MoU IV

IITB and GoM

2021

So far

MoU-I	16th August 2107 Water	• Point Model, GIS Plug-in for village level water budget, MLP
MoU-II	2nd November 2018 Water	• Improvements - soil, weather mapping, cadastral, ET0. • Analysis of the model • Crop Hierarchy and Rabi • DPR and village level validations • Initial work on the Dashboard
MoU-III	3rd October 2019 Water	• Hourly model, hourly weather, integration with MLP • Dashboard, IT Stack, Advisory framework • Pilot Extension to Community
	Energy	• Key problem - constraint and quality, infrastructure • Energy Demand estimation - simple indices, overloading • Extension - pumps, capacitors, transformer burn-outs
MoU-IV	**2021**	**Water, Energy and Post-Harvest Processing.**

MoU III -WATER

Water budget model
- Daily to hourly
- Preliminary validation
- Interaction with GSDA, NBSS
- Suggestions for improvements in GW recharge
- Regional geography conceptual framework ready

Dashboard
- IT stack
- Weather data (smooth, smart)
- Village-weather
- Role-based access
- FFS, MLP
- Sample contingency

Community extension
- Conceptual Framework
- L1 meeting done
- Solution space analysis framework
- L2 meeting

MoU IV

Water budget model Improvements

A. Validation
- Validation in 4 clusters
- Extending validation in rabi season

C. Implementation of regional geography
- Aquifer properties and other additions
- Zone-level water reallocation
- Better SW and GW estimation

Community extension

B. Pilot Extensions
- Kharif (farmer-level) and Rabi (village-level)
- Kharif - solution space analysis

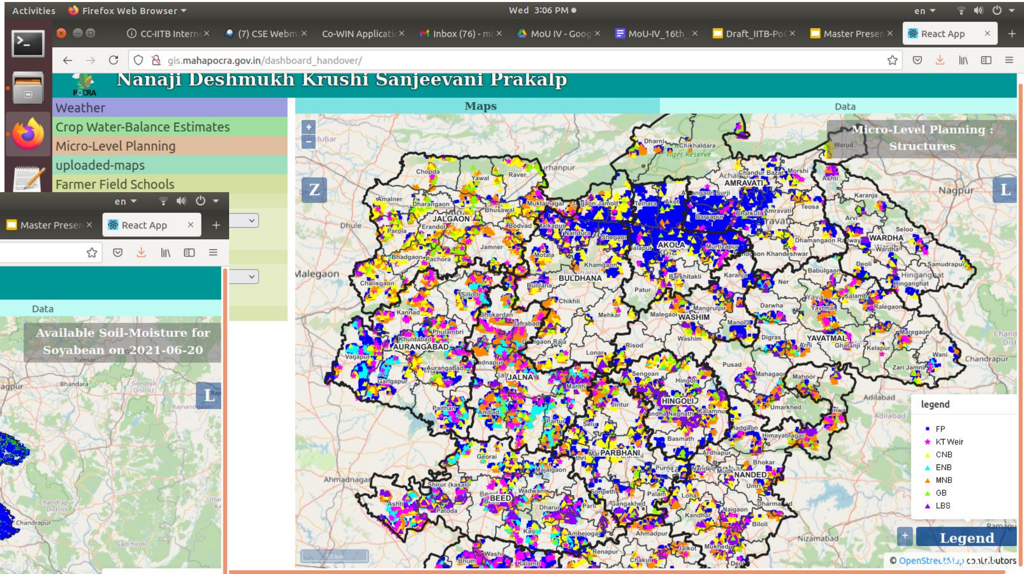
D. Rabi crop planning framework
- Village level Rabi Supply-Demand analysis
- Water allocations
- Zonal water entitlements
- Cropping pattern scenarios

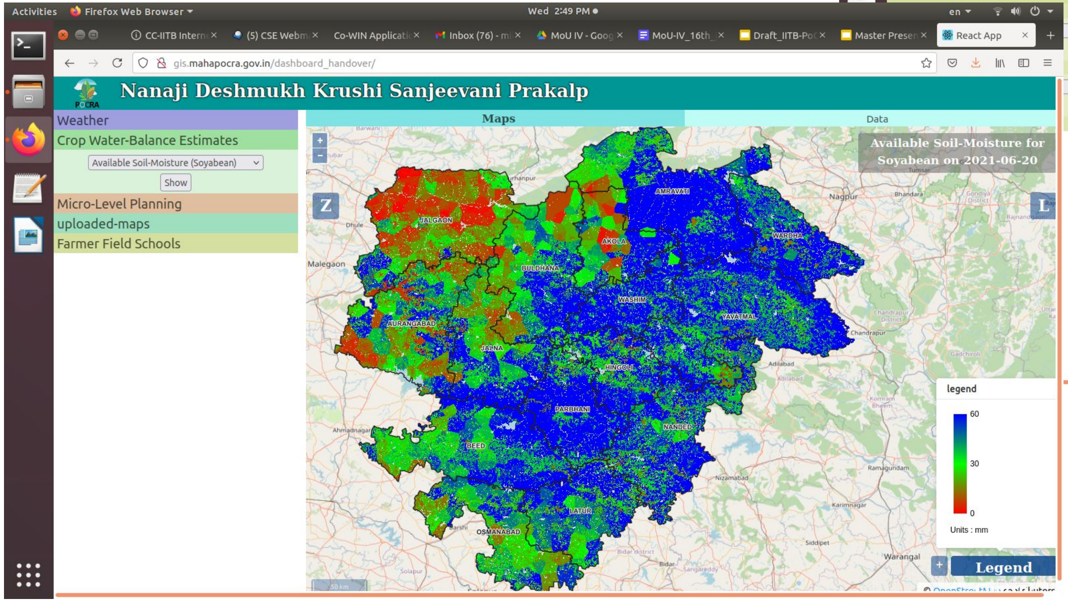
E. PMU and IT Support
- Dynamic MLP computation
- Enhancing IT stack
- Adding new functionalities

Sample Water Outputs and Future Work

- Changes to **water budget model** - daily to hourly (water budgets for 2020 being computed currently for all villages) → further changes in the model planned in MoU IV such as incorporation of regional geography, computation of within-zone and across-zone water flows, zonal water reallocation
- **Dashboard** - IT stack, weather (smooth, smart), roles-based access, FFS, sample contingency - handed over to MahaIT PoCRA team
- Preliminary **validation** of the model - setting up the methodology, preliminary results in three clusters indicated positive results for hourly model runoff → more comprehensive validation to be carried out in MoU IV, validation to be extended in the rabi season as well.
- Interaction with **GSDA, WB experts** - pointers towards improvement in GW recharge - to be incorporated during MoU IV
- Conceptualizing key indicators required for **Rabi planning** - PMI, Rabi water use index, water allocation index, entitlement-endowment framework → rabi planning module for crop planning planned in MoU IV, to be incorporated as interactive, scenario-building, decision-making module in MLP App to be run by community
- **Community extension** framework - maahiti - gaavki framework, core agreement at village level (VCRMC), Sangaon meeting --> median kharif yield, formats, surveys, primary data required at village level to carry Kharif Hangam Baithak → to demonstrate easy-to-understand village level exercises and develop protocols which will feed into the information comprehension and collective action based extension framework.

