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# SUBSIDIES &THE PERSISTENCE OF TECHNOLOGY ADOPTION

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*Evidence to Action Summit*

*25 May 2017*

***basis.ucdavis.edu***

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# THE PROBLEM

- Sub-Saharan Africa largely sat out the seed-fertilizer “Green Revolution” that swept through most of the developing world over the 1960 – 2000 period with tiny increases in the yields of basic grains.
- In 2009, SSA farmers used an average of 13 kg/hectare, compared to 94 in other developing countries.
- Mozambique is no exception to this pattern – at the national level, most maize farmers use no fertilizer and average less than 1 ton per hectare.
- IFDC program in Moz. Identified a gaping 2-3 ton/hectare yield gap between what is possible with existing technologies and what farmers achieve.
- Given the prevalence of poverty, the question is why this failure to adopt profitable technology exists, and what should be done about it.

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# COMPETING EXPLANATIONS

- TECHNOLOGICAL: Poor quality soils are not fertilizer responsive (the yield gap is more apparent than real); this implies new soil or seed solutions are necessary.
- ECONOMIC: Liquidity, risk, and info constraints bind farmers; this implies that smart & temporary learning subsidies, or financial interventions, are needed.
- BEHAVIORAL: Time inconsistent preferences (or hopelessness); this implies that all it takes is a nudge.
- HYBRID: Some combination of the above.

# INPUT SUBSIDIES: TEMPORARY OR PERMANENT?

- Governments and (sometimes) aid agencies have responded to this apparent yield gap challenge with input subsidies.
- Malawi, for example, beginning with its “starter pack” program in the early 1990s have been a leader in this approach in Sub-Saharan Africa.
- Across 10 countries implementing input subsidy programs, 2011 expenditures totaled over a billion USD, or 28.6 percent of public agricultural spending.

# MODEL STRUCTURE & ASSUMPTIONS

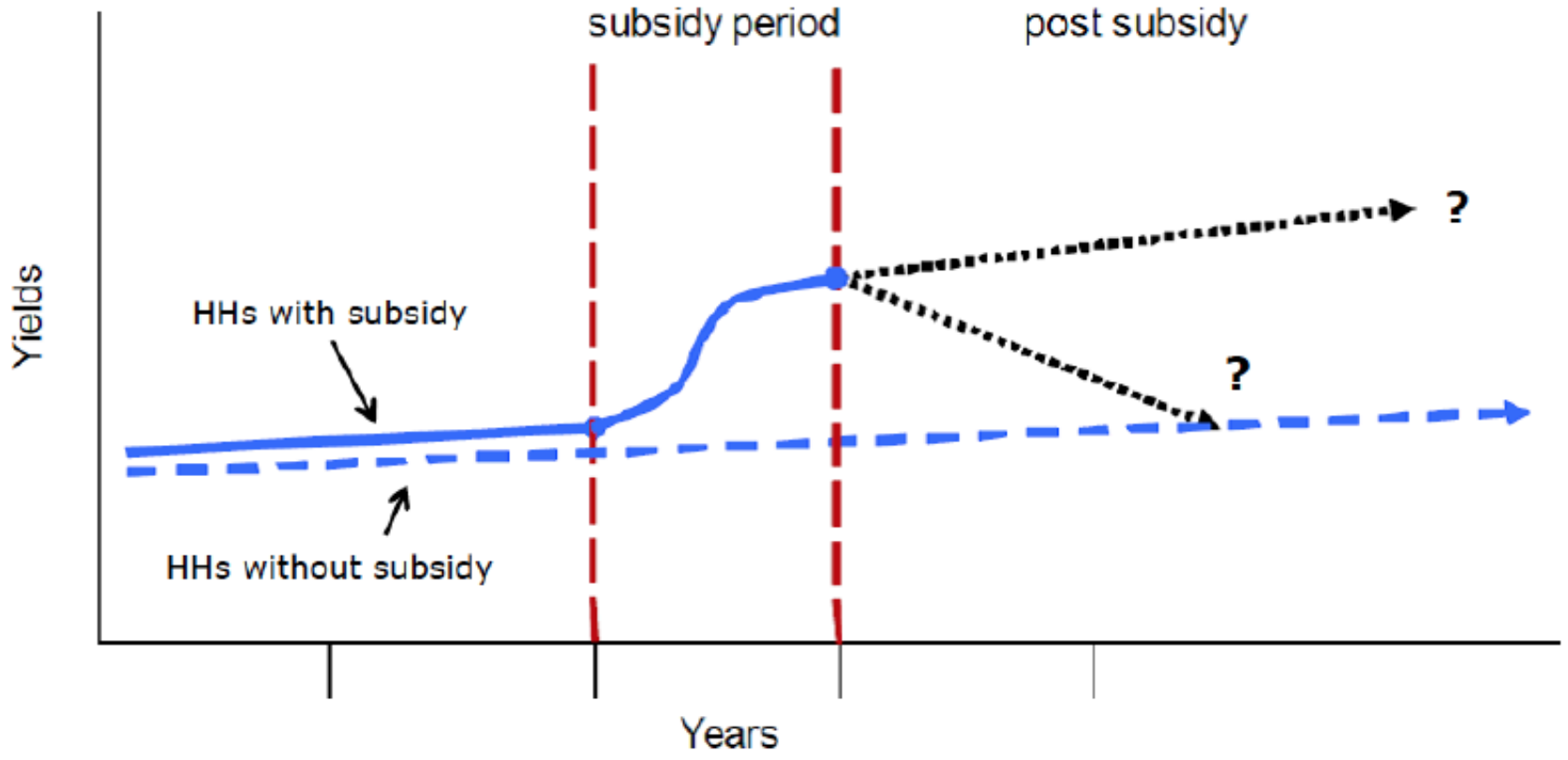
- This high level of public funding begs the question: why subsidize a (supposedly) privately profitable input at all?
- Subsidies can be a smart approach for development impact if they can break a technology trap by:

