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Rethinking
Food Markets

Improving the bargaining power of smallholder sesame producers in Ethiopia through information and collective marketing

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Science, Innovation and Policy Symposium
10-11 December 2024
IFPRI HQ, Washington D.C.

Motivation – why sesame?

General

- Potential of agricultural development was studied recently for 44 SSA countries and **Ethiopia was one of the three countries – along with Nigeria and Tanzania** – that comprise half of SSA's agricultural potential (Goedde et al., 2019).

Specific

- An empirical analysis that considered all value chains to be equally important for the economy prioritized
  - **oilseeds,**
  - fruits/tree crops,
  - vegetables,
  - tobacco/cotton/tea and cattle value chains in Ethiopia (Benfica and Thurlow, 2017).

Motivation – why sesame?

- Sesame is the main/primary oil crop and the second most exported agricultural commodity in Ethiopia.
- Ethiopia makes around 2.6% of the global sesame production (FAOSTAT, 2020).
- Sesame contributes about 2.3% of grain production with a total production of about 20 thousand tons in the 2018/2019 production season.
- Main growing areas are the lowlands of northwest Ethiopia (80% of production) (CSA, 2020).

Motivation – why sesame?

- **Key constraints of the sesame value chain**
  - Weather variability,
  - Low adoption of technologies,
  - Poor finance and infrastructure,
  - High production and transaction/marketing costs,
  - Low crop diversity in the sesame growing areas - resulted in high disease infestation,
  - There is no sesame seed system – applies to all oil crops, and
  - Heavy government intervention in sesame marketing.
    - ECX – a public institution – is the key actor in sesame marketing – including exporting.
    - Excessive and unpredictable foreign currency control mechanisms

The innovation

- **Components**
  - Sesame market information (MI)
    - Data collected every week
    - Information sent to famers every two weeks
  - Collective action (CA) – training and supporting sesame growers to collectively act voluntarily.
- **Objective**
  - Measuring the effect of MI and CA on sesame productivity, the average price received by the producers, and farm income using a randomized control trial.

