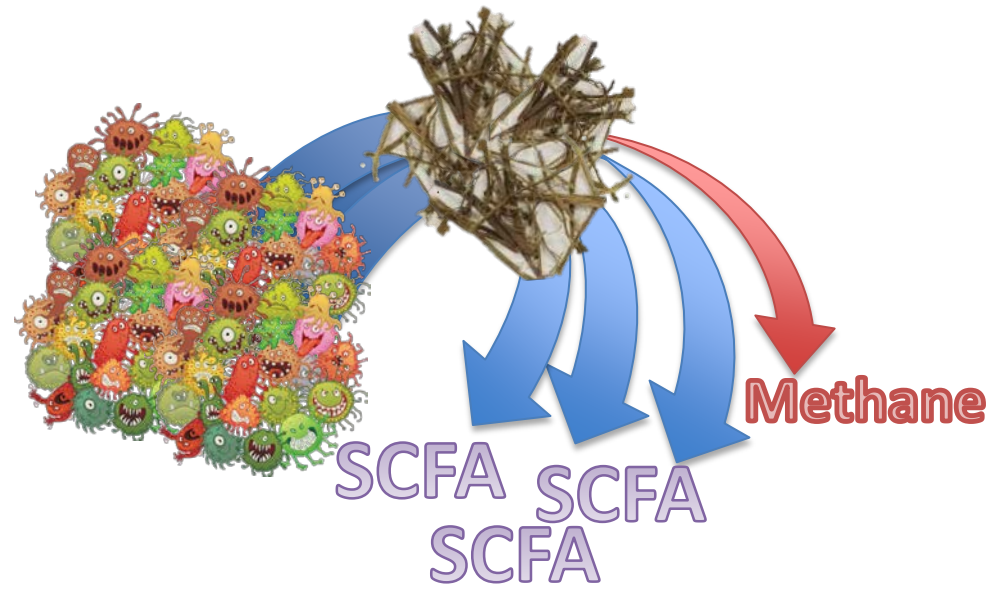
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NUTRITION IMPACTS FERMENTATION

Ruminal fermentation,
low protein



Ruminal fermentation,
adequate protein



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Contents lists available at [ScienceDirect](#)

Global Food Security

journal homepage: www.elsevier.com/locate/gfs



Livestock: On our plates or eating at our table? A new analysis of the feed/food debate



Anne Mottet^{a,*}, Cees de Haan^b, Alessandra Falcucci^a, Giuseppe Tempio^a, Carolyn Opio^a,
Pierre Gerber^{a,c}

^a Food and Agriculture Organization of the United Nations, Animal Production and Health Division, Viale delle Terme di Caracalla, 00153 Rome, Italy

^b Independent consultant, The Netherlands

^c Animal Production Systems Group, Wageningen University, P.O. Box 338, Wageningen, The Netherlands



COMPETING WITH HUMANS?

Human-edible (in part)

- Corn silage / corn grain
- Soybean meal
- Corn hominy
- Molasses

Human-inedible

- Lucerne hay
- Wheat straw
- Cotton seed
- Corn gluten feed
- Algae biofuel residue

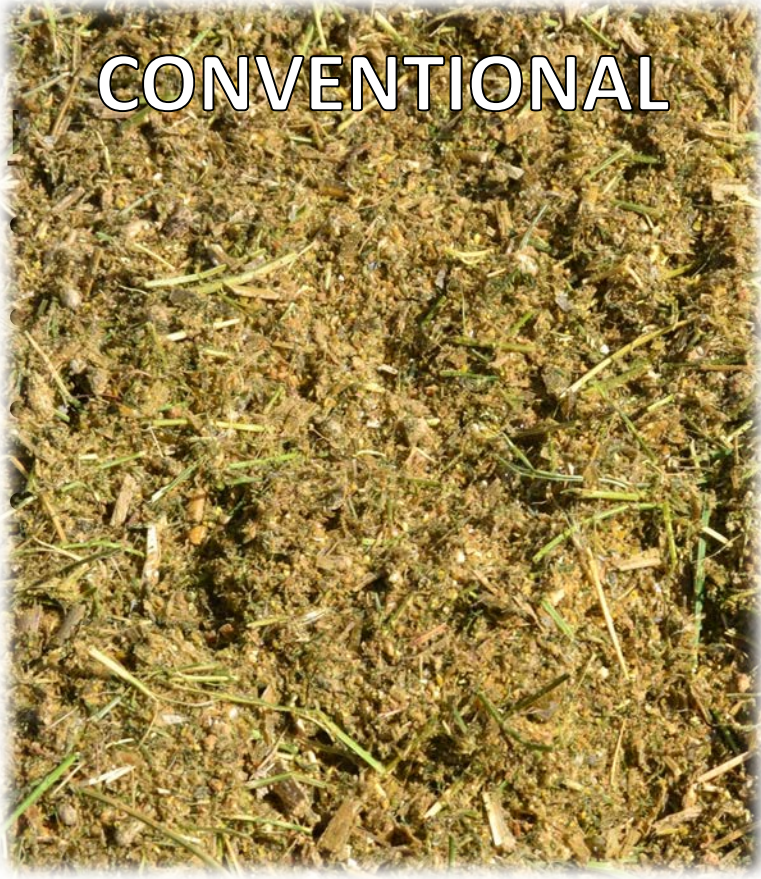


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COMPETING WITH HUMANS?

