Catalyzing Solar irrigation market in Chakhaji

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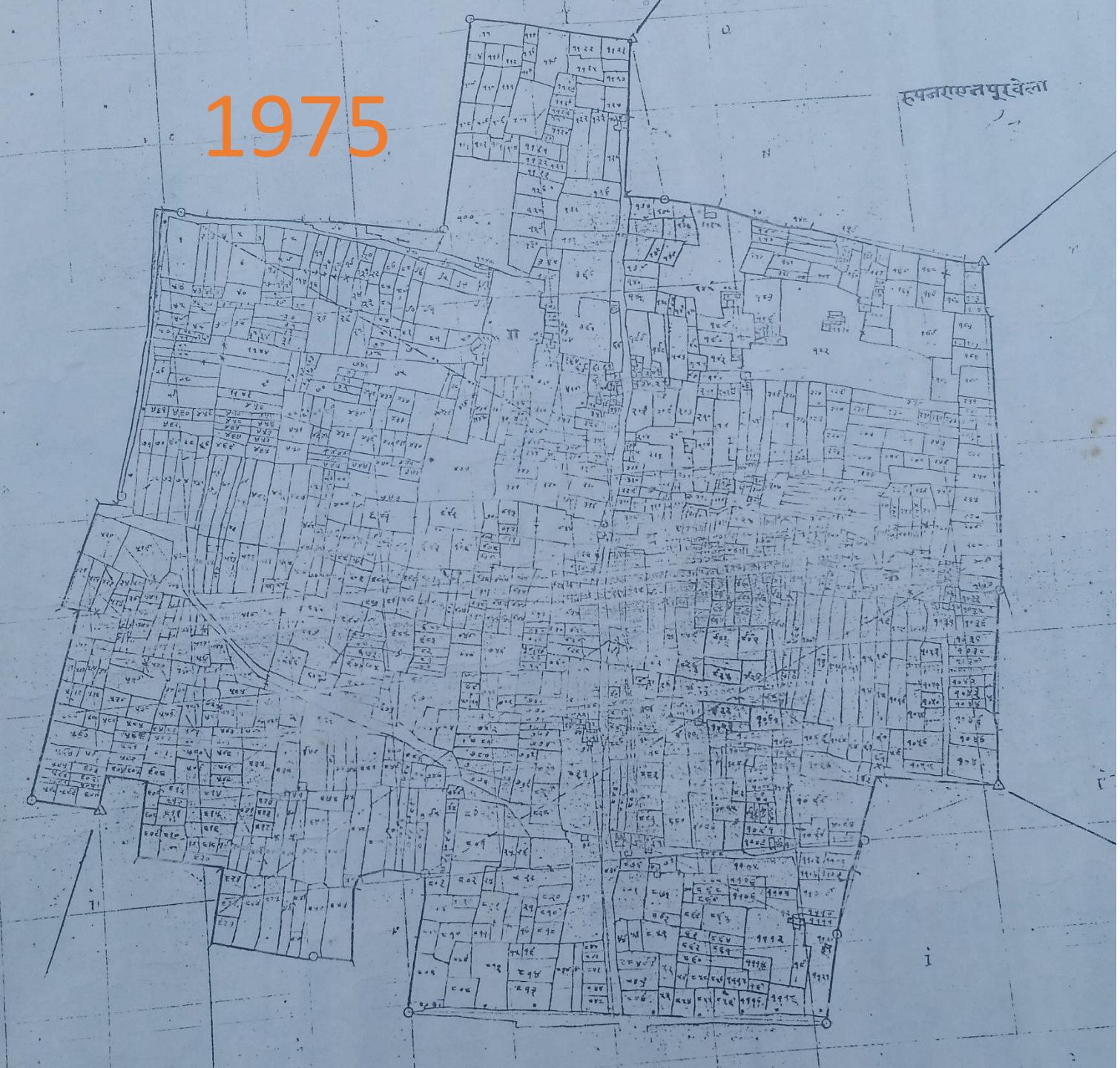


- Extreme fragmentation of small farm holdings is the defining feature of Bihar agriculture
- Poor electricity infrastructure
- Emergence of diesel irrigation market

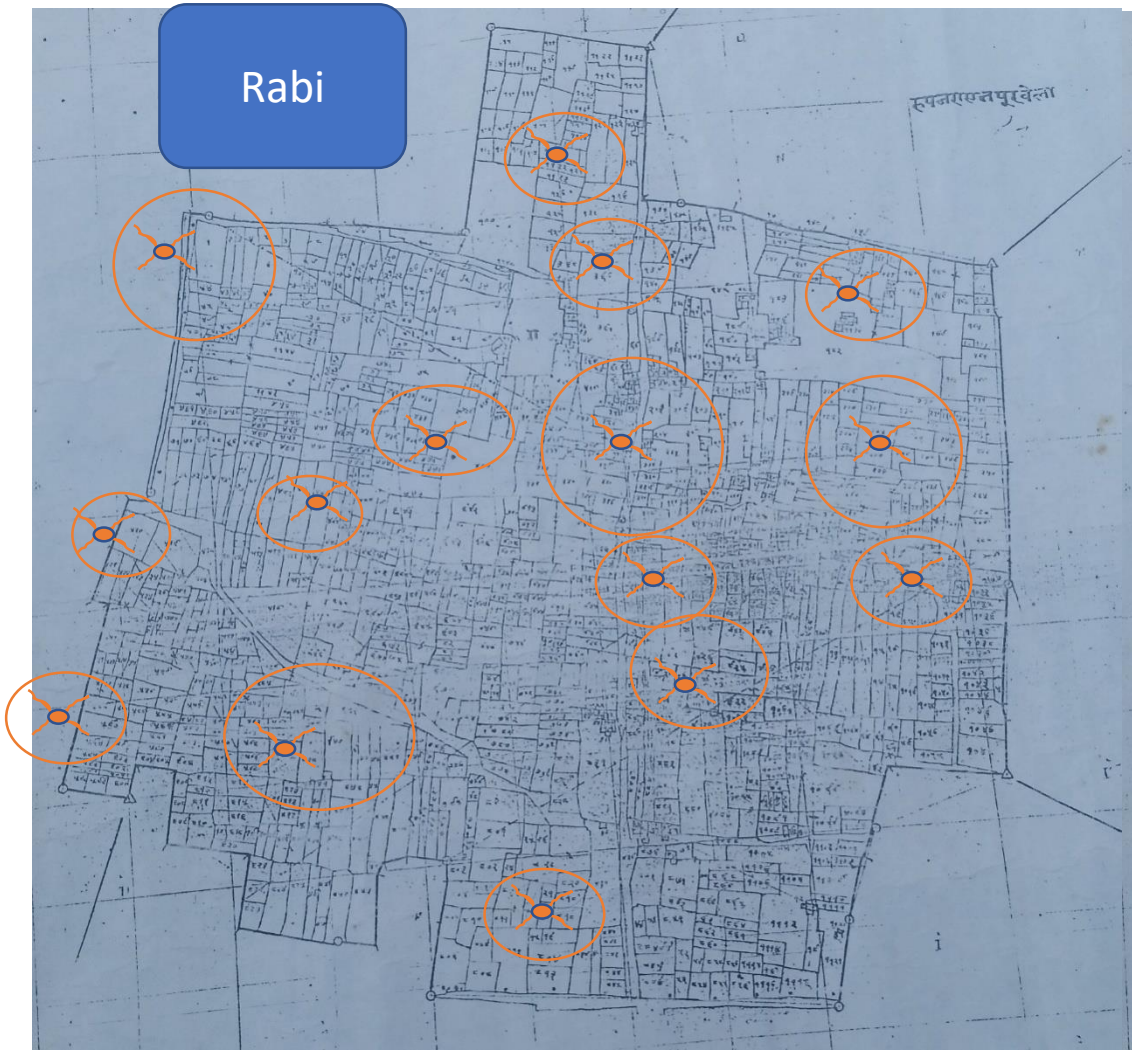
Diesel irrigation is neither effective nor affordable.

