

# नानाजी देशमुख कृषी संजीवनी प्रकल्प पाण्याचा ताळबंद व झोन सर्वे ट्रेनिंग

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# आजचा कार्यक्रम

- गावातल्या समस्या - शेती आणि पाणी
- पाण्याचे वार्षिक चक्र व त्याचे घटक
- Detailed Farm and Well Survey in selected locations
- Zone Survey व गावामध्ये लागणारी सामग्री, त्याचा वापर व कृती
- शेती साठी लागणारे पाणी - zone मध्ये पाण्याचे गणित व हिशेब
- एक उदाहरण

# गावातील महत्वाच्या समस्या

- खरीप हंगामातील वाढत/लांबत चाललेले पावसाचे खंड (dry spells)
  - दुबार पेरणी
  - पिकाचे नुकसान
  - संरक्षित सिंचनाची गरज
- रब्बी हंगामात पिकाला कमी पडणारे पाणी
  - उत्पादकता कमी, बाजार भाव कमी, आर्थिक नुकसान
  - भूजलासाठी स्पर्धा, विहिरी लवकर आटणे
  - रब्बी च्या सुरुवातीला पाण्याच्या उपलब्धतेनुसार सामुहिक रित्या पिक पद्धत ठरविण्याची गरज

# गावातील महत्वाच्या समस्या

- वाढत चाललेली मातीची धूप
  - मातीचा थर कमी होणे
  - मातीतील पाणी साठवून ठेवण्याची क्षमता कमी होणे
  - खरीप मध्ये पावसाचा खंड पडल्यास मातीतील पाणी कमी पडणे
  - रब्बी मध्ये केवळ मातीतील ओलाव्या वर घेतली जाणारी पिके कमी होणे
- Ridge to valley पद्धतीने मृद संधारणाची कामे करून माती ची धूप कमी करणे आवश्यक

# उपलब्ध पाण्याचा अंदाज, त्याचे नियोजन व उपाय

## पाण्याचा ताळेबंद

- खरीप साठी लागणाऱ्या संरक्षित सिंचनाचा अंदाज
- मृद व जल संधारण कामा द्वारे खरीप माधे उपलब्ध होऊ शकणार्या संरक्षित सिंचनाचा अंदाज
- रबी साठी लागणाऱ्या पाण्याचा अंदाज
- रबी साठी उपलब्ध पाण्याचा अंदाज
- गाव पातळीवर मृद व जल संधारण कामांसाठी योग्य जागेची निवड

## प्रकल्पातील जल व मृद संधारण कामे

- शेततळे
- नाला रुंदीकरण, खोलीकरण
- MNB, CNB, Compartment Bunding, Graded Bunding
- CCT, Deep CCT
- विहीर, बोरेवेल
- Loose boulder structures, Drainage Line Treatment

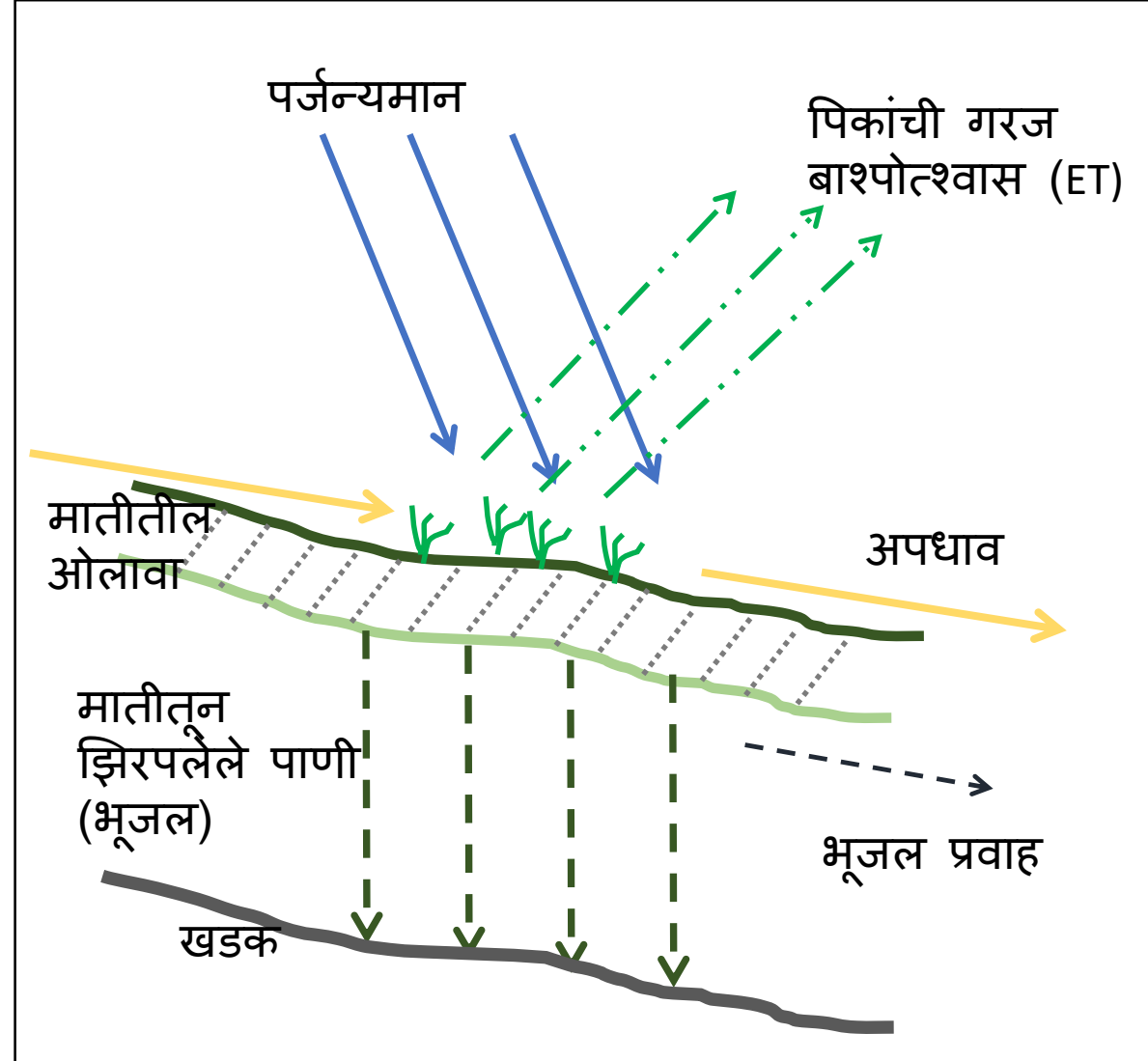
## खरीप हंगामात संरक्षित सिंचनासाठी नाला व अपधाव नियोजन

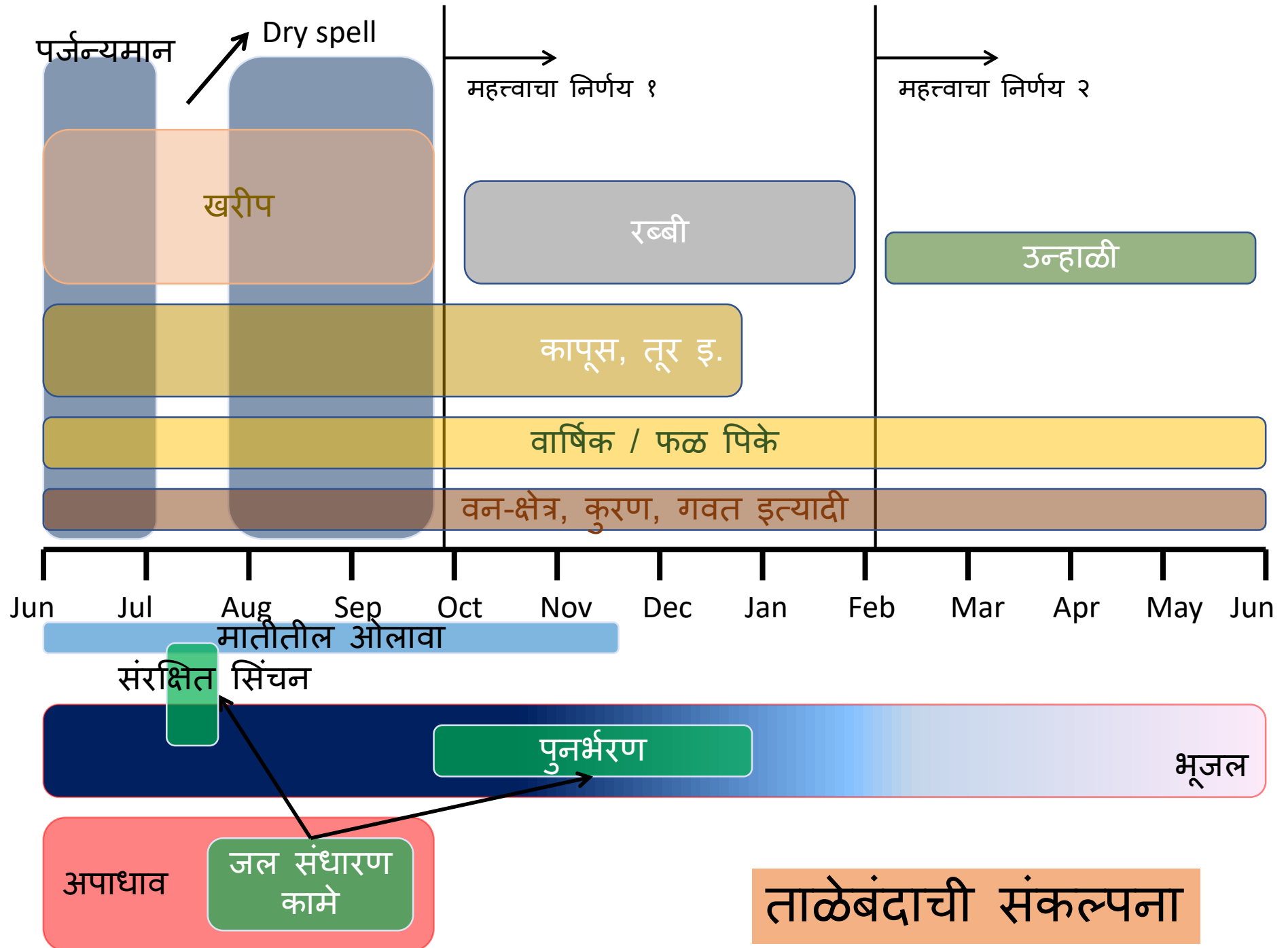
७० हे. चा छोटा पाणलोट



शेत तळे,  
छोटे बंधारे,  
खोलीकरण इ.

