

Water Allocation: Update (Part B,C and D)

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PoCRA Team
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Date: 25th Feb'19

Work done - Charts

1. Delivered Backend queries and database for village level chart – output village-wise year-wise table with numbers (IITB)
2. Finalized Design of Front end display – printable pdf format in marathi for flex (Runtime)
3. Completed Front end automation for numeric entries in chart – graph formation, village name etc (Runtime)
4. Water Balance Queries also available in Postgress - last 6 years all scenarios (IITB)

Documents delivered: Procedure to prepare village chart, Database formulation, DPR guidelines - improved version, Water allocation - Version I

Schema and online chart generation

	census_code integer	village_name character varying(100)	chart_year integer	village_area_hectare numeric	rainfall_crorelitres numeric	runoff_crorelitres numeric	kharif_area_hectare numeric	longkharif_area_hectare numeric
1	530131	Pach Pimpal	2013	242.08	247.99	0	0	0
2	527026	Manegaon	2013	919.21	710.55	286.27	68.49	408.18
3	527027	Kothali	2013	684.25	528.93	221.92	57.99	333.42
4	527032	Salbardi	2013	365.50	282.53	105.46	28.42	157
5	527034	Hartale	2013	3541.04	2737.22	1157.80	520.79	1155.11

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Census Code

Chart Year

Please Fill Fields First

Charts available to download in pdf format

Work in upcoming weeks

1. Monitoring and Evaluation Framework - Key Indicators
2. Water Allocation Framework
3. Farmer Sampling methodology for sound results
4. Farm level PDO indices design and analysis for sample case studies
5. Farm level indicator schema
6. Village level Aggregation method for PDO indices
7. Connecting with DBT and other datasets - IT

Principles:

- Targeting - landed and landless
- Improvement in access to water
- Translating access into yields
- Translating yields into stability

Monitoring and Evaluation: principles

Key Indicators

1. KPI 1 - water productivity at farm level
 - a. Access to protective irrigation for rainfed farmers
2. KPI 2 - Improved yield stability
 - a. spatial yield variation - zonal
 - b. temporal yield variation - yearly
3. KPI 5 - Farmers reached with agricultural assets
 - a. beneficiary shift

Data sources -

1. primary sampling to be done on DBT database (farm level)
 - a. Identify rainfed project beneficiary farmers
2. Identify main P1 and P2 kharif crops in village (village level)
 - a. crop sowing report/ water budget
 - b. irrigated and rainfed area for main crops
 - c. total crop yields for selected crops

Farmer selection guidelines

Farmer category	Main Crops	Intervention	Farm location	Indicator
Measures vulnerability	Measures impact on crop choice	Measures impact of intervention	Measures spatial variance	Measures productivity
P3 farmer with no assets and no watering given	Main P3 kharif crop in village	Public Intervention - streamline (CNB/MNB/PT)	In stream proximity below intervention location	Yield benefit to near stream small holder farmers
P2 farmer with no assets	Main P2 kharif crop in village	Public Intervention - streamline (CNB/MNB/PT)	In stream proximity below intervention location	Yield benefit to near stream small holder farmers
P2 farmer with new watering asset	Main P2 kharif crop in village	away/not impacted by public intervention	Away from stream proximity	Yield benefit due to project intervention
P3 farmer with new watering asset	Main P3 kharif crop in village	away/not impacted by public intervention	Away from stream proximity	Yield benefit due to project Intervention

Water Productivity (kg/m³)

Computation:

$$\frac{\text{Yield} * \text{Area}}{(\text{AET} + \text{Water Allocation})}$$

- Conducted at Village level/Zone level for 2 main P2 and P3 kharif crops.
(soybean/cotton/tur/moong)
- Conducted for sample farmers in each zone to gauge spatial yield variability
- To be conducted at baseline and year 3 onwards

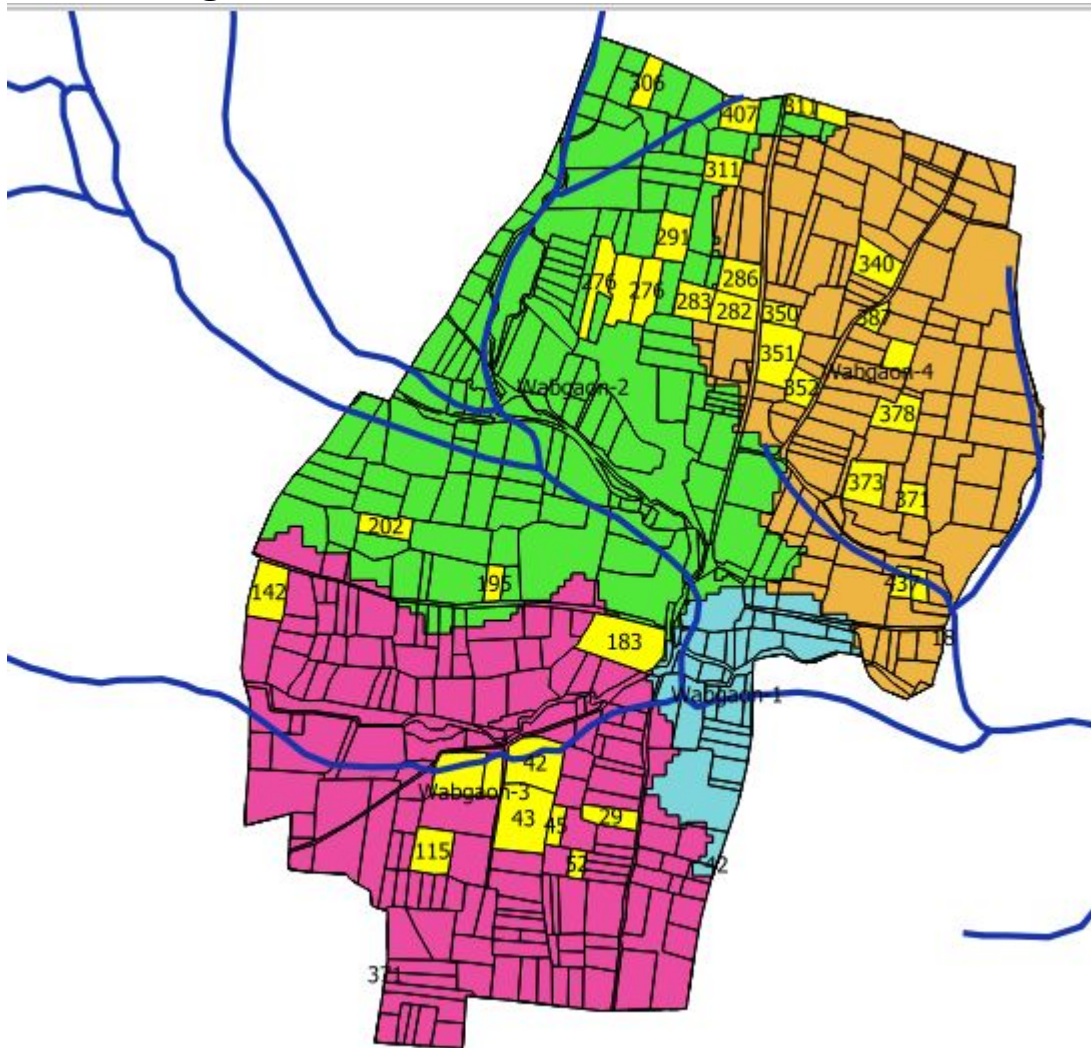
Field Visits - Wardha, Jalgaon, Latur (2nd - 5th Feb'19)

