

# PoCRA

## IIT Bombay's analysis

17<sup>th</sup> May 2017

# PoCRA – Main objectives

- On-farm climate resilience through [component A]
  - Improved water availability and water use efficiency
  - Improved soil health
  - Improved agricultural practices
- Beyond-farm-gate climate resilience [component B]
  - Shift towards climate resilient crops/commodities, crop diversification
  - Improved supply-chains and value-chains, seed supply-demand
  - FPCs as agent of change
- Strengthening knowledge and policy framework for climate resilience [component C]
  - Strengthening state institutions, review and formulation of GoM strategy and policy on climate resilience
  - Strengthen local private sector capacity (entrepreneurship and SMEs)

# Intervention framework

## ➤ Component A

- Participatory Mini-watershed Plans
- Tech. Transfer at farm level + “blue water”+JSA
- Soil management

## ➤ Component B

- Promoting FPC
- Strengthening value-chains
- Improving seeds

## ➤ Component C

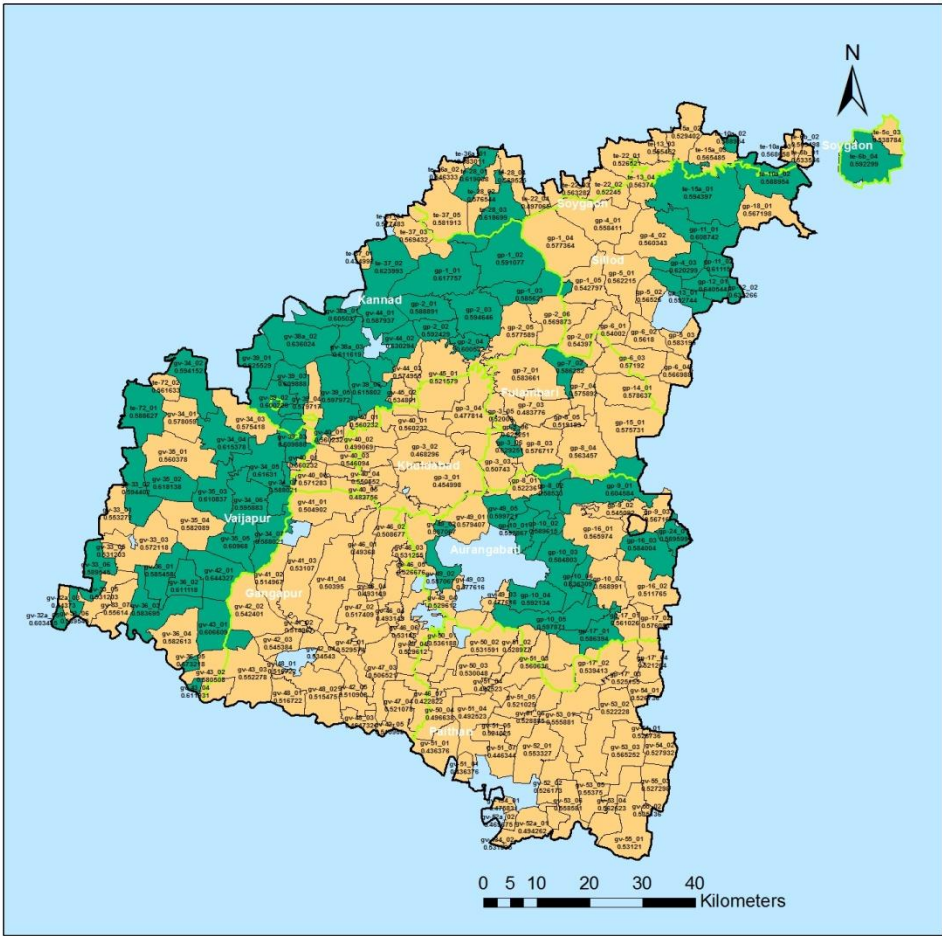
- Institutional Capacity-SDAO and other agencies
- CIC private partnership development
- Knowledge and Practice

# Relevant research at IIT Bombay

- Building GIS platform [component D]
- ICT for agriculture [component B]
- Post harvest issues and linkages with water [component B]
- Seasonal and regional water budgets [component A]
- Spatial differences in water availability and soils within village [component A]
- Changes in SOPs of some key state departments [component C]

# 1. GISE @ CSE IITB

## AURANGABAD DISTRICT INDEX MAP



MAHARASHTRA STATE

NANAJI DESHMUKH KRUSHI SANJIVANI PRAKALP  
(PROJECT ON CLIMATE RESILIENT AGRICULTURE IN MAHARASHTRA)

**Legend**

Range

- Most Vulnerable Clusters - 487 Villages
- Rest of the Clusters
- Aurangabad District Taluka Boundary

UTM.WGS 84.ZONE 43N

In the collaboration with  
ICTA&I, IIT Bombay

2017

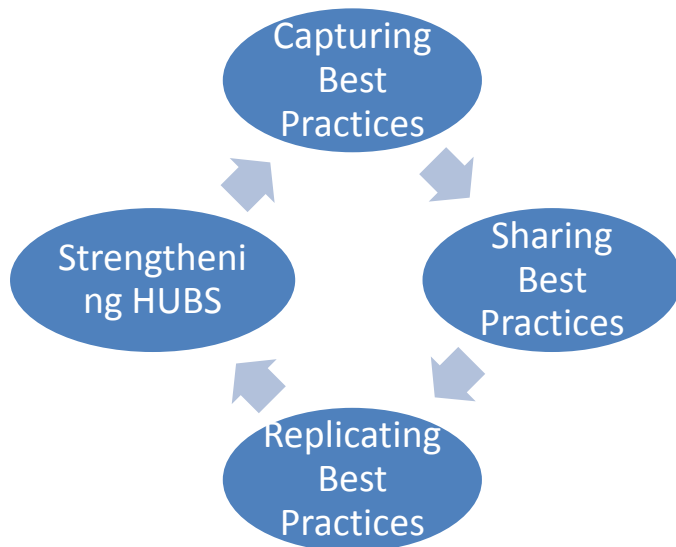


*Building GIS platform for  
Cluster identification for PoCRA districts*

## 2. ICT focused for Agriculture

### Business Chain Development

- ATMA, Pune
  - Organic Farming Hub creation
  - Documenting best practices
  - Information dissemination within the farmer group
  - Peer to peer knowledge transfer



### Extension Services

- Biogas Plant scheme implementation thorough ICT
  - Process documentation
  - Training through ICT
  - Successful implementation
- Scheme Pravah
  - In-house use of ICT for processing scheme applications
  - Designed with people
  - Fastening delivery of scheme