  -Making technology affordable to low-income farmers (overcoming liquidity constraints)

  - Sharing the risk of experimentation

  - Reducing learning costs & break the “let someone else experiment” equilibrium
- Note: all of these are arguments for *temporary* subsidies. But will temporary subsidies work, and will their impacts persist over time?

# FERTILIZER ADOPTION



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# MOZAMBIQUE VOUCHER PROGRAM

- Voucher program funded by the European Union, implemented by Mozambican government, FAO, and IFDC.
- 2 year program from 2009 – 2010 and 2010 – 2011, in which there were 25,000 vouchers of maize and rice in five provinces
- The impact evaluation focuses on maize vouchers in the Manica Province.
- Vouchers gave a 73 percent subsidy on a package of 12.5 kg of improved seeds and 100 kg of fertilizer.
- Market price of this package was about USD 117.

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# IMPACT EVALUATION DESIGN

- Voucher funds were available for only 5,000 maize farmers in Manica Province.
- With the cooperation of the Ministry, 94 localities were randomly assigned to one of three treatments:
    1. Subsidy only (41 villages)
    2. Subsidy plus basic savings program (30 villages)
    3. Subsidy plus “matched savings” program (31 villages)

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# IMPACT EVALUATION DESIGN

- Eligibility rules at household levels (0.5 – 5 hectares in maize; willing & able to make voucher co-pay).
- Subsidies assigned by random lottery to eligible households within the 41 villages.
- Losers of the lottery became the control group for the experiment.
- Extension agents informed farmers who had won and lost the lottery, and distributed the vouchers.
- Today, we're going to focus on the 41 "subsidy only" villages. Other work is looking at the impact of the savings interventions, and analysis of the impacts is ongoing.