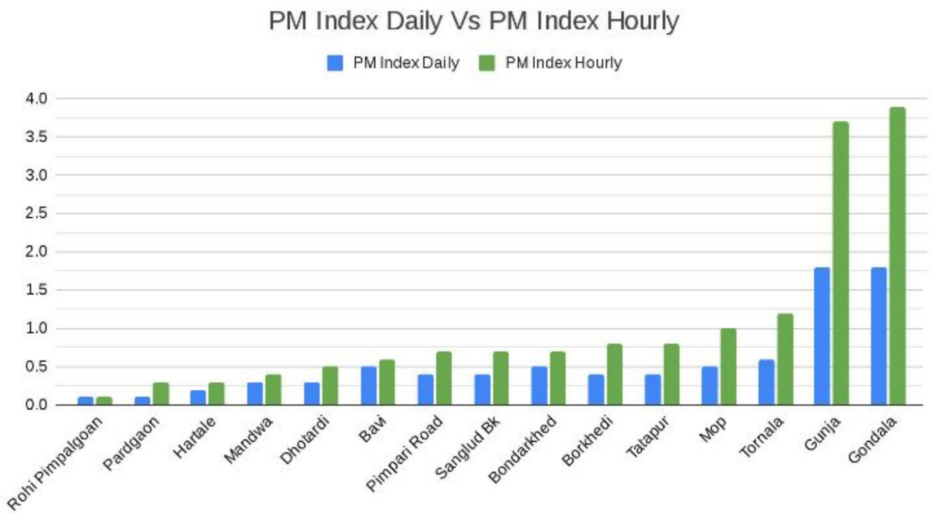
Dashboard - Dry-spells and more



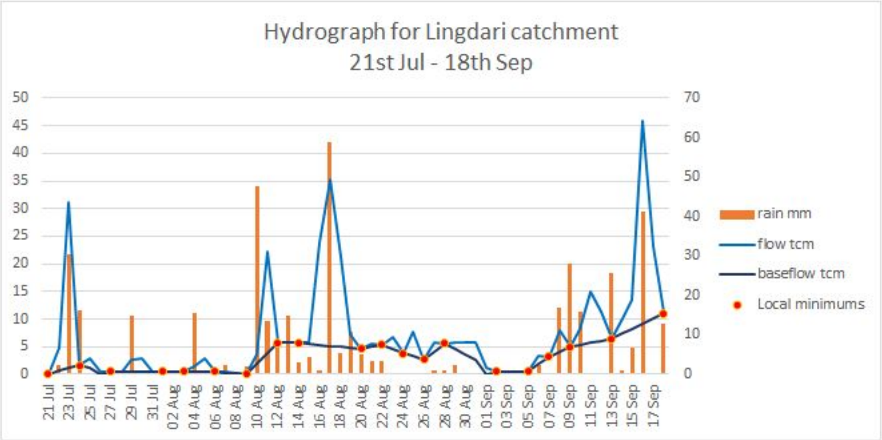


This year: Water Availability during a Dry Spell

Improvements in the model - last year and this year



Ponding, Baseflows



A. Model Validation (In 4 clusters, 1 catchment per cluster, for Kharif and Rabi seasons)

Model Component	Scale	Method to be used	Number
Runoff	Point/ Farm	V notch with sensor	Total 6 farms to be monitored
Runoff	Regional	Water Level Sensors on CNB	20 sensors to be installed at sub-catchment and catchment levels
Soil Moisture	Point	Soil Moisture Sensor	2 locations per farm, total 6 farms to be monitored
Groundwater recharge	Regional	Monitoring of well water levels throughout Kharif and Rabi seasons	5-10 wells per catchment
AET (Indirect)	Point	Detailed interviews with farmers	5-10 farmers per catchment
Post monsoon water availability (GW + SM + Surface water)	Regional (cluster)	Farmer interviews, cropping pattern, GW extraction measurements, Baseflow measurements, GW level monitoring	5-10 farmers per village in the cluster

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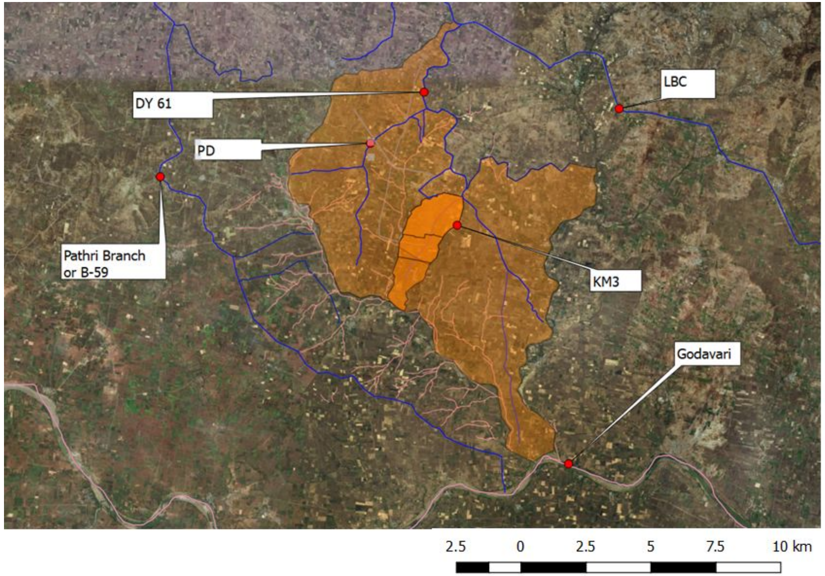
Selected clusters and sensor installation status

Cluster	Taluka	District	Villages	No. of water level sensors (installed)	No. of soil moisture sensors (installed)	No. of V-notches (installed)
511_gv-101_03	Loha	Nanded	Mangrul, Polewadi, Berali Kh.	7 (7)	4 (0)	2 (0)
524_mr-47_05	Ahmadpur	Latur	Morewadi, Chobli, Gadewadi	6 (1)	4 (0)	2 (0)
510_wrb-1a_01	Ner	Yavatmal	Adgaon, Karkheda, Bhalki, Umartha	6 (6)	4 (0)	2 (0)
502_pga-3a_03	Karanja	Washim	Wai Pr. Karanja, Lohara, Kisan Nagar	2 (2)	2 (0)	1 (0)

All the sensors to be installed and functioning by 1st week of July

Regional Water Balance

- Command Areas
- Key Finding : excessive dependence on losses.
- Even in Head area



