CGIAR Initiative on Sustainable Animal Productivity

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Environmental co-benefits of improved forages in smallholder dairy systems of Kenya

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The importance of livestock

For PEOPLE

- Employment, income
- Economy
- Food and nutrition
- Cultural value
- Resilience and risk management

And the PLANET

- Biggest land user
- Natural resources:
  - Manure, soil carbon, energy…
  - Water use/pollution, degradation, GHGe…

Sustainability is a big issue and needs to be managed

Optimize the environmental footprint

"Good" & "Bad"

Without compromising the good!

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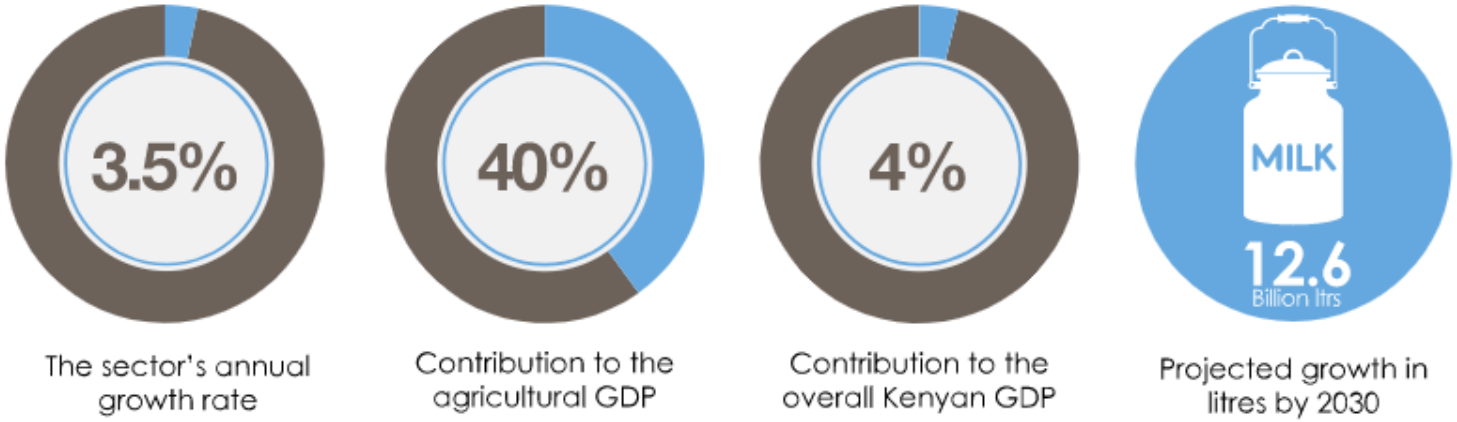
The Kenya case: Rising demand ~ ready market

http://www.kenyamarkets.org/current-sectors/dairy



Kenya has the second largest market in the dairy industry in Africa

Production is dominated by smallholder farmers with an average of 2-3 cows.

