Evaluating the Socio-economic Impacts of Western Seed's Hybrid Maize Program

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BASIS

AMA Collaborative Research Support Program

Motivation

- Economic research on improved seed adoption in SSA often treats hybrids as a single homogeneous technology
  - Can seeds developed for the mid-altitude environment improve livelihoods for smallholders?
  - Big seed companies may overlook this market, while local companies can target it
  - WSC has received social impact investment (Acumen/AGRA) based on the belief that they can improve lives of smallholders in these agro-ecological zones
- The investors want to know whether the expected impacts are there
  - Multiple constraints might however limit the uptake of improved seeds, among them:
    - Information
    - Liquidity

Outline

- Core experimental design based on randomized information treatments in WSC expansion areas
- Secondary analysis of different information treatments and learning networks
- Expanded experimental design examines complementary relaxation of liquidity constraints
- Soil quality and impact heterogeneity
- Pending Questions:
  1. Voucher modalities (electronic, paper, etc.)
  2. Potential for interlinking soil test results and vouchers?
  3. If we gave farmers personalized recommendations
     - Would farmers trust, understand , and follow them?
     - What variety of fertilizer would these farmers be able to get?
     - Lime vs. fertilizer

Core Experimental Design

- The simple experimental design we would like to see is:

No Access to WSC Hybrids	Access to WSC Hybrids
A	*B*

- Comparing farmers in *A* with farmers in *B* would get at returns to investing in local seed companies like WSC
- However, can't exclude farmers from accessing WSC hybrids
- Instead must find a feasible mechanism that will mimic this treatment assignment
- Our strategy: exploit WSC expansion into new areas (impact investment has facilitated expanded seed production capacity)

Core Experimental Design

- Starting point: WSC hybrids are ‘unknown’ in the new expansion areas
- Gives us the opportunity to randomize the information saturation that farmers get about these hybrids in the new expansion areas
- Information spillovers from informed to uninformed farmers is likely, so we developed a geographic strategy centered around learning zones:

Minimal WSC Information	Saturated WSC Information
A	*B*

Core Experimental Design

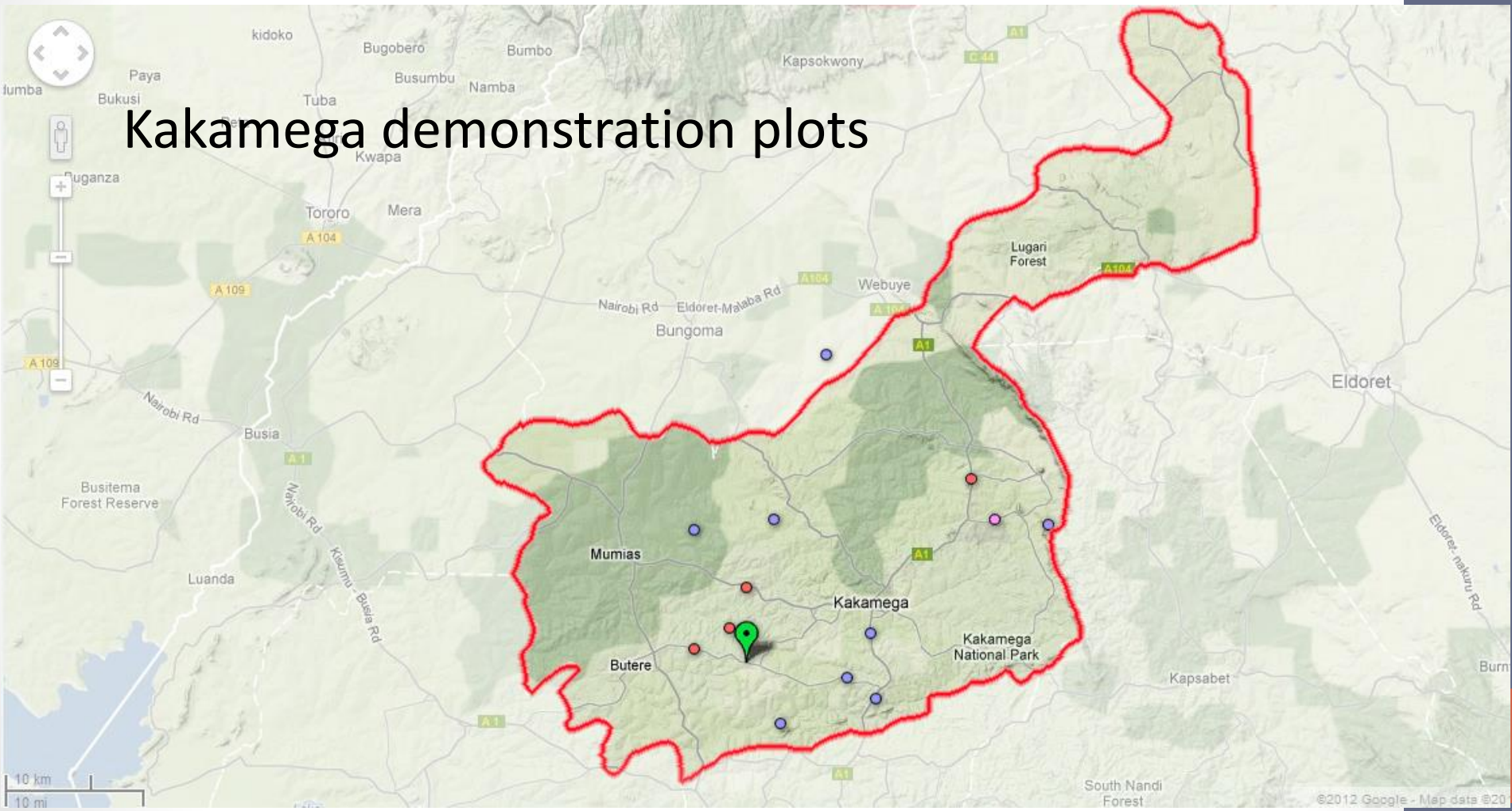
Implementation:

