Sustainable forage adoption through seed value chains, market information, and seed perception pathways: Evidence from Kenya

Francis Mucira Murage[1], Miroslava Bavorová[1], Ayat Ullah[1], Nils Teufel[2]

[1]*Department of Economics and Development, Faculty of Tropical AgriSciences, Czech University of Life Sciences Prague*

[2]*International Livestock Research Institute, Kenya*

Introduction

- Forage crops adoption is essential for improving feed security and sustainable smallholder dairy production (Herforth et al., 2025).
- Fragmented seed systems and information asymmetries constrain adoption (Burkart et al., 2026; Florez et al., 2024).
- Studies largely examined the determinants of forage adoption.
- The study examines the relationships between market information access, farmers' perceptions of seed availability, affordability, and quality, and the adoption of Napier grass, oats, and forage maize across informal, semi-formal, and formal seed value chains, respectively.

Figure 1: A farmer milking his cow

Figure 2: Napier grass on a farm

Methods

- We analysed household survey data from 424 smallholder dairy farmers in Nyandarua and Uasin Gishu counties collected in July and August 2025.
- We compared three forage seed value chains: informal Napier grass, semi-formal oats and formal forage maize.
- Data was analysed using ordered logit and multivariate probit regression models.

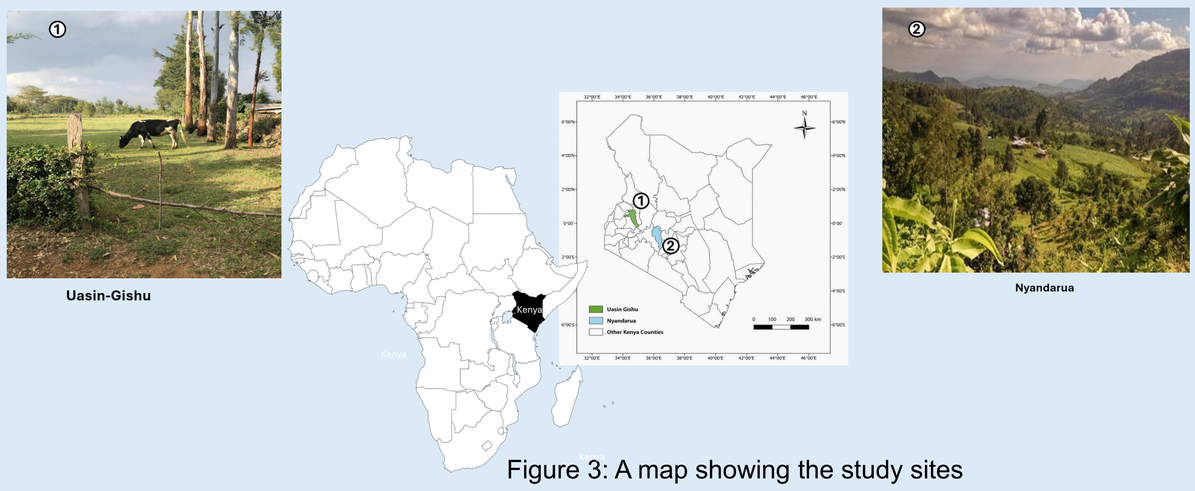

Figure 3: A map showing the study sites

Results

- Napier grass was the most widely adopted forage crop 75%, followed by forage maize 61% and oats 48% (Figure 4).
- A combination of Napier grass, Oats, and forage maize was the most common, followed by Napier grass only and the combination of Napier grass and forage maize (Figure 5).

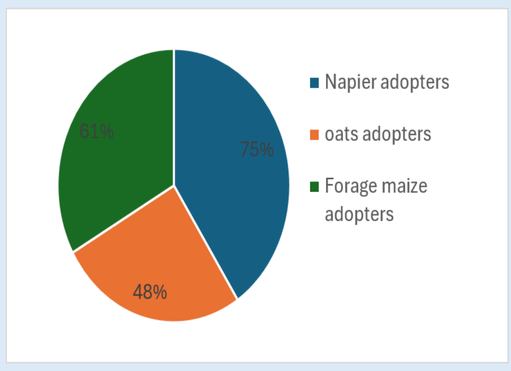

Figure 4: Forage crop adoption among sampled households (N = 424).

