What are the channels of transmission of drought risk to pastoral households? Evidence from high-frequency panel survey in Kenya and Ethiopia

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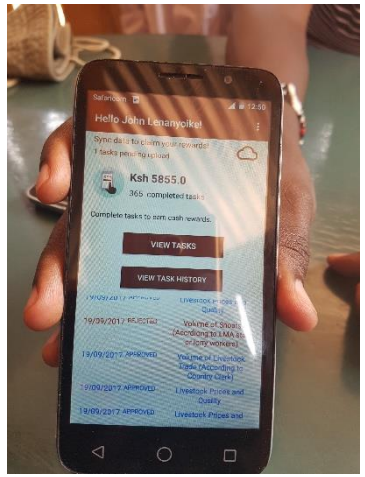

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Background

- ✓ Drought remains the most severe shock adversely affecting the livelihoods of pastoralists in Africa
- ✓ In northern Kenya, ≈50% of livestock losses are caused by drought (Jensen et al., 2016).
- ✓ Consequently, poverty rates, food insecurity, and malnutrition have risen
- ✓ Efforts to build resilience and address vulnerability in these fragile settings emphasize the need for accurate early warning information and anticipatory action (Banerjee et al., 2022).
- ✓ However, the mechanisms through which drought risks are transmitted to pastoral households are not well known.

Objectives

This study:

i. Examined the spatial and temporal dynamics in milk production, forage suitability and rainfall availability.

ii. Assessed the relationship between rainfall availability and forage suitability

iii. Assessed the impact of forage suitability on milk production, milk consumption, and dietary diversity.

Data & Methods

- ✓ Weekly panel survey data come from 2 sentinel zones (SZ): 1 in Northern Kenya and 1 in Southern Ethiopia.
- ✓ Each SZ has 4 sentinel clusters (SC) and each SC has 8 households selected
    - ➢ Selected households own livestock and have at least 1 child under 5 years.
- ✓ Data collected over 52 weeks, March 2021-April 2022 using crowd-sourcing technique via a mobile phone application called KAZNET.
- ✓ Descriptive analysis used to examine trends in the key variables of interest.
- ✓ Fixed-effects instrumental variable 2SLS estimated in panel data (Eq 1) to assess the ***effect of forage suitability on milk production and consumption as well dietary diversity***.

Data & Methods Cont…

$$\boldsymbol{y_{it} = \alpha_i + x_{it}\delta + \varepsilon_{it}} \qquad (1)$$

- ✓ y_{it} :outcome variable for pastoralist i at week t,
- ✓ $\boldsymbol{x_{it}}$: a vector of variables affecting y_{it} including forage suitability
- ✓ $\boldsymbol{\delta}$ is a vector of parameter estimates
- ✓ α_i and ε_{it} are the household-specific unobserved time-invariant heterogeneity and the idiosyncratic error term, respectively
- ✓ We used rainfall availability as an instrument for forage suitability for milk producing grazers