- WSC agreed to ‘overbook’ potential demo plots in expansion areas, and provided GPS coordinates for each potential plot
- We defined a 5 km radius learning zone around each potential demo
- Research team randomly selected a fraction of these potential demo plots for exclusion
  - exclusion means no demo plot was established & no WSC promotion activities take place within that zone

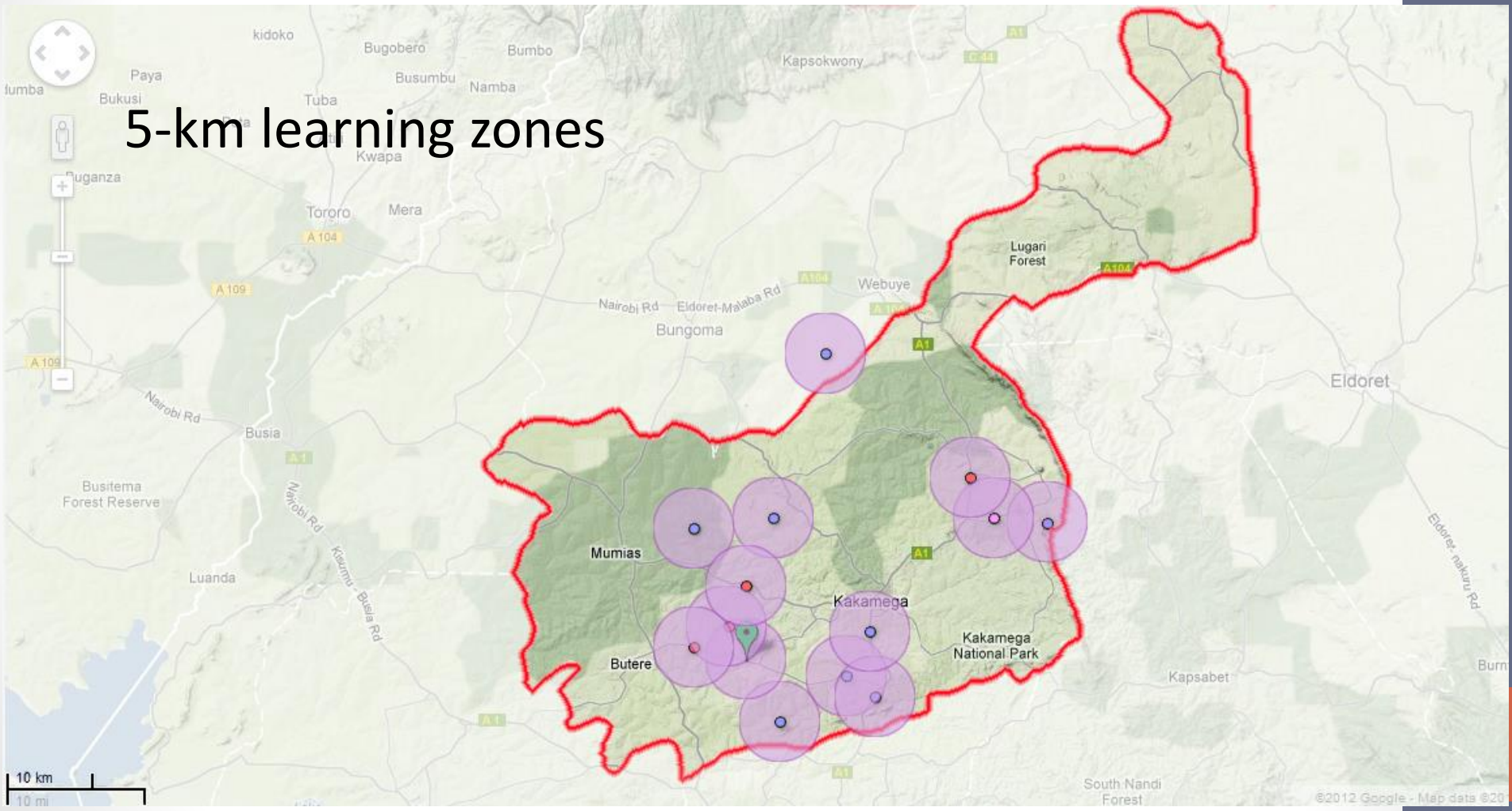
Core Experimental Design

- A matched set (more below) of potential demo plots were selected for inclusion, and sampled famers within these learning zones were saturated with WSC information just before 2013 long rains planting time:
  1. Close proximity to a demo plot planted with a variety tailored to the learning zone and its agro-ecological characteristics
  2. Information packets and village information sessions
  3. Free 250 g trial seed packet for use on own fields
  4. Random variation in information trail results based on weather
- Let's look at how this worked:

Core Experimental Design



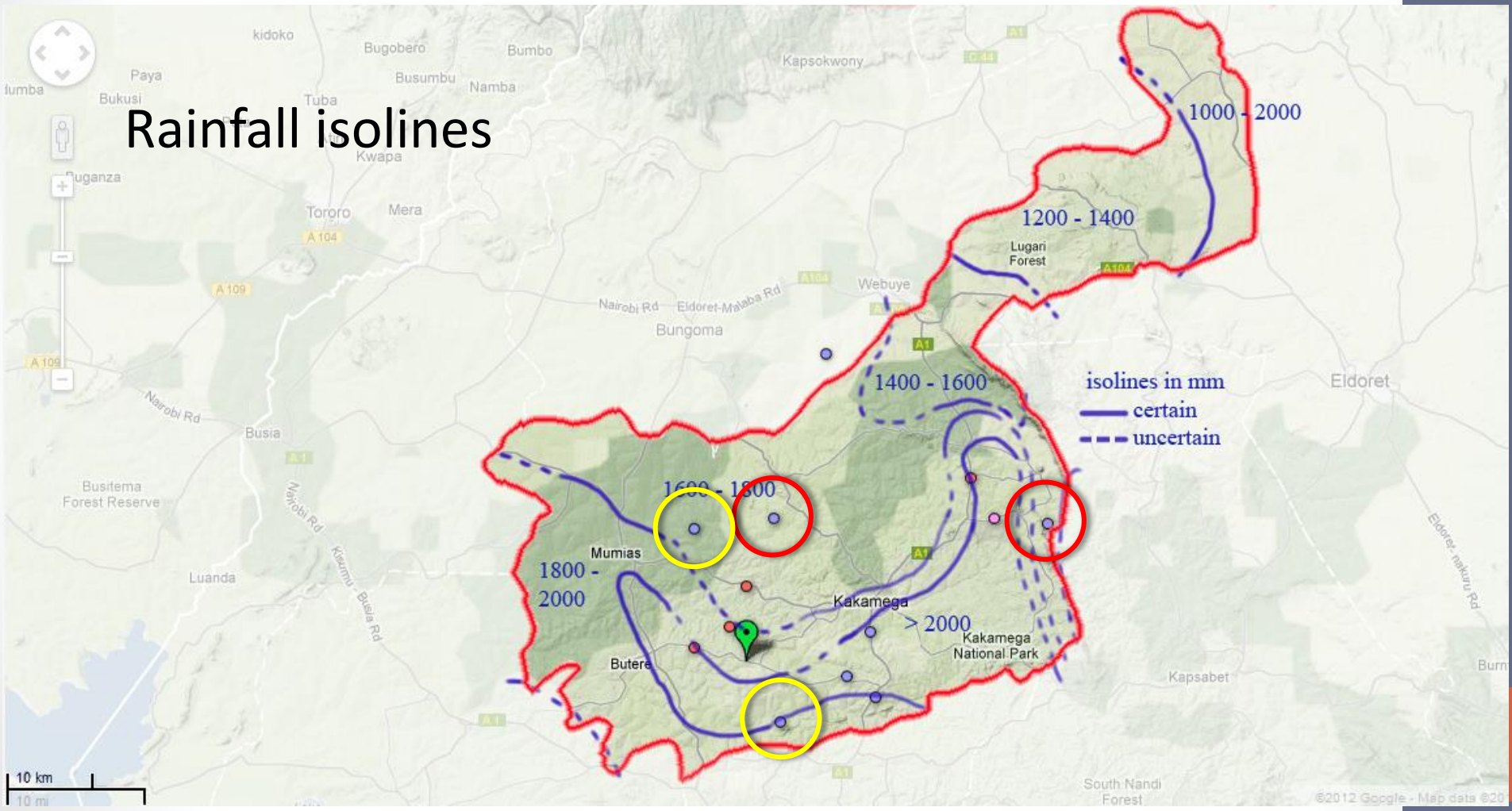
Core Experimental Design



Core Experimental Design

- For the overall study, we have 36 learning zones
  - 18 treatment, 18 control
- Given this modest number of learning zone clusters, we employed matched pair cluster randomization to improve statistical power, matching on:
  - Type of demonstration plot seed (selected during the booking process by WSC)
  - Rainfall
  - Altitude
- After matching demo plots up into pairs, an Excel program flipped a coin and allocated one to treatment and one to control

Core Experimental Design



Core Experimental Design

- Stepping back, with this strategy we have (cluster-) randomized the following information treatments:
  - Proximity to WSC demo plots: most distant for hhs in control zones, but (non-random) variation in distance even for farmers within treatment zones
  - Village information sessions: only farmers in treatment zones
  - Free WSC seed packets: only farmers in treatment zones
- In addition, nature will provide further variation in information:
  - Success of the nearby demo plot
  - Success of trial packet on own-farm
  - According to WSC, the demo plot variation will be driven largely by weather
- Statistically, our design will work *if* these treatments predict WSC uptake
- Put differently, the hope is that our information instruments give a robust 1st-stage regression!
- Note that this first stage regression will itself be interesting!

Secondary Study
(1st stage regression!)

- Informative of the impact of the different components of the information treatment
  - Distance to demo plot: optimal saturation of demo plots
  - Using the outcome on demo plots: interactions between distance and quality of demo
- To unpack the impact of the own-plot experiment, we can bring in treated farmers' neighbors
