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

EQUIP: STRENGTHENING SMALLHOLDER SYSTEMS FOR THE FUTURE:

Feed and Fodder Learning Session

FEED THE FUTURE INNOVATION LAB FOR LIVESTOCK SYSTEMS
University of Florida
April 21, 2021

USAID FROM THE AMERICAN PEOPLE

BILL & MELINDA GATES foundation

ILRI INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

CGIAR

UF IFAS UNIVERSITY of FLORIDA

OUTLINE

- Livestock Systems Innovation Lab
- Landscape analysis
- Forage / Fodder development
- Feed efficiency
- Feed by genetics interaction
- Role of gender in feeding

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FEED THE FUTURE INNOVATION LAB FOR LIVESTOCK SYSTEMS

- **Vision:** To sustainably intensify livestock production to improve the nutrition, health, incomes and livelihoods of the poor.

- **Scope:** Manage 45 field-to-fork research for development projects in 8 countries.

- **Motivation**: Animal-source foods (ASF):

  - Are the best, high quality nutrient-rich food for 6-23 mo. olds (WHO, 2018);

  - 59% of children are not fed much-needed nutrients from ASF (UNICEF, 2020)

PREMIER PARTNERSHIP PROJECT

The LSIL is the first project funded by the USAID – Bill & Melinda Gates Foundation strategic partnership.

Our EQUIP project leverages USAID funds that established the Livestock Systems Innovation Lab

UNITED STATES AGENCY INTERNATIONAL DEVELOPMENT
USAID

BILL & MELINDA GATES foundation

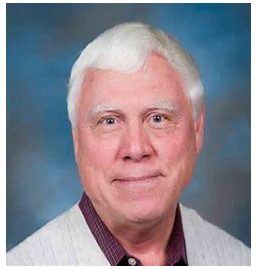
THE UF FEED PROJECT TEAM

Dairy management and genetics

Geoff Dahl

Francisco Penagaricano

Agronomy

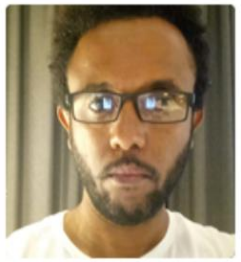


Ken Boote

Jose Dubeax

Esteban Rios

Animal Nutrition



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LANDSCAPE ANALYSIS

PI Name & Institution:
For ET: Dr. Adugna Tolera, Hawassa University
For BF: Dr. Augustine Ayantunde, International Livestock Research Institute (ILRI)

Collaborators:
For ET: Ethiopian Institute for Agricultural Research (EIAR), Tanager-ACDI/VOCA and ILRI
For BF: Institute de l'Environnement et de Recherche Agricole (INERA)

FEED DATABASE DEVELOPMENT

Milestone: Approximately 8000 new feed entries made into new (BF) and existing (ET) feed databases on listing types, availability, quality, prices, etc.

Opportunities:

- Allows formulation of least cost, environmentally benign rations that optimize productivity
- Allows contingency planning by governments/other stakeholders
- Highlights low productivity of private sector feed mills, providing an opportunity for improvement

Item	ET		BF	
	From literature	Sampled by EQUIP	From literature	Sampled by EQUIP
No. of feeds reviewed/sampled	2175	767	1658	395
No. analyzed by EQUIP with NIRS	1491		1804	
Total entries in the feed database	4433		3857	