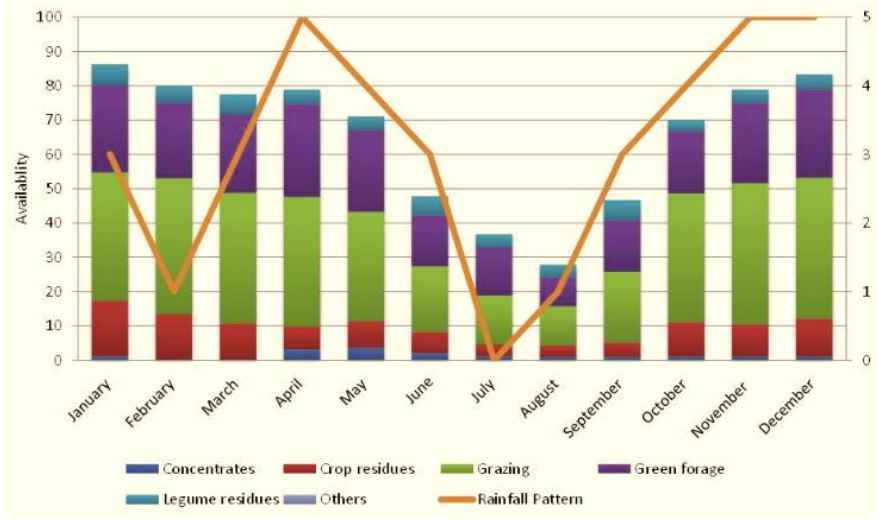
OF LOW PRODUCTIVITY

& emitting ~ 12.3 Mégatonnes (Mt) CO^2 eq

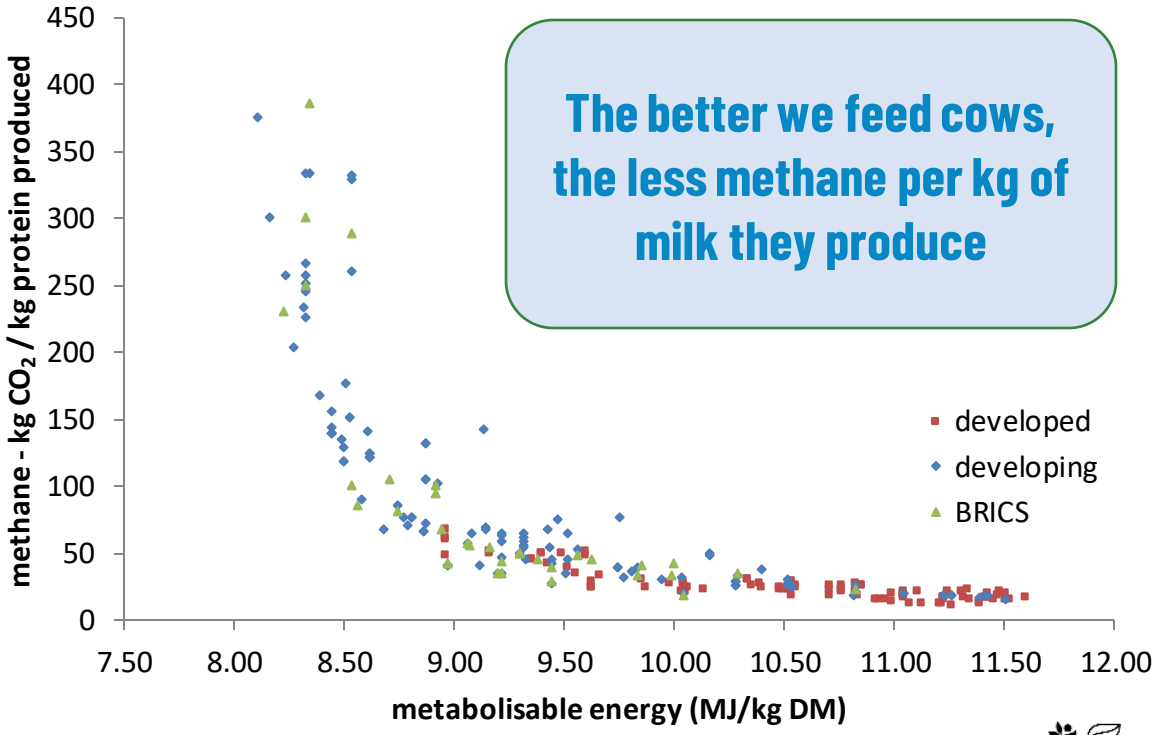
Integrating improved forages in livestock production systems: pitched as triple-win/climate smart solution

- ✓ Increasing year-round availability of feed quantity and feed quality (+ CC adaptation).
- ✓ Increasing livestock productivity and efficiency (feed being highest cost driver)
- ✓ Reducing GHGe intensity
- ✓ Improving land productivity

