PoCRA - Field Visit analysis and TOR

- IITB PoCRA Team

24th July, 2018

Agenda

- Analysis of water budgets through priority hierarchy of demand and supply
  - Paradgaon, Jalna
  - Hivare Bazaar
  - Kadvanchi
  - Learnings and scope for improvement
- Design of guidelines for planning and approval process
- Plugin and app update
- Issues in microplanning process and DPR preparation
- Terms of Reference

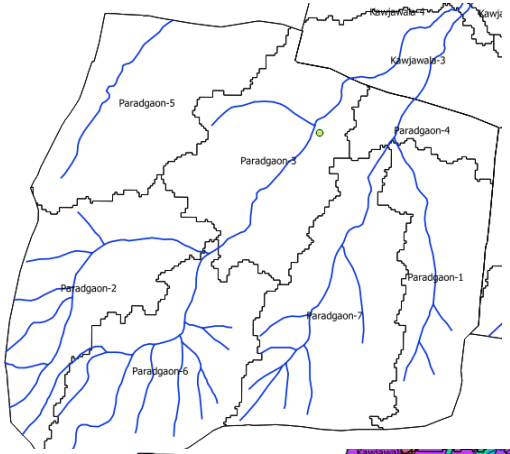
Paradgaon - Inputs

Cropping pattern

Crop	1	2	3	4	5	6	7	Grand Total
Zone Area ha	**367.23**	**448.83**	**472.59**	**127.03**	**455.55**	**525.42**	**529.89**	**2926.54**
कापूस	193	236	261	62	262	329	258	1601
सोयाबीन	57	40	54	0	56	66	120	393
तूर	62	47	56	5	43	59	73	345
मुग	42	34	36	28	43	44	50	277
रबी हरभरा	0	37	33	25	39	36	50	220
रबी गहू	0	25	27	18	32	34	58	194
रबी ज्वारी	0		42	32	37	39	38	188
खरीप ज्वारी		43	42	25	37			147
बाजरी	13	11	10	5	14	11	25	89
ऊस			12			13		25
पोटखराबा		22						22
मोसंबी	0	2	1	2	1	3	4	13
कायम पड (गावठाणसह)		11						11
द्राक्ष		2	1					3
लिंबू	0	1	0	0	0	0	0	1
Grand Total	**367**	**511**	**575**	**202**	**564**	**634**	**676**	**3529**

Year	Rainfall mm
2013	547
2014	429
2015	480
2016	1009
2017	818
5 year Avg	656.6

Paradgaon


Kawjawala-4
Kawjawala-3
Paradgaon-5
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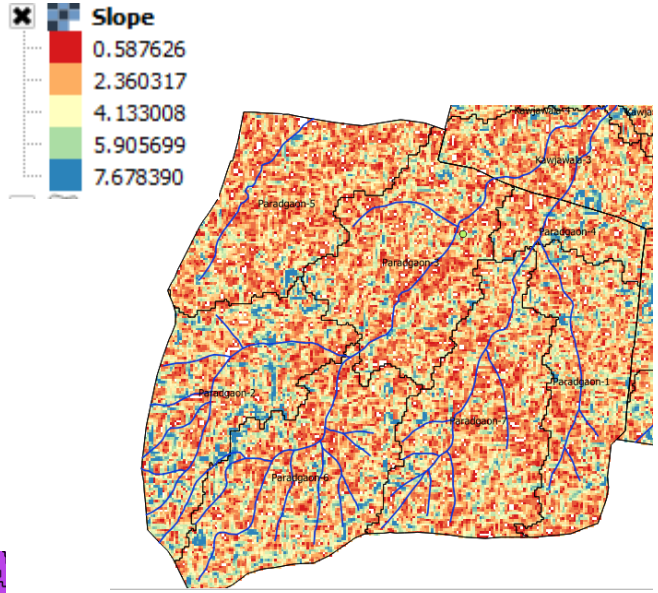
Paradgaon-2
Paradgaon-1
Paradgaon-7
Paradgaon-6


Slope
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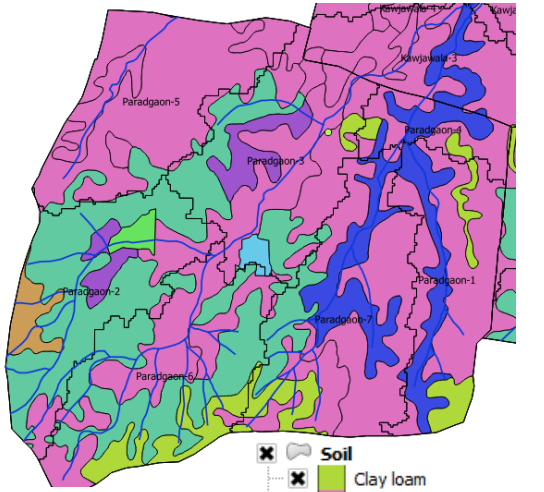
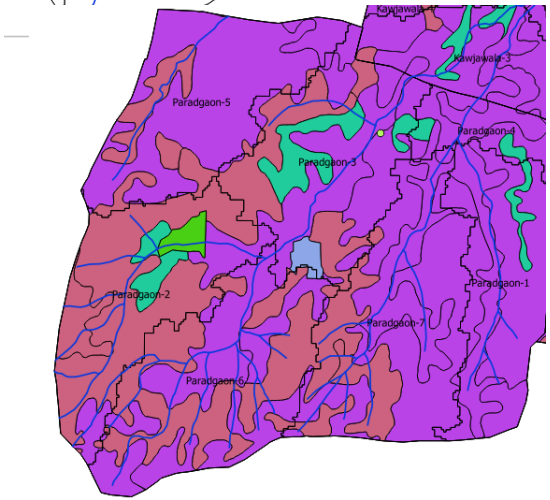

Soil
Clay loam
Clayey
Gravelly clay
Gravelly clay loam
Gravelly sandy clay loam
Gravelly sandy loam
Habitation Mask
Waterbody Mask


Kawjawala-4
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Paradgaon-5
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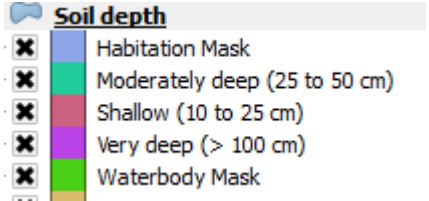
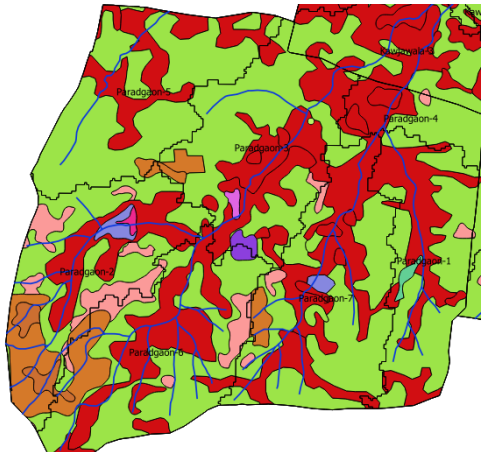
Paradgaon-6


Soil depth
Habitation Mask
Moderately deep (25 to 50 cm)
Shallow (10 to 25 cm)
Very deep (> 100 cm)
Waterbody Mask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Paradgaon-5
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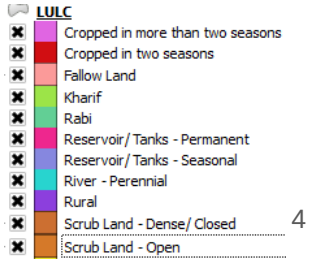
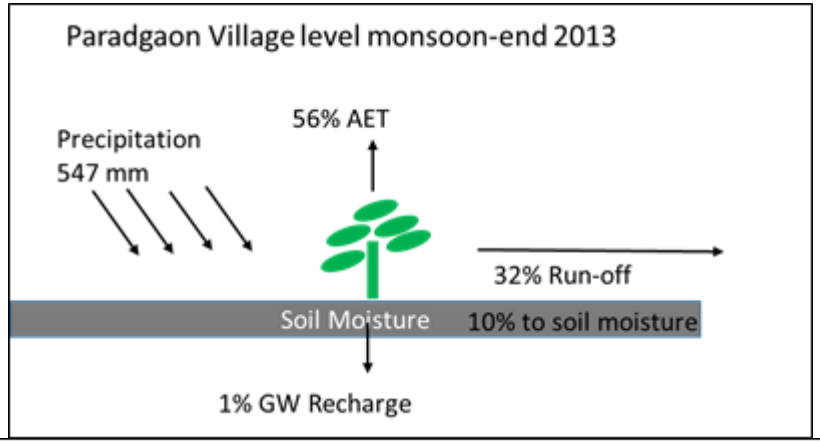