# 2. ICT focused for Agriculture – contd.

## Business Chain Development

- Rubrics : stakeholder Aalysis

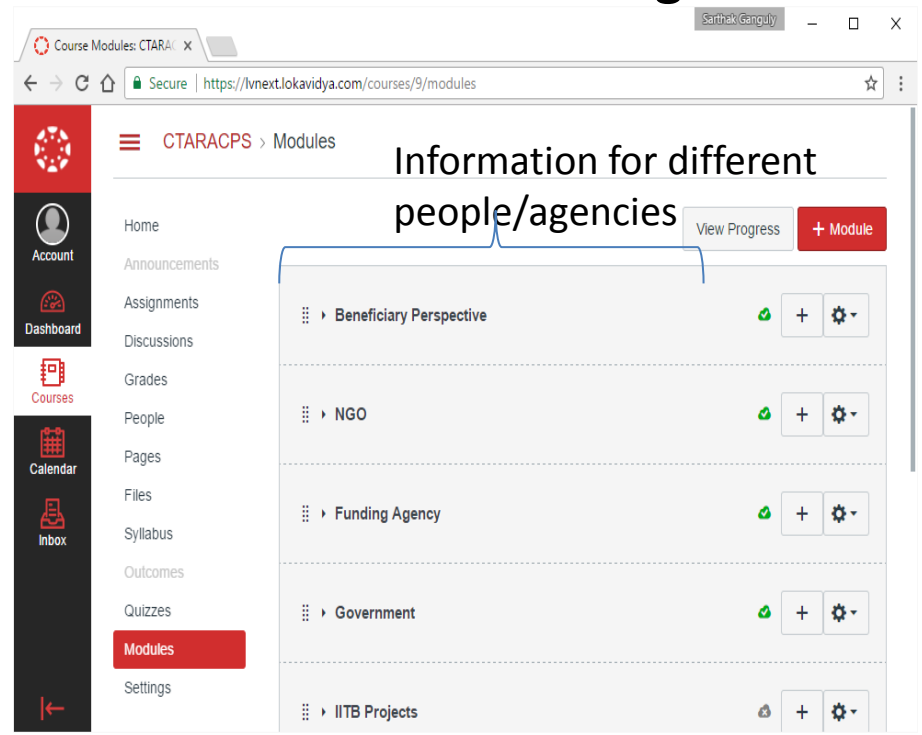
Use of ICT by FPOs in various supply chain operations				
<b>Use of ICT for Good Agriculture Practices</b>	Not aware of any advisory system	Aware of few programs on (Phone/Radio/T V/App) but do not follow regularly	Follows a certain program regularly but never asked any query	Participate in these programs and refer to videos and apps for more information
	Are you aware of/use any agrj- advisory system/ App (Kisao, call centre, Radio, DD Kisao, app, website etc)	-Do you follow that regularly? -What type of help do you get from these systems? -How many messages do you get in a day and how many you read?	Have you raised a query? How many times? Did you get reply? Was it useful?	(Same question follows)
<b>Tools/Methods used to increase the customer base</b>	Never used any media (only through word of mouth)	Uses only media like newspapers, pamphlets etc. but not regularly	Uses social media as well but not on regular basis	Regularly uses certain platforms like newspapers, pamphlets, WhatsApp, and other social media for publicity
	Have you ever publicized your FPO by some media? Do you use that platform regularly? Since when are you using, and how much increase in % of customers by using that platform?			

- AGRI HUB: hands-on centers near villages
  - Exhibition
  - Hands-on sessions
  - Appropriate choice

## Extension Services

- IMD Pune – IVR system
  - One way communication delivers less
  - Feedback system from farmers
  - **Two way communication**

## LV Next: decision making



Some observations in detail –  
*by various research scholars*



# 1. Post harvest issues – Market fluctuations

- Wide variations in prices across season – proxy to post-processing, value addition, storage facilities
- Wide fluctuations in prices on a given day – proxy to quality and quantity of inputs
- Imperfections in market access – big arbitrage

Crop	Survey data	APMC published data			
	farmer survey 2015: avg rate received (Rs/Q) for those who sold	Average modal wholesale market rate in sinnar or Nashik APMC for year 2015-16 in Rs/Q	Std dev of modal price distribution for year 2015	Mean of daily price spread (Max rate - min rate)	Mean price spread as % of mean price (Quality aspect)
Rabi Jowar	1450	1822	8%	51	3%
Harbhara	4000	4289	9%	707	16%
Bajra	1500	1526	6%	251.9	17%
Wheat	1700	1666	12%	240	14%
Soyabean	3200	3662	4%	267.3	7%
Maize	1192	1442	4%	56	4%
Methi Kothmir	No rate by weigh	1560	48%	873.7	56%
Onion	840	1708	71%	1910.6	112%
Kharif Tomato	1043	1220	50%	899.7	74%
Pomegranate	5269	2889	64%	3286.1	114%
Grapes	2700	3644	50%	1909.2	52%

# Hierarchy of crops

Crop	Survey data	Secondary data	Survey data	Secondary data	Survey result		
	Survey data: Average of Input cost/acre for year 2015-16	2013-14 CoC Rs/acre for Maharashtra (source: DES)	Survey average Q/acre yield (2015-16)	State avg yield 2013-14 Q/acre	Survey result: Output value per acre	Survey result: Profitability per acre (Output- input) Rs/acre	Survey result: Output/ Input ratio
Rabi Jowar	4,859	8,324	4.2	2.7	35,778.78	9,453	3
Harbhara	4,250	9,532	1.2	2.5	5,018.13	768	1
Bajra	4,606	12,195	2.4	3.9	12,071.00	7,465	3
Wheat	7,325	12,109	7.6	5.5	12,661.60	5,337	2
Soyabean	8,656	11,150	6.8	2.6	23,956.25	15,300	3
Maize	11,367	NA	11.3	12.1	24,033.67	12,667	2
Methi Kothmir	10,409	NA	Not by weight	NA	48,823.08	38,414	5
Kharif Onion	29,304	33,638	50.8	50.1	49,372.00	20,068	2
Rabi Onion	33,587		60.2		65,680.00	32,093	2
Kharif Tomato	61,024	NA	148.3	NA	147,053.24	86,029	2
Pomegranate	98,846	NA	73.4	NA	394,262.82	295,417	4
Grapes	125,000	NA	168.0	NA	501,500.00	376,500	4

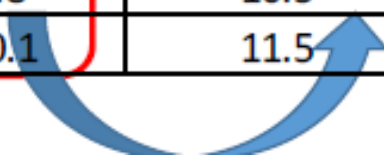
As we go down, *in general, average*

- Input cost/acre increases
- yield and output per acre increases
- profitability per acre increases

