IFPRI

Accelerating technical change through video-mediated agricultural extension

Evidence from Ethiopia

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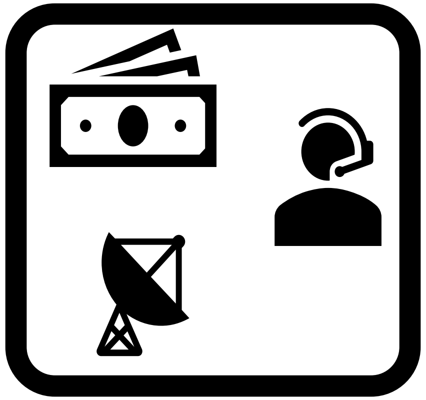
Highlights

- Ethiopia has one of Africa’s largest extension systems; the country also invested in ICTs for agriculture to improve delivery of technical content to farmers
- This study evaluates the impact of a large-scale video-mediated extension approach on the **adoption of improved agronomic practices**
- Unique features of the intervention: (i) it is **implemented by the government**, and (ii) it **targets (female) spouses** in addition to (typically male) heads of households
- Consistent with recent studies in India and Uganda, results indicate that video-mediated extension:
  - Improved farmers **access** to extension services
  - Improved farmers **knowledge** about the subject technologies and practices
  - Increased **adoption** of promoted technologies/agronomic practices
- However, no additional impact was found by targeting (female) spouses
- The video-mediated extension becomes less costly as the scale of operation increases

Motivation

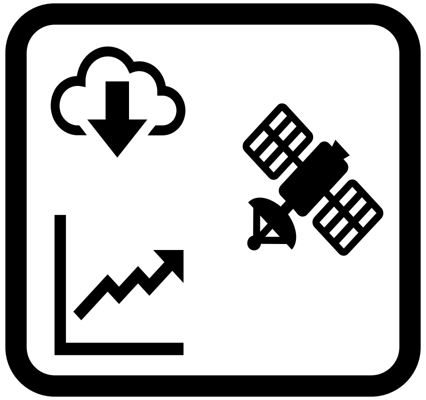
- ICTs gain considerable attention as a powerful medium/tool for agricultural development and rural economic growth*

Farm and natural resource management



Market and price information

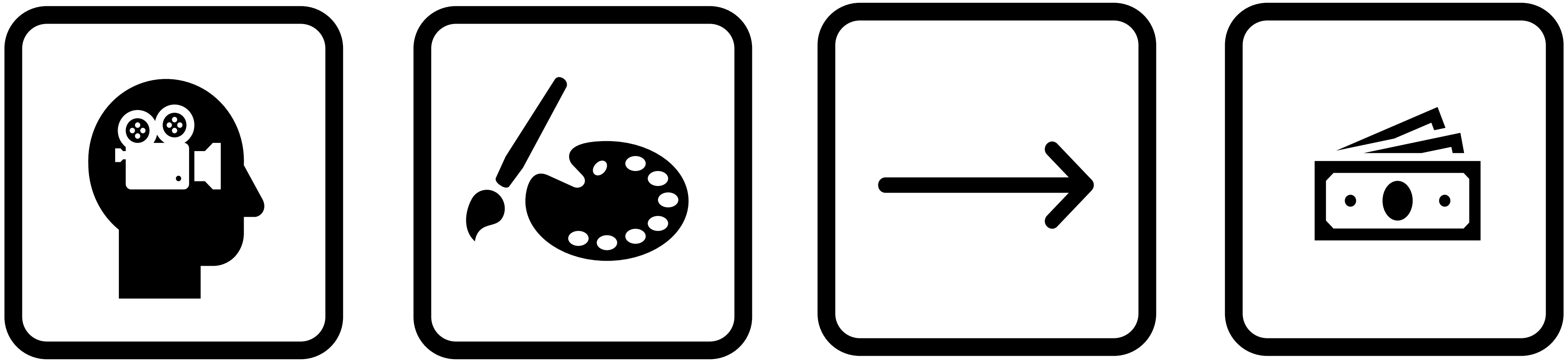
Rural enterprise and finance



Data and analytics

* See reviews by Aker (2011) ; Nakasone, Torero and Minten (2014); Fabregas et al. (2019); Spielman et al. (2021

Video is a particularly powerful medium



Appealing | Customizable | Consistent | Low cost

- But few studies exist on digital tools/videos implemented *at scale**

* See studies on **women's fertility and autonomy** (Chong and La Ferrara 2009, Jensen and Oster 2009); **Financial literacy** (Berg and Zia 2013); **Aspirations** (Bernard et al. 2014; Riley, 2017); **Agriculture extension** (Gandhi et al. 2007 (India), Vasilaky et al. 2015 (India); Van Campenhout et al. 2021 (Uganda).

Small design attributes can have a large effects

- Although ICTs are a powerful medium with broad application, outcomes can be significantly impacted by small changes in how they are used

Context matters:

- What works in one setting may not work in another
- Small changes in design can make big differences
- This creates opportunities for replication, learning

Our setting:

- Video-mediated approach to extension provision
- Fully integrated in the public extension system
- Gender inclusive

Ethiopia has one of the largest public extension systems in Africa

- The country invested heavily in its extension system since the mid 2000s, and there is significant improvement in access to extension services
  - Personnel: 60,000 extension agents (43 EAs/10,000 farmers)
  - Facilities: 15,000 Farmer Training Centers (FTCs)
  - Training: ~25 agricultural TVETs and colleges
- The country has recorded significant growth in modern input use and productivity over the last two decades (Bachewe et al. 2016)
- However, studies show that without proper adoption of improved management practices, future productivity gain from increased input use will be limited (Berhane et al. 2017, 2018)
- To improve adoption of agronomic practices, the country started experimenting innovative extension delivery methods (e.g., SMS, IVR, video)

The conventional extension approach: *focus on promoting inputs, less attention to management*

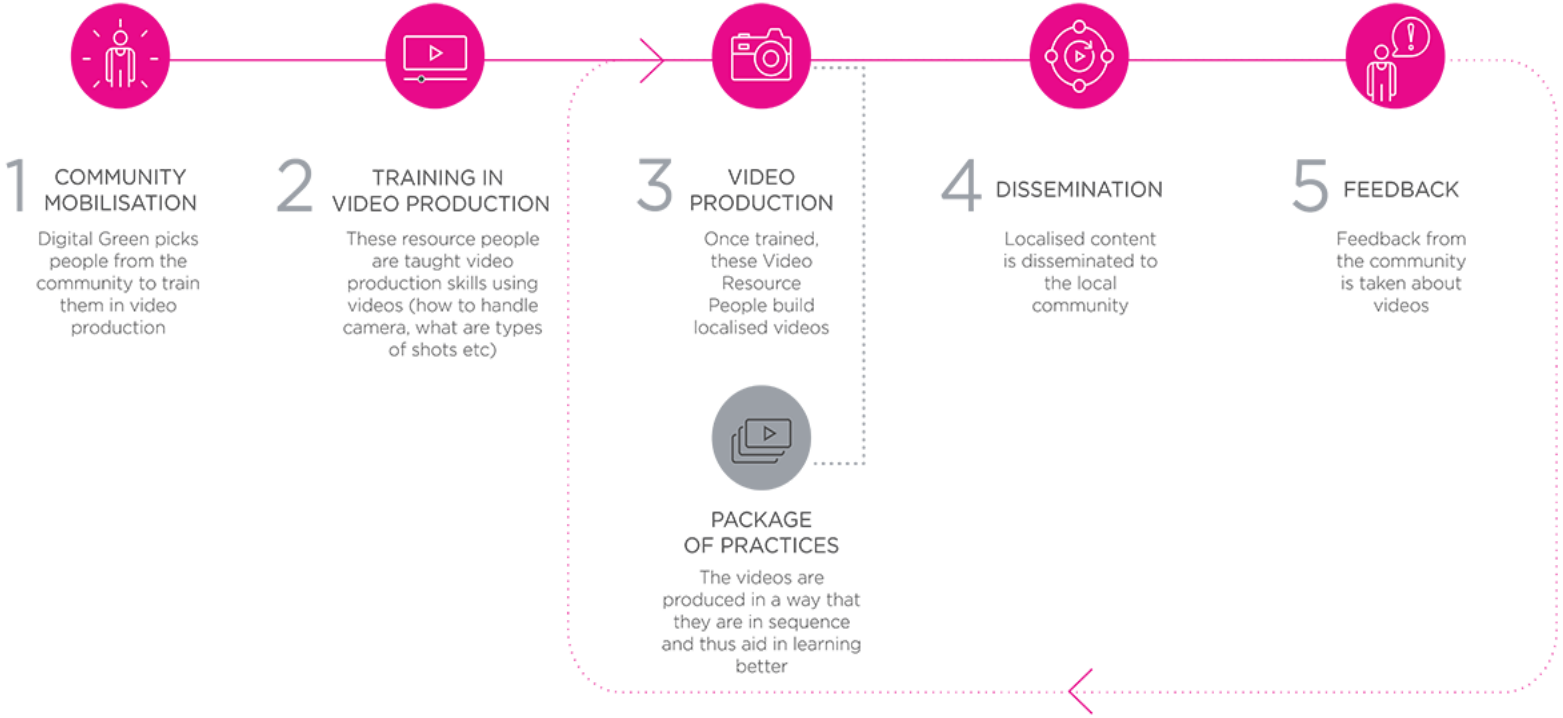
- The conventional extension approach is characterized by:
  - Person-to-person visits → limited outreach
  - Words of mouth → ineffective to convey technical agronomic messages
  - Focus on promotion of physical inputs → less attention to management practices
  - Typically targets (male) head of households → less inclusive
  - Extension agents are trained as specialists but function as generalists → lack technical knowledge on topics outside their field of study

Our research question

- Is video-mediated extension effective in changing farmer behavior and increasing adoption of recommended practices?

