Impacts of Land Registration and Cash Grants on Agricultural Investment: Evidence from Women Farmers in Uganda

Joao Montalvao, Michael O'Sullivan

December 2023

ABSTRACT

This paper presents long-term results from a randomized control trial (RCT) with married couples in rural Uganda testing the impacts of two interventions – alone and together – aimed at empowering women. The first intervention offered couples assistance with obtaining a freehold land title at no cost, with incentives in place for the inclusion of the wife's name on the title (as (co-)owner of the land). The goal of this intervention was to strengthen women's property rights. The second intervention offered women an unconditional cash grant. The goal was to relax women's credit constraints. Results show that both interventions significantly increased long-term agricultural investment, the value of harvest produced and traded in the market by the households, and increased women's decision-making power vis-a-vis their husbands.

1. Introduction

Women farmers in poor country contexts face multiple institutional and market distortions. One important institutional imperfection is weak property rights over land. In general, secure land rights are expected to improve the incentives individuals have to make efficient long-term productive investments. Therefore, it is not surprising that developing country governments are increasingly focused on reforming land rights. It is possible however that land rights reforms alone in an environment with imperfect credit markets might not be as effective [Ghatak 2017, Bó and Finan 2016]. In fact, theoretical work by Besley *et al.* [2012] shows that very poor borrowers might become worse off if land rights reforms are not accompanied by an increase in the supply of credit. Understanding the complementary or substitutable role of improving land rights and relaxing credit constraints is important for policy reasons, given increasing policy attention to land rights institutional reforms.

Using a randomized control trial approach in rural Uganda, this paper tests the effectiveness of two interventions – separately and together – targeted to women farmers. The first intervention is land titling and is aimed at strengthening land rights. The second intervention is a cash grant and is aimed at relaxing liquidity constraints. Uganda is an appropriate setting to conduct this study since over 80% of its land is held under (non-registered) customary tenure and 90% of the population lives in rural areas. Furthermore, access to credit remains a major challenge in much of Uganda despite advances in its financial system, driven by the market-oriented policy reforms of the 1990s. According to the 2016/17 Uganda National Household Survey, just under 8% of individuals aged 18 years and above received a formal loan in the 12 months preceding the survey.

This study addresses the following research question: does relaxing liquidity constraints affect the impact of land titling on investment, productivity, and welfare? Economic theory predicts that secure property rights increase the incentives individuals have to invest in long-term productive activities through various channels [Besley 1995, Besley and Ghatak 2010], including a reduction in the risk of expropriation and an increase in the collateralizability of land. But to

the extent that such new investments require upfront liquidity, these mechanisms will be muted in a setting with imperfect credit markets – without an accompanying increase in credit supply.[1] Despite enhanced tenure security, households could invest differently than they would under complete credit markets: in general, combining land titles with loans can offer households greater flexibility to determine their investment portfolios and thus enable a more efficient allocation of resources.[2]

2. Target Population and Interventions

2.1. Target Population

The study's target population comprises around 1,600 households across 378 rural villages in four districts in Western Uganda: Mbarara, Sheema, Buhweju, and Isingiro. Households in the sample have limited access to the two key treatments (land titling and credit/liquidity). All households own at least one undocumented parcel of land and only 8% of the households have access to formal credit. All households in the sample are engaged in agricultural activities. To the extent that the majority of the Uganda population is rural, untitled, and with limited access to credit, if scaled up the interventions could benefit 5 million households. The Government of Uganda is implementing a large-scale land titling program which will target 1 million households in rural areas.

The findings from our baseline data collection reveal that the majority of the sample cultivates food crops, and 95% of them cultivate bananas, but only half of the households in the sample cultivate cash crops such as coffee and sugarcane. More than 95% of sample households do not irrigate their land using irrigation methods. In terms of non-labor inputs, a little over half of the

---

[1] For example, banks might remain reluctant to provide credit to poor households despite the improved collateralizability of land due to inefficient and slow judicial systems when trying to settle default issues in court.

[2] If households face binding credit constraints, their investment opportunities remain limited despite secure land rights (e.g., they could invest in land fallowing, which does not require upfront liquidity). The availability of credit, however, opens up new investment opportunities. For example, it allows households to invest in farm inputs that require some upfront liquidity (e.g., hired labor, fertilizer, pesticides). It also allows for investments in costly non-farm income generating activities (e.g., setting up a petty trade or even migrating to an urban location), which might contribute to a resource allocation away from agriculture toward services and industry.

sample (42%) uses fertilizer (organic or inorganic) while only 10% of the sample uses pesticides. Most of the sample (97%) uses household labor on their parcel of land and only 44% use hired labor.

A key goal of the Land Titling intervention is to improve women's land rights. To do so, both the financial and the informational incentives for titling were carefully designed to promote joint spousal titling. Specifically, the financial incentives were offered in two variations: unconditionally and conditional on the household agreeing to jointly title the land in the names of both spouses. The informational incentives were also offered in two variations: a "gender-silent" version focused on the general benefits of titling, and a "gender-informed" version focused on the benefits of joint titling to the family. Results indicate that more than 80% of the household chose to include the names of wives on the titles.

