The Sustainability of Technology Dissemination Programs

Shared Drip Irrigated Horticulture in Senegal

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Background

- Hypothesized obstacles to the adoption of improved agricultural technologies include credit constraints, informational barriers, and lack of technical support, among others.
- A common approach is to “entice” early adopters with subsidized/free access to equipment/inputs and support, with the hope that the experience will lead self-sustaining usage and diffusion.
- Does it work?

Background

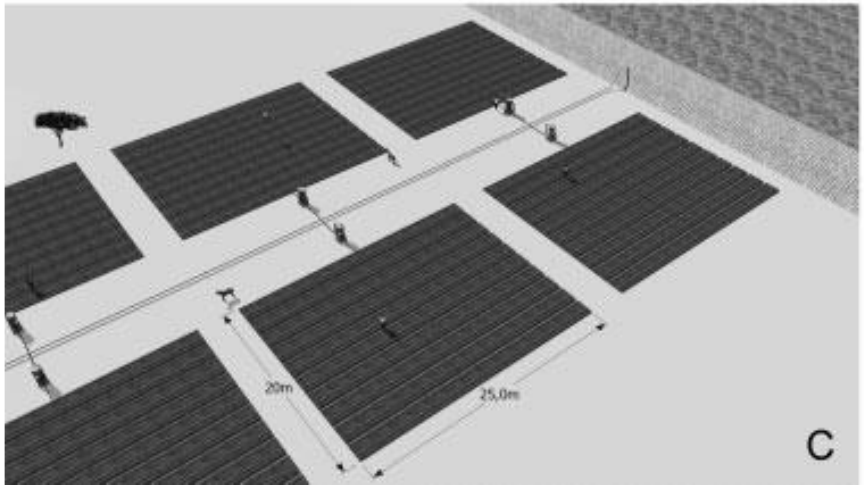
- (Absent) economies of scale may exacerbate some of these hypothesized obstacles for smallholders:
  - Costs/performance of infrastructure
  - Informational externalities (Conley and Udry 2010, Bandiera and Rasul 2006)
  - Access to markets
  - Training and extension (Bimer and Anderson 2007)
  - Supply chains
- A possible solution is to organize farmers in groups.
- However, group adoption can also exacerbate some of the challenges of achieving lasting impacts, including collective action, especially after external intervention ceases (Purcell and Anderson 1997)

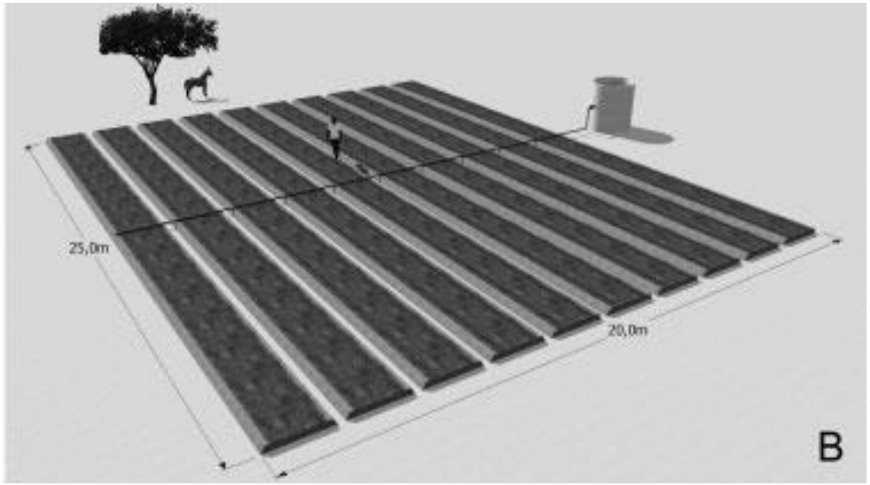
Drip Irrigation

- Irrigation a major bottleneck for dry season horticulture in the western Sahel: labor intensive and water availability.
- Drip irrigation: a proven technology for increasing yields and reducing water requirements (Woltering et al 2011).
- Low pressure drip irrigation: adapted for developing countries, but still requires a scale of ~5 Ha. Challenge for adoption by smallholders with holdings <1 Ha.

TIPA

- TIPA (Technology adoption for poverty alleviation): a model of collective drip usage (Woltering et al 2011)
- (~50) Farmers share irrigation infrastructure but cultivate separately owned (contiguous) plots of land (0.1 Ha)





PAPSEN-TIPA

- A joint project by Senegalese Government, Italian Cooperation, and MASHAV to expand TIPA to 70 sites in 3 regions around Dakar.
- Contractual agreement with the group:
  - Long-term ownership of land and equipment.
  - Commitment to following agronomic recommendations.
  - Commitment to pay for all inputs (after first two seasons) and to punish free riders.
  - Group will obtain access to credit
- Training and supply chains organized by PAPSEN-TIPA for the duration of the project (3 years)
- Support for self-financing of TIPA offered to other groups after 2nd year.

Expected Impacts

- 50% increase in yields
- >100% increase in cultivated land (off season)
- Time use?

