Can agricultural subsidies reduce gendered productivity gaps? Panel data evidence from Zambia

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Outline

Input subsidies in SSA

Why should input subsidies matter for gender in sub-Saharan Africa (SSA), or should they?

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'Because many poor women are farmers, and many poor farmers are women, there are reasons to direct agricultural development towards this group'

Doss, 2018

Input subsidies in SSA

- Farmer Input Subsidy Program (FISP) have been key policies to develop agriculture and reduce poverty, and achieve food security in SSA since the 1970s (Jayne, et al., 2018)
  - FISPs were scaled back in the 1990s during Structural Adjustment Programs, but were reintroduced (and reloaded) in the mid-2000s
- Large scales FISPs were implemented in 10 SSA countries by 2010, and in 11 SADC countries by 2016
- Whether FISPs are efficient and effective engenders immense debates in the region, see Jayne et al (2018) for a review
  - the 'Malawi Miracle', where FISPs are associated with overall positive gains is often cited as a success (Chirwa and Doward, 2013)

Input subsidies in SSA

- FISPs have improved access to farming inputs for both men and women (Jayne, et al., 2018; Fisher and Kandiwa, 2014)
- Yet, overall effects on poverty remain low and isolated (Jayne et al 2018) and impacts on gender productivity understudied
- Notwithstanding the debates, FISPs will likely remain important policy options for agricultural development in the region (Jayne et al 2018)
- Thus, a lot of different questions should be asked of FISPs, as we do here

Research question

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This question is important for two main reasons

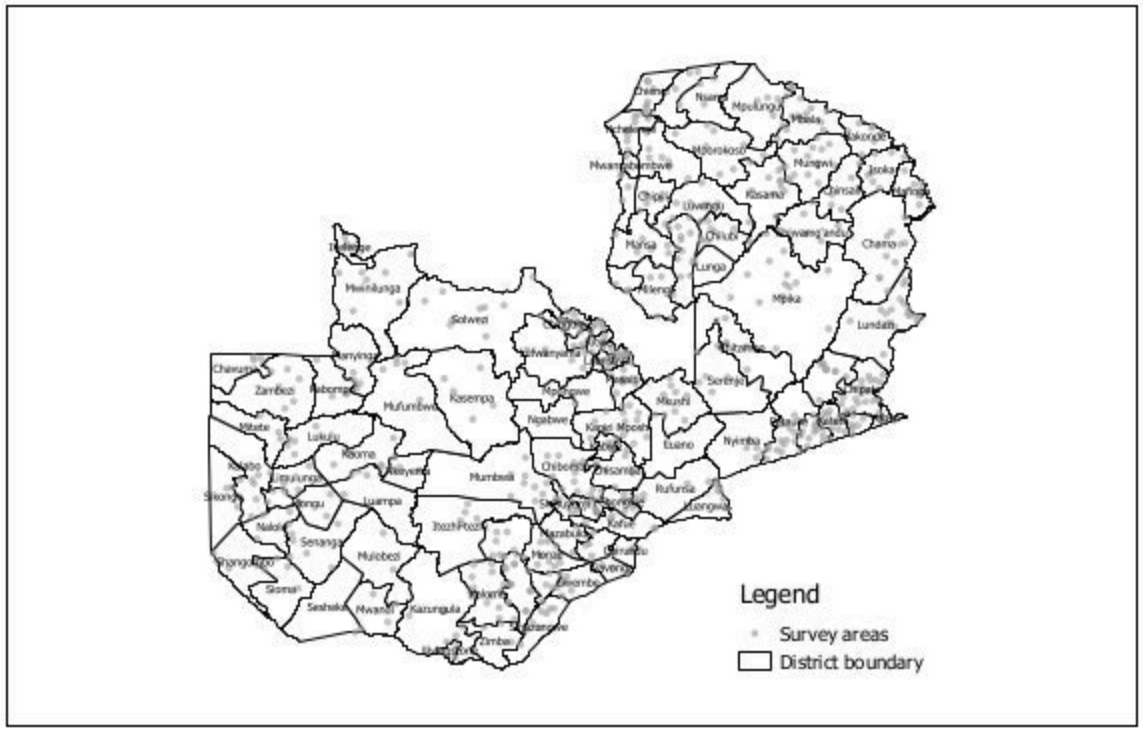
- First, large gender gaps have been estimated in SSA; 15.6% in Nigeria, 27.4% in Tanzania, 25.4% in Malawi and 30.6% in Uganda and between 30 and 50% in Tanzania (Kilic, et al., 2015, Mukasa and Salami, 2015, Slavchevska, 2015)
- Second, there are indications that FISPs improve access to improved inputs for both men and women (Fisher and Kandiwa, 2014, Jayne, et al., 2018)