# Simple hydrological cycle ताळेबंदातील प्रमुख घटक



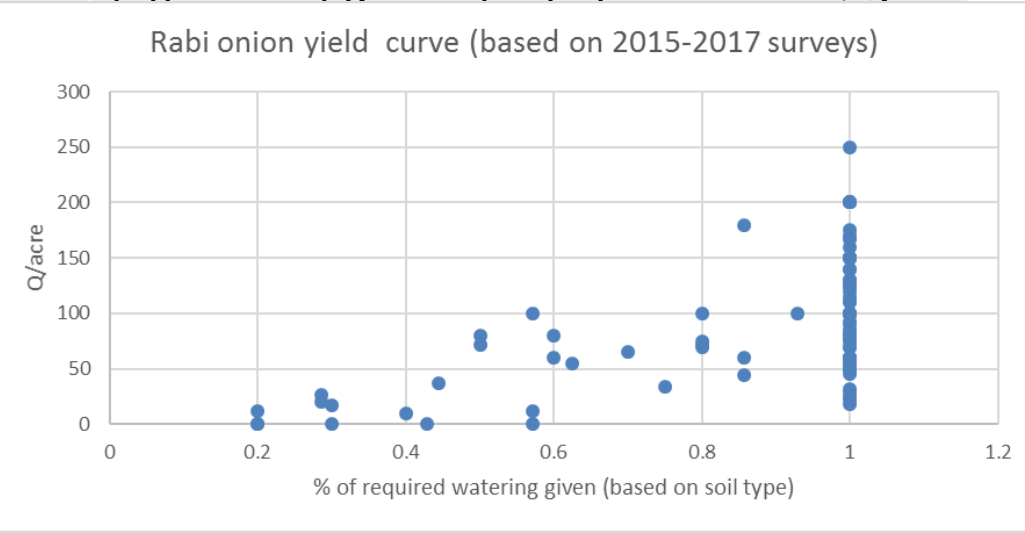
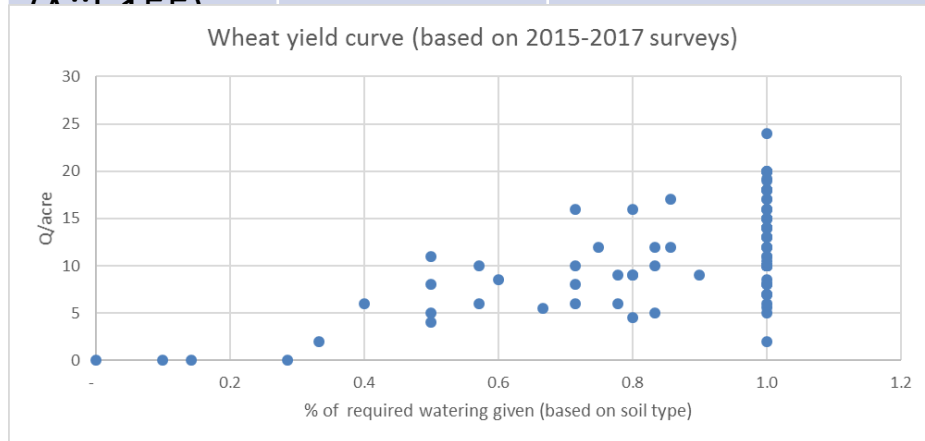


1. Climate resilience and need for water budget
2. Water balance: Technical details
3. Water budget exercise: Methodology adopted
4. Example



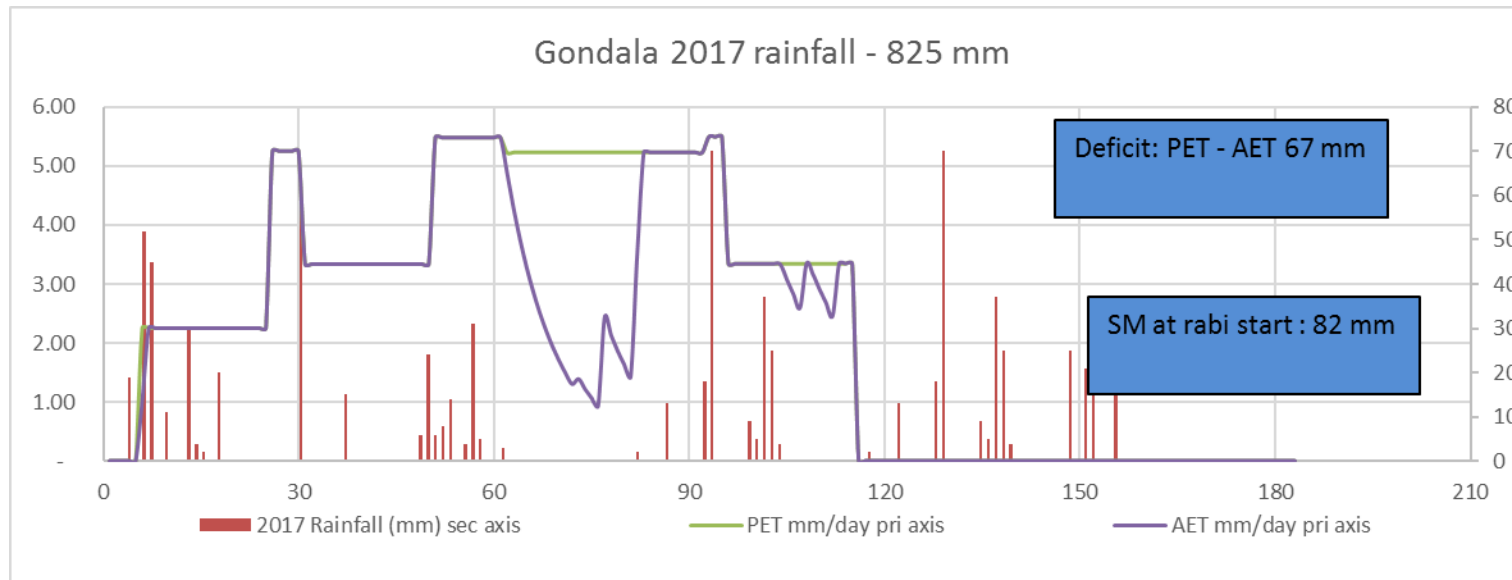
# Ghusar cluster: Farmer yields surveys

Crop	Farmer No	Unirrigated	Irrigated
<b>Cotton</b> (A.M. 155)	1. w/FP	7Q/acre (in 2017)	8Q/acre (one irr in 2016)
			8Q (July 2017 protective irr)
			12Q (1 kharif protective + 1 in Nov 2017)
			6Q (one irrigation)
			6-7Q (post mung; one irr Oct 2017)
	3. (w/bore)	5-6Q (after mung; no irrigation)	
(Jackie)	4.	6-7Q (post mung)	
<b>Soyabean</b>	1.	Crop failed (2017)	
	2. (w/bore)		
	3.	1.5Q (2017)	
<b>Tur</b>	1.	1.5Q/acre	

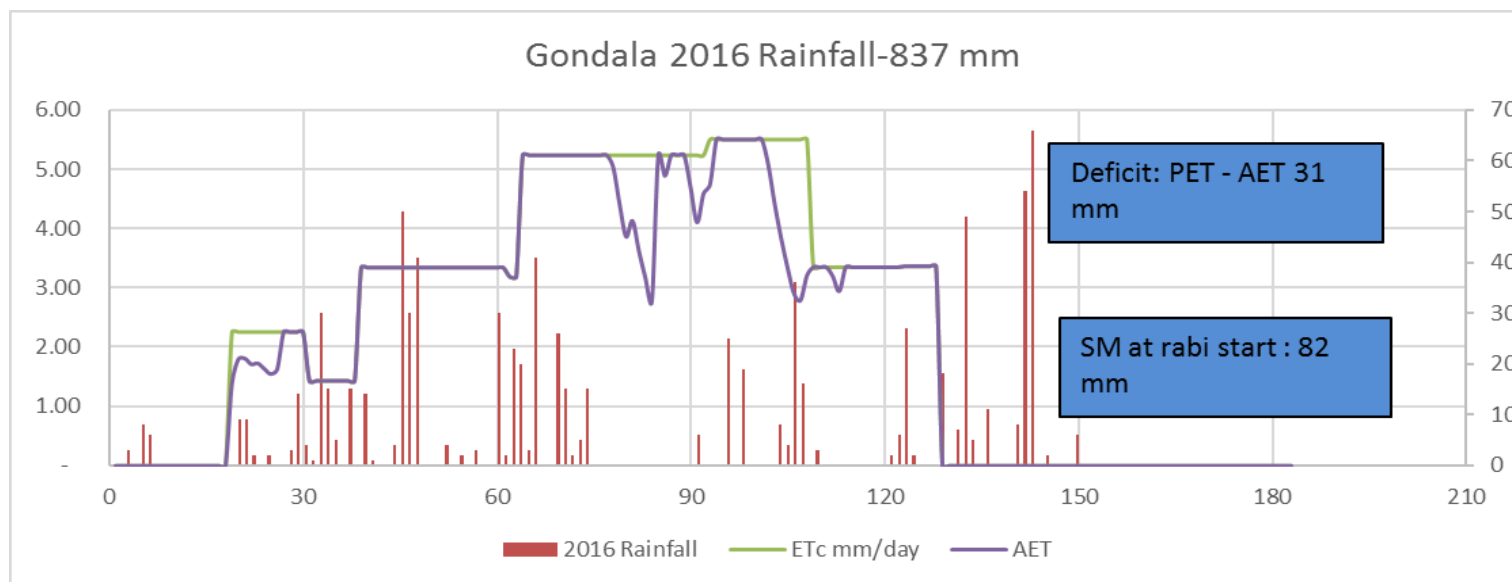


How do we stabilize yields?