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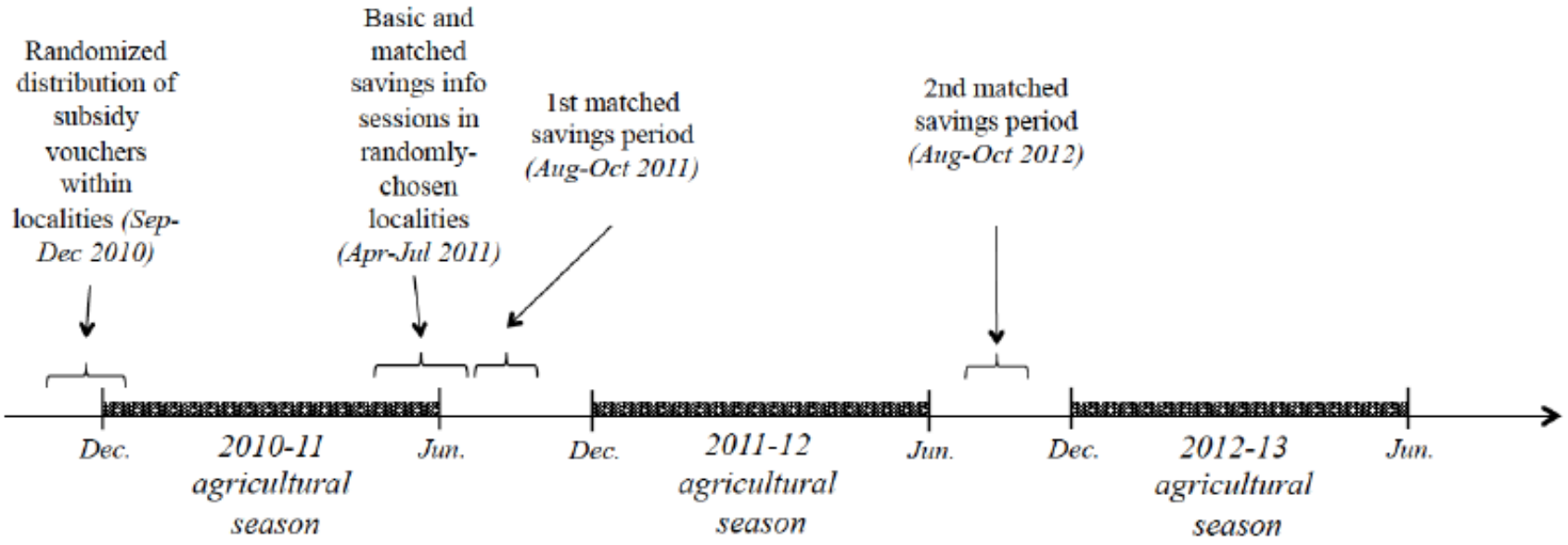
# IMPACT EVALUATION TIMELINE

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# UPTAKE AND USE OF VOUCHERS

- Only about half of the lottery winners picked up the vouchers.
- In the end, a slightly smaller number actually used the vouchers.
- In addition, 13 percent of lottery losers ended up using the vouchers.