= a true triple-win or climate-smart intervention



Maass et al, 2013

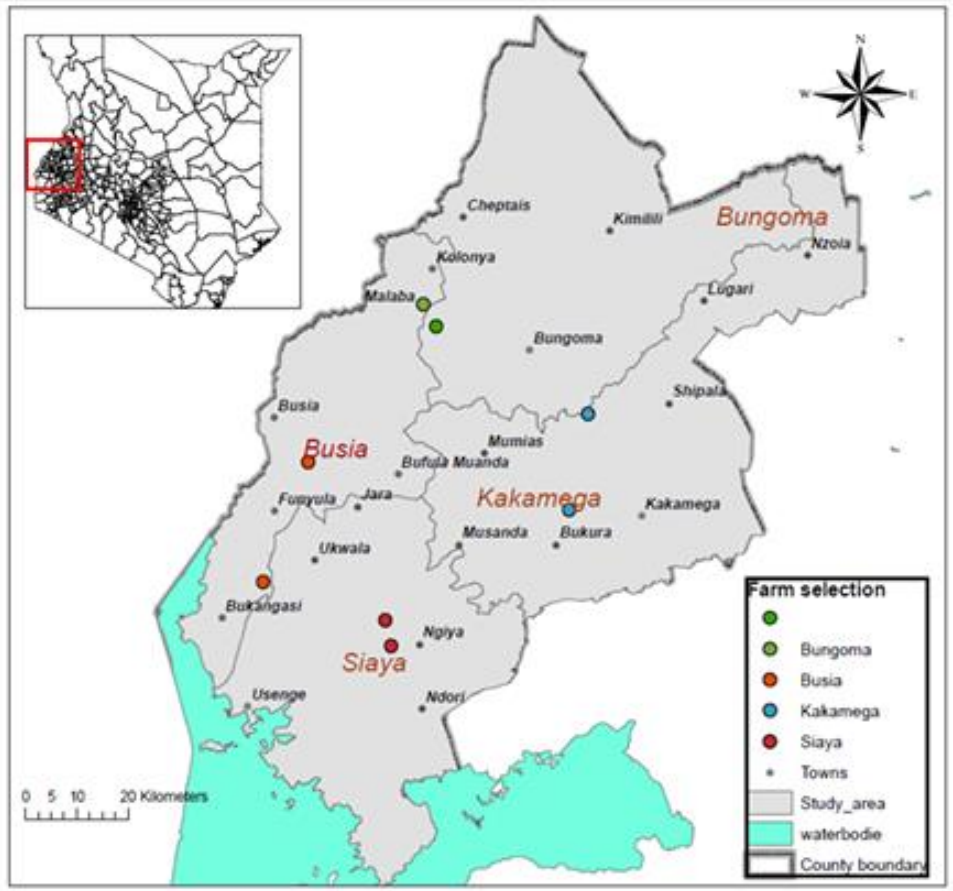


The better we feed cows, the less methane per kg of milk they produce

Herrero et al 2012

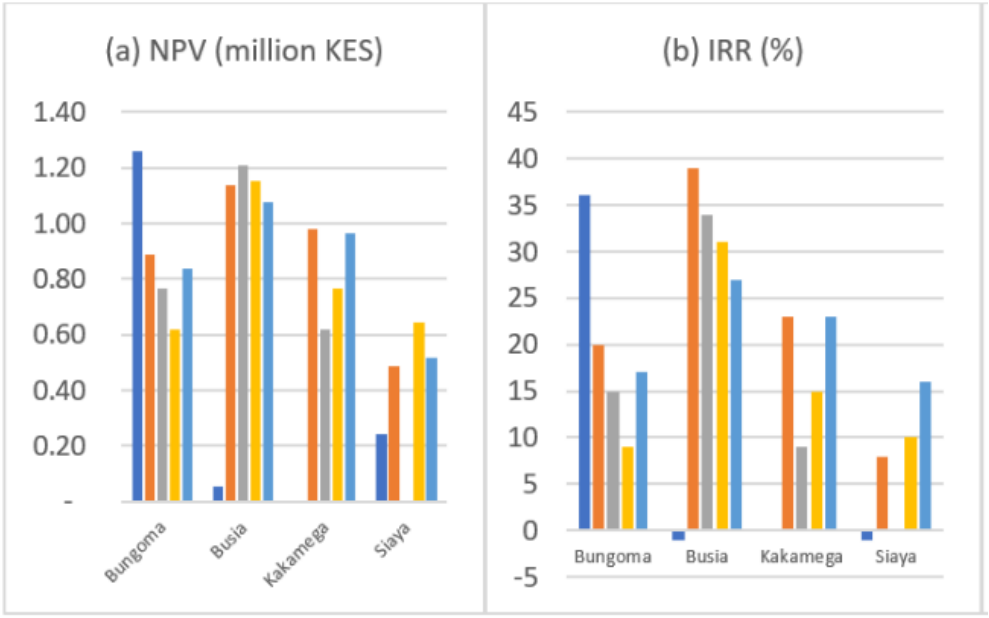
Filling the information gap on the economic significance and the environmental co-benefits