2.2. Interventions

This study test two interventions targeted to women farmers in Uganda. The first intervention (**Land Titling intervention**) was designed and carried out in partnership with the Uganda Ministry of Lands, Housing& Urban Development (MLHUD), provides households with financial and informational incentives designed to promote land registration and joint spousal titling. The financial incentives comprise fully subsidized freehold land titles, and the informational incentives include information on the benefits of titling through an innovative video documentary. The intervention includes four door-to-door visits. During the first visit, households are provided with information and offered the opportunity to title a parcel of land (randomly selected for households with multiple parcels). During the second visit, the parcel boundaries are defined in the presence of neighbors and local government officials, and households are assisted with the adjudication process. During the third visit, the core land demarcation and surveying activities take place. During the fourth and final visit, freehold land titles are delivered to the households after being processed by the Government of Uganda.
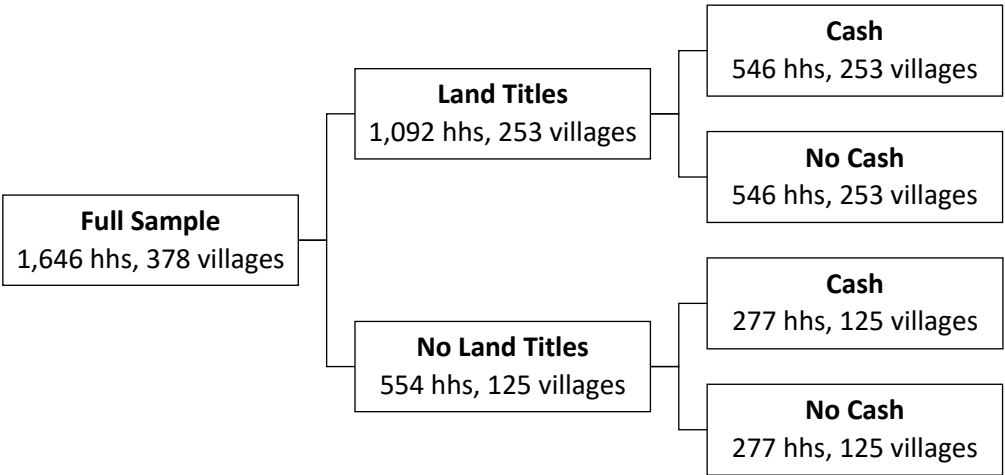
The second intervention (**Cash intervention**) disburses cash grants of approximately UGX 700,000 to women farmers. While the cash grants are unconditional, they are "labelled" for

productive investment either in the farm (e.g. buying inputs and cultivating higher-value crops) or off-farm (e.g. starting or growing an off-farm business). We partnered with local banks to distribute the grants directly to women farmers. The cash grants are disbursed approximately 4-5 years after the implementation of the land titling intervention.

3. Research Design and Empirical Framework

3.1. Research Design

The study is a randomized controlled trial. We conduct a 2X2 experiment. Figure 1 outlines the design. The original sample comprises around 1,646 households spread across 378 villages, with an average number of 4-5 households per community. A two-step randomization is followed. The first stage takes place at the village level: villages (sample households therein) either receive an offer for a fully-subsidized land title or no offer. The village level randomization was stratified by parish. The second stage takes place at the household level within villages: sampled households either receive a cash grant offer (targeted to the wife) or no offer. The household level randomization will be stratified on village, take-up of land titling, farm size, and value of harvest.

```
                                                          ┌─────────────────────────┐
                                                          │        Cash             │
                                ┌──────────────────────┐  │ 546 hhs, 253 villages   │
                                │     Land Titles      │──┤                         │
                                │ 1,092 hhs, 253 villages │  ┌─────────────────────────┐
                                └──────────────────────┘  │      No Cash            │
        ┌─────────────────────┐                           │ 546 hhs, 253 villages   │
        │    Full Sample      │──┤                        └─────────────────────────┘
        │ 1,646 hhs, 378 villages │                       ┌─────────────────────────┐
        └─────────────────────┘                           │        Cash             │
                                ┌──────────────────────┐  │ 277 hhs, 125 villages   │
                                │    No Land Titles    │──┤                         │
                                │ 554 hhs, 125 villages │  ┌─────────────────────────┐
                                └──────────────────────┘  │      No Cash            │
                                                          │ 277 hhs, 125 villages   │
                                                          └─────────────────────────┘
```

The main source of data for the impact evaluation will be household surveys to collect detailed household and plot level data. Households were first interviewed in Feb-Mar 2017 (baseline) prior the interventions, and were interviewed again in Jul-Aug 2022 (endline) post

interventions. The surveys were administered to the household head and his or her spouse. The main final outcomes of interest are agricultural investment and productivity, as well as investment in non-farm income generating activities and income.

3.2. Empirical Framework

We estimate the following OLS ANCOVA specification for the impact on outcome y_{ij} for household i in community j at endline:

$$y_{ij} = \alpha + \gamma title_{ij} + \delta cash_{ij} + \beta[title_{ij} \times cash_{ij}] + \rho_{ij} + \lambda y_{ij0} + \varepsilon_{ij}.$$

$title_j$ equals one if household i is in a community j assigned to receive land titles and zero otherwise. $cash_{ij}$ equals one for households assigned to receive a cash grant and zero otherwise. ρ_{ij} is a randomization strata fixed effect. y_{ij0} is the outcome measured at baseline. ε_{ij} is an error term clustered by community j, the level of randomization of the Land Tilting intervention. The parameters of interest are γ, δ, and β, which identify the standalone causal impact of land titles, the standalone causal impact of cash grants, and the complementary/substitutability between titles and cash.