Location of Left Bank Canal and command area - Kekar Jawala, Parbhani

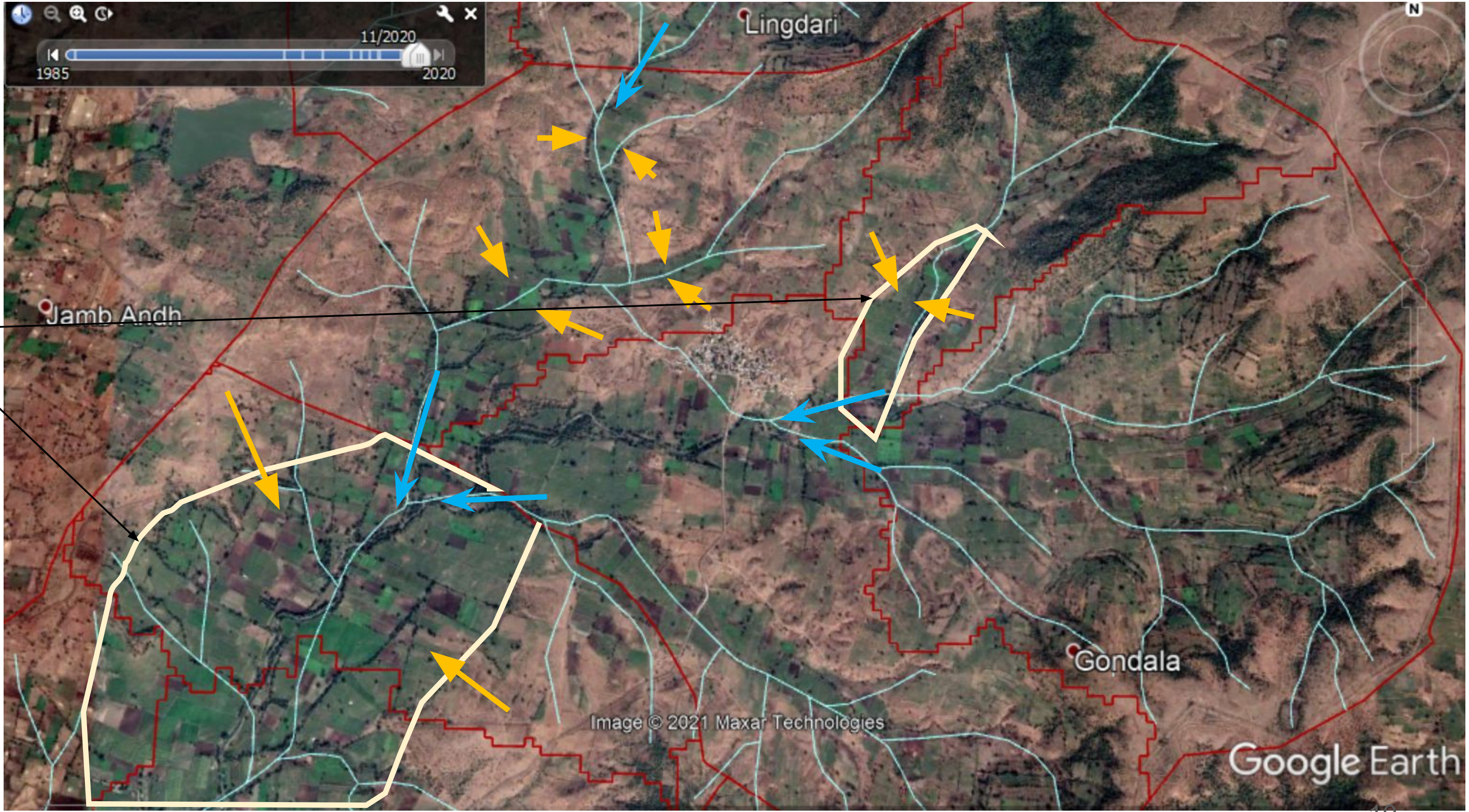
Focus on Minor and Parts A, B, C from Head to Tail

Zone wise annual water balance

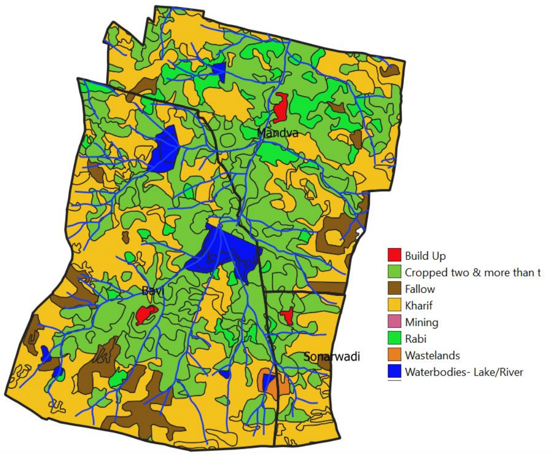
Zone	Area (Ha)	AET	PET	GWr	WTF	GWrf	GWex	SWap	GWin
Part A	194.65	1037	1364	52	31	231	383	388	131
Part B	97.75	1027	1223	53	34	23	330	223	288
Part C	121.29	804	1040	54	29	0	251	81	226
OC	292.4	1034	1317	52	32	162	365	333	183
TC	413.69	966	1235	53	31	114	332	259	196

Within-zone and across-zone - surface water and groundwater flows

Stream proximity



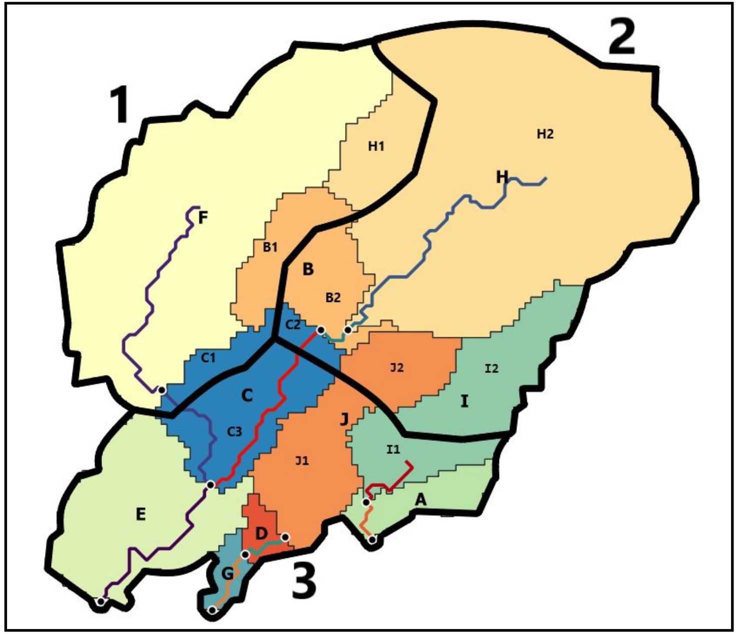
Groundwater and Surface water flows across villages



Village	Area	SM (mm)	GW (mm)	SW (mm)	Total available (est.) (mm)	Total applied (obs.) (mm)	Total used (mm)	Overall match (mm)
		A	B	C	D = A+B+C	E	F	G = D-F
Bavi	2519	110	107	28	**245**	89.9	**200**	**45**
Sonar wadi	351	69	176	30	**275**	132.6	**201**	**74**
Mandwa	1735	110	82	13	**204**	165.4	**265**	**-58**
Cluster	4605							**8**

Regional Geography - better estimation of groundwater and surface water flows

- Decomposition of domain into “Pieces” for better hydrological modelling
- Stream Proximity - aggregation of lateral flows
- Flatter areas - accumulation of groundwater flows
- Analysing and planning for CNBs, Percolation tanks etc.



C. Model Improvements

1. Improvements in groundwater recharge (4 MM)
    a. GW recharge in clayey and sandy soils.
    b. Incorporation of aquifer properties.
    c. Incorporation of outcomes from field measurements (components A2 and A3)

2. Implementing regional geography GIS framework (6 MM)
    a. Integration of stream-network and differential watersheds to IT stack.
    b. Zone-ordering of all clusters and integration with the IT stack.
    c. Delineation of new zones of interest, if any, such as stream proximity zones. and addition to IT stack.

3. Use of regional geography to compute regional flows (4 MM)
    a. Within- and across-zone water reallocation module. This will include computations for movements of surface as well as groundwater flows.
    b. Changes to current plugin and validation through results of A2 and A3.