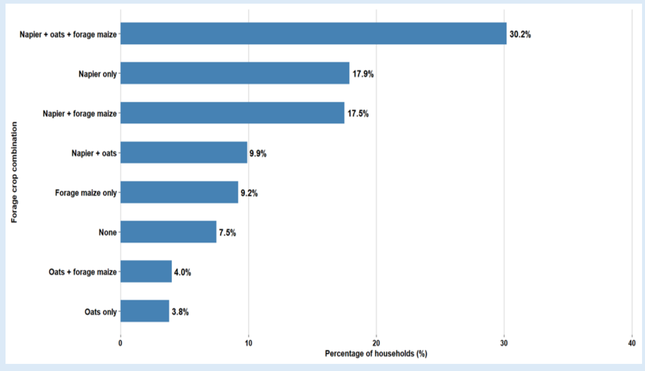

Figure 5: Distribution of forage crop adoption combinations among sampled households (N = 424).

Dairy cooperatives were the primary source of market information across all three forage crops, followed by fellow farmers for oats and forage maize, and extension officers for Napier grass (Figure 6).

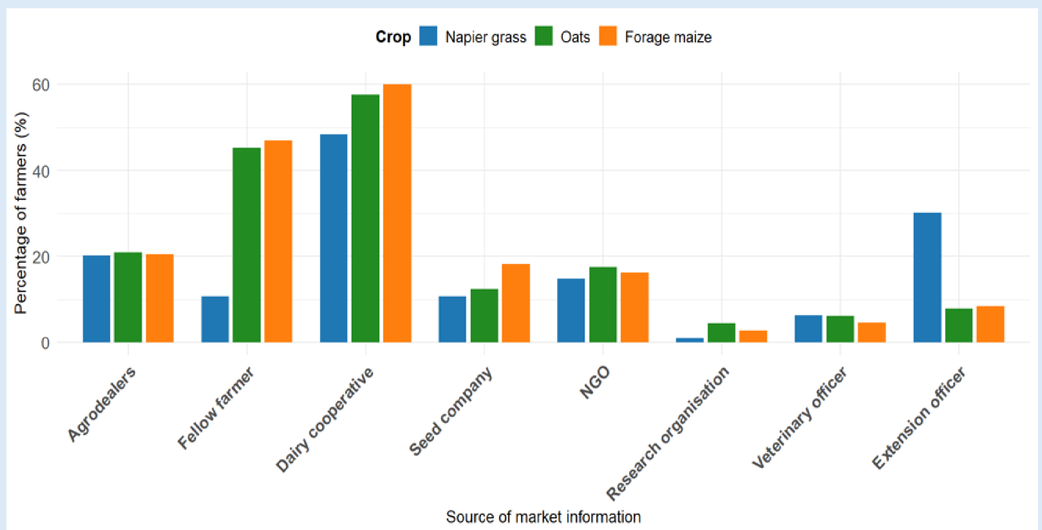

Figure 6: Sources of forage market information

Market information access was positively associated with perceived seed availability and affordability across all three crops, and with perceived seed quality for oats and forage maize (Table 1).

Table 1: Relationships between market information access and seed perceptions (Ordered logit model)