4. Results

Tables 2-6 report treatment impacts on the household parcel randomly selected to potentially receive a land title. There are four main findings from these tables. First, we find no evidence that the titling intervention shifted the intra-household distribution of perceived ownership rights over the parcel (Table 2). This is despite the high titling take-up rates and most titles having been issued in women's names.

Second, both interventions led to increased investment in non-labor inputs, tree planting, and cultivation of perennial crops (Tables 2-4): the interventions caused a 4 percentage points (pp) increase in probability of chemical usage, 5-6pp increase in the likelihood of tree planting, and an 11-12pp increase in the likelihood of perennial crops cultivation.

Third, both interventions increased value of harvested crops on the parcel and the amount of cash received from selling some of that harvest. Specifically, the interventions increased value of harvested by around USD 140-180, and income from crop selling by around USD 107-115.

Fourth, rather than complementing each other, the titling and cash interventions appear to have substituted each other. The coefficient on the interaction effect between the two treatments is negative and highly significant. We cannot reject the hypothesis that the standalone impact of the titling intervention is equal to that of the cash intervention.

Tables 7-11 examine whether the treatments had an impact on other parcels owned by the household (for those with multiple parcels). There are two main findings here. First, we find no evidence that the titling intervention crowded out investment on these other parcels. Hence, the observed increased investment on the selected parcel was not at the expense of non-selected parcels. Second, while less precisely estimated, we find that the cash intervention had a similar pattern of impacts on non-selected parcels to those observed on the selected parcel.

Finally, Table 12 reports treatment impacts on woman's decision-making power within the households. We find that both treatments significantly increased woman's say over main household expenditures. We also find significant improvements induced by the cash treatment in her say over how to spend her own and her household's income.

Part 1: Baseline Characteristics

Table 1: Summary of household demographics (baseline data)

	mean	sd	min	max	count
Household size	6.94	2.77	1.00	22.00	1509
Num of male HH members	3.40	1.81	0.00	13.00	1509
Num of female HH members	3.54	1.87	0.00	13.00	1509
Num of children	2.12	1.52	0.00	10.00	1509
Num of adults	2.64	1.61	0.00	11.00	1509
Num of elderly	0.33	0.64	0.00	3.00	1509
polygamy HH (yes=1)	0.14	0.35	0.00	1.00	1509
Edu Attainment-husband [0-15]	5.96	3.98	0.00	15.00	1328
Edu Attainment-wife [0-15]	4.66	3.57	0.00	15.00	1380
No school-husband [yes=1]	0.12	0.32	0.00	1.00	1509
Completed primary school-husband [yes=1]	0.58	0.49	0.00	1.00	1509
Completed secondary school-husband [yes=1]	0.18	0.38	0.00	1.00	1509
Completed higher education-husband [yes=1]	0.01	0.09	0.00	1.00	1509
No school-wife [yes=1]	0.21	0.41	0.00	1.00	1509
Completed primary school-wife [yes=1]	0.60	0.49	0.00	1.00	1509
Completed secondary school-wife [yes=1]	0.11	0.31	0.00	1.00	1509
Completed higher education-wife [yes=1]	0.00	0.03	0.00	1.00	1509
Num of children attending school	1.96	1.47	0.00	10.00	1509
Observations	1509				

Part 2: Treatment Impacts on Selected Parcels

Table 2: Parcel Ownership

VARIABLES	Parcel was identified (yes=1)	Still owned (yes=1)	Is it family land(yes=1)	Owned by husband(yes=1)	Owned by wife(yes=1)	Owned by both husband and wife(yes=1)
Title	-0.006	0.039	0.021	0.037	0.002	-0.050
	(0.009)	(0.026)	(0.041)	(0.038)	(0.020)	(0.041)
Cash	-0.016	0.053**	-0.055	0.042	0.016	-0.061
	(0.012)	(0.027)	(0.041)	(0.039)	(0.023)	(0.041)
Title X Cash	0.017	-0.035	0.050	-0.044	-0.033	0.089
	(0.017)	(0.034)	(0.054)	(0.054)	(0.032)	(0.057)
Observations	1,404	1,378	1,247	1,247	1,247	1,247
R-squared	0.083	0.054	0.074	0.066	0.060	0.054
Control Mean	0.987	0.863	0.322	0.259	0.0667	0.663
Control SD	0.112	0.345	0.468	0.439	0.250	0.474
P-value: Title = Cash	0.408	0.539	0.0608	0.906	0.524	0.799
Estimates: Title + TitleXCash = 0	0.0114	0.00452	0.0710	-0.00726	-0.0313	0.0382
P-value: Title + TitleXCash = 0	0.348	0.836	0.0858	0.854	0.180	0.370
Estimates: Cash + TitleXCash = 0	0.00163	0.0185	-0.00517	-0.00258	-0.0172	0.0276
P-value: Cash + TitleXCash = 0	0.879	0.363	0.881	0.946	0.396	0.486