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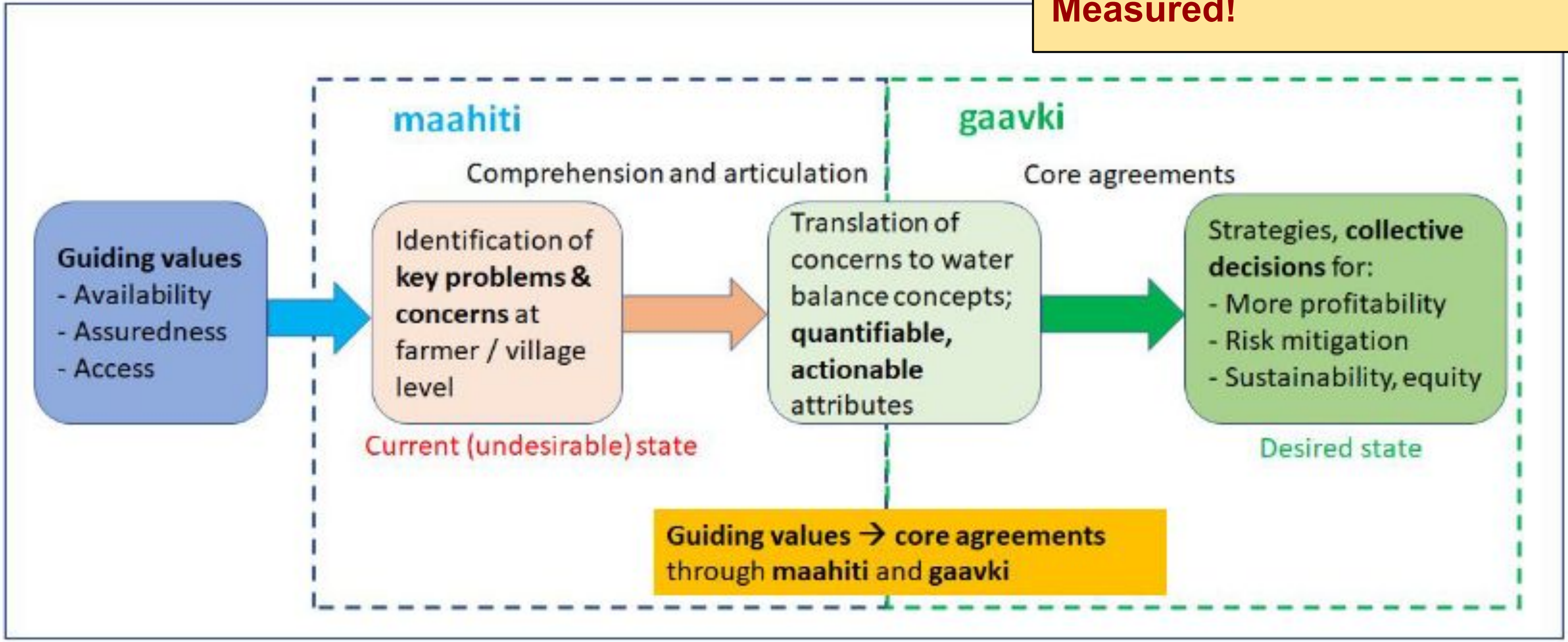
Community Extension Framework

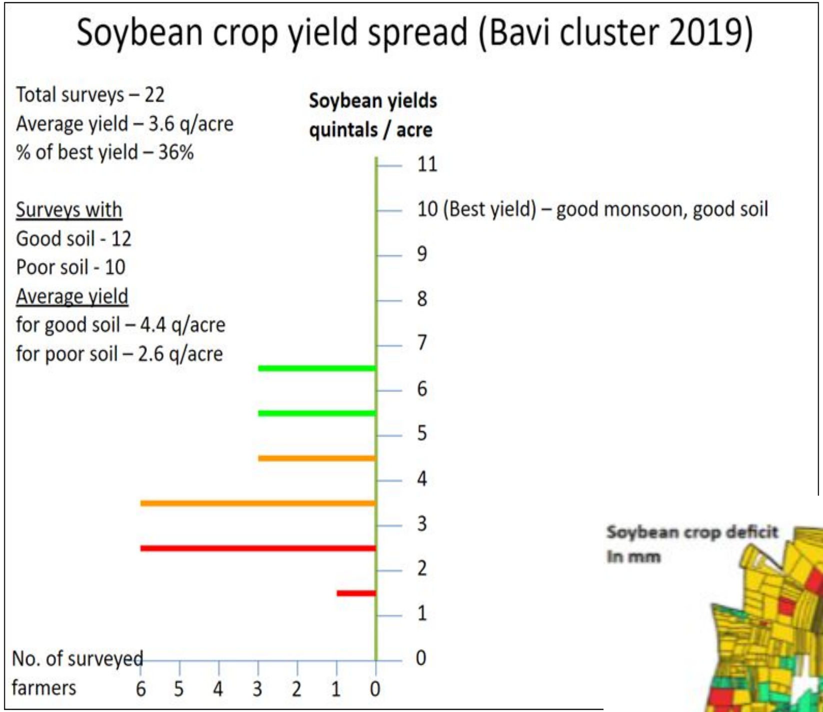
Knowledge Extension Must Be Measured!

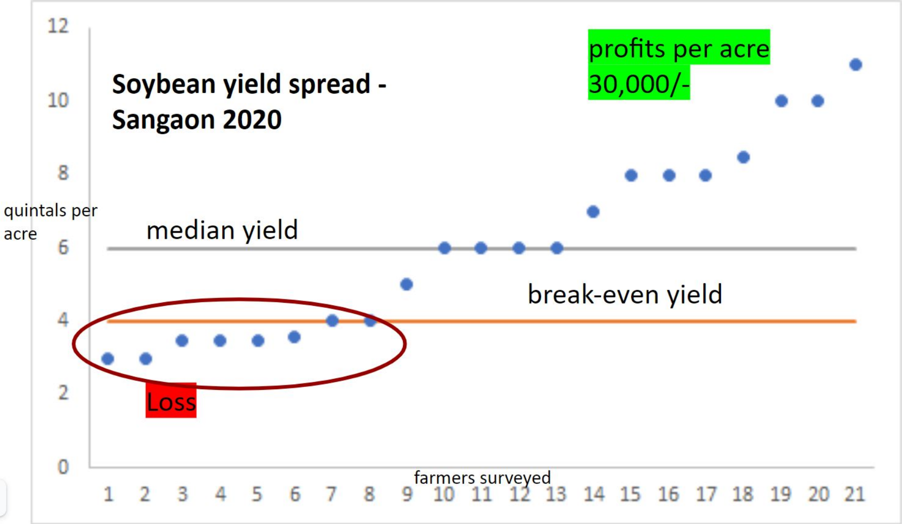


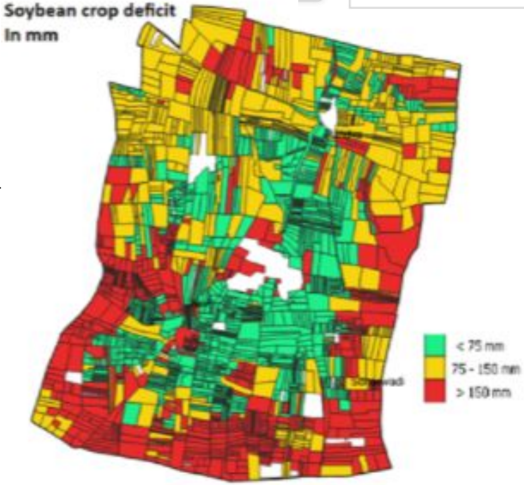
Based on Ostrom's Common Pool Resources Framework - Information, Comprehension, Articulation and Community Action.