LULC
Cropped in more than two seasons
Cropped in two seasons
Fallow Land
Kharif
Rabi
Reservoir/ Tanks - Permanent
Reservoir/ Tanks - Seasonal
River - Perennial
Rural
Scrub Land - Dense/ Closed
Scrub Land - Open

Paradgaon Zone wise Balance

Supply side



Paradgaon, Jalna Rainfall 2013: 547 mm

Zones	Zone Area ha	Total rainfall TCM	Runoff TCM	Run off % of rainfall	Soil Moisture (SM) monsoon end (TCM)	SM as % of rainfall	GW recharge in monsoon TCM	GW recharge % of rainfall	Crop AET monsoon end (TCM)	Crop AET as % of rainfall
1	367	1,993	465	23%	287	14%	7	0%	1,233	62%
2	449	2,438	1,080	44%	123	5%	78	3%	1,157	47%
3	473	2,568	847	33%	219	9%	35	1%	1,467	57%
4	127	690	168	24%	102	15%	4	1%	415	60%
5	456	2,476	726	29%	265	11%	27	1%	1,459	59%
6	525	2,851	1,041	37%	198	7%	43	2%	1,569	55%
7	530	2,878	810	28%	365	13%	36	1%	1,666	58%
All zones	2,927	15,894	5,138	32%	1,559	10%	231	1%	8,966	56%

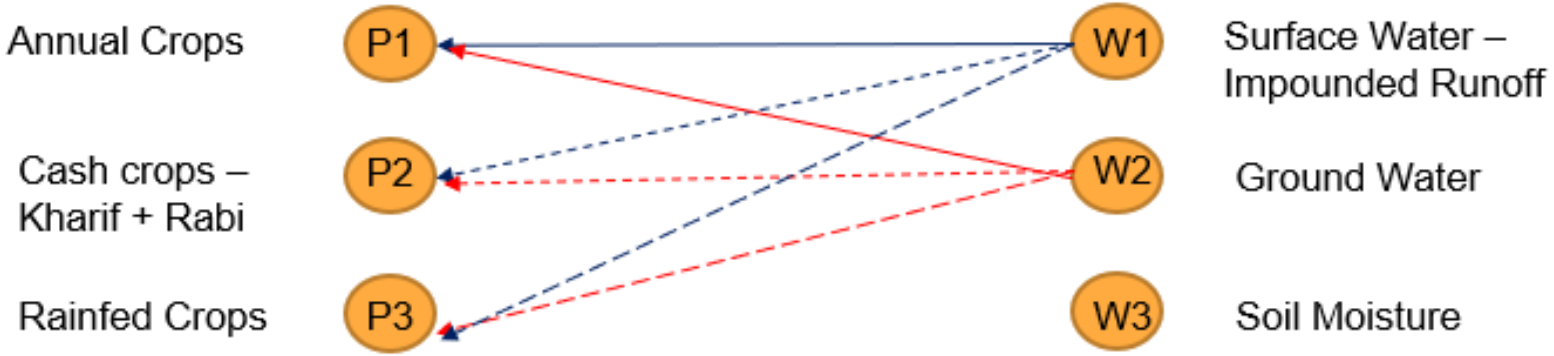
Paradgaon Jalna: 2013 Demand vs. Supply

Zones	Zone Area ha	Total Runoff TCM	Current storage available (after evaporation losses) TCM	GW available TCM	Net water avaialable for irrigation (SW + GW) TCM	K, LK: Crop end deficit (Unmet demand of K and long K) (TCM)	Rabi crop deficit (Unmet demand of Rabi crops) (TCM)	Drinking water demand (TCM)
1	367	465	114	7	121	928	-	
2	449	1,080	118	78	196	1,469	244	158
3	473	847	146	35	181	1,557	365	
4	127	168	82	4	86	296	242	
5	456	726	112	27	139	1,277	373	
6	525	1,041	174	43	217	1,923	409	
7	530	810	112	36	148	1,384	516	
All zones	2,927	5,138	858	231	1,089	8,835	2,149	158

The question: How are these deficits really handled by farmers on the ground?

Priority Hierarchy of Demand and Supply

- Measuring compulsory load (P1) and discretionary load (P2,P3) in the village
- Measuring Water availability – W1- surface storage, W2 - GW recharge and W3 - soil moisture
- Strategizing intervention planning to convert P2 load to P1, P3 load to P2 or P1 to more area



- Guiding limit on number of wells based on current cropping pattern
- Preparing norms to limit no. of proposed farm ponds
- Measuring how much additional land can be brought under P1 crops without damaging P3 crops

This can be converted into an handheld planning analysis app

Crop classification based on irrigation priority

Priority	Description	Kharif crops	Rabi crops	Current cropped Area (ha)
P1	100% committed water	Sugarcane, mosambi, limbu, grapes,		42
P2	Plan to irrigate (but may be unable to)	Soybean, irrigated cotton/tur	Wheat	588*
P3	No plan to irrigate	Rainfed cotton, tur, Mung, Kharif Jowar, Bajri	Harbhara, Rabi Jowar (fodder)	2866*
* Note: since we do not have separate cropped area for irrigated and rainfed crops it is assumed that 10% of cotton and tur area is irrigated and 90% is rainfed				

Paradgaon: Allocation of supply

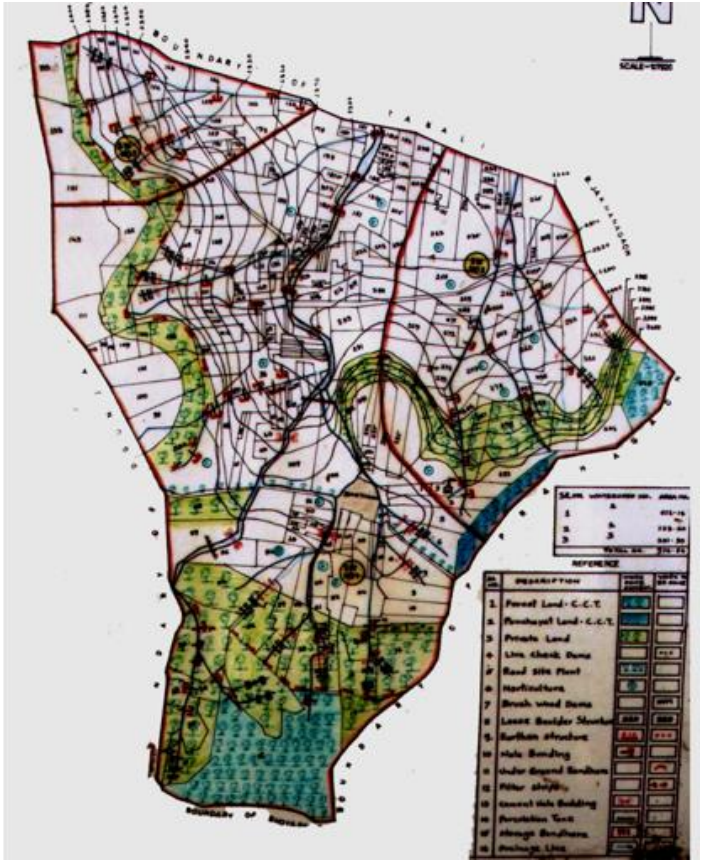
- First allocation to P1 crops
- Protective irrigation for P2 Kharif in bad rainfall years else buffer for P2 Rabi
- No plan to irrigate P3 crops: impact observed in poor yields

Zones	Net water avaialable for irrigation (SW +GW) TCM	P1 annual irrigation demand (TCM)	P2 K+LK irrigation demand (TCM)	P2 Rabi irrigation demand (TCM)	P3 ignored annual irrigation demand	Total demand TCM
1	121		131		798	928
2	196	55	176	124	1,358	1,713
3	181	196	176	125	1,425	1,923
4	86	18	25	78	418	538
5	139	9	167	143	1,331	1,650
6	217	222	229	161	1,720	2,332
7	148	37	226	257	1,380	1,900
All zones	1,089	538	1,129	889	8,429	10,984

How do we classify water?

- W1 water: interventions increase water in the stream system and is available to farms within stream proximity. E.g. All drainage line treatments
- W2 water: interventions (e.g. CCT, compartment bunding) that increase ground water which can be accessed by farmers in off-stream farms through extraction devices such as wells or farm ponds
- W3 water: interventions that increase soil moisture in farms that can be accessed by rainfed farmers (e.g. compartment bunding, practices such as organic mulching etc.)

How do interventions help?