Note: OLS regression specifications include village fixed effects. Title and Cash are dummy variables equal to 1 if the household is targeted for the title and cash interventions, respectively, and 0 otherwise. SD stands for standard deviation. Robust standard errors clustered by village are in parentheses, ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table 3: Investment on Structures, Conservation, and Tree Planting

VARIABLES	Structures /buildings	Man-made water structure	Used soil conservation methods	Planted trees (last 12 months)
Title	0.026	0.006	0.028	0.061***
	(0.038)	(0.029)	(0.038)	(0.021)
Cash	0.034	0.012	0.014	0.049**
	(0.043)	(0.029)	(0.038)	(0.022)
Title X Cash	-0.001	-0.045	0.022	-0.104***
	(0.056)	(0.039)	(0.053)	(0.030)
Observations	1,401	1,401	1,401	1,401
R-squared	0.067	0.111	0.095	0.078
Control Mean	0.503	0.158	0.361	0.0633
Control SD	0.501	0.366	0.481	0.244
P-value: Title = Cash	0.848	0.847	0.704	0.596
Estimates: Title + TitleXCash = 0	0.0253	-0.0386	0.0501	-0.0426
P-value: Title + TitleXCash = 0	0.510	0.177	0.191	0.0823
Estimates: Cash + TitleXCash = 0	0.0328	-0.0330	0.0356	-0.0552
P-value: Cash + TitleXCash = 0	0.372	0.202	0.324	0.00599

Note: OLS regression specifications include village fixed effects. Title and Cash are dummy variables equal to 1 if the household is targeted for the title and cash interventions, respectively, and 0 otherwise. SD stands for standard deviation. Robust standard errors clustered by village are in parentheses, ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table 4: Investment on Labor and Non-Labor Inputs

VARIABLES	Use of non-labor input			Labor input					Parcel size (Acres)
				Number		Cost of non-HH labor (USD)			
	Organic fertilizer	Inorganic fertilizer	Pesticides/herbicides/fungicides	HH members	Non-HH labor		Winsorize	HIS	
Title	0.040	0.010	0.040**	-0.060	0.019	12.330	12.330	0.152	0.131
	(0.037)	(0.013)	(0.019)	(0.120)	(0.120)	(8.446)	(8.446)	(0.142)	(0.120)
Cash	0.011	0.037**	0.039*	0.202	0.083	13.456	13.456	0.196	0.185*
	(0.039)	(0.015)	(0.023)	(0.132)	(0.128)	(8.509)	(8.509)	(0.147)	(0.098)
Title X Cash	0.029	-0.030	-0.032	-0.036	0.177	-9.655	-9.655	0.011	0.127
	(0.054)	(0.021)	(0.029)	(0.170)	(0.184)	(12.328)	(12.328)	(0.211)	(0.283)
Observations	1,401	1,401	1,401	1,401	1,401	1,401	1,401	1,401	1,401
R-squared	0.080	0.087	0.090	0.078	0.048	0.087	0.087	0.059	0.053
Control Mean	0.297	0.0253	0.0538	1.665	0.652	18.16	18.16	0.881	0.676
Control SD	0.458	0.157	0.226	1.637	1.631	83.62	83.62	1.777	0.887
P-value: Title = Cash	0.433	0.108	0.967	0.0253	0.599	0.891	0.891	0.767	0.636
Estimates: Title + TitleXCash = 0	0.0691	-0.0199	0.00843	-0.0959	0.196	2.675	2.675	0.163	0.258
P-value: Title + TitleXCash = 0	0.0711	0.251	0.726	0.423	0.161	0.755	0.755	0.286	0.369
Estimates: Cash + TitleXCash = 0	0.0402	0.00705	0.00744	0.166	0.260	3.801	3.801	0.207	0.312
P-value: Cash + TitleXCash = 0	0.260	0.627	0.679	0.126	0.0520	0.662	0.662	0.181	0.283

Note: OLS regression specifications include village fixed effects. Title and Cash are dummy variables equal to 1 if the household is targeted for the title and cash interventions, respectively, and 0 otherwise. SD stands for standard deviation. Robust standard errors clustered by village are in parentheses, ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table 5: Crop Choices