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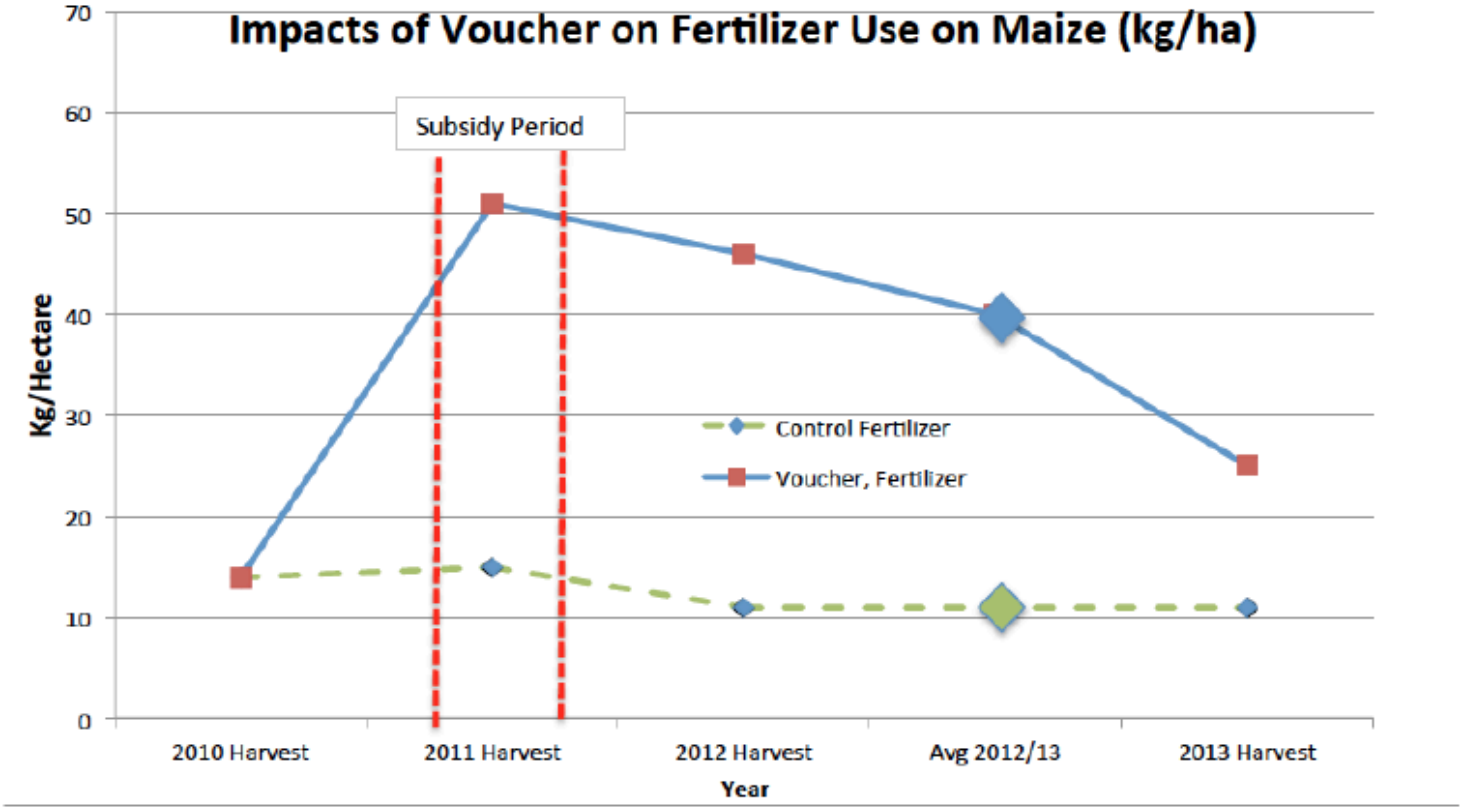
# IMPACTS OF VOUCHERS ON FERTILIZER FOR MAIZE

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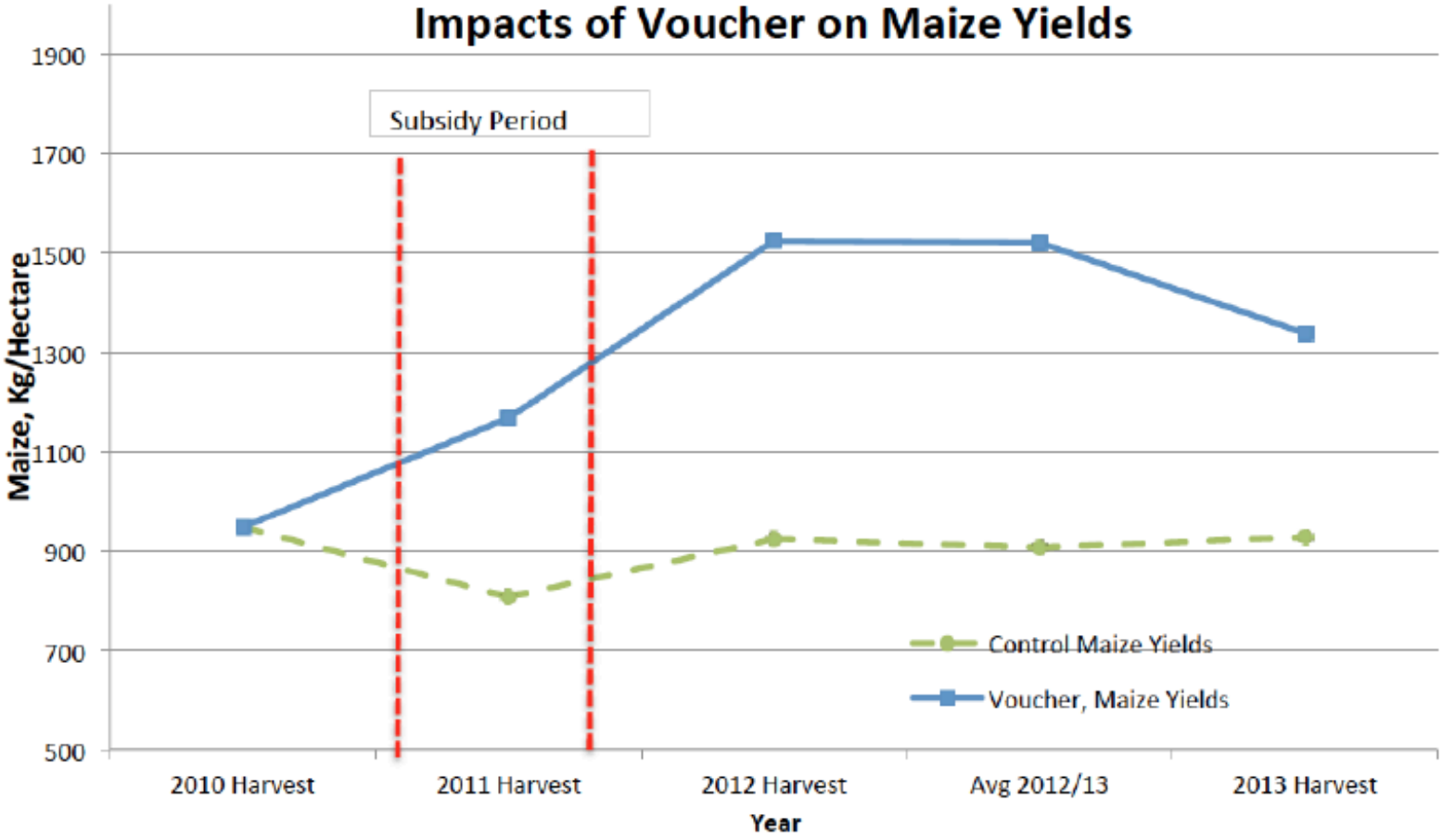
# IMPACTS ON MAIZE YIELDS

