Product market reforms and technology adoption by Senegalese onion producers

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ATAI, J-PAL, CEGA Evidence for Ag Development and Transformation, MIT, Dec 7, 2017

The technology adoption problem

- **Multiple constraints** to adoption (ATAI whitepaper 2011)
  - **Supply** side issues
    - Lack of local access to technology
    - Lack of information
  - **Demand** side issues
    - Lack of knowledge
    - Inadequate behavior: time inconsistency
  - **Contextual** issues
    - Lack of financial services: credit, insurance, payments
- But **low expected return** likely a first-order determinant of low adoption
  - Unfavorable trade and exchange rate **policies** (appreciated CFA)
  - Limited access to remunerative/deep **markets**; high transaction costs (Suri 2011)
  - **Market power** of intermediaries and lack of price pass-through (Falcao 2017)
  - Lack of precise **quantity and quality recognition** in transactions (this research)

The price pass-through controversy

- Local markets may not be **competitive**, negating the **pass-through** of price increases (e.g., for quality) to producers
- **Conflictive evidence**
  - Review of crop markets in SSA concludes on general **competitiveness** (Dillon and Dambro 2016)
  - Casaburi & Reed (2017) find **92% pass-trough** to cocoa farmers of a subsidy to traders in Sierra Leone
  - Bergquist (2017) finds only **22% pass-through** by traders to consumers of a maize price subsidy in Kenya, and local **collusion** over prices offered to farmers even with entry
- But competition of large traders in **far away markets** may be low, even if local traders and intermediaries are competitive (Dillon & Dambo; this study)

The Senegal onion market experiment

- **Hypothesis**: Small improvements in market structure can lead to important production responses by farmers and income gains
- **Experiment**: Introduce market reform to inform agents on quantity (scales) and quality (labeling of grades) of onions
- **Results**
  - **Direct effect**: Observe improvement in prices received for quality
  - **Behavioral response**: Observe farmers' re-optimization
    - **Production response**: More adoption of quality-enhancing technology
    - **Marketing response**: More sorting to achieve quality

