

# Analysis of milk production, butter marketing and household use of inputs in rural Ethiopia

*Berhanu Gebremedhin, Kaleb Shiferaw, Azage Tegegne and Dirk Hoekstra*

30<sup>th</sup> International Conference of Agricultural Economists (ICAE)

July 28 - August 2, 2018

Vancouver, British Columbia



Foreign Affairs, Trade and  
Development Canada

Trade Commissioner Service

Affaires étrangères, Commerce  
et Développement Canada

Service des délégués commerciaux

**ILRI**  
INTERNATIONAL  
LIVESTOCK RESEARCH  
INSTITUTE



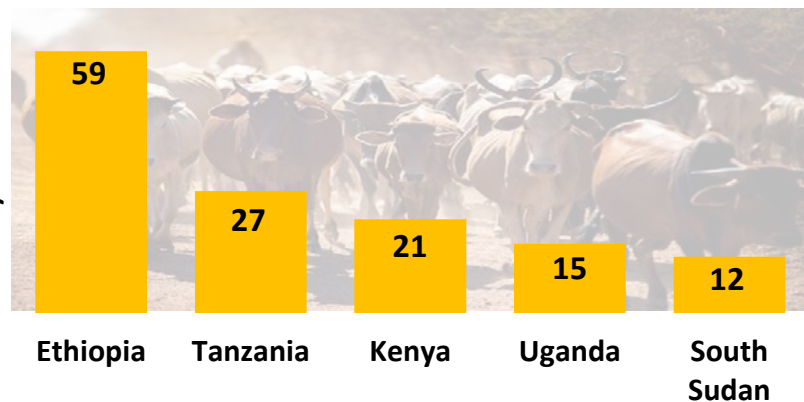
# Motivation

Smallholder dairy farming has a potential to improve the lives of rural poor in most developing countries

- Productive capital (draft animals) for farmers
- Important source of income
- Sources of nutrients for human
- Sustain smallholder crop-dairy systems (provide manure)

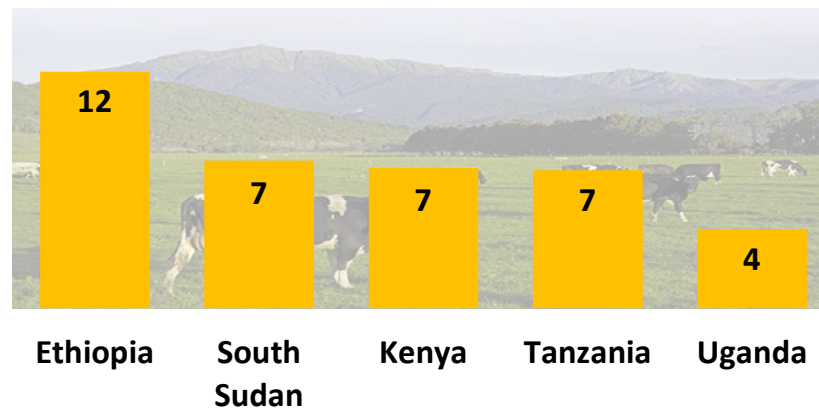
# Motivation (Cont'd)

Number of cattle (head in millions) in 2016



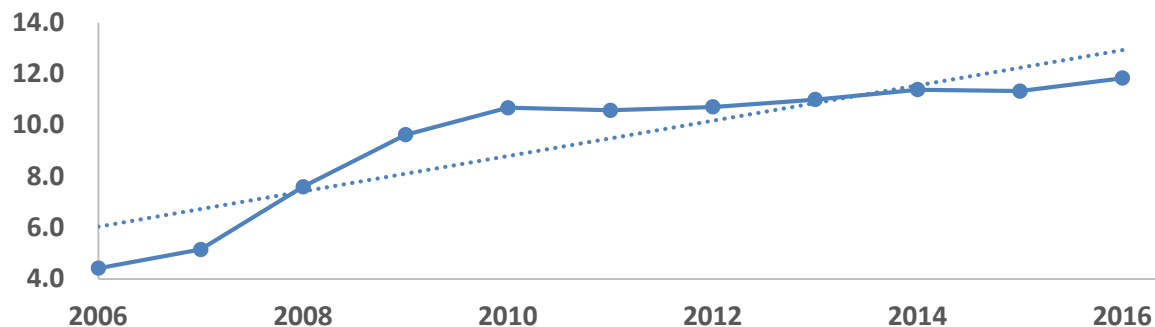
Top 5 Eastern African countries in terms of cattle population