Type of Intervention	Impact	Type of water harvested
Nala kholikaran	Increases GW recharge in the stream system available to farmers within stream proximity through wells	W1
Compartment bunding	Increases GW recharge in farms, reducing the flow in streams. With time, due to subsurface flows, this	W2 and W3 W2 --> W1
CNB/ Gabion	Increases runoff impounded in the streams, which can be accessed via GW or in farms close to stream systems	W1
Percolation tank	Increases runoff impounded in the streams, which can be accessed via GW or in farms close to stream systems	W1
Off stream GW filled Farmponds	extraction devices and not harvesting device. These may extract W2 or W1 water	not a harvesting device
Farmponds filled with stream or wells in streams	Harvesting devices in the stream system (W1 water)	W1
Farm runoff filled Farmponds	Farm runoff filled farmponds are harvesting devices in the off-stream system (W2 water)	W2
CCT	Increases GW recharge in non-agricultural land which becomes available to wells in farms	W2 --> W1

Paradgaon: Allocation

Current state bad year Rainfall 2014: 420mm										
Water availability	Runoff generated	Availabl e TCM	Irrigation demand	Deficit TCM	PET TCM	Irrigation allocation TCM	yield %	Area ha	Index	Value
W1		180.8	P1 crops: annual	560	692.5	560.3	1.00	42.0	P1 Index	0.53
W2		643.5	P2 crops: Kharif	1,217	2,823.0	227.3	0.65	587.6	P2 Index	0.5
GW recharge from rain	3386	190.7	P2 crops: Rabi	909	1,018.5	227.3	0.33	194.0		
W3		33.8	P3 crops	9,812	16,116.7	33.8	0.39	2,672.4		
Total		1,048.7	Total	12,498.5	20,650.7	1,048.7		3,496.0		
Current state good year Rainfall 2016: 1009mm										
Water availability	Runoff generated	Availabl e TCM	Irrigation demand	Deficit TCM	PET TCM	Irrigation allocation	yield %	Area ha	Index	Value
W1		180.8	P1 crops: annual	497	692.5	497.0	1.00	42.0	P1 Index	0.32
W2		643.5	P2 crops: Kharif	824	2,823.0	347.6	0.83	587.6	P2 Index	0.8
GW recharge from rain	15373	715.5	P2 crops: Rabi	761	1,018.5	695.2	0.94	194.0		
W3		33.8	P3 crops	6,343	16,116.7	33.8	0.61	2,672.4		
Total		1,573.5	Total	8,425	20,651	1,573		3,496		

- P1 index : Water committed to annual crops as a fraction of total available water for irrigation.
- P2 index: fraction of groundwater available for P2 crops after allocation to annual crops

Paradgaon: Proposed state

- Proposed cropping:
  - P1: Reduction in grapes and sugarcane; increase in mosambi, lemon, pomegranate
  - P2: Increase in soybean and vegetables; reduction of long Kharif crops like cotton and tur
  - Overall PET is reduced BUT total irrigation requirement (P1+P2) has increased
  - Expected profitability to increase

Crop Category	Current PET TCM	Current area ha	Current PET TCM/ha	Proposed PET TCM	Proposed area ha	Proposed PET TCM/ha
P1 Annuals	692.5	42.0	16.5	1,176.9	91.0	12.9
P2 Kharif	2,823.0	587.6	4.8	3,318.6	768.1	4.3
P2 Rabi	1,018.5	194.0	5.3	840.0	160.0	5.3
P3 Kh + Rabi	16,116.7	2,672.4	6.0	13,441.0	2,361.9	5.7
Total	20,650.7	3,496.0	5.9	18,776.5	3,381.0	5.6

Crop Category	Current area ha	Sum of current expected profit from crop	Expected profit Rs/ha current	Proposed area ha	Sum of proposed expected profit from crop	Expected profit Rs/ha proposed
P1	42	9,903,750	235,804	91	20,410,000	224,286
P2	782	33,294,055	42,597	928	38,886,950	41,900
P3	2,672	63,120,175	23,619	2,362	53,119,821	22,490
All	**3,496**	**106,317,980**	**30,411**	**3,381**	**112,416,771**	**33,250**

Paradgaon Proposed state: Interventions

New structures (units: TCM)	Total TCM added	Type
Nala Kholikaran	20.89	W1
compartment bunding	42.30	95%to W2; 5% to W3
CNB/gabion	30.80	W1
FPs	30.80	W1
Community FP	250.00	W1
percolation tank	-	W1
Total TCM	**374.79**	

- 89% of new water created by proposed interventions will be available only within stream proximity => allows more farmers to move from P2 to P1 crops
- 11% of the new water created can benefit off-stream farmers but only if they have wells
- Marginal impact to rainfed farmers except those who shift to P2 by getting a new well

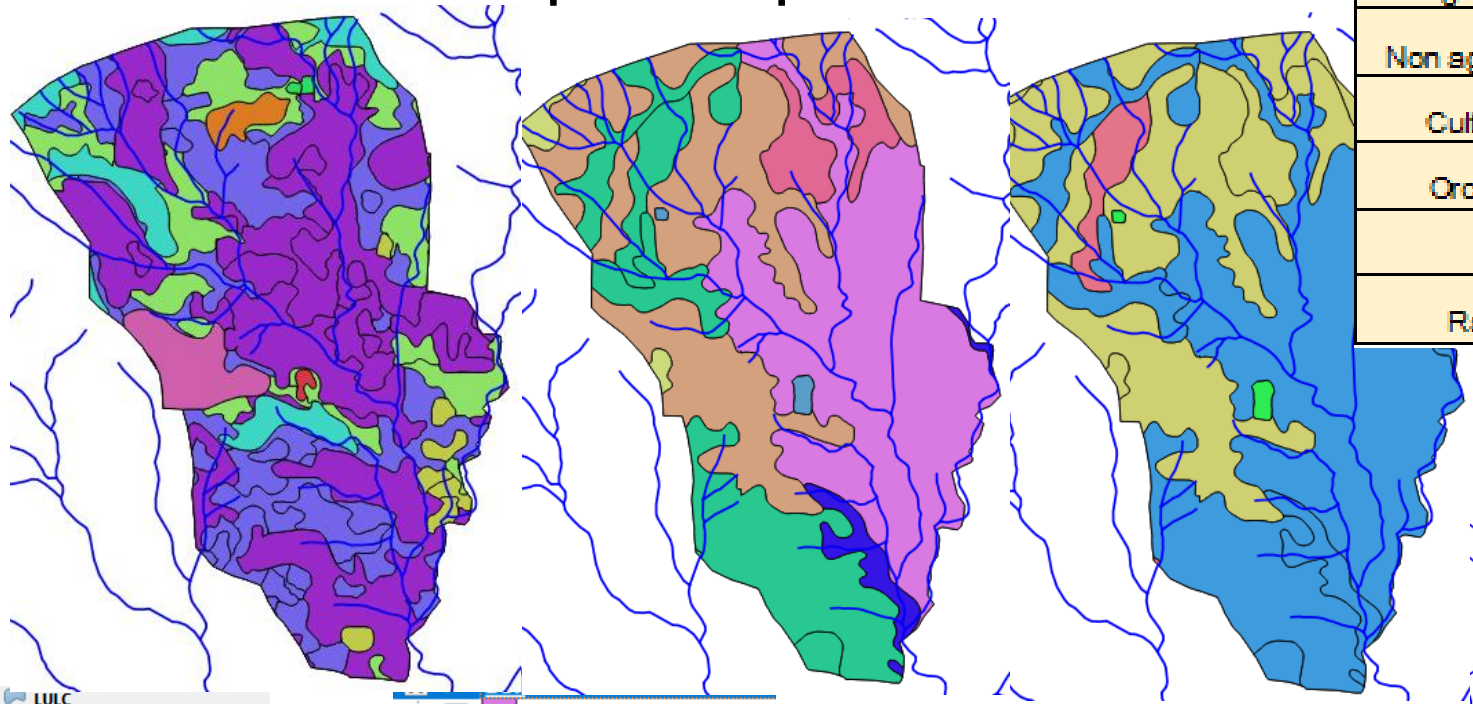
Paradgaon: Proposed State Balance

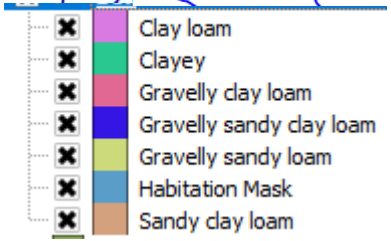
- More area under P1 crops but higher P1 risk index. How much more area can be moved under P1 crops?
- Conversion of P3 -> P2 by provision of wells……How many more can be added?