# Differences across villages, access to and cost of water

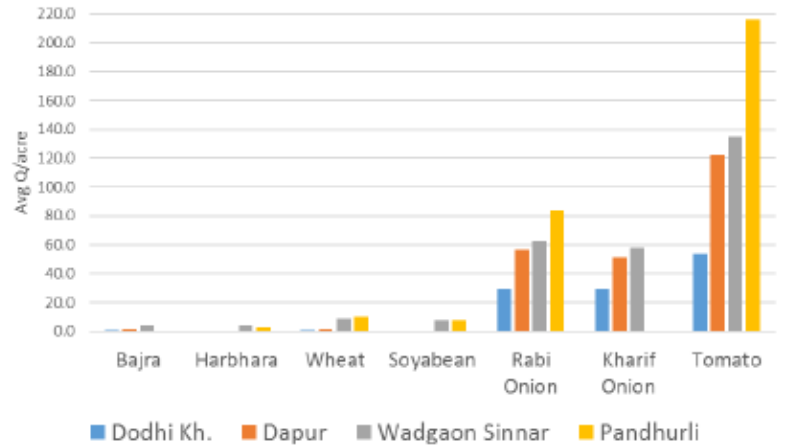
Village	Average # wells per farmer	Average pumping Horsepower per farmer	% farmers with horizontal bores in wells	Avg Months of water availability in well for irrigation	Avg Months of water availability for irrigation from all sources
Wadgaon Sinnar	1.6	5.3	50%	9.1	9.6
Dodhi Kh.	1.4	3.7	44%	6.9	7.2
Dapur	1.1	6.7	39%	9.7 *	9.8
Pandhurli	1.2	5.2	33%	9.8	10.5
Other 5 villages	2.3	9.5	59%	10.1	11.5

Increased Cost of water



# Returns increase as assuredness of water increases

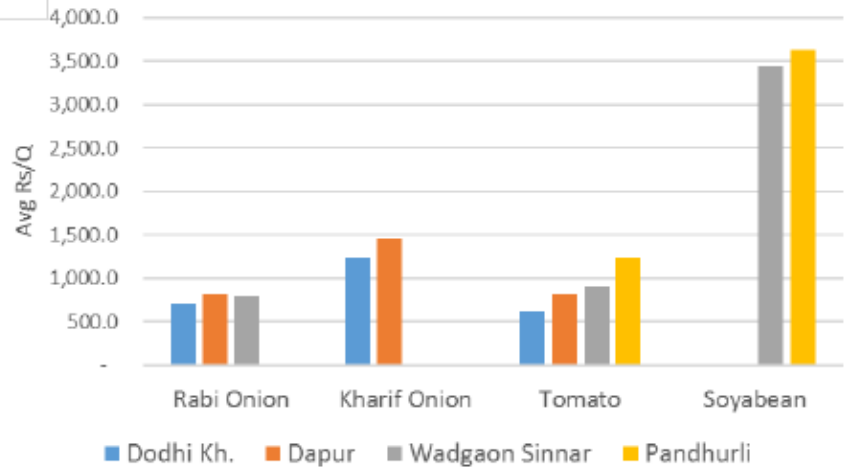
Comparison of yields for different crops: 2015-16



- Water scarce Dodhi has lowest yield for all crops
- Pandhurli has highest yields

- Dodhi farmers fetched lowest market rates
- Pandhurli farmers have highest rates

Avg Market Rate Received (Rs/Q): 2015-16

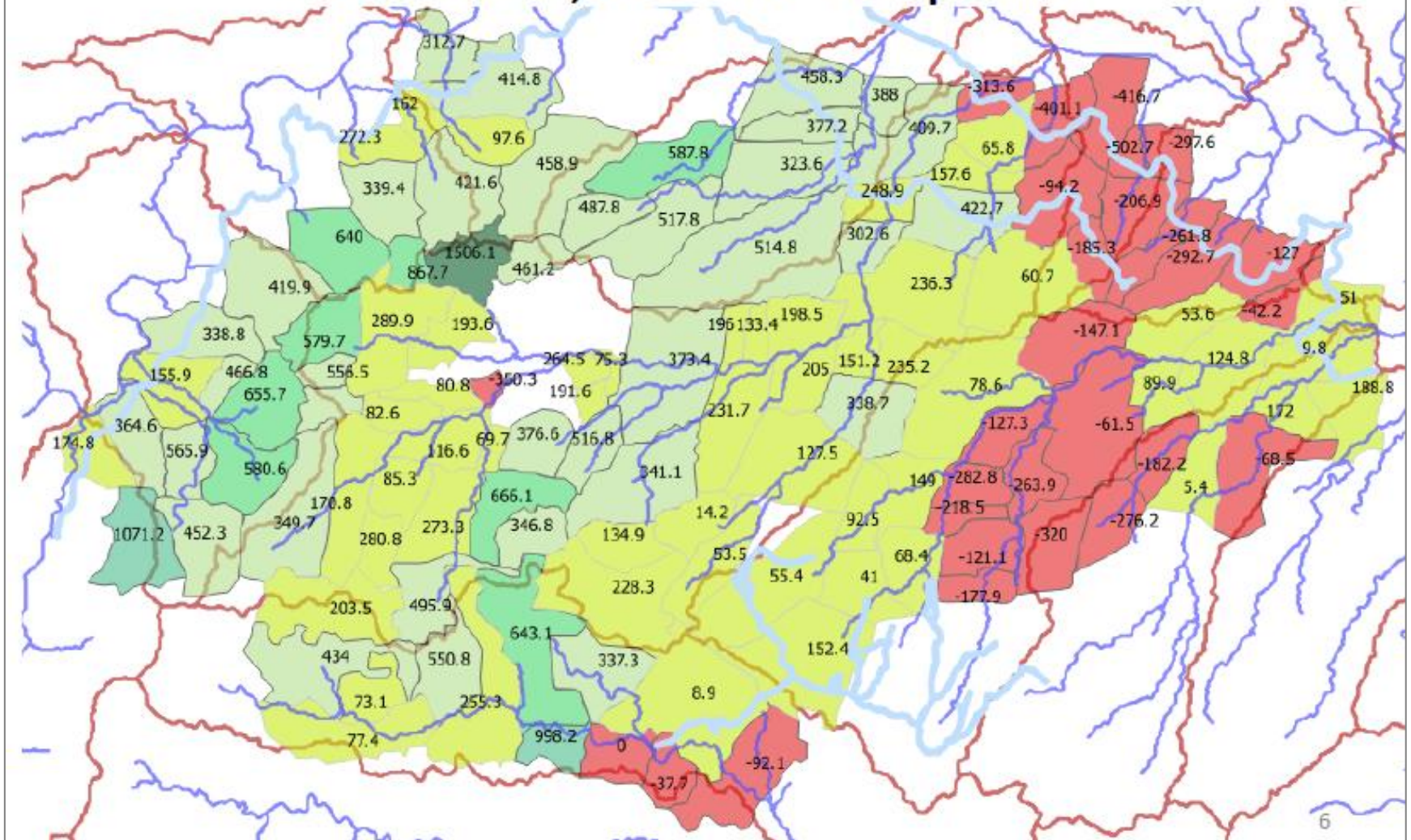


Uncertainty in water availability → increased cost of water → shift towards high-value crops → high yields?? → high returns??  
**→ HIGH RISK**

