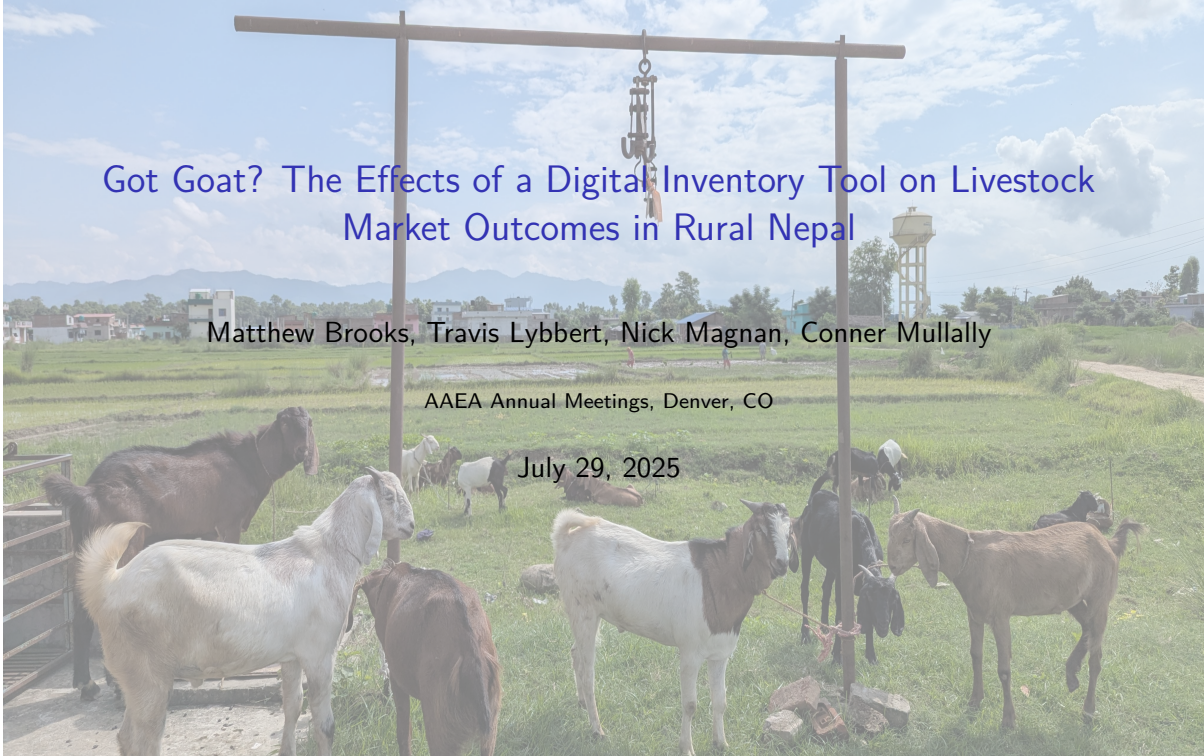

Got Goat? The Effects of a Digital Inventory Tool on Livestock Market Outcomes in Rural Nepal

Matthew Brooks, Travis Lybbert, Nick Magnan, Conner Mullally

AAEA Annual Meetings, Denver, CO

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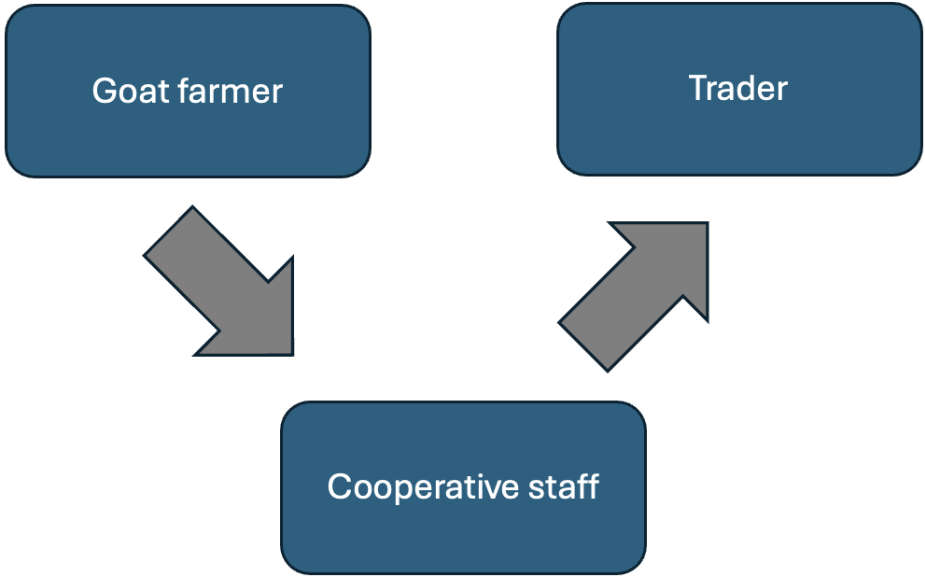
Motivation