Research question

- We assess whether accessing FISP impacts maize productivity differently on female- and male-managed plots
  - a plot manager makes every day management decisions on a given plot, including land use, crops to plant, when and how, etc
  - a plot is female managed if the main decision maker on that plot is a woman, includes spouses in male headed hhs and female hh heads
- We focus on maize because this was the primary crop supported under the conventional FISP in Zambia
  - Government centrally administered conventional FISP and managed procurement and input distribution in Zambia

Data and context

- We used two-wave panel data from the nationally representative Rural Agricultural Livelihoods Survey (RALS)
- Data are from 10, 248 maize plots (4,813 and 5,435 plots for 2012 and 2015, respectively)



Empirical model

- Following Karamba and Winters (2015), we estimated the main model as[1]:

$$y_{ijt} = \beta_o + \beta_1 female_{ijt} + \beta_2 FISP_{ijt} + \beta_3 \left(female_{ijt} x FISP_{ijt}\right) + \beta_4 \mathbf{X}_{ijt} + \beta_5 \mathbf{tillage}_{ijt} + \beta_6 H_{ijt} + \beta_7 C_{ijt} + \beta_8 year + c_i + u_{ijt} \quad (1)$$

  - y_{ijt} is maize yield (kg/ha); ijt index household, plot and year; $female = 1$ if plot is female managed: $FISP = 1$ is accessed inputs in 2010/2011 and 2013/2014: $\mathbf{X}$ captures plot specific factors, **tillage** - tillage options, **H** - household characteristics, **C** - exogenous factors; c_i is unobserved time-invariant heterogeneity; u_{ijt} are IID errors, and β's are estimable parameters
  - β_3 measures the productivity effects of FISP on female managed plots
  - We used Correlated Random Effects (CRE) to control for c_i

[1] We also used Unconditional Quantile Regressions of Firpo, et al. (2009) to assess the distribution of impacts.