  - These farmers are on average close to a demo plot, but received neither the information session nor the sample packs
- We will use experiments to elicit WTP of both treated farmers and their neighbors
  - What do treated farmers learn & how will this affect WTP for seeds?
  - Do neighbors learn from the demo? From their neighbors' sample pack experiments?
  - Help to identify other constraints if do not buy when $p < WTP$

Expanded Experimental Design

- Core strategy should work for yields & livelihood measures if we get high adoption *intensity*
- But what if partial adoption (other constraints)?
- Particularly in Western Kenya, we worry that information may not be the only/main constraint
  - Improved seeds are more fertilizer-responsive, but many smallholders cannot afford fertilizer; this can limit adoption
- A second level of randomization: soil improvement vouchers
  - Will allow us to get closer to the *potential* impact of WSC seeds if liquidity constraints are relaxed

	Minimal WSC Information	Saturated WSC Information
No Voucher	A	B
Voucher	C	D

Soil testing

- One issue with vouchers is that different soils respond differently to fertilizer
  - If farmers with marginally responsive soils are induced to adopt, we will have biased impact estimates
- Our solution: soil testing
  - Can help us deal with this bias
  - Also allows us to explore impact heterogeneity (if impacts vary by soil quality)
- Other possibilities:
  - Fine tune soil amendment recommendations to use with the voucher coupons
  - Inform public debate on fertilizer vouchers

Pending Questions

- Fertilizer vouchers:
  - Implementation questions
    - Traditional vouchers
    - E-vouchers
    - Fraud, ease of use
  - Potential for interlinking soil test results and vouchers?
  - If we gave farmers personalized recommendations
    - Would farmers trust, understand , and follow them?
    - What variety of fertilizer would these farmers be able to get?
    - Lime?