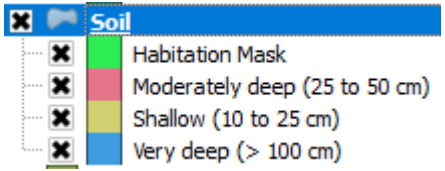
Proposed state bad year Rainfall 2014: 420mm											
Water availability	Runoff generated	Available TCM		Irrigation demand	Deficit TCM	PET TCM	Irrigation allocation TCM	yield %	Area ha	Index	Value
W1		482.5		P1 crops: annual	922	1,176.9	922.4	1.00	91.0	P1 Index	0.64
W2		714.4		P2 crops: Kharif	1,277	3,318.6	238.4	0.69	768.1	P2 Index	0.5
GW recharge from rain	3452	202.2		P2 crops: Rabi	748	840.0	238.4	0.39	160.0		
W3		35.9		P3 crops	7,978	13,441.0	35.9	0.41	2,361.9		
Total		**1,435.0**		**Total**	**10,925**	**18,776**	**1,435**		**3,381**		
Proposed state good year Rainfall 2016: 1009 mm											
Water availability	Runoff generated	Available TCM		Irrigation demand	Deficit TCM	PET TCM	Irrigation allocation TCM	yield %	Area ha	Index	Value
W1		482.5		P1 crops: annual	796	1,176.9	796.3	1.00	91.0	P1 Index	0.39
W2		714.4		P2 crops: Kharif	873	3,318.6	609.9	0.92	768.1	P2 Index	0.8
GW recharge from rain	15763	819.1		P2 crops: Rabi	623	840.0	609.9	0.98	160.0		
W3		35.9		P3 crops	4,985	13,441.0	35.9	0.63	2,361.9		
Total		**2,051.9**		**Total**	**7,278**	**18,776**	**2,052**		**3,381**		

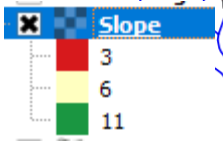
Kadvanchi : Input maps

Land use	Area in Ha
Total geographical land	1508
Non agricultural land	402
Cultivable land	1106
Orchards (P1)	346
P2	318
Rainfed P3	906







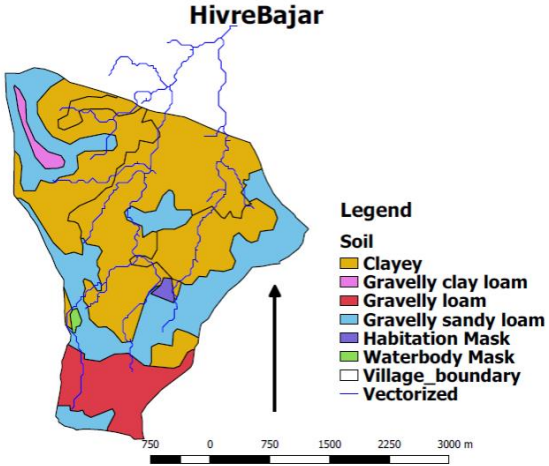


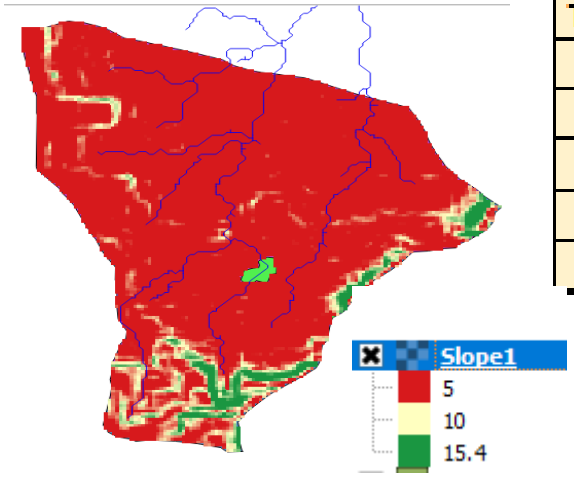
Kadvanchi Water Balance

Kadvanchi good year 2016 : 959mm; Cultivable area: 1106 ha; geographical area: 1508 ha; With drip impact: 0.6 PET											
Water availability	Monsoon Runoff generated (TCM)	Available TCM		Irrigation demand	Deficit TCM	PET TCM	Irrigation allocation TCM	yield %	Area ha	Index	Index value
W1		1,313.8		P1 crops: annual	1,849	3,191.0	1,848.6	1.00	346.0	P1 risk index	0.8
W2		480.9		P2 crops: Kharif	131	999.0	130.6	1.00	268.0	P2 index	0.5
GW recharge from rain	8,069	513.5		P2 crops: Rabi	204	270.0	203.9	1.00	50.0		
W3		25.3		P3 crops: Kharif	1,005	3,362.0	-	0.70	548.0		
				P3 crops: Rabi	974	1,469.0	25.3	0.35	358.0		
Total		**2,333.6**		**Total**	**4,161.8**	**9,291.0**	**2,208.4**		**1,570.0**		

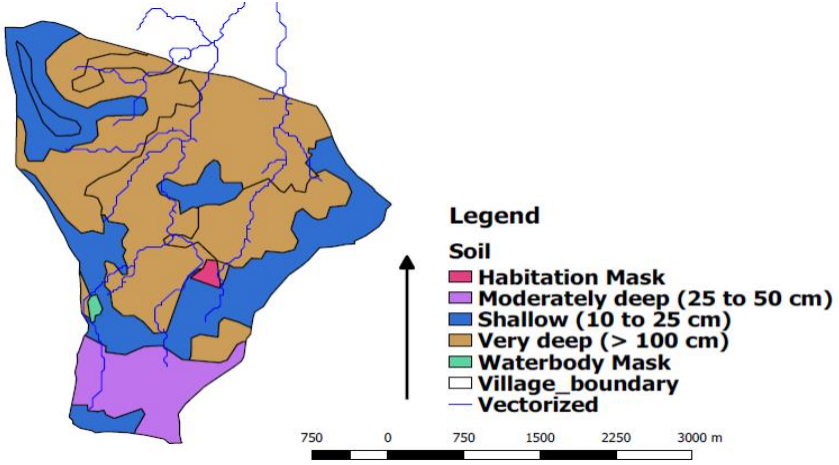
Kadvanchi bad year 2015 : 523mm ; Cultivable area: 1106 ha; geographical area: 1508 ha; Drip impact: 60% PET reduction											
Water availability	Monsoon Runoff generated (TCM)	Available TCM		Irrigation demand	Deficit TCM	PET TCM	Irrigation allocation TCM	yield %	Area ha	Index	Index value
W1		1,313.8		P1 crops : annual	2,167	3,169.0	2,061.7	0.97	346.0	P1 risk index	1.0
W2		480.9		P2 crops : Kharif	421	988.0	-	0.57	268.0	P2 index	-
GW recharge from rain	3,522	267.0		P2 crops : Rabi	227	270.0	-	0.16	50.0		
W3		25.3		P3 crops : Kharif	1,804	3,345.0	-	0.46	548.0		
				P3 crops : Rabi	1,140	1,469.0	25.3	0.24	358.0		
Total		**2,087.0**		**Total**	**4,620.3**	**9,241.0**	**2,087.0**		**1,570.0**		

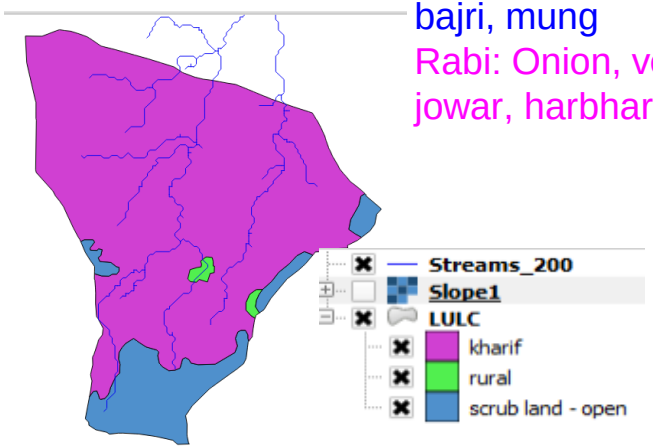
Hivare Bazar: Input maps





Land use	Area in Ha
Total geographical land	976.84
Non agricultural land	423
Cultivable land	553.84
Orchards (P1)	22.8
P2	658.9
Rainfed P3	251





Main crops:
Kharif: Onion, vegetables, bajri, mung
Rabi: Onion, vegetables, jowar, harbhara