- This study contribute to our understanding on the impact of video-based extension approach:
  - When it is fully integrated into the public extension system
  - When it is targeted to both spouses in a household than just the head (typically male)

Digital Green



Digital Green in Ethiopia

1,200 videos produced

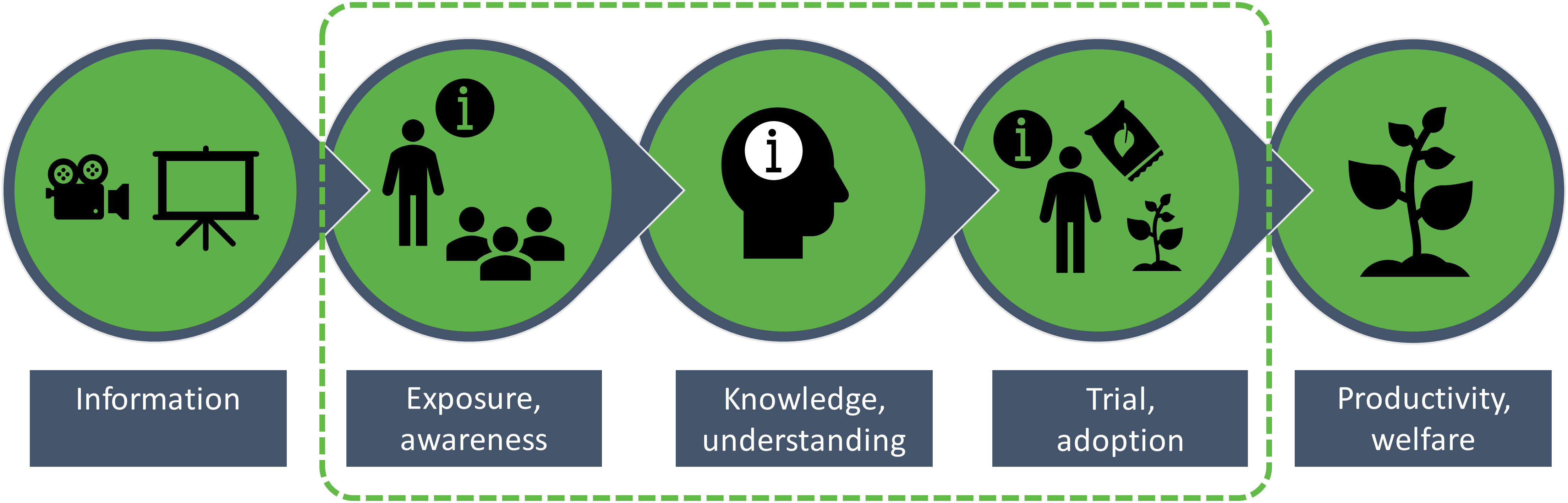
7,200 villages covered

~450k households reached

(www.digitalgreen.org)

Video – row planting

A simple impact pathway



Focus crops and practices

- Teff
- Wheat
- Maize

- Row planting
- Precise seeding rate
- Precise urea dressing

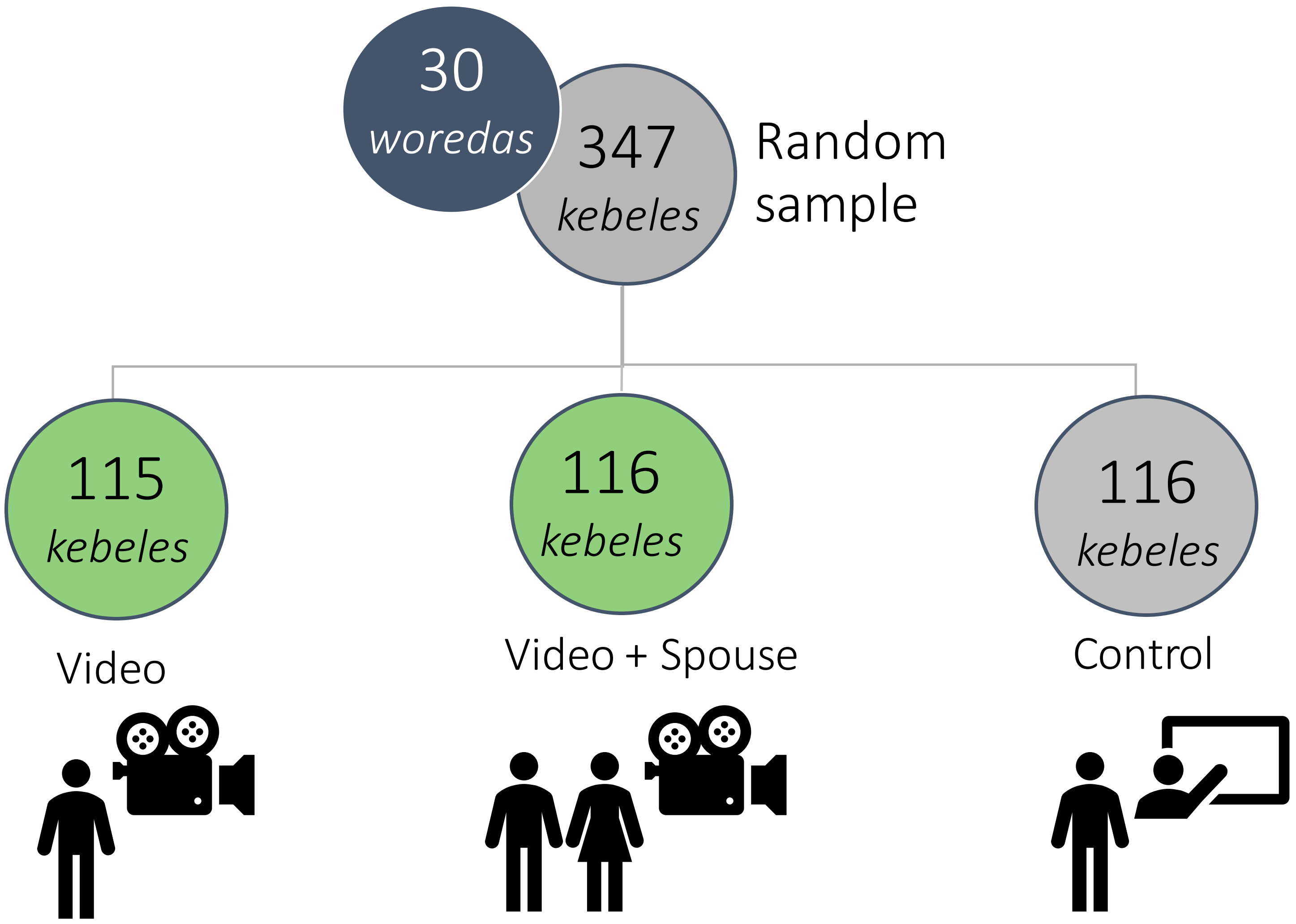
Focus on GoE's priority crops and technologies → only change is the reliance on videos

The research process

1. **2016/17: analysis of the pilot project using monitoring data**
   - Localized video (both in content and character) are associated with adoption
   - The approach works in high-potential areas, the need to expand to diverse context
   - The need for gender inclusive approach (i.e., only 1 in 4 viewers and facilitators were women)
2. **2017/18: designed experimental evaluation for the "expansion" phase**
   - Conducted power calculations for a clustered randomized controlled trial
   - Selected 30 districts, i.e., districts with a sufficient number of clusters (*kebeles* = cells) that had no prior exposure to video-mediated extension
3. **2017/18: trained DG staff on impact evaluation basics, study protocol, monitoring**
   - HQ and field staff training, emphasizing (a) thinking like and evaluator, and (b) strict adherence to study protocol
4. **2019/20: Data collection, analysis, and outreach**
   - 2 rounds of household data collection; 3 rounds of extension agent data collection
   - Multiple technical reports, papers, and briefs
   - Presentation to policy makers, development partners, academic institutions
   - Ultimately, the results motivated a new round of investment in digital support tools/platforms for extension