# Kharif dry spell impact



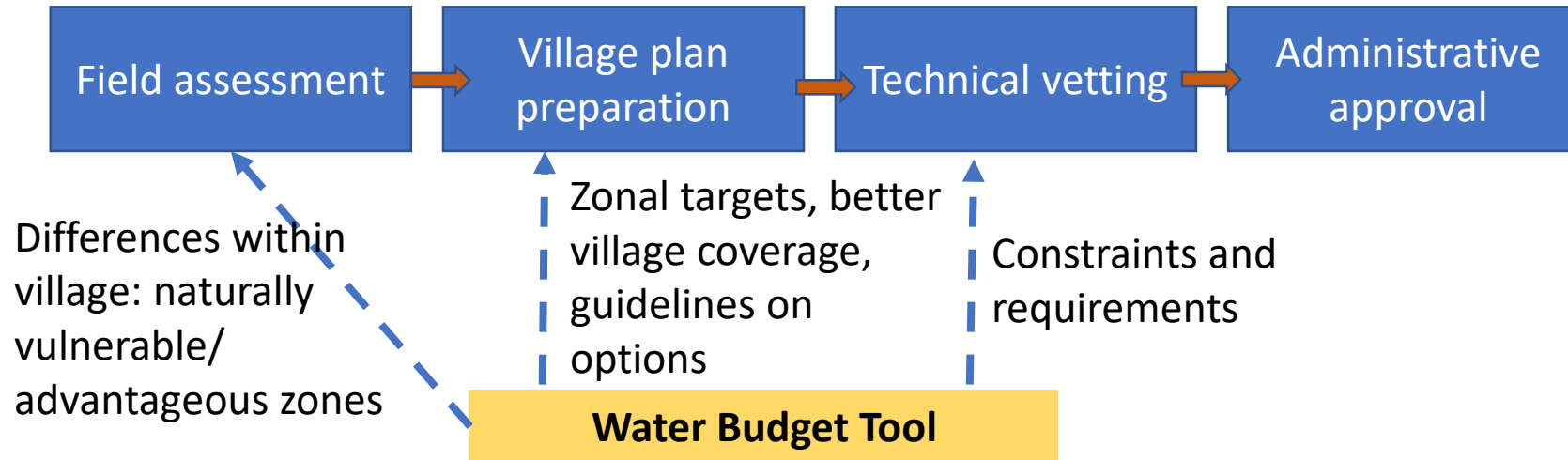
Component s (mm)	Year 2017
Rainfall	825.00
Runoff	251.50
Soil Moistur	82.60
GW Recha	113.83
AET	377.11



Crop: Soyabean

Component s (mm)	Year 2016
Rainfall	837.00
Runoff	273.00
Soil Moistur	82.60
GW Recha	84.40
AET	397.02

# New water balance approach



- How does community benefit?
  - Identification and targeting of naturally vulnerable farmers
  - Better choice, siting and better utility from interventions
  - Better coverage of entire village, uniform benefits
  - Focus on assuring protective irrigation to improve yields
  - More informed rabi cultivation and guidance on sustainability
  - Better land use and overall water availability including DW

# Role of RDF Fellows in Water Budgeting

- To assess across village the status of agriculture production and access to water
- To help in assessment of existing infrastructure and its utility in the village. (water in wells, FP utility)
- To ensure that correct data is available to field team
- To facilitate that correct data is recorded for village planning
- To guide the preparation of village plan
- Identify vulnerable farmers in the village
- Ensure that needs of village are correctly reflected in village plan
- To Monitor the implementation of village plan

भौगोलिक नकाशे

विहीर/शेतकरी सर्वे प्रक्रिया

क्षेत्रीय नियोजन

# Well Mapping and Detailed Farmer Survey for zones in village

Vulnerability Map	Stream Map
Less Vulnerable	Away from the stream
Less Vulnerable	Near the stream
More Vulnerable	Away from the stream
More Vulnerable	Near from the stream

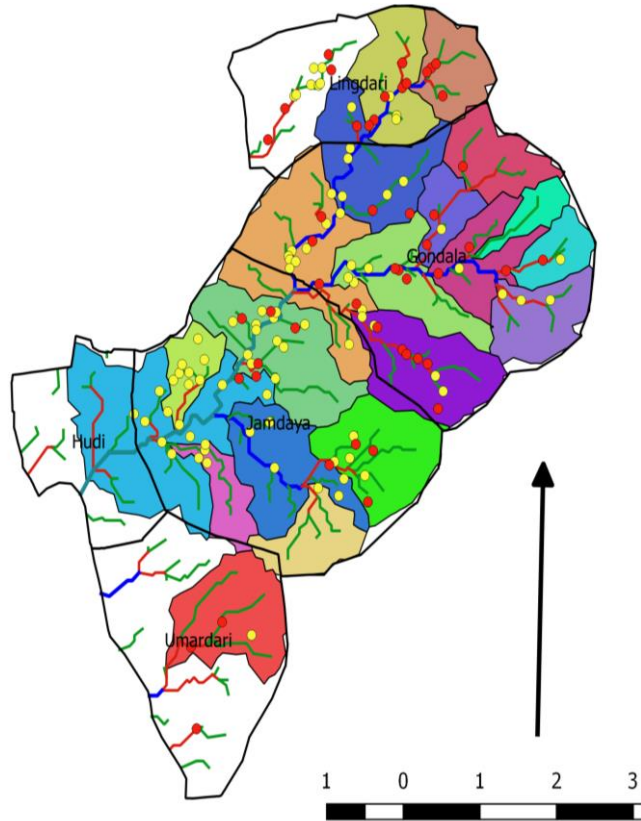
- Well selection criteria
  - Identify a farmer within the zone who is less vulnerable and who is more vulnerable (vulnerability maps)
  - Select a farmer whose field is close to the stream and whose field is away from the stream (use stream maps)
  - wells in these farmer fields should be mapped (zone maps)

- Available inputs/maps
  - Zone Maps with Gat no.
  - Streams Map with Gat no.
  - Vulnerability maps for two main crops with gat no.
  - Land Use Maps
  - Soil Texture Maps

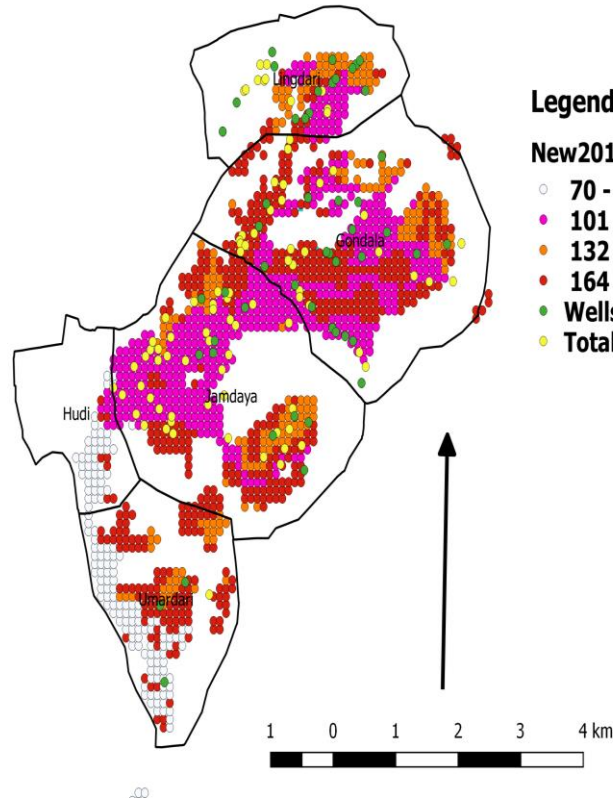
Survey questions
Well depth (feet)
In which month does it get filled to maximum level
Current well level (bgl)
Last month for irrigation
Well level in Oct, Dec, Jan
Borewell depth

# Well Mapping and Detailed Farmer Survey for zones in village

## Zone\_Map



## Soyabean\_2017

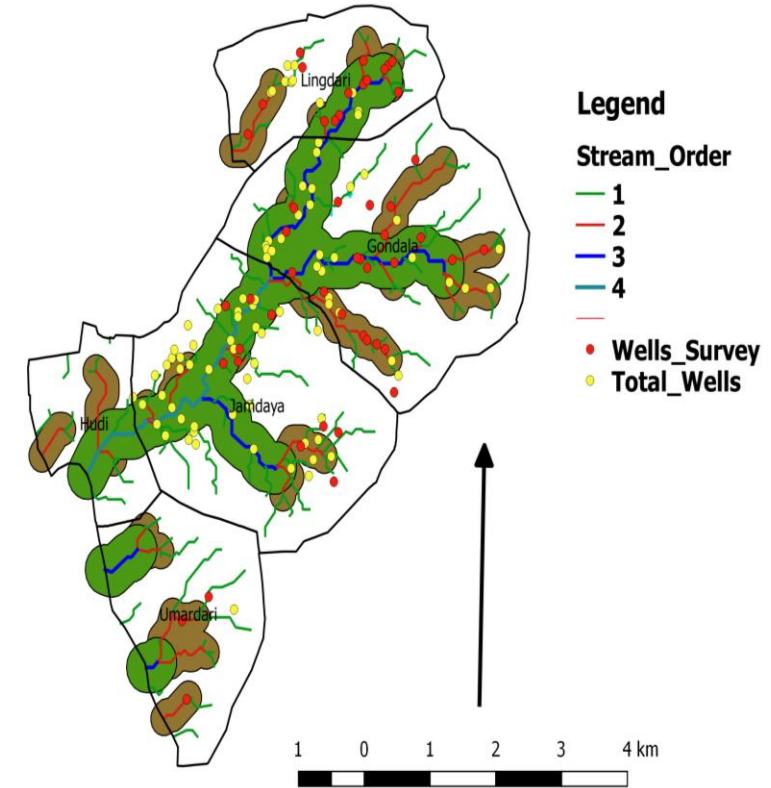


### Legend

New2017soya

- 70 - 101
- 101 - 132
- 132 - 164
- 164 - 236
- Wells\_Survey
- Total\_Wells

## Stream\_Order



### Legend

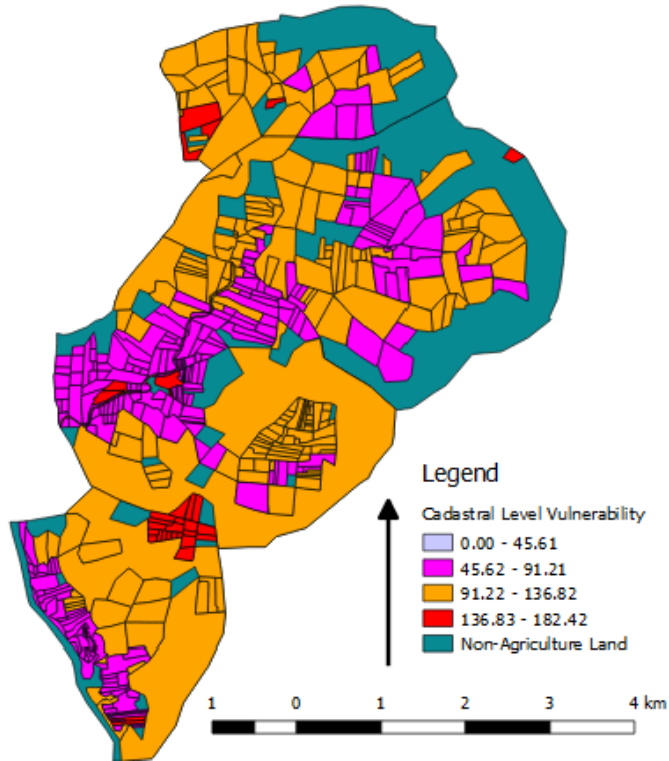
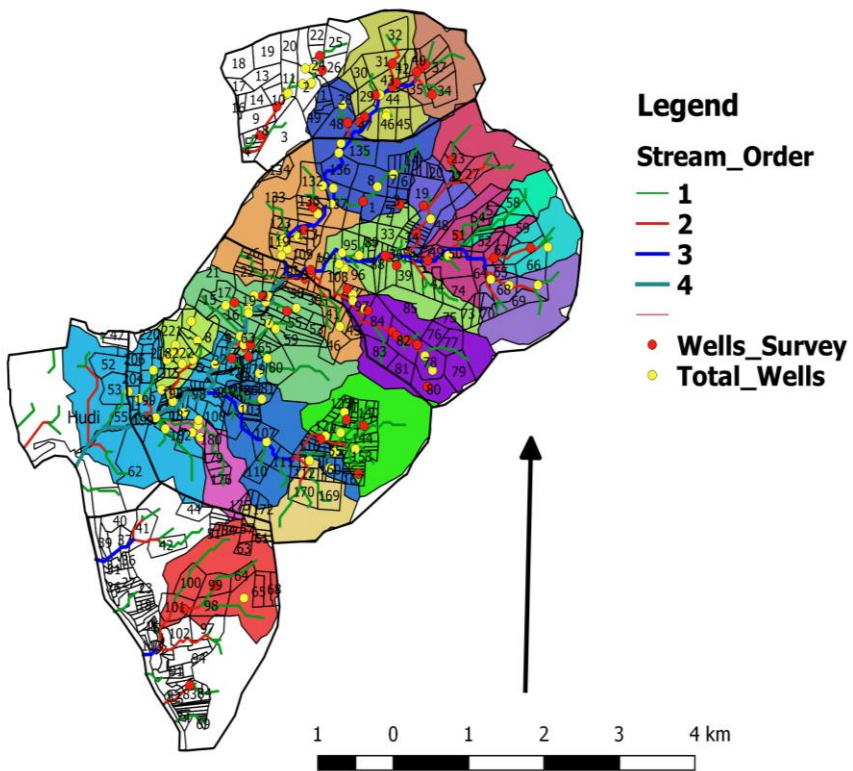
Stream\_Order