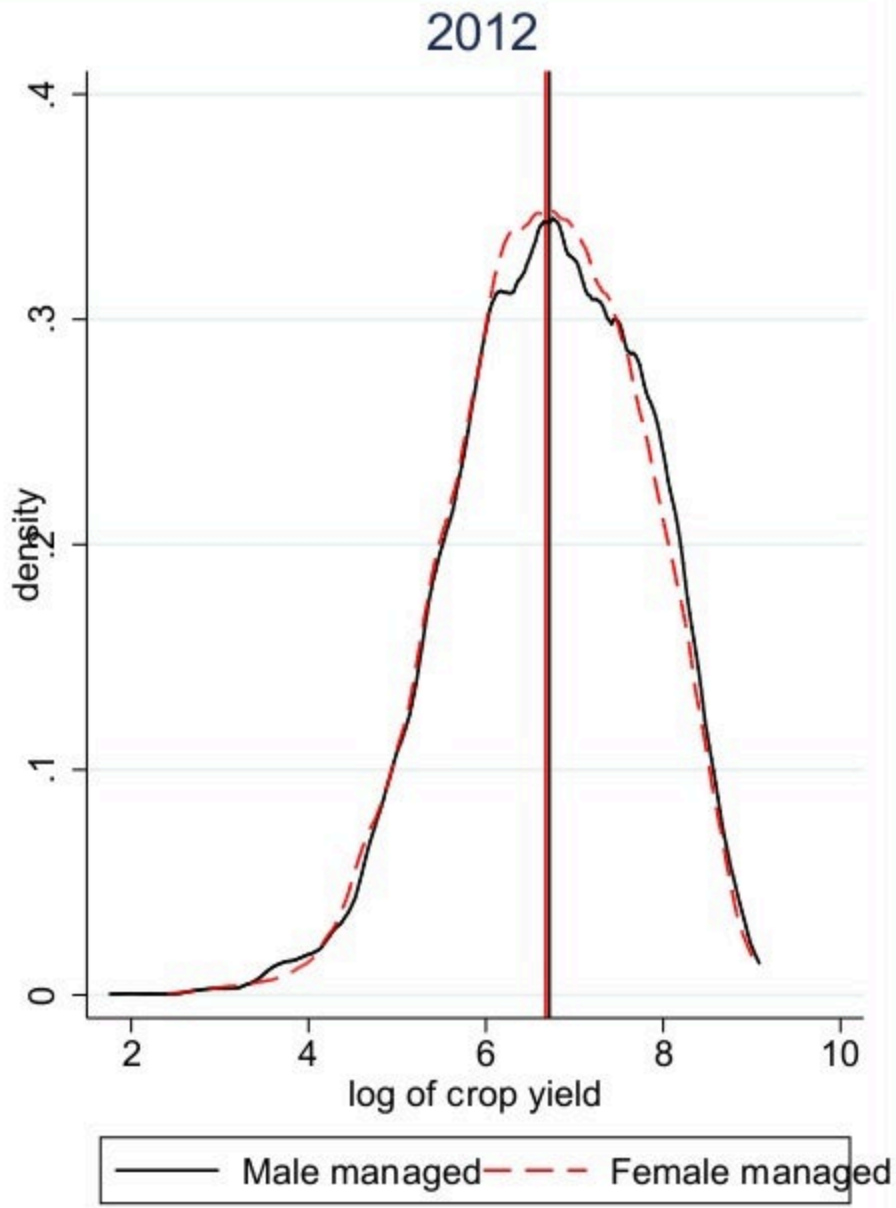
Variable descriptions

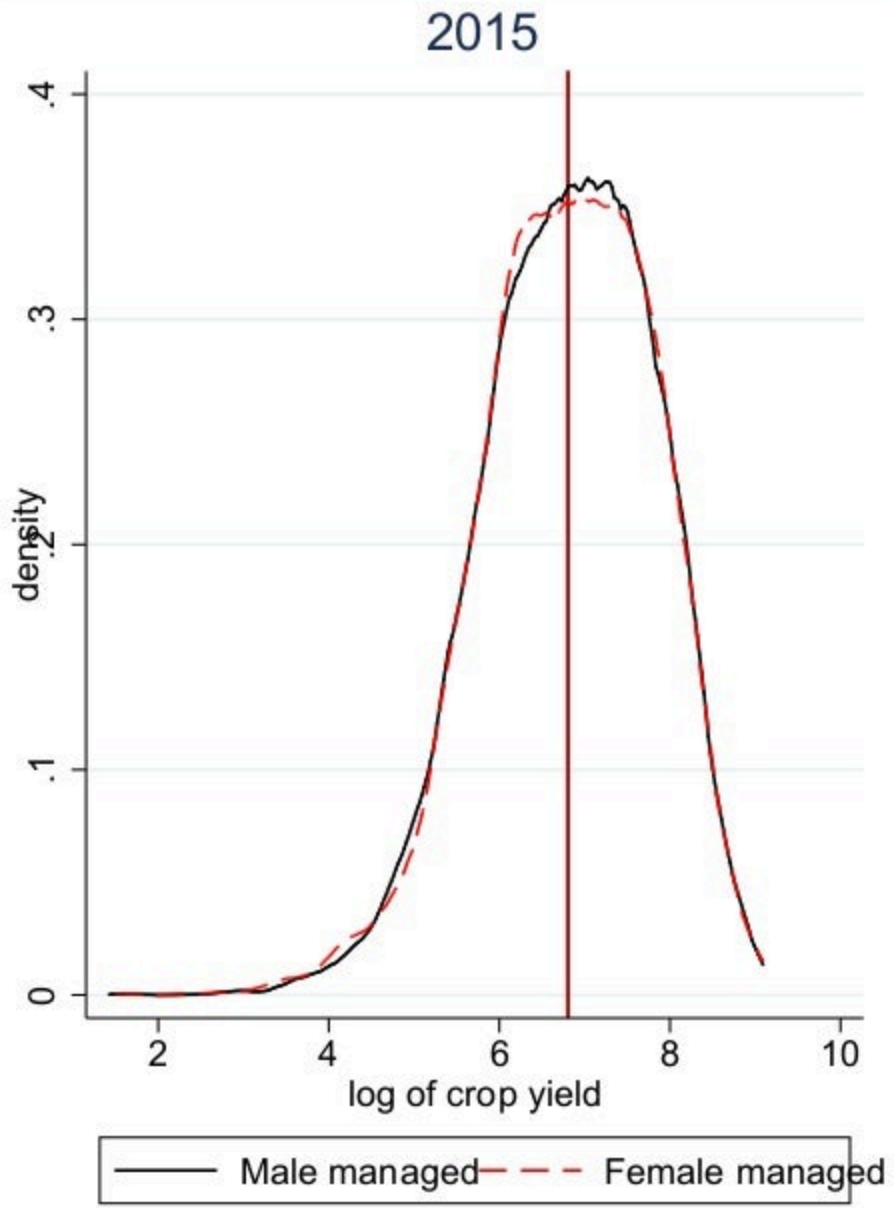
Table 1: Summary Statistics for the Main Variables