Design

- Randomized controlled trial
- 3 study arms
- 4 main regions of Ethiopia

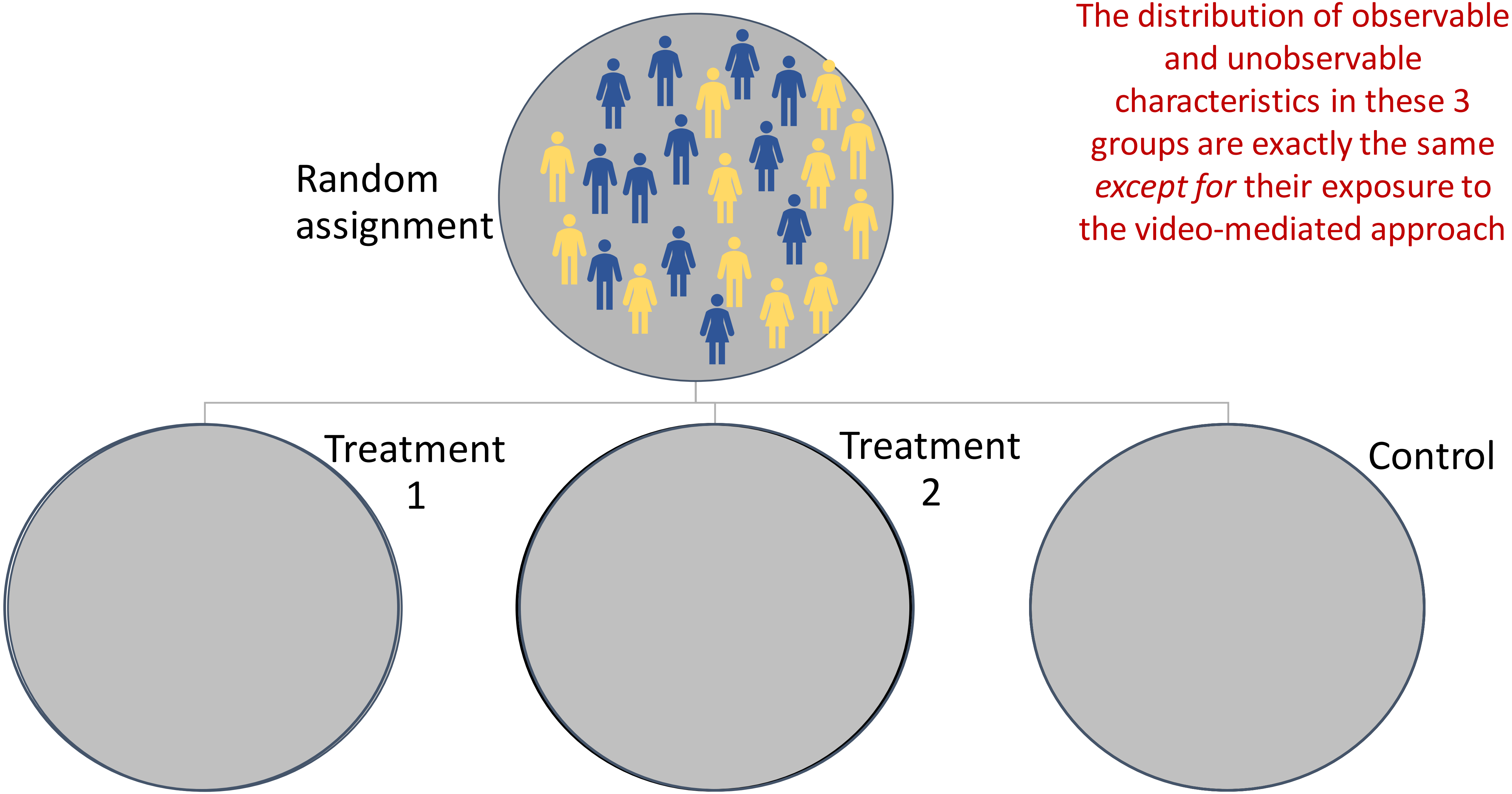


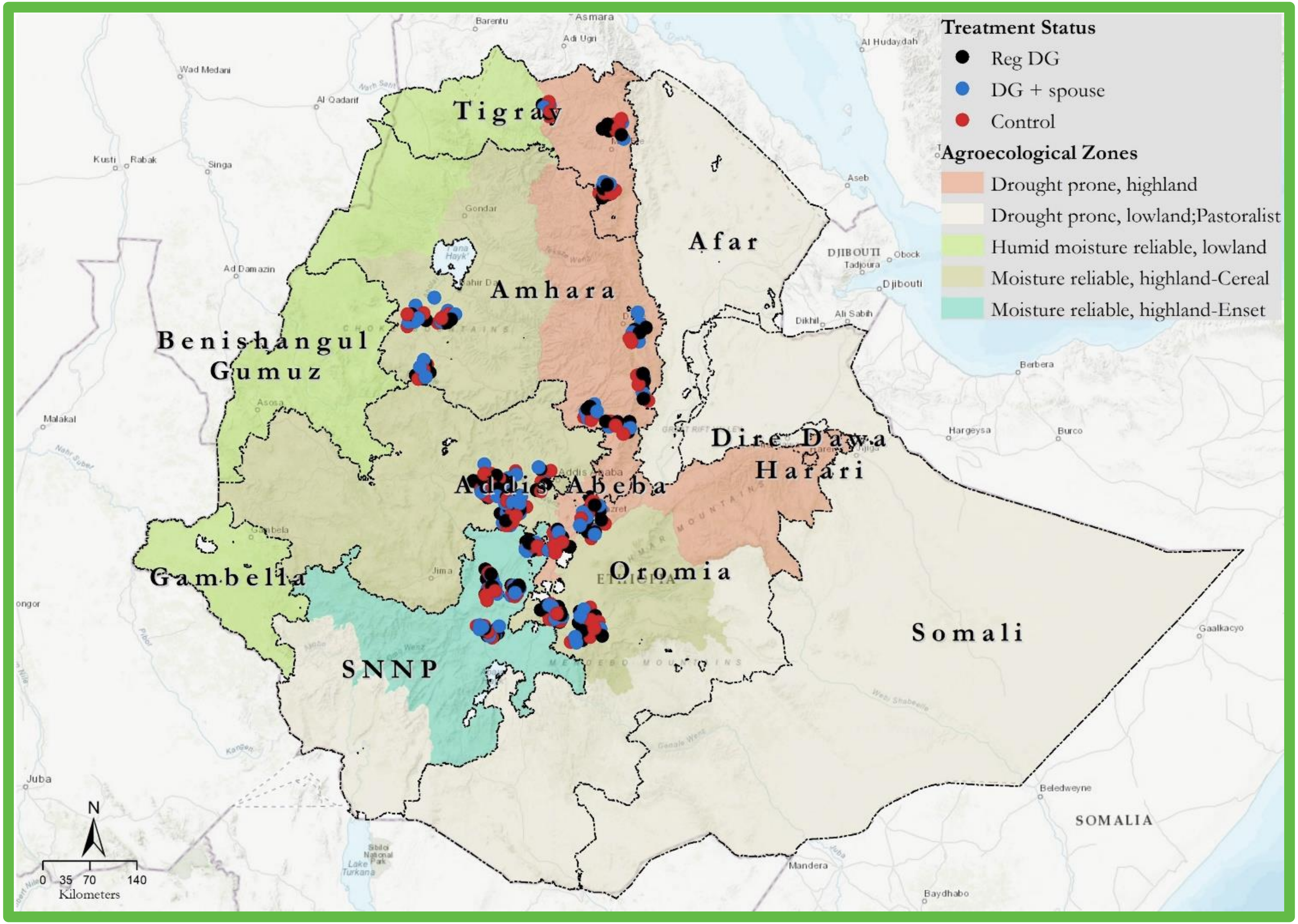
7 households per *kebele*
(2 close to FTC, 3 medium far, 2 remote)

Total sample size: 2,345 households

Randomization

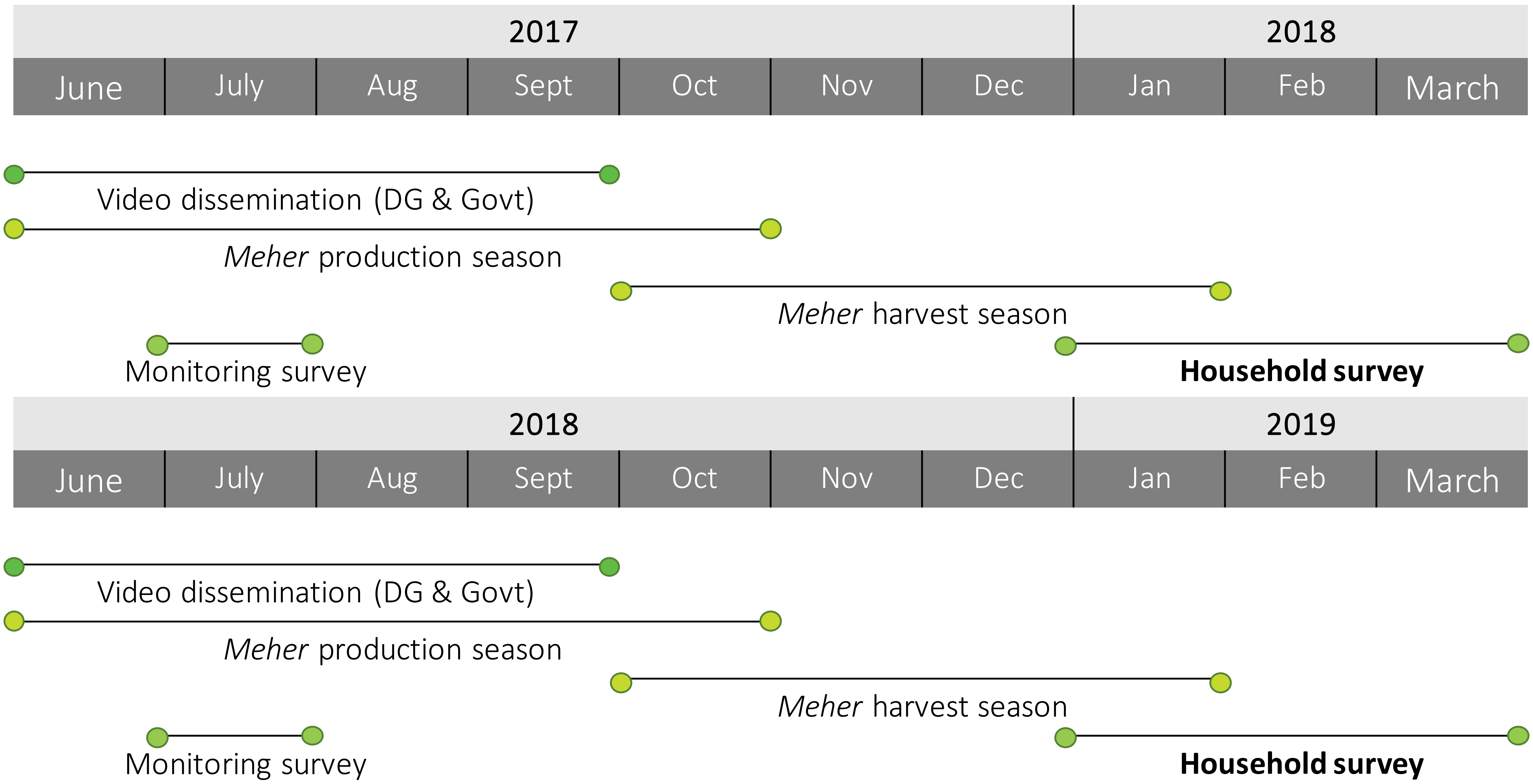
The distribution of observable and unobservable characteristics in these 3 groups are exactly the same *except for* their exposure to the video-mediated approach





Treatment Status
Reg DG
DG + spouse
Control
Agroecological Zones
Drought prone, highland
Drought prone, lowland;Pastoralist
Humid moisture reliable, lowland
Moisture reliable, highland-Cereal
Moisture reliable, highland-Enset
Tigray
Amhara
Afar
Benishangul Gumuz
Dire Dawa
Harari
Addis Abeba
Oromia
Gambella
SNNP
Somali
DJIBOUTI
SOMALIA
N
0 35 70 140
Kilometers

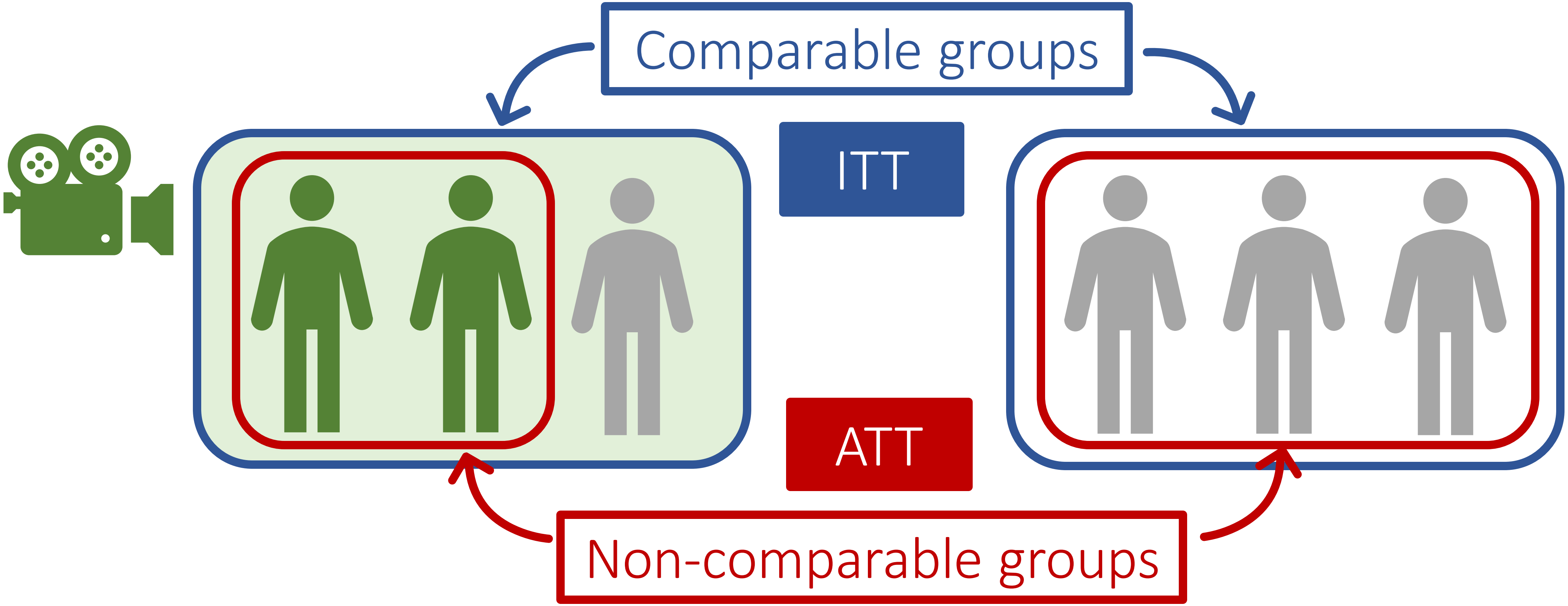
Timeline


2017
2018
June
July
Aug
Sept
Oct
Nov
Dec
Jan
Feb
March
Video dissemination (DG & Govt)
Meher production season
Meher harvest season
Monitoring survey
Household survey
2018
2019
June
July
Aug
Sept
Oct
Nov
Dec
Jan
Feb
March
Video dissemination (DG & Govt)
Meher production season
Meher harvest season
Monitoring survey
Household survey