Number of dairy cows (head in millions) in 2016



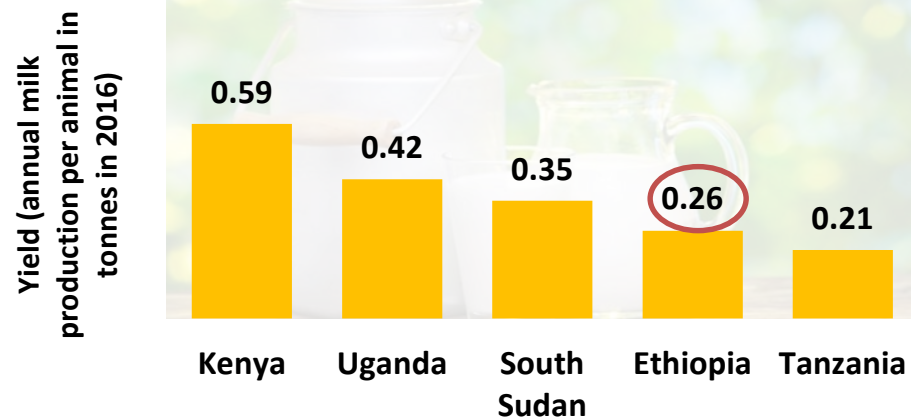
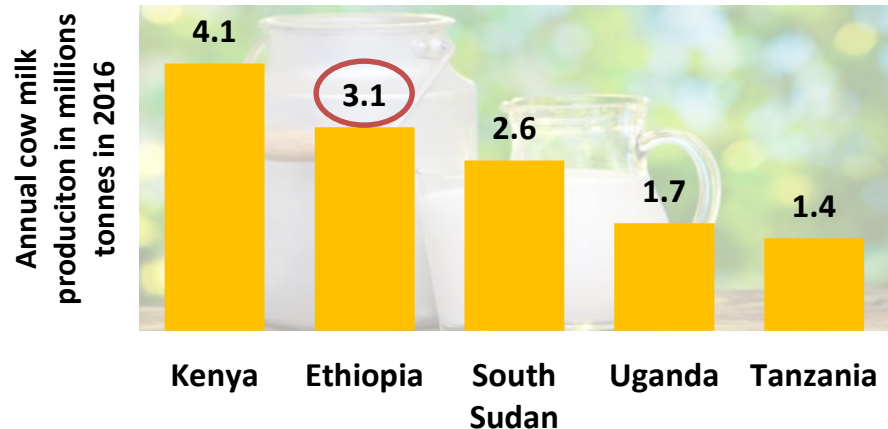
Top 5 Eastern African countries in terms of dairy cow population