- 1
- 2
- 3
- 4
- Wells\_Survey
- Total\_Wells

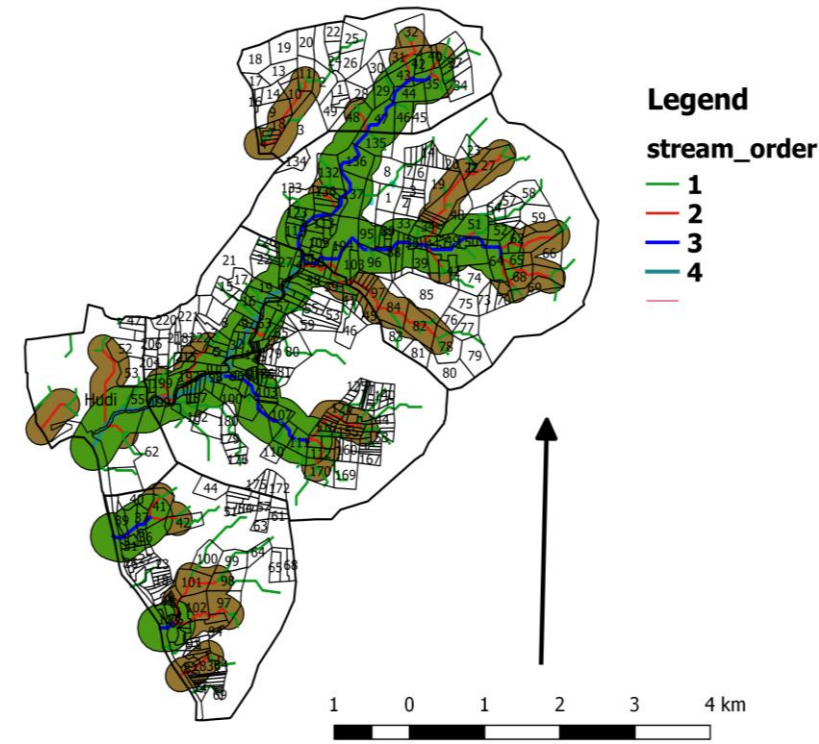


# Well Mapping and Detailed Farmer Survey for zones in village

**Zone\_Map**



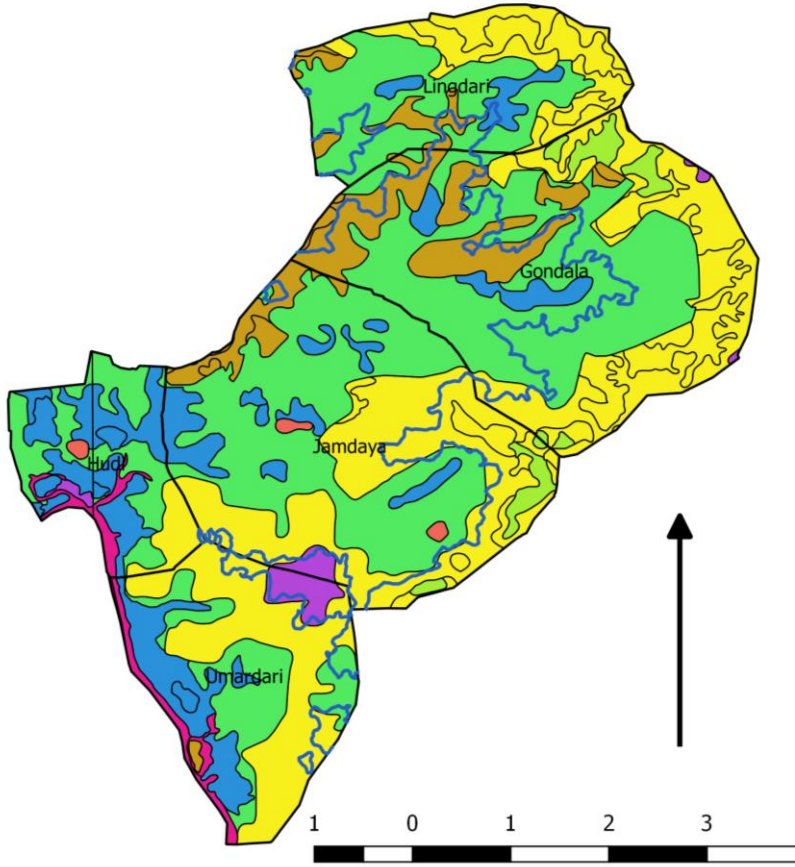
**Stream\_Order**



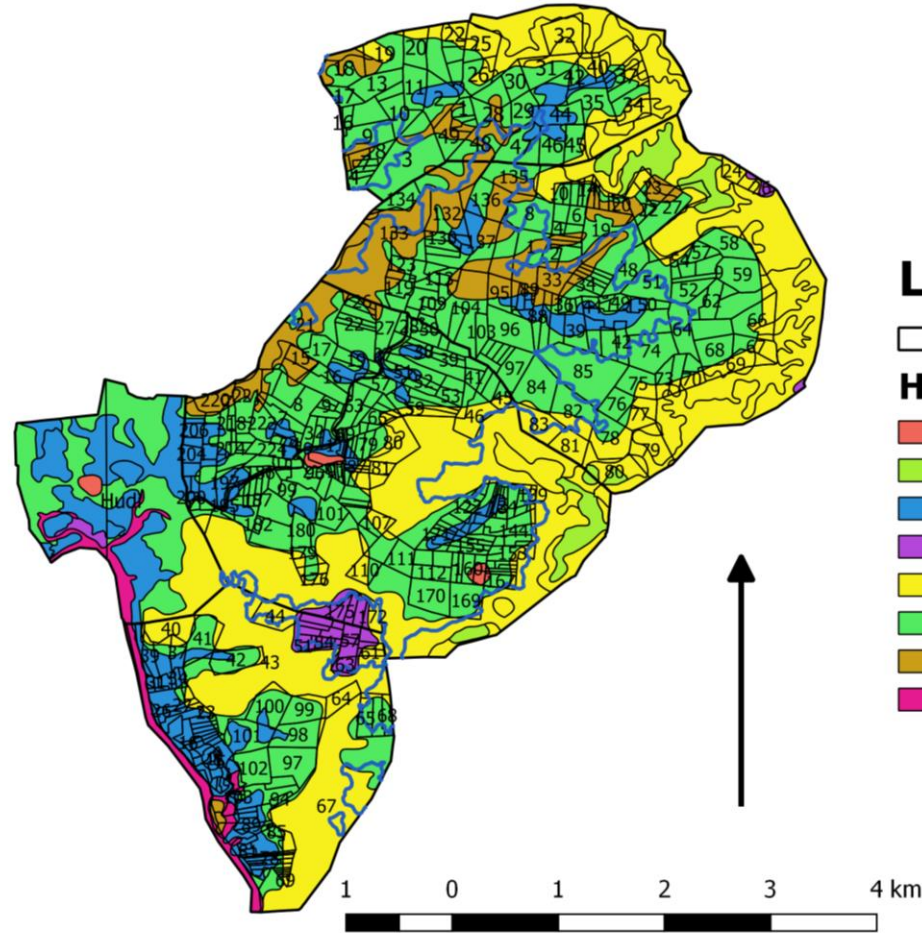


# Land use map (Gondhala, Hingoli)

## Gondala Cluster LU Map



## Gondala Cluster LU Map

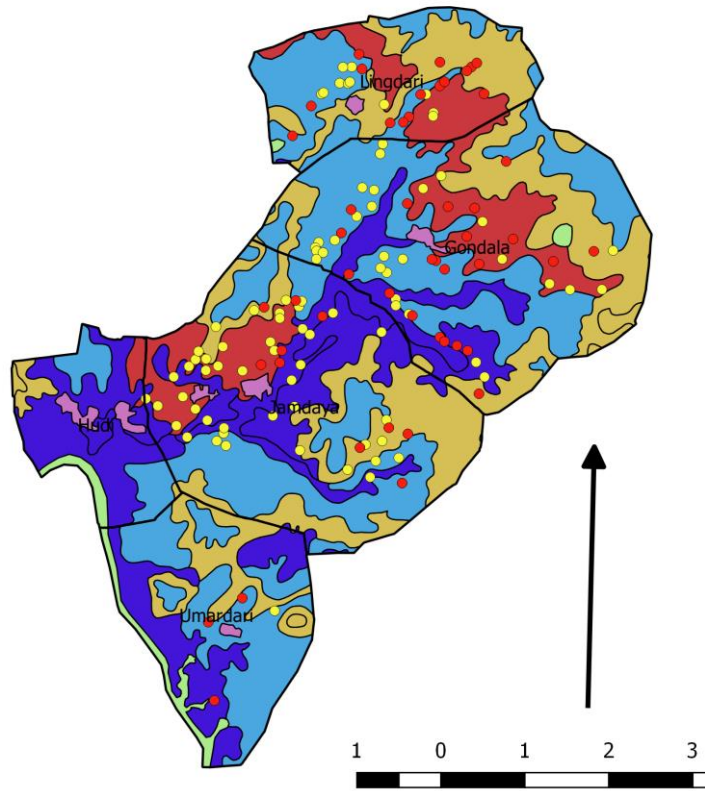


### Legend

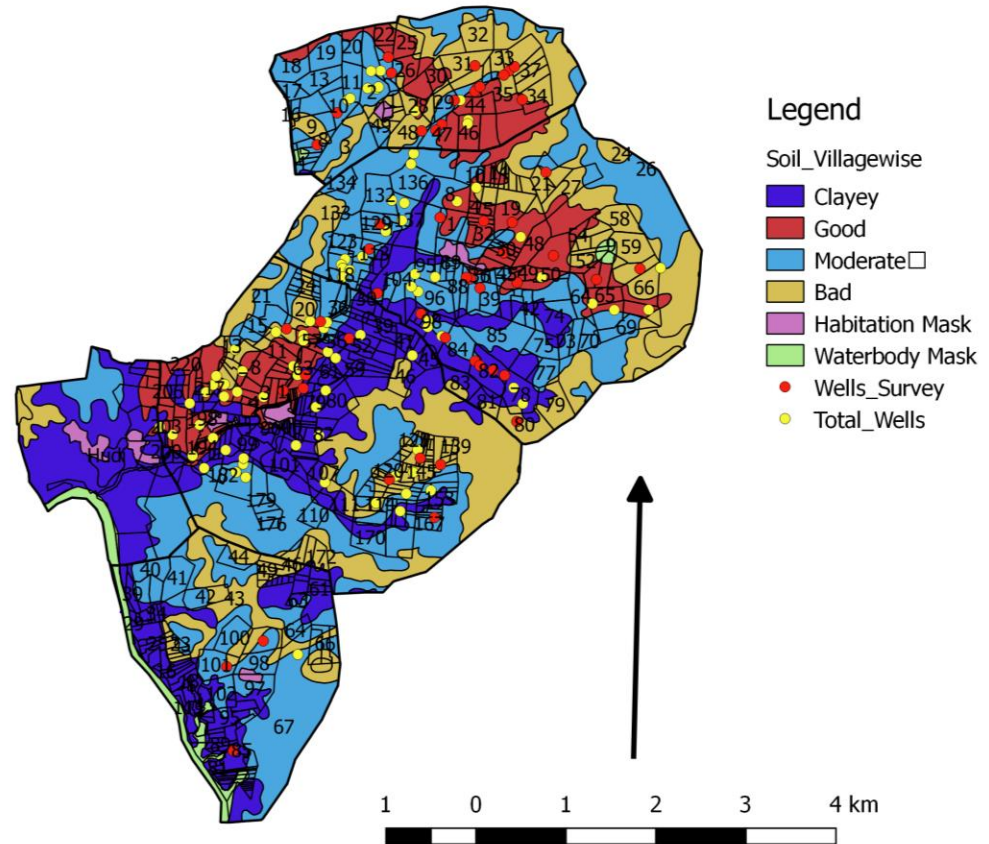
- Hingoli
- Hingoli\_LU**
- Built Up
- Dense Forest
- Double
- Fallow
- Scrub
- Single
- Wasteland
- Waterbodies

# Sample soil texture map (Gondhala, Hingoli)

Soil Map



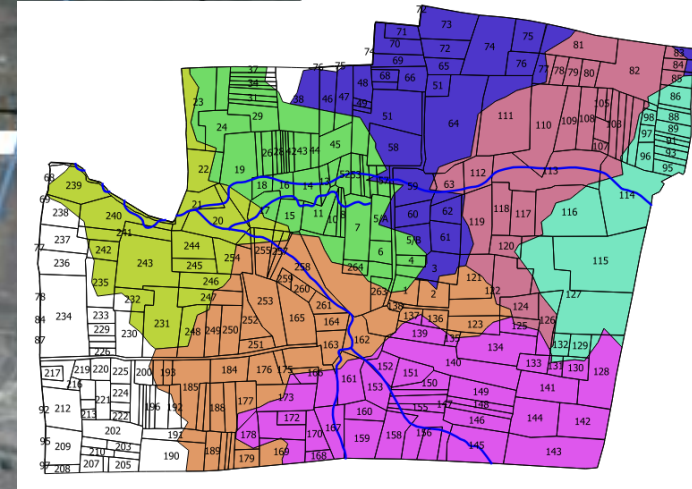