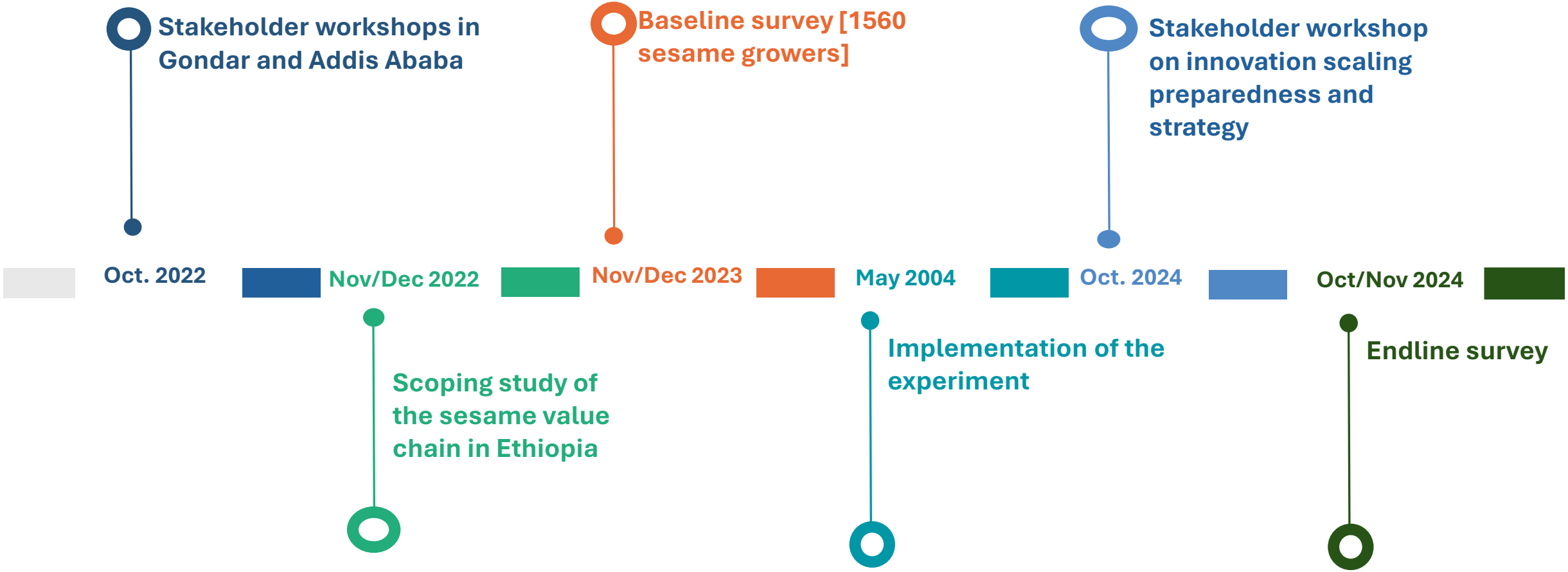
The Experiment

- **Location**
  - Central Gondar: Tach Armachiho and Tsegede
  - West Gondar: Metema and Mirab Armachiho
- **Villages and households**
  - 26 villages (520 households): Market information
  - 26 villages (520 households): Market information + collective action
  - 26 villages (520 households): Control
- **Stakeholder engagement**
  - Actively working with Gondar ARC, District Offices of Agriculture, and DAs.

Expected outcomes

- Collective action
  - Reduction in transaction cost.
  - Increase in average output price per unit.
- Digital information services
  - Increase in sesame yield.
  - Increase in cash income from crop production.

Timeline of the experiment



Analysis plan

- **Interest is in individual level effects of MI and MI&CA.**
  - We are running individually randomized group-treatment (IRGT) trial.
- The analysis will measure ITT and LATE/CACE, + attrition
  - ITT (assuming full compliance = ATE)
    - Mixed effects model – unobserved heterogeneities at village and time-period levels.
  - LATE/CACE
    - 2SLS
  - Attrition
    - We will conduct joint test whether baseline characteristics vary systematically by trt and attrition status jointly.

Baseline characteristics - outcome variables Control vs MI

Variable	N (Control)	N (MI)	Mean (Control)	Mean (MI)	Mean Diff	p-value
Total annual sesame harvest in ton	516	515	0.90	0.98	0.08	0.30
Total income from sesame production in 1000 Birr	516	514	78.38	85.10	6.72	0.32
Household food expenditure per capita in the last seven days	520	520	798.65	955.95	157.30	0.24

Baseline characteristics - outcome variables Control vs MI&CA

Variable	N (Control)	N (MI and CA)	Mean (Control)	Mean (MI and CA)	Mean Diff	p-value
Total annual sesame harvest in ton	516	518	0.90	0.91	0.01	0.90
Total income from sesame production in 1000 Birr	516	517	78.38	79.24	0.85	0.88
Household food expenditure per capita in the last seven days	520	520	798.65	1009.82	211.17	0.34

Baseline characteristics - explanatory variables (D) Control vs MI

Variable	N (Control)	N (MI)	Mean (Control)	Mean (MI)	Mean Diff	p-value
The HH has sufficient access to market information: 1=Yes	520	519	0.16	0.19	0.03	0.19
The HH has credit: 1=Yes	520	520	0.50	0.42	-0.08	0.01
HH has used fertilizer in crop production: 1=Yes	520	520	0.14	0.17	0.03	0.17
HH has used tractor in sesame production: 1=Yes	520	520	0.19	0.19	-0.01	0.81

Baseline characteristics - explanatory variables (C)
Control vs MI

Variable	N (Control)	N (MI)	Mean (Control)	Mean (MI)	Mean Diff	p-value
Distance to market [walking minutes]	520	520	41.94	33.46	-8.49	0.01
Literacy (# completed grade by the HHH)	520	520	5.39	4.62	-0.78	0.00
Age of the Household head [years]	520	520	40.75	42.47	1.72	0.01
Farmland allocated to sesame: ha	520	520	2.87	3.00	0.13	0.37
Fertilizer (Urea & DAP/NPS) used for sesame: kg	517	514	24.47	19.01	-5.47	0.76
Labor (family + hired) used for sesame: MD	520	520	74.97	72.58	-2.39	0.58

Baseline characteristics - explanatory variables (D)
Control vs MI&CA

Variable	N (Control)	N (MI & CA)	Mean (Control)	Mean (MI & CA)	Mean Diff	p-value
The HH has sufficient access to market information: 1=Yes	520	519	0.16	0.14	-0.02	0.44
The HH has credit: 1=Yes	520	520	0.50	0.49	-0.01	0.76
HH has used fertilizer in crop production: 1=Yes	520	520	0.14	0.10	-0.04	0.05
HH has used tractor in sesame production: 1=Yes	520	519	0.19	0.17	-0.03	0.26

Baseline characteristics - explanatory variables (C)
Control vs MI&CA

Variable	N (Control)	N (MI & CA)	Mean (Control)	Mean (MI & CA)	Mean Diff	p-value
Distance to market [walking minutes]	520	520	41.94	38.52	-3.43	0.34
Literacy (# completed grade by the HHH)	520	519	5.39	5.20	-0.19	0.48
Age of the Household head [years]	520	520	40.75	41.57	0.82	0.21
Proportion of farmland allocated to sesame: %	520	520	2.87	3.02	0.15	0.26
Fertilizer (Urea & DAP/NPS) used for sesame: kg	517	515	24.47	4.43	-20.05	0.20
Labor (family + hired) used for sesame: MD	520	520	74.97	79.01	4.04	0.60

The balance of key variables between clusters is good - implying reliable randomization.