Number of milk producing animal in millions

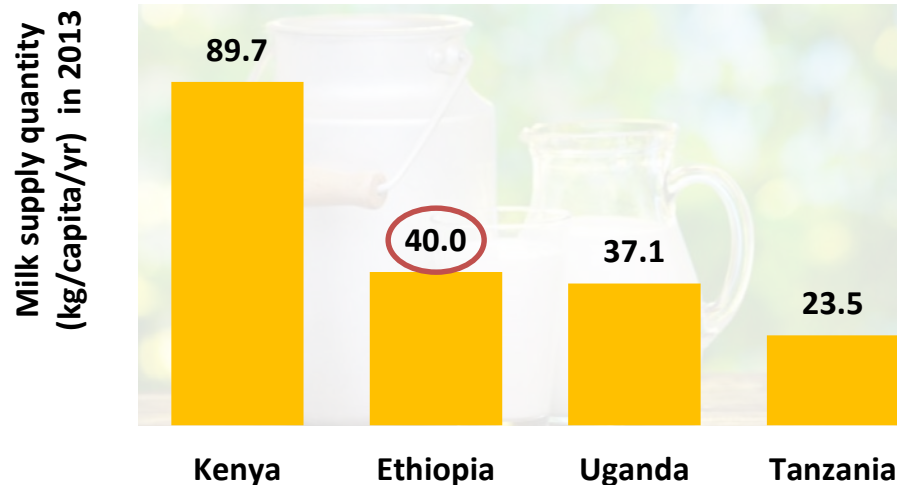
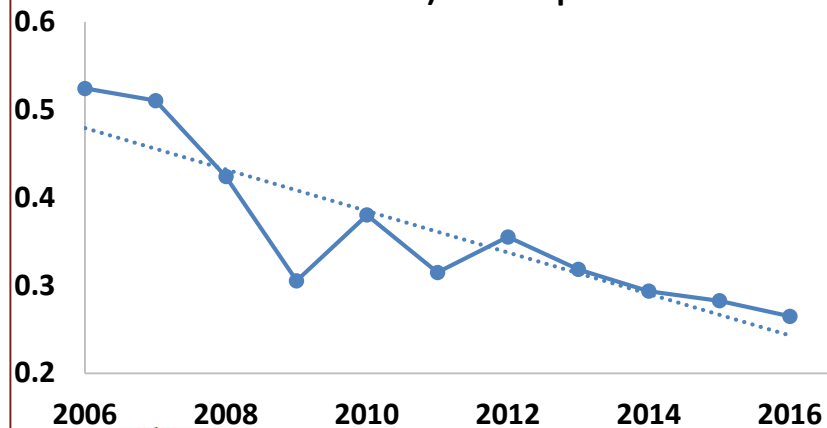


# Motivation (Cont'd)

*But low realization*



Yield (annual milk production per animal in tonnes) in Ethiopia



# Motivation (Cont'd)

## Reasons for low performance

- Limited availability and use of improved inputs
- Lack of awareness about improved practices
- Limited access to services and infrastructure
- Weak market linkage

## Possible solution: Promotion of market-oriented production

- Increase volume of production and productivity
- Allow farmers to escape from semi-subsistence poverty traps
- Generate regular income and will have a multiplier effects

# Research question

## Main question

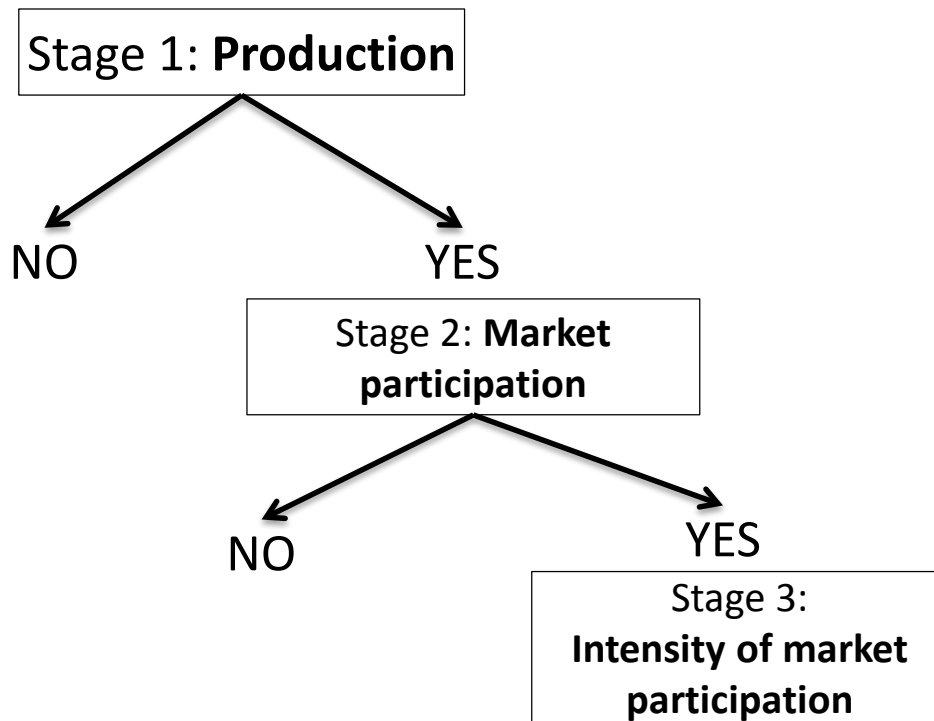
What factors affect Ethiopian rural households' decisions to participate in market oriented dairy production.

