Solar Powered Irrigation Pumps in Nepal's Terai

This draft based on the outline that sent few weeks ago. I followed the variables manshened in it and add some

All numbers calculated here consider the entire sample - including zeros.

There us two variables appear in two different datasets:
'Time to irrigate 1 katha' and 'fuel use for a year', the results from both datasets appear here as well

About the tables:

- Each table is divided into two: The first for 'Saptari' and second for the 3 districts of Rautahat ,Bara and Sarlahi - I called it 'RBS' and colored if for convenience
- I added a brief explanation of the variable if needed
- also added the question from the questionnaire and its serial number
- Some variables needed calculation, so I added the calculation method and the variables included

Land

Table 1: Total Own Land Cultivated - Summer

The total own land cultivated for a houshold in **Summer** season (In hectare)
Q [4.4] *total_ownland_cultivated*

SAPTARI	Control		Treatment	
year	N	Mean	N	Mean
2017	91	0.32	22	0.61
2018	91	0.30	22	0.62
2019	84	0.16	23	0.25

RBS	Control		Treatment	
year	N	Mean	N	Mean
2018	107	0.23	26	0.72
2019	95	0.31	22	1.14

Table 2: Gross Cropped Area

total cultivated area for a year in hectare:

the total area sown for monsoon,winter, summer and annual crops- all together
Q[4.8] *total_land_cultivated*

SAPTARI	Control		Treatment	
year	N	Mean	N	Mean
2017	91	2.53	22	4.08
2018	91	2.50	22	3.88
2019	84	2.11	23	3.02

RBS	Control		Treatment	
year	N	Mean	N	Mean
2018	107	4.04	26	5.33
2019	95	3.66	22	7.07

Table 3: Cropping Intensity

measured by percentage in household level
Gross cropped Area/Net Cropped Area ×100
sum ([4.8] total_land_cultivated) / [4.1e] land_for_cultivation

SAPTARI	Control		Treatment	
year	N	Mean	N	Mean
2017	91	175	22	196
2018	91	168	22	188
2019	84	144	23	152

RBS	Control		Treatment	
year	N	Mean	N	Mean
2018	107	171	26	203
2019	95	177	22	186

Irrigation

Irrigation measured by 3 parameters

- Size of the irrigated area
- Time taken to irrigate cultivated area
- Irrigation intensity

Table 4: Size of the irrigated land

Irrigated area for a household in hectare
Q [4.9] Irrigated area out of total land cultivated

SAPTARI	Control		Treatment	
year	N	Mean	N	Mean
2017	91	2.25	22	3.25
2018	91	1.98	22	3.06
2019	84	1.87	23	2.73

RBS	Control		Treatment	
year	N	Mean	N	Mean
2018	107	2.55	26	3.88
2019	95	3.21	22	5.13

Irrigation in hours

Time taken to irrigate cultivated area - measured by hours in household level

The data about '1 hectare irrigation time' - is from two dataset:

Water extraction mechanism [6.2] and *Agriculture [5.0]*

Table 5: Time taken to irrigate 1 ha

Q [6.21] How long does it take to irrigate 1 katha of land with this pump

SAPTARI	Control		Treatment	
	N	Mean	N	Mean
2017	94	47	22	61
2018	94	46	22	62
2019	92	51	23	89

RBS				
2018	107	24	30	21
2019	100	16	30	32

Table 6 and table 7 are about 2 parameters:

1. Total hr = Total irrigation hours of a farmer
   Multiply *hrs_irr_1katha*[5.7]
   by *no_of_irrigation_for_1_katha*[5.8]
   by *cult_area_under_crop*[5.5]

2. irrigation per ha
   Total hr divide by farmers area size *cult_area_under_crop*

Table 6: Time taken to irrigate - YEARLY

SAPTARI	Control			Treatment		
Year	N	Total hr	irrigation per ha	N	Total hr	irrigation per ha
2017	94	203	87	22	405	116
2018	94	188	81	22	342	102
2019	92	212	110	23	380	192

RBS	Control			Treatment		
Year	N	Total hr	irrigation per ha	N	Total hr	irrigation per ha
2018	107	348	99	26	244	81
2019	95	396	104	21	456	83