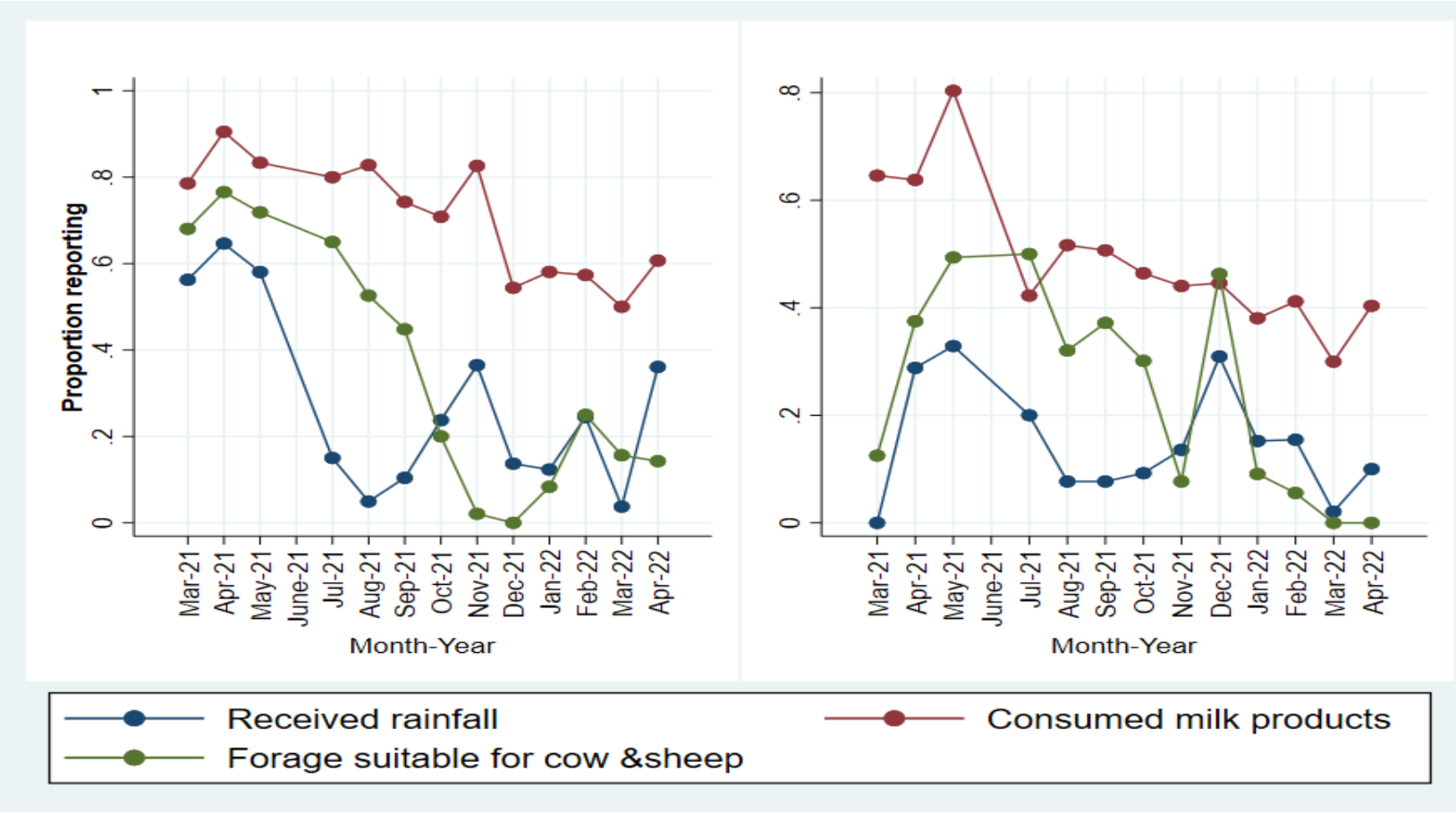
Descriptive results

Table 1: Summary statistics

Variable	Whole Sample	Harweyu	Higo	Magole	Saba	Korr	Merille	Ol-turot
Herd size (TLU)	4.4	4.2	5.6	8.1	6.5	2.5	2.2	3
Milk production (Ltrs)	1.4	2.3	1.1	1.4	1.3	0.4	1.2	2.4
Age of index child (months)	24.3	21.5	24.8	36.1	22.8	24.3	15.8	25.2
Prop MAM(MUAC < 12.5CM)	0.1	0	0	0	0	0.3	0.1	0
Proportion of children consuming milk products	0.7	0.9	0.3	1	1	0	0.7	0.8
Proportion of households consuming milk products	0.6	0.7	0.1	1	1	0	0.6	0.7
Proportion of women consuming milk products	0.6	0.6	0.1	0.9	1	0.1	0.5	0.7
Proportion reporting rainfall availability	0.2	0.3	0.2	0.2	0.3	0.1	0.1	0.2
Proportion reporting forage suitability for grazers	0.3	0.5	0.4	0.4	0	0.3	0.3	0.1
Observations	**320**	**45**	**45**	**45**	**45**	**45**	**45**	**45**

Descriptive results

Fig 1: Trend in household milk consumption, forage suitability and rainfall availability-Ethiopia (Left) Kenya (Right)



Estimation results: 2SLS first stage (effect of rain availability on forage suitability for grazers)

Variable	Forage suitability for grazers
Rainfall availability (instrument)	0.380(0.092)***
Harweyu (Reference)	-
Higo	-0.121(0.0765)***
Magole	-0.036(0.075)***
Saba	-0.431(0.078)
Korr	-0.101(0.079)***
Merile	-0.089(0.075)**
Ol-turot	0.351(0.079)***
Observations	**287**
No. of cluster	**7**
F-Value (Testing instrument relevance)	**16.98*** **

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

2SLS estimation results: impact of forage suitability on milk volume and consumption

	Outcome			
Variable	(1) Log(Milk Volume)	(2) Child consumed milk products	(3) Woman consumed milk products	(4) Household consumed milk products
Forage suitability for grazers	0.507**	0.469***	0.661***	0.512**
	(0.209)	(0.182)	(0.228)	(0.199)
Sentinel cluster effects	YES	YES	YES	YES
Observations	287	290	290	290
No. of cluster	7	7	7	7

Standard errors in parentheses

*** p<0.01, ** p<0.05, *p<0.1

Results and Discussion

- ✓ Improvement in forage suitability led to:
  - increased household milk production
  - increased consumption of milk products by the child and their caregivers as well as at household level .
  - Increased consumption of more diversified diets as evidenced by increased diversity scores
- ✓ Forage suitability is an important channel of drought risk transmission to welfare of individuals/households

Conclusion

- ✓ High frequency data provide timely information on periods of forage deficit in fragile contexts
  - ✓ This information is useful to identify the mechanisms through which drought impacts households.
  - ✓ Such information is helpful for targeted interventions for addressing food insecurity
  - ✓ Specifically, our study suggests that early interventions through increased access to livestock feeds would help address drought risks and improve nutrition.
  - ✓ The findings call for the need for increased investment in high-frequency data collection in remote and fragile contexts using cost-effective approaches such as citizen science.

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