VARIABLES	Primary Season (Jan-Jun, 2022)								Secondary Season (July-Dec, 2021)							
	# of crops	Cereal	Legumes	Vegetables	Fruits	Spices	Perennial	Other crops	# of crops	Cereal	Legumes	Vegetables	Fruits	Spices	Perennial	Other crops
Title	0.109	0.034*	-0.019	-0.007	-0.026	0.007*	0.118***	-0.002	0.121	-0.003	0.011	0.007	-0.021	0.007	0.137***	0.004
	(0.099)	(0.019)	(0.036)	(0.021)	(0.038)	(0.004)	(0.032)	(0.006)	(0.111)	(0.034)	(0.045)	(0.023)	(0.036)	(0.006)	(0.045)	(0.003)
Cash	0.269**	0.021	0.032	0.007	0.001	0.003	0.114***	0.007	0.214*	-0.018	0.053	0.020	-0.036	0.006	0.121**	-0.000
	(0.128)	(0.020)	(0.037)	(0.023)	(0.042)	(0.003)	(0.035)	(0.009)	(0.118)	(0.032)	(0.048)	(0.024)	(0.042)	(0.005)	(0.047)	(0.000)
Title X Cash	-0.136	-0.018	0.027	0.001	0.019	-0.006	-0.119**	-0.009	-0.238	0.020	-0.081	-0.047	0.011	-0.006	-0.169**	0.000
	(0.164)	(0.030)	(0.052)	(0.030)	(0.055)	(0.006)	(0.049)	(0.010)	(0.152)	(0.045)	(0.062)	(0.030)	(0.055)	(0.008)	(0.066)	(0.005)
Observations	1,401	1,401	1,401	1,401	1,401	1,401	1,401	1,401	884	884	884	884	884	884	884	884
R-squared	0.085	0.109	0.092	0.071	0.062	0.063	0.163	0.096	0.109	0.156	0.124	0.095	0.159	0.105	0.219	0.079
Control Mean	1.399	0.0538	0.291	0.0791	0.620	0.000	0.187	0.00633	1.657	0.121	0.222	0.0505	0.869	0.000	0.247	0.000
Control SD	1.302	0.226	0.455	0.270	0.486	0.000	0.390	0.0794	1.024	0.327	0.417	0.220	0.339	0.000	0.433	0.000
P-value: Title = Cash	0.179	0.512	0.157	0.491	0.479	0.379	0.895	0.209	0.473	0.627	0.379	0.606	0.703	0.887	0.741	0.140
Estimates: Title + TitleXCash = 0	-0.0267	0.0153	0.00795	-0.00612	-0.007	0.000896	-0.0003	-0.0108	-0.117	0.0169	-0.0708	-0.0402	-0.015	0.000647	-0.0316	0.00420
P-value: Title + TitleXCash = 0	0.832	0.463	0.831	0.755	0.845	0.755	0.993	0.137	0.343	0.582	0.113	0.0889	0.793	0.874	0.500	0.388
Estimates: Cash + TitleXCash = 0	0.133	0.00267	0.0583	0.00769	0.0200	-0.00303	-0.00505	-0.0016	-0.024	0.00131	-0.0287	-0.0275	-0.025	-0.0002	-0.0477	-0.00008
P-value: Cash + TitleXCash = 0	0.198	0.904	0.0882	0.699	0.589	0.548	0.881	0.729	0.808	0.967	0.468	0.131	0.483	0.976	0.300	0.988

Note: OLS regression specifications include village fixed effects. Title and Cash are dummy variables equal to 1 if the household is targeted for the title and cash interventions, respectively, and 0 otherwise. SD stands for standard deviation. Robust standard errors clustered by village are in parentheses, ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table 6: Value Harvested and Income from Selling Crops

VARIABLES	Primary Season (Jan-Jun, 2022)							Secondary Season (July-Dec, 2021)						
	Harvest [USD]	Harvest [USD] (winsorize)	Harvest [USD] (IHS)	Sold crop(yes=1)	Crop sale [USD]	Crop sale [USD] (winsorize)	Crop sale [USD] (IHS)	Harvest [USD]	Harvest [USD] (winsorize)	Harvest [USD] (IHS)	Sold crop(yes=1)	Crop sale [USD]	Crop sale [USD] (winsorize)	Crop sale [USD] (IHS)
Title	-2,412.916	131.888***	0.226	0.022	147.816**	115.468***	0.244	58.798	14.064	-0.068	-0.014	104.541**	83.835**	0.083
	(2,532.433)	(50.679)	(0.263)	(0.038)	(66.295)	(41.749)	(0.244)	(75.111)	(55.440)	(0.318)	(0.048)	(47.949)	(39.549)	(0.288)
Cash	-2,085.572	177.710***	0.597**	0.096**	136.356**	107.536**	0.564**	110.353	58.948	0.214	0.041	88.329*	69.986*	0.305
	(2,443.700)	(66.263)	(0.282)	(0.041)	(66.052)	(48.594)	(0.268)	(88.300)	(69.245)	(0.382)	(0.055)	(51.749)	(40.946)	(0.350)
Title X Cash	2,205.989	-140.634	-0.140	-0.008	-182.287*	-127.612*	-0.145	195.340	127.707	0.506	0.065	-149.075*	-111.890*	0.188
	(2,524.039)	(97.377)	(0.380)	(0.055)	(104.207)	(73.358)	(0.362)	(156.180)	(103.441)	(0.483)	(0.069)	(79.861)	(60.950)	(0.441)
Observations	1,401	1,401	1,401	1,401	1,401	1,401	1,401	884	884	884	866	884	884	884
R-squared	0.030	0.086	0.089	0.089	0.083	0.079	0.088	0.094	0.132	0.105	0.102	0.141	0.120	0.101
Control Mean	2704	291.4	3.306	0.506	208.4	197.9	3.009	345.8	340.9	3.893	0.610	163.7	159.5	3.358
Control SD	42909	504	3.409	0.501	467.3	396.2	3.115	537.5	518.4	3.305	0.489	302.7	283.1	2.928
P-value: Title = Cash	0.419	0.506	0.190	0.0708	0.881	0.878	0.221	0.551	0.482	0.397	0.265	0.779	0.757	0.468
Estimates: Title + TitleXCash = 0	-206.9	-8.745	0.0854	0.0137	-34.47	-12.14	0.0995	254.1	141.8	0.438	0.0505	-44.53	-28.05	0.271
P-value: Title + TitleXCash = 0	0.595	0.913	0.763	0.736	0.632	0.829	0.704	0.0931	0.0853	0.190	0.290	0.408	0.496	0.372
Estimates: Cash + TitleXCash = 0	120.4	37.08	0.456	0.0875	-45.93	-20.08	0.420	305.7	186.7	0.720	0.106	-60.75	-41.90	0.494
P-value: Cash + TitleXCash = 0	0.508	0.606	0.0840	0.0208	0.561	0.710	0.0897	0.0283	0.0156	0.0123	0.0108	0.327	0.355	0.0592