Objectives: Farmer survey to study water allocation, design PDO indices and soil sample collection



Surveyed Farmers

Wabgaon, Wardha



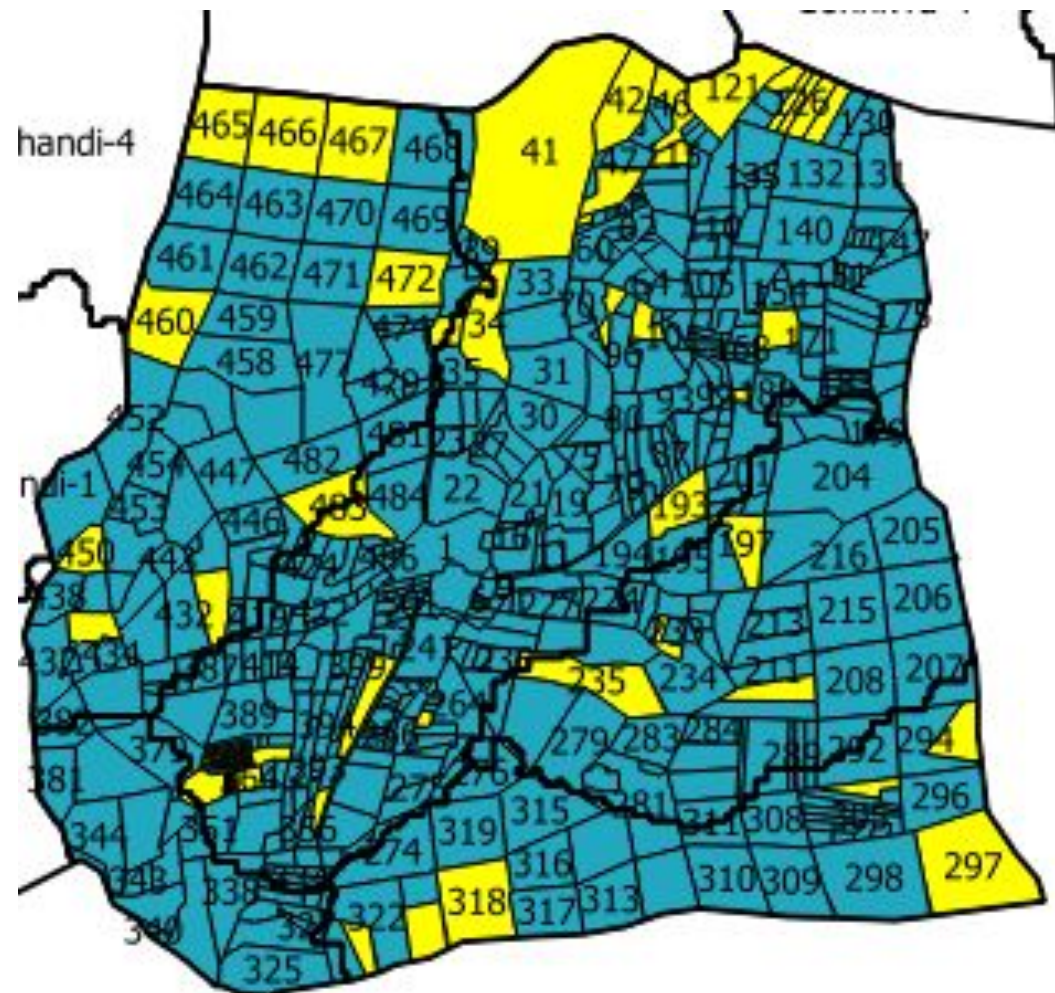
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Scale 1:33,737

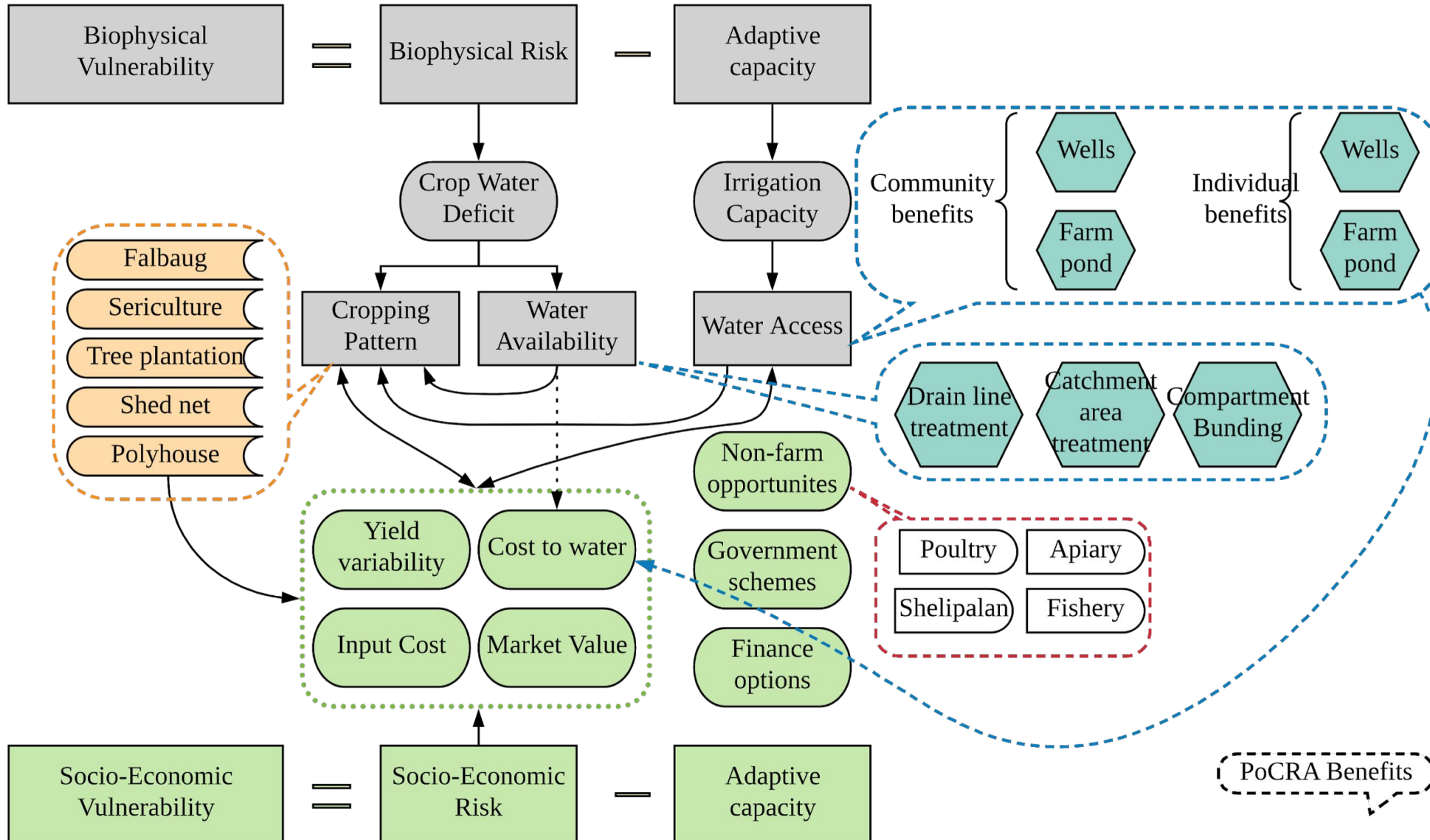
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Magnifier