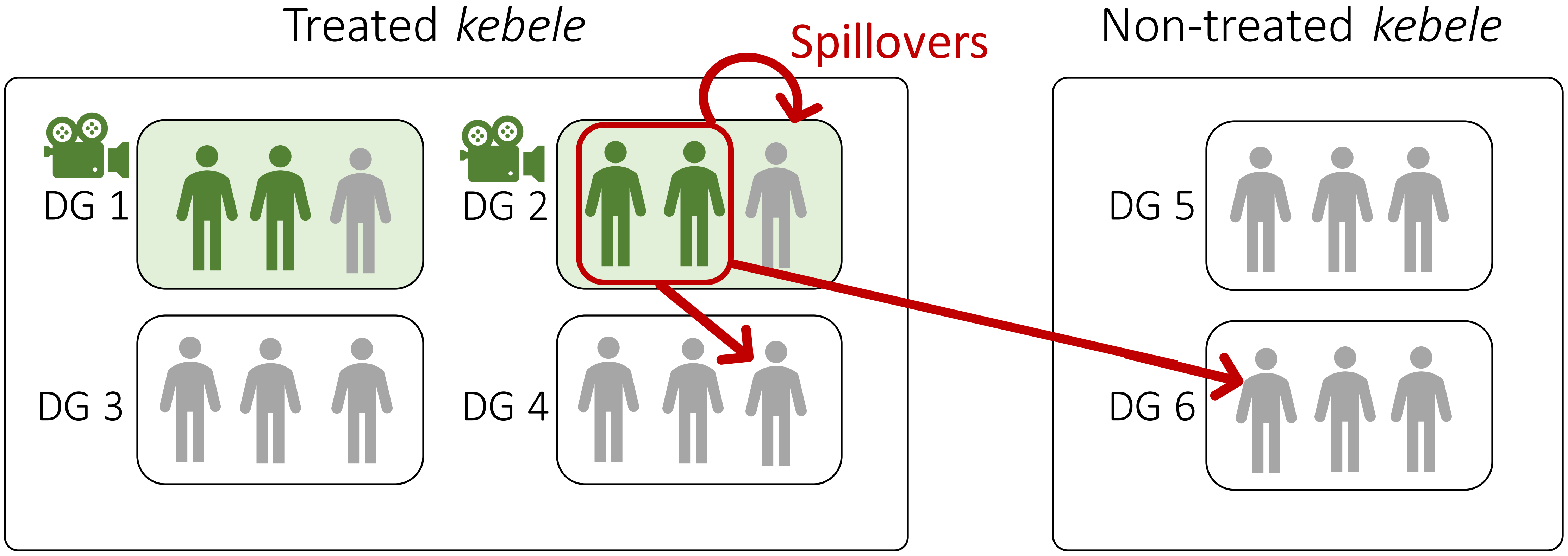
Empirical strategy: estimate treatment effects

- Intent-to-treat (ITT) estimates
  - estimated by comparing all farmers in treatment and control *kebeles*, irrespective of whether they effectively attended a video screening.
  - directly policy-relevant
  - Avoids problem of information spillovers from participants to non-participants within treatment *kebeles* (and related violation of exclusion restriction if treatment assignment as an IV for participation)

ITT vs ATT



Spillovers


Treated *kebele*
Spillovers
Non-treated *kebele*
DG 1
DG 2
DG 3
DG 4
DG 5
DG 6

Estimating treatment effects

Pooled treatment effect

$$y_i = \alpha + \beta T_k + X_i'\delta + \mu_w + \varepsilon_i$$

Differential treatment effects

$$y_i = \alpha + \beta^1 T_k^1 + \beta^2 T_k^2 + X_i'\delta + \mu_w + \varepsilon_i$$

y_i – level of outcome y measured at the household level i

T_k – treatment status of *kebele* k where the household lives

X – vector of household- and development group-level characteristics

μ_w – *woreda*-level fixed effects

ε_i – Standard errors clustered at *kebele* level

Estimating treatment effects

$$y_i = \alpha + \beta T_k + X_i'\delta + \mu_w + \varepsilon_i$$

Ordinary least squares

- y_i denotes the level of outcome y measured at the household level i
- T_k indicates the treatment status of *kebele* k where the household lives
- X is a vector of household- and development group-level characteristics that account for baseline imbalances
- μ_w is a set of *woreda*-level fixed effects that account for *woreda*-level stratification
- Standard errors clustered at the *kebele* level

$$y_i = \alpha + \beta^1 T_k^1 + \beta^2 T_k^2 + X_i'\delta + \mu_w + \varepsilon_i$$

Differential treatment effects

- T_k^1 is treatment for Regular DG and T_k^2 is treatment for DG + spouse
- We also test for the equality of coefficients between Regular DG and DG + spouse (i.e., $\beta^1 = \beta^2$) to assess the additional effect of treating spouses in households where the head of the household is treated

Experimental integrity

	Regular DG	DG + Spouse	Control
Compliance (year 1) Development groups in which videos screened	57%	61%	6%
Compliance (year 2) Development groups in which videos screened	52%	52%	4%

Balance

- The treatment and control groups are balanced on most time-invariant variables and on the baseline levels of primary outcome variables
- We control for imbalances wherever required

Experimental integrity

Variable	Total (%)	Regular DG (%)	DG + Spouse (%)	Control (%)
Model farmer in household	27	28	27	27
Teff technology adopted	35	37	36	31
Wheat technology adopted	29	31	30	27
Maize technology adopted	41	42	42	39
N	2,422	798	812	812

Variable	Total (%)	Regular DG (%)	DG + Spouse (%)	Control (%)
Among HHs that watched at least one video				
Model farmer in household	36	37	36	29
Teff technology adopted	44	48	43	23
Wheat technology adopted	37	37	38	39
Maize technology adopted	51	51	53	19
N	701	330	340	31

Balance test

Variable	Entire sample	Video	Video + Spouse	Control	Video-Control	Video + Spouse-Control
HH size (no.)	5.919 (2.184)	5.965 (2.199)	5.892 (2.180)	5.900 (2.175)	0.065 (0.145)	-0.009 (0.147)
HH head is male (%)	0.902 (0.298)	0.897 (0.304)	0.906 (0.291)	0.901 (0.298)	-0.004 (0.016)	0.005 (0.017)
HH head age (years)	45.842 (12.937)	45.905 (13.018)	45.983 (12.922)	45.639 (12.887)	0.266 (0.731)	0.344 (0.727)
HH head is literate (%)	0.496 (0.500)	0.461 (0.499)	0.484 (0.500)	0.542 (0.499)	-0.081** (0.036)	-0.058* (0.034)
Observations	2,422	798	812	812	1,610	1,624

Balance test

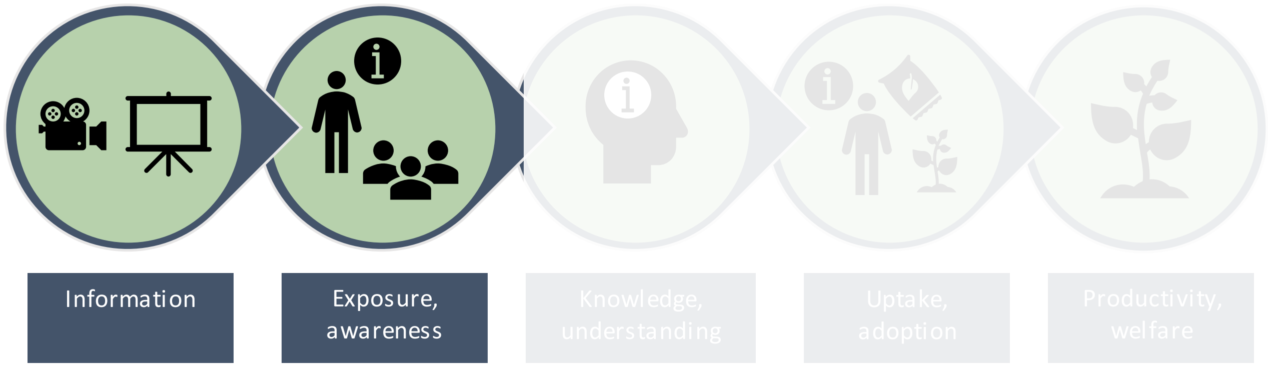
Variable	Entire sample	Video	Video + Spouse	Control	Video-Control	Video + Spouse-Control
HH cultivated teff	0.636	0.655	0.635	0.617	0.038	0.018
(%)	(0.481)	(0.476)	(0.482)	(0.486)	(0.048)	(0.048)
Teff plots	1.068	1.080	1.124	1.000	0.080	0.124
(no.)	(1.244)	(1.234)	(1.327)	(1.163)	(0.116)	(0.120)
HH cultivated wheat	0.616	0.617	0.617	0.615	0.002	0.002
(%)	(0.486)	(0.487)	(0.486)	(0.487)	(0.049)	(0.048)
Wheat plots	0.866	0.866	0.823	0.909	-0.043	-0.086
(no.)	(0.928)	(0.934)	(0.828)	(1.012)	(0.097)	(0.090)
HH cultivated maize	0.550	0.564	0.555	0.531	0.033	0.025
(%)	(0.498)	(0.496)	(0.497)	(0.499)	(0.051)	(0.048)
Maize plots	0.701	0.703	0.691	0.708	-0.005	-0.017
(no.)	(0.759)	(0.711)	(0.726)	(0.835)	(0.081)	(0.080)
Observations	2,422	798	812	812	1,610	1,624

Balance test

Variable	Entire sample	Video	Video + Spouse	Control	Video-Control	Video + Spouse-Control
Distance to the nearest… (in minutes):						
Asphalt road	104.566	109.654	102.070	102.062	7.593	0.009
	(106.259)	(106.500)	(98.762)	(112.995)	(9.336)	(9.568)
Dry season road	27.526	32.089	27.804	22.762	9.327**	5.042
	(47.453)	(46.983)	(57.774)	(34.229)	(3.610)	(3.490)
All weather road	30.420	35.858	28.926	26.569	9.289**	2.357
	(41.725)	(48.275)	(37.565)	(38.074)	(3.689)	(3.074)
Market	69.817	76.397	68.836	64.330	12.067**	4.506
	(60.745)	(70.273)	(54.714)	(55.630)	(5.419)	(5.016)
Admin. center	131.30	125.748	118.174	149.889	-24.141	-31.716
	(613.75)	(82.509)	(88.301)	(1,053.322)	(38.775)	(38.912)
FTC	31.173	31.551	31.484	30.490	1.061	0.994
	(36.432)	(45.669)	(30.293)	(31.532)	(2.364)	(2.047)
Observations	2,422	798	812	812	1,610	1,624