CONVENTIONAL



BYPRODUCT



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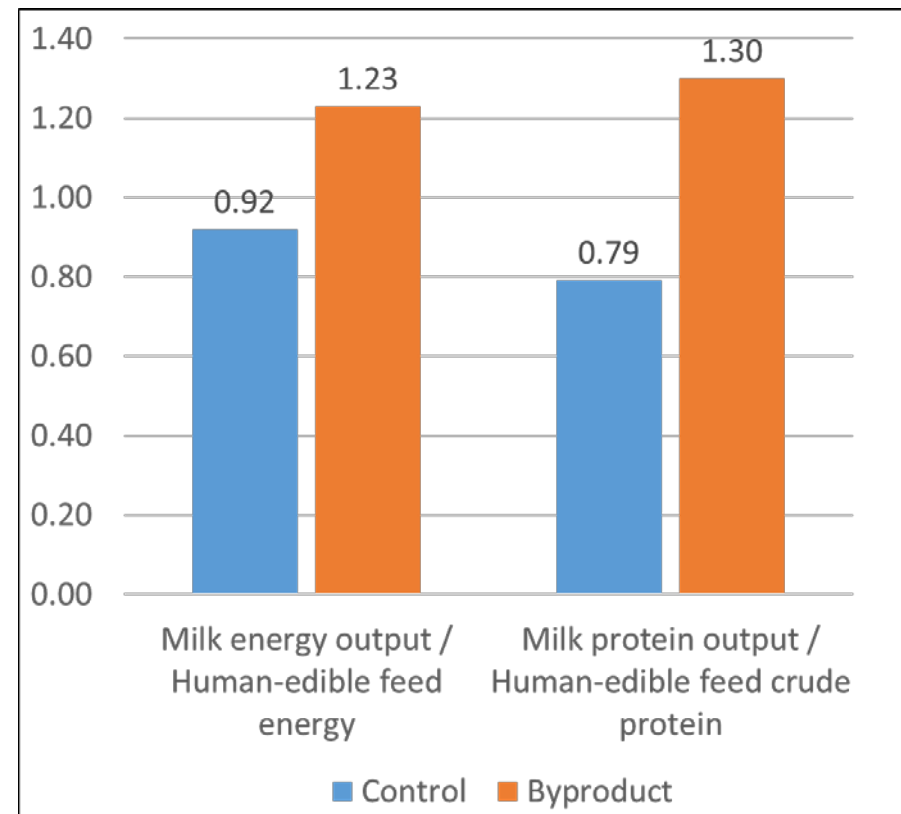