Hivare Bazar WB

- 78 mm post-monsoon rainfall assumed to be available to Rabi

Bad year: 2014 rainfall 384mm -geographical area = 977ha; cultivable area = 554 ha; drip impact: Rabi P2 crops 60% PET											
Water availability	Monsoon Runoff generated	Available TCM		rrigation demand	Deficit TCM	PET TCM	Irrigation allocation TCM	yield %	Area ha	Index	Index value
W1		123.5		P1 crops: annual	229	298.6	229.2	1.00	22.8	P1 risk index	0.18
W2		89.8		P2 crops: Kharif	851	1,507.1		0.44	273.6	P2 Index	0.75
GW recharge from rain	436	337.8		P2 crops: Rabi	1,258	1,411.7	1,064.4	0.86	385.3		
W3		4.7		P3 crops: Kharif	307	490.8	-	0.37	124.6		
Post monsoon rain		742.5		P3 crops: Rabi	446	504.2	4.7	0.12	126.4		
Total		1,298.3		Total	3,091.7	4,212.4	1,298.3		932.7		

Good year: 2016 rainfall 473mm -geographical area = 977ha; cultivable area = 554 ha; drip impact: Rabi P2 crops 60% PET											
Water availability	Monsoon Runoff generated	Available TCM		rrigation demand	Deficit TCM	PET TCM	Irrigation allocation TCM	yield %	Area ha	Index	Index value
W1		661.2		P1 crops: annual	230	295.6	230.3	1.00	22.8	P1 risk index	0.17
W2		89.8		P2 crops: Kharif	843	1,487.9	48.7	0.47	273.6	P2 Index	1.66
GW recharge from rain	1,576	562.9		P2 crops: Rabi	1,035	1,411.7	1,034.9	1.00	385.3		
W3		4.7		P3 crops: Kharif	276	478.2	-	0.42	124.6		
				P3 crops: Rabi	420	504.2	4.7	0.18	126.4		
Total		1,318.6		Total	2,803.4	4,177.6	1,318.6		932.7		

Issues and Learnings

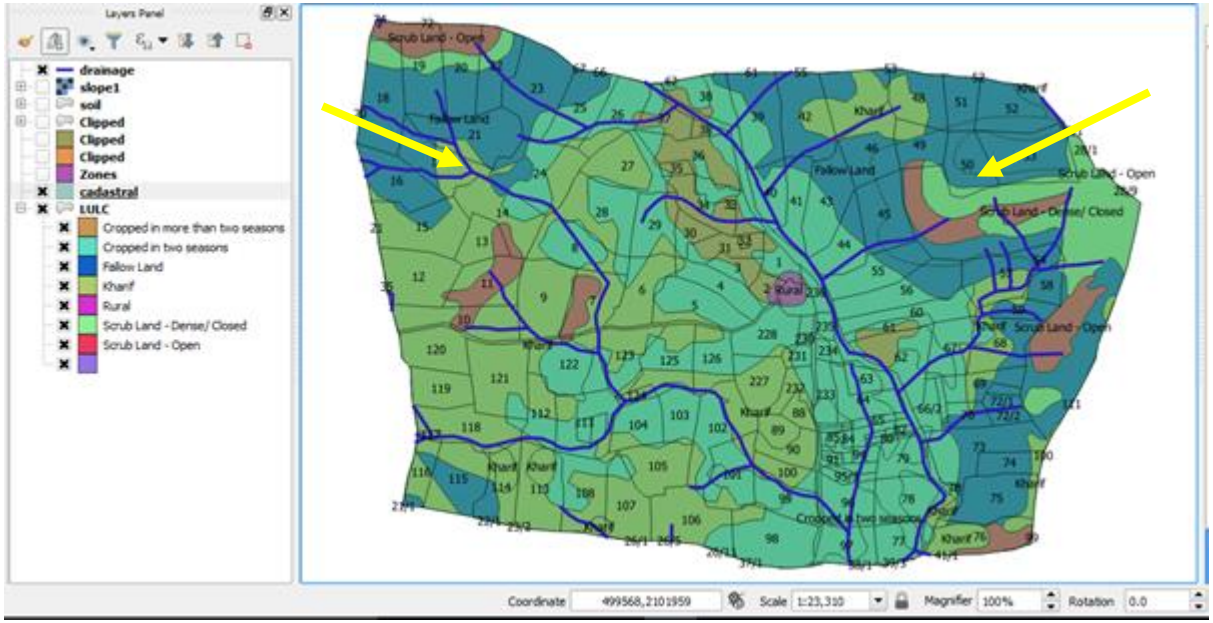
- Separation of area under rainfed and irrigated crops in field input. E.g. cotton, tur, harbhara.
- Importance of considering area under drip and its impact on irrigation requirement
- Non-agricultural land and interventions on it adds significant water to the budget (both HB and Kadvanchi benefit from this)
- Importance of proximity map to know which farms benefit from W1 water
- Assessment of which farm and non-farm interventions can be targeted to the majority of farmers i.e. rainfed

How to Enable Transfers

- Farmer classification based on cropping pattern and access to water

Priority	Description	Kharif	Rabi	Stream Proximity Farms	Off stream Farms
P1	100 % committed water	sugarcane, mosambi, limbu grapes		W1 - 100% access - wells, FP's, lift irrigation. W2 - GW based FP,s, W3 - area treatment (CCT, CB)	W1- access - stream proximity wells and transfers, runoff based FP's , W2 - offstream wells, GW based FP's, W3 - Area treatment
P2	Plan to irrigate (but may be unable to) - limitation of irrigation assets	irrigated cash crops - irrigated cotton or tur, vegetables,	wheat, onion	W1 - access possible through wells, lift irrigation, W2+ W3 - Area treatment (CCT,CB)	W2 - offstream wells, W3 - area treatment
P3	No plan to irrigate due to abcense of irrigation assets - wells, motor, pipeline	rainfed - soybean, jowar, bajri, cotton, tur	harbara, jowar fodder	W1 - rental lift irrigation or rental well water, W3 - Area treatment (CB, soil moisture conservation)	W3 - CB, Silt deposition for soil moisture improvement

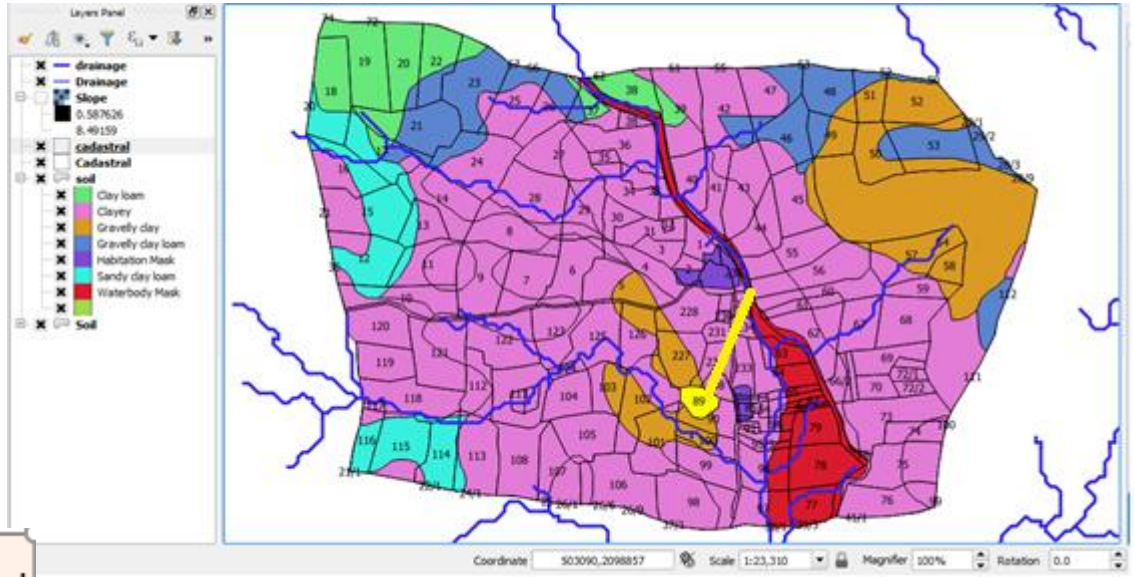
Suleman Deola Visit, Beed



- Murmati soil, discharge zone on eastern upstream side - vulnerable farmers
- Off stream Farmers drawing water from wells in stream proximity