	Pooled		
Variable	Male managed plot	Female managed plot	Mean diff.
Yield (kg/ha)	1795.513	1777.702	17.811
Accessed FISP (yes =1)	0.550	0.596	-0.047***
Plot size (hectares)	1.453	1.080	0.374***
Number of plots	5.015	4.559	0.455***
Top dressing fertilizer (kg)	106.074	105.860	0.214
Basal dressing fertilizer (kg)	105.504	105.888	-0.384
Kgs of seed used	30.532	35.867	-5.336***
Accessed credit (yes=1)	0.228	0.215	0.013
Plot with title (yes=1)	0.073	0.078	-0.005

Results

MAIZE YIELD DISTRIBUTIONS BY GENDER





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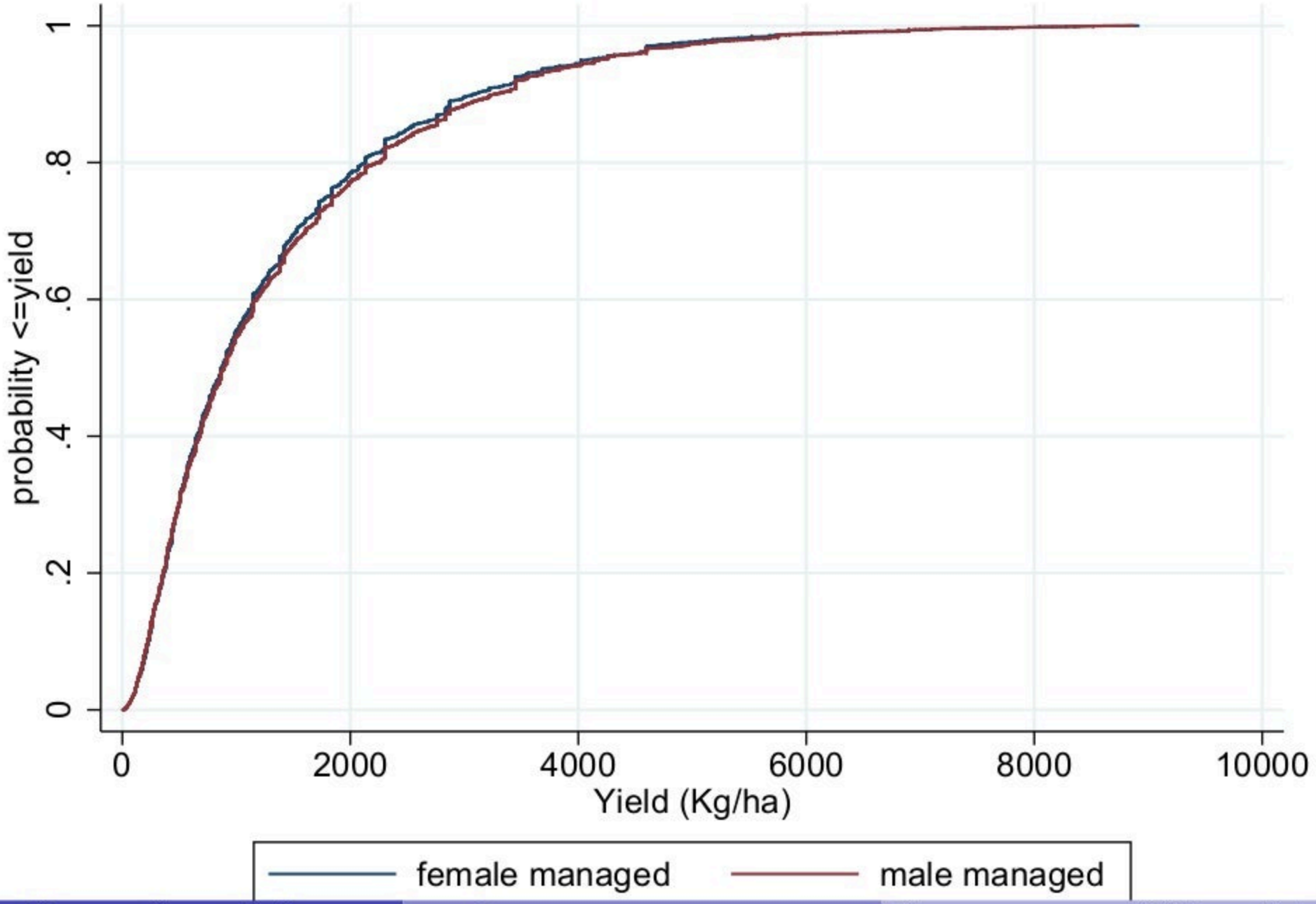