Table 7: Time taken to irrigate - SEASONAL

Saptari

	Control			Treatment		
MONSOON	N	Total hr	irrigation per ha	N	Total hr	irrigation per ha
2017	89	73	59	20	137	99
2018	90	53	50	22	109	61
2019	83	92	85	22	189	158

SUMMER	N	Total hr	irrigation per ha	N	Total hr	irrigation per ha
2017	70	58	153	18	140	314
2018	62	66	171	16	118	272
2019	48	45	226	17	87	402

WINTER	N	Total hr	irrigation per ha	N	Total hr	irrigation per ha
2017	88	91	107	22	167	104
2018	87	102	112	22	135	107
2019	81	99	129	22	141	168

Rautahat Bara Sarlah

Season	Year	Control			Treatment		
		N	Total hr	irrigation per ha	N	Total hr	irrigation per ha
Monsoon	2018	105	208	118	25	117	60
	2019	94	253	151	21	316	130
Summer	2018	33	144	171	7	111	98
	2019	38	51	62	11	85	53
Winter	2018	105	81	60	25	54	41
	2019	94	92	55	21	89	47

Irrigation Intensity

Measured by percentage in household level
Gross Irrigated Area/Gross Cropped Area ×100

sum *[4.9] irrigated_out_of_tot_land_cult* / sum *[4.8] total_land_cultivated*

Table 8: Irrigation Intensity - YEARLY

SAPTARI	Control		Treatment	
	N	Mean	N	Mean
2017	91	86.23	22	76.94
2018	91	80.99	22	76.03
2019	83	88.58	23	90.07
RBS				
2018	104	65.23	26	79.27
2019	94	88.75	22	85.07

Table 9: Irrigation Intensity - SEASONAL

SAPTARI	Monsoon		summer		Winter	
	Control	Treatment	Control	Treatment	Control	Treatment
2017	90.87	81.82	79.29	72.16	85.05	76.21
2018	84.28	77.27	75.46	79.84	83.65	76.48
2019	90.08	93.60	89.73	86.91	88.50	86.20
RBS						
2018	71.10	92.75	66.54	90	59.29	63.42
2019	98.39	95.45	63.09	75	83.31	78.57

Frequency of households who irrigate

The table contains -

- The number of households who irrigate
- Percentage of households from their group - **not** from the entire sample

Table 10: households who irrigate

Q [4.9] Irrigated area out of total land cultivated

SAPTARI	Monsoon		Summer		Winter	
	Control	Treatment	Control	Treatment	Control	Treatment
2017	83	18	57	16	81	20
2018	77	17	50	17	79	20
2019	81	22	49	16	78	21

RBS	Monsoon		Summer		Winter	
	Control	Treatment	Control	Treatment	Control	Treatment
2018	98	25	26	9	96	23
2019	95	21	27	9	94	21

Fuel use

The details about 'Total fuels litres for a year' has two datast

From 'Procurement basline' of RBS file I removed two observations with 15,000 and 10,000 liters of fuel per year becouse it was really high compared to the rest

Table 11: Fuel consumed in a Year (In liters)

Q [7.16] Total litres of diesel/kerosene consumed for agriculture pumps in a YEAR

SAPTARI	Control		Treatment	
	N	Mean	N	Mean
2017	94	129.18	22	201.8
2018	94	87.42	22	134.0
2019	92	86.70	23	108.0

RBS				
2018	71	362.14	25	622.08
2019	46	145.87	16	384.69

Table 12: Fuel consumed - Saesons and Year (In liters)

[6.18a] How many liters of fuel per hour **x** *[6.30] How many days in a season was the pump used* **x** *[6.31] How many hours per day*

SAPTARI	Control				Treatment			
	Monsoon	Summer	Winter	Yearly	Monsoon	Summer	Winter	Yearly
2017	49	30	26	96	36	42	50	116
2018	42	19	29	75	100	79	11	184
2019	45	29	68	98	82	48	52	182

RBS								
2018	107	149	239	339	171	180	229	507
2019	67	99	50	108	119	292	124	458

Frequency of households who use fuel

The table contains -

- The number of households who irrigate
- Percentage of households from their group - **not** from the entire sample