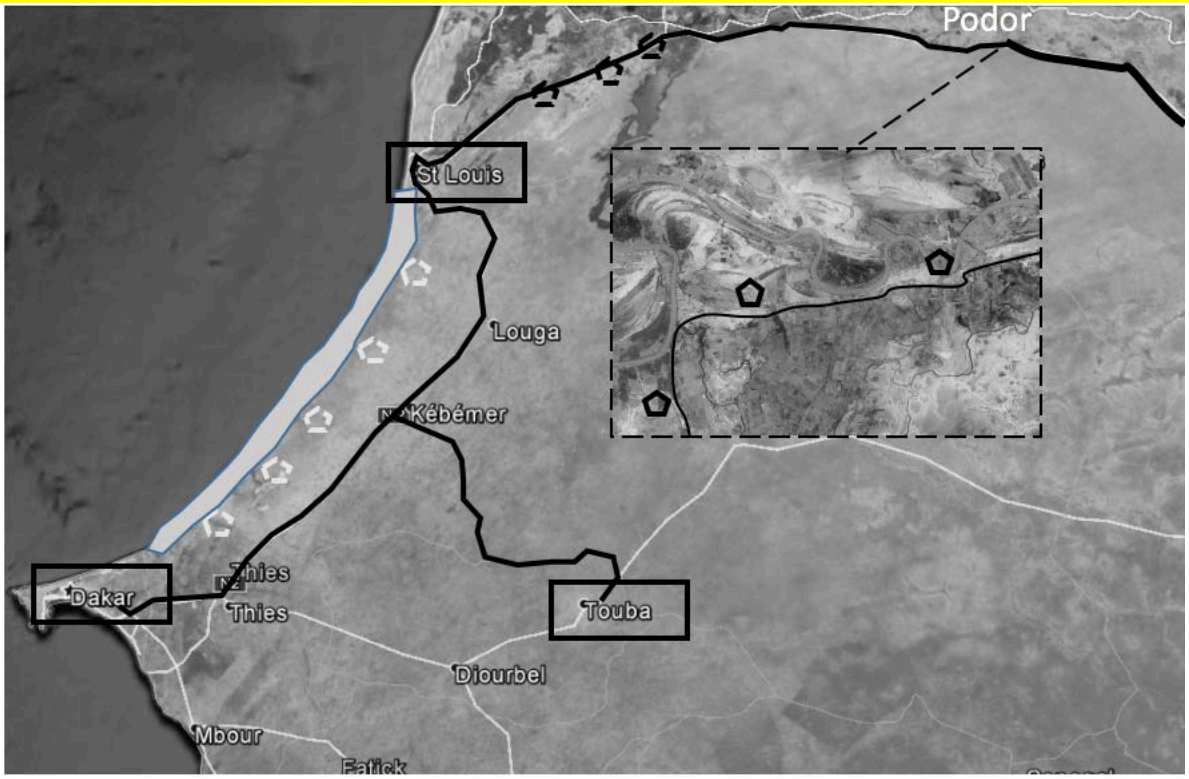
Onions in Senegal

- Basic daily **ingredient** in every Senegalese kitchen
- Mostly **imported** from Holland
- **Low quality** makes domestic onions not competitive with imports
- A huge policy issue as **delinks** domestic producers from domestic consumers
- **Policy response**:
  - Since 2000, 7 months **import ban** to encourage domestic production
  - 35% **import tariff** = tax on consumers

Onion production in Podor

- Important **production** zone: Podor department (study area) 3,500 ha
- Strong **regional development agency** (SAED) and **local university** (UGB) for extension
- Distant to markets, but good **infrastructure**
- Size and quality of onions depend on **fertilizers** used
- Current sale based on **volume** (bags), not **weight** and **grading**
- Use **urea** to produce larger onions to fill bags, but high water intensity and high perishability (high post-harvest losses)
- Can use 10-10-20 **N-P-K** to increase weight and quality, if remunerated