Knowledge and Extension

Agent	Knowledge	Our Support
Farmer	• His/her yields and key decisions which led to poor/good outcomes • His resource envelope • Typical investments and their cost-benefit analysis • Extension agencies and their roles	- Formats for farmer surveys - Crop water deficits - Farm-level Kharif advisory
Village	• Median yields and problematic cases and their analysis • Cropping Pattern of the village and various scenarios • Linkage with water and energy - availability and access • Exemplary good and bad cases	-Formats for village surveys -Entitlement-endowment maps -Rabi advisory
Extension Agent	• Regions with low yields and poor access to water (poor endowments) • Yield curves - relation between soil-type, watering, yields, incomes • Village resource envelope: Aggregate crop water demand, available water, entitlements, endowments • Suite of farmer-level and village-level solutions and their consequences	-Training material for surveys -Water budget charts -Solutions basket







Vulnerability maps

B. Community Extension

1. Kharif (3 MM)
    a. Documentation of kharif yields, dry spells, coping mechanisms.
    b. Use of vulnerability maps for targeting interventions and documentation of access to protective irrigation in the village.
    c. Documentation of solutions-space analysis, cost-benefit of farmer investments and interventions.
2. Rabi (5 MM)
    a. Demonstration of concepts of entitlements and endowments, zonal water availability, and post monsoon indices to the villagers
    b. Documentation of rabi yields and rationing of water and presenting the same to the villagers.
    c. Demonstration of groundwater overexploitation, uncertainty associated with access to water.
    d. Design of a template for cost benefit analysis of investments by farmers and its demonstration.
    e. Testing, validation and demonstration in the pilot village for crop planning and crop diversification considering P1, P2, P3 crops and crop hierarchies (see section D on Rabi Planning Framework below).

The key objective will be to demonstrate easy-to-understand village level exercises and develop protocols which will feed into the information comprehension and collective action based extension framework.

Deliverables as Field visits and Actionable reports in the clusters selected for model validation

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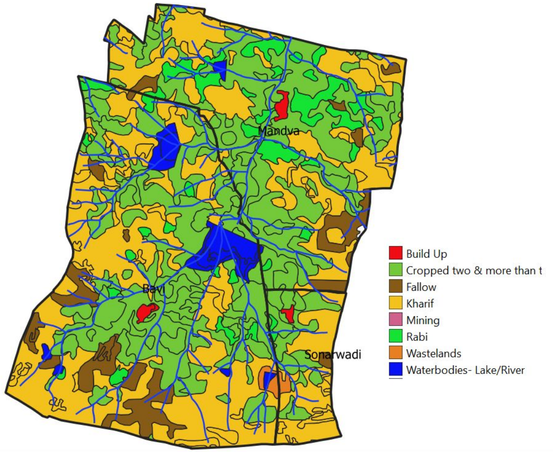
Entitlement - Endowment - actual use

- Impounding of surface water - significant impact
- Significant change in cropping pattern
- Risk of over-extraction and change in endowments



Inputs for Rabi adhava baithak

Farmer level

- Cost benefit analysis

Village level

- Crop planning
- Optimal cropping pattern
- Energy adequacy

Village	Area	SM (mm)	GW (mm)	SW (mm)	Total available (est.) (mm)	Total applied (obs.) (mm)	Total used (mm)	Overall match (mm)
		A	B	C	D = A+B+C	E	F	G = D-F
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Cluster	4605					121.6	206.2	8

D. Rabi Planning Framework

- Objectives
  - To provide better grounds for GW regulation based on entitlements and endowments
  - To facilitate village-level crop planning
  - To identify low-endowment zones for NRM interventions
- Deliverable: Stand-alone module (plug-in) : may be incorporated in MLP app

To be used for village-level Rabi planning meeting

- Inputs
  - Zone map with (improved) rabi water availability at the start of the rabi season
  - This will require kharif cropping data entered, zone-wise water budget files ready and zone-level water reallocation done
  - Crop data table with watering, yield, market rate, income ready for all LK, annual, rabi and summer crops
  - List of probable crops to be sown in rabi – to be entered by the community
- Output - *cropping pattern scenarios for profit maximization as well as equity maximization*
  - Probable area under all rabi crops
  - Possible zone-level cropping pattern scenarios considering crop yield curves, incomes, profits etc.
  - Possible regions for NRM interventions

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E. IT and PMU support

1. Changes to MLP script and plugin
   a. incorporation of IMD forecast data
   b. dynamic water budget computation in MLP app.

2. Support to the PMU for design and framework for improvements in existing MLP charts and new cluster-level charts.

3. IT support for fixing bugs, maintenance, and coordination with PMU .

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Man-months, persons, estimates (revised 4th Jun)

• A: A1(10) + A2(12) + A3(8) + A4(2)	= 32 MM
• B: B1(4) + B2(4)	= 08 MM
• C: C1(4) + C2(6) + C3(4)	= 14 MM
• D: D1(4) + D(6)	= 10 MM
• E: E1(1) + E2(2) + E3(3)	= 06 MM
• **Total : 70 man-months**	

• Project Engg1	: A(5), B(1), C(2), D(4)	= 12 MM	: 09.6 L
• Project Engg2	: A(5), B(3), D(2), G(2)	= 12 MM	: 08.4 L
• Field Engg1	: A(8), B(2)	= 10 MM	: 03.5 L
• Field Engg2	: A(6)	= 06 MM	: 01.4 L
• Senior IT	: C1(3), C2(3), C3(2), D(2), G(2)	= 12 MM	: 16.8 L
• Team Leader	: A(2), B(2), C(4), D(2), G(2)	= 12 MM	: 14.4 L
• Field staff(2)	: A(2*3)	= 06 MM	: 01.2 L

• Honorariums	: 03.0 L
• Faculty fees	: 9.0 L
• **Total : 67.3 lakhs**	

Equipment: 15 lakhs, Food, Accommodation, Travel: 12 lakhs, Contingency: 11 lakhs
Total: 105.3 lakhs

• Phase-wise deliverables

Phase	Delivery date	Duration	Deliverables	Payment
Phase 0	**May 31st**	15 days	Inception report	10%
Phase I	Jul 15th	1.5 months	A1, G1	10%
Phase II	Oct 15th	3 months	A2, B1, C2	25%
Phase III	Jan 15th	3 months	D1, C1, C3	25%
Phase IV	Mar 15th	2 months	A3, A4	15%
Phase V	May 15th	2 months	D2, G2	10%

** E3 is support; has no specific deliverable

Objectives of MoU-III Energy

- Calculation of energy - water productivity
  - Energy and water usage of various crops
- Identify and evaluate risks in access and quality of power to farmers
  - Analysis of energy infrastructure in one village
- Design of extension program to improve pump selection
  - Analysis of pump selection practices and measurement of efficiencies
  - Design of extension program for capacitor usage and pump selection
- Measure village level irrigation energy infrastructure, its determinants and impacts on access
  - Energy and Irrigation infrastructure analysis including water transfers
  - Analysis of pending connections and latent demand

Outputs and the Future

	Outputs		Agenda for MoU IV	Compnent ID
1	Quality of Supply		Demand-side Management: DT User groups for Load Management	**F , G**
2	Latent Demand			
3	Sub-Optimal LT networks		Training of colleges as support agencies	**I**
4	Peaks in Irrigation - Overloading		Restructuring of LT network for reduced cost connections and improved voltage profile	**J**
5	Energy-Water Indices			
6	Heavy farmer investments in irrigation infrastructure		Continue monitoring water and energy usage on sample set of farmers	**H**

Quality of electricity supply is a major , widespread issue

Pump failure and tripping : In addition to frustration and inconvenience, causes increased water usage due to poor control and management; 8 hours of supply - sprinklers and drip systems left for full day or two - uncertainty in water applied.