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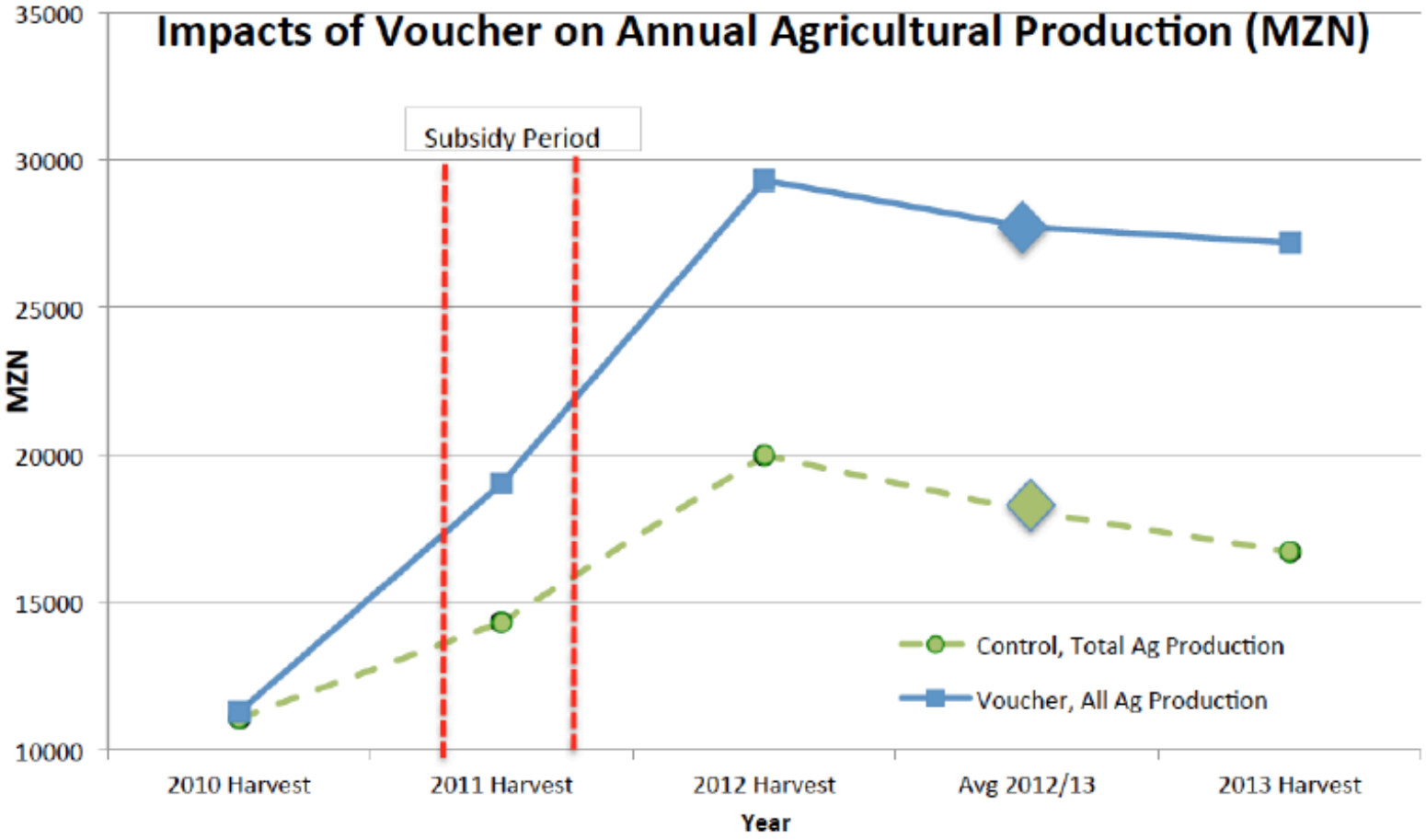
# IMPACTS ON TOTAL ANNUAL PRODUCTION