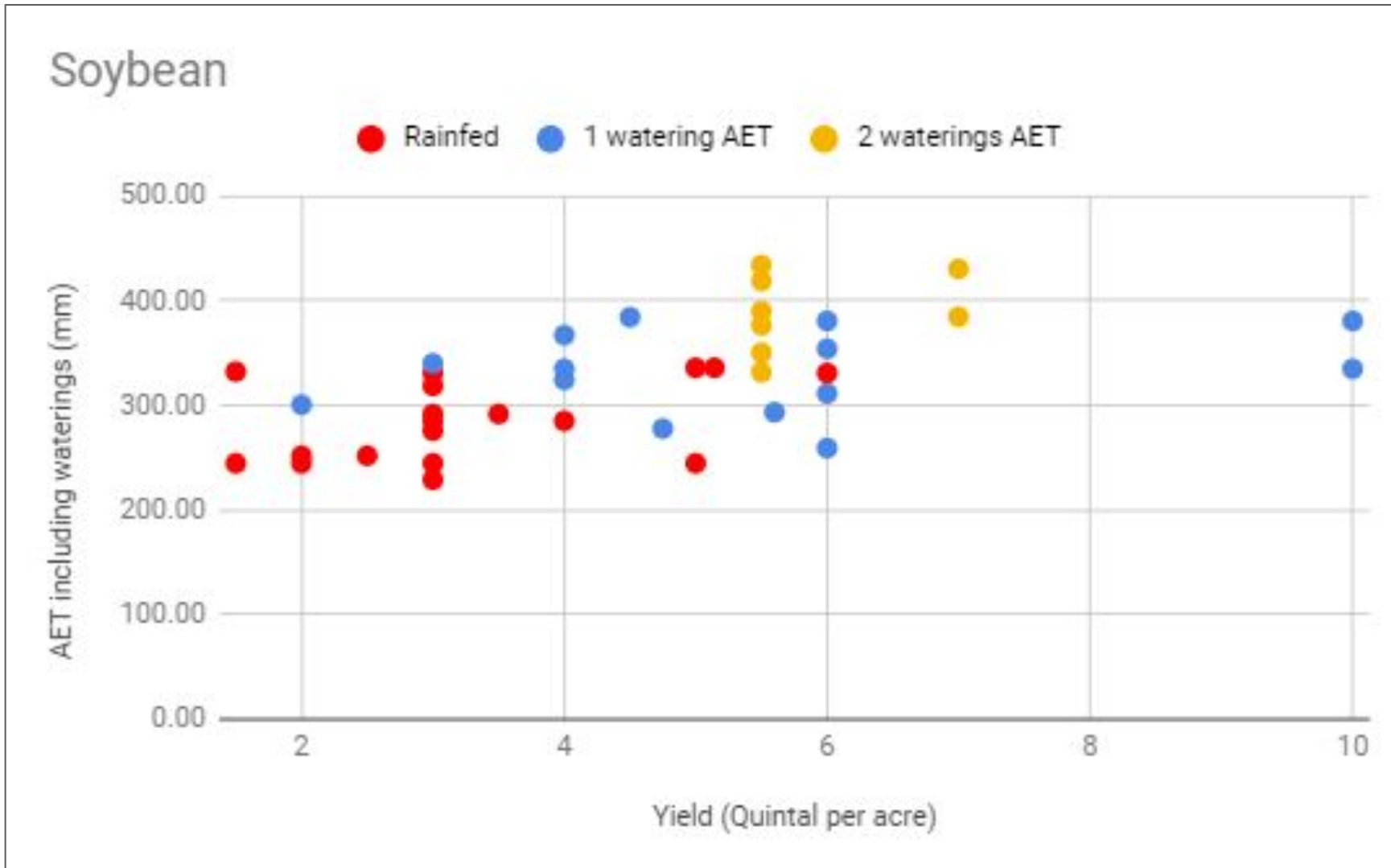
Yelda, Beed



Vulnerability identification

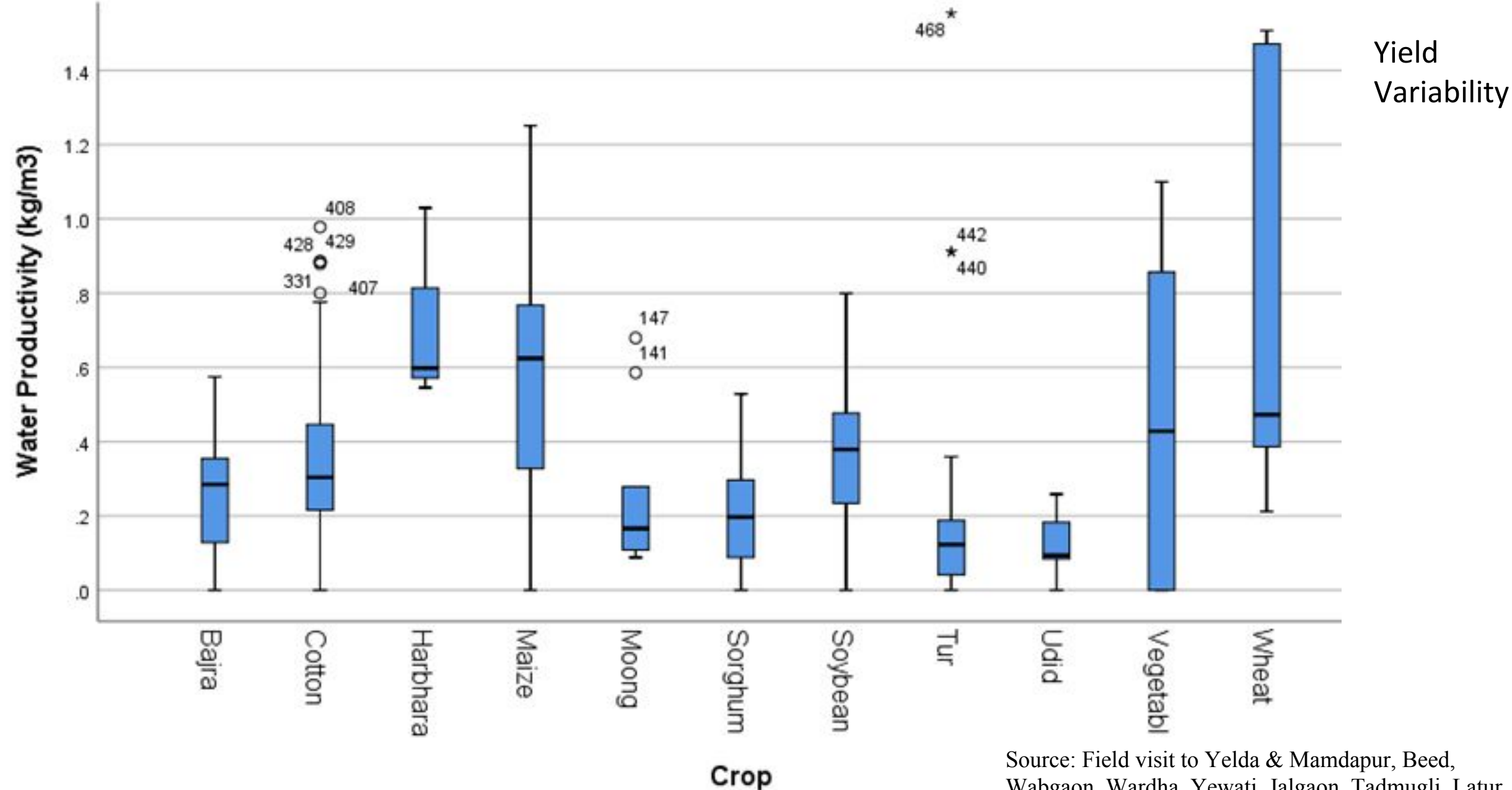


Water Productivity: Watering and Yields



Source: Field visit to Yelda, Beed

Water productivity for different crops

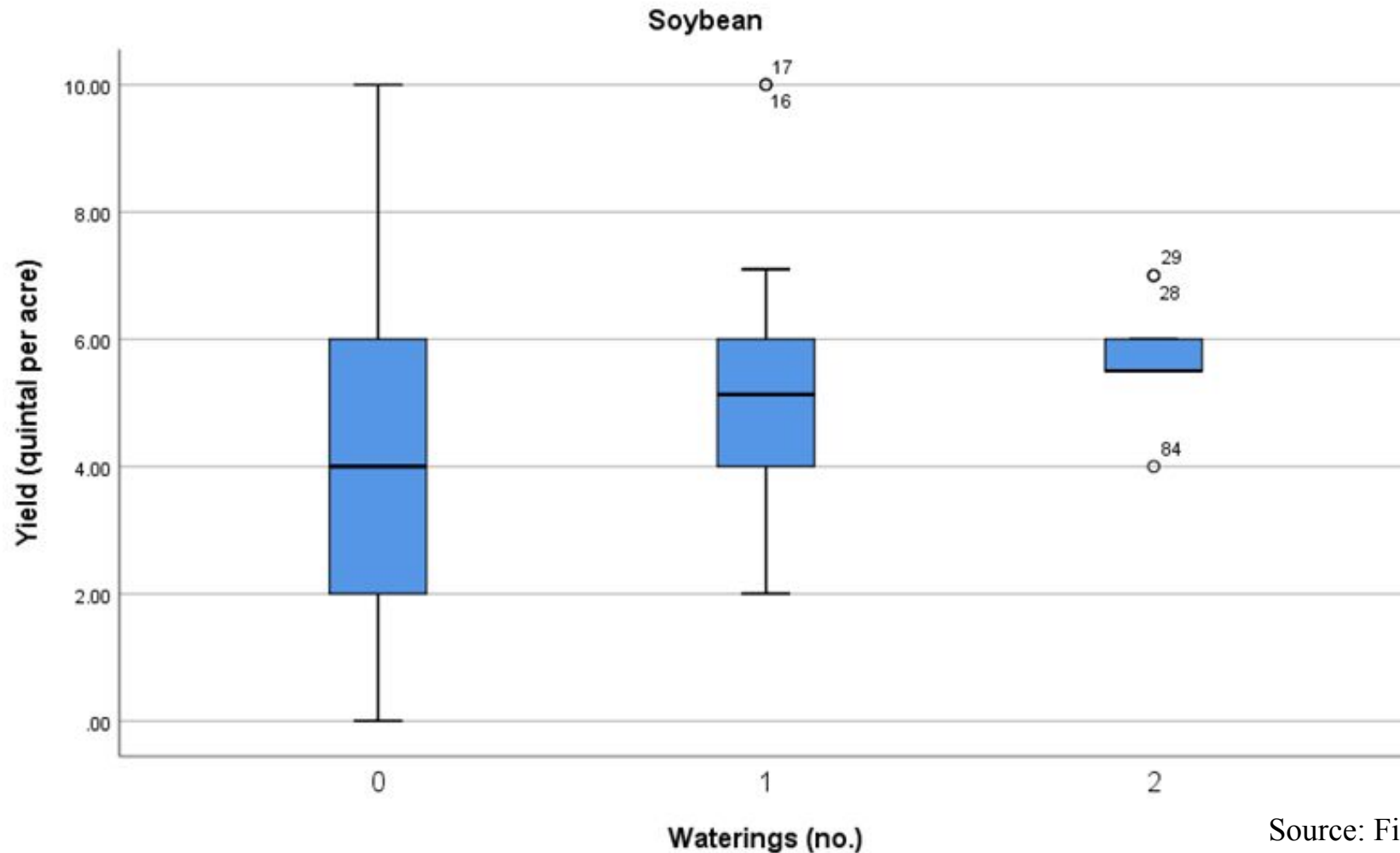


Source: Field visit to Yelda & Mamdapur, Beed, Wabgaon, Wardha, Yewati, Jalgaon, Tadmugli, Latur