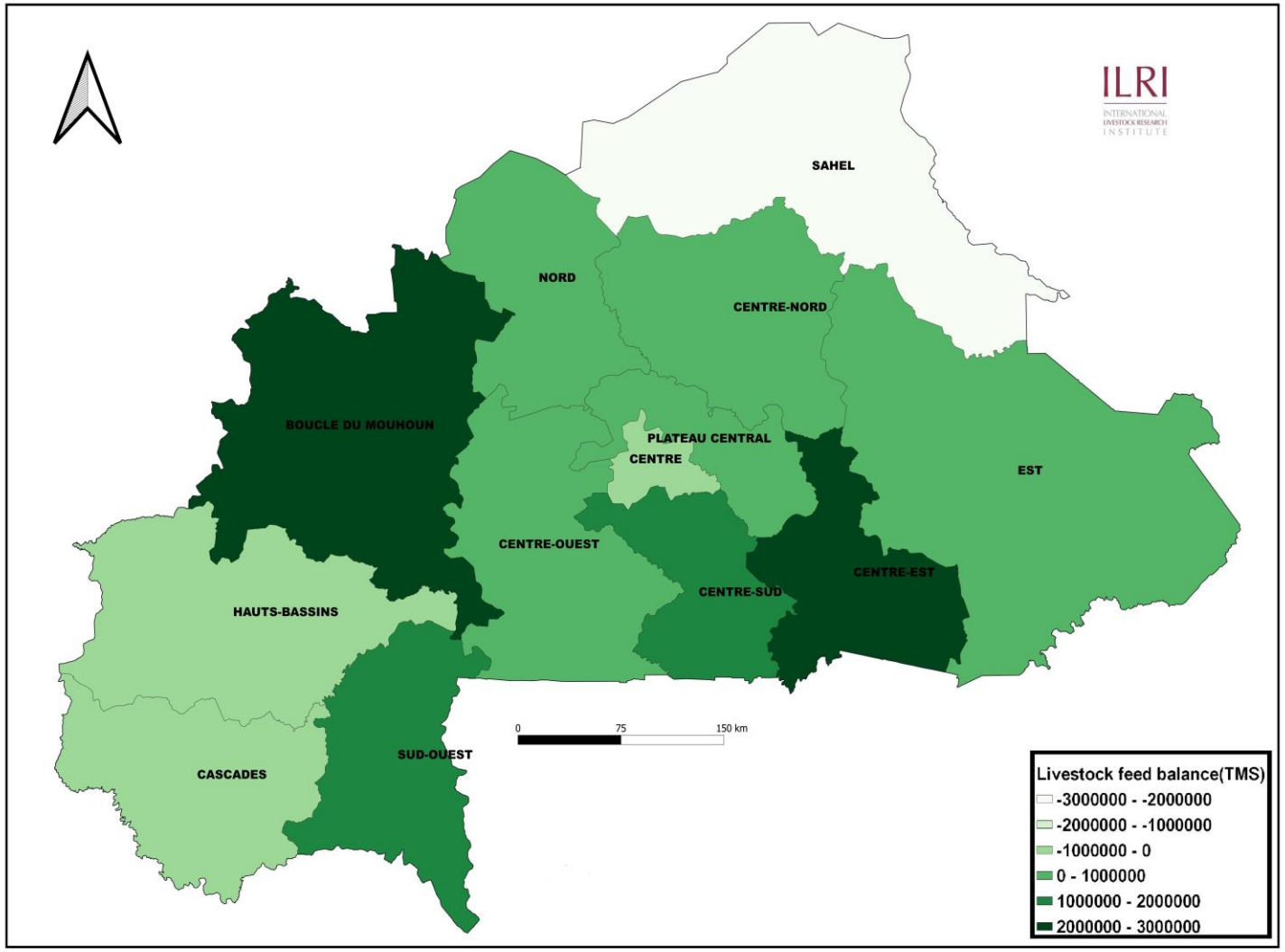
FEED SUPPLY-DEMAND SCENARIO

Milestones:

- Mapped the feed supply-demand scenario across BF
- Showed 6 tons surplus feed produced for BF but a 2-ton deficiency in the north (Sahel zone)

Opportunities:

- Increase feed production with drought tolerant hybrids in the Sahel Zone
- Increase feed conservation and transport from other areas to the Sahel Zone.
- This can create business opportunities for smallholders especially women and youth



IMPROVING ACCESS AND MARKET

Linking livestock keepers and feed traders 800 km apart in Niger reduced feed costs by 30% and increased feed sales by 12.6 tons in 4 months ($3,600) in 2019, and by 9.5 t ($2,700) in 2020.

Ramana Doni earned 33% more money from sales of her (well-fed) sheep.