Access - Case study- P3 farmer away from stream

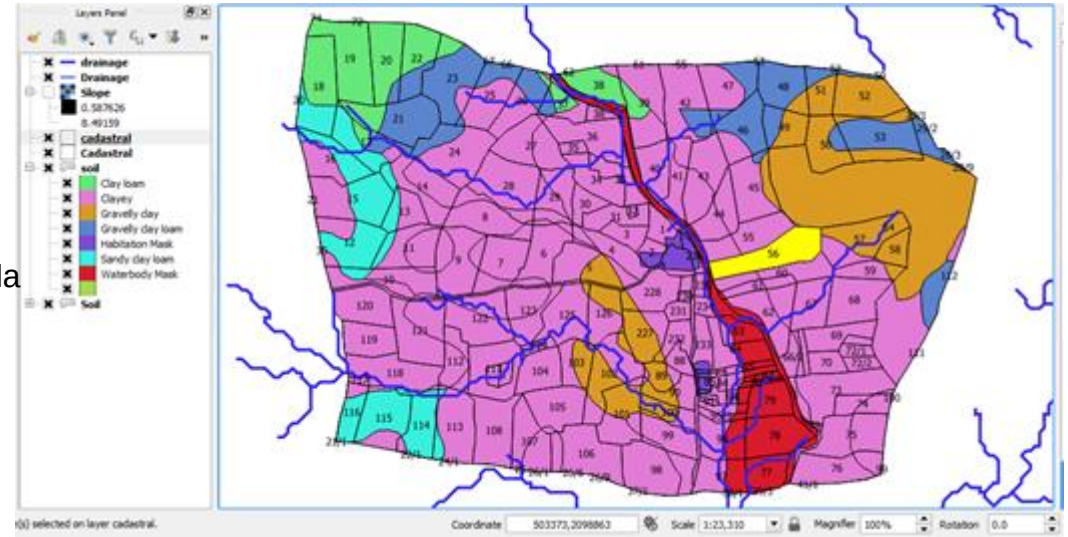
- Village – Suleman Deola
- Farmer Name: Raosaheb Toradmal
- Gat no. 89
- Gat Size: 3 Acre
- Assets: well in gat no. 56 near nala
- Farmer category: P3
- Crops Acre – soybean- 1.5 , Udid – 1.5,
- Rabi jowar – 1.5 Acre



Crops	Area in Acre	PET in TCM	Total deficit (TCM)	Water Used (TCM)
P1 – Annual Crops	0	0		W1: well – pipeline
P2	0	0	0	W2: nil
P3	4.5	12	7.3	W3: Soil moisture

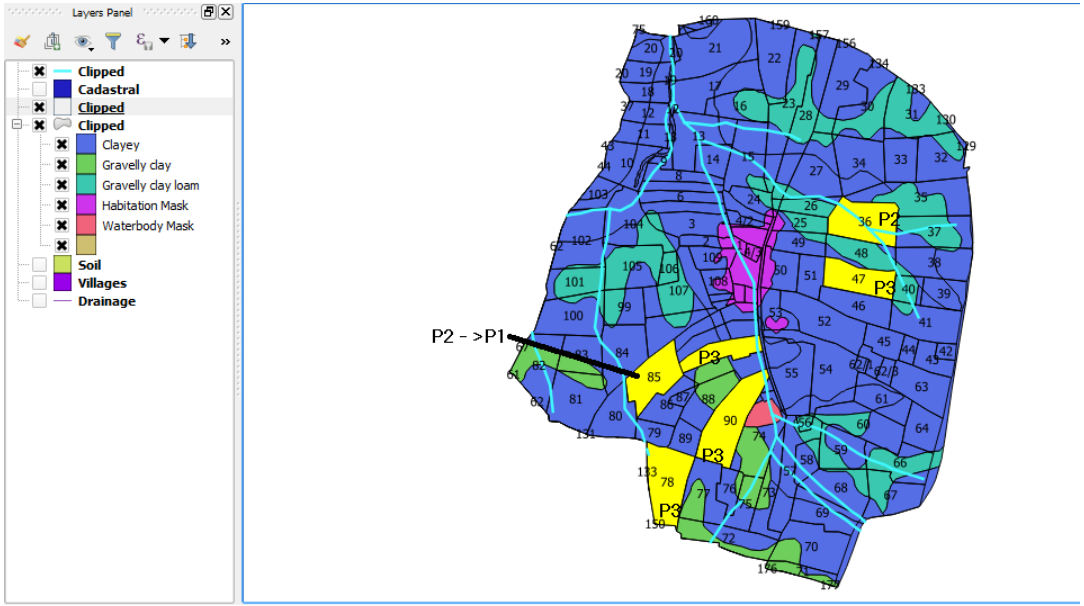
Continued..

- Village – Suleman Deola
- Farmer Name: Balasaheb Toradmal
- Gat no. 56
- Gat Size: 8 Acre
- Assets: well and borewell in gat no. 56 near nala
- Farmer category: P1
- Crops Acre – citrus- 1.5 ,orange – 2,
- cotton – 1 Acre



Crops	Area in Acre	PET in TCM	Total deficit (TCM)	Water Used (TCM)
P1 – Annual Crops	3.5	12.4	8.7	W1: Well
P2	1	3.1	1.6	
P3	0	0	0	

Shelgi, Latur Visit - surveys



- Considerable variation in soil types at farm level, soil depth - 0.5 - 8 foot variation
- Effect of PT seen in downstream wells (water retention till Feb - March
- Stream wells functional from july to december
- Non stream wells keep getting water after december

P3 Farmers - Typical scenario and demands (Shelgi)

Farmer Name	Gat no.	Farm Area in hectare	Crop category	Crops	Crop Area in ha	PET in TCM	Deficit in TCM	Water Access/ Current Assets	Demands/ Proposed Assets
Biradar Murlidhar Suleman	78	1.8	P1 Annuals	Soybean, Tur,Udid,Moong, harbara				W1: nil	well (shift to P2 crops)
			P2 Kharif					W2: nil	
			P2 Rabi					W3: soil moisture, complete rainfed farming	
			P3 Kharif+Rabi		1.8	9.9	4.3		
Maruti Niwrati Shinde	47	1.6	P1 Annuals	Soybean, Tur,Udid,Moong, harbara				W1: nil	well desilting and deepening, shelipalan
			P2 Kharif					W2: 1 well, recharge from PT, needs repair, no waterings now	
			P2 Rabi						
			P3 Kharif+Rabi		2.4	9.1	4.1	W3: soil moisture	
Ramdev Maruti Biradar	90	1.2	P1 Annuals	Soybean,Udid,Moong, gram				W1:nala near farm, lift for rabi - rental pump	well, pump, pipeline (shift to P2 crops)
			P2 Kharif						
			P2 Rabi					W2: nil	
			P3 Kharif+Rabi		1.6	5.9	2.5	W3: soil moisture	
niwratti Gundaji Birarar	92	1.2	P1 Annuals	Soybean, Tur,Udid,Moong, gram				W1: small nala - well near nala	well deepening (shift to P2 crops)
			P2 Kharif					W2:nil	
			P2 Rabi					W3: soil moisture	
			P3 Kharif+Rabi		3.0	4.0	1.7		

P1 and P2 farmers: Typical scenarios

Village Name	Farmer Name	Gat no.	Farm Area in hectare	Crop category	Crops	Crop Area in ha	PET in TCM	Deficit in TCM	Water Access/ Current Assets	Demands/ Proposed Assets
Shelgi, Latur	Sarubhai harubhai kamble (P2)	36C	3.05	P1 Annuals					W1: nil	drip for vegetables (improving P2 yield)
				P2 Kharif		0.1	0.5	0.2	W2: well on stream	
				P2 Rabi	vegetables, onion	0.6	3.4	1.3		
				P3 Kharif+Rabi	soybean, tur, moong	1.0	4.3	1.4	W3: soil moisture, complete rainfed farming	
Shelgi, Latur	Bhiwaji Digambar Kamble (P2)	85	1.5	P1 Annuals						
				P2 Kharif	groundnut	0.4	1	0.6	W1:Farm pond	Farmpond repair, annual crops (shift from P2 to P1 crops)
				P2 Rabi	sunflower	0.2	1	0.28378	W2: well, borewell - 2500 foot pipeline	
				P3 Kharif+Rabi	soyabean	0.2	2	0.5	W3:soil moisture	
Suleman Deola, Beed	Raju Nizam Sikh (P2)	111	1.2	P1 Annuals						
				P2 Kharif	cotton	1	3.2	1.2	W1: well near nala	
				P2 Rabi	onion	1	2.2	0.9	W2: nil	
				P3 Kharif+Rabi	bajri	1	1.4	0.7	W3: soil moisture	Farm pond (shift to P1)
Suleman Deola, Beed	Jagannath Sunde (P1)	9	8.4	P1 Annuals	citrus, orange, mango	4.2	35	23.5	W1: well near nala in gat 56 - 2.5 km pipeline	Farm pond (additional area under P1), annual crops
				P2 Kharif	cotton	0.8	12.8	4.9	W2:borewells - 2	
				P2 Rabi					W3: soil moisture	
				P3 Kharif+Rabi	jowar, moong	2.8	10.4	5.7		

Plugin and app update

- Mahabhulekh Data
- Automation of Zoning Process
- Preparation of Agri advisories and Monitoring System
- Technical and Research support
- Android App Development
- Further Research Required

Mahabhulekh Data

Problem – Currently Microplanning teams are facing problems while entering cropping data as zone wise such database is not readily available with Agri - assistant.