## Specific research questions

1. What factors determine household decision to engage in milk production?
2. What factors constrain or promote household decisions to engage in butter marketing and the volume of butter sold?
3. What factors determine household decision to use modern dairy inputs and the intensity of use of those inputs?

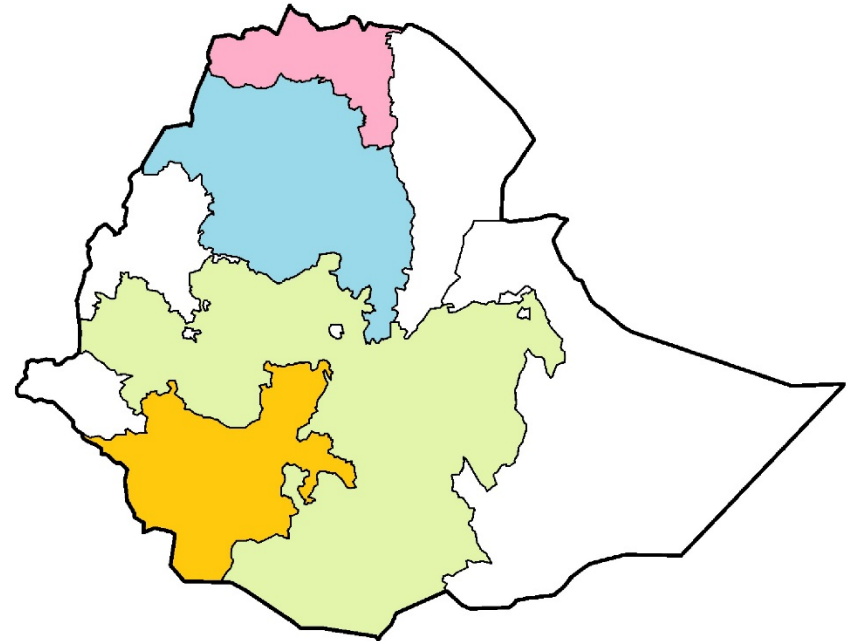
# Empirical model

Participation in output or input market can be thought of as three-stage decision problems



# Data

- Sample size: 5000 rural households from 4 regions
- When: February-April, 2014
- Who: ILRI Ethiopia
- Representativeness:
  - 94% of cattle population
  - 93% of dairy cows
  - 92% milk production and
  - 86% of the human population.