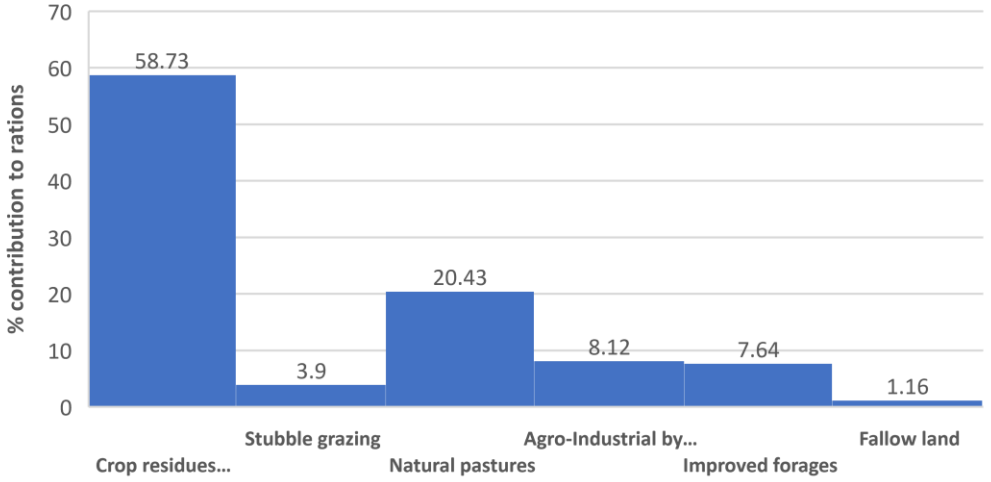
IMPORTANCE OF CROP RESIDUES

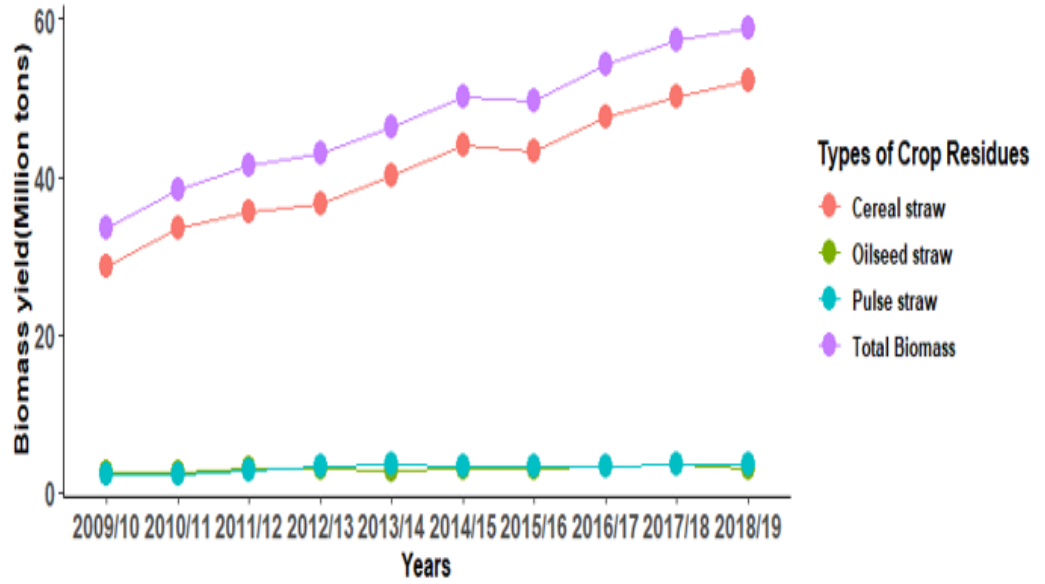
Milestones:

- Crop residues are by far the most important feed source in LMICs and their contribution is growing
- Crop residues are notoriously poor in quality

Opportunities:

- Physical, chemical and biological methods can be used to improve crop residue quality
- Investments in technologies and training on crop residue improvement, transport and storage are needed
- These can present business opportunities for small/medium enterprises





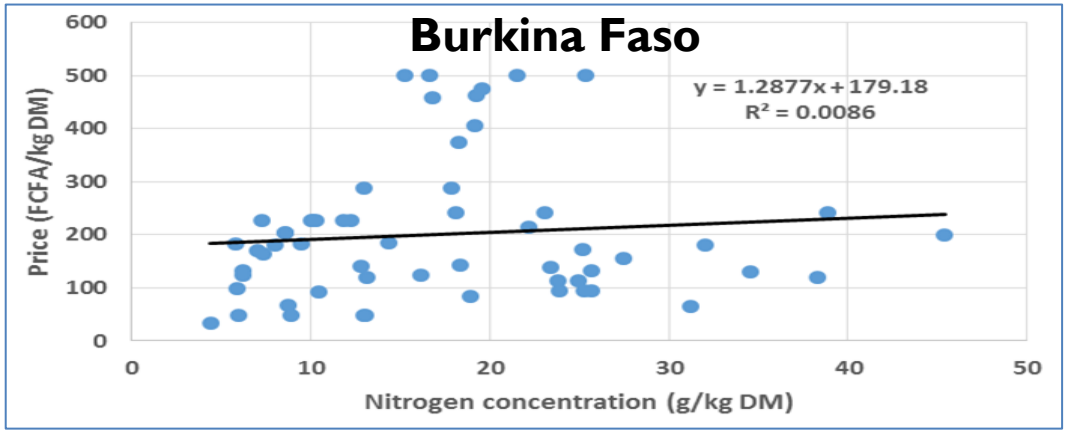
FEED PRICE-QUALITY RELATIONSHIP

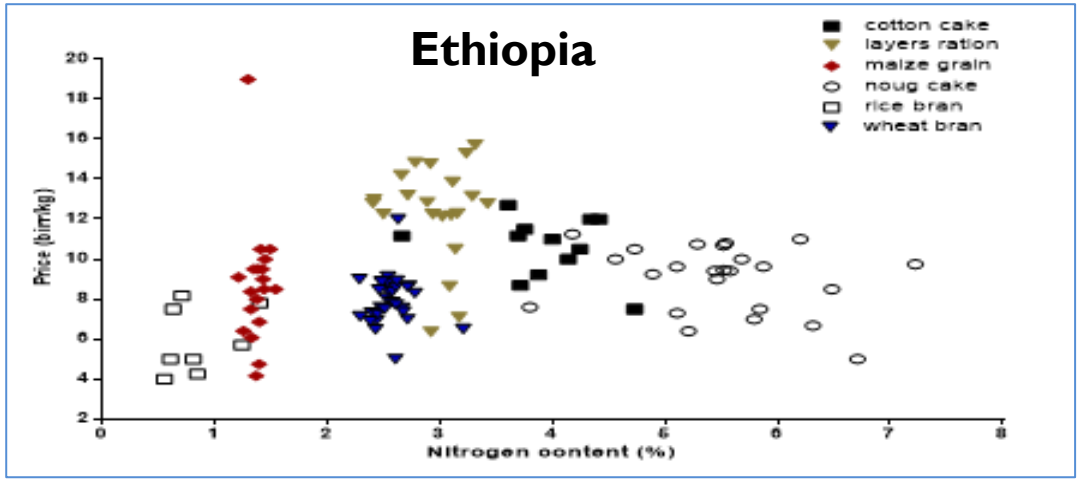
Milestone: Little/no relationship between feed quality and price

- Caused by lack of awareness for feed quality
- Limits livestock productivity and increases emissions

Opportunities:

- Raise awareness on importance of feed quality
- Develop a feed quality index that will inform pricing, incentivize quality and increase productivity
- Use cheap hand-held NIRS systems to assess quality (business opportunity)