Solution – Provide default cropping pattern values in the PoCRA App for Microplanning team and Agri assistant.

Analysis Required -

•Analysis of Mahabhulekh Data and Gat wise extraction of cropping data from the database.

•Matching of the database with the cadastral shapefile.

•Extraction of area under Non Ag land from the shapefile.

•Integration with Plugin output and PoCRA App.

•Transfer of code for PoCRA app is required from Nano stuff for integration.

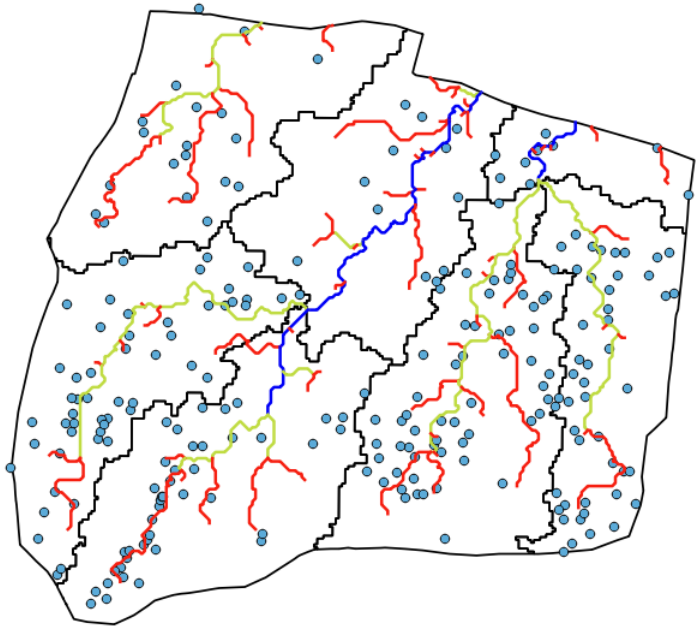
Automation of zoning Process

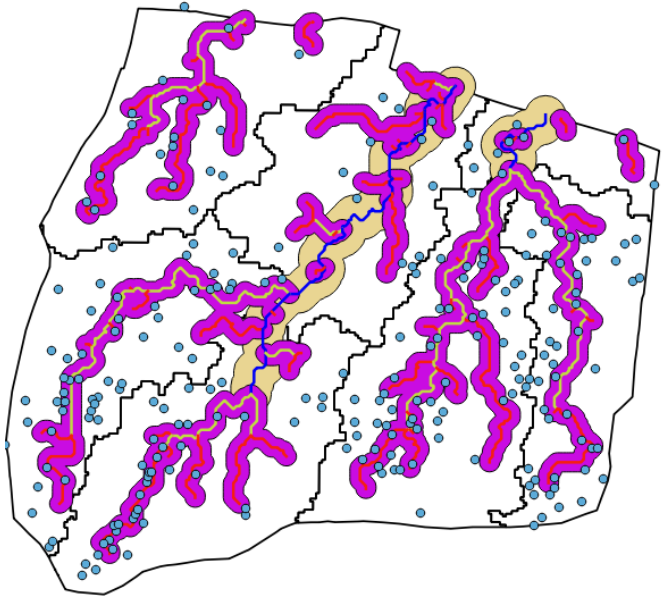
Problem – Currently Zoning is being done manually which is very time consuming and one dedicated person is required.

Solution – Automation of zoning process for PoCRA as well as other districts.

Analysis Required -

- Study of available algorithms for delineation of watersheds.
- Design of merging algorithms for the automation of zones.
- Inclusion of stream proximity in the Zones.
- Study the possibility of generation of zones from GSDA PDF maps.
- Study the other approaches for generation of zones.





Problem - Preparation of Agri advisories and Monitoring System

Solution -

Preparation of Dashboard for monitoring the Current Crop stress scenarios.

•The dashboard will provide Sowing and Irrigation related advisories.

Analysis Required

- Integration of real time Rainfall API from skymet into the Dashboard.
- Integration of ETo Feed from ahwere or Compute the ETo from the skymet data.
- Extension of our water balance framework towards more dynamic one. Use of daily and predicted rainfall, ETo values in our model for Advisories on irrigation, sowing date. Following indexes can be used to prepare some advisories.
- Percentage Available soil Moisture.
- Moisture Adequacy Index.
- Rainfall Deviation/Standardized Precipitation Index.
- NDVI, NDWI deviation Index.
- Area Under Crop Sowing.

•Percentage Available soil Moisture = [(SMw-PWP)/(FC_PWP)]*100

•SMw – Weekly available soil Moisture from Model for selected crop.

•PWP – Permanent wilting point

•FC - Field capacity

•Frequency: weekly

Sowing Date can be predicted based upon it.

•Mai: Moisture Adequacy index = [AET/PET]*100

•AET : weekly crop evapotranspiration

• PET / RET: weekly potential / reference evapotranspiration

• PWP: Permanent wilting point of soil

• Frequency: weekly

• Initiation: with the dates of actual sowing

(MAI) is a better measure for assessing the degree of adequacy of rainfall and soil moisture to meet the potential water requirement of crops. It can be used for generation of irrigation based advisories.

Technical and Research support

Dashboard example for tracking soil-moisture status(soil-moisture deficit):

1. Maintain a “roster file” of grid-points covering each district and containing all the necessary static (point-wise) data to simulate the soil-moisture balance model
2. Load the current roster, input the available rainfall data, run the model and save the new status into an updated roster file.
3. Apply step 2 whenever latest rainfall data becomes available.
4. Display the status in the rosters for various days in the form of colour-shaded GeoTiff rasters