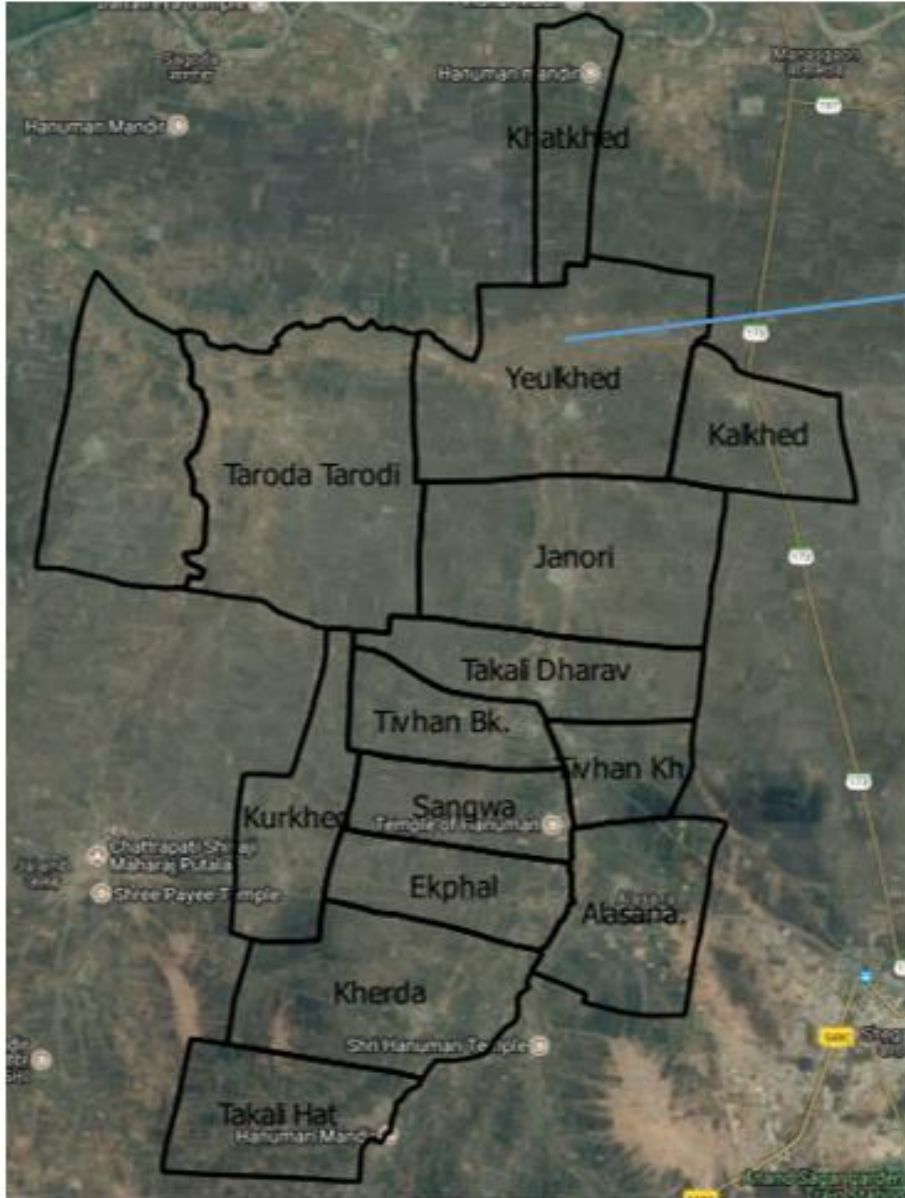
Soil Map



क्षेत्रीय नियोजन



# पाण्याचा ताळेबंद: येउलखेड मधील अनुभव



# येउलखेड मधील प्रमुख समस्या

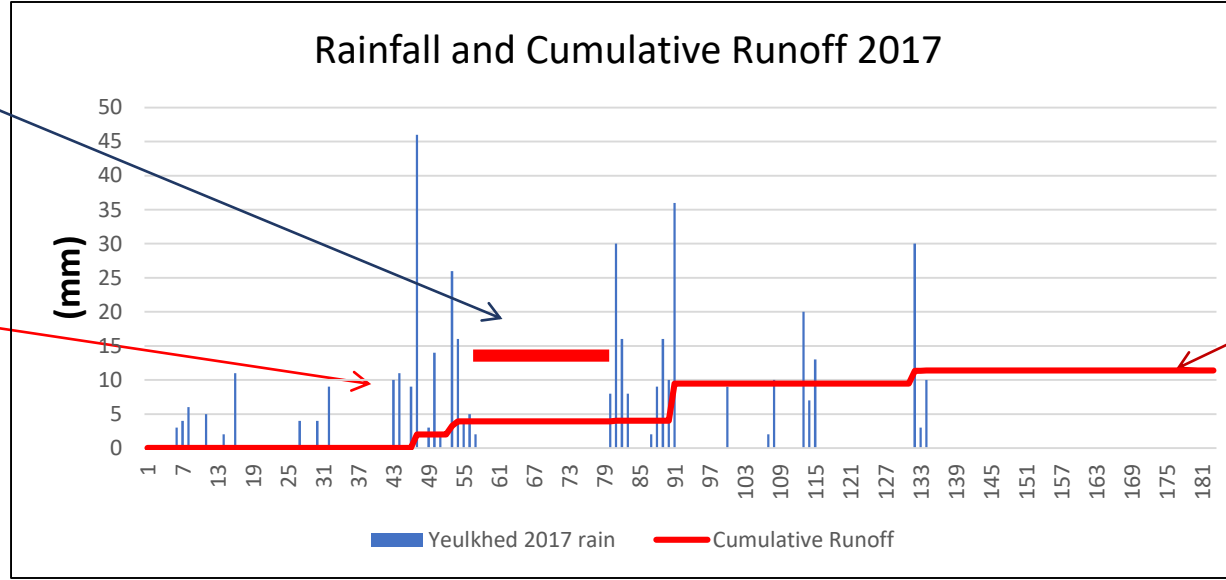
- खरपान पट्ट्यात असल्यामुळे भूजल स्रोत सिंचनासाठी अनुपयोगी
  - खरपण पट्टा असल्याने भूगर्भात खरे पाणी
  - अधिक वापर केल्यास मातीची प्रत बिघडते
- येउलखेड मध्ये clayey मातीचा थर असल्यामुळे मातीची पाणी साठवण क्षमता गाठल्यावर पावसाचे अधिक पाणी अपघावाचा रूपात वाहन जाते
  - पाझर कमी होते, भूगर्भात पुनर्भरण कमी होते
  - खरीप संरक्षित सिंचन आणि रबी साठी अपघाव नियोजनाची गरज
- येउलखेड मधील जमिनी जवळपास सपाट असल्याने व उतार कमी असल्याने शेत तले घेताना योग्य जागेची निवड करणे आवश्यक
  - land treatment आवश्यक