Note: OLS regression specifications include village fixed effects. Title and Cash are dummy variables equal to 1 if the household is targeted for the title and cash interventions, respectively, and 0 otherwise. SD stands for standard deviation. Robust standard errors clustered by village are in parentheses, ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Part 3: Treatment Impacts on Non-Selected Parcels

Table 7: Parcel Ownership

VARIABLES	Parcel was identified (yes=1)	Still owned (yes=1)	Is it family land(yes=1)	Owned by husband(yes=1)	Owned by wife(yes=1)	Owned by both husband and wife(yes=1)
Title	-0.016	-0.015	-0.020	0.014	0.024	-0.018
	(0.012)	(0.033)	(0.046)	(0.043)	(0.022)	(0.045)
Cash	-0.014	0.021	-0.075*	0.044	0.033	-0.065
	(0.011)	(0.034)	(0.045)	(0.039)	(0.025)	(0.043)
Title X Cash	0.029*	0.019	0.140**	-0.055	-0.046	0.094
	(0.016)	(0.046)	(0.062)	(0.058)	(0.034)	(0.063)
Observations	1,272	1,247	1,031	1,031	1,031	1,031
R-squared	0.076	0.112	0.101	0.088	0.075	0.086
Control Mean	0.986	0.826	0.395	0.282	0.0630	0.685
Control SD	0.116	0.379	0.490	0.451	0.244	0.466
P-value: Title = Cash	0.894	0.273	0.227	0.493	0.724	0.294
Estimates: Title + TitleXCash = 0	0.0131	0.00387	0.120	-0.0412	-0.0211	0.0757
P-value: Title + TitleXCash = 0	0.225	0.896	0.0111	0.335	0.396	0.0856
Estimates: Cash + TitleXCash = 0	0.0149	0.0394	0.0651	-0.0112	-0.0125	0.0284
P-value: Cash + TitleXCash = 0	0.205	0.215	0.127	0.794	0.617	0.528

Note: OLS regression specifications include village fixed effects. Title and Cash are dummy variables equal to 1 if the household is targeted for the title and cash interventions, respectively, and 0 otherwise. SD stands for standard deviation. Robust standard errors clustered by village are in parentheses, ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table 8: Investment on Structures, Conservation, and Tree Planting

VARIABLES	Parcel has structures /buildings	Man-made water structure	Used soil conservation	Planted trees (last 12 months)
Title	-0.062	-0.023	0.056	0.019
	(0.039)	(0.030)	(0.039)	(0.025)
Cash	-0.038	-0.016	0.028	0.012
	(0.040)	(0.030)	(0.040)	(0.028)
Title X Cash	0.055	0.007	-0.026	0.006
	(0.055)	(0.040)	(0.054)	(0.037)
Observations	1,363	1,363	1,363	1,363
R-squared	0.068	0.093	0.088	0.082
Control Mean	0.595	0.204	0.430	0.110
Control SD	0.492	0.404	0.496	0.313
P-value: Title = Cash	0.521	0.808	0.483	0.792
Estimates: Title + TitleXCash = 0	-0.00678	-0.0166	0.0299	0.0250
P-value: Title + TitleXCash = 0	0.862	0.551	0.460	0.343
Estimates: Cash + TitleXCash = 0	0.0177	-0.00953	0.00148	0.0181
P-value: Cash + TitleXCash = 0	0.626	0.718	0.968	0.471

Note: OLS regression specifications include village fixed effects. Title and Cash are dummy variables equal to 1 if the household is targeted for the title and cash interventions, respectively, and 0 otherwise. SD stands for standard deviation. Robust standard errors clustered by village are in parentheses, ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table 9: Investment on Labor and Non-Labor Inputs