Onion commercialization in Podor

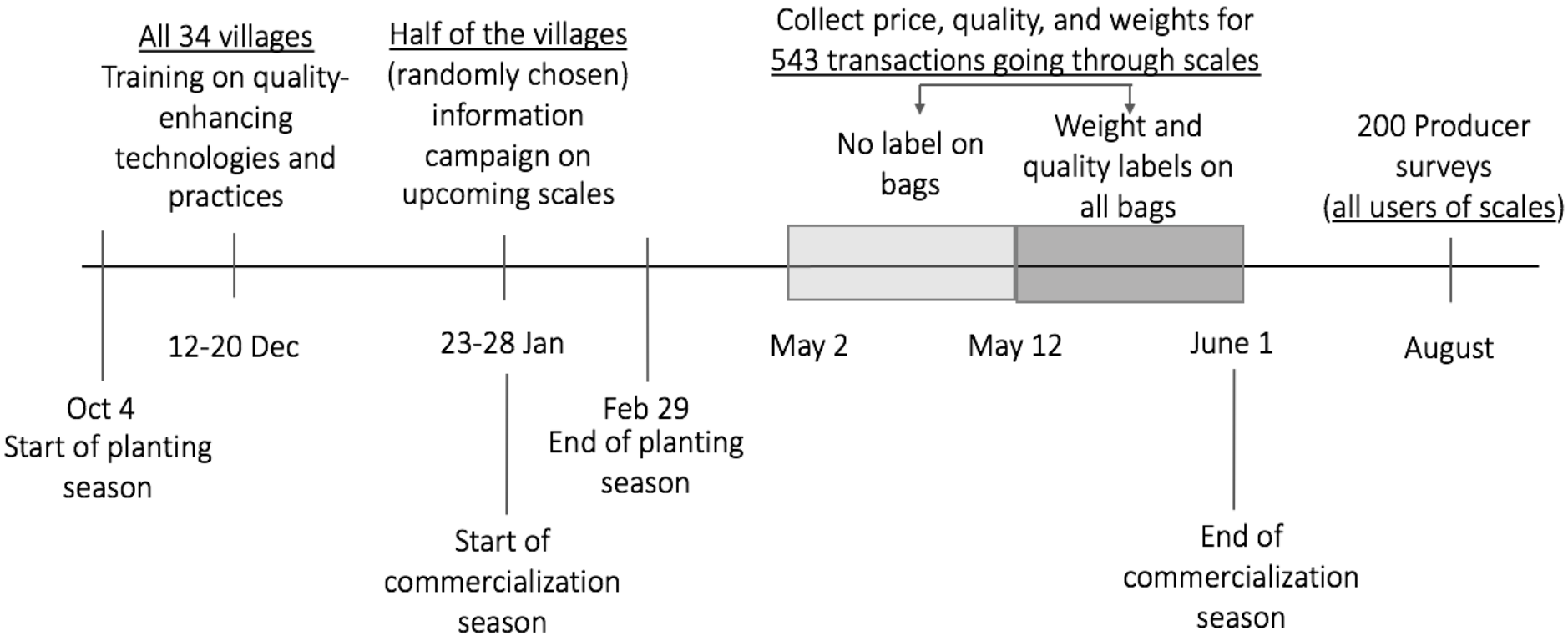


- **Farmers** bring product to consignment agents (**coaxers**) on local assembly markets
- For fixed fee, **coaxers** negotiate and sell to long-distance traders (**banabanas**)
- Onions sold on **volume** in presumed 40 kg bags
- **No** scales or quality measures as “banabanas would no longer come”

Experimental design

- **ATAI experiment in market reform**
  - 2013: Local market authorities agree to the introduction of scales and quality labeling (three grades)
  - 2014: We work on implementation of weighting and labeling with local University Gaston Berger
- **Study design**
  1. Universal **training** for onion producers on quality enhancing technologies and practices (SAED)
  2. **Information** campaign on scales/labels in random half of 34 villages delivering onions to assembly markets → Assess effect on **production** and **marketing** behavior
  3. Use delays in authorization for effective operation of scales as a time discontinuity for Diff-in-Diffs → Assess effect on **prices** for farmers in treated vs. control villages before and after

Time line of experiment



Enable quality response in all villages (**training**)
Induce **production responses** for quality in treated villages (**information campaign**)
Induce **marketing response** (**sorting for quality**): can be done by all at market
Observe **price effect** by double difference for treated villages when labeling effective

Information campaign and knowledge about scales

Information	Control villages	Treatment villages
% who know about introduction of scales	97.44	98.75
% who learned about it through		
Information campaign	18.42	53.46
Friends/relatives	23.68	11.32
Coaxer	15.79	13.21
On delivery	42.11	20.75
Other	0.00	1.26
% who learned about it in the month of		
January	21.05	50.94
February	13.16	3.14
March	5.26	2.52
April	47.37	32.70
May	13.16	9.43
Doesn't know	0.00	0.63
% who changed production behavior since learned about scales	23.08	78.80
n	39	161

Ultimately, all farmers **knew** about introduction of scales, but farmers in T villages learned about it early on (January) through the information campaign vs. at delivery for C farmers

→ **Farmers in T villages had time to adjust their production and marketing practices**

Results: Impact of market reform on production and marketing behavior

Information about market reforms induced a change in **production behavior**:

- 9%pts decline in incidence of use of **pro-volume urea** from a base of 95%
- 27%pts increase in incidence of use of **pro-weight 10-10-20** from a base of 28% (doubles)
- Increase in application of 10-20-30 by 116 kg/ha from a base of 43 kg/ha (nearly triples)

All farmers increased **sorting**, especially for transactions occurring after the introduction of scales and labels.