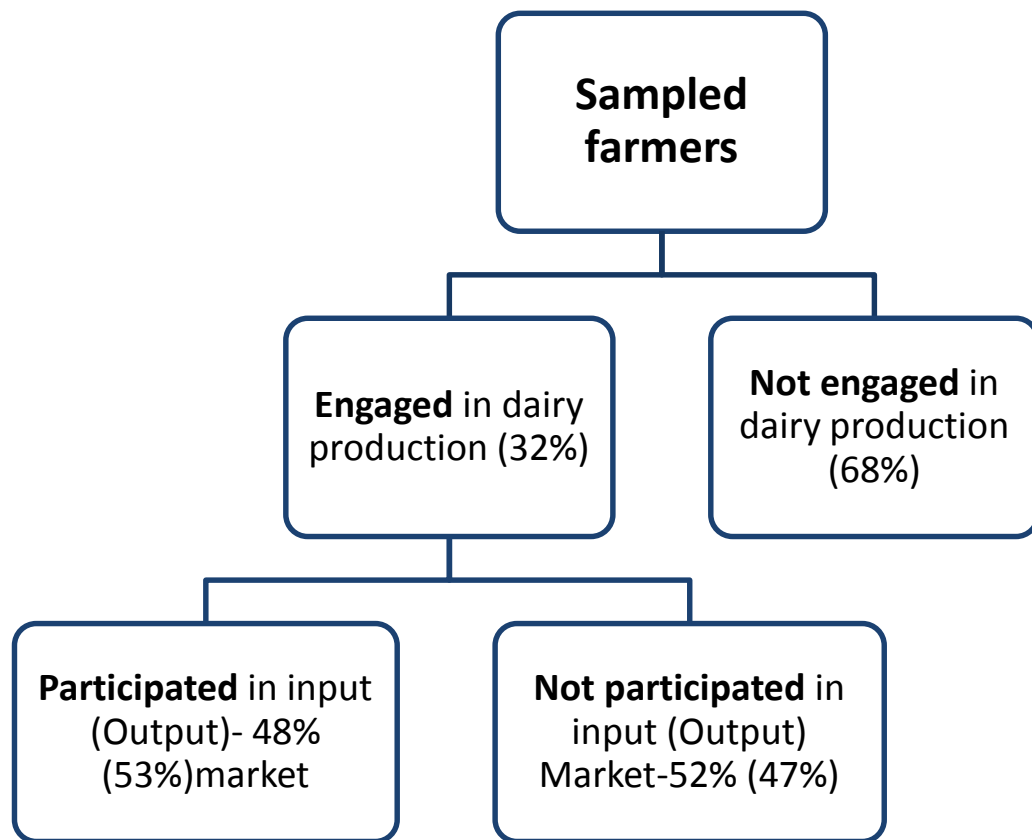




# This paper

- Considered both the input as well as output markets
- Focused on the most traded dairy product
- Takes into account the production decision as well
- Use nationally representative dataset

# Descriptive results



Key explanatory variables	Mean	SD
Age	45.5	12.55
Land owned (ha.)	1.41	1.37
No of dairy cows	1.42	0.77
Crossbred cows (%)	0.06	0.23
Total milk production	332	440
Town-market (hh:mn)	1:48	1:28
Input market (hh:mn)	1:10	1:17
Credit	0.18	0.39
Male headed households	0.81	0.40
No education	0.58	0.49
Compound feed seller	0.20	0.34
Bran sellers	0.13	0.40

# Results-Milk production and butter market participation

VARIABLES	Dairy Production	Butter market participation	Intensity of participation
Male headed household (yes=1)	0.281*** (0.000)	-0.329*** (0.000)	0.300** (0.015)
Land owned (ha.)	0.112*** (0.000)	-0.073*** (0.003)	0.098*** (0.002)
Lagged number of small ruminants	0.024*** (0.000)	-0.008* (0.072)	0.005 (0.367)
Lagged number of cross breed cows	0.392*** (0.000)	-0.149*** (0.009)	0.080 (0.286)
Total milk produced during the year (in liter)		0.001*** (0.000)	0.001*** (0.000)
Credit use (=1 if the farmer took credit )	0.104** (0.045)	0.017 (0.812)	0.057 (0.537)
Lagged district butter prices (birr/kg)	0.004** (0.046)	0.001 (0.817)	-0.002 (0.496)