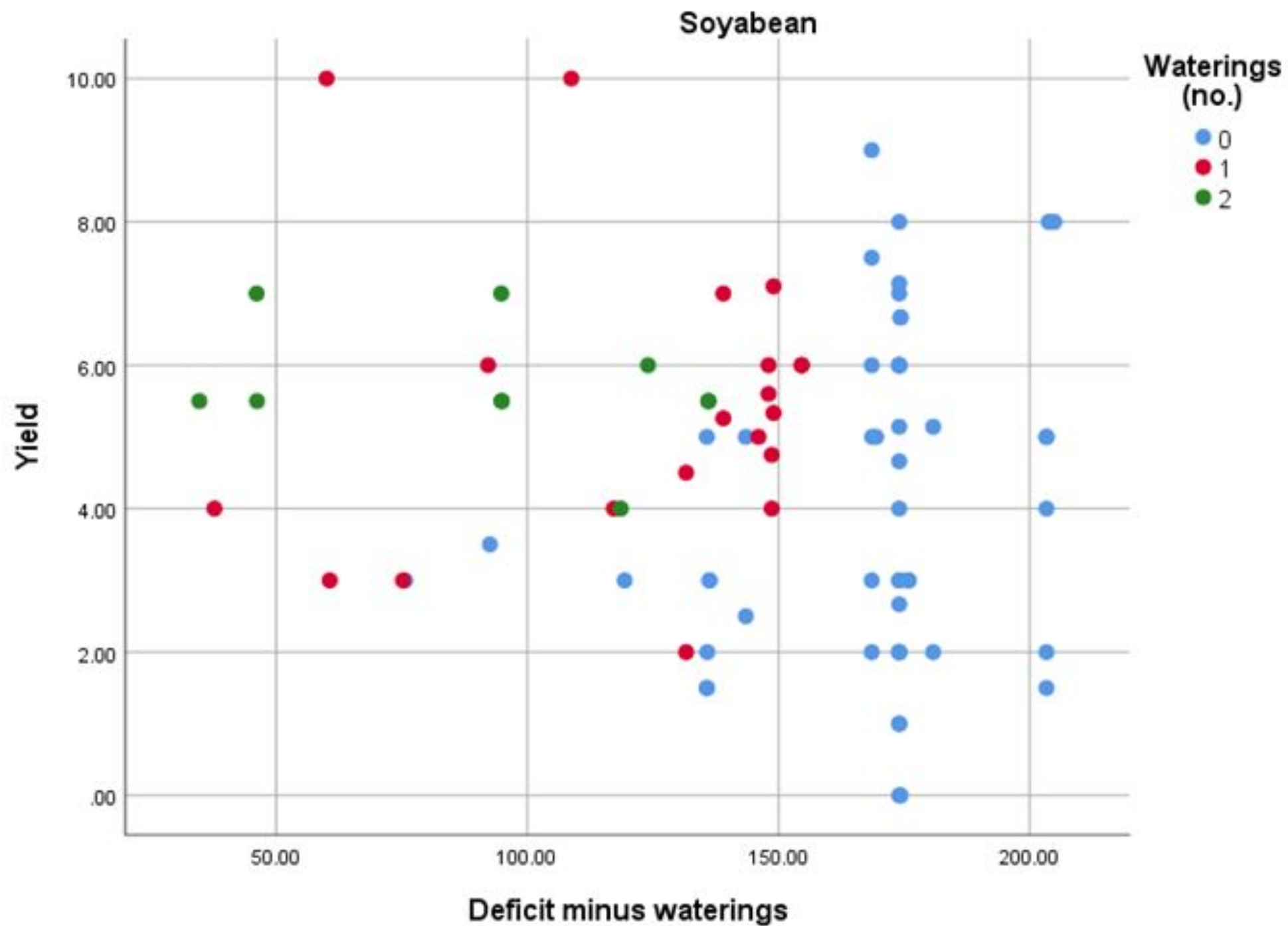
Yield variability box plots

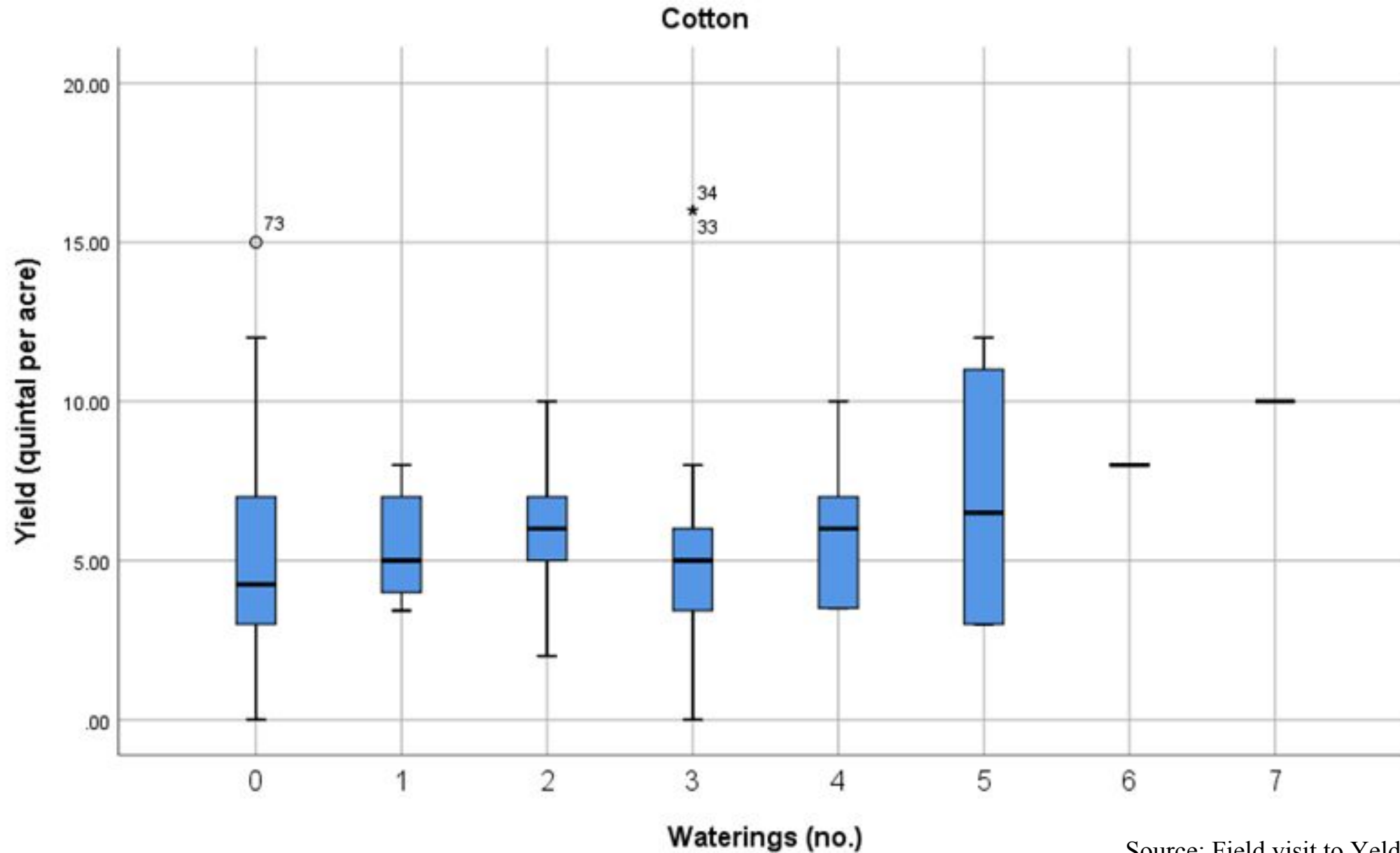
Factors contributing to variation include:

- 1) soil texture
- 2) soil depth
- 3) waterings
- 4) AET/ Deficit



Source: Field visit to Yelda & Mamdapur, Beed, Wabgaon, Wardha, Yewati, Jalgaon, Tadmugli, Latur