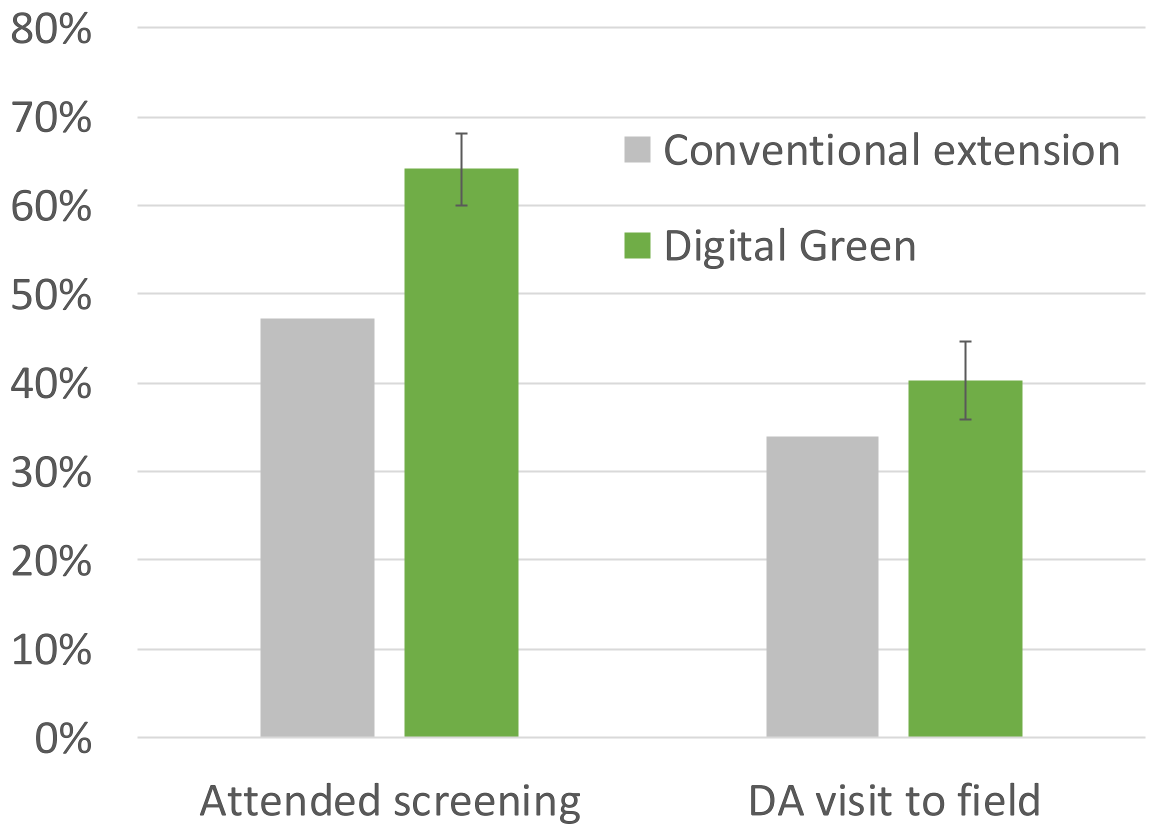
Balance test

Variables	Entire sample	Video	Video + Spouse	Control	Video-Control	Video + Spouse-Control
Before 2017/18 *meher* HH tried (___) for **teff**						
Lower seeding rate (%)	0.320	0.342	0.340	0.278	0.064*	0.062
	(0.467)	(0.475)	(0.474)	(0.448)	(0.036)	(0.038)
Row planting (%)	0.167	0.169	0.192	0.139	0.030	0.053
	(0.373)	(0.375)	(0.394)	(0.346)	(0.031)	(0.033)
Urea side dressing (%)	0.361	0.385	0.382	0.318	0.067*	0.064
	(0.480)	(0.487)	(0.486)	(0.466)	(0.039)	(0.041)
Before 2017/18 *meher* HH tried (___) for **wheat**						
Lower seeding rate (%)	0.282	0.284	0.309	0.251	0.033	0.058*
	(0.450)	(0.451)	(0.462)	(0.434)	(0.030)	(0.032)
Row planting (%)	0.224	0.227	0.233	0.213	0.014	0.020
	(0.417)	(0.419)	(0.423)	(0.410)	(0.036)	(0.035)
Urea side dressing (%)	0.347	0.346	0.361	0.334	0.012	0.027
	(0.476)	(0.476)	(0.481)	(0.472)	(0.036)	(0.038)
Before 2017/18 *meher* HH tried (___) for **maize**						
Lower seeding rate (%)	0.400	0.407	0.401	0.392	0.016	0.010
	(0.490)	(0.492)	(0.490)	(0.488)	(0.040)	(0.040)
Row planting (%)	0.480	0.474	0.478	0.489	-0.015	-0.011
	(0.500)	(0.500)	(0.500)	(0.500)	(0.048)	(0.048)
Urea side dressing (%)	0.396	0.400	0.400	0.389	0.011	0.011
	(0.489)	(0.490)	(0.490)	(0.488)	(0.045)	(0.046)
Crop management (%)	0.405	0.407	0.399	0.408	-0.000	-0.009
	(0.491)	(0.492)	(0.490)	(0.492)	(0.043)	(0.043)
Observations	2,422	798	812	812	1,610	1,624

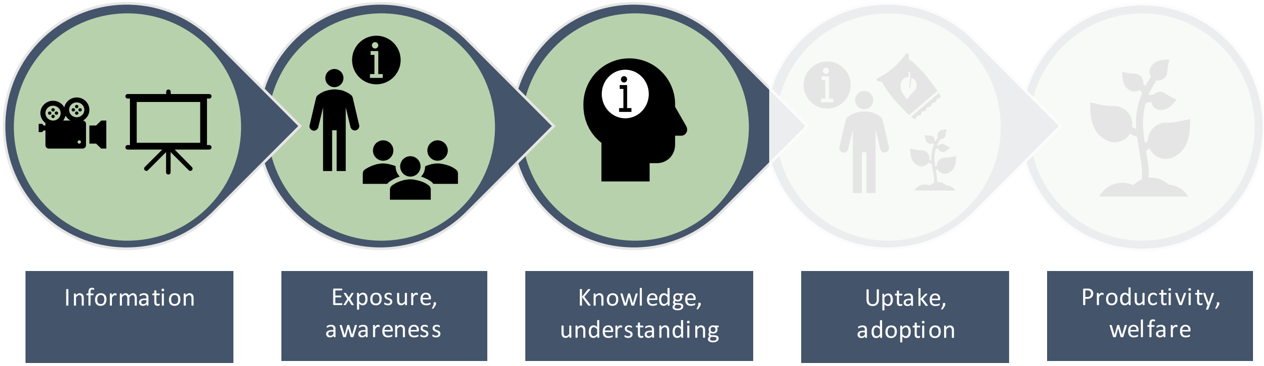


Can video increase farmers' exposure to extension?

Household heads’ access to extension

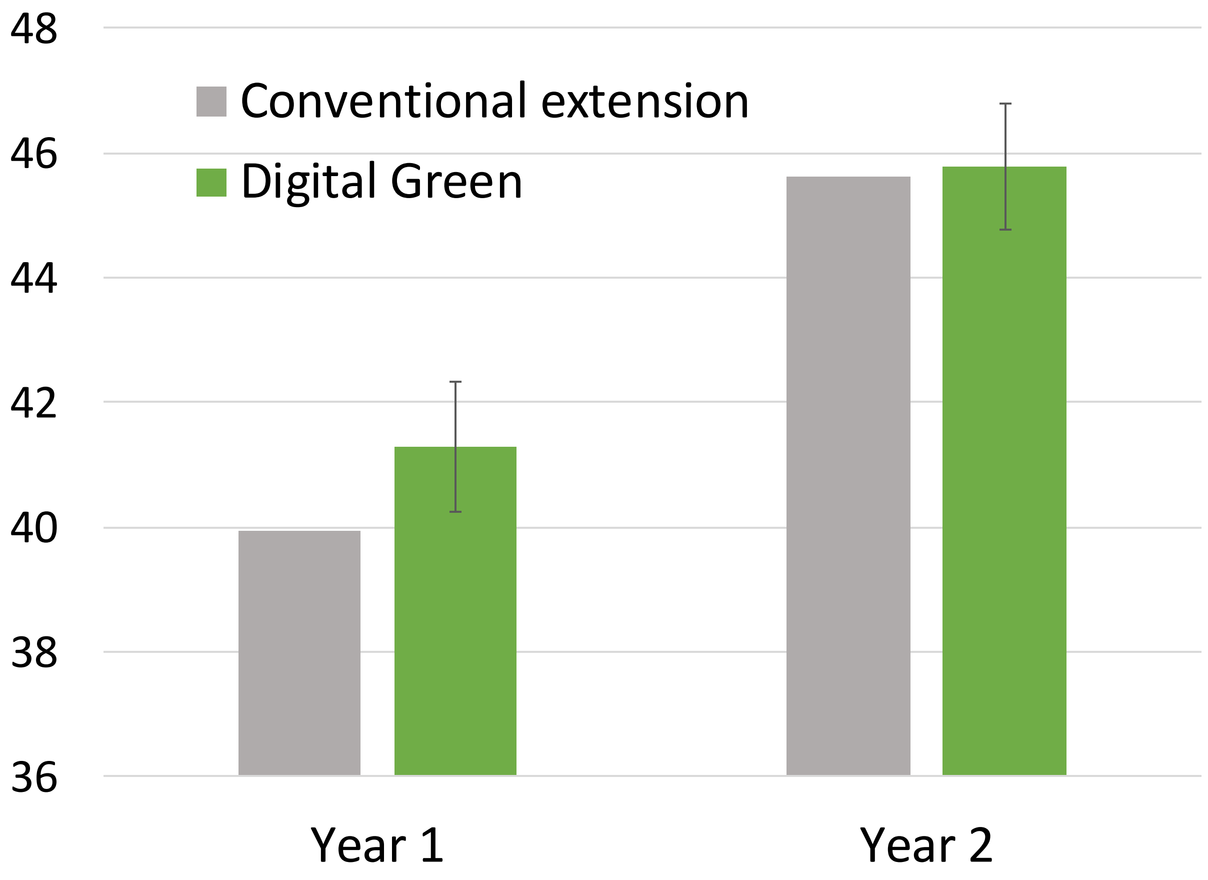


- 35% ↑ in attendance to extension session
- 18% ↑ in probability that a farmer receives a visit from an extension agent