IWMI-CCAFS Bihar Solar Pilot

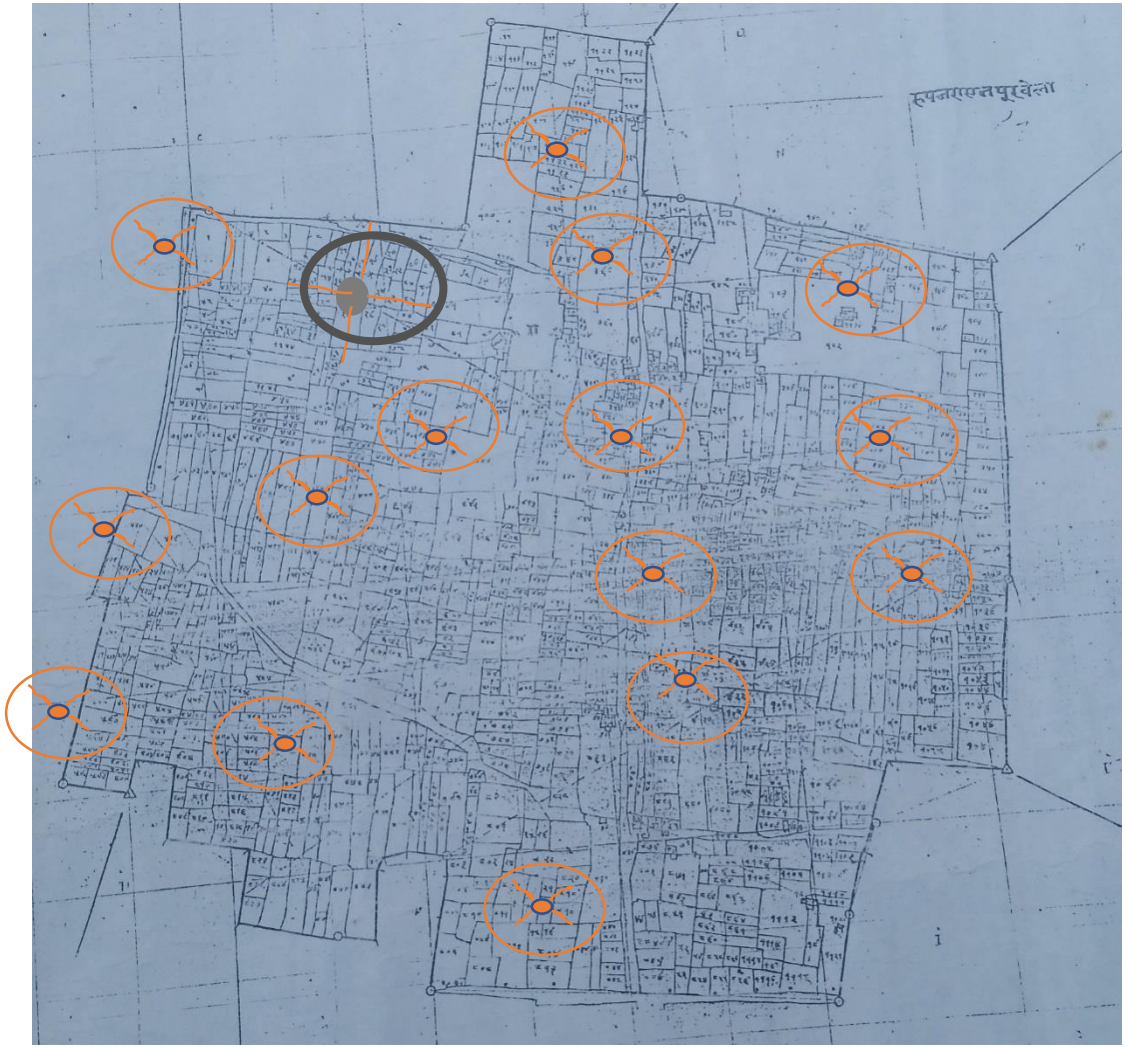
- Bihar Govt's solar pump program: Sprink
  2-3 HP solar pumps for technology dem
- Objective of IWMI-CCAFS-AKRSP Pilot
  pumps can transform monopolistic wa
  competitive, equitable ones.

Desired Outcome: Compelling Evidence for Bihar Govt. to redesign Solar Pump Program for larger, deeper livelihood impacts, CC adaptation and mitigation.