- Markets are efficient when there is perfect information (Adam Smith 1776; Hayek 1945; Arrow and Debreu 1954)
- Rural livestock markets are characterized by asymmetric information between buyers and sellers (Jensen 2007, Bernard and Spielman 2009; Anagol 2017, Roba et al. 2018, Neupane et al. 2023, Yitayew et al. 2024)
- **Research question:** Does a digital tool that reduces information frictions affect the price and quantity of goats sold at market equilibrium in rural Nepal?
  - RCT with N=93 cooperatives (71,000+ members)
  - 43 cooperatives receive access to a digital Collective Marketing Tool (dCM); 50 do not

Empirical setting



Conceptual framework

We expect the dCM to impact outcomes in two ways:

1. Reduce information frictions between goat farmers and cooperative staff

- Coop staff have information on available goat inventory
- Farmers have information on time and location of upcoming sales

2. Reduce information frictions between cooperative staff and traders

- Traders have information on available goat inventory
- Coop staff have contact information for a network of traders operating in their region

We hypothesize these changes will affect goat market outcomes:

- Quantity of goats sold through cooperative
  - dCM facilitates sales for farmers, coops, and traders, reducing transaction costs
- Price of goats sold through cooperative
  - Higher volume sales may give coops more bargaining power
- Revenue from goat sales through cooperative
  - Combined effect of quantity and price changes

Data and descriptive statistics

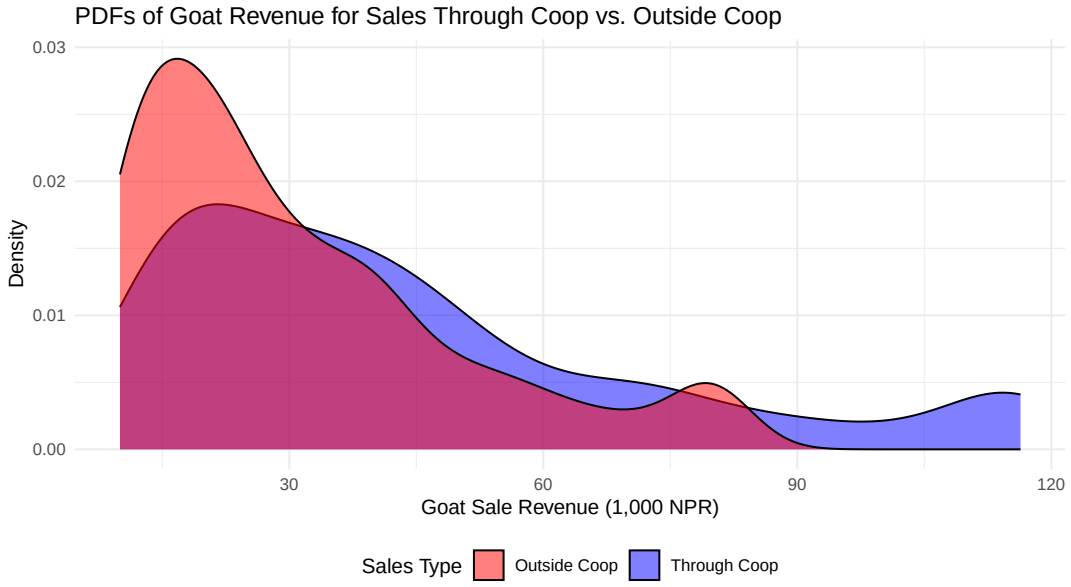
Descriptive statistics

Table 1: Farmer-Household Summary Statistics (N=2,747)