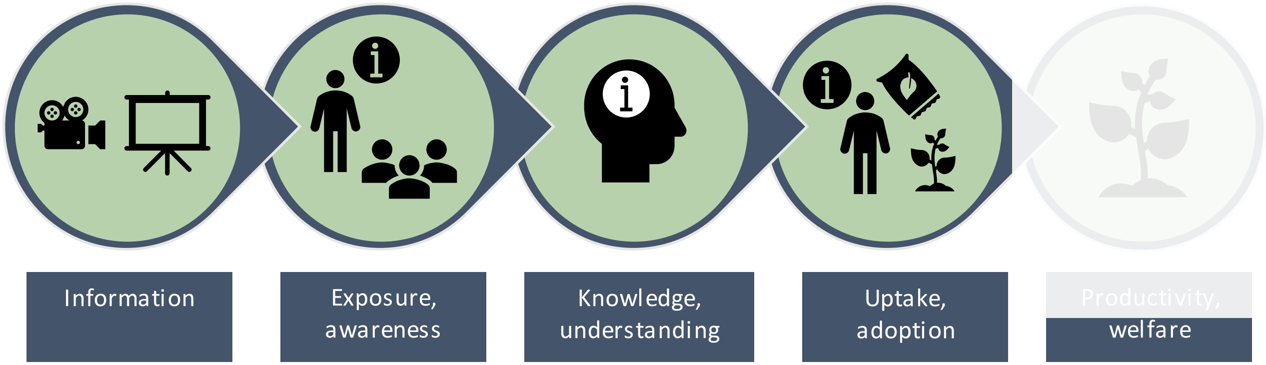


Can video increase farmers' content knowledge?

Household heads’ knowledge scores

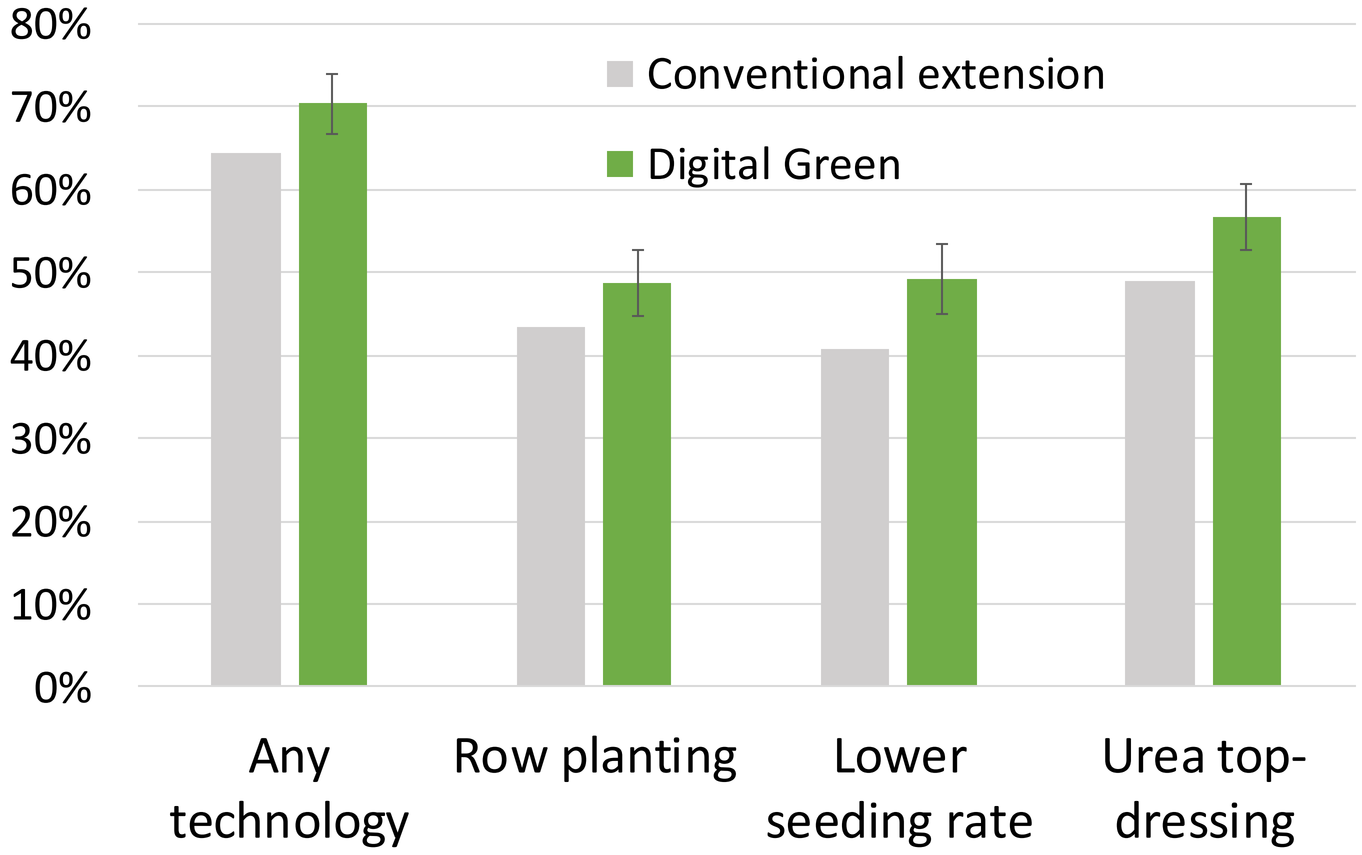


- Significant increase in knowledge in year 1
- Overall increase in knowledge in year 2
- No specific treatment effect in year 2



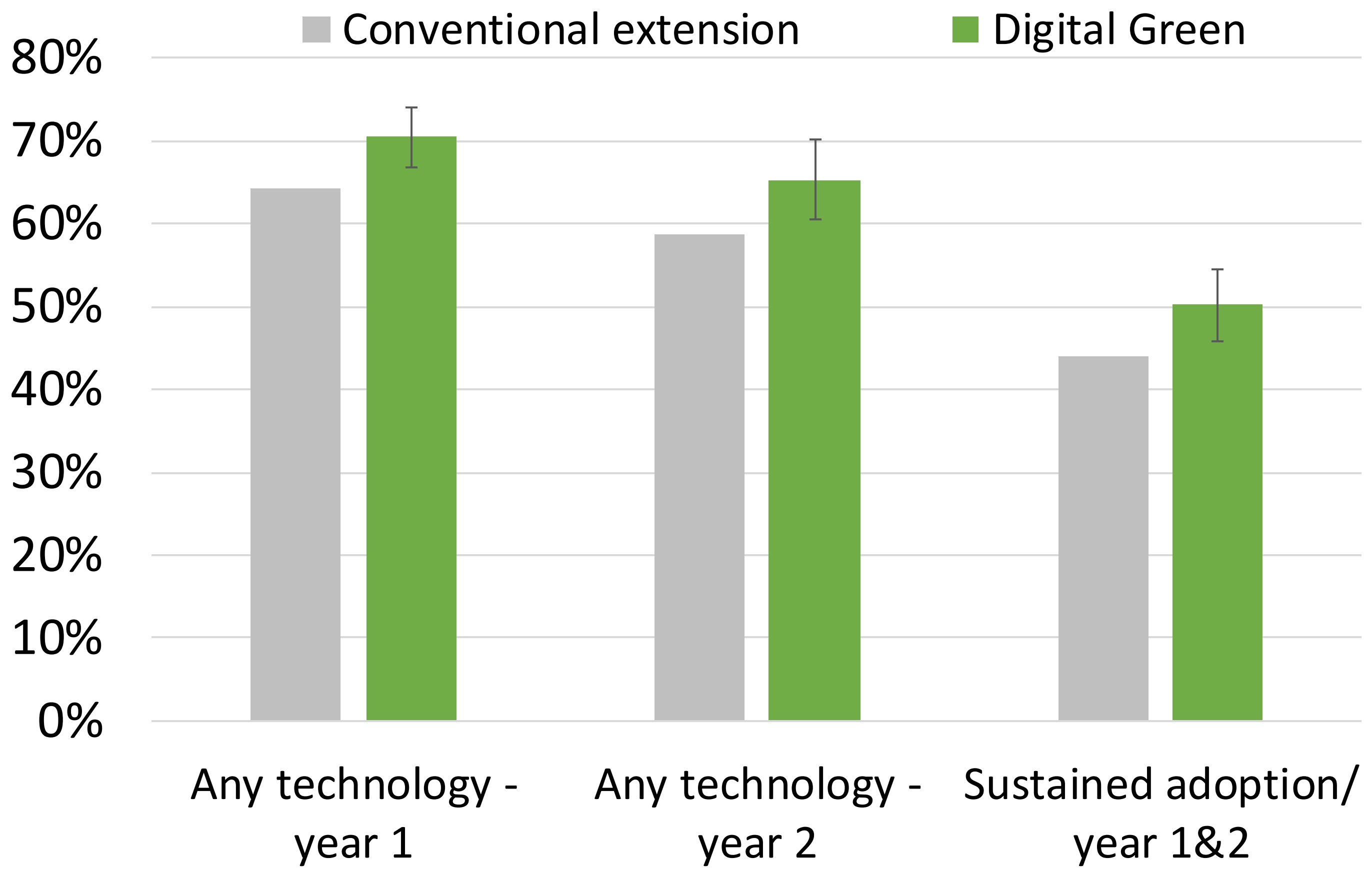
Can video increase farmers' adoption of technologies, practices, and inputs?