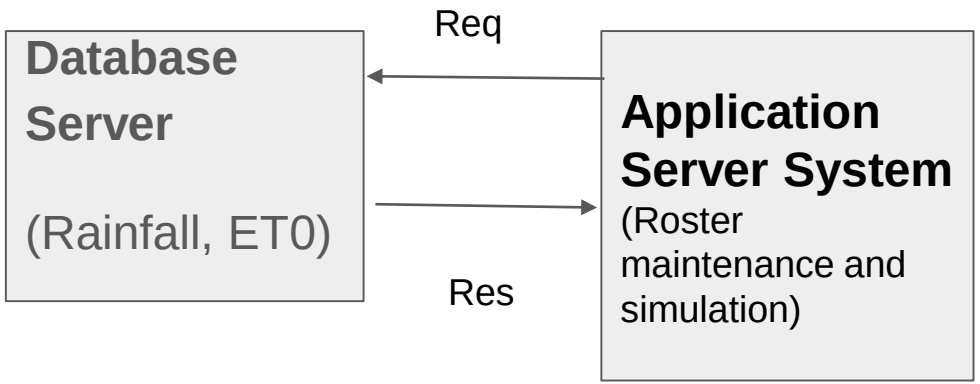
Technical and Research support

Updated Roster :: Features total: 36888, filtered: 36888, selected: 0

	Grid Row N	X	Y	District	Taluka Cod	Village Co	Soil Textu	Soil Depth	LULC Type	Rainfall C	Slope	status_yea	status_doy	sow_thresh	sm1_frac	layer2_moi	pri_runoff	infil	aet	gw_rech	sec_runoff
30587	176	743500	2196500	Hingoli	4112	545881	clayey	1.50000...	forest	Sirsam Bk.	7.328...	2013	44	30	0.43179...	0.413046...	43.67425...	351.32...	102.19...	0.00000...	72.816583..
31609	182	732500	2199500	Hingoli	4112	545873	waterbo...	0.10000...	scrub	Sirsam Bk.	6.778...	2013	44	30	0.38376...	0.427116...	234.8090...	160.19...	95.323...	11.1301...	45.227490..
32461	187	723500	2202000	Hingoli	4112	545853	waterbo...	0.10000...	agriculture	Malhiwara	8.327...	2013	44	30	0.35281...	0.427116...	206.7712...	146.22...	89.299...	10.1490...	41.055335..
30725	177	725500	2197000	Hingoli	4112	545864	waterbo...	0.10000...	agriculture	Malhiwara	4.113...	2013	44	30	0.35281...	0.427116...	206.7712...	146.22...	89.299...	10.1490...	41.055335..
32813	189	725500	2203000	Hingoli	4112	545853	waterbo...	0.10000...	agriculture	Malhiwara	3.601...	2013	44	30	0.35281...	0.427116...	206.7712...	146.22...	89.299...	10.1490...	41.055335..
34904	201	727000	2209000	Hingoli	4112	545847	waterbo...	0.10000...	agriculture	Malhiwara	4.831...	2013	44	30	0.35281...	0.427116...	206.7712...	146.22...	89.299...	10.1490...	41.055335..
34738	200	731000	2208500	Hingoli	4112	545846	waterbo...	0.10000...	agriculture	Malhiwara	6.168...	2013	44	30	0.35281...	0.427116...	206.7712...	146.22...	89.299...	10.1490...	41.055335..
35435	204	731500	2210500	Hingoli	4112	545845	waterbo...	0.10000...	agriculture	Malhiwara	3.547...	2013	44	30	0.35281...	0.427116...	206.7712...	146.22...	89.299...	10.1490...	41.055335..
24115	139	726500	2178000	Hingoli	4112	545959	waterbo...	0.10000...	wasteland	Basamba	0.587...	2013	44	30	0.36046...	0.427116...	231.7813...	140.21...	89.293...	11.3873...	33.124727..
24116	139	727000	2178000	Hingoli	4112	545959	waterbo...	0.10000...	agriculture	Basamba	7.688...	2013	44	30	0.36046...	0.427116...	231.7813...	140.21...	89.293...	11.3873...	33.124727..
27597	159	727500	2188000	Hingoli	4112	545919	waterbo...	0.10000...	agriculture	Basamba	5.496...	2013	44	30	0.36046...	0.427116...	231.7813...	140.21...	89.293...	11.3873...	33.124727..
16633	96	726500	2156500	Hingoli	4115	546338	gravelly ...	0.10000...	forest	Kurunda	14.08...	2013	44	30	0.41200...	0.273005...	103.1711...	226.82...	123.68...	49.5392...	29.798557..
19644	113	753000	2165000	Hingoli	4114	546213	waterbo...	0.10000...	agriculture	Akhada B...	4.014...	2013	44	30	0.42717...	0.428510...	288.9438...	151.05...	94.191...	15.7295...	28.703721..
19474	112	755000	2164500	Hingoli	4114	546201	waterbo...	0.10000...	agriculture	Akhada B...	3.355...	2013	44	30	0.42717...	0.428510...	288.9438...	151.05...	94.191...	15.7295...	28.703721..

Roster in shapefile format

Technical and Research support

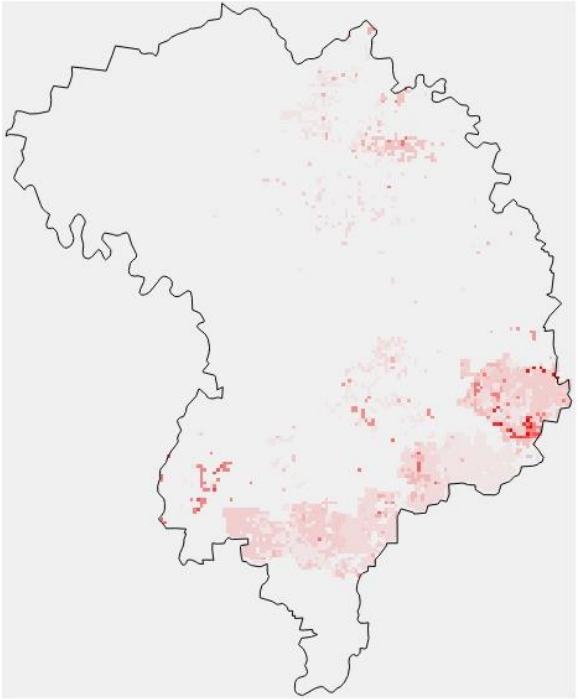


Roster-based soil-moisture deficit monitoring - basic technical architecture

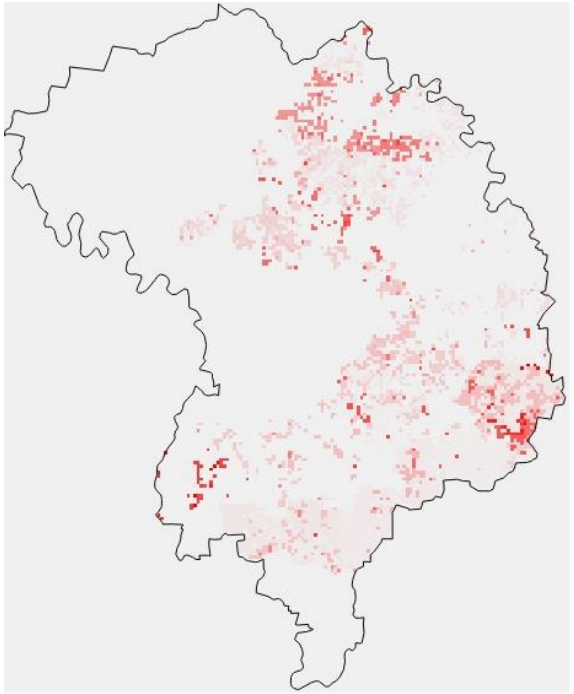
Examples of other possible utilities on the dashboard:

- For analysis of available data for insights
- For generating various indices at various geo-levels like district, cluster, (mini-/sub-)watershed, village, cadastral, etc.
- GIS processing tools customized for specific tasks required in planning
- Other POCRA activities

Example of tracking/monitoring soil-moisture status

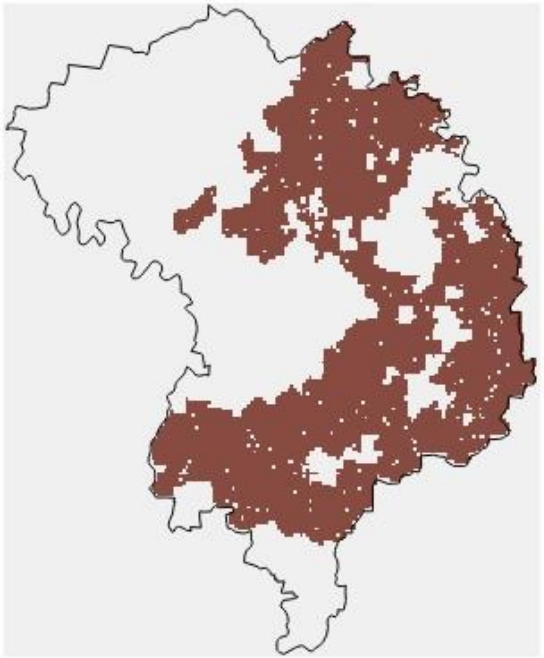


Hingoli soyabean on 15 Jul 2013;
max-deficit: 21mm

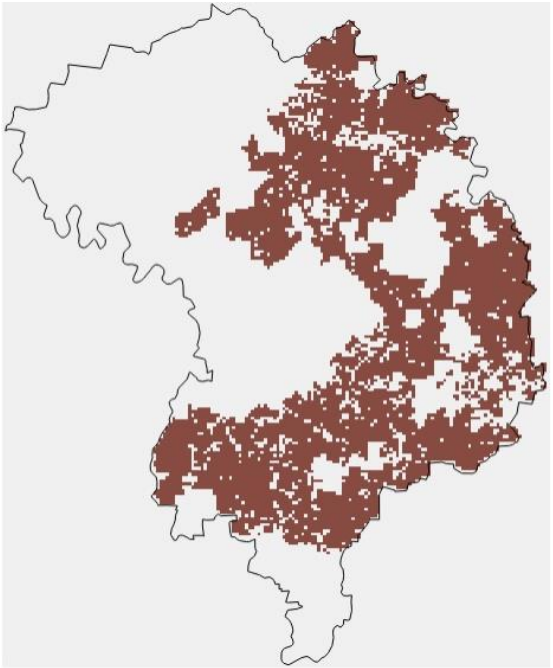


Hingoli soyabean on 12 Aug 2013;
max-deficit: 72mm

Example of tracking/monitoring soil-moisture status



AET/PET for Hingoli soyabean on 15 Jul 2013



AET/PET for Hingoli soyabean on 12 Aug 2013

Further Research Required

Impact of compartment bunding.

Interaction of surface and groundwater and further improvement in water balance.

Impact of Drip irrigation on PET.

Absence of technical manual from MRSAC soil map. Validation of MRSAC soil map by taking 50 soil samples from the 5 villages.

Research on Water productivity and water use efficiency.

Design of Formats for students from Agri Universities, 6 months stay in the village.