# Margin analysis (Average partial effects)

Selected variables	Dairy production (%age point)	Butter market participation (%age point)*	Intensity of participation (In percent)*
Male headedness	+ 9.8	-8.9 (+1.4)	+12 (-0.8)
Access to credit	+3.6		
An increase in annual milk production by 1000 litres		+25 (+9.7)	+172.3 (+142.5)
A decrease the average distance to market town by half (1:24)		+2.7 (+1.5)	
An increase of land size by one standard deviation (1.6hectars)	+6.2	-1.6% (+2.4)	+9 (+3.4)

\*The figures in parenthesis are unconditional effect (clearance from previous stage)

# Results-Dairy input market participation

VARIABLES	Diary input market participation	Intensity of participation
Male headed household (yes=1)	0.074 (0.609)	-0.580*** (0.000)
Household non-farm income (1000 Birr)	0.016** (0.027)	0.010 (0.126)
Land owned (ha.)	0.032 (0.408)	-0.117** (0.014)
Total number of lactating cows (no.)	0.126** (0.027)	0.094 (0.155)
Proportion of cross breed lactating cows	0.221 (0.322)	0.294 (0.138)
Distance to the nearest livestock input provider (walking minutes)	-0.001** (0.036)	
Compound feed seller are available in the PA	0.442** (0.022)	
Relative market price of Maize to butter	4.643 (0.250)	-13.508*** (0.003)

# Margin analysis (Average partial effects)

Selected variables	Input market participation (%age point)*	Intensity of participation (In percent)*
Male headedness		-5.6 (-9.6)
Doubling household non-farm income	+2 (+0.8)	
An increase of land size by one standard deviation (1.4hectars)		-16.6 (+3.3)
A decrease in the average distance to livestock input market by half (0:40 hr)	+1.6 (+0.7)	
Availability of Compound feed seller in the village	+14.4 (+5.7)	
An increase in maize to butter price ratio by one standard deviation		+27.6 +10.4

\*The figures in parenthesis are unconditional effect (clearance from previous stage)

# Robustness analysis

- A constrained model was estimated where the stages were assumed to be independent
  - ✓ LR test strongly rejected the restricted model
- The validity of exclusion restriction variables were tested in both models
  - ✓ The variables fulfilled the exclusion criteria
- A model where the third stage were assumed to have truncated normal distribution were estimated
  - ✓ The Vuong test showed that lognormal model fit the data better

# Key conclusions

- Transaction costs limits farmers' participation in both dairy input and output markets
- Scale of production is very small and huge gain is possible
- There is knowledge gap in terms of improved dairy farming practices
- Dairy farmers face liquidity constraints



# Acknowledgements

This work is financed by

- DFATD and ILRI

It is implemented in a partnership with

ILRI, IWMI, the Ministry of Agriculture, the Ethiopian Institute of Agricultural Research, Regional Agricultural Research Institutes, Regional Bureaus of Agriculture and Regional Livestock Health and Development Agencies.

It contributes to the CGIAR Research Program on

- Policies, Institutions and Markets (PIM)

*better lives through livestock*

ilri.org

ILRI thanks all donors and organizations who globally supported its work through their contributions to the CGIAR system

*Patron: Professor Peter C Doherty AC, FAA, FRS*

*Animal scientist, Nobel Prize Laureate for Physiology or Medicine–1996*

Box 30709, Nairobi 00100 Kenya  
Phone +254 20 422 3000  
Fax +254 20 422 3001  
Email [ilri-kenya@cgiar.org](mailto:ilri-kenya@cgiar.org)

[ilri.org](http://ilri.org)  
*better lives through livestock*  
ILRI is a CGIAR research centre

Box 5689, Addis Ababa, Ethiopia  
Phone +251 11 617 2000  
Fax +251 11 667 6923  
Email [ilri-ethiopia@cgiar.org](mailto:ilri-ethiopia@cgiar.org)

*ILRI has offices in East Africa • South Asia • Southeast and East Asia • Southern Africa • West Africa*



This presentation is licensed for use under the Creative Commons Attribution 4.0 International Licence.

# CRP and CGIAR logos