FODDER/FORAGE DEVELOPMENT

PI Name & Institution:
For ET: Dr. Fekede Feyissa, M. Menta, and A. Ashagrie, EIAR
For BF: Nouhoun Zampaligré, INERA and Dr. Ken Boote, UF

Collaborators:
For ET: Drs. Boote, Esteban Rios and Jose Dubeaux, UF
For BF: Drs. Boote, Esteban Rios and Jose Dubeaux, UF

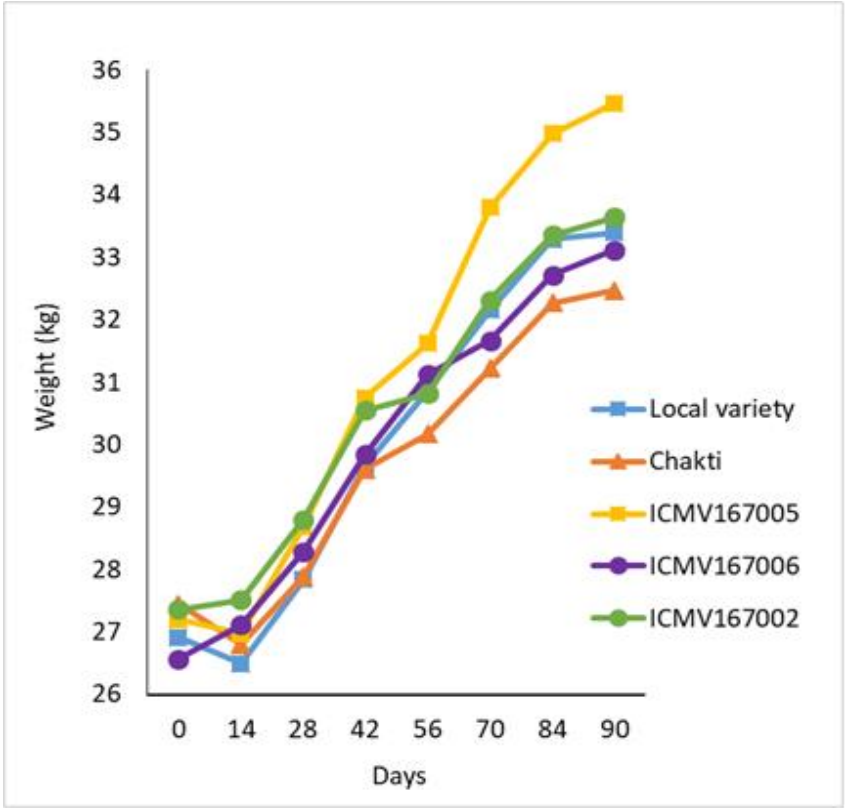
VALIDATION OF BEST BET INTRODUCED FORAGES

Milestones :

- Validated the improved productivity and nutritive value of introduced and local best-bet forages in various countries
- Several have been recommended to the govts. for release

Opportunities.

- Expedite approval of release of these varieties, and provide an enabling seed system environment
- Focus on traits that enhance livestock performance not just agronomy e.g. those that improve nutritive value (low lignin/FAE/BMR, leafy, fibrolytic enzymes, high N/ low tannin, etc.)
- Target dual-purpose hybrids to smallholders; develop forage-only hybrids to maximize livestock productivity



Liveweight gain by sheep fed stover of local and improved dual-purpose millet varieties

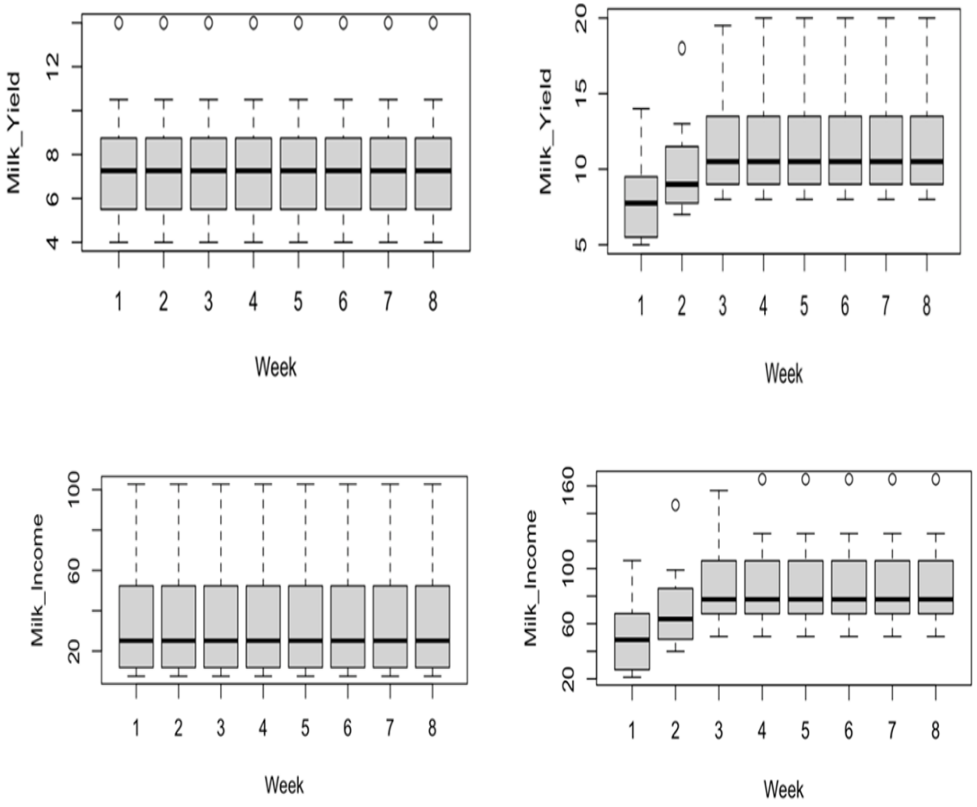
IMPROVED FORAGE DIETS IMPROVED PRODUCTIVITY & PROFITS

Milestones:

- Substituting improved forages for concentrates did not reduce milk yield.
- When farmers grew and fed cows our improved forages, milk yield increased by **36**% and profits by **49%** compared to farmers' practice.
- Showed that farmers were willing to pay for improved fodder, but this varied with region, livestock system, etc.

Opportunities

- Examine and understand barriers to adoption of improved forages, particularly by women.
- Raise awareness, provide training and sustained private sector-led extension support on adoption / use of improved forages.



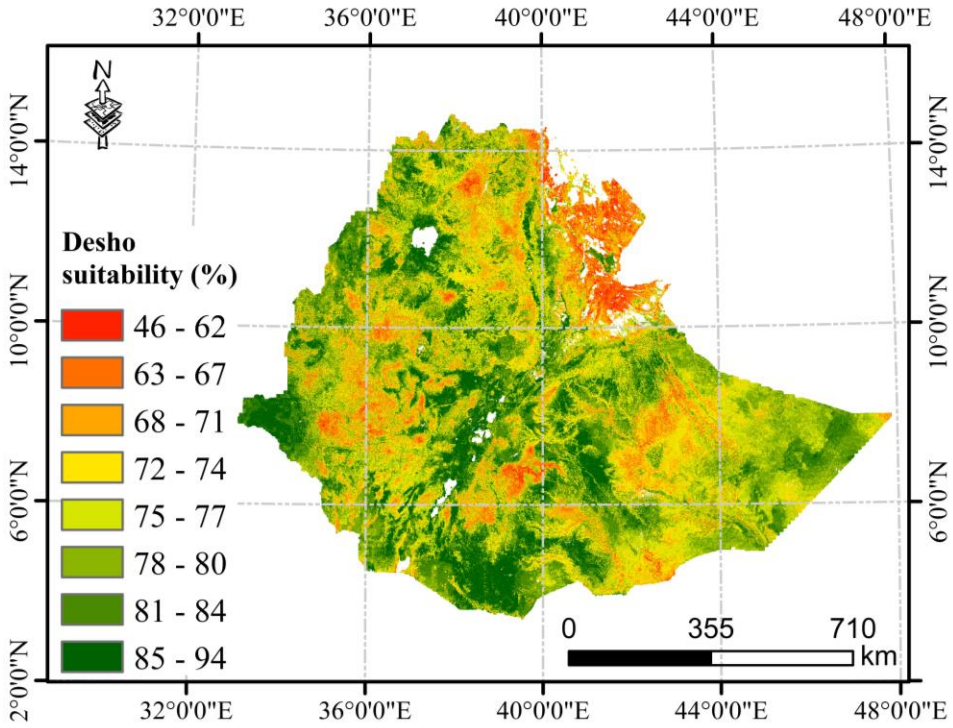
Effects of farmer's practice (left) and improved forage (right) diets on milk yield (l/d) and , milk income (Birr/day) in ET.

FACTORS AFFECTING WTP FOR IMPROVED FORAGE

Variable	Tobit double censorship statistics for WTP for cultivated forage (ll = 0. ul = 200)		
	Coefficient	t	P>t
Cotton cake prices 2017	0.056429***	5.62	0.00
Crop residue expenditures	-0.0001111	-0.46	0.646
Trans-boundary trans-humance	-111.79**	-2.49	0.014
Ethnic group	-69.41114*	-1.89	0.06
Practice of fattening	-28.10858	-0.81	0.422
Number of years of experience	0.990793	0.73	0.465
Knowledge of forage crops	137.89***	3.05	0.003
Practice of grazing	-47.17054	-0.65	0.516
Practice mowing and conservation	-9.985132	-0.28	0.778
Livestock number	0.0024388	0.03	0.978

MODELING NUTRITION IMPACTS

- Mapped areas suitable for irrigated fodder production
- Showed that adopting irrigated fodder and crossbred cows can increase substantially milk production and consumption of eggs **(28-fold)** and milk **(3-fold) in the home**



Areas suitable for growing Desho grass in Ethiopia

FEED ANALYSIS

PI Name & Institution:
For ET: Dr. Alan Duncan, ILRI (late Michael Blummel)
For BF: Dr. Augustine Ayantunde, ILRI

Collaborators:

For BF: Dr. Nouhoun Zampaligre, INERA

MOBILE NIRS SYSTEMS ARE AS GOOD AS TRADITIONAL SYSTEMS

Milestones:

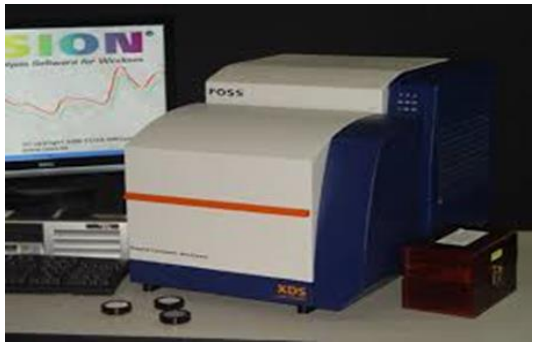
- Showed that mobile NIRS systems costing 3% of the cost of desktop systems are just as accurate for feed analysis
- This will be a game changer for feed analysis in LMICs

<US$2,000

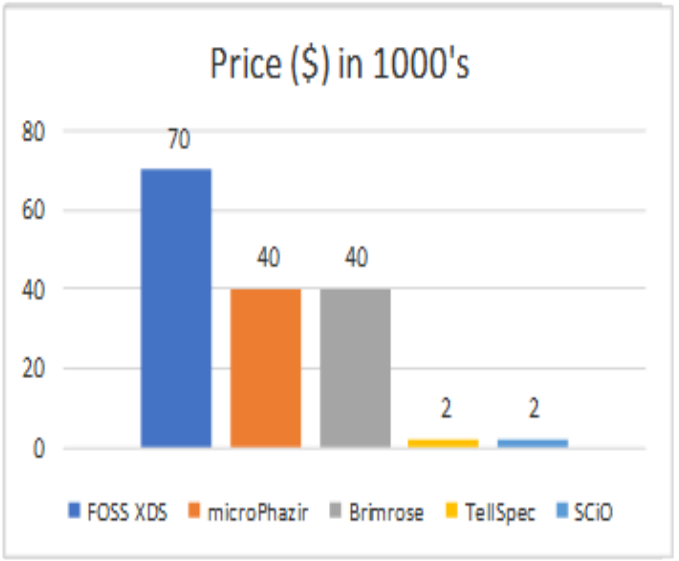
Opportunities:

Creates opportunities that can revolutionize

- feed analysis leading to feeding balanced rations, improved livestock productivity and lower emissions.
- feed marketing with accurate labelling on quality and safety.
- Presents business opportunities for smallholders



>US$ 70,000



NIRS	R^2 crucible	R^2 plastic bag
FOSS XDS	0.94 - 0.99	0.94 - 0.99
Brimrose	0.85 - 0.97	0.81 - 0.97
microPhazir	0.90 - 0.98	0.86 - 0.97
TellSpec	0.84 - 0.96	0.85 - 0.97
SCiO	0.62 - 0.81	0.50 - 0.66