Distribution Transformer (DT) failure : Rectification 8 days to 2 months; Crop damage, expenditure on diesel, cables to draw from neighbouring DT

DT Failure Rate in Karanja Lad S/D, Washim, 112 villages

No. of failure events for a DT	No. of DTs			
	2016	2017	2018	2019
1	98	88	133	153
2	21	27	20	25
3	5	7	7	7
4	2	3	-	4
Total failure events	163	175	194	240
Failure rate (%)				28

Talukas mentioned as having high failure rates by Chief Engg. Akola zone:

Mehekar, Lonar, Buldhana, Deulgaon Raja, Sindkhed Raja (**Buldhana)**
Malegaon, Risod, Washim (**Washim)**; Akot, Telhara (**Akola)**
(**Not Karanja Lad**)

Additional DTs are repaired informally by farmers

Summary of voltage to 40 pumps in 5 districts: Washim, Buldhana, Aurangabad, Osmanabad, Yavatmal (Oct '20 to Jan '21)

	Duration at least one phase is less than specified voltage	Duration that 3-phase average is less than specified voltage
< 180 V	24 pumps: 30 - 73%	22 pumps: 30 - 71%
< 150 V	18 pumps: 30 - 64%	10 pumps: 28 - 57%
< 120 V	10 pumps: 30 - 63%	6 pumps: 15 - 54%

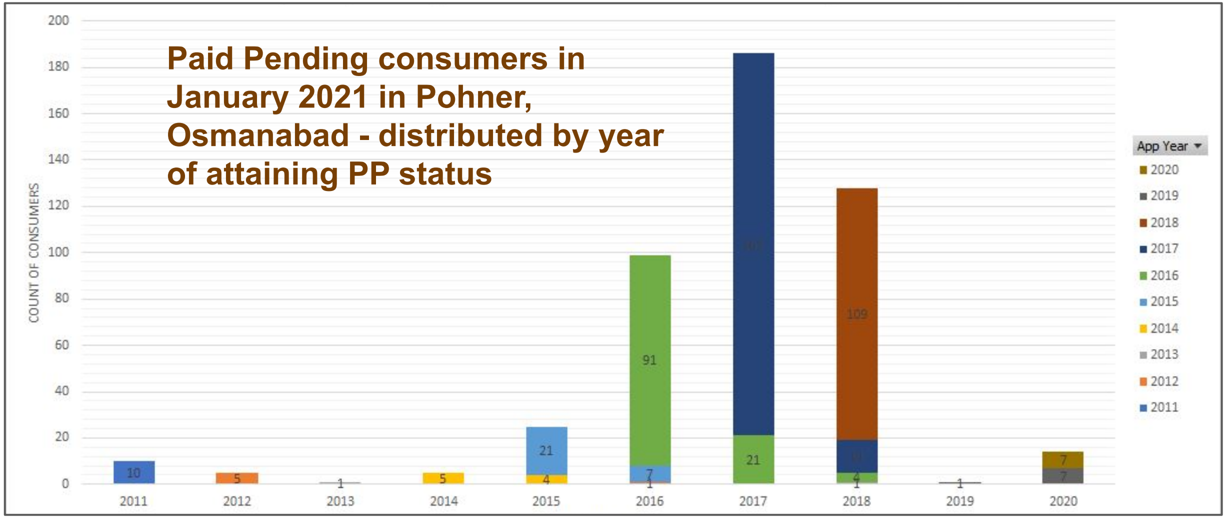
Low Voltage Supply at Ambedkar & Ballinge DT

Duration of Supply	180 - 200V	200 - 220V	220 - 240V
Ballinge DT January 2021	43%	55%	1%
Ambedkar DT December' 2020	1%	4%	93%

Latent Demand is a problem

High number of unsanctioned connections:

Section- Subdivision	Pohner-Osmanabd	Karanja-Washim
No of Villages	21	112
Ag consumer	2740	11533
Paid Pending (PP)	466 17%)	1248 (11%)
Applied Not yet PP	165 (6%)	2240 (20%)



No applications were accepted in Pohner in 2019 due to zero funds -suppressing demand.

<u>Reasons for delay:</u>

Right of Way (RoW) issues; RoW issues have Increased with HVDS

Infra augmentation - such as new DT

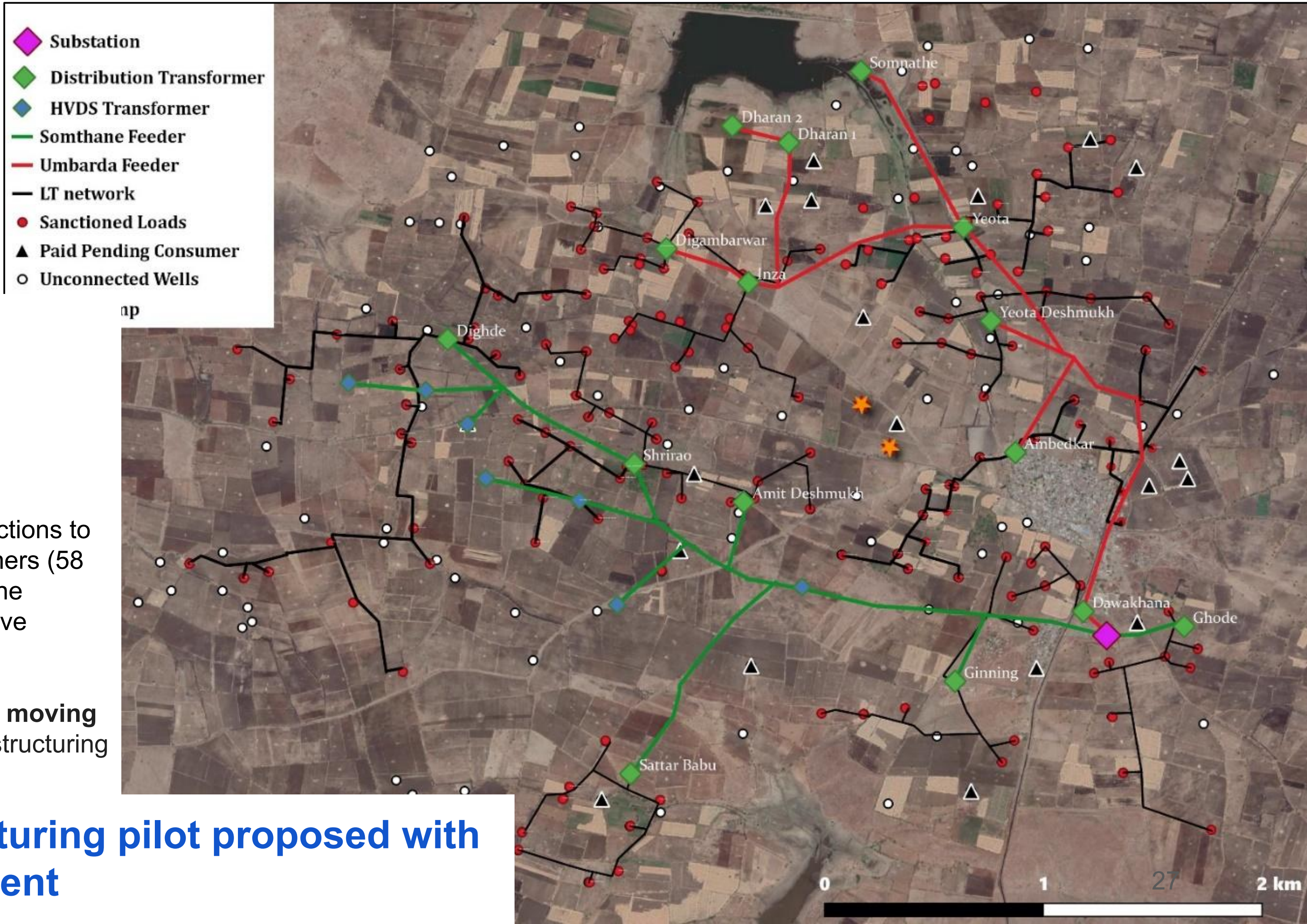
Delay by contractor - sometimes because of untraceable applicant or location, farmer migration, transfer of land, dead water source, refusal by the farmer stating ‘don’t want anymore’