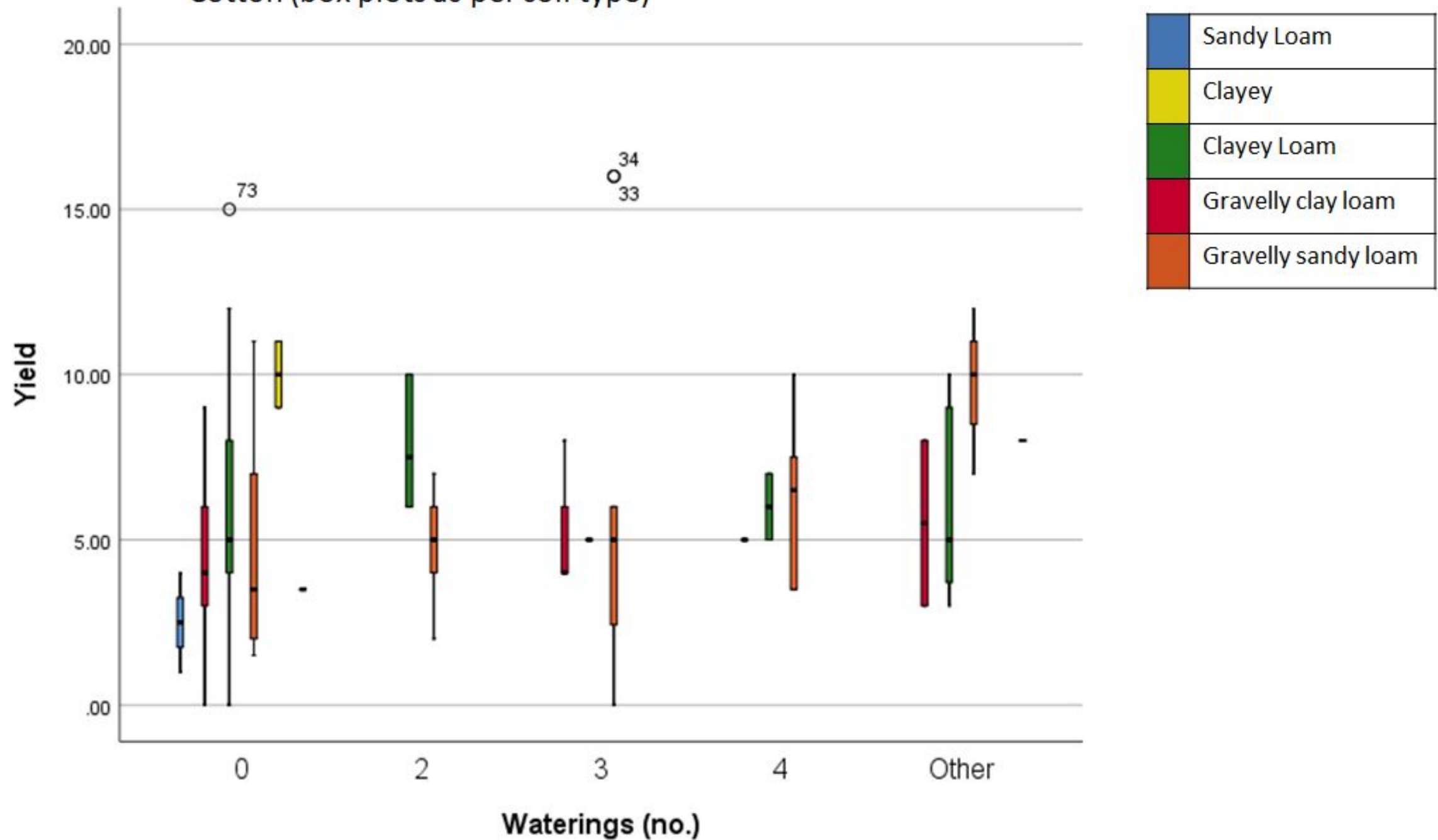


Factors which need to be considered include:

- 1) no. of pickings
- 2) pest attack

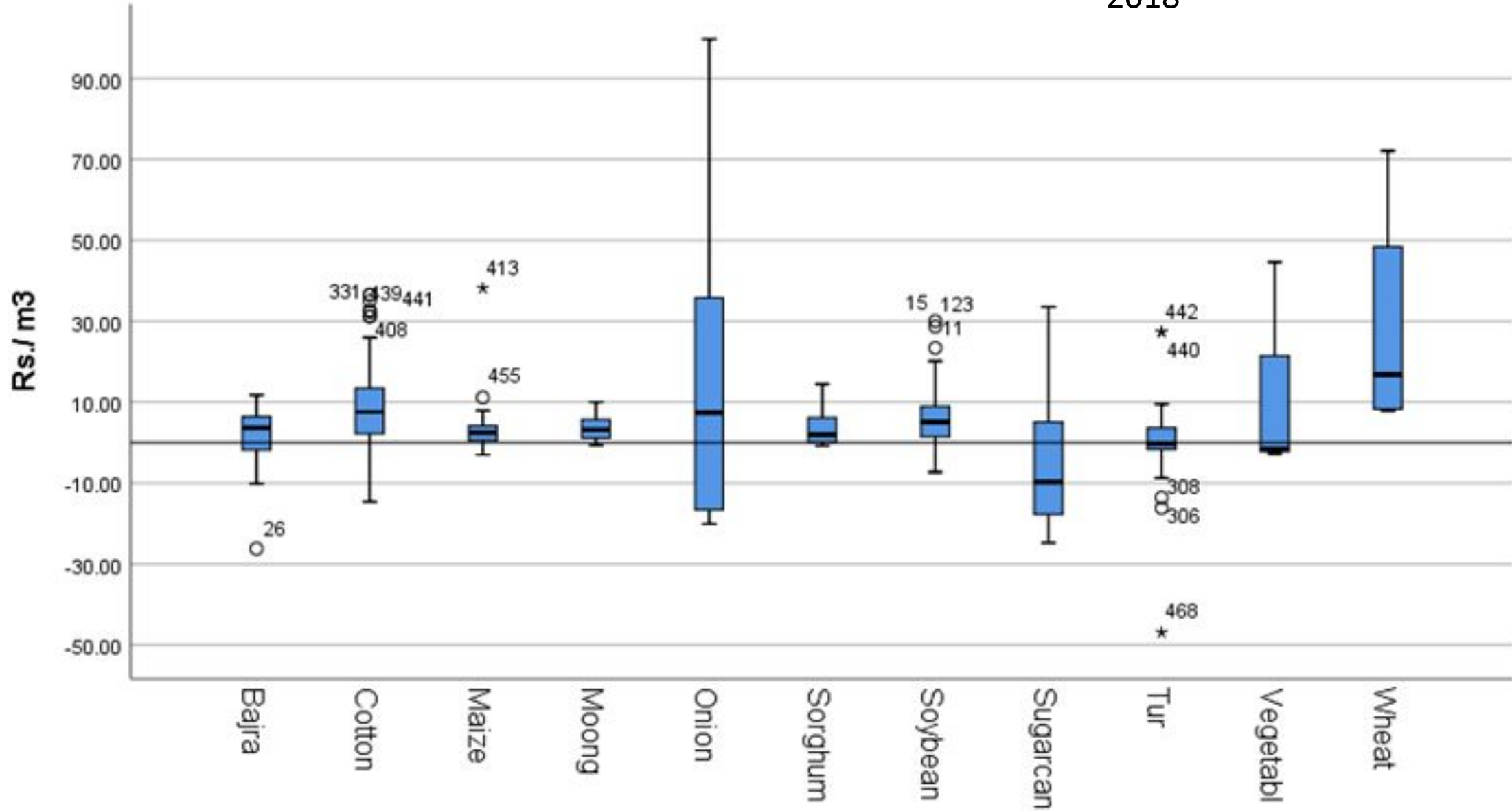
Source: Field visit to Yelda & Mamdapur, Beed, Wabgaon, Wardha, Yewati, Jalgaon, Tadmugli, Latur

Cotton (box plots as per soil type)



Economic productivity of different crops

2018



Source: Field visit to Yelda & Mamdapur, Beed, Wabgaon, Wardha, Yewati, Jalgaon, Tadmugli, Latur

1. Cropping Pattern
2. Watering and Yield
3. Well Profiles
4. PoCRA benefits
5. Farm level Indices
6. *DBT schema to be added*

Cropping_Pattern	
Total_area_acre	integer
soil_type	varchar
soil_depth_foot	integer
crop_year	integer
crop_name	varchar
crop_season	varchar
crop_type	varchar
crop_area_acre	decimal
sowing_month	varchar
harvesting_month	varchar
no_of_waterings	integer
Watering_months	varchar
Watering_source	varchar
Irrigation_type	varchar
Dripper_rate_LPH	decimal
pumping_hrs_perday	integer
Drip_frequency_days	integer
crop_yield_quintal_peracre	integer
crop_input_cost_rsperacre	integer
market_rate_rsperacre	integer
market_name	varchar
market_distance_km	integer
PET_mm	integer
AET_mm	integer
Monsoon_deficit	integer
Rainfall	integer
Farm_ID	integer
Census_code	integer

General_Info	
Farmer Information	
Contact_no	integer
Total_area_acre	integer
Earning_members_no_farm	integer
Earning_members_no_other	integer
Main_occupation	varchar
Secondary_occupation	varchar
Livestock	varchar
Livestock_no	integer
Fodder_source	varchar
Fodder_availability_months	integer
Annual_income_livestock_Rs	integer
Drinking_water_source	varchar
Drinking_water_availability_months	varchar
Migration	boolean
Along_with_family	boolean
Migration_no_of_months	integer
Migration_daily_wages_Rs	integer
Migration_place	varchar
Crop_loan	integer
Bank_name	string
Loan_year	integer
Loan_waiver_recieved	boolean
Loan_waiver_year	integer
Pocra_demands	varchar
New_cropping_pattern_post_demands	varchar
Farm_ID	integer
Census_code	integer