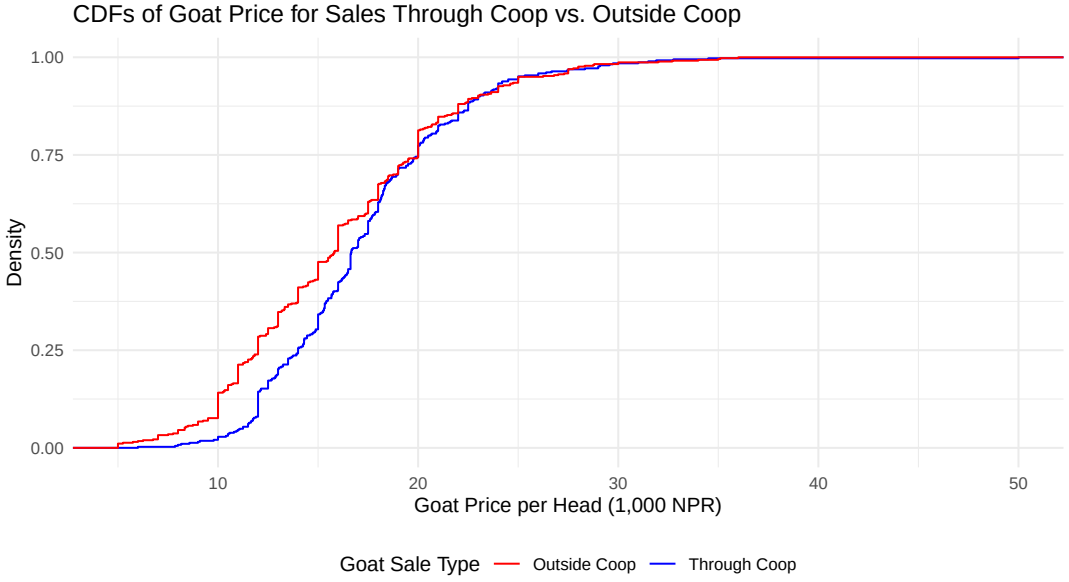
Statistic	N	Min	Mean	St. Dev.	Max
Raises goats (1/0)	2,747	0	0.78	0.42	1
Herd size	2,747	0	6.32	5.71	20
Sold goats through coop (1/0)	2,747	0	0.14	0.35	1
No. goats sold through coop	389	1	2.62	1.70	7
No. goats sold total	815	1	2.36	1.54	8
Average coop goat price (1,000 NPR)	389	6.00	17.29	4.83	50.00
Goat revenue through coop (1,000 NPR)	389	12.00	44.42	29.36	116.36
Goat revenue total (1,000 NPR)	815	10.00	38.59	26.48	155.00

Source: Farmer survey with approx. 30 farmers in each of 93 cooperatives; April 2025.

Coop sales tend to result in more revenue



Coop prices second-order stochastically dominate non-coop prices



Empirical framework

$$Y_{ic} = \beta_1 \text{dCM}_c + \beta_2 Y_{i0} + \beta_3 \mathbf{X}_i + \theta_s + \varepsilon_{ic} \quad (1)$$

- Y_{ic} is an outcome for farmer-household i in cooperative c
- dCM is a dummy for household i is in a cooperative c assigned the dCM
- Y_{i0} is the pre-treatment value of outcome for the farmer-household
- $\mathbf{X}_i$ are farmer-household demographic variables
- θ_s are strata-fixed effects

Results

1. More likely to raise goats, larger herds

dCM Effect on Goat Rearing

Dependent Variables:	Raises goats (1/0)	Herd size
Model:	(1)	(2)
Variables		
dCM	0.07**	1.3***
	(0.03)	(0.48)
Control mean	0.74	5.7
Fit statistics		
Observations	2,747	2,747
R^2	0.02178	0.05737

Clustered (Coop ID) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Notes: All models include strata fixed effects.

2. More likely to sell through coop

dCM Effect on Quantity of Goats Sold

Dependent Variables:	Sold through coop (1/0)	Goats sold through coop	Goats sold
Model:	(1)	(2)	(3)
Variables			
dCM	0.03*	0.07	0.05
	(0.02)	(0.05)	(0.06)
Control mean	0.11	0.30	0.65
Fit statistics			
Observations	2,747	2,747	2,747
R^2	0.20956	0.34613	0.23555

Clustered (Coop ID) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Notes: All models include strata fixed effects.