Feasibility study: Restructuring of LT Networks in Umbarda, Karanja Lad, Washim

Population: 4933
Cultivable area: 1300 ha
Farmers: 893
Connections: 189
Paid Pending: 19
Unconnected wells: 59

Restructuring to provide connections to pending / unauthorized consumers (58 connections, 40% increase in the number of connections) , improve voltage, reduce overloading

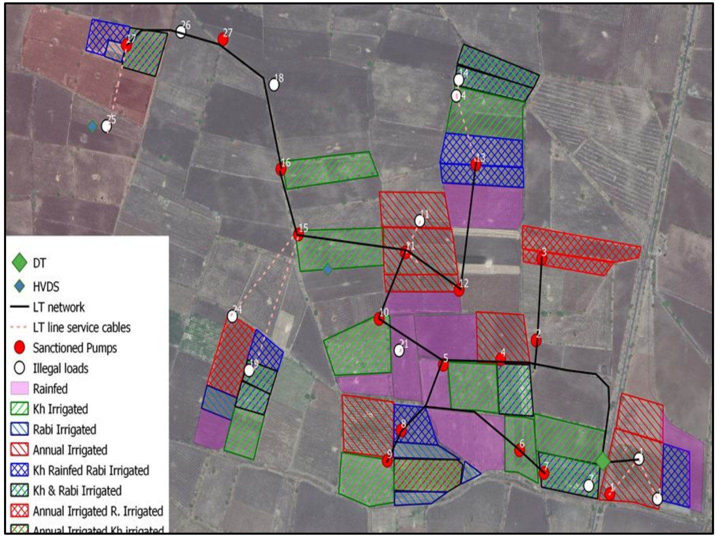
At a cost of **Rs.27.5k + cost of moving 11 km of LT lines**; Without restructuring Rs.58.5k.



MoU IV, J. Restructuring pilot proposed with MSEDCL involvement

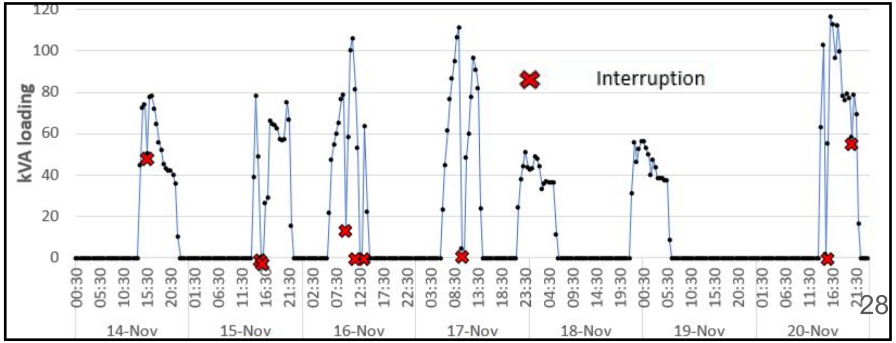
Overloading: Infrastructure insufficient for irrigation requirements

DT loading ⟺ Irrigation requirement



Ambedkar DT (100 kVA):
Cropping and requirement in peak (week 3 - 4 Nov).

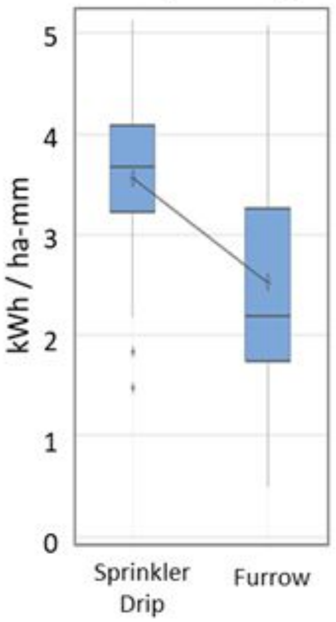
Crop	Area (Ha.)	Dug well	Bore well	Irrgs / Wk	Irrig. Dpth (mm)	Volume (m3)	Elec. Units Reqd.
Wheat	10.2	90%	10%	0.6	67	4,100	1,230
Harbhara (Sprinkler)	0.5	100%	0%	0.5	67	168	60
Cotton (Furrow)	12	90%	10%	0.3	45	1,620	486
Cotton (Drip)	4.2	90%	10%	0.3	35	441	132
Tur	17	100%	0%	0.3	45	2,295	574
Orange(Furrow in Nov.)	2	90%	10%	0.25	45	225	92
Sugarcane	1	100%	0%	1	50	500	125



Total energy estimated = 2,700 kWh / week
Average loading = 0.86 with 7 hours of daily supply.
Peak loading measured 128 kVA; Farmers prefer daytime usage
Measured data: 3019 kWh / week

Estimates based on indices developed through measurements and observations….

Energy - water indices / correlations



Energy required for pressurised and un-press. Irrigation from dugwells

Flow rate and power measurements conducted on 160 pumps on dug wells and borewells
120 Irrigation depth measurements for 20 different crops
Energy and water usage monitored for 33 farmers in the districts of Aurangabad, Washim, Osmanabad, Yavatmal, and Buldhana, Nov '20
Transfers from borewell to dug well, canal to dugwell, etc, monitored and accounted for

Typical parameters in Vidarbha and Marathwada	
Dug well depths (m)	9 to 15 m
Borewell depth (m)	60 to 180 m
Borewell low rates observed/ estimated (m3/hr)	5 to 12 m^3/hr
Borewell Energy (kWh/ ha-mm)	5 to 13 kWh /ha - mm

DT Loading depends on irrigation requirement. Plan loading, make schedules based on requirements. Informal practices of load sharing in existence.

DT User groups → Community Action:
Load Management , Understanding of network, Capacitor Usage, Document Demand

MoU IV: F, G. DT User Groups on 4 Distribution Transformers

Farmer investments in Irrigation infrastructure vs. public expenditure on energy

Farmer investment in infrastructure is high

<u>Minimum costs</u>
Dugwell: 4 lakhs
Pipes: Rs.10k
Sprinkler: 30k
Avg. maint. for pump/ DT: Rs.500 - 1000 per year

Energy tariffs:
Rs. 1400 to 6200 per ha
Energy cost: 4.5 x tariff

MoU IV, H. Continue monitoring energy water usage on selected farmer

Profiles of select farmers from metered sample with costs and expenditures

Village	Source(s)	Area (ha)	Annulzd Infra (Rs/ha)	Energy Tariff (Rs./ha)	Energy cost (Rs/ha)	Ratio : Infra/ Energy	Crops in 2020-21
Umbarda, Washim	Dug well	2.5	7,043	1,224	5,583	1.3	Cotton, Soybean, Tur, Wheat, Fodder
Yehala, Yavatmal	Dam	5	7,033	2,340	10,669	0.7	Cotton, Soybean, Tur, Turmeric, Groundnut (summer), Gram , Sugarcane, Banana
Junoni, Osmanabad	Dug well, borewell	6	7,202	2,228	10,159	0.6	Soybean, Tur, Gram, Wheat, Soybean (summer)
Umbarda, Washim	Dug well	3	11,235	1,400	6,382	0.7	Soybean, Cotton, Tur, Wheat, Gram
Yehala, Yavatmal	Dam	1.8	11,905	3,668	16,727	1.1	Cotton, Soybean, Tur, Groundnut (summer), Gram, Wheat
Garaj, Aurangabad	Borewells (2)	1.5	12,437	4,879	22,249	1.8	Cotton, Maize, Ginger, Wheat, Moog, Sugarcane, Orange
Manbha, Washim	Dug well, borewells (3)	5	14,892	2,850	12,997	0.7	Cotton, Soybean, Tur, Wheat, Orange, Papaya
Yehala, Yavatmal	Dam	2.5	16,021	6,206	28,296	1.0	Cotton, Soybean, Wheat, Groundnut (summer), Sugarcane, Guava, Soybean (summer)
Garaj, Aurangabad	Dugwell near dam	2.6	20,976	4,419	20,149	1.7	Soybean, Tur, Wheat, Jwari, Grapes, Vegetables
Garaj, Aurangabad	Dug well, borewell, canal	3.2	41,391	5,367	24,473	0.6	Cotton, Maize, Wheat, Gram, Ginger, Maize (rabi), Orange