Farmer_Water_balance	
Total_area_acre	integer
AET_mm	integer
PET_mm	integer
Deficit_mm	integer
Yield_quintal_permm	integer
Farm_ID	integer
Census_code	integer

Well_profile	
Well_depth_foot	integer
pump_hp	integer
Soil_type	varchar
Soil_depth_foot	integer
Murum_starts_foot	integer
Hard_rock_starts_foot	integer
horizontal_bores_no	integer
Horizontal_bores_depth_foot	integer
water_level_may_foot	integer
water_starts_rising_month	varchar
maximum_water_level_month	varchar
maximum_water_level_foot	varchar
Last_watering_month	varchar
Farm_ID	integer
Census_code	integer

Well_Watering_Info	
Farm_ID	integer
watering_no	integer
watering_month_or_date	varchar
water_level_before_watering_foot	integer
duration_of_watering_hrs	integer
duration_of_watering_days	integer
water_level_after_watering_foot	integer
days_for_water_level_rise	integer
water_level_after_rise_foot	integer
crops_watered	varchar
area_watered	integer
Census_code	integer

Village_Data	
Census_code	integer

Farmer_Info	
Census_code	integer
Farmer name	string

Measurements: Farm Level to Village Level

Activities:

1. Interview Based Rapid Assessments
2. Crop Cutting Tests for Yield Measurement

Sampling method and Village selection to be decided

- For villages selection at Cluster Level - sample size - 30 - 40 farmers
- For Farmer selection in Village - Sample size - 10-12 farmers

Linkages with DBT for indices

District

Wardha

Taluka

Deoli

Village

Wabgaon - 534260

Component

Promoting an Efficient and Sustainable Use of Water for

Sub_Component

A3.3 Construction of new water harvesting structures

Activity

--Select--

FROM REGISTRATION DATE

TO REGISTRATION DATE

FROM REGISTRATION DATE

TO REGISTRATION DATE

SEARCH

Drag a column header and drop it here to group by that column

Refresh

Sr.No.