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# LON-TERM IMPACTS OF ECONOMIC WELL-BEING OF FARM HOUSEHOLDS

- From a development perspective, this may be the greatest test of whether or not this high level of public investment pays off: Do these changes result in improved household living standards and reduced rural poverty?
- Initially – in 2011 – there was no visible impact on total households consumption expenditures, a common proxy for well-being.
- However, in the two post-subsidy years, researchers observed an increase in per-capita daily household consumption of 36 percent.

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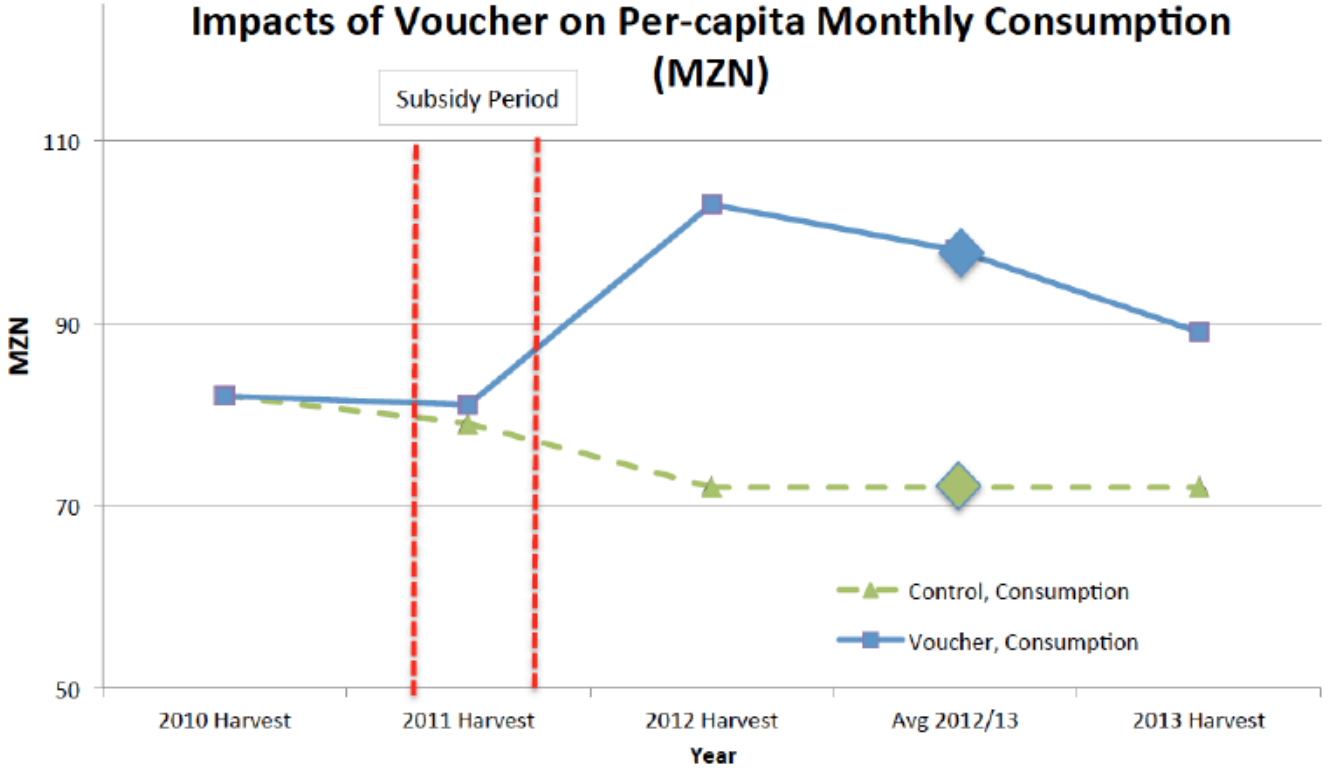