DT User Groups, scale-up through UMA colleges: MoU IV, I

- 10 - 15 colleges of Vidarbha and Marathwada through Unnat Maharashtra Abhiyan
- IIT to conduct workshops and provide support
- Scope:
  - One Distribution Transformer per college
  - Introduction of Demand-side measures to farmers: Load management and capacitors
  - Documentation and analysis of infrastructure, documentation of latent demand
  - Development of Load Management schedule
- DT User group model feeds into the ‘information comprehension and collective action’ framework

Big Picture.

Energy: Like water, key Input. Lots of farmer investments. Crucial for resilience.
MSEDCL and Dept. of Agriculture i.e., Supply and Demand side need to coordinate.

Energy Sector Outputs and Future Work

DT User group:

Infrastructure analysis-> DT level simulation, modelling

Energy demand measurements, loading measurements on DT, irrigation habits -> Current loading scenarios

Water - energy correlations, water transfers, irrigation requirements and practices -> Load management scenarios in rabi;

Extension programme on capacitor usage -> Capacitor usage on selected user group DTs / villages

Restructuring in Umbarda:

Buy-in from MSEDCL for restructuring and provision of new connections; Timeline for restructuring

Latent demand analysis, pending connections, unsanctioned drawl, reasons for delay in new connections including buy-in from farmers on line and DT locations on gats-> Village level comprehension on current network and on latent demand; Formalizing latent demand, documenting with MSEDCL; Demand updation;

Restructuring, -> Updating demand, and new restructured network; Community acceptance on new network, DT locations, LT line locations in fields (Right of Way); Handover to MSEDCL;

Energy - water measurements:

5 villages energy-water measurements; Common crops, horticulture; Sources-> dugwells, farm ponds, dam; Dug well to borewell transfers; Farmer surveys conducted fortnightly/monthly

Parbhani village selection and meter installation; Existing villages -> Changing a few farmers, re-installing meters where removed; Monitoring changes in crop selection, water usage in the second year

Objectives -

Post Harvest Component

To reduce postharvest losses of selected agriculture produce through appropriate technological interventions

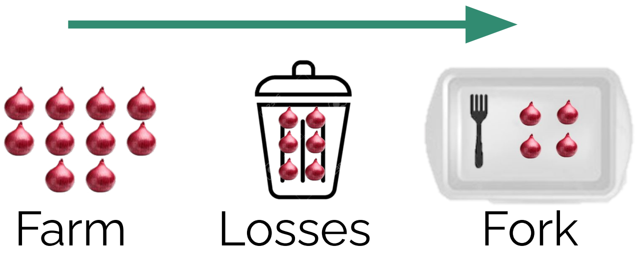
Specific Objective I

To minimise onion storage losses through implementation of Climate agnostic onion storage structure for FPCs.

Specific Objective II

To introduce appropriate value addition route through processing of selected agri commodities to increase financial returns of the FPCs

Problem



Losses in 'Storage phase' of Value Chain

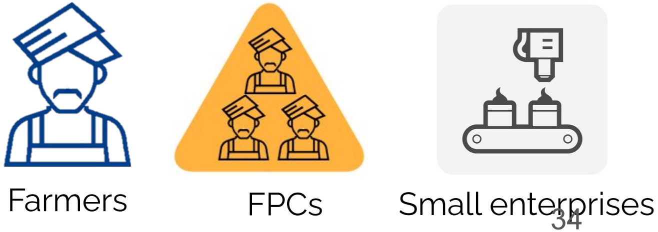
20-50 % | **~15-25 Billion** ₹ PA

- Poor and insufficient storage infrastructure
- Farmers face huge losses during 'Peak supply period'
- Consumers suffer from high retail prices during 'Peak Demand Period'
- High perishability of Onion
- B:C ratio (for Onion crop) is continuously shrinking

Potential Solution

- Through focused research of last 3+ years, IIT Bombay has developed a **Climate Agnostic Onion Storage Structure** to curb storage losses by 90% as proven at smaller scale

Stakeholders



Actions & Deliverables…1

Development of a detailed project report and installation of large scale (500-1000 tonnes) onion storage structure.

Detailed Mapping of Onion

Production,Processing and Storage. Current storage practices

Financial Modeling

Projected income & Expenditure, Cost-benefit & Break Even Analysis

Screening of FPCs

Portfolio, Quantum, Productivity, capability, Willingness to adopt technology etc.

Assisting FPCs

SWOT analysis, Risk mitigation strategies Implementation Planning,

Actions & Deliverables...2

To prepare a DPR for one FPC in regard to value addition of agriculture produce via new processes & products developed at IIT Bombay and elsewhere.

- **Matrix Development for Crop Screening**
- **Screening of FPCs**
- **Detailed Feasibility Study**
- **Financial Viability**
- **Market Viability**

Schedule

Components	Activity	Month
1.	**Development of a detailed project report for onion storage structure**	
1.1	Preliminary report:	2nd
1.2	Interim report	4th
1.3	Final report	6th
2.	**Development of a DPR for one FPC in regard to value addition of agriculture produce via new processes & products**	
2.1	Preliminary report:	2nd
2.2	Interim report:	4th
2.3	Final report	6th
3.	**Commissioning of the onion storage project**	
3.1	Assist in Selection of the suitable location and geographic features of the area.	9th
3.2	Assist FPC in Procurement,, Installation and Commissioning of the project	12th

Budget

Sr No	Name of Personnel	Unit Rate (per month)	Number of Months	Total (lakh)
1	Prof. Amit Arora	30000	5	1.5
2	Project Research Engineer (1)	50000	12	6.0
3	Project Research Assistant (2)	30000	12	7.2
4	Students and Interns (4)	20000	6	4.8
5	Project Manager for Implementation work (1)	100000	5	5
Total Human resource				24.5
Head-wise totals				
Human Resources				24.5
Travel + Logistics:				3.0
Contingency				4.0
Total				**31.5**

Overall Budget (all in Rs. Lakh)

Component	**Water**	**Energy**	**Post-Harvest**	**Total**
Manpower	67.3	31.0	24.5	
Equipment	12.0	4.0	0	
Logistics	15.0	8.0	3.0	
Contingency	11.0	6.0	4.0	
Total	105.3	49.0	31.5	**185.8**
With IIT Overheads (20% on selected components) but without GST				**218.82**

Schedule

Phase	Duration	Payment#
Phase 0	Within 15 days from commencement of work	10% of Agreement cost
Phase I	2 months from commencement of work	10% of Agreement cost
Phase II	5 Months from commencement of work	25 % of Agreement Cost
Phase III	8 months from commencement of work	25 % of Agreement cost
Phase IV	10 Months from commencement of work	20 % of Agreement cost
Phase V	12 Months from commencement of work	10 % of Agreement cost

धन्यवाद