Impacts of FISP on Maize Yield

Table 2. Estimates of the Impacts of FISP on Maize Yield (kg/ ha)

	(1) Ordinary Least Squares	(2) Fixed effects	(3) Correlated Random Effects
Female manager (yes =1)	-139.119**	134.879	-136.802**
	(-2.362)	(0.964)	(-2.316)
Accessed FISP (yes =1)	90.197*	-30.413	92.886*
	(1.831)	(-0.317)	(1.895)
Female manager x FISP	135.653	-302.553	129.451
	(1.534)	(-1.610)	(1.479)
Plot size	2.151	33.399**	10.642*
	(0.864)	(2.220)	(1.900)

Table 3. Overall Average Marginal Effects of Access to FISP and Female-Manag (Based on CRE Results in Column 4 in Table 2)

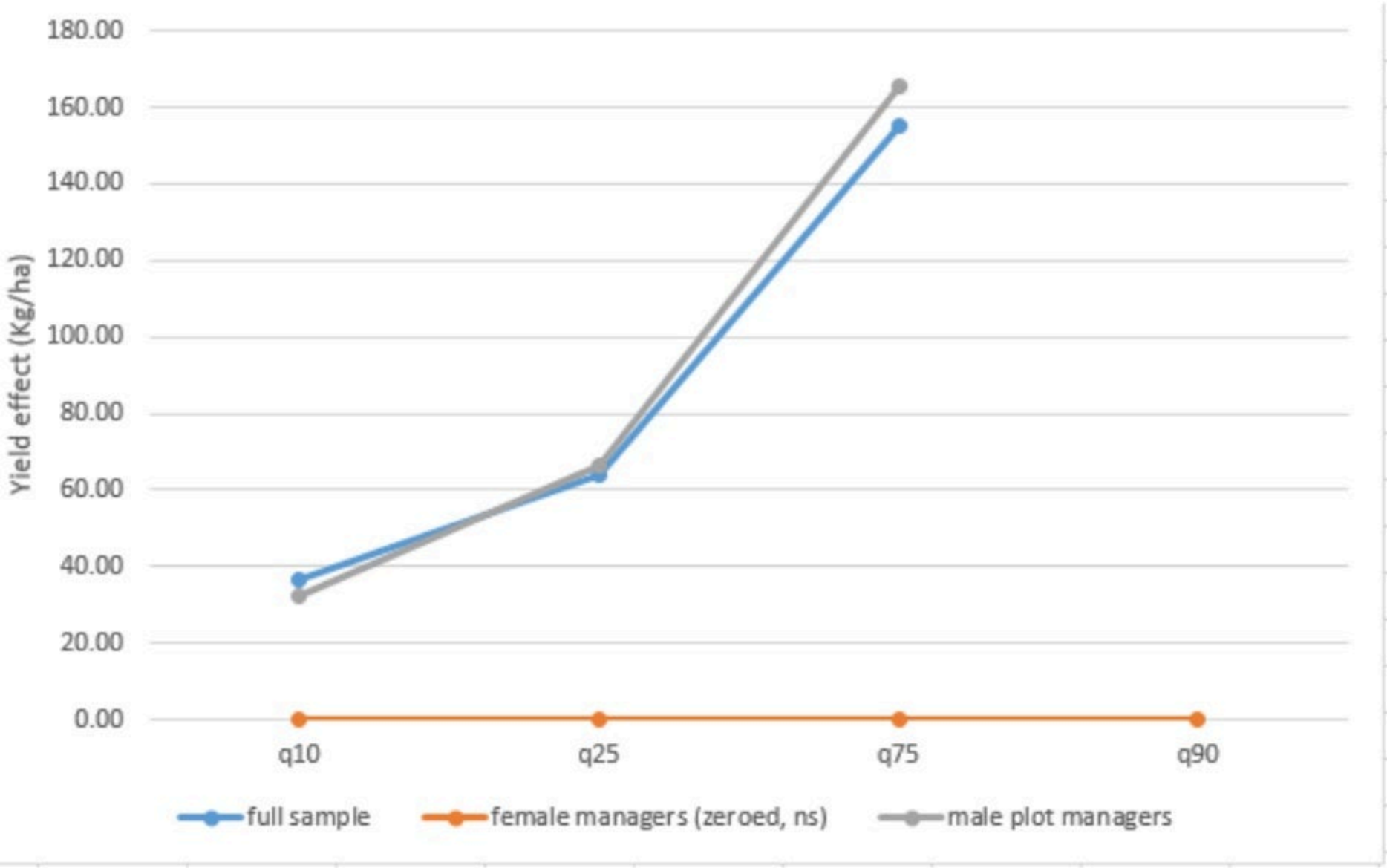
	Marginal effect	Standard Error	T-Stat
Accessed FISP (yes=1)	222.34	77.15	2.88
Female managed plot (yes=1)	-7.35	67.13	-0.11