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# LON-TERM IMPACTS OF ECONOMIC WELL-BEING OF FARM HOUSEHOLDS

- With households, on average, just a little bit above conventional poverty lines, an increase in consumption of this magnitude implies a substantial reduction in the incidence and depth of poverty.
- Researchers also observed significant impacts on households assets, savings, and food stocks.
- There are strong impacts, but let's not forget that the uptake and usage rate of the vouchers was under 50 percent of lottery winners.

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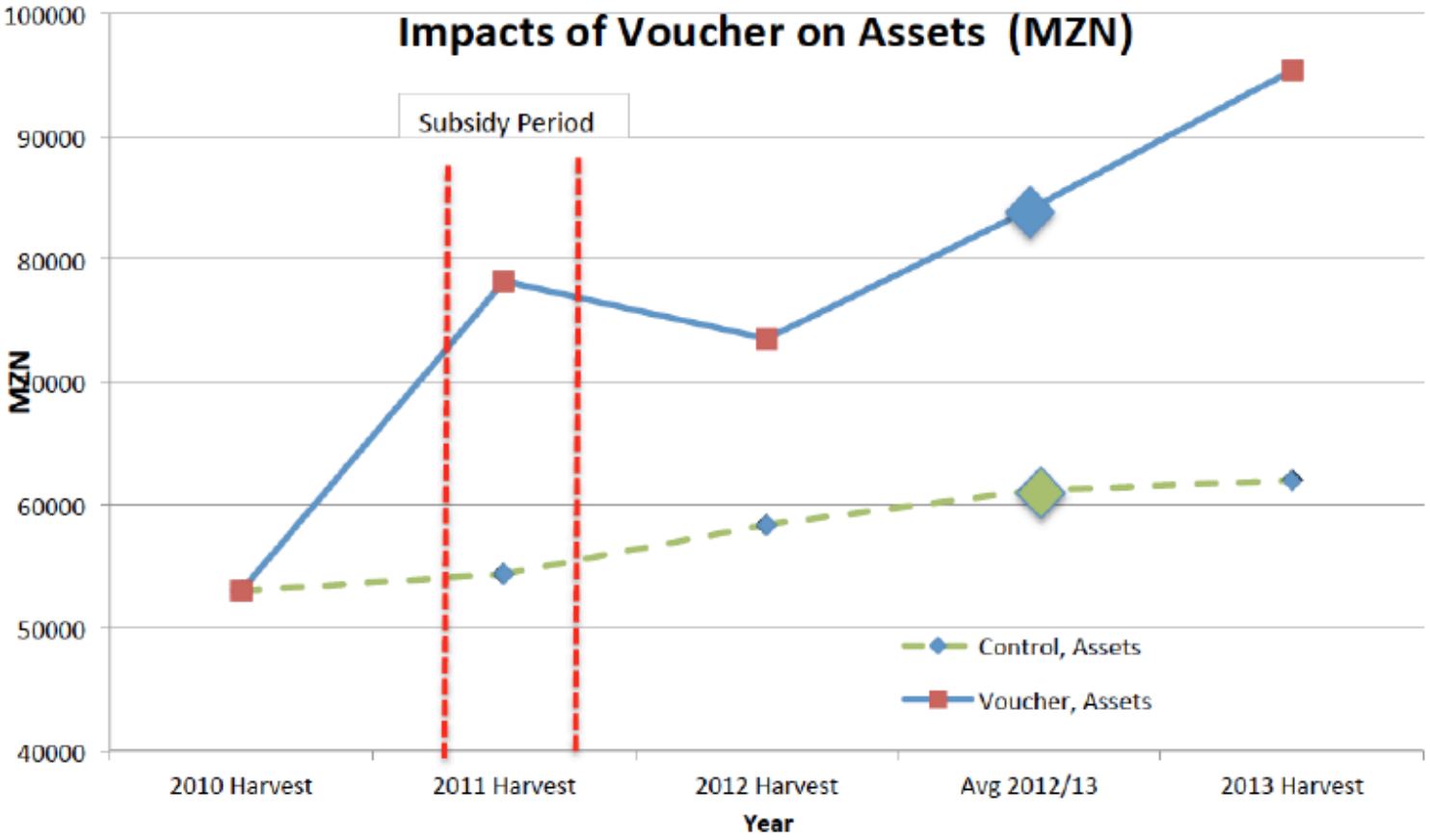
# IMPACTS OF VOUCHERS ON ASSETS