## 2. Water budgets

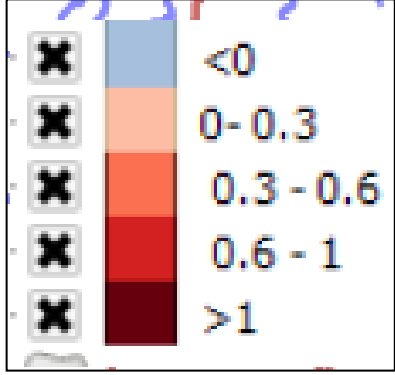
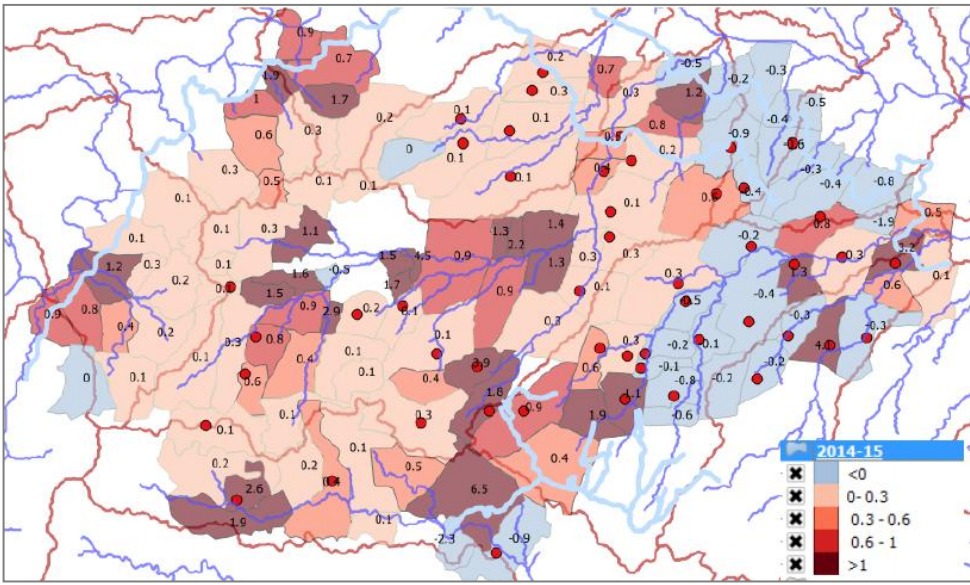
- ***Demand side at village level*** – cropping patterns, farmer surveys and interactions, formats for estimation of seasonal and crop-wise groundwater extraction etc.
- ***Supply side*** – rainfall, estimation of runoff, groundwater movements and surface allocations (local, small and medium), farm-ponds, existing water harvesting structures
- Outputs – Village level water balance and ***community*** cropping pattern, sustainable extraction
- **Drinking water security – ignored**

# 2014-15 Water mm left for Rabi after orchards, Kharif crop use

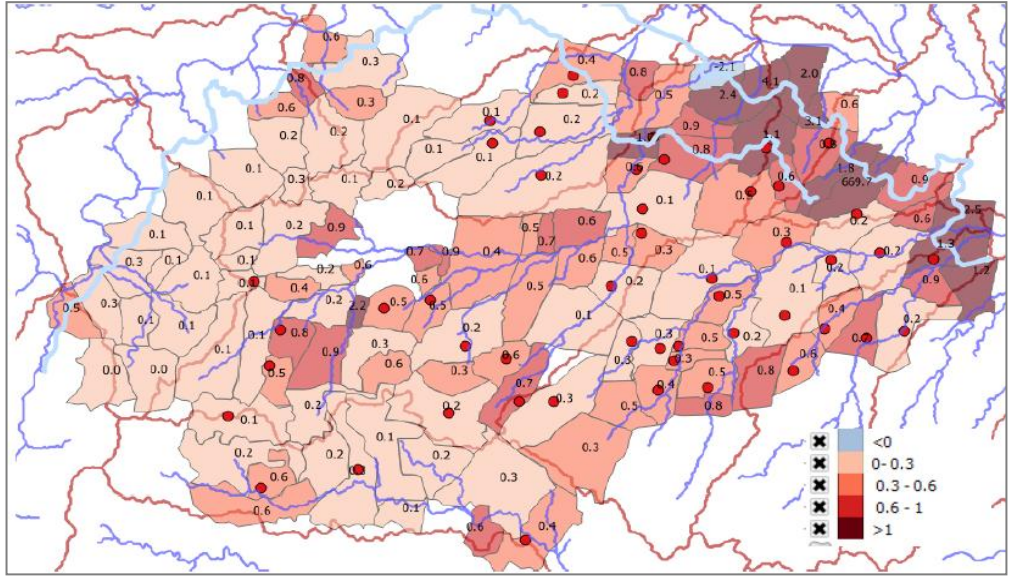


Sinnar taluka, Nashik district (ref – crop sowing reports, rainfall data)