# अपधाव नियोजनाची गरज

पावसाचा खंड -  
२२ दिवस

प्रति दिन  
पर्जन्यमान

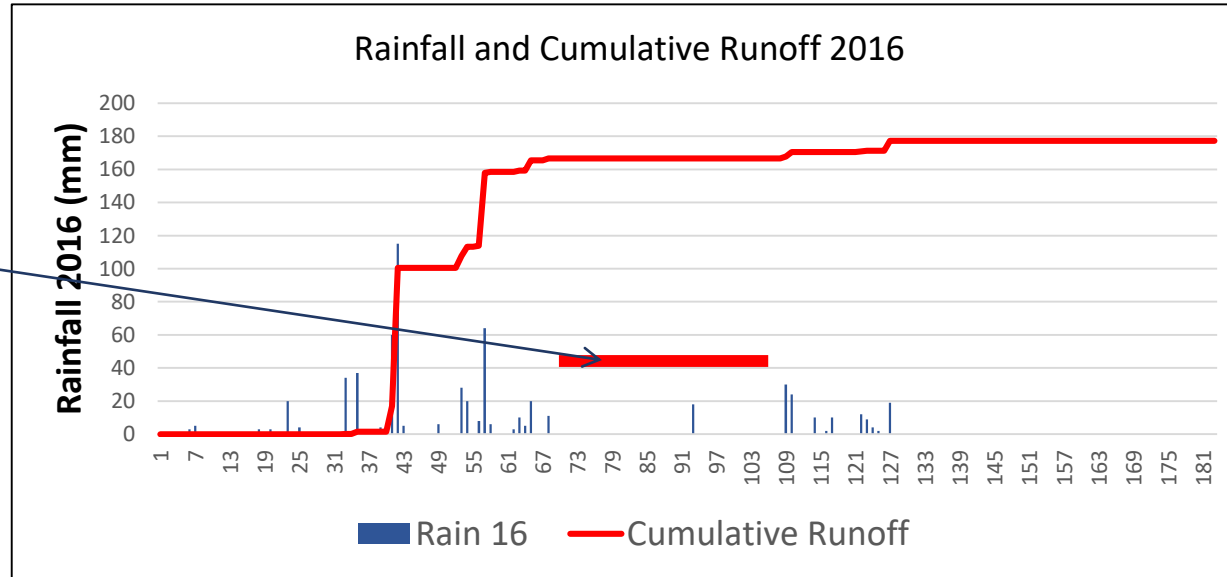
येउलखेड(२०१७)



संकलित  
अपधाव  
(cumulative)

पावसाचा खंड -  
४० दिवस

येउलखेड(२०१६)



# येउलखेड मधील सदय स्थिती



Nala Deepening and Widening



Nala without Deepening and Widening



Impact of Deepening on Nearby Farm Ponds

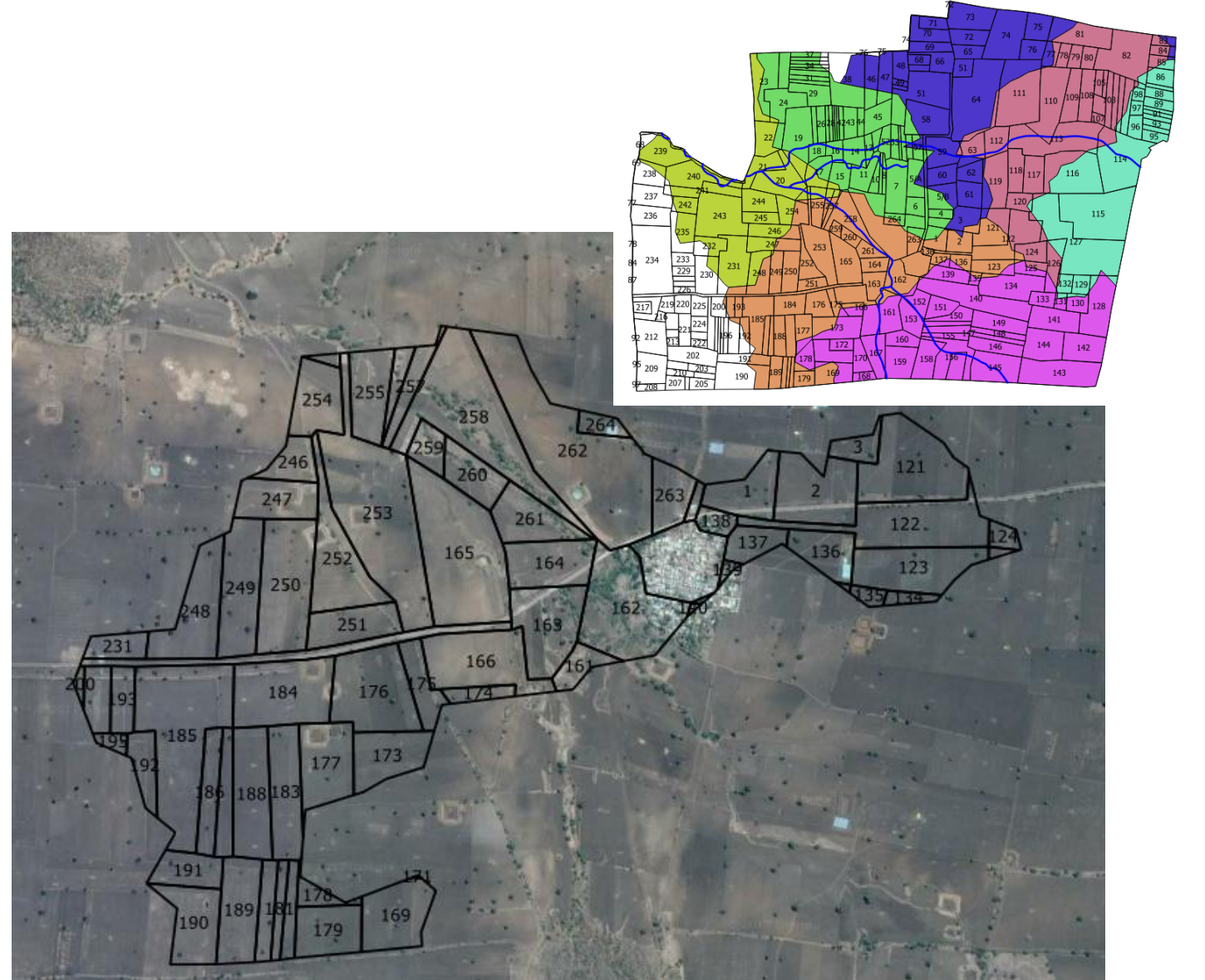


Farm Ponds Away from Nala or streams



# येउलखेड झोन - पाण्याचा ताळेबंद उदाहरण

- झोन पातळी वर पाण्याचा ताळेबंद
- येउलखेड - ८ सबझोन (पाणलोट) मध्ये विभागले
  - प्रत्येक सब झोन माधे ३० - ५० गट नो.
  - **Zone Total Area: 125 Acre**
  - **Zone Agricultural Area: 110 Acre**





# basic model data and questions

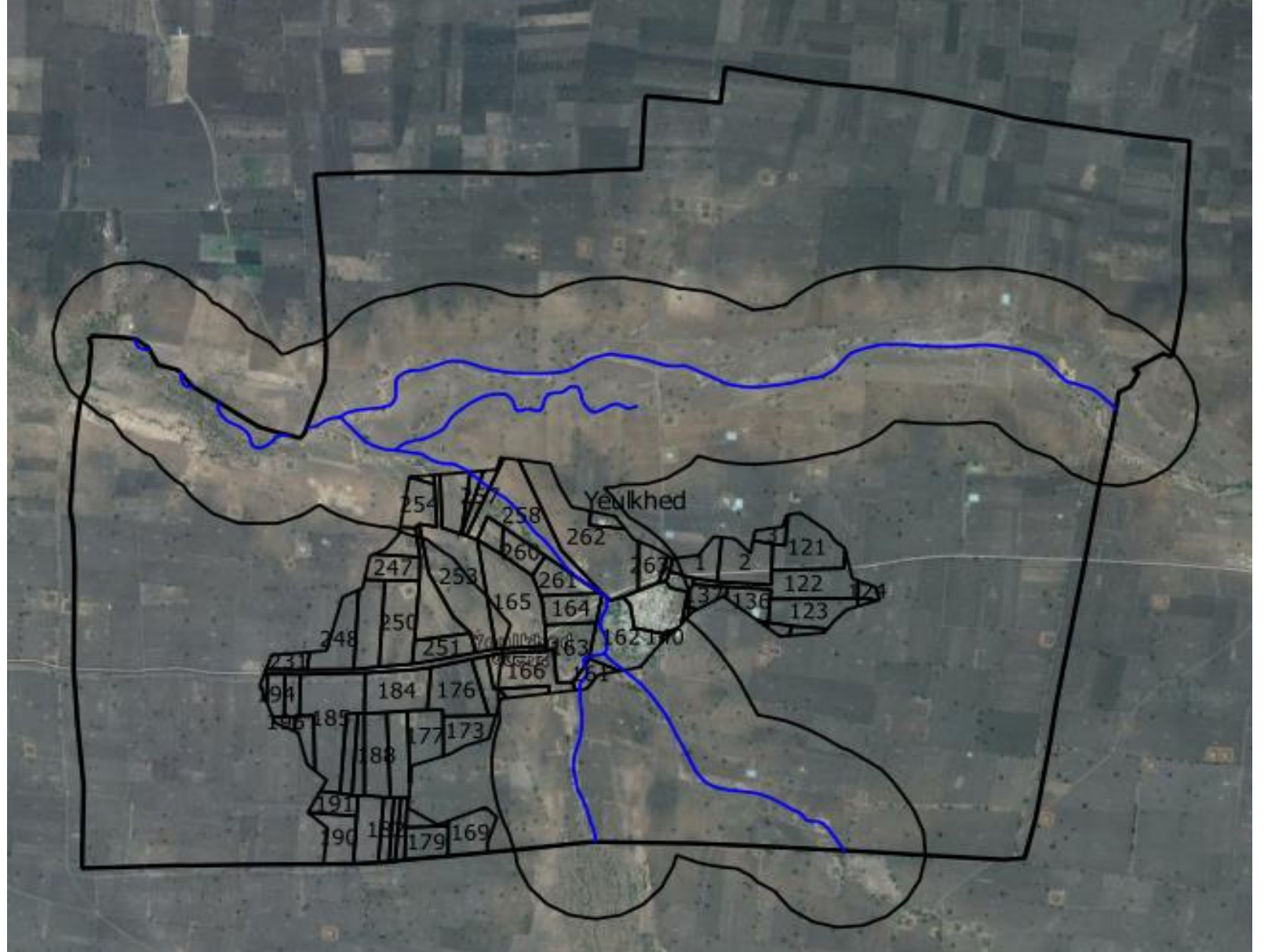
सर्वे साठी दिले जाणारे साहित्य

2017	Soyabean (mm)	Cotton (mm)
Rainfall (input)	435.0	435.0
Runoff	11.7	17.1
Infiltration	423.3	417.9
SM	106.4	45.9
GW recharge	-	-
AET	317.0	372.1
PET (input)	407.8	759.1
Monsoon PET-AET	90.9	387.1