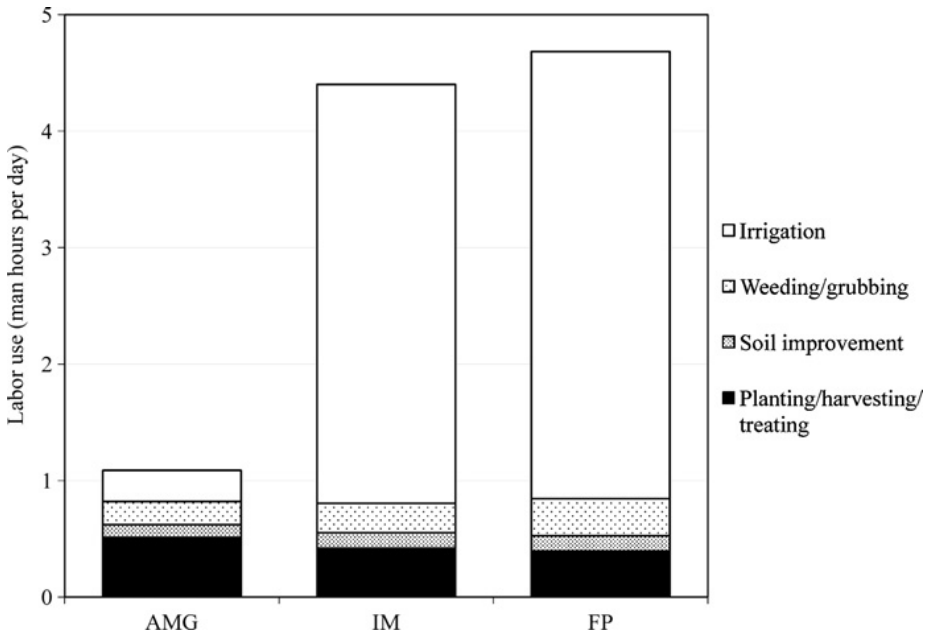


Fig. 3. Labor use per activity in man hours per day for a 500 m^2 garden averaged over all crops per treatment.

Research Questions – Short Term

- Impact of participation on household decisions on:
  - Consumption/investment
  - Cultivation practices in pre-existing plot
  - Reallocations of Time Use
  - Nutrition
- How do impacts depend on revenue amount?
- Heterogeneous impacts by gender and by being part of a women group (non-experimental).

Research Questions – Long Term

Are there lasting impacts?

- Maintenance of the installed TIPA system
- Diffusion to other households / groups
- Other (private) investments (of generated income)

If not, why?

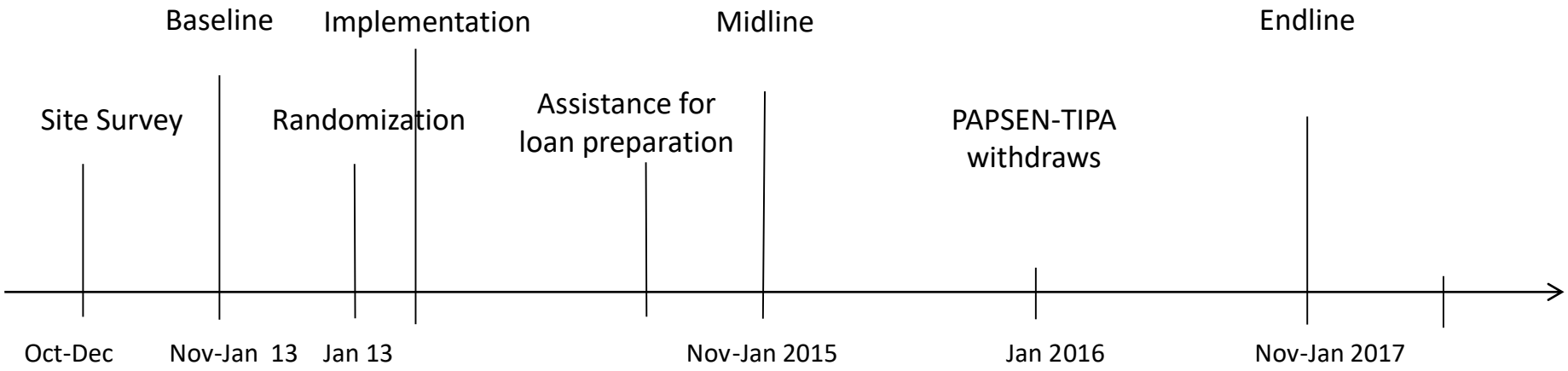
- Failures of collective action?
- More attractive investment/consumption options?

Correlates (non-experimental): heterogeneity in returns, history, gender composition, ...

Experimental Design

- Candidate sites require:
  - Sufficient available public land
  - Sufficient water availability
  - Functional and interested farmer group (Preference to women groups)
- Site selection: 70 sites to be randomly selected for implementation out of pool of candidate sites (expected >150)
- Within each site, plots distributed to group members (about 50) through a lottery.

Data Collection / Timeline



Data Collection:
Surveys: Baseline, Midline (2 years) and Endline (4 years).
Continuous monitoring of participation, payments, productivity.

Impacts to Measure

	Group Level	Household Level
In Site	• Payment for Inputs • Maintenance of infrastructure • Production, Sales	• Production and Income • Sale / Consumption (Nutrition) • Investment • Time Use • Improved Agricultural practices (in own plots by group members) • Demand for TIPA (loans/self financed)
Out of Site	• Demand for TIPA (loans/self financed)	• Demand for TIPA (loans/self financed)

Design trade-offs

- Randomize sites / clusters of sites?
  - Reduced power vs. measurement of diffusion (depends on geographical distribution).
- Vary treatment?
  - Cluster/Communal
  - Nutritional Interventions
  - Group Credit
  - Activities promoting group cooperation?
  - Group Size?
  - Preference to women groups

Thank you