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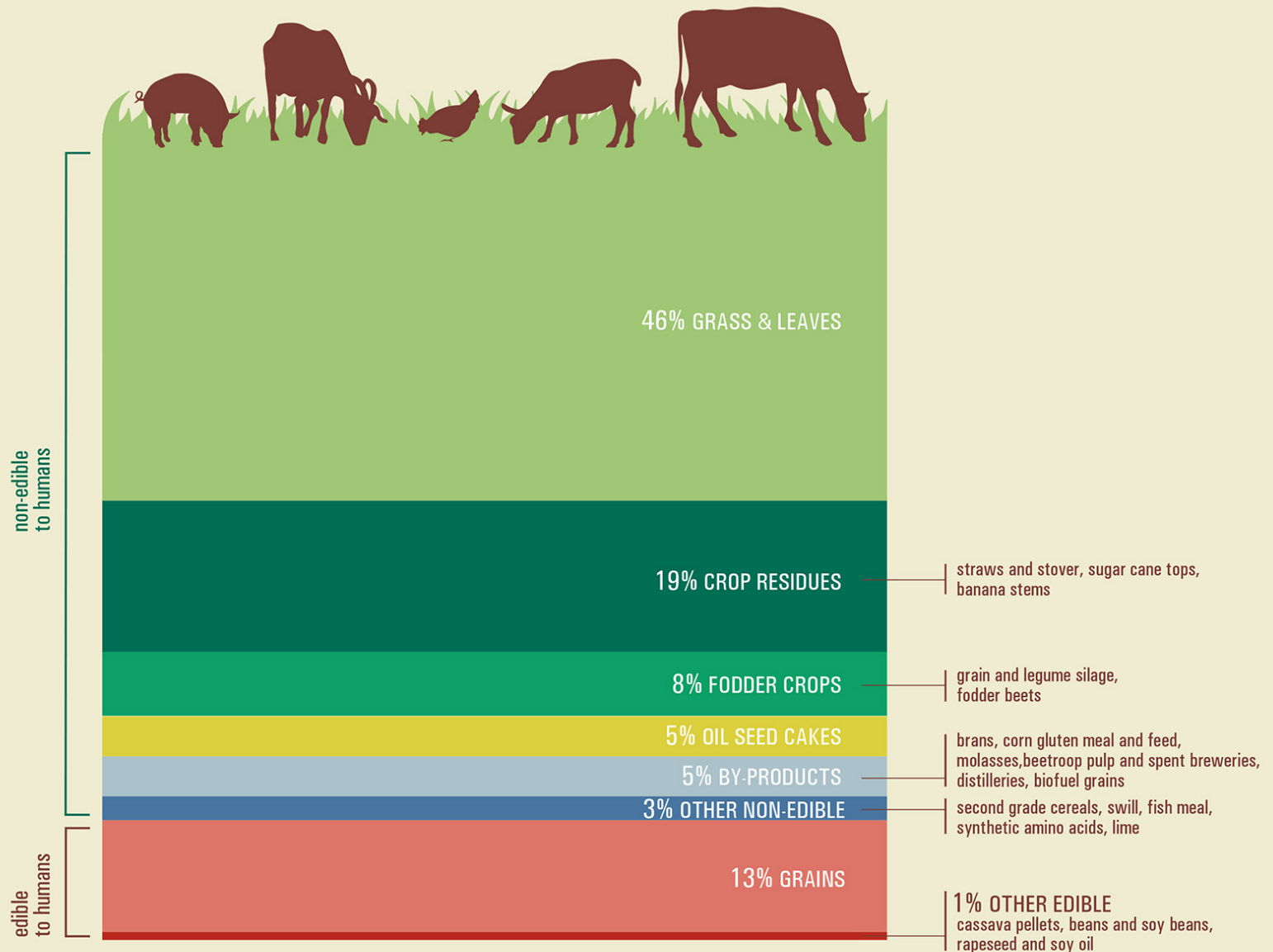
COMPETING WITH HUMANS?

- Byproduct diet supported > 35 kg/d of milk production
- Assuming the least wasteful use of food reasonably possible, the conventional diet had a slightly negative recoveries
- The high byproduct diet resulted in net gain of human-edible nutrients
- Ignores “nutrient upgrading”



6 BILLION TONNES DRY MATTER

*Infographic from FAO
on Mottet et al., 2017*





COMPETING WITH HUMANS?

Common Ethiopian byproducts

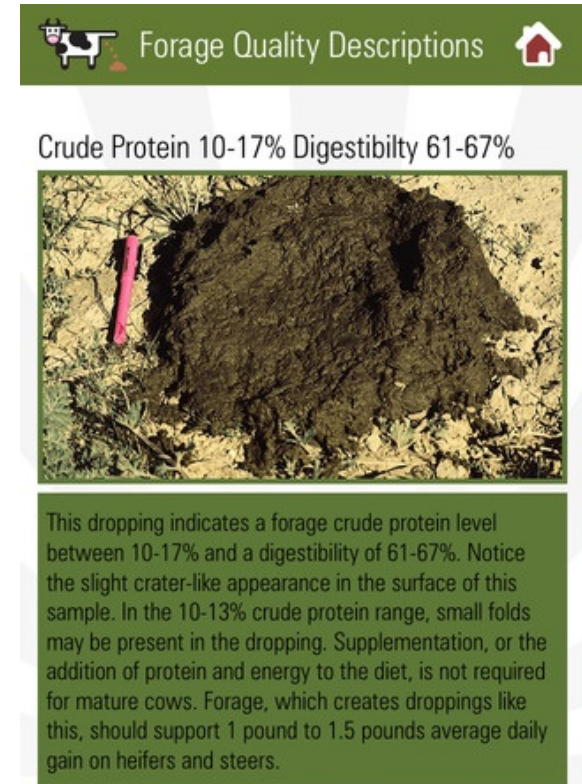
- Spent brewer's grains
- Noug cake
- Cottonseed cake
- Enset leaves
- Wheat bran
- Bean hulls





KNOWLEDGE: KEY TO SUCCESS

- Identify most critical primary deficiencies
- Avoid negative associate effects
- Avoid anti-nutritional factors
- Growing numbers of apps can help



Cow Poop Analyzer app



SUMMARY: FORMULATION IMPACTS

- For animals in low-input environments, addressing key nutrient bottlenecks with targeted (formulated) supplements can dramatically enhance productivity
- Particularly true for ruminants, due to compounding effects on digestibility of other diet components
- Depending on the species, supplementation strategies do not need to compete with human food supplies





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