Chakhaji, Samastipur, Bihar
320 cultivators,160 acres, 2300 plots



Bihar Govt's BREDA's Solar Pump Program



2-3 hp solar pumps using delivery pipes

1-2 per village

Minimum 1 acre farm size

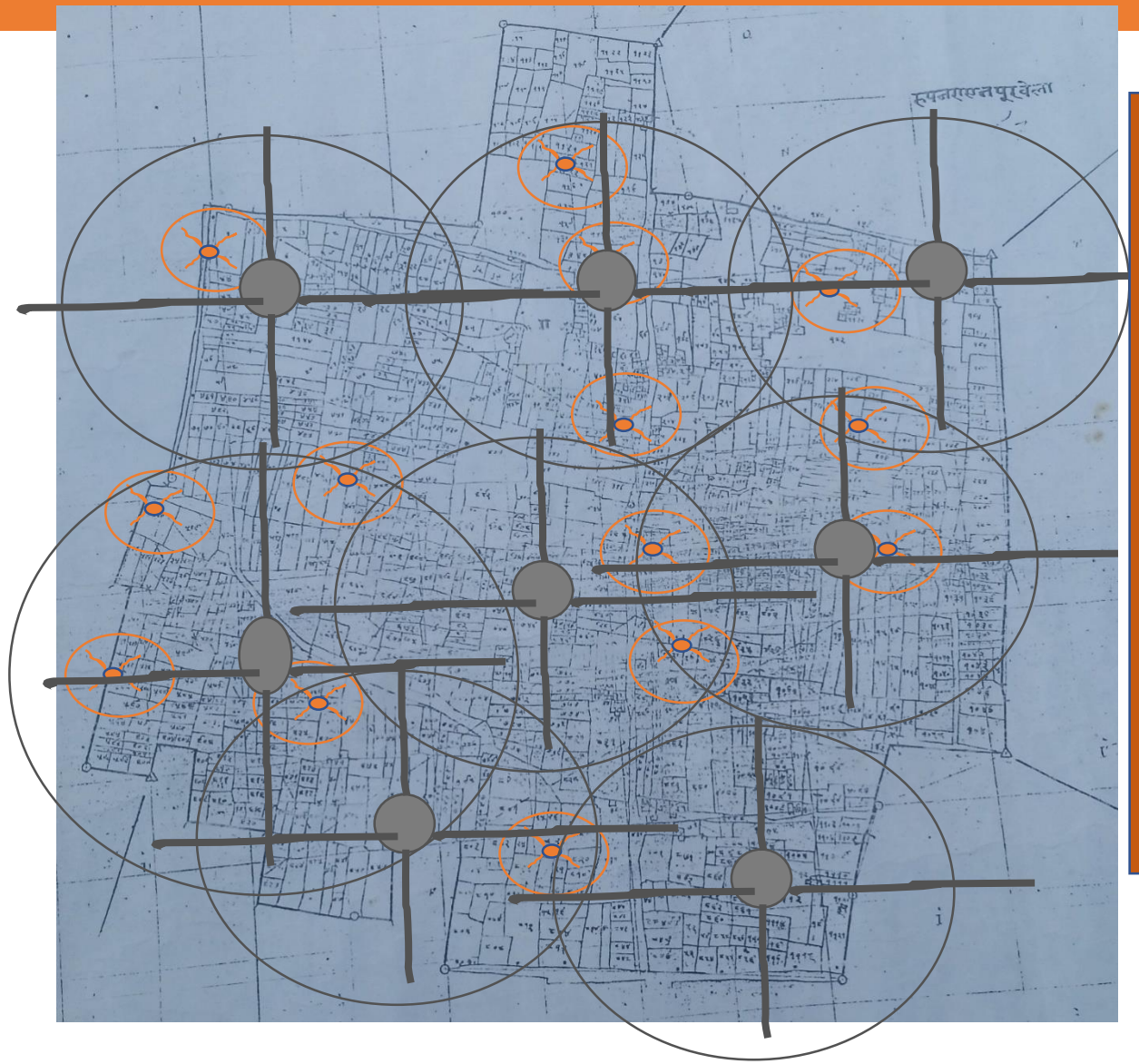
Large farmers for own irrigation

High Cost of maintenance support

Solar as stand-by pump

No impact on water market

solar pump owner as Irrigation Service Providing Entrepreneur

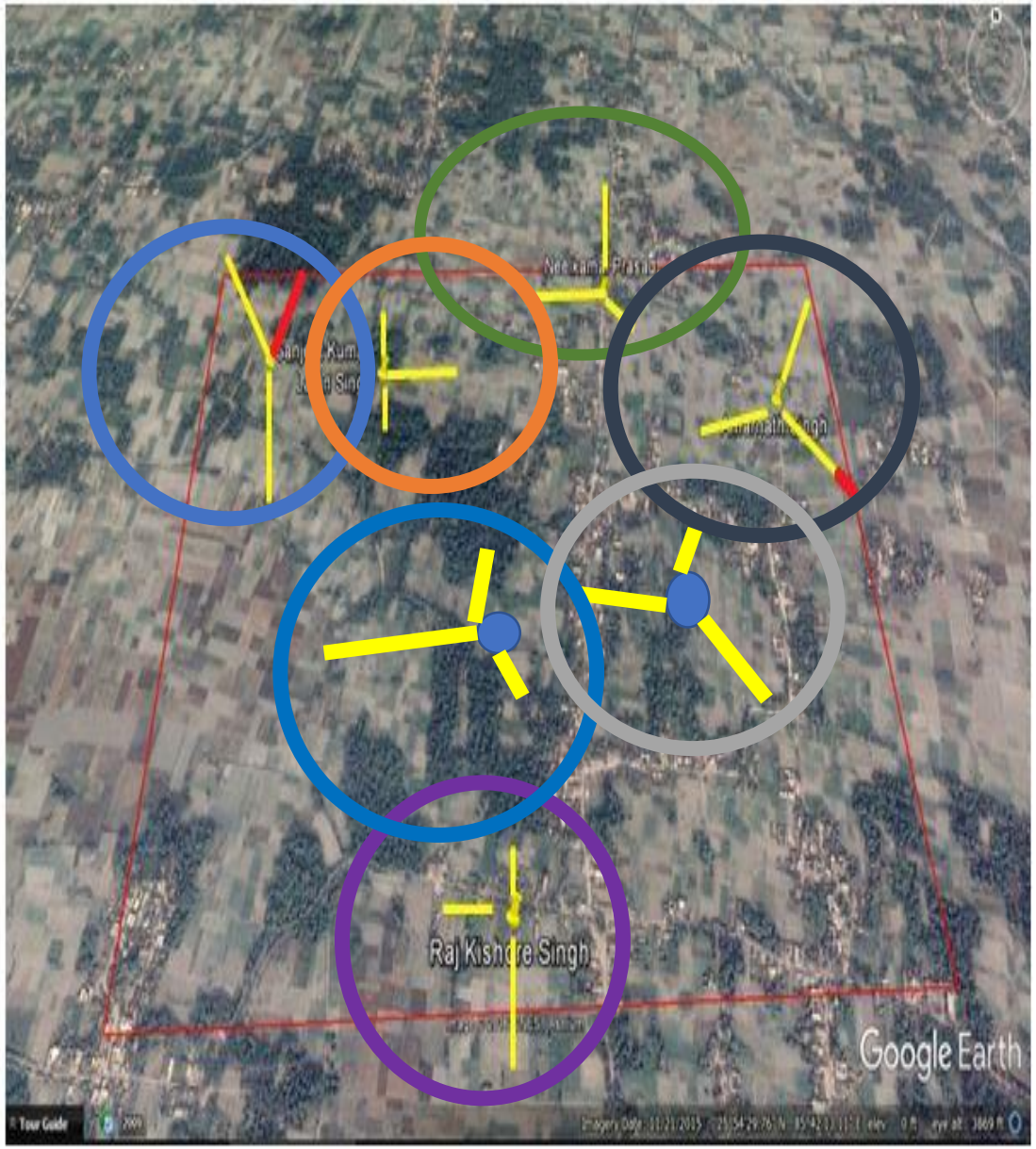


Hypotheses:

1. Irrigation expands;
2. Diesel pumps crowded out
3. Water market turnover grows 3-4 fold;
4. Water prices fall to 40-50%
5. SISP's lose from lower prices but gain by larger volume;
6. Land use intensity increases;
7. Chakhaji's Agri. GDP doubles.
8. Each solar pump creates a full-time job

Solar Irrigation Service Model..