3. Revenue rises from coop sales; no net effect on revenue

dCM Effect on Price and Revenue from Goat Sales

Dependent Variables:	Goat price coop	Goat revenue coop	Goat revenue
Model:	(1)	(2)	(3)
Variables			
dCM	-0.448	1.28*	0.332
	(0.623)	(0.743)	(0.931)
Control mean	17.4	4.98	10.6
Fit statistics			
Observations	389	2,747	2,747
R^2	0.03115	0.32513	0.35331

Clustered (Coop ID) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Notes: All models include strata fixed effects. Price and revenue in units of 1,000 NPR.

Discussion and conclusion

Results recap

- Relaxing information constraints leads coop members to invest more in goat rearing and sell more goats through the coop, substituting away from outside coop sales
- Despite more sales through coop, no overall effect on revenue from goat sales (yet)

Discussion and conclusion

Results recap

- Relaxing information constraints leads coop members to invest more in goat rearing and sell more goats through the coop, substituting away from outside coop sales
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Takeaways

- Incomplete information is a constraint to the efficient functioning of markets for livestock in rural Nepal
- A low cost digital tool that aggregates information results in transactions occuring that would not otherwise have occurred, improving producer and consumer surplus

Discussion and conclusion

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Thanks!

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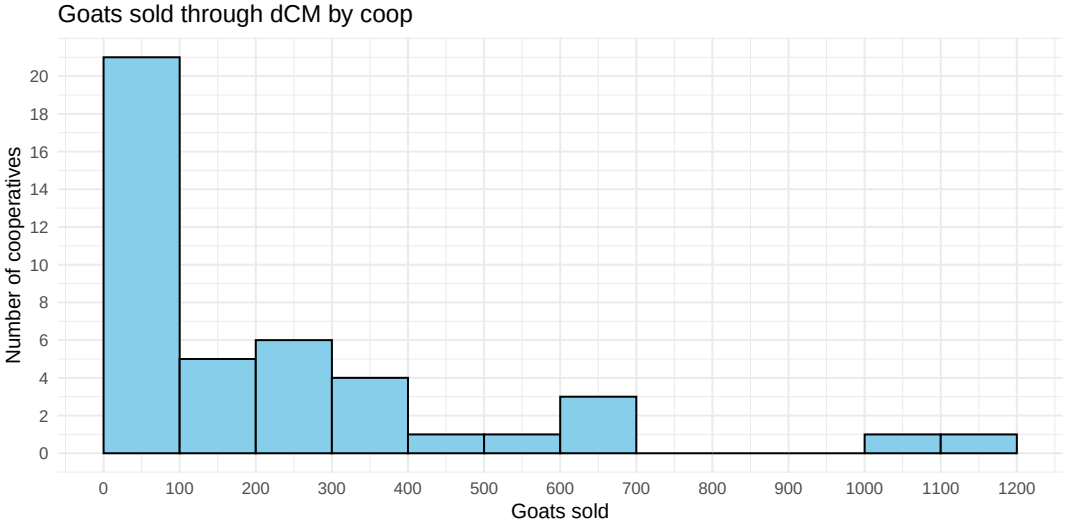
Appendix

dCM usage: goats sold using dCM by coop

The median number of goats sold through dCM per coop is 151 but there is a wide range–8 coops have not set up a sale with the dCM, and two coops have sold >1,000 goats.



Related literature

- Cooperatives engaged in collective marketing face a collective action problem:
  - When more member participate, cooperative bargaining power improves (Miller and Mullally 2022)
  - But farmers have incentives to side-sell: quicker cash (Geng et al. 2023), appearance of better price
- Sharing aggregate intentions to sell through the cooperative boosts participation in collective sales (Aflagah et al. 2022)
- Information on livestock ownership is sparse and systematically biased downwards (Abay et al. 2025)

Empirical setting details 1

- Nepal is home to over 13,000 agricultural cooperatives, with over 1.2 million Nepalis as members (International Co-operative Alliance, 2020)
- This study is an RCT with 93 agricultural cooperatives–with 71,703 members–that collectively market goats

Empirical setting details 2

Status quo:

- Coop staff and traders are unsure of number/type of goats farmers are ready to sell
- Farmers are unsure when/where sale will take place

digital Collective Marketing (dCM) tool:

- Coop staff collect near real-time information on goat inventory from farmers
- Traders have access to this information
- Farmers who have goats to sell are notified by automated SMS of the time and location of upcoming sales

Data sources detail

- Cooperative leader survey (1 leader in each of 93 cooperatives, 2 rounds, N=186)
- Administrative data from dCM (quantities and prices for N=309 sale transactions)