Does not require information about the reforms (T) as can be done **upon arriving** at the market

Results: Impact of reform on quality and price

Impact on quality

- 16%pts increase in likelihood of onions being of **good quality** from a base of 8%

Impact on price

Diff-in-Diffs before-after scales effective, for treatment (can adjust quality as informed) vs. control

- Test of **parallel trends** before introduction of labels satisfied
- Diff-in-Diffs 6 to 9% **increase in price** received after introduction of labels if informed

Results: Testing for quality as the channel to price increase

Observe partial correlation between quality and price

- **Higher price** received correlates with **higher quality**
- Price effect mainly associated with introduction of **labels**

Cost and benefit

Increase in revenue

No change in **number of bags** harvested per ha

Increase in **weight** of bags: quantity effect

Increase in **quality** of onions sold: quality effect

Increase in **price** received if informed: +6 to 9%

Increase in cost

Fertilizer, sorting

Increase in net income per hectare: +11%

Reverse "market for lemons" effect

High quality sold through **certification** system

Low quality sold directly on **volume** through coaxers

Summary of results

- Market reform led to increased adoption of quality-enhancing **technology** in production and of **sorting** by quality in marketing
- Role of **market information** on quantity and quality :
  - Increase in **price** premium received by farmers on assembly markets: 6-9%
  - Some increase in **weight**
- Overall **net benefit to farmers**: 11% increase in net income per hectare
- Hence, some **price pass-through** to farmers achieved
- Importance of farmers' **behavioral response** in overall benefit from innovation

Typical ATAI result: Intervention favoring adoption induces both direct effect and behavioral response

Innovation	Direct effect	Behavioral response
Index insurance, emergency loans	Better shock coping: post-shock liquidity available for recovery and investment	Better risk management: more investment in/adoption of more risky-profitable activities
Flood tolerant rice variety: SwarnaSub1	Agronomic resilience Less yield loss in bad years Sub1: 682kg/ha	More adoption of fertilizer, labor-intensive practices. Higher yields in normal years Sub1: 283kg/ha
Short duration rice variety	Earlier harvest: higher price, less exposure to risk	Agricultural Transformation: new faming system with third crop and smoother labor calendar
Market improvement: scales and labels (this study)	Higher price for quality	Better fertilizer and more sorting for quality

Behavioral response can be a large share of total gain from innovation: need be understood, facilitated, and amplified

Epilogue

- Use of scales and labeling was **discontinued** at end of experiment under banabana pressures (market-power): confirms lack of competitiveness in distant markets
- Scales are in place on other onion markets throughout the country, managed by **local Market Management Committees**, with scales certified by the Ministry of Commerce, and supported by a market fee paid by farmers
- Scales and labels could easily be **maintained** in Podor
- But market reform requires **collective action** or **government intervention** to induce local Market Management Committee to introduce and sustain the reforms

Policy dialogue in Senegal

- Government of Senegal recognizes the importance of increasing the **quality** of domestic production to liberalize the domestic market
- Reducing **post-harvest losses** is a key element to domestic competitiveness
- Huge generic policy issue in
  - Enabling domestic **farmers** to keep **access to domestic consumers** instead of wholesalers/ supermarkets/ agroindustry procuring from imports, as increasingly done
  - Reducing high tax on **consumers** for major staple food
- FAO/MAFAP and Ministry of Commerce **dialogue** on the issue, with useful ATAI evidence to inform the discussion

Policy dialogue in Senegal

- Can be done through **interlinked contracts** between producer organizations (GIE) and wholesaler/importer
  - Current **preferred approach** by FAO/MAFAP and Ministry of Commerce
  - **Productive Alliances** approach championed by World Bank
  - But **difficult** to make it work in crops for domestic market due to high potential for side-selling
- Or can be done through **local certification services** (this experiment)
  - **Simple** to implement, market-based, sustainable
  - But requires separate management of **other dimensions** of contracts: credit, insurance, technical assistance according to context
- Senegal study **suggestive**. Need further **experimentation** with contracting and certification services over **whole value chain**
- **Ethiopia** ATAI-ATA study on wheat certification for flour content on local markets: price and production effects


End