- Replacing diesel pumps with large solar pumps (5HP)
- Invest in buried pipeline for water distribution
- Overlapping command area to encourage competitive irrigation market
- Farmers contributes 40% of total investment in four annual instalments



Midline study

- To understand and systematically map the irrigation operations, utilization factors of solar entrepreneurs as well as of diesel-based irrigation service providers

Parameters

Number of farmers and area served, pump operation, % of irrigation sold

To understand and quantify the impact of S-ISP introduction on the agrarian system and agricultural GDP of Chakhaji village

Parameters for Assessing the impact

Crop productivity, Cost Of irrigation, Gross value Of Output, Land Area under Cultivation, No Of Irrigations per crop, Cropping Intensity

Tools Used

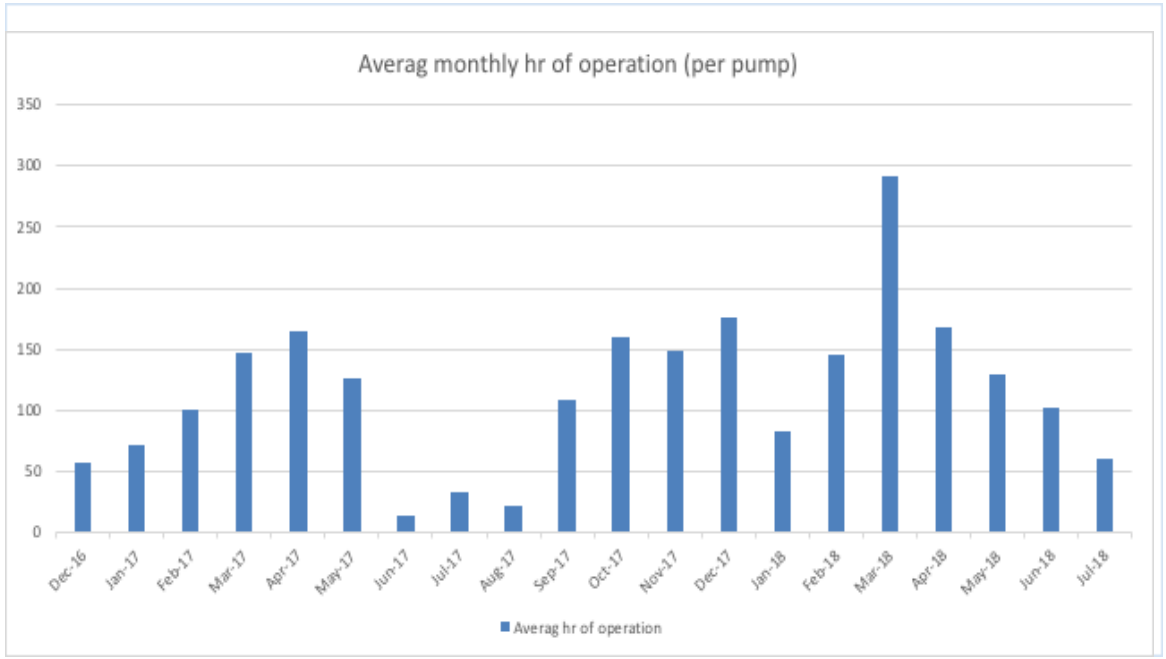
- Survey Questionnaire
- FGDs
- Semi Structured Interviews
- Daily data of irrigation operation

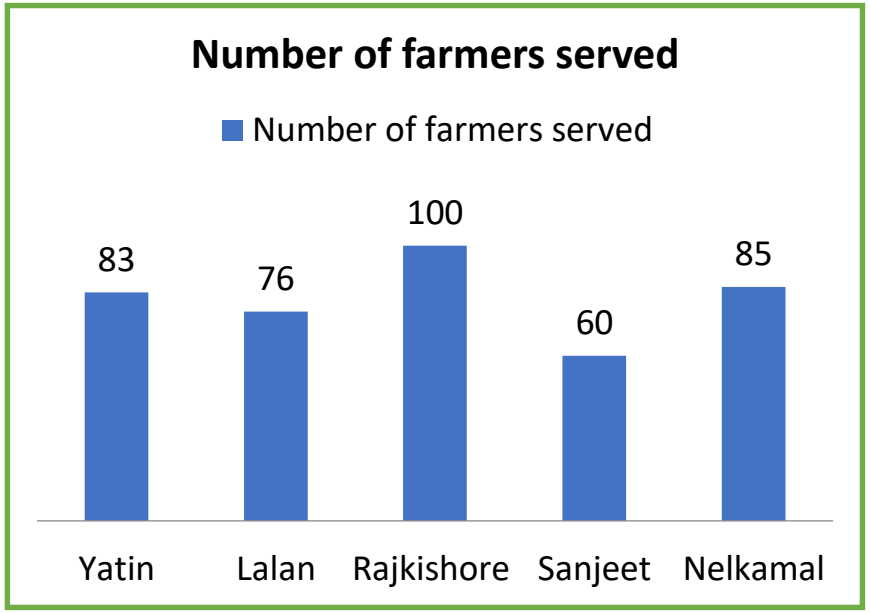
Sampling Methodology

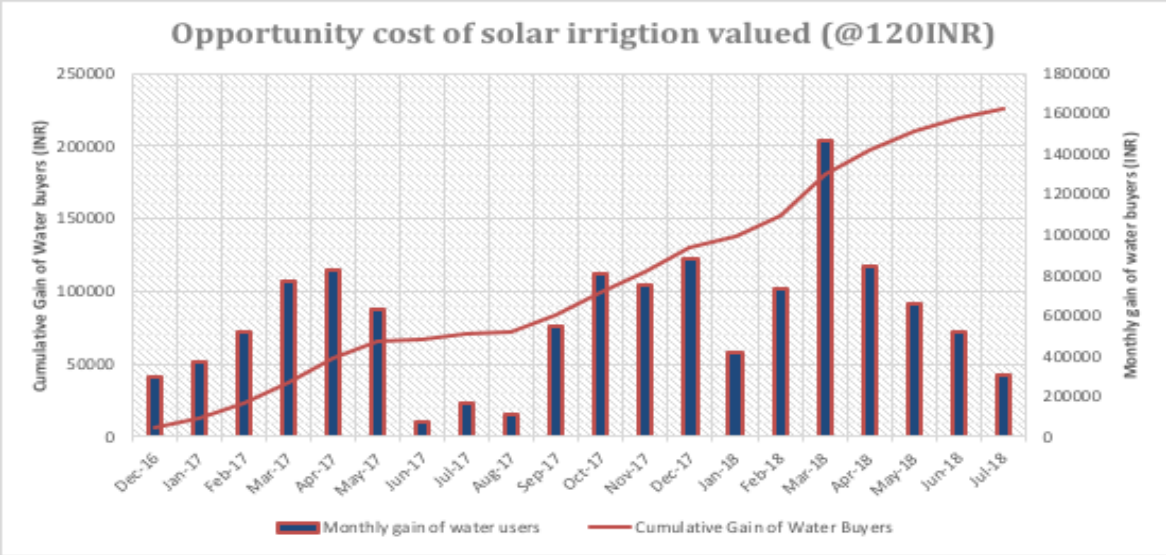
Sampling Details			
Chakhaji (79)		Chandoli (40)	
Water buyers	Water sellers	Water buyers	Water sellers
68	11	26	14
Sampled Area		35% of Total Solar irrigated area.	