Endline survey

- Started in mid November.
- We have interviewed about 942 (+60%) of the 1560 households.
- Considerable level of attrition observed. Reasons:
  - **Total displacement of the household**
    - Family members of armed forces are displaced due to fear of retaliation and potential imprisonment.
  - **Imprisonment**: several farmers have been imprisoned for various reasons related to the war, including direct participation in hostilities.
  - Farmers close to active war zone **could not travel** to “safer” areas where interviews are being held.
  - Farmers in remote villages, whose members are involved with the waring parties **hesitate to travel** for fear of retaliation.
- Planned to be finalized in the third week of December.
- Reports expected to be available in Q1 2025.


Thank you!

Annex
Annex

Analysis plan

- **Interest is in individual level effects of MI and MI&CA.**
  - We are running individually randomized group-treatment (IRGT) trial.
- The analysis will measure ITT and LATE/CACE, + attrition
  - ITT (assuming full compliance = ATE)
    - We pre and post intervention data, $t = 1,2$, on $i = 1, \dots, N$ sample of farmers clustered in villages $k = 1, \dots, K$, and treatment arms $\gamma = 1,2, \& \ 3$ - where 1 is control and 2 is MI, and 3 is MI&CA, the ATE on income from sesame production, $y_{jk\gamma t}$, (our design outcome) can be estimated as

$$y_{ik\gamma t} = \mu + \boldsymbol{\beta_1 D_{\gamma t}} + \nu_k + \upsilon_{kt} + \epsilon_{ik\gamma t}$$

    - Where μ is the overall mean, $\boldsymbol{D}_{\gamma t}$ is a three-level treatment indicator for control and two treatment conditions, β_1 is the treatment effect, $\nu_k \sim N(0, \sigma_\nu^2)$ is the between-village random effect, $\upsilon_{kt} \sim N(\tau_t, \sigma_t^2)$ is the within-village, between time-period random effect, and $\epsilon_{ik\gamma t} \sim N(0, \sigma_\epsilon^2)$.
      - The parameters to be estimated are $\Theta = [\mu, \boldsymbol{\beta}_1, \sigma_\alpha^2, \sigma_t^2 \ \tau_1, \tau_2]$.
      - The treatment effects of primary interest are $\boldsymbol{\beta}_1 = [\beta_{1,MI}, \beta_{1,MI\&CA}]$, implying mean differences between the arms and the control.

Analysis plan…

- LATE/CACE [focus on one-sided non-compliance]
- 2SLS

  Let $Z_{ik\gamma t}$ is randomized treatment assignment and $T_{ik\gamma t}$ is treatment received taking the value 1 if the individual actually received the treatment and 0 otherwise.

  - **First stage [estimating prob of treatment received]**

$$logit(\Pr(T_{ik\gamma t} = 1) = \delta_0 + \delta_1 Z_{ik\gamma t} + \boldsymbol{\delta X_{ik\gamma t}} + \zeta_{ik\gamma t}$$

  where δ_1 is the compliance effect (effect of trt assignment on actual trt received), $X_{ik\gamma t}$ covariates (e.g., baseline characteristics) that influence compliance, and $\zeta_{ik\gamma t}$ is first stage error term.

  - **Second stage [outcome model]**

$$y_{ik\gamma t} = \mu + \rho_1 \hat{T}_{ik\gamma t} + \boldsymbol{\rho X_{ik\gamma t}} + \nu_k + \upsilon_{kt} + \eta_{ik\gamma t}$$

  Where $\hat{T}_{ik\gamma t}$ is predicted value of $T_{ik\gamma t}$ from the first stage above.

Analysis plan …

- **Attrition**
  - Missing data problem
  - The focus will be whether attrition is informative [not random]
  - We will conduct joint test whether baseline characteristics vary systematically by trt and attrition status jointly.
    - We will model attrition as an outcome itself.

$$\psi_{ik} = \alpha + \lambda_1 T_{\gamma k} + \lambda_2 X_{ik} + \lambda_3 \left(T_{\gamma k} * X_{ik}\right) + \varepsilon_{ik}$$

where λ_1 direct effect of treatment on attrition, λ_2 effect of baseline characteristics on attrition, and λ_3 Interaction term capturing whether the relationship between baseline.