VARIABLES	Use of non-labor input			Labor input					Parcel size (Acres)
				Number		Cost of non-HH labor (USD)			
	Organic fertilizer	Inorganic fertilizer	Pesticides/ herbicides/ fungicides	HH members	Non-HH labor		Winsorize	HIS	
Title	-0.001	0.005	-0.001	-0.088	0.071	83.238**	34.403**	0.256	-3.898
	(0.044)	(0.018)	(0.030)	(0.106)	(0.207)	(41.879)	(14.676)	(0.191)	(3.294)
Cash	0.042	0.006	0.021	-0.033	0.072	62.572*	30.513**	0.534***	-3.232
	(0.046)	(0.020)	(0.032)	(0.102)	(0.188)	(32.229)	(13.826)	(0.170)	(3.302)
Title X Cash	0.012	0.013	0.047	0.231	0.177	-103.865**	-41.851*	-0.416	3.736
	(0.060)	(0.028)	(0.046)	(0.151)	(0.259)	(44.776)	(21.366)	(0.270)	(3.357)
Observations	1,170	1,170	1,170	1,170	1,170	1,376	1,376	1,376	1,376
R-squared	0.101	0.084	0.106	0.081	0.069	0.126	0.094	0.085	0.048
Control Mean	0.413	0.0502	0.143	2.046	1.002	40.41	32.41	1.263	5.200
Control SD	0.493	0.219	0.351	1.290	2.193	195	113.3	2.100	57.71
P-value: Title = Cash	0.306	0.962	0.462	0.600	0.999	0.660	0.812	0.149	0.398
Estimates: Title + TitleXCash = 0	0.0109	0.0187	0.0464	0.143	0.248	-20.63	-7.447	-0.161	-0.162
P-value: Title + TitleXCash = 0	0.803	0.321	0.166	0.236	0.168	0.557	0.602	0.391	0.835
Estimates: Cash + TitleXCash = 0	0.0536	0.0196	0.0682	0.198	0.249	-41.29	-11.34	0.117	0.503
P-value: Cash + TitleXCash = 0	0.168	0.339	0.0333	0.0816	0.181	0.151	0.477	0.574	0.179

Note: OLS regression specifications include village fixed effects. Title and Cash are dummy variables equal to 1 if the household is targeted for the title and cash interventions, respectively, and 0 otherwise. SD stands for standard deviation. Robust standard errors clustered by village are in parentheses, ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table 10: Crop Choices

VARIABLES	Primary Season (Jan-Jun, 2022)								Secondary Season (July-December, 2021)							
	# of crops	Cereal	Legumes	Vegetables	Fruits	Spices	Perennial	Other crops	# of crops	Cereal	Legumes	Vegetables	Fruits	Spices	Perennial	Other crops
Title	-0.083	-0.033	0.009	-0.010	0.011	-0.002	-0.062	-0.011	-0.002	0.021	0.020	0.034	-0.005	-0.006	-0.008	0.004
	(0.184)	(0.029)	(0.043)	(0.028)	(0.038)	(0.005)	(0.040)	(0.012)	(0.038)	(0.047)	(0.024)	(0.039)	(0.006)	(0.049)	(0.008)	(0.003)
Cash	0.355*	0.045	0.007	0.014	0.005	0.000	-0.060	0.005	0.040	0.038	0.026	0.010	-0.006	-0.021	-0.006	-0.000
	(0.197)	(0.032)	(0.044)	(0.034)	(0.038)	(0.007)	(0.038)	(0.013)	(0.037)	(0.046)	(0.024)	(0.039)	(0.006)	(0.045)	(0.006)	(0.000)
Title X Cash	-0.084	-0.007	0.026	0.001	0.044	-0.001	0.078	0.008	-0.015	-0.052	-0.044	0.001	0.005	0.000	0.029**	0.000
	(0.262)	(0.042)	(0.058)	(0.042)	(0.052)	(0.006)	(0.055)	(0.017)	(0.051)	(0.064)	(0.033)	(0.052)	(0.005)	(0.061)	(0.014)	(0.005)
Observations	1,376	1,170	1,170	1,170	1,170	1,170	1,170	1,170	906	906	906	906	906	906	906	884
R-squared	0.083	0.128	0.119	0.076	0.138	0.069	0.194	0.073	0.164	0.105	0.101	0.199	0.023	0.229	0.111	0.079
Control Mean	2.466	0.143	0.552	0.154	0.734	0.00386	0.402	0.0193	0.194	0.299	0.0597	0.786	0.00498	0.373	0.00498	0.000
Control SD	2.371	0.351	0.498	0.362	0.443	0.0621	0.491	0.138	0.396	0.459	0.238	0.411	0.0705	0.485	0.0705	0.000
P-value: Title = Cash	0.00926	0.00688	0.959	0.413	0.871	0.381	0.961	0.0966	0.319	0.695	0.816	0.500	0.946	0.751	0.818	0.140
Estimates: Title + TitleXCash = 0	-0.168	-0.0398	0.0359	-0.00878	0.0551	-0.00265	0.0161	-0.00314	-0.0174	-0.0313	-0.0237	0.0351	-0.000672	-0.00620	0.0208	0.00420
P-value: Title + TitleXCash = 0	0.339	0.188	0.376	0.775	0.131	0.296	0.695	0.812	0.686	0.460	0.296	0.340	0.525	0.891	0.0234	0.388
Estimates: Cash + TitleXCash = 0	0.271	0.0380	0.0337	0.0148	0.0493	-0.000433	0.0180	0.0131	0.0245	-0.0142	-0.0182	0.0105	-0.000718	-0.0211	0.0221	-0.000078
P-value: Cash + TitleXCash = 0	0.103	0.179	0.396	0.586	0.155	0.387	0.634	0.208	0.502	0.747	0.415	0.751	0.387	0.600	0.0607	0.988

Note: OLS regression specifications include village fixed effects. Title and Cash are dummy variables equal to 1 if the household is targeted for the title and cash interventions, respectively, and 0 otherwise. SD stands for standard deviation. Robust standard errors clustered by village are in parentheses, ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Table 11: Value Harvested and Income from Selling Crops