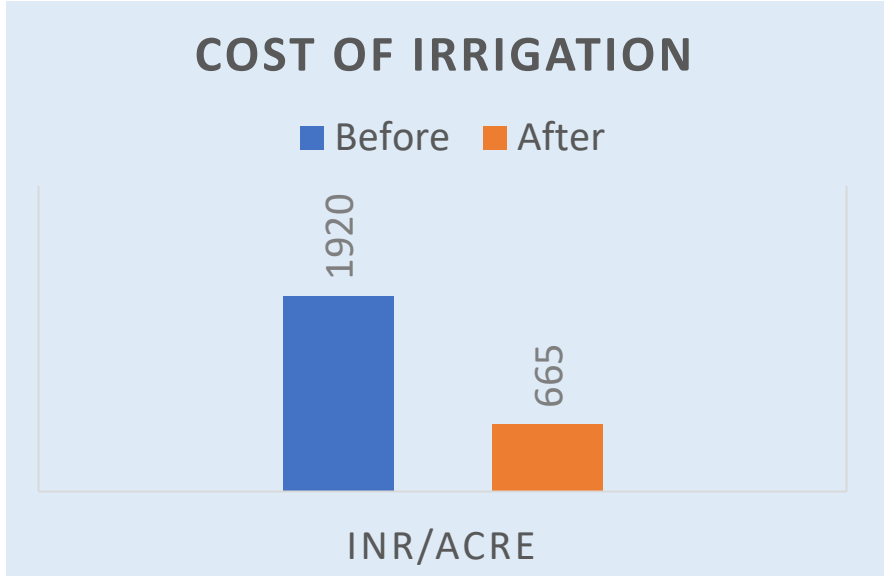
Cluster Sampling

Reduction in Cost of irrigation….