# Ratio of rabi water used to rabi water available



2014-15 bad year



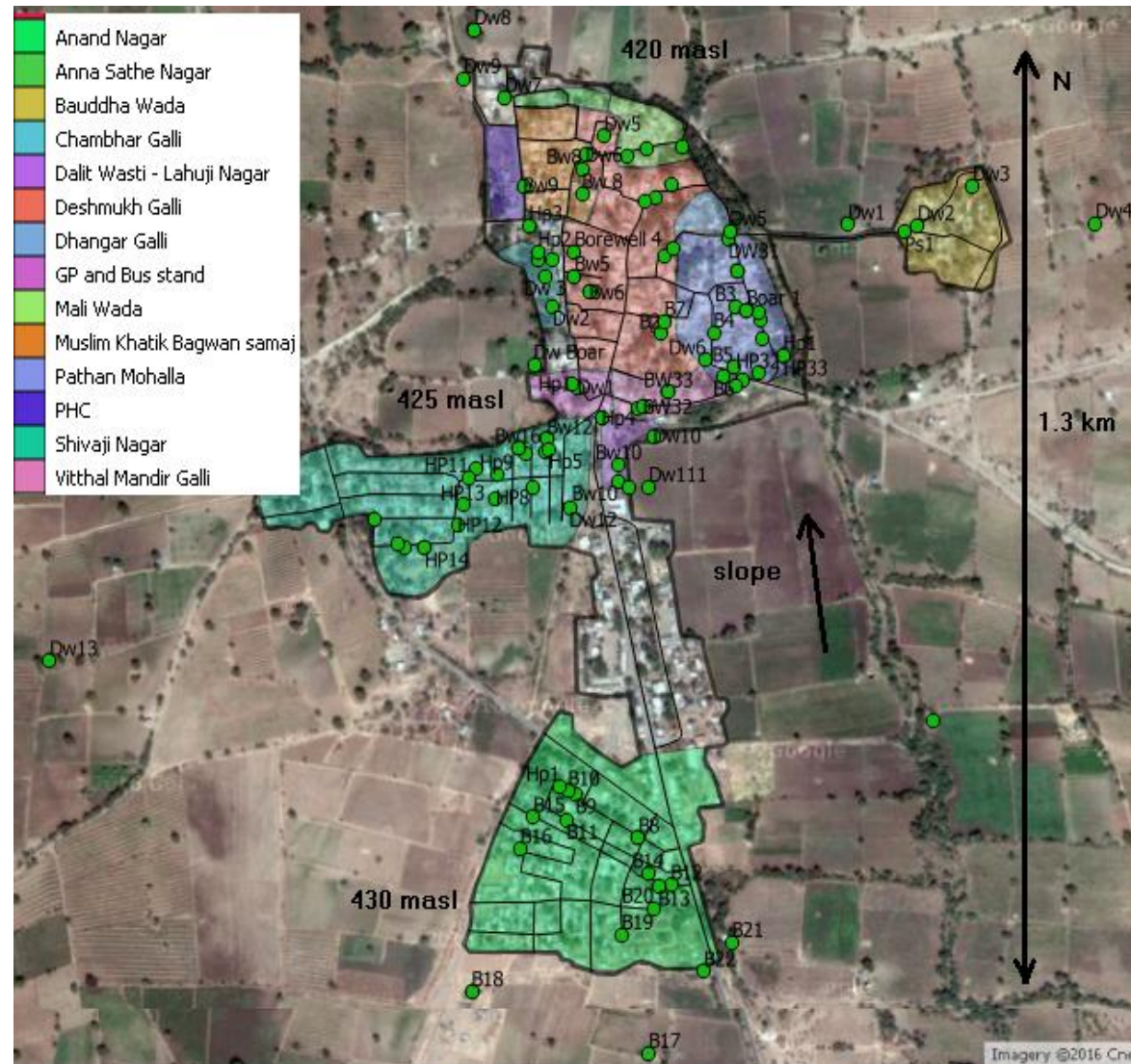
2016-17 – good year





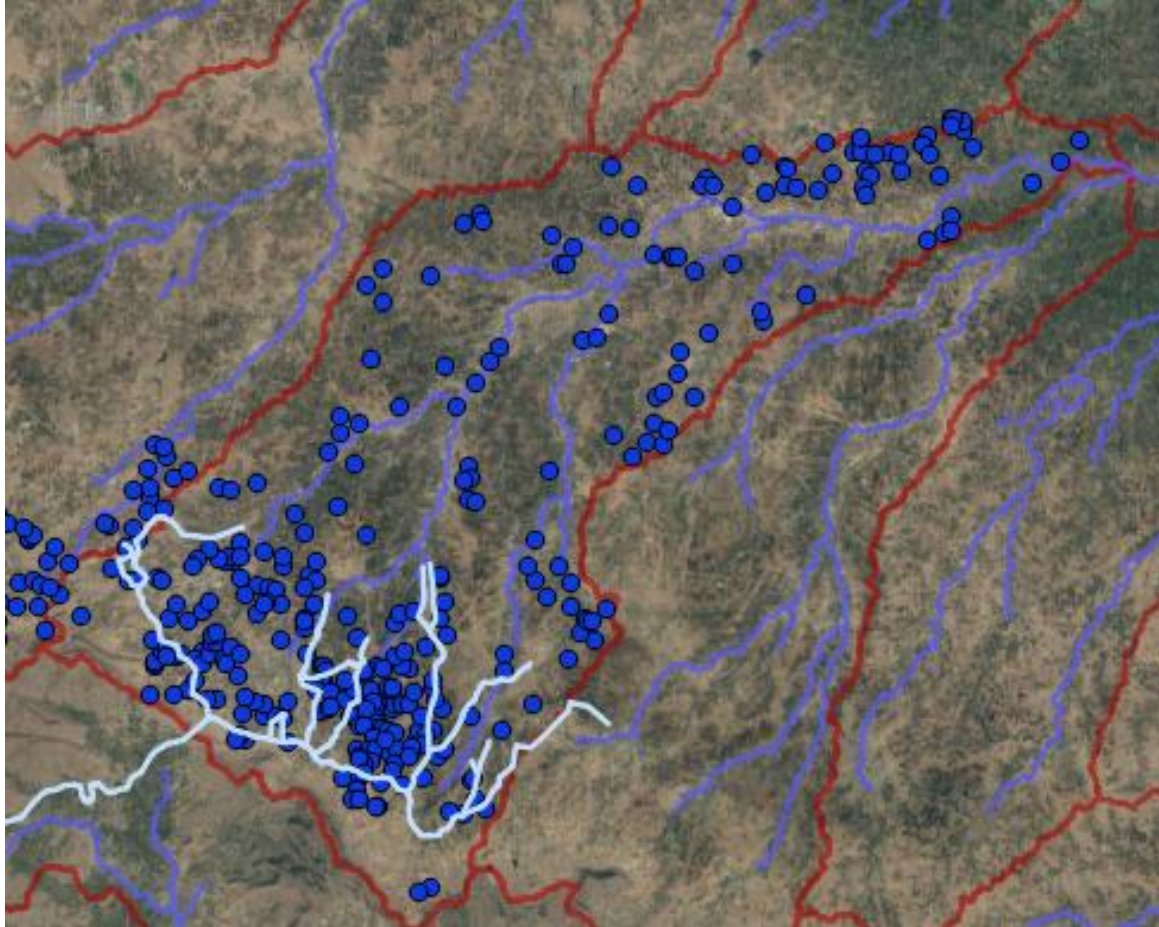
### 3. Drinking water - *habitation level analysis*

- Drinking water sources marked on **Gaothan map**
- Gaothan divided into different localities
- **Different people cope with drinking water scarcity in different ways**
- **Drying of public drinking water sources, rise in deep private borewells, vulnerability of landless and farmers without wells**