VARIABLES	Primary Season (Jan-Jun, 2022)							Secondary Season (July-December, 2021)						
	Harvest [USD]	Harvest [USD] (winsorize)	Harvest [USD] (IHS)	Sold crop(yes=1)	Crop sale [USD]	Crop sale [USD] (winsorize)	Crop sale [USD] (IHS)	Harvest [USD]	Harvest [USD] (winsorize)	Harvest [USD] (IHS)	Sold crop(yes=1)	Crop sale [USD]	Crop sale [USD] (winsorize)	Crop sale [USD] (IHS)
Title	476.604	35.273	0.056	-0.013	-27.225	18.152	0.093	239.883	-39.018	0.185	0.038	37.794	30.856	0.147
	(495.732)	(84.069)	(0.267)	(0.034)	(124.211)	(82.620)	(0.254)	(421.098)	(71.359)	(0.276)	(0.048)	(82.044)	(50.135)	(0.253)
Cash	1,533.008	261.973**	0.477	0.001	8.899	82.486	0.384	250.319	14.512	0.619**	0.084*	-15.973	3.554	0.539**
	(1,101.418)	(122.202)	(0.295)	(0.037)	(136.794)	(101.860)	(0.277)	(446.491)	(79.417)	(0.288)	(0.050)	(77.838)	(46.894)	(0.258)
Title X Cash	-1,656.258	-202.485	-0.353	0.030	-57.712	-101.589	-0.272	-610.145	40.838	-0.412	-0.102	-48.810	-42.312	-0.350
	(1,127.052)	(151.336)	(0.402)	(0.052)	(168.754)	(130.946)	(0.379)	(593.569)	(103.494)	(0.394)	(0.068)	(105.431)	(66.789)	(0.358)
Observations	1,376	1,376	1,376	1,170	1,376	1,376	1,376	1,376	1,376	1,376	891	1,376	1,376	1,376
R-squared	0.076	0.066	0.093	0.105	0.053	0.069	0.092	0.031	0.078	0.074	0.093	0.065	0.077	0.076
Control Mean	625	560.9	4.344	0.764	575.5	489.7	4.034	517.9	401.7	2.762	0.649	272.6	229.1	2.492
Control SD	1467	916.6	3.454	0.425	1756	1036	3.296	2432	1076	3.462	0.478	1056	630.9	3.159
P-value: Title = Cash	0.201	0.0438	0.134	0.704	0.773	0.520	0.278	0.987	0.419	0.132	0.315	0.532	0.591	0.140
Estimates: Title + TitleXCash = 0	-1180	-167.2	-0.297	0.0165	-84.94	-83.44	-0.179	-370.3	1.820	-0.228	-0.0640	-11.02	-11.46	-0.203
P-value: Title + TitleXCash = 0	0.147	0.148	0.308	0.659	0.444	0.389	0.518	0.456	0.980	0.444	0.186	0.870	0.793	0.456
Estimates: Cash + TitleXCash = 0	-123.3	59.49	0.124	0.0301	-48.81	-19.10	0.112	-359.8	55.35	0.207	-0.0179	-64.78	-38.76	0.189
P-value: Cash + TitleXCash = 0	0.584	0.492	0.644	0.410	0.628	0.812	0.660	0.388	0.394	0.431	0.700	0.378	0.408	0.434

Note: OLS regression specifications include village fixed effects. Title and Cash are dummy variables equal to 1 if the household is targeted for the title and cash interventions, respectively, and 0 otherwise. SD stands for standard deviation. Robust standard errors clustered by village are in parentheses, ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.

Part 4: Treatment Impacts on Women's Empowerment

Table 12: Wife reports to have a say on the following decisions

VARIABLES	Major HH Exp	HH Income	Own Income	Child Edu	Childbearing
Title	0.076**	0.043	0.027	-0.014	-0.028
	(0.031)	(0.030)	(0.029)	(0.026)	(0.025)
Cash	0.077**	0.066**	0.060*	0.012	0.021
	(0.035)	(0.031)	(0.031)	(0.024)	(0.023)
Title X Cash	-0.117**	-0.121***	-0.073*	0.015	0.016
	(0.046)	(0.043)	(0.041)	(0.036)	(0.034)
Observations	1,380	1,380	1,380	1,380	1,380
R-squared	0.074	0.088	0.088	0.084	0.079
Control Mean	0.756	0.782	0.808	0.865	0.894
Control SD	0.430	0.414	0.395	0.342	0.308
P-value: Title = Cash	0.972	0.463	0.254	0.343	0.0381
Estimates: Title + TitleXCash = 0	-0.0409	-0.0776	-0.0461	0.00101	-0.0125
P-value: Title + TitleXCash = 0	0.211	0.0199	0.133	0.969	0.600
Estimates: Cash + TitleXCash = 0	-0.0398	-0.0545	-0.0123	0.0269	0.0372
P-value: Cash + TitleXCash = 0	0.183	0.0757	0.647	0.329	0.146

Note: OLS regression specifications include village fixed effects. Title and Cash are dummy variables equal to 1 if the household is targeted for the title and cash interventions, respectively, and 0 otherwise. SD stands for standard deviation. Robust standard errors clustered by village are in parentheses, ***, **, and * indicate significance at the 1, 5, and 10 percent critical level.