Farmer uptake/experimentation – year 1

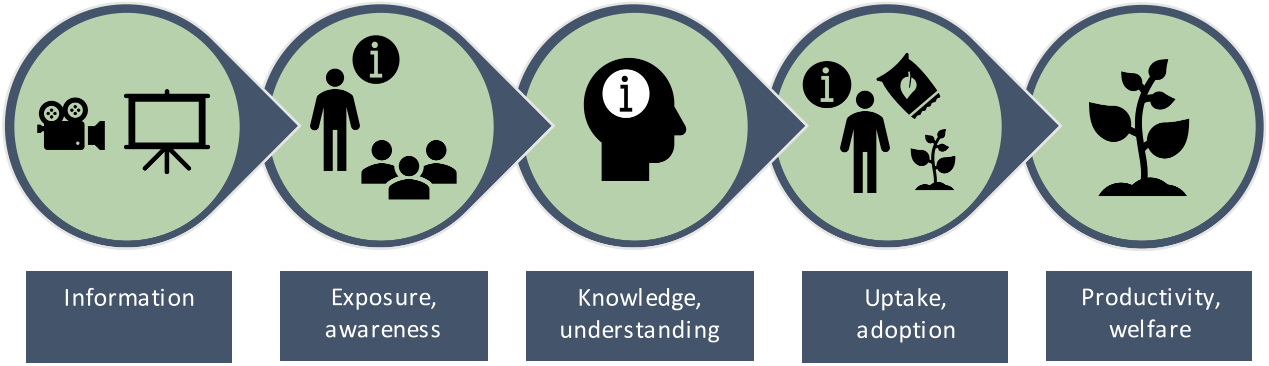


- 10% ↑ in uptake of technologies as a whole
- From 12% in row planting to 20% in lower seeding rate

Farmer adoption over time

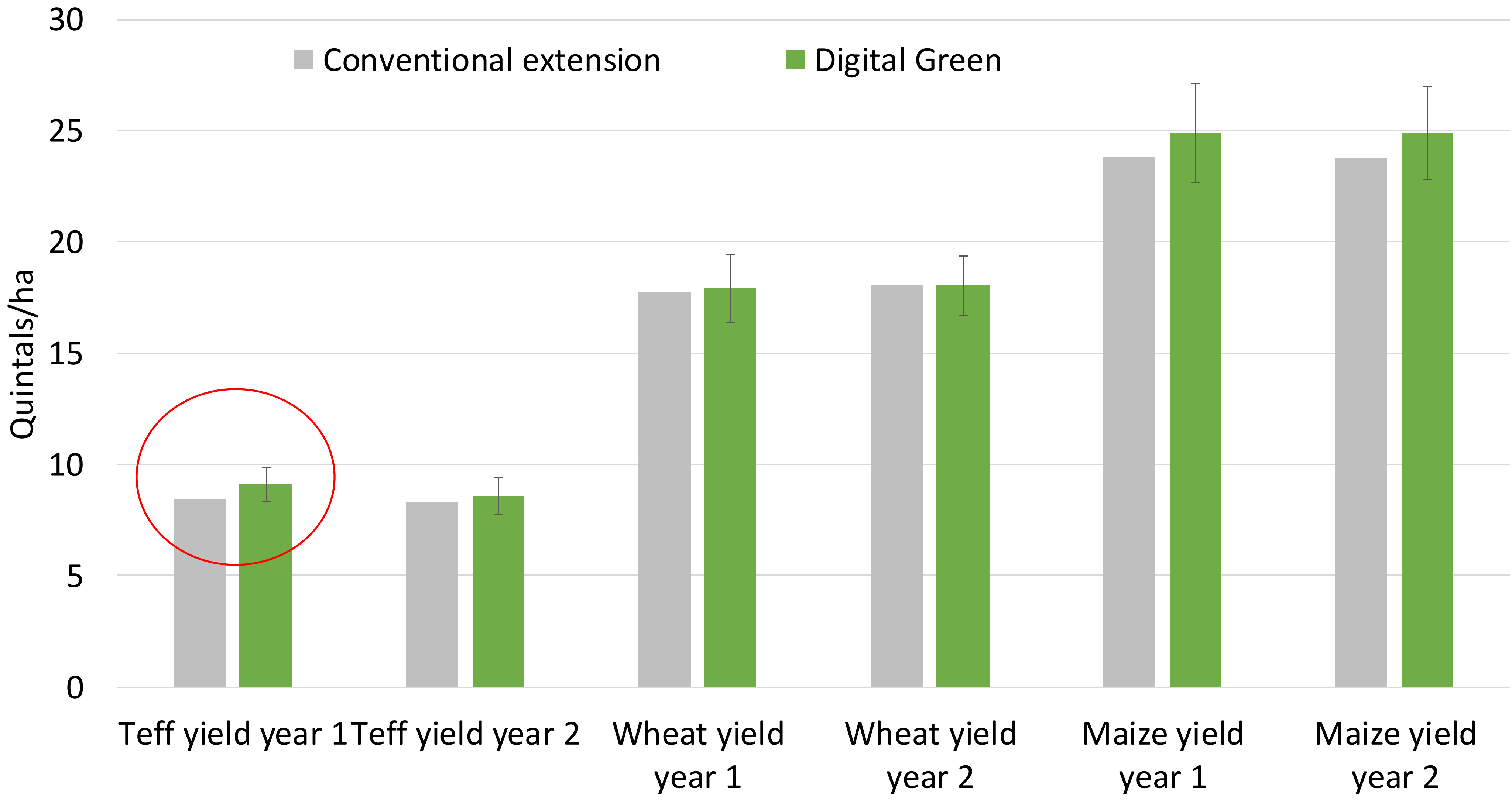


The difference in uptake rates in year 1 almost entirely translates into differences in adoption rates in year 2

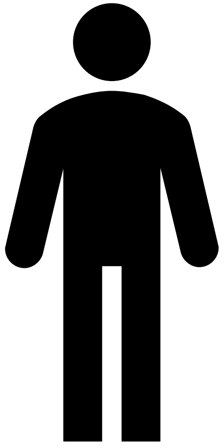


Can video increase farm productivity?

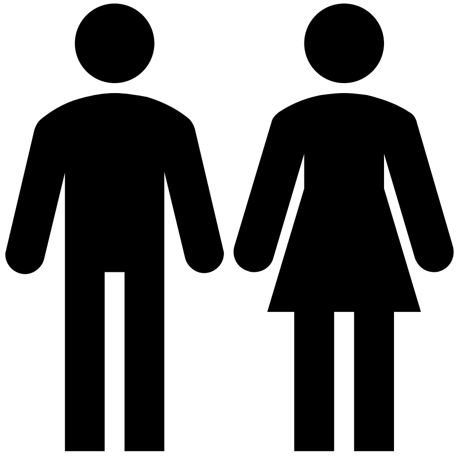
Yields



30
25
20
15
10
5
0
Quintals/ha
Conventional extension
Digital Green
Teff yield year 1
Teff yield year 2
Wheat yield year 1
Wheat yield year 2
Maize yield year 1
Maize yield year 2