Factors	Napier – Avail.	Napier – Afford.	Napier – Qual.	Oats – Avail.	Oats – Afford.	Oats – Qual.	Maize – Avail.	Maize – Afford.	Maize – Qual.
Market info	0.51** (0.20)	0.68** (0.21)	0.02 (0.22)	0.99*** (0.20)	0.92*** (0.21)	0.42 (0.22)	1.04*** (0.22)	0.68** (0.22)	0.59* (0.23)
HH Age	0.01 (0.01)	0.02* (0.01)	0.00 (0.01)	-0.00 (0.01)	-0.01 (0.01)	-0.00 (0.01)	-0.01 (0.01)	-0.01 (0.01)	0.00 (0.01)
HH Gender	-0.11 (0.22)	-0.00 (0.24)	-0.29 (0.25)	0.09 (0.22)	0.18 (0.23)	-0.10 (0.24)	-0.19 (0.23)	0.16 (0.24)	-0.20 (0.24)
Education	0.33 (0.20)	0.38 (0.21)	0.08 (0.22)	0.17 (0.19)	-0.05 (0.20)	0.11 (0.20)	0.11 (0.20)	0.03 (0.20)	-0.02 (0.21)
Income	0.26 (0.20)	0.46* (0.21)	0.43 (0.22)	0.01 (0.19)	0.05 (0.20)	0.46* (0.20)	0.11 (0.20)	0.07 (0.20)	0.35 (0.21)
Credit access	-0.23 (0.20)	-0.46* (0.21)	0.61** (0.22)	0.24 (0.19)	0.13 (0.20)	0.84*** (0.21)	0.49* (0.20)	0.11 (0.20)	0.31 (0.21)
Farm size	0.01 (0.01)	-0.01 (0.01)	-0.02 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.02* (0.01)	-0.01 (0.01)	-0.00 (0.01)	-0.01 (0.01)
Herd size	0.01 (0.01)	0.01 (0.02)	0.01 (0.02)	0.04* (0.02)	0.04* (0.02)	0.04* (0.02)	0.01 (0.01)	0.02 (0.02)	0.00 (0.02)
Nyandarua	0.63** (0.22)	0.67** (0.24)	-0.69** (0.25)	-0.06 (0.22)	0.16 (0.23)	-0.97*** (0.24)	-0.07 (0.23)	-0.03 (0.24)	-1.02*** (0.26)

HH-Household head; ***, **, and * significant at 1%, 5%, and 10% levels, respectively

- Perceived seed affordability and quality were associated with Napier grass adoption, while perceived seed availability, affordability, and quality were associated with oats and forage maize adoption (Table 2).
- Higher household income is associated with a higher likelihood of adopting all three forage crops, while larger herd size is associated with a higher likelihood of adopting oats and forage maize.

Table 2: Association between seed perceptions and forage crops adoption decisions (MVP)

Factors	Napier Coeff. (S.E.)	Oats Coeff. (S.E.)	Forage Maize Coeff. (S.E.)
Seed perceptions			
Seed availability	−0.054 (0.091)	0.296*** (0.085)	0.371*** (0.088)
Seed affordability	0.232* (0.134)	0.407*** (0.111)	0.489*** (0.119)
Seed quality	0.305** (0.119)	0.385*** (0.101)	0.244** (0.114)
Socioeconomic factors			
HH Age	0.003 (0.006)	−0.009 (0.006)	−0.007 (0.006)
HH Gender	−0.298 (0.188)	−0.096 (0.182)	−0.339* (0.190)
HH Education	0.166 (0.157)	−0.050 (0.153)	0.020 (0.154)
HH Income	0.517*** (0.154)	0.393** (0.156)	0.622*** (0.152)
Credit access	0.165 (0.150)	0.066 (0.146)	−0.004 (0.148)
Farm factors			
Farm size	0.000 (0.007)	−0.013 (0.009)	0.000 (0.007)
Herd size	0.008 (0.013)	0.047*** (0.017)	0.033* (0.019)
Nyandarua	0.362** (0.180)	0.094 (0.182)	0.966*** (0.204)

HH-Household head; ***, **, and * significant at 1%, 5%, and 10% levels, respectively

Conclusion

- Tailor interventions to the characteristics of each forage seed value chain to enhance forage adoption.
- For the informal Napier system, strengthen farmer-to-farmer information and improve access to reliable information on planting material affordability and quality.
- For the semi-formal oats and formal forage-maize systems, strengthen cooperative and agrodealer information on seed availability, affordability, and quality, alongside reliable seed distribution.

Acknowledgement

- International livestock research institute (ILRI) through the CGIAR trust fund initiative on sustainable animal productivity for livelihoods, nutrition and gender inclusion (SAPLING) for funding the study.
- Faculty of Tropical Agrisciences, Czech University of Life Sciences, Prague, Czech Republic under the internal grant agency (IGA) grant number: 20263143 for supporting this work.

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Contact: Francis Mucira Murage (murage@ftz.czu.cz) Tel: +420 776660192