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# LEARNING BY DOING

- What explains these strong and persistent effects of a one-time intervention?

- Researchers measured farmers' expected returns to fertilizer under different climatic conditions and found a very strong learning impact of vouchers:

  -Relative to the control group's expectations in 2013, voucher farmers expect an improved seed/fertilizer package to yield on average 2828 kg of maize, which is 51 percent higher than what the control group expected.

  -If we compare these expectations to the baseline (2011) expectations of the control group, we see a 71 percent increase in expected returns to fertilizer.

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# VALIDITY OF LEARNING

- Researchers analyzed the actual production data, which shows that on farmers' fields, 100 kg of fertilizer would boost yields by about 1660 kg/hectare, or about 25 percent more than what farmers report.
- This is good news: this indicates that farmers' reported expectations are not unrealistic.

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# SMART SUBSIDIES

- In summary, researchers discovered evidence that temporary subsidies can be a wide investment that have sustained development impacts.
- It's not yet clear whether the impacts are starting to dissipate after two years, as this was beyond the scope of the study, but the evidence seems to indicate that the impacts persist.
- Strong learning effects seem to explain at least a large part of these sustained impacts.
- Temporary subsidies can thus be smart policy – but can they be made smarter and more effective?

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# MAKING SUBSIDIES SMARTER

- We do not know, based on this study, if impacts would have been stronger if the program had lasted longer (especially given that the first year of the study was disrupted by drought).
- What could have been done to boost the use of the vouchers (and the subsequent learning) above the modest 50 percent level?
  - Suspect that for many, the 27% co-pay may be too high/risky
  - Would fully subsidized vouchers have helped?
  - Would additional financial technologies (credit or insurance) have helped?
- Fertilizer that was used was a “standard” blend – could we have achieved larger impacts with more appropriate fertilizer blends?

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# MAKING SUBSIDIES SMARTER

- Finally, researchers are finding strong evidence that the learning effects spill over through social networks, and that influences input use.
- Are there better ways, in this case, to use social learning so that more of the benefits from vouchers spill over and help others?
- There is much more to be learned in this area.

# POTENTIAL IMPACTS OF SAVINGS INTERVENTIONS

- Surprisingly to the researchers, the savings interventions reduced the post-subsidy impacts of the subsidies.
- This effect is clear evidence that risk is a major constraint, and given the choice to better self-insure or invest more (and increase their exposure to risk!), many farmers choose the former.
- In addition, there seems to be some evidence that savings enables investment in other activity, as well. This indicates possible benefits to interventions that allow households to follow their comparative advantage.
- This leads to policy questions about the goals of interventions: whether it is increased food production specifically, or boosting incomes.

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