- सर्वे करायचा आधी अंदाज बांधण्या करिता
- झोन मधील एकन पिकाची पाण्याची गरज (दोन मुख्य पिके)
  - खरीप साठी पाण्याचा तुटवडा
    - पिकला लागणाऱ्या अथवा दिल्या जाणार्या अधिक पाण्याचा अंदाज
  - संरक्षित सिंचनासाठी अपधाव नियोजनातून पाण्याचा उपलब्धते साठी वाव
    - पिकला लागणारे अधिक पाणी
  - रबी मध्ये मातीच्या ओलाव्यावर पिकांना वाव

# अपधाव नियोजनाची गरज

- नदी व नाल्याचा जवळ असलेल्या शेतकऱ्यांचे पुरामुळे नुकसान
  - दुबार पेरणी
  - नदी नाला रुंदीकरण करण्याची गरज
  - इतर जल संधारण कामांना वाव
- नदी नाला नसलेल्या भागात पाण्याची अनुपलब्धता
  - शेत तळ, बोरेवेल
  - Contour bunding



# झोन सर्वे मधून भरून आणावयाचा फॉर्म

Name	Gat	Index	Area	Crop	K/L/R	Yield	Internal/ External Water/D eepBore well	Multiple Assets	Extra Water Numb er	possible interven tions

- सब झोन मधील गट नो. सर्वे
  - खरीप पिके
  - रबी पिके
  - पिकांखालील क्षेत्र
  - पिकाचे उत्पन्न
  - पाण्याची उपलब्धता
  - शेताजवळ असलेले पाण्याचे स्रोत
  - अस्तित्वात असलेली जल संधारण कामे
  - खारीप मधील संरक्षित सिंचनासाठी पाण्याची उपलब्धता
  - रबी साठी पाण्याची उपलब्धता

# Gat no. wise cropping pattern (Areas are in Acre)

Sr. No	Name	Gat No.	Total Area	Cotton	Soya	Tur	Udid	Moong	Harbara	Jwahr	Others
1	Shiv Shankar Pundker	176	4.5	4.5					4.5		
2	Sandeep jamre	184	9				9		9		
3	Prushotam Punker	175	4	2	2				2		
4	Shashi Punker	2 & 3	7	2	2	2			2		Lilly, Guava – 1
5	Gajanan kisan Khandar	164	6	1.5	2.5				1		
6	Balram	250	4	Bad rainfall					2		
7	Mali	264	3.75				2	1	3.75		Karli – 1
8	Dinkar Rothe	253	6		3		3		6		
9	Balkrishna als	186	2		2						
10	suresh metange	246	7.2				7.2		7.2		
11	Shrikant Pundker	252	2	1.5		0.5					
12	Purushotam	247	10	4	3		3		6		
13	Gopal Pundker	136	9	7			1		1		Guava - 1
14	Sanjay punker	263	21	2	12	2			12		
15	Devilal Metange	177	7.5						7		
16	Bhagwan khnadare	164	1		1						
17	Devanand Khandare	260	2	1	1				1		
18	Mahadev Hanumate	161	12	3	9				9		Ajwain - 3
19	Anil Metange	249	8		6	2					
<b>Total Area under Crop</b>			125.95	28.5	43.5	6.5					

# पाण्याचा ताळेबंद

Crop	Area (Acre)	Water Requirement (mm)	Total Water Requirement (Acre - mm)
Cotton	28.5	700	19950
Soya	43.5	450	19575
Tur	6.5	400	2600
Udid	25.2	250	6300
Others	6	250	1500
	16.25	250	4062.5
<b>Total</b>	<b>125.95</b>		<b>53987.5</b>
<b>Average Sub Zone Water Requirement in mm</b>			<b>428.6</b>

Crop	Area (Acre)	Et load (mm)	Total Water Requirement (Acre - mm)
<b>Gram</b>	<b>73.45</b>	<b>250</b>	<b>18362</b>
<b>Total</b>	<b>125.95 Acre</b>		<b>145.79 mm</b>

2017	Values in mm
Rainfall (input)	435.0
<b>Runoff</b>	<b>11.4</b>
Infiltration	423.6
SM	111.1
GW	Nil
AET	312.5
PET (input)	409.8
<b>PET-AET Deficit</b>	<b>97.3</b>
No. of waterings	2
Farm pond (20)	30X30X3 m
Capacity of Farm pond	1350 cum
Capacity of 20 Farm ponds	27000 cum
Total Area	125 Acre
Total Area	500000 sq-m
Capacity of 20 Farm ponds	27000/ 500000 m
Capacity of 20 Farm ponds	54 mm

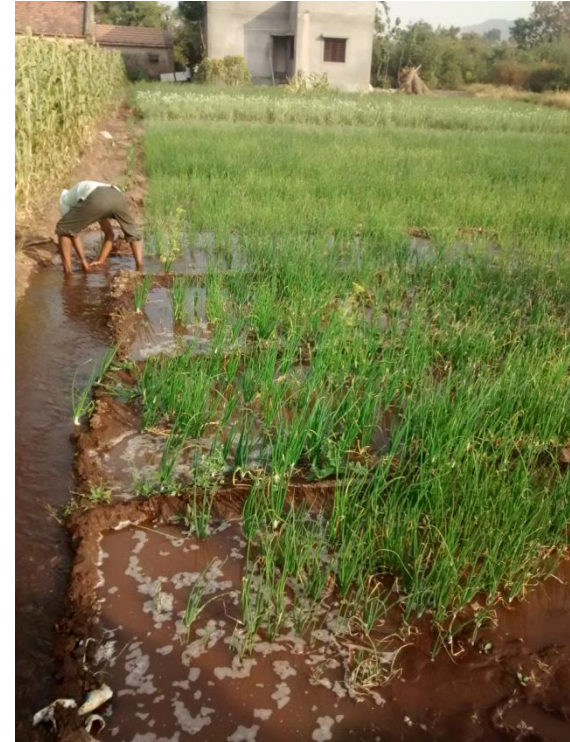
# पाण्याचा ताळेबंद व महत्वाचे अंदाज

- Is the zonal Kharif load within budget?  $435 - 11 - 0 = 424 \text{ mm}$  : Kharif Load: 428 mm]
- Is the zonal Rabbi load within budget?  $111.1 + 0 < 145.8 \text{ mm}$  [soil moist.+ gw :111.1 + 0 < Rabi Load: 145.8 mm]
- Was the runoff enough to fill the storage? Yes/No [runoff: 11.4 mm < storage: 54 mm]
- Can we provide protective irrigation to meet kharip load through run-off storage? No  
[kharif load: 428 mm]
- If yes how many irrigations can be provided to kharip crop, given 40 mm water per irrigation? How many were needed?  
No
- Can we meet Rabi load for Harbara through available soil moisture + GW?  $111.1 + 0 < 145.8$  ]

# Ghusar Seasonal zonal water balance –good year (2016)

2016 Seasonal Water Budget		Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7
Monsoon balance (TCM)	Monsoon Protective Irrigation Demand	40.4	45.5	23.6	28.0	26.2	26.2	30.4
	Existing Runoff Storage	36.2	32.9	37.3	20.9	23.1	39.5	42.8
	Monsoon balance: current supply-demand	-4.1	-12.5	13.7	-7.1	-3.1	13.4	12.4
	Monsoon Protective Irrigation Index	0.9	0.7	1.6	0.7	0.9	1.5	1.4
Post- monsoon balance (TCM)	Rabi Total Water Requirement	1608.4	1891.9	510.7	436.3	822.9	822.9	1261.1
	Drinking Water Requirement	0.0	0.0	0.0	0.0	0.0	110.0	0.0
	Water Available from Soil Moisture	502.0	582.8	198.4	194.7	278.1	278.1	391.9
	Water Available from GW	4.8	4.8	4.8	4.8	4.8	4.8	4.8
	GW recharge available from current storage	36.2	32.9	37.3	20.9	23.1	39.5	42.8
	Rabi balance : GW supply+ SM + structures- Rabi demand - DW	-1065.3	-1271.3	-270.1	-215.9	-517.0	-610.5	-821.5
	Post-monsoon Protective Irrigation Index	0.3	0.3	0.5	0.5	0.4	0.3	0.3
Design (TCM)	Water Available from Runoff (80%)	1675.2	1907.0	801.3	785.5	1032.6	1032.6	1362.4
	Additional water available for impounding	1602.7	1841.1	726.7	743.8	986.4	953.5	1276.8