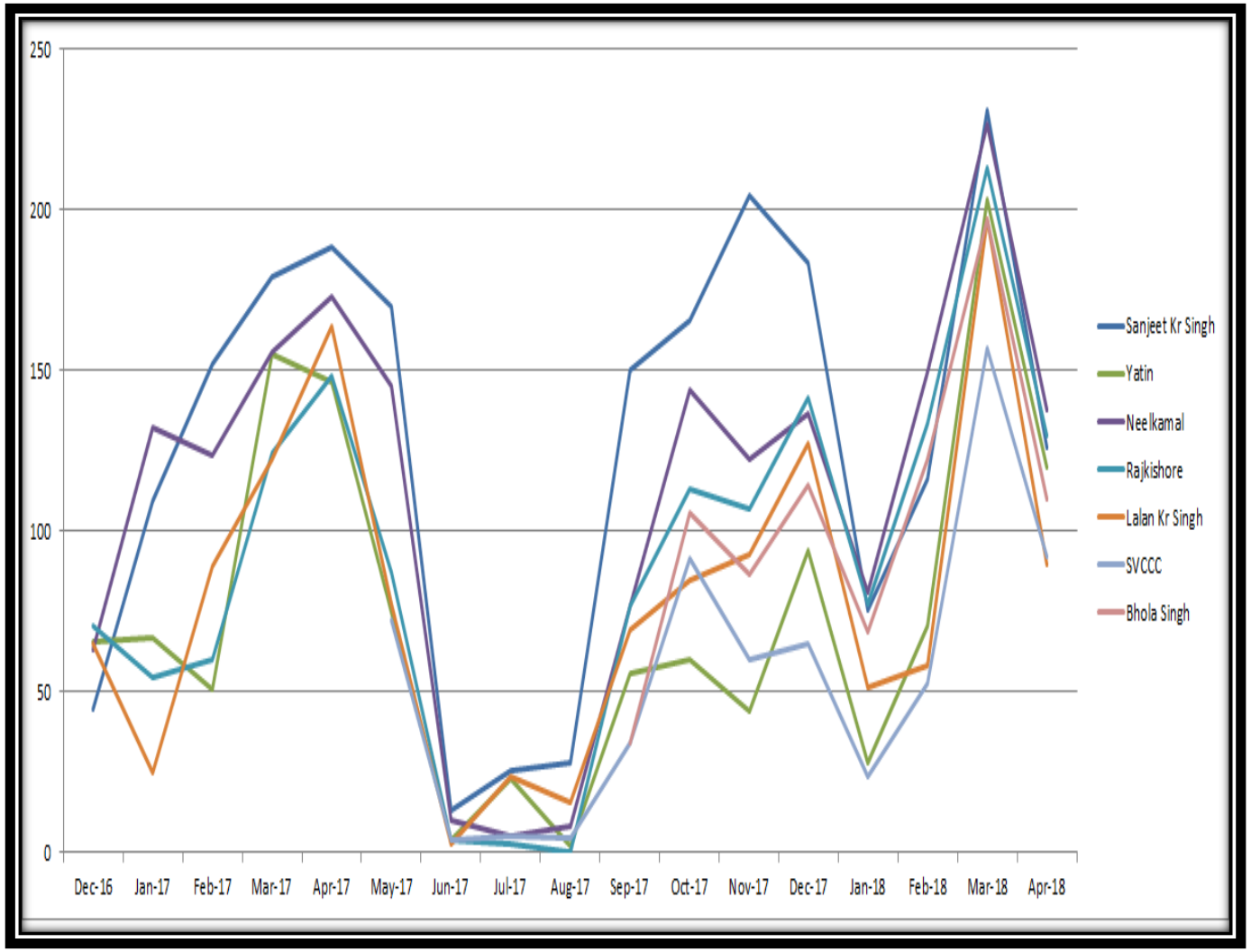


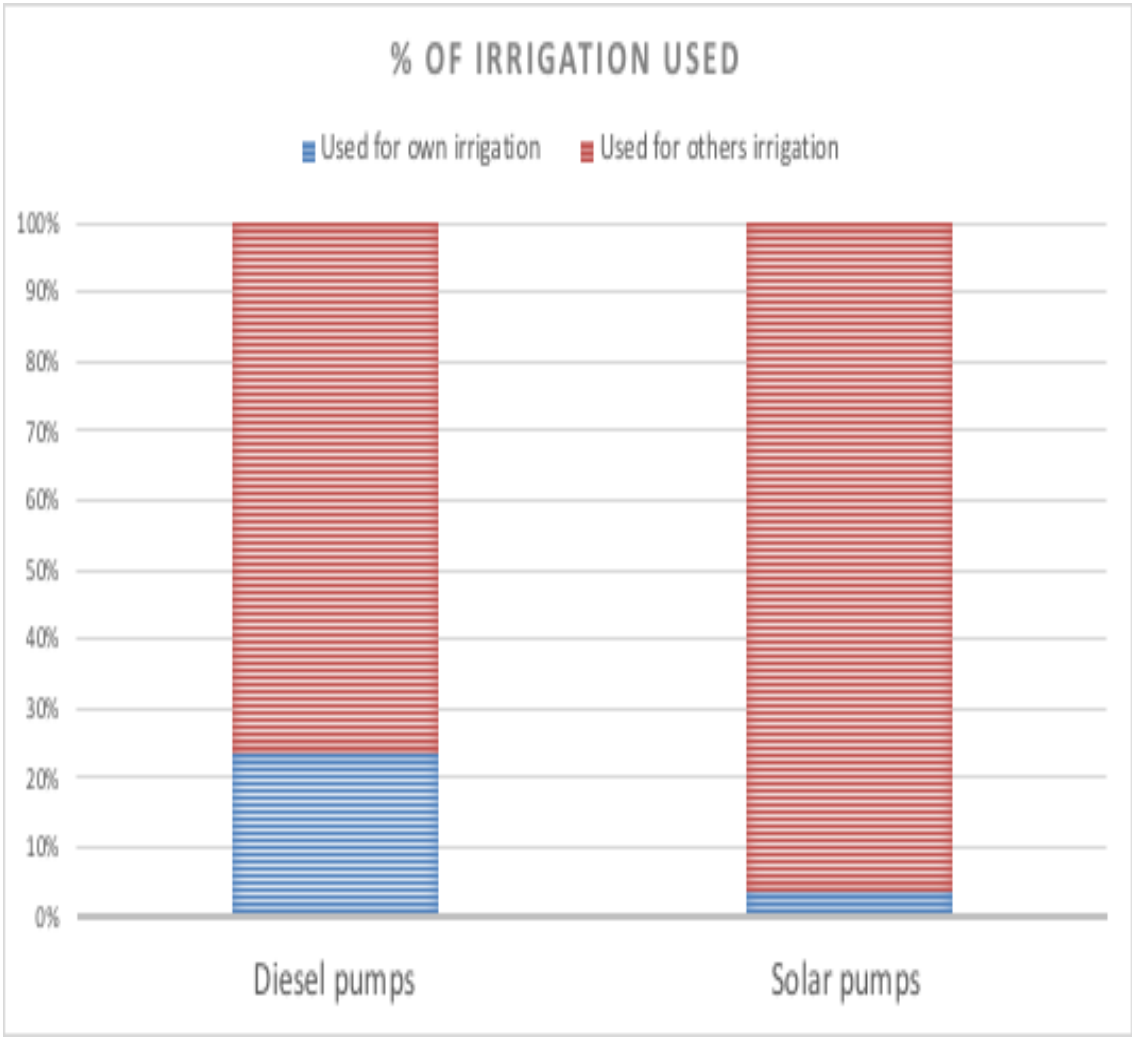




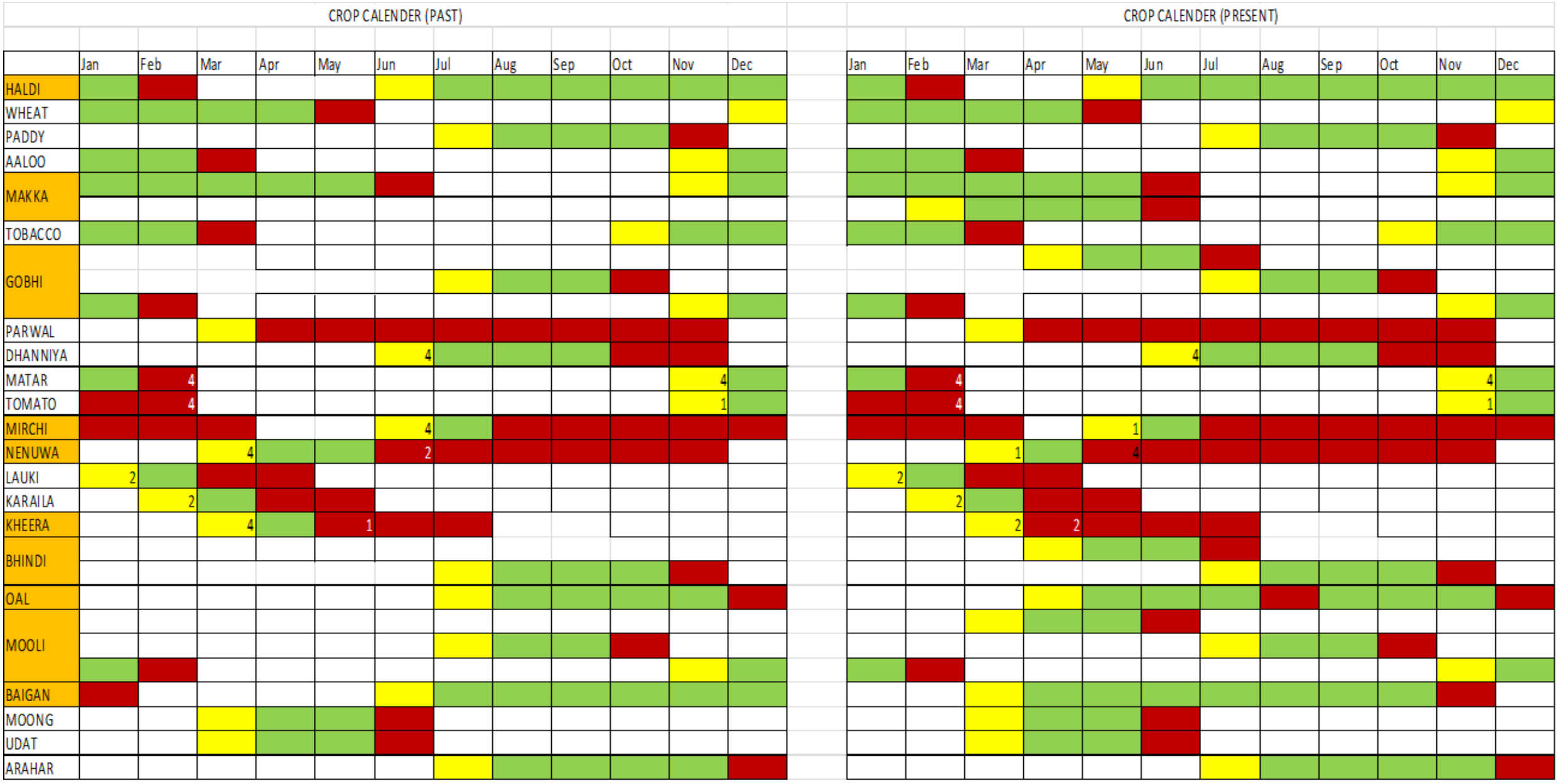


Asset Utilization

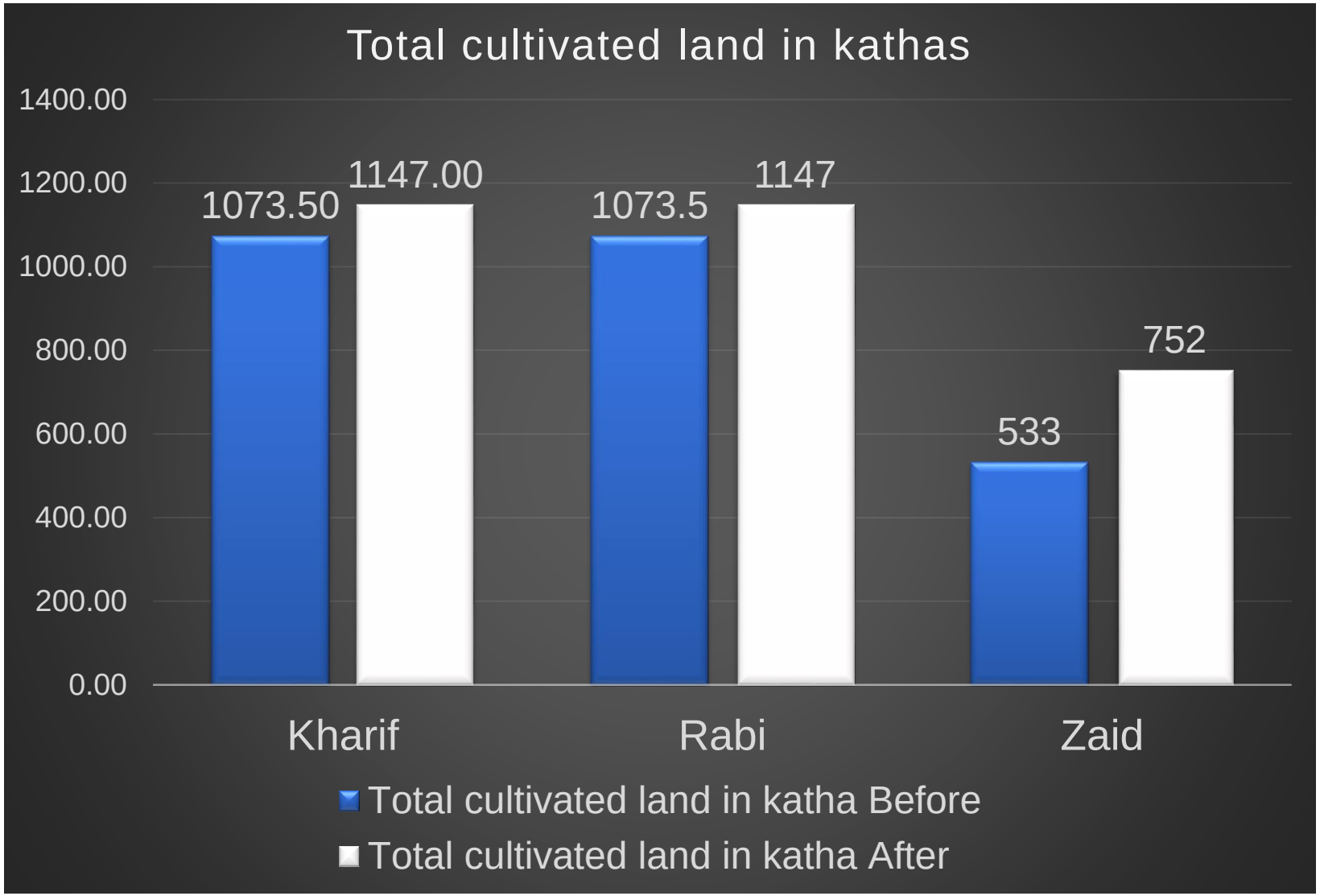




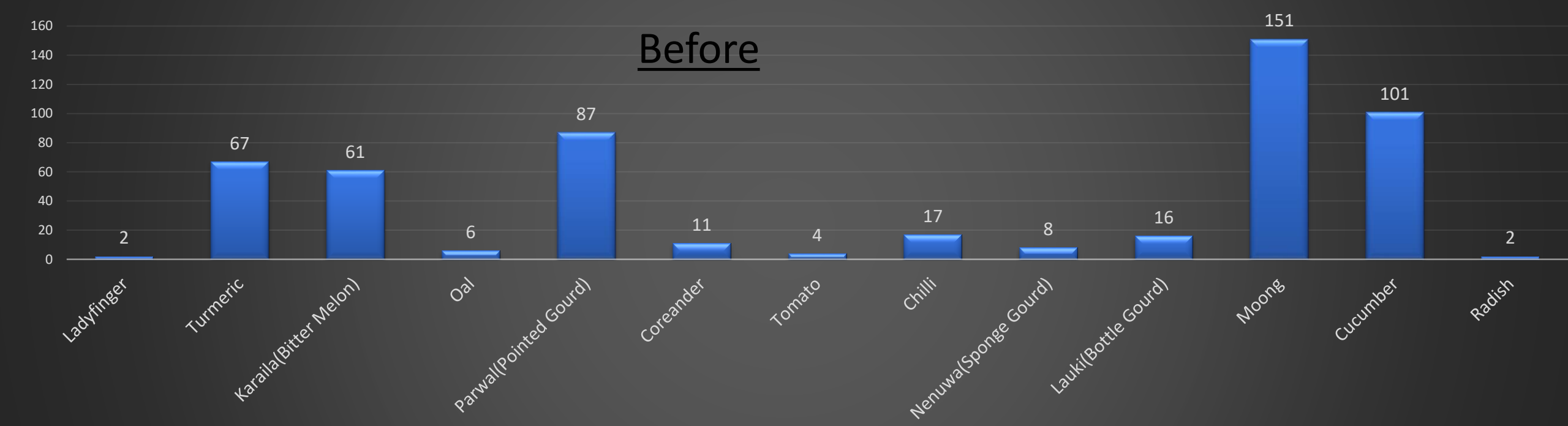
Crop Calendar

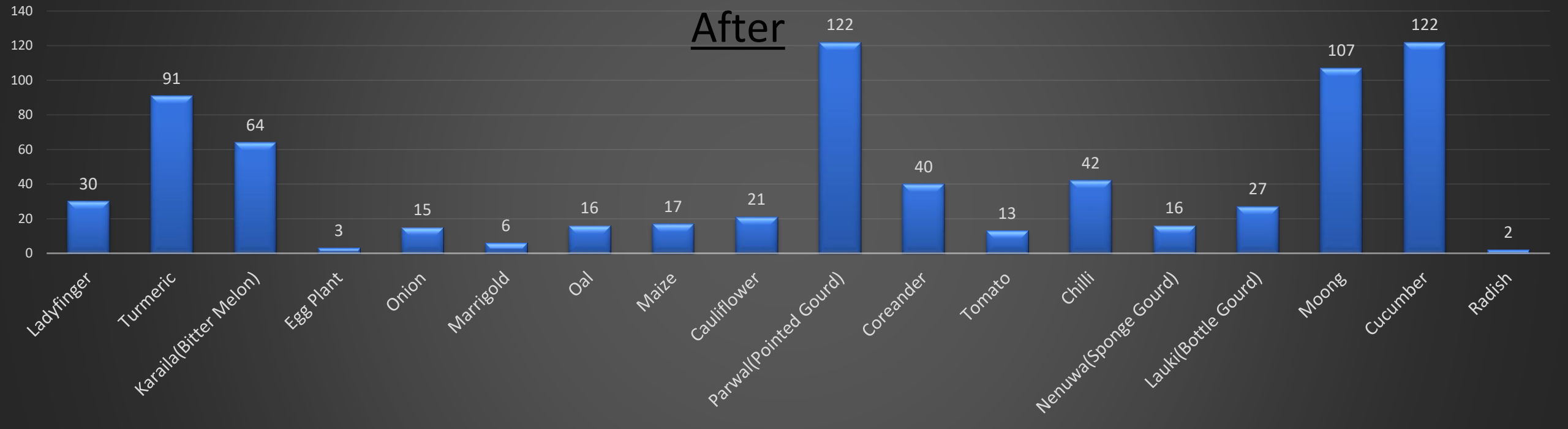


Cropping intensity

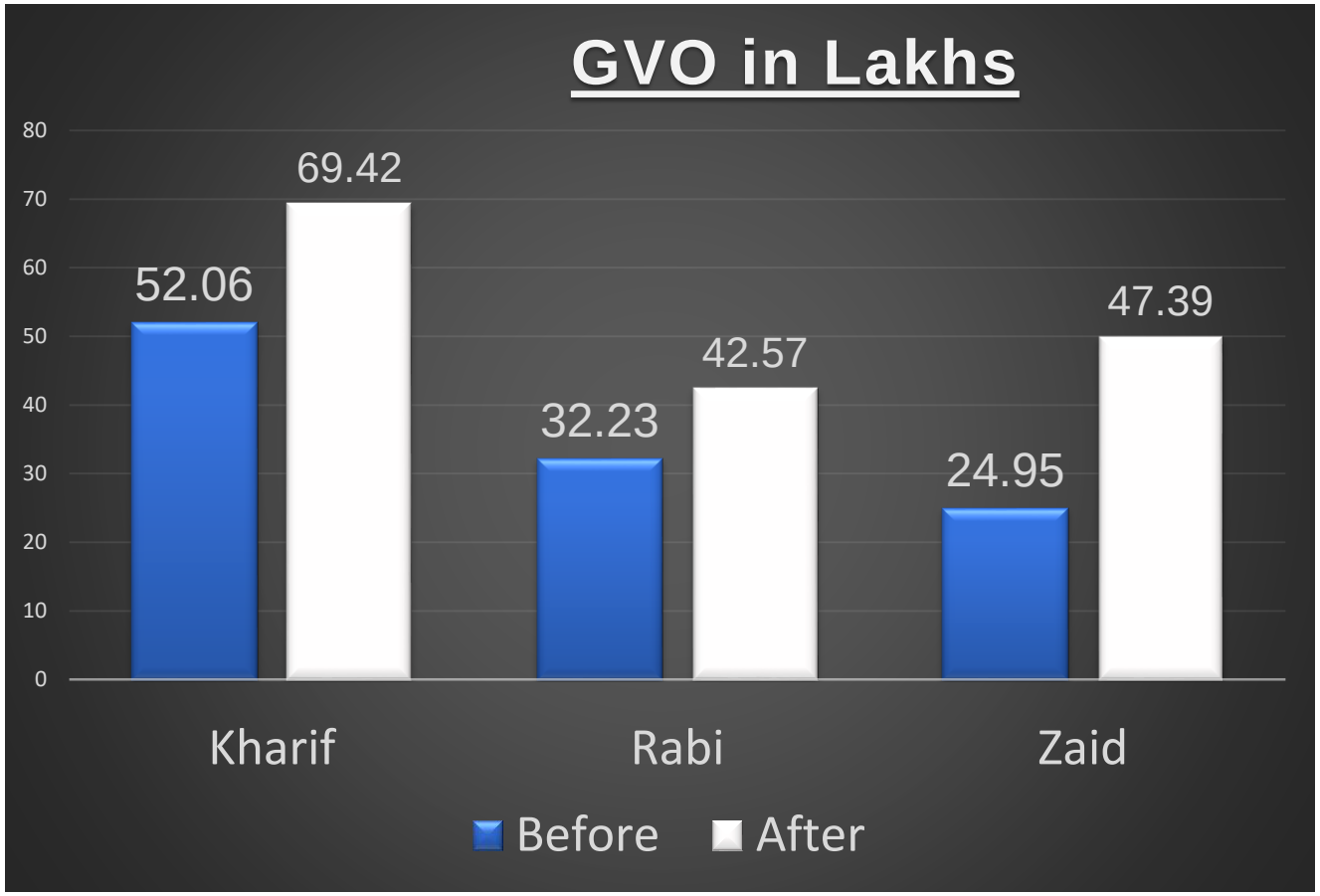


- Vegetable crops are increasing in all the seasons
- Significant rise in summer crop
- Long duration crops are replacing short duration low value crops


Before
160
140
120
100
80
60
40
20
0
2
67
61
6
87
11
4
17
8
16
151
101
2
Ladyfinger
Turmeric
Karaila(Bitter Melon)
Oal
Parwal(Pointed Gourd)
Coreander
Tomato
Chilli
Nenuwa(Sponge Gourd)
Lauki(Bottle Gourd)
Moong
Cucumber
Radish


After
140