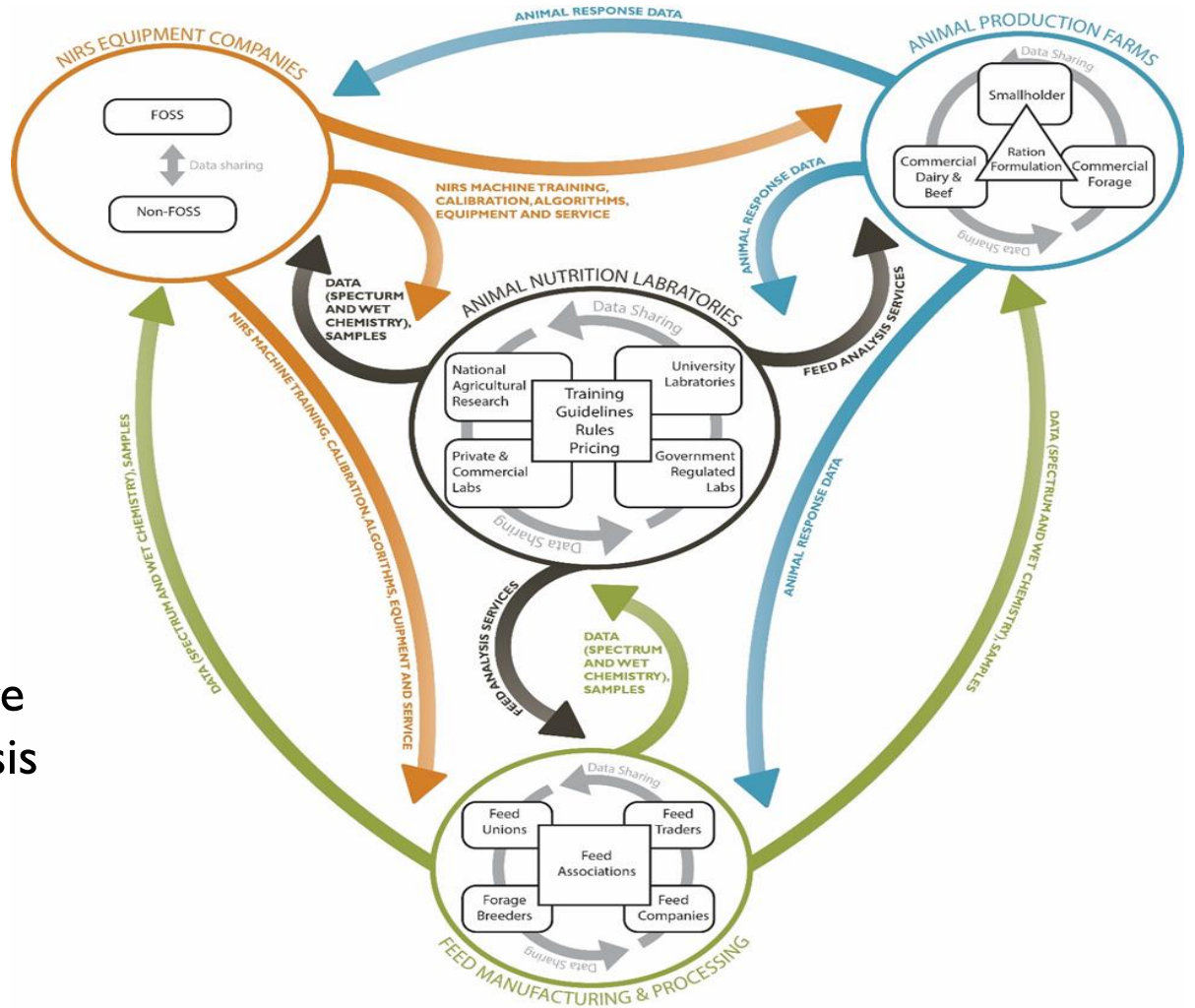
ESTABLISHMENT OF NIRS CONSORTIA

Milestone:

- Established a community of practice (ET) and PPP (BF) aimed at sharing equations and capacity development, and advancing feed analysis

Opportunities:

- Prevents continued accumulation of dysfunctional donor-funded NIRS machines in LMIC labs
- Need to create an Africa-wide consortium for more pronounced improvement of capacity in feed analysis



FEED EFFICIENCY

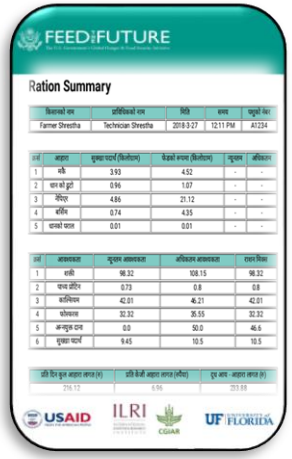
PI Name & Institution:
For ET and BF: Dr. Ermias Kebreab, University of California - Davis

Collaborators:
For ET: A. Ashagrie, EIAR, A. Tolera, Hawassa University
For BF: INERA, N. Zampaligre

RATION FORMULATION SOFTWARE

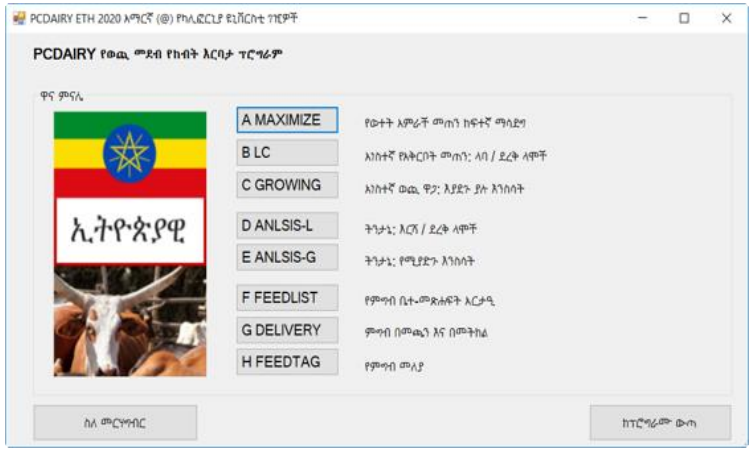
Milestones:

- 94% of farmers who used our ration formulation app in Nepal reported improved milk production
- Developed software for formulating balanced rations in BF and ET in local languages
- Updated the software with our meta analysis data on local feed quality and nutritional requirements of tropical cattle



Opportunities:

- Train technicians and farmers to use the software; and provide sustained private sector led, IT-enabled extension support
- Creates a business opportunities for entrepreneurs
- Need to develop a smart phone-based app for ET and BF



FEED X GENETICS INTERACTION

PI Name & Institution:
For ET: Dr. Carl Birkelo and Dr. Bayissa, Tanager (ASI) - ILRI

Collaborators:
Dr. Geoff Dahl, UF; Dr. Francisco, Penagaricano, UW
Ethiopian Regional Cooperative Extension Service,

IMPROVED FEEDING CRITICAL FOR OPTIMIZING PRODUCTIVITY

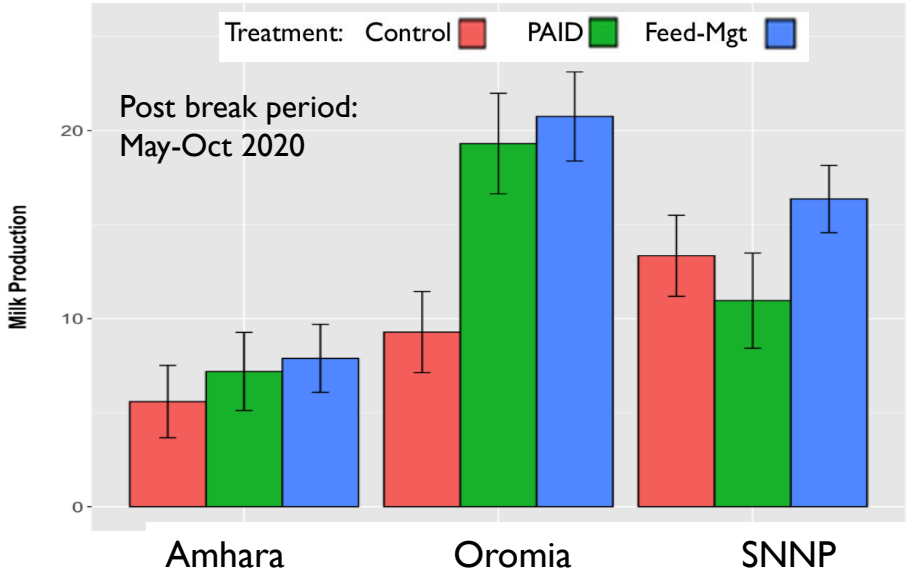
Milestone:

- Showed that improving feeding increased milk production by 42 (pre break) to 59% (post break).
- Showed that improving genetics without simultaneously improving feeding yields little to no benefits
- Improved feeding must be a component of livestock productivity improvement strategies

Opportunities:

- Raise awareness and provide sustained IT enabled-private sector led extension support for improving feeds and feeding
- Complement existing genetics investments with feed supplements to maximize impacts

Effects of adding feeding and management to a genetics (PAID) intervention on milk production (kg/day)



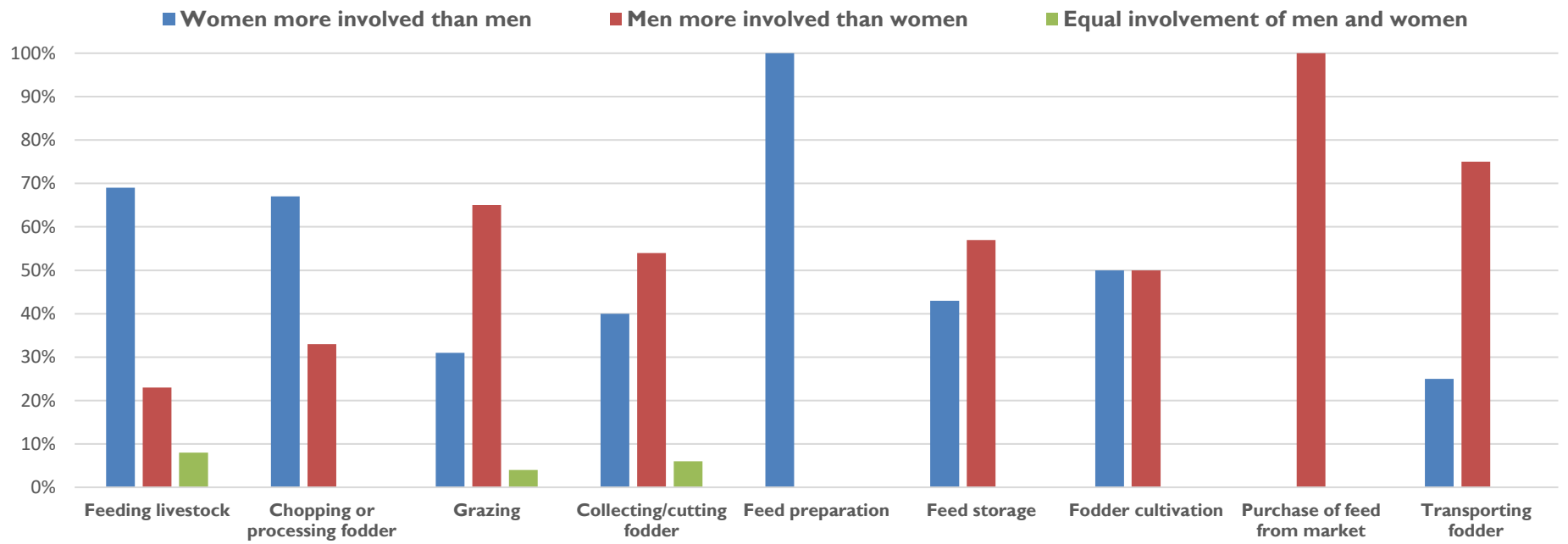
ROLE OF GENDER IN LIVESTOCK FEEDING

Milestones:

- Submitted a journal paper on the topic
- Showed that women were more often involved in feeding of livestock, feed preparation, and feed processing while men were more often involved in grazing, feed purchase and transport.
- Showed that women play an important role in marketing feed.
- Some farmers in ET prefer purchasing feed from women at higher cost, because the quality is better and the feed is less likely to be adulterated.

Opportunities:

- Need to build capacity and empower women to ensure adoption of feed innovations
- More information needed for some feed tasks



TAKE HOME MESSAGES

- Feed is the most potentially impactful and expensive factor limiting livestock production
- Interventions that ignore proper feeding will have little to no benefits.
- Need to invest in research, training and extension in various areas to advance quality feed production and proper feeding in LMICs.
- Great opportunity for private sector engagement in many facets of feed production, conservation and trade
- Need to address farmer-herder conflicts urgently, particularly in W. Africa.
- Women as well as men are highly involved in feed activities
- The FEED team including the Livestock Lab partners are highly capable to address the feed sector research, teaching, extension and private sector engagement needs highlighted.

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