FullName

RegistrationNo

MobileNumber

RegistrationDate

Gender

Category

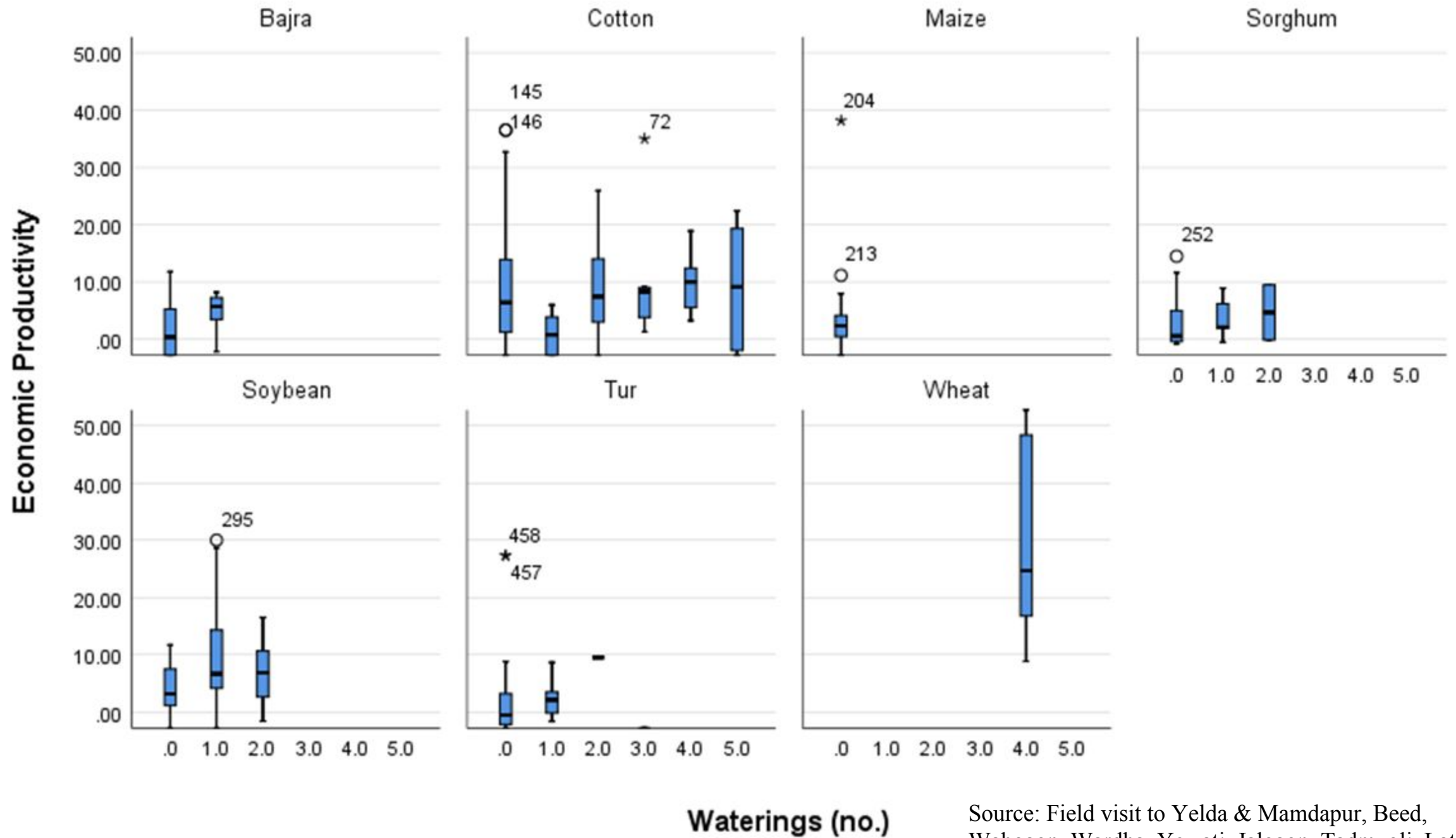
PriorityLevel

Project beneficiary mapping

1. Maps for access to protective irrigation
2. Maps for access to rabi water

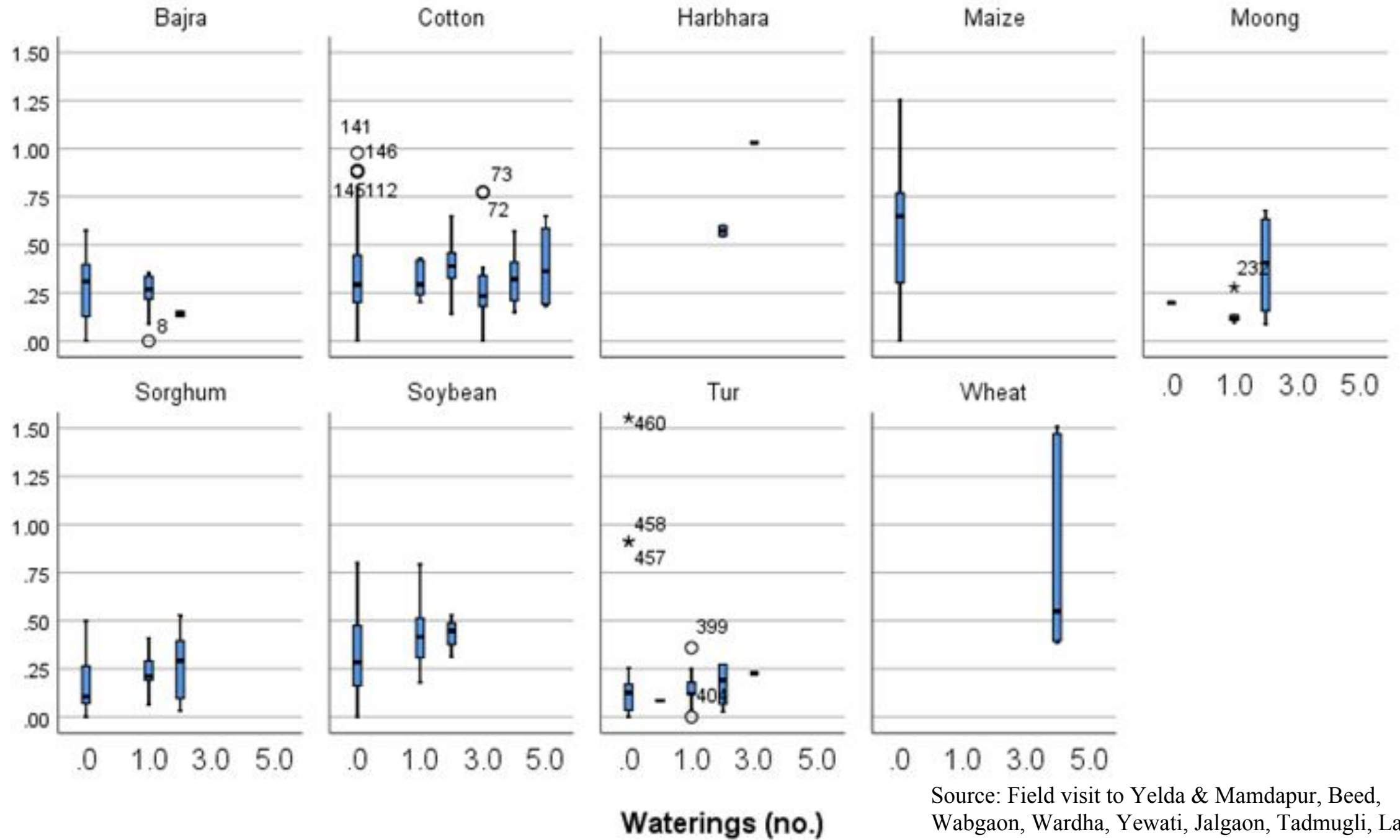
Data required: current cropping, intervention provided, existing assets in DBT format

Backup Slides



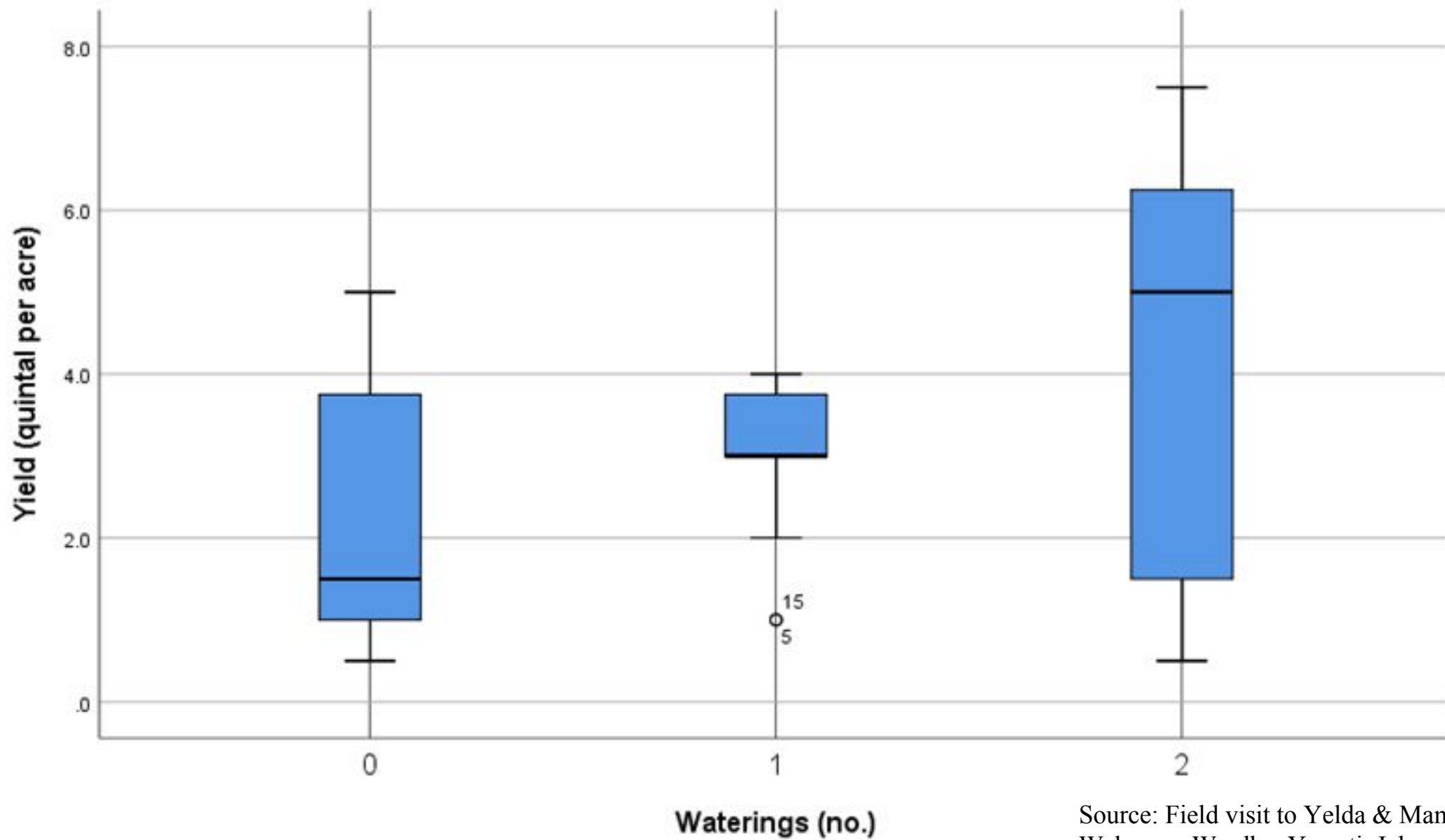
Source: Field visit to Yelda & Mamdapur, Beed, Wabgaon, Wardha, Yewati, Jalgaon, Tadmugli, Latur

Water Productivity



Source: Field visit to Yelda & Mamdapur, Beed, Wabgaon, Wardha, Yewati, Jalgaon, Tadmugli, Latur

Sorghum



Source: Field visit to Yelda & Mamdapur, Beed, Wabgaon, Wardha, Yewati, Jalgaon, Tadmugli, Latur

Linkages

KPI 1: Farm level water productivity

1. Physical water productivity (kg/m³)
2. Economic water productivity (Rs./m³)

*cropwise for P1,P2 main kharif crop for sample farmers

KPI 2: Yield stability

1. Zonal sampling - near streams/away from streams/upstream/downstream

*cropwise for P1,P2 main kharif crop for sample farmers

KPI 5: Farmers reached with agricultural assets

1. Small holder rainfed farmers with access to protective irrigation in village
2. shift in category (P3-P2-P1)

DBT

Beneficiary selection for M&E

1. current assets
2. current cropping
3. PoCRA benefits
4. new cropping pattern

Data required

Detailed survey - sample farmers

1. crop yield for selected crops
2. farmer economics (investment - market value)
3. watering information
4. asset information

