Breakout Session A:

Practical Lessons Learnt

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Session agenda

- Programme motivations and goals
- Research design and overall outcomes
- Results:
  - Farmer characteristics’ impact on adoption, transplanting and survival
  - Implementation, extension & tree management practices
  - Effect of monitoring, input subsidies and incentives
- Tradeoffs in costs/outcomes
- Smartphones for surveys and field monitoring
- Future research questions
- Future programme goals

- Discussion throughout!
Trees on Farms Programme objectives

- Increasing agricultural productivity
- Enhancing farmer resilience to climate change
- Mitigation of climate change

HOW?
- Intercropping of Musangu
- Partnership model (Dunavant, SVA & Musika)
- Scale-up over 2-3 years across 100,000 farmers
Why Musangu (Faidherbia albida)?

• Reverse phenology, and very well suited to intercropping
  • Minimal competition with crops in growing season;
  • Active in dry season; pods for livestock (up to 1000kg/tree) and flowers for honey in time of scarcity (Barnes, 2003);
  • Nutrient cycling from deep soil, high biomass production;
  • Widespread evidence of yield increases;

• Environmental benefits: soil health & fertility, erosion protection, improve soil structure water infiltration, Climate mitigation

• Co-benefits - food security, resilience to weather shocks
Barriers to adoption

• Short run costs and long-run benefits
• Liquidity or resource constraints (land/labor)
• Limited access to inputs and extension
• Weak marketing of benefits
• Land tenure

Motivation for testing input subsidies & rewards
• Bridge the gap between short-run costs and long run benefits
• Positive externalities (erosion, flooding, climate)
Approach to analysis

• Timeline:
  Training and uptake > seedling collection > transplanting > surviving trees

• Analysis of survival outcomes based on farmer characteristics, implementation
  – correlations (omitted variables can be important!)

• RCT experiment allows identification of causal links between treatments & outcomes
Characteristics included

- Household size
- Age of respondent
- Gender
- Female-headed household
- Years of education
- Months of food shortage
- Non-agricultural wealth
- Years with Dunavant
- Knowledge of Musangu
- Risk attitudes
- Private discount rate
- Total land holdings
- Number of fields
- Planted cotton last year
- Planted Musangu in past
- Used fertilizer last year
- Soil types
- Research design variables
Research design and mean outcomes

Contract: pays a reward for 35 or more trees

Randomly assigned treatments:
- Cost sharing of inputs (full subsidy to full cost)
- Reward $0 – 150 for at least 35 trees
- Timing of reward announcement

Outcomes:
• Mean planted is 28 seedlings
• Mean planted is 43 for those planting > 0
• Mean survival is 17
• Mean survival is 23 for those planting > 0
• 1 out of 4 had at least 35 trees and received rewards
• 1 out of 3 had >35 trees from those who planted > 0
Which types of farmers signed up?

Take-up: Contract and input purchase directly after training.

- Female-headed households
- Farmers with lower risk aversion
- Farmers with larger households
- Those who had been working with Dunavant longer

Correlations may suggest:
- Female-headed HHs see Musangu as of greater benefit
- Labor availability may be important for take up;
- Extension relationships and trust important
Who collected seeds & transplanted?

(of those who signed contracts)

Seedling pickup
- Months of food shortage
- Total land holdings
- Years with Dunavant
- Previous Musangu planting
- Soil type (sandy black soils)

Transplanting
- Smaller household size
- Age
Which farmers had better survival?

- Prior experience planting Msangu (+5 trees)
- Fertilizer in previous year (+3 trees)
- Years of education and age
- More years with Dunavant
- Those reporting sandy black soil, or sandy soil
- For smaller rewards (< K75), smaller households and those with more land
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Correlations may suggest:

- Survival rates are partly within control of farmer (experience matters)
  - some of this impact is due to transplanting higher numbers, suggesting that these farmers know to compensate for mortality
- Soil fertility matters (may also be proxy for wealth)
- Soil type suitability matter
Impact of farmer group structure

• Group level effects were significant
  – Local environmental conditions, centralized nursery success, YGL capacity and peer effects
• Higher average incentives within the group improved individual performance
• Differences between groups have a larger effect on survival compared to farmer differences (though this may be influenced by group-level nurseries)
What about group-level nurseries?