Pedgaon village, Parbhani district

## 4. Water transfers – spatial and seasonal

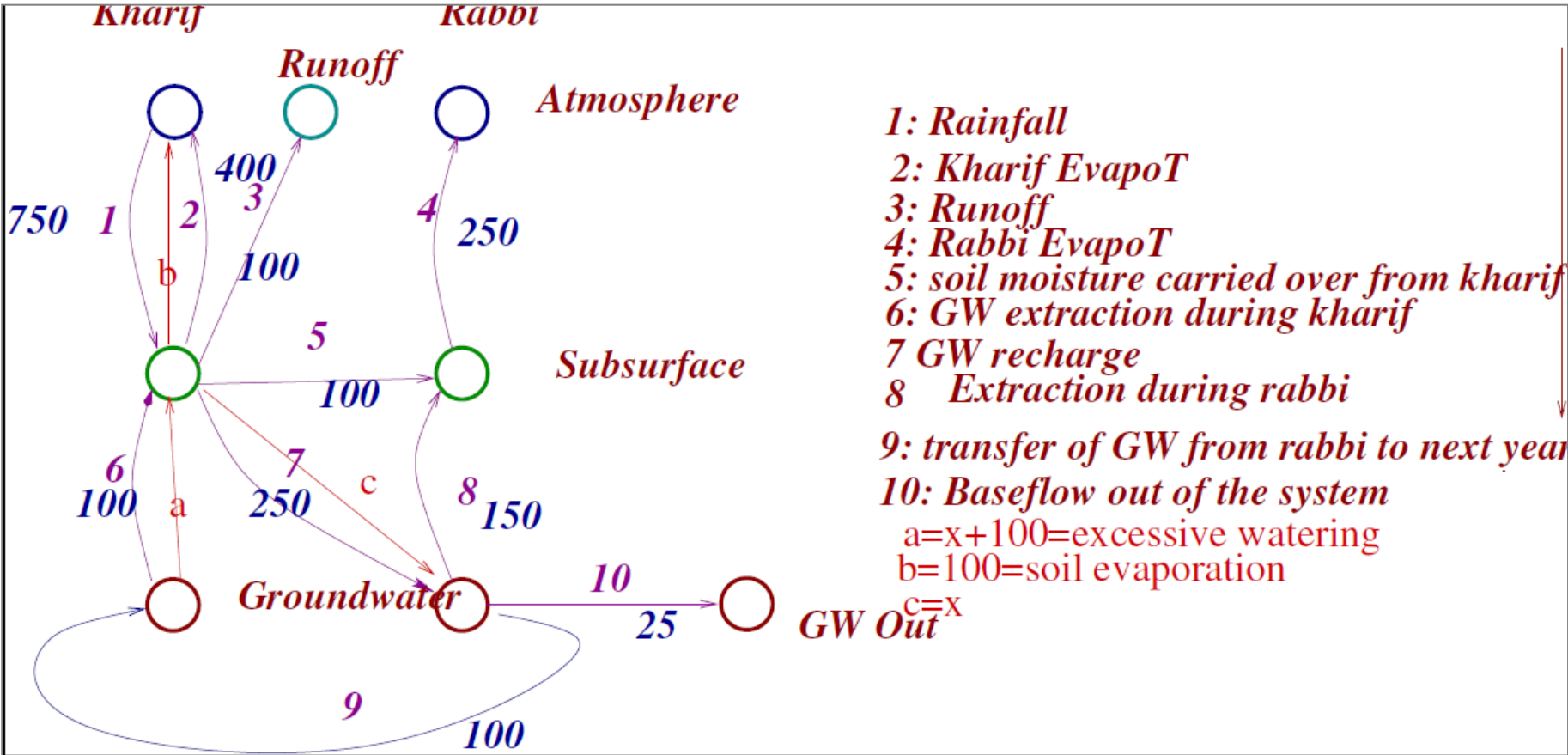


**High density of farm ponds along Bhojapur canal, Sinnar taluka, Nashik district**



Surface irrigation canals recharge wells in command area → recharge extracted through wells near head → used to fill farm ponds for protecting horticulture in summer → tail ends cannot access canal water / for assuring rabi crops

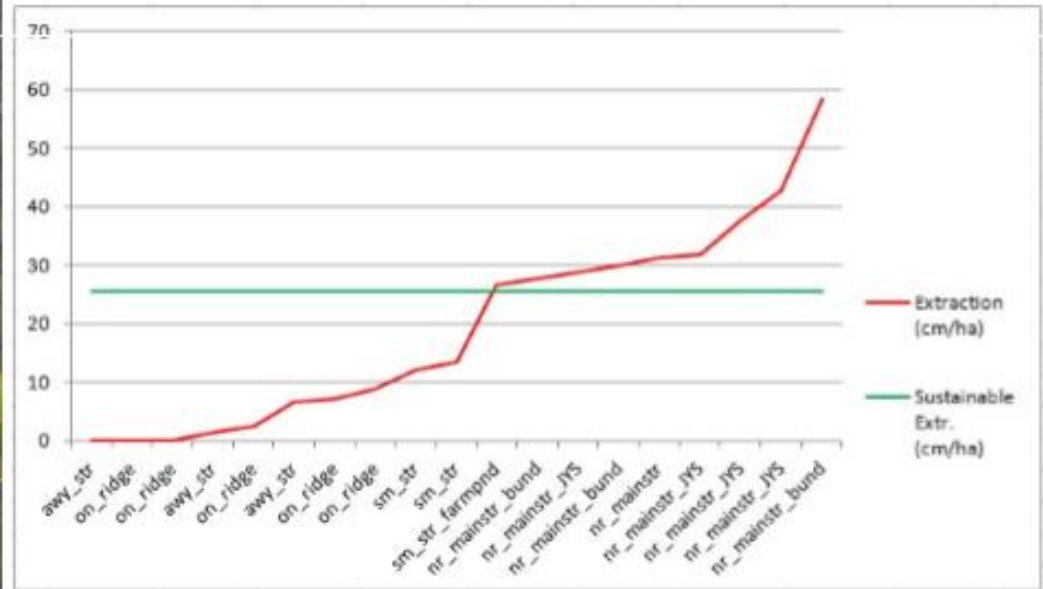
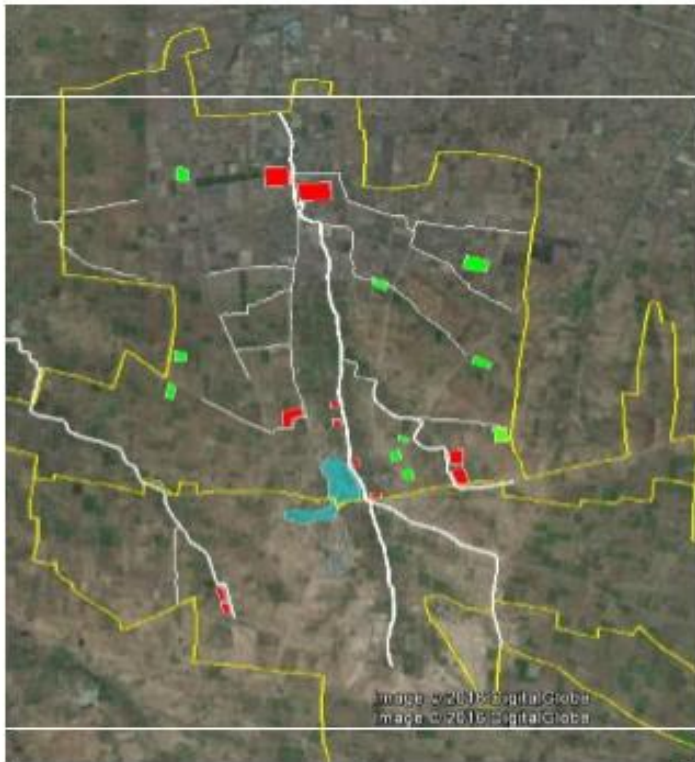
# Groundwater critical –