120
100
80
60
40
20
0
30
91
64
3
15
6
16
17
21
122
40
13
42
16
27
107
122
2
Ladyfinger
Turmeric
Karaila(Bitter Melon)
Egg Plant
Onion
Marrigold
Oal
Maize
Cauliflower
Parwal(Pointed Gourd)
Coreander
Tomato
Chilli
Nenuwa(Sponge Gourd)
Lauki(Bottle Gourd)
Moong
Cucumber
Radish

Gross Value Of Output



- There is significant increase in crop yield due to timely irrigation
- Gross value of output is almost doubled in summer season.

Policy conclusion…

- Shift from “pump promotion” to “irrigation expansion”
- Catalyze solar irrigation market by promoting higher size pump
- Underground pipeline should be linked with the solar promotion
- ISPs should invest 50% of capital investment

- Equitable irrigation market; cost of irrigation reduced, buyers get more share of pump utilization and shift towards credit payment
- Create grant + loan product with 50% capital subsidy
- Underground buried pipeline can help maximizing asset utilization

THANK YOU

Comparative analysis of Solar pumps

Bore depth	70	300	300
time to irrigate a katha (Summer)	90	45	20
Daily operation in Summer (water output is good)	5	6.5	8
Farmer served	self	40	80-100
Area covered (acres)	1	10	25
Charge (per hr)		100	100
Sellers gain		100	100
Buyers gain (per Katha)		45	93
Timeliness	no	yes	yes
Reliable	no	yes	yes
Adequacy	no	yes	yes
Annual pump run (Hr)		800	1100
Design	Owner centric	Seller centric	Buyers centric
% of water sold		70 to 80%	90 to 95%
Earning for the seller		64000	88000
Saving for water buyers		36000	102300