• Group leaders manage large nurseries in research
• Increases project costs
• Lowers nursery management effort of farmer but adds seedling transport
• Quality of seedlings collected overall was good.
• Variable success in centralized nurseries flow through to farmers.
• Quality of seedlings collected correlated with survival
  o +5 surviving trees if all seedlings were good quality
  o - 8 surviving trees if all seedlings were poor quality
Farmer contract perspectives

- Generally accurate recall

- 75% knew the 35 tree threshold for rewards

- 78% knew their exact reward 4 months after training, but fewer did a year after training

- Overall said reward drawn was lower than expected (driven by those in lower 50% of rewards)

- More likely to say their reward was as expected if after take up decision
Relative rewards

• Overall, perceived others’ rewards as higher than theirs (true even for those in top 50% of rewards)

• Farmers with neighbors who are randomly assigned higher incentives do better
  – Controlling for farmer’s own incentive

• Consistent with motivation spillovers – being near another farmer who is doing well (high incentives) results in higher own performance
Farmer feedback on work/benefits

• Expectations of work required were balanced
  – Overall 34% saying it was more work, 28% less work
  – If watered, fewer said work was as they expected

• When asked about the benefits of planting Musangu
  – Most farmers noted soil fertility

• Few farmers reported that a benefit of planting Musangu was rewards, but rewards still impacted survival

• 96% said they’d like to plant Musangu again in 2012
Tree Management Practices

- Intercropped with cotton (66%), g/nuts and maize (14% each).
- Field care: 51% weeded, 20% places stakes, 20% made firebreaks, and 8% mulched.
- Watering was most difficult activity, then transplanting.
- Seedlings mortality while awaiting transplanting biggest reason for planting fewer than collected.
- Farmer visit fields 53 times on average.
- Higher incentives did not increase likelihood of visible evidence of management practices during a final plot visit.
Monitoring and YGL support

Intensive monitoring
• Farmers monitored frequently to track activities had 10 more surviving trees
• Response to monitoring positive: 97% of those monitored said they were proud to be visited
• Cost of monitoring this intensively is high

Lead farmer (YGL) contact
• When farmers needed advice: 60% of farmer consulted their YGL, only 6% said a neighbour
• Lead farmer support important: farmers who said they had seen their YGL > 10 times had 4 more surviving trees than otherwise.
Program take up, by reward level

![Graph showing program participation (Est'd coefficient) against conditional reward (ZMK) for different input costs.]
Tree planting and survival, by reward level

Tree planting

Tree survival
Cost effectiveness

• Per tree costs vary with participation rates, share earning rewards, per farmer program costs
  – Tradeoff between enrolling more farmers and more trees per farmer
• High fixed programme costs + low variable costs
  – Subsidize take up without incentives
• High variable costs
  – Cost recovery through inputs, pay incentives
Smartphones as M&E tools

- Real time data using mobile-phone based surveys
- Integrated GPS allows for plot geo-referencing
- Cost effective & user-friendly

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<tr>
<td>Name</td>
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<td>Year of most recent CFU training</td>
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What sort of livestock do you have on your farm? Cows, Chickens, Pigs
Number of COWS 5
Summary of findings

• Input costs increase take up but not tree survival
  – No perverse impacts of subsidies

• Incentives increase survival conditional on participating
  – Selection into program because of incentives is minimal

• A diverse group of farmers joins the program and earns rewards

• Monitoring improves tree survival outcomes

• Lead farmers and peers matter, but do does individual effort
  – Higher rewards for neighbors has a positive spillover effect
Future research questions

1. What happens after rewards stop?
   – Persistent effects: Incentives motivate investments during difficult first year
   – Temporary effects: Farmers only perform to earn incentive
   – Proposal: Follow up survey in Oct/Nov 2013

2. Why does monitoring increase survival?
   – A number of plausible hypotheses: builds trust, reminder effect, accountability
   – How much monitoring is enough?
   – Proposal: A new study with current or new partners
Trees on Farms approach in 2013

• Implementation approach
  – Nurseries established by each farmer
  – Free provision of inputs, no rewards in general
  – Possible pilot with input costs and rewards based on simulated ‘optimal contracts’

• Applying Dunavant Yield extension structure
  – Group leaders train group farmers

• Scale-up goals 2013
  – Group leaders and group farmers in established areas
  – Group leaders in new areas, with group farmers to follow in ‘14
  – Total of 10,000 farmers participating in 2013

• Registration in global climate change programmes