**Critical –**

- 5. Soil moisture carried from kharif to rabi
- 7. Groundwater recharge (available for rabi cropping)
- 9. Transfer of groundwater from rabi to summer
- 10. Baseflows out of the system (available for downstream)

## 5. Within village spatial differences

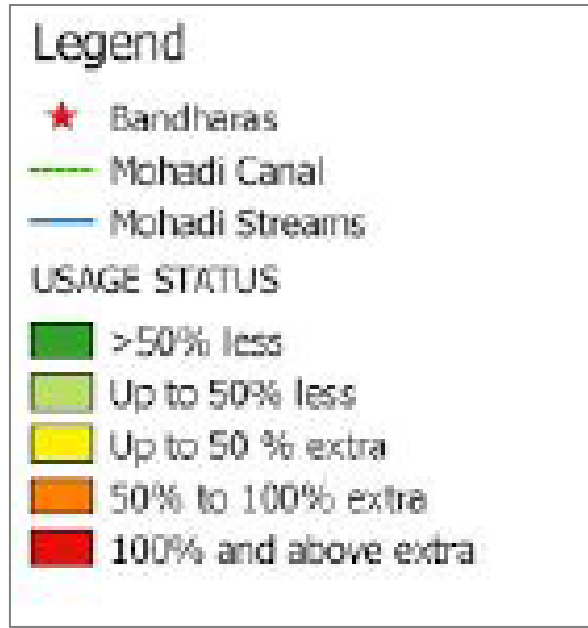
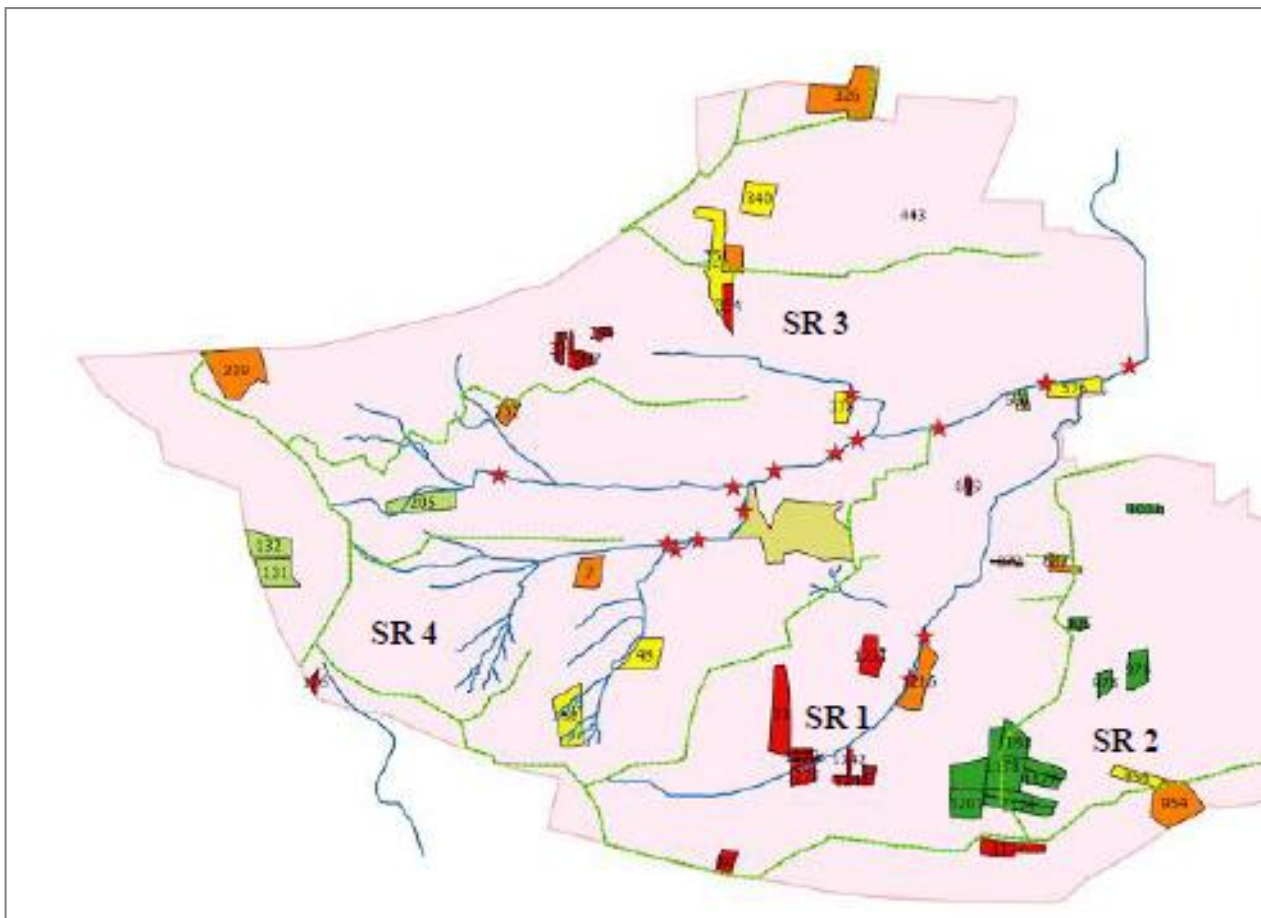


Pedgaon village, Parbhani district

- Uneven access to water, uneven quality of soils within village
- Farm level water balance tells the story