Table 13: households who consumed fuel

Q [7.12] Did you buy fuel for the pump

SAPTARI

Year	Control	Treatment
2017	48	8
2018	48	7
2019	32	4

RSB

Year	Control	Treatment
2018	63	25
2019	46	16

Aquaculture

also here I removed from 'Lands_I_basline' of RBS files - 3 observations with 300 to 400 ponds land size becouse it was really high compared to the rest

Table 14: Total ponds area used for aquaculture (In ha)

Q [4.1c] Land for aquaculture,ponds

SAPTARI	Control		Treatment	
	N	Mean	N	Mean
2017	13	0.43	12	0.39
2018	14	0.47	12	0.39
2019	17	0.51	15	0.40

RBS	Control		Treatment	
year	N	Mean	N	Mean
2018	21	0.63	15	1.57
2019	16	0.65	17	1.62

VEGETABLES	Control		Treatment	
year	N	Mean	N	Mean
2017	70	0.29	17	0.36
2018	71	0.32	19	0.39
2019	56	0.16	17	0.45

OILSEEDS	Control		Treatment	
year	N	Mean	N	Mean
2017	43	0.20	14	0.44
2018	42	0.21	11	0.48
2019	24	0.49	6	0.59

Cereals	year	Control	Treatment
Maize	2017	0.11	0.19
	2018	0.20	0.15
	2019	0.18	0.28
Paddy	2017	1.36	2.05
	2018	1.31	1.99
	2019	1.16	1.67
Wheat	2017	0.73	1.07
	2018	0.72	0.86
	2019	0.64	0.96

Table 15: Cropping Pattern - Saptari

Table 16: Annual income per ha (NPR in thousands) Saptari

year	Control	Treatment
2017	16.78	22.87
2018	15.63	21.42
2019	24.15	24.69

RBS

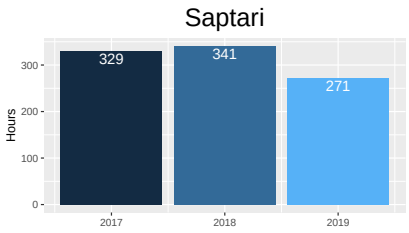
year	Control	Treatment
2018	115.91	1823.94
2019	235.51	121.03

Avg.Irrigation hours 6.2

Daily Monitoring Excel	Survey Section 6.2	Survey Section 5
	Water Extraction Mechanisms	Land

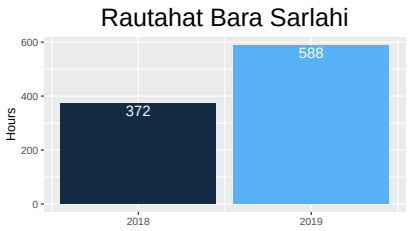
Irrigation hours YEAR

saptari



Irrigation hours YEAR

Rautahat Bara Sarlahi



Irrigation days YEAR

saptari

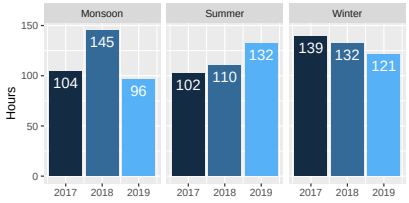
Irrigation days YEAR Rautahat Bara Sarlahi

Primary pump use YEAR saptari

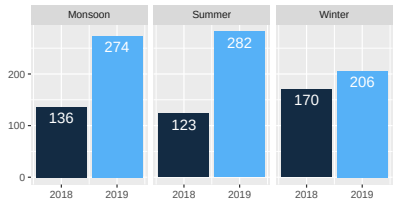
Primary pump use YEAR Rautahat Bara Sarlahi

By seasons

Irrigation hours season saptari



Irrigation hours season Rautahat Bara Sarlahi



Irrigation days season saptari

Irrigation days season Rautahat Bara Sarlahi

Daily Monitoring Excel	Survey Section 6.2	Survey Section 4.9
	Water Extraction Mechanisms	Agriculture

Irrigated land YEAR saptari

Irrigated land YEAR Rautahat Bara Sarlahi

Daly monitoring timeline

X-axis - daily with season marking

1. **Number of hours of irrigating daily**

2. **The number of farmers who watered each day**