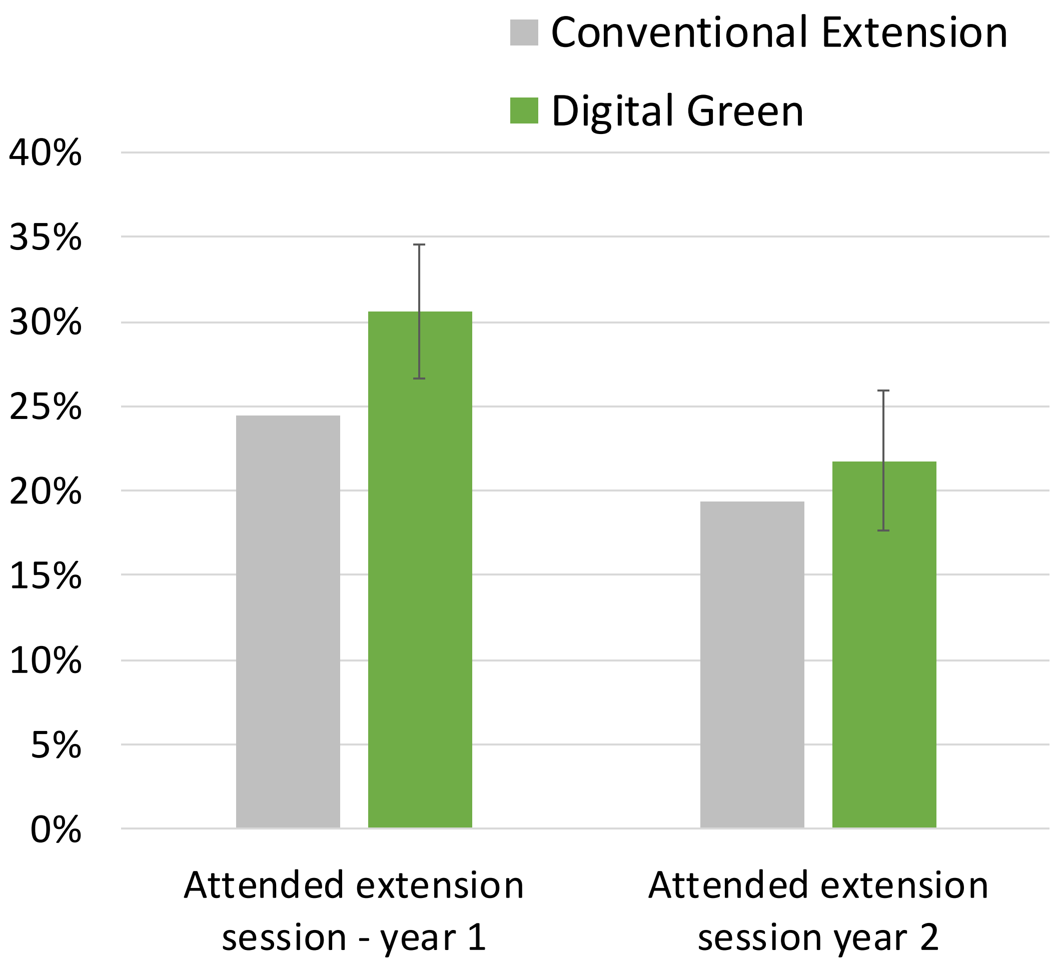


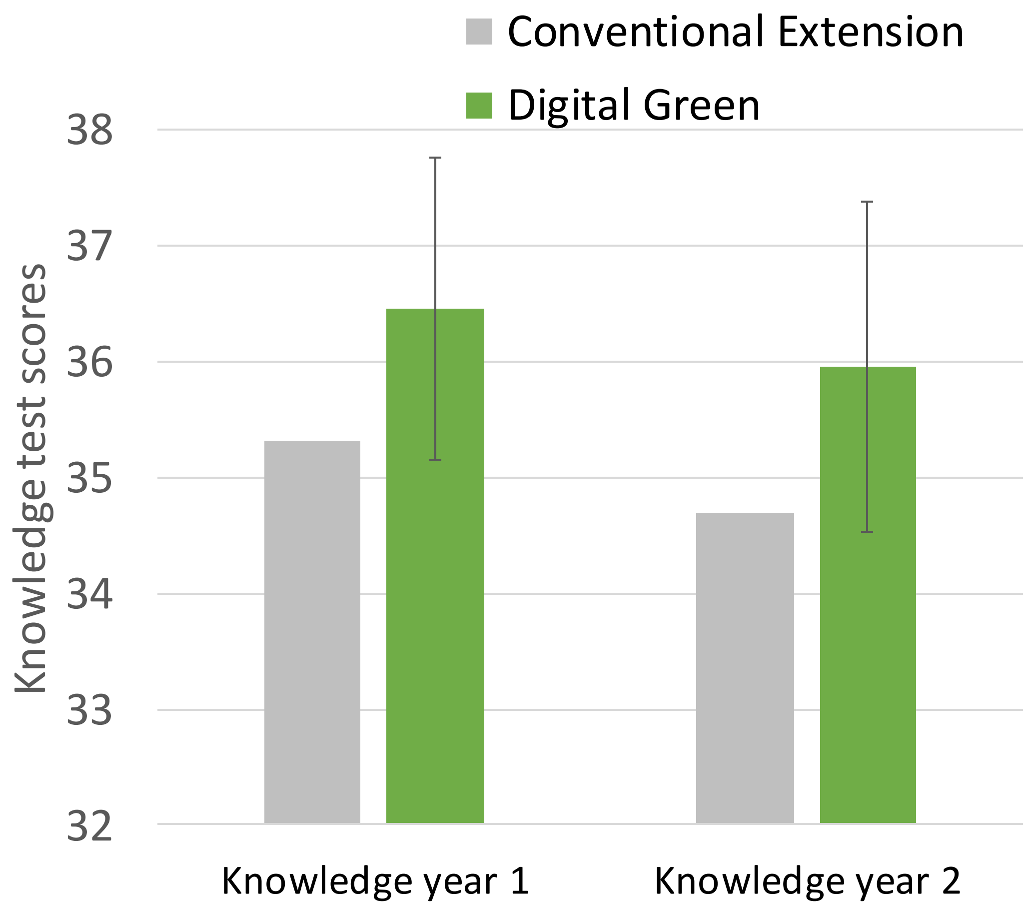
VS



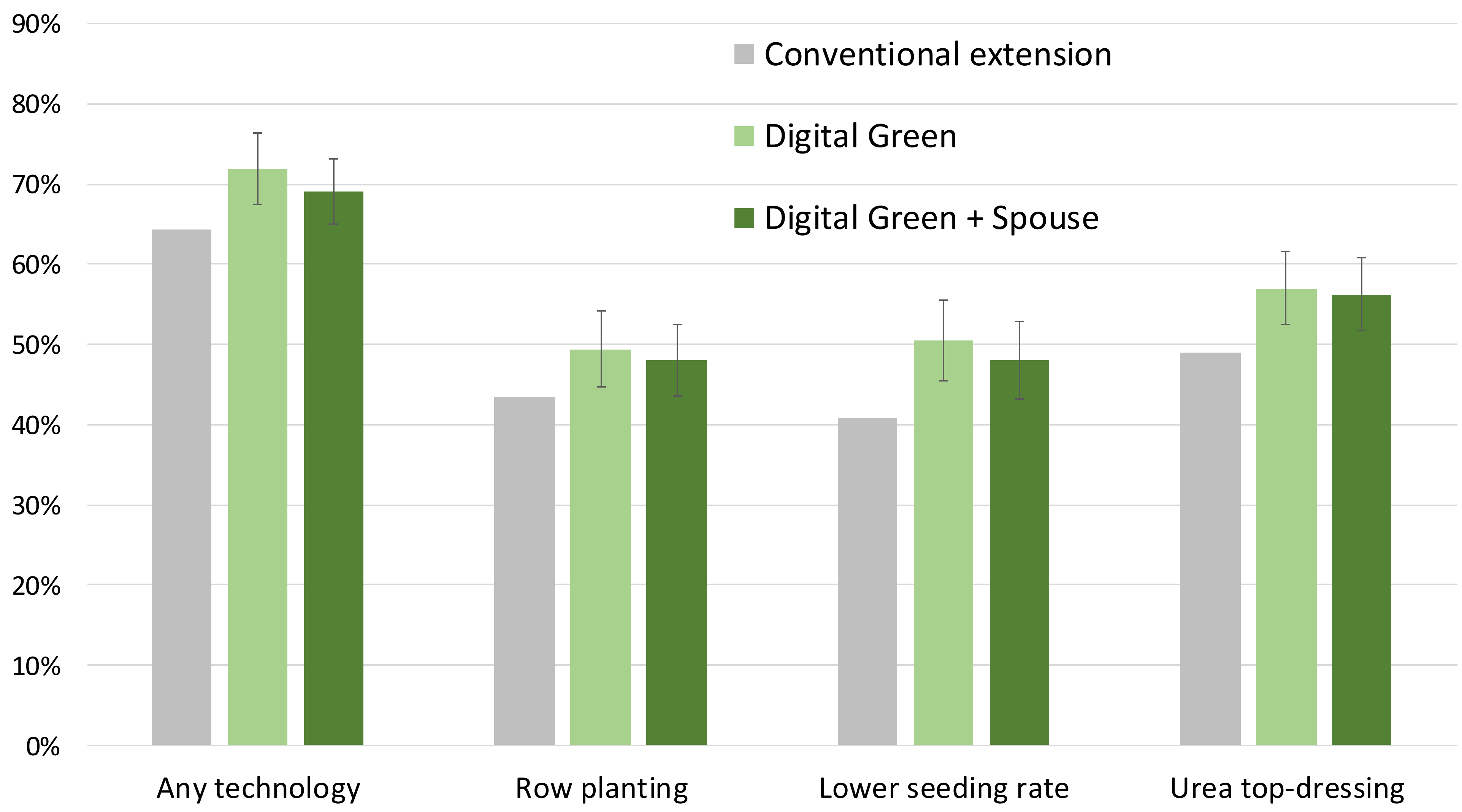
Is there evidence of gender-differentiated effects?

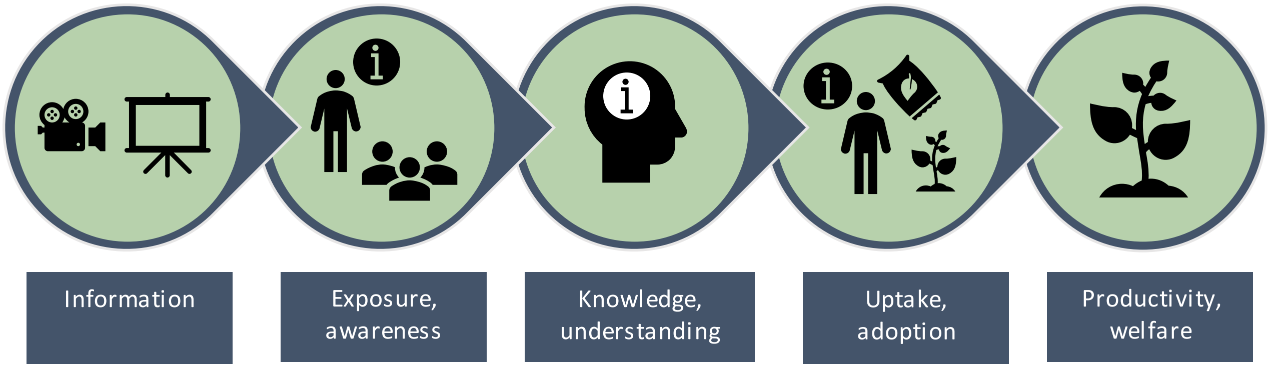
Gender-differentiated effects – exposure and knowledge





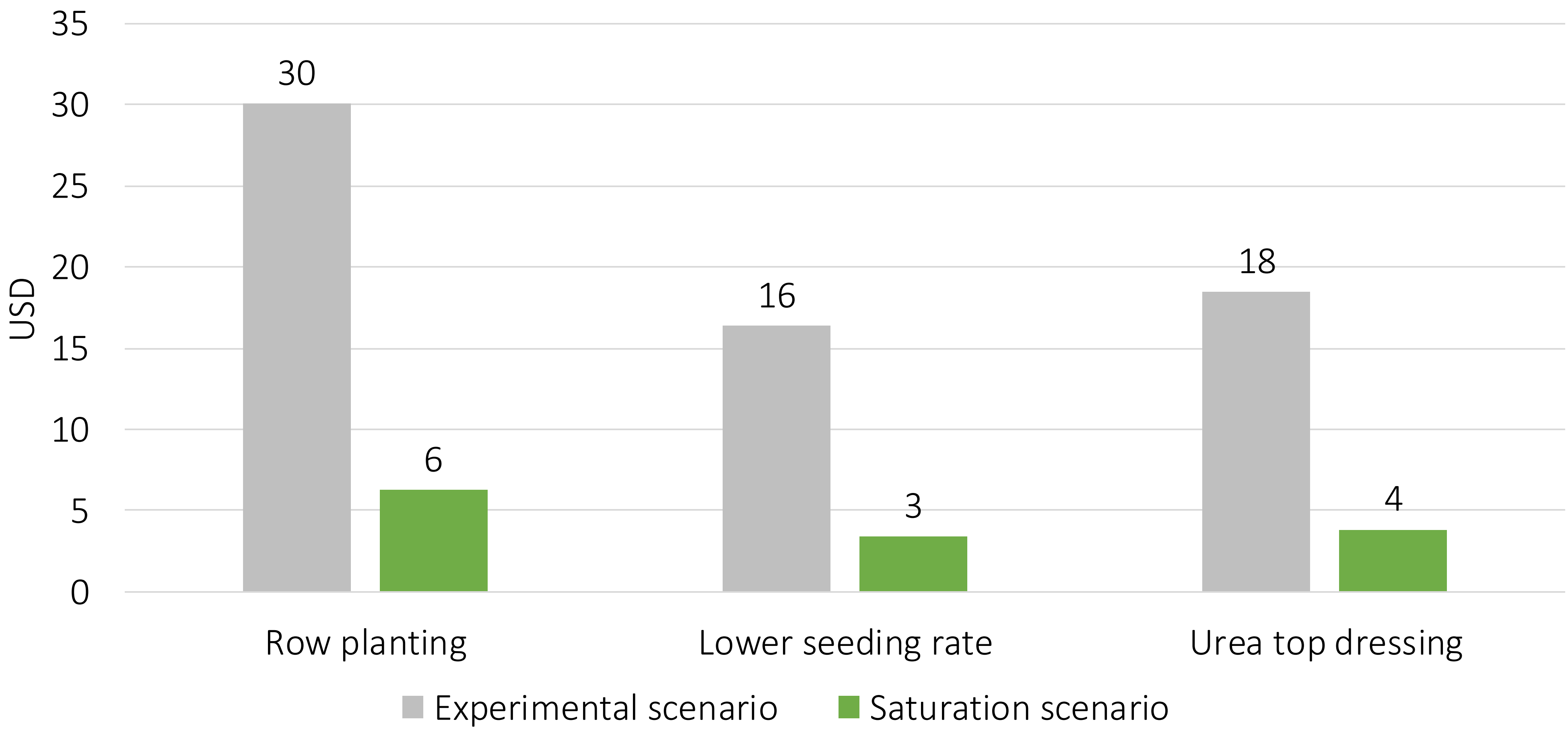
Gender-differentiated effects – uptake/adoption





Can video-mediated extension go to scale?

Marginal cost-effectiveness ratio (cost per additional adoption)



Conclusions

Encouraging results from a large-scale intervention, implemented by the Government of Ethiopia:

- Video-mediated extension approaches can have measurable effects on agricultural outcomes
- But outcomes may vary by crop, technology, channel, and context
- No clear gender-mediated effects

Continued experimentation and learning are critical to adapting video-mediated extension approaches to context

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