Overall distribution of effects

Table A2: Differential effects of selected variables at selected maize productivity distribution points

	25th percentile	50th percentile	75th percentile	90th percentile
Female manager (yes =1)	-28.294	-117.133**	-124.478	-245.280*
	(-0.737)	(-2.000)	(-1.335)	(-1.691)
Accessed FISP (yes =1)	69.195***	92.367**	164.729***	92.327
	(3.004)	(2.482)	(2.689)	(0.918)
Female manager x FISP	-17.227	-2.594	-24.600	219.712
	(-0.353)	(-0.034)	(-0.198)	(1.095)
Plot size	5.065***	2.620	4.262	20.070*
	(3.795)	(0.811)	(0.912)	(1.691)

Distribution of effects by plot manager



At 222kg/ha, is FISP profitable?

	Simulation 1	Simulation 2	Simulation 3
Average fertilizer return (Kg/ha)	222	222	222
Market price for Maize (ZMW/kg)	1.2	1	1.2
Average fertilizer return (ZMW/ha)	222	222	222
Market price for Fertilizer (ZMW/kg)	6	6	1.14
Transport cost maize/fertilizer (ZMW/km/kg for <=100km)	0.2	0.2	0.2
Actual fertilizer application rate (kg/ha)	154	154	154
Average fertilizer cost (ZMW/ha)	954.8	954.8	206.36
Average value cost ratio (VCR)	**0.23**	**0.23**	**1.08**

Notes: Simulations 1 is the base case, it considers transaction costs in maize marketing and access to fertilizer. Simulation 2 assumes a farm gate maize price (zero transaction cost) and simulation 3 assumes farmers only paid 19% of the commercial fertilizer price as in the current FISP in Zambia.

- Value cost ratio = Returns to fertilizer/fertilizer cost
- Cutoffs > 1.5 and mostly 2 considered profitable
- For all simulations, FISP is not profitable given its returns of 222kg/ha in this study

Discussions and conclusion

- FISP did not disproportionately raise maize productivity on female managed plots. Thus, conclude in line with Karamba and Winters (2015) that FISP alone is insufficient to address gendered productivity gaps
- Overall, FISP is unprofitable with returns averaging 222kg/ha
  - low soil carbon matter and acidity limit responsiveness of soils to fertilizer (Burke et al 2017)

Discussions and conclusion

Because FISPs are here to stay (for now) (Jayne et al, 2018), and women are key agricultural producers, and given the high social rates of return associated with women, FISPs can play a role in reducing gender gaps if complemented with policies to destroy the patriarchy.

- Usual knee-jerk policies giving only inputs insufficient. Need to:
  - address under-laying, deep-rooted socio-cultural norms that disadvantage and marginalize women
  - improve womens access to agricultural information, land, credit and labor saving technologies to reduce their drudgery
  - facilitate women participation in non-farm enterprises to raise complementary income

Acknowledgments

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