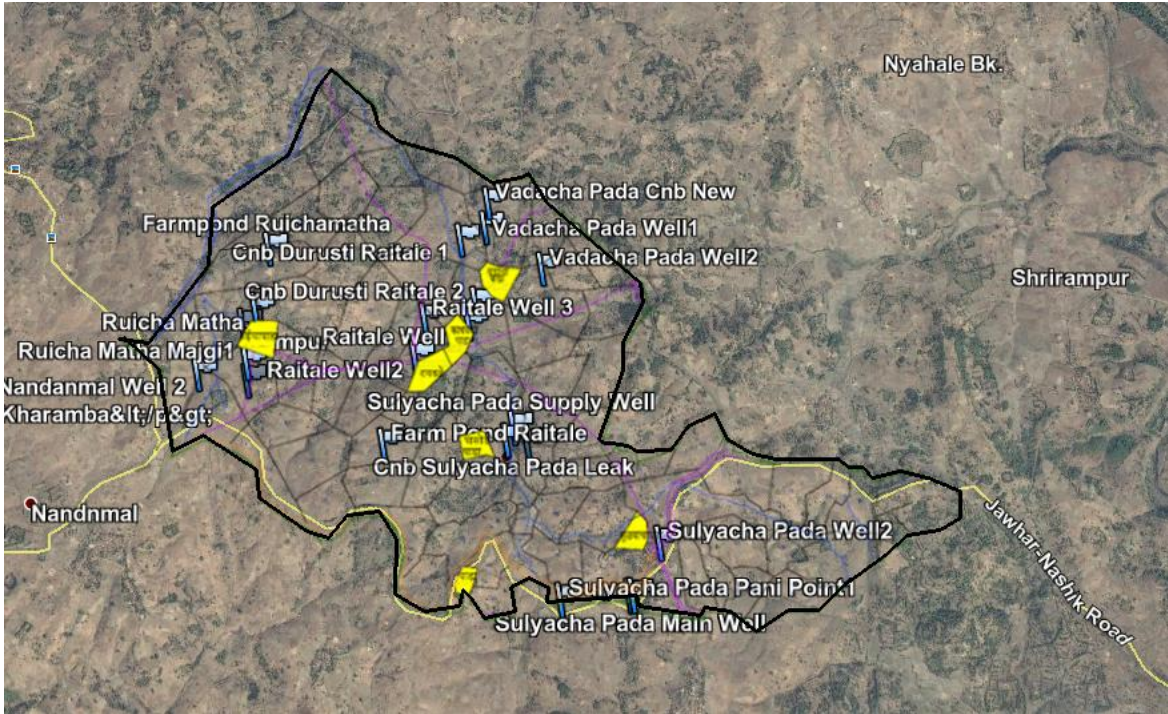
**Targeting of works becomes necessary**

# Within village spatial differences



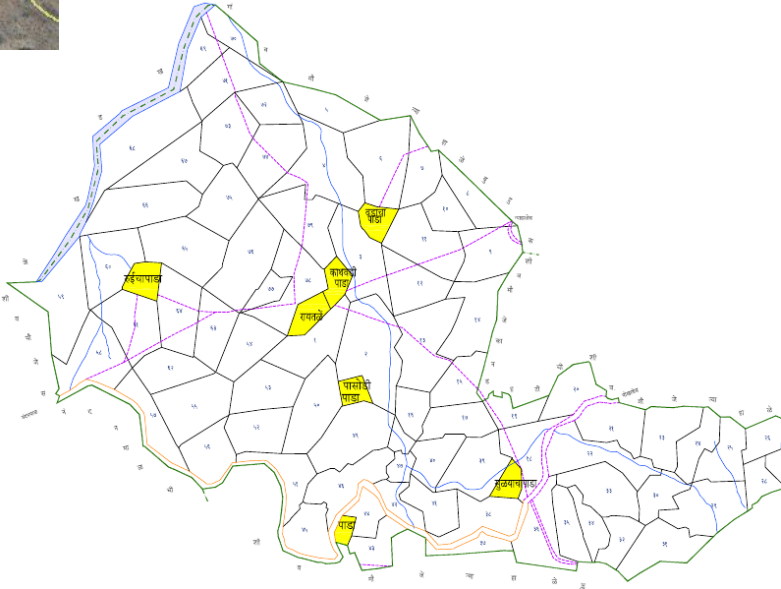
Mohadi village, Nashik district

# Jalyukt Shivar structures on revenue map



Raitale (Jawhar taluka) – During assessment of JSA in Palghar district

Revenue map overlaid on Google Earth and all drinking water sources, streams and interventions marked



# Conclusions

- Groundwater critical for rabbi
  - Groundwater extraction ratio – an indication of competition, uncertainty and investments
  - Community management critical for resolving within-village as well as regional imbalances
  - Targeting is crucial
- 
- *Shift from supply-side interventions to demand-interventions (crop plans, water use plans etc.)*
  - *Caution in promoting farm ponds and horticulture (and summer crops) in dryland regions*
  - *Micro-irrigation for reducing risks in kharif dry spells (provided farmer has a source); not a justification for summer crops*

## 6. Knowledge and policy strengthening

- Important Output- change in Standard Operating Procedures so as to bring positive outcomes
- More accurate data and ability to comprehend, respond and advise
- Bringing in new engagements and allocation of funds from within existing budgets
- New interventions and standard formats and designs



# Agriculture department

- **Standard format** for water balance at village, watershed levels
- **Standard maps** like MRSAC - LULC, Soil etc. and **surveys** for estimation of groundwater extraction, monitoring, flows etc.
- Processes for **reporting** cropping patterns and adherence
- **Better planning techniques** for investment and **targeting** for JYS and other programs
- Inputs of **local colleges** as consultants/designers

# Irrigation department

- Changes in **design processes** of local-sector irrigation-integration in RDD framework
- Changes in **operation and accounting** of small, medium and large projects – planned vs. actual command area and water use, decision making regarding flood charis, no. of rotations, timings etc.
- Integration of MSRLM and **livelihood support**
- More diligence from WSSD and **integration in RDD framework.**

# Overall conclusions

- **Community understanding** of water-budget crucial
- **De-risking kharif**: engineering problem. Farm-ponds where suitable, community access to wells during stress periods, pur-charis and other irrigation options
- **Stabilizing rabbi**: Totally based on GW. Community advisory essential.
- **Summer, horticulture and cash crops**: important for economic security: rotation within farmers, better access to infrastructure, reduction in competitive costs
- **Extension** of various on-farm good irrigation practices

# Intervention framework

## Component A

- Participatory Mini-watershed Plans ++
- Tech. Transfer at farm level + “blue water”+JSA ++
- Soil management +

## Component B

- Promoting FPC ++
- Strengthening value-chains +
- Improving seeds

## Component C

- Institutional Capacity-SDAO and other agencies ++
- CIC private partnership development
- Knowledge and Practice ++

**+ : Analysis**

**++: Design**

# IIT – PoCRA collaboration

- GIS and analytic support
- Core activities at the farm/village/institution level
- Instrumentation and Communication design
- Applied Research

## MOU

### - Consultancy

- For faculty, 30-50K per day, 4-6 days a month)

### - Sponsored Projects

- Research Staff , (PG training, 1-2 years of exposure), Administrative staff (graduate, drafting, accounting, documentation) Rs. 40-60K p.m.
- Student projects – outputs from and feeding into MTPs, Field-stays, TDSLs, PhD work
- Field coordinators (working with field staff from GoM, guiding field methods internally, liaison with field stake-holders) Rs. 50K-70K
- Coordinator (overall leadership of interaction in key area of project) Rs. 90-120K p.m..