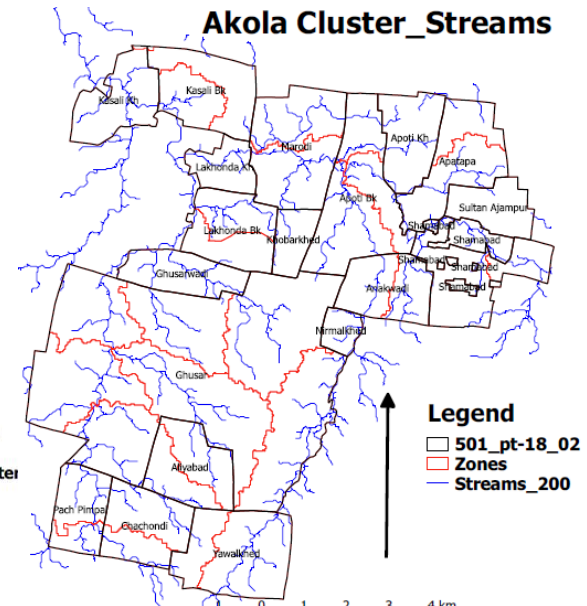
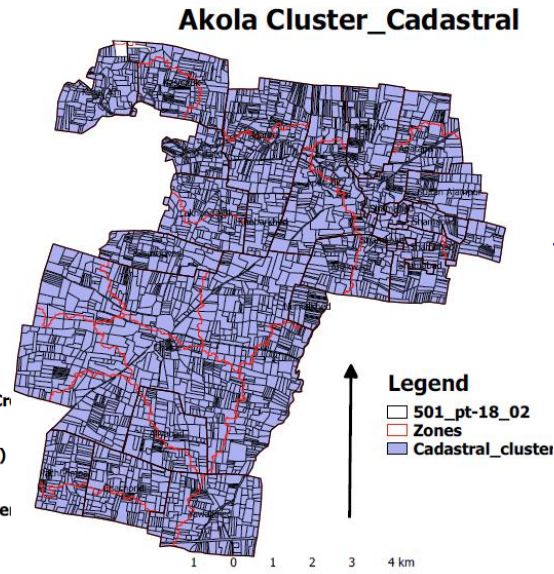
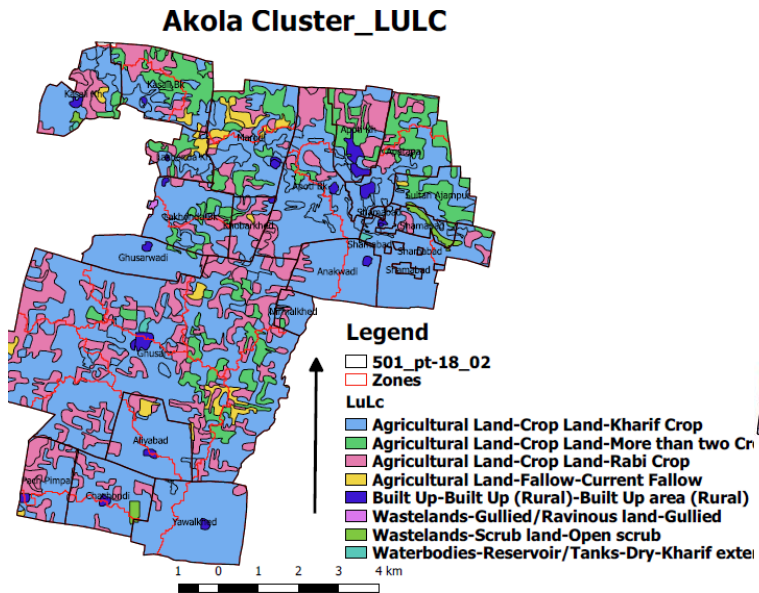
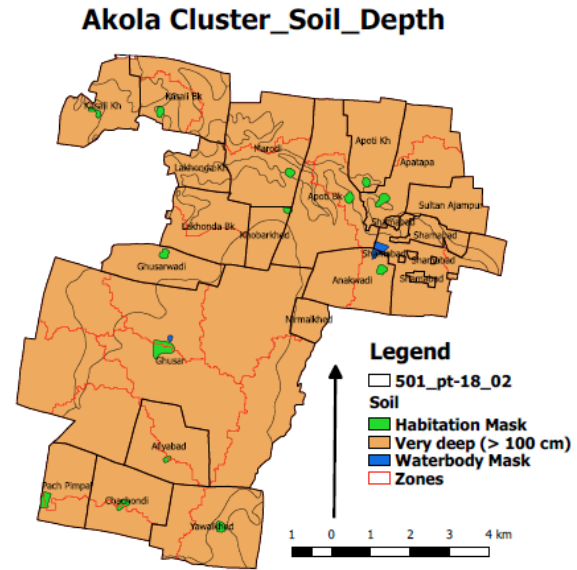
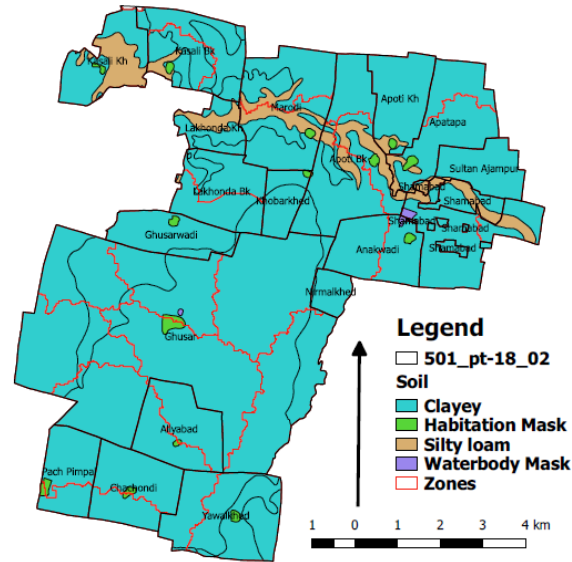
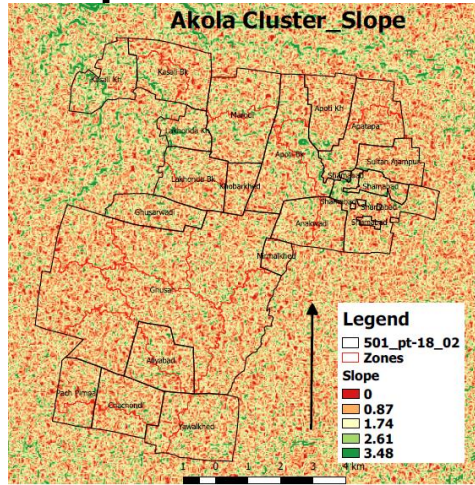




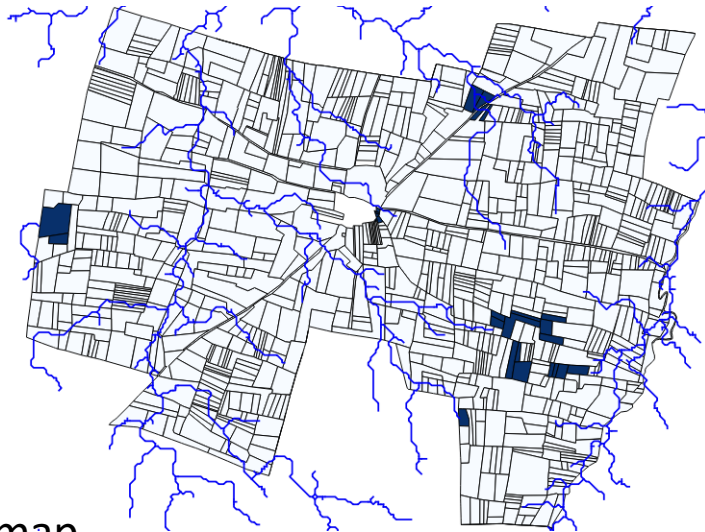
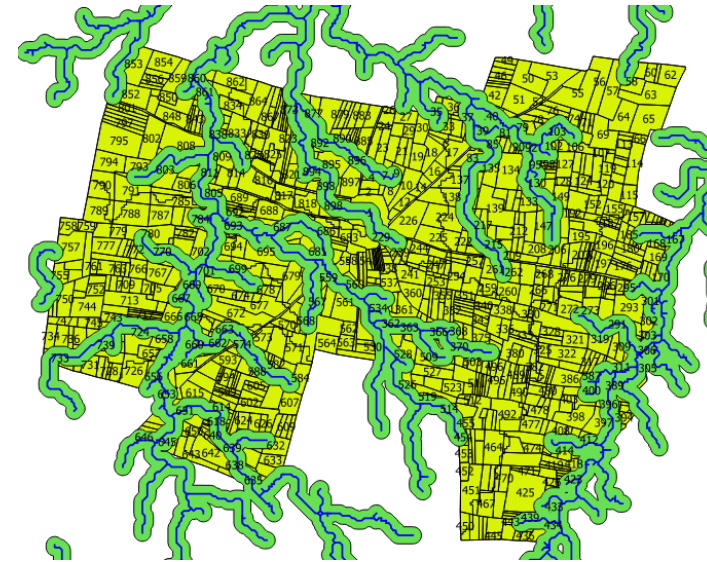
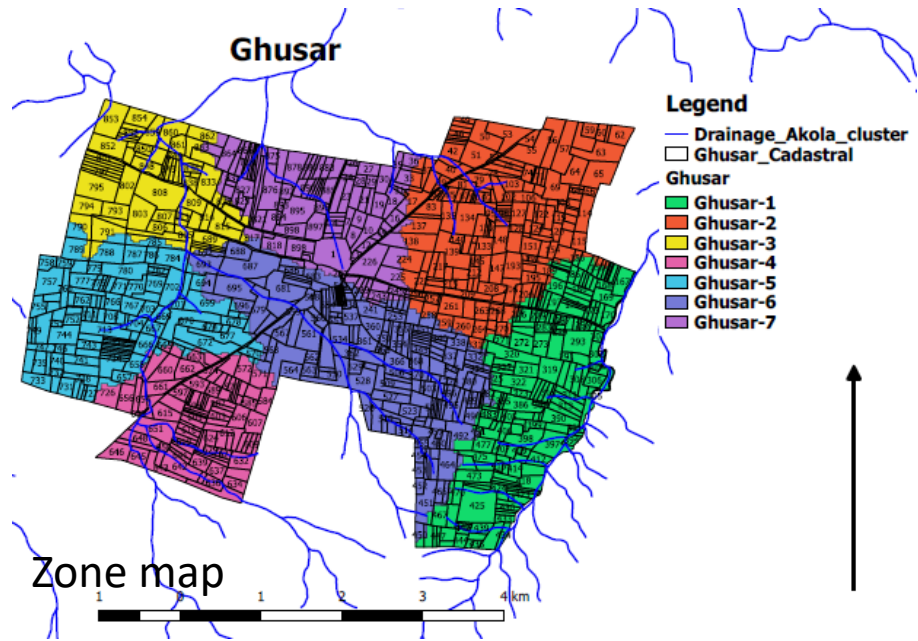
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# Example – Ghusar (saline belt) village inputs



# Ghusar: Microplanning kit



# Ghusar Post monsoon computation (good year and bad year)

2017: Rainfall 550mm	PET Monsoon End	AET Monsoon End	Monsoon Deficit(PET- AET)	GW Recharge in Monsoon	Runoff in Monsoon	Soil Moisture Monsoon end	Post Monsoon PET
Cotton	401.09	381.15	19.95	-	76.93	76.92	389.13
Moong	261.37	228.09	33.28	-	116.66	190.25	-
Tur	376.04	359.13	16.91	-	90.45	85.42	242.37
Soyabean	434.56	377.16	57.39	-	69.08	88.76	-
Harbhara	-	-	-	-	-	-	250.00
2016: Rainfall 920mm	PET Monsoon End	AET Monsoon End	Monsoon Deficit(PET- AET)	GW Recharge in Monsoon	Runoff in Monsoon	Soil Moisture Monsoon end	Post Monsoon PET
Cotton	342.51	337.27	5.24	-	410.14	113.60	424.43
Udid	232.12	228.80	3.32	4.68	426.45	201.06	-
Tur	314.97	295.34	19.63	-	437.19	126.45	288.90
Soyabean	403.78	346.98	56.80	-	402.37	111.65	18.62

# Ghusar field inputs: cropping pattern and current structures

Crop	Ghusar 1	Ghusar 2	Ghusar 3	Ghusar 4	Ghusar 5	Ghusar 6	Ghusar 7	Total village
Soybean	20	21.29	0	0	0	15.6	10.11	67
Jowar	14	6	8	7	4	20	13	72
Cotton	314.92	375	70	67.89	149	348.95	257	1582.76
Moong	52	90	182	177	220	70	26	817
Udid	5	4	5	5	7	12	6	44
Tur	55	65	35	30	27	60	20	292
Total	460.92	561.29	300	286.89	407	526.55	332.11	2874.76
Ag Area	461.92	561.29	300	297.41	407.73	526.55	332.11	2887.01
Non Ag	0.27	0	0	0	0	0	0	
Farm ponds	33	30	34	19	21	36	39	212



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