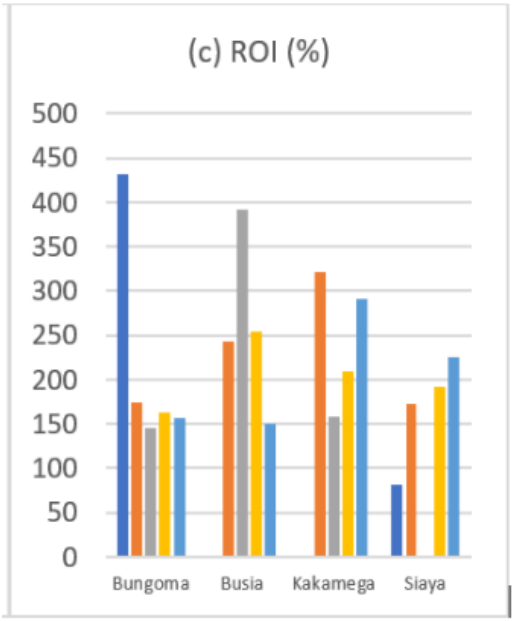
- **Western Kenya**: Busia, Kakamega, Bungoma, Siaya.
- **162 farmers testing** *Megathyrsus maximus* cv. Mombasa, Tanzania; *Urochloa* hybrid cv. Mulato II, Cayman; *Brachiaria brizantha* cv. Xaraes.
- **Data collection**: 1 year, 2 growing seasons. management practices, labour costs, fertilizer costs, manure costs, forage and hay sales, literatura.
- Economic evaluation
- Environmental assessment



Economic analysis

- Discounted free cash model
  - 12% discount rate
  - benefits from sales of hay and fresh forage (t/ha/y)
  - costs of forage establishment and maintenance.
- Annual benefits flows for the sales of
  - Fresh forage: 200 KES / bunch
  - Hay: 350 KES / 12 kg bale
- Estimation of profitability
  - Net Present Value (NPV)
  - Internal Rate of Return (IRR)
  - Return on Investment (ROI)





Environmental analysis

Environmental ex-ante assessment tool - "CLEANED" (https://alliancebioversityciat.org/tools-innovations/cleaned)

- inputs: agro-ecology, feed basket, feed management
- outputs: changes in land requirement, water use and greenhouse gas emissions

baseline wet season basket:

- 62% local natural grass,
- 5% Napier grass,
- 7% bean haulms,
- 10% maize stover,
- 5% sweet potato vines
- 11% Leucaena.

baseline dry season basket:

- 10% local natural grass,
- 60% Napier grass,
- 6% bean straw,
- 13% maize stover a
- 11% Leucaena.

Scenario:

- replacement of 50% Napier grass with Cayman
- resulting in 15% increase of milk yield (from 1600 to 1840 l/yr)

	Baseline	Cayman	Difference
Land requirement Total land required (ha/MT FPCM)	0.23	0.21	-9%
GHG emissions kg CO_2 eq. /kg FPCM	1.40	1.32	-6%
Water impact m^3/kg FPCM	0.47	0.40	-16%

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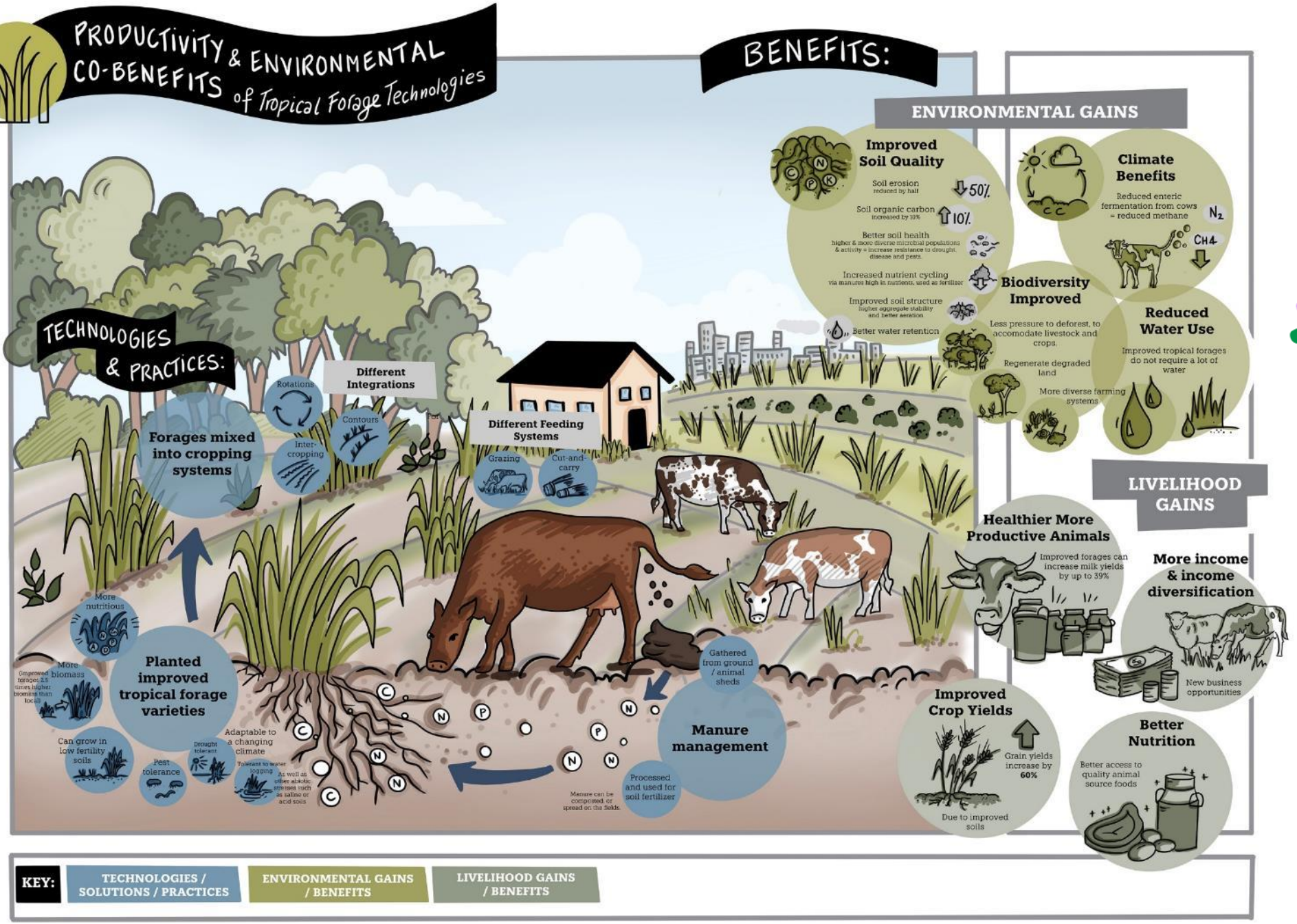
Conclusion

- Cultivating improved forages and using them to optimize dairy cows' feeding strategies
  - More efficient use of farmers' land and water
  - Positive returns on the investments
- Can act as a good climate change mitigation option

This information is useful for farmers as well as local private and local development partners when looking for solutions for the feed scarcity they commonly face.



Grasses

Most used/ commercialized
> 150 Mil ha worldwide

Legumes

High protein content
Biological Nitrogen Fixation

Shrubs and trees

Also mainly legumes
Often high drought tolerance
Slow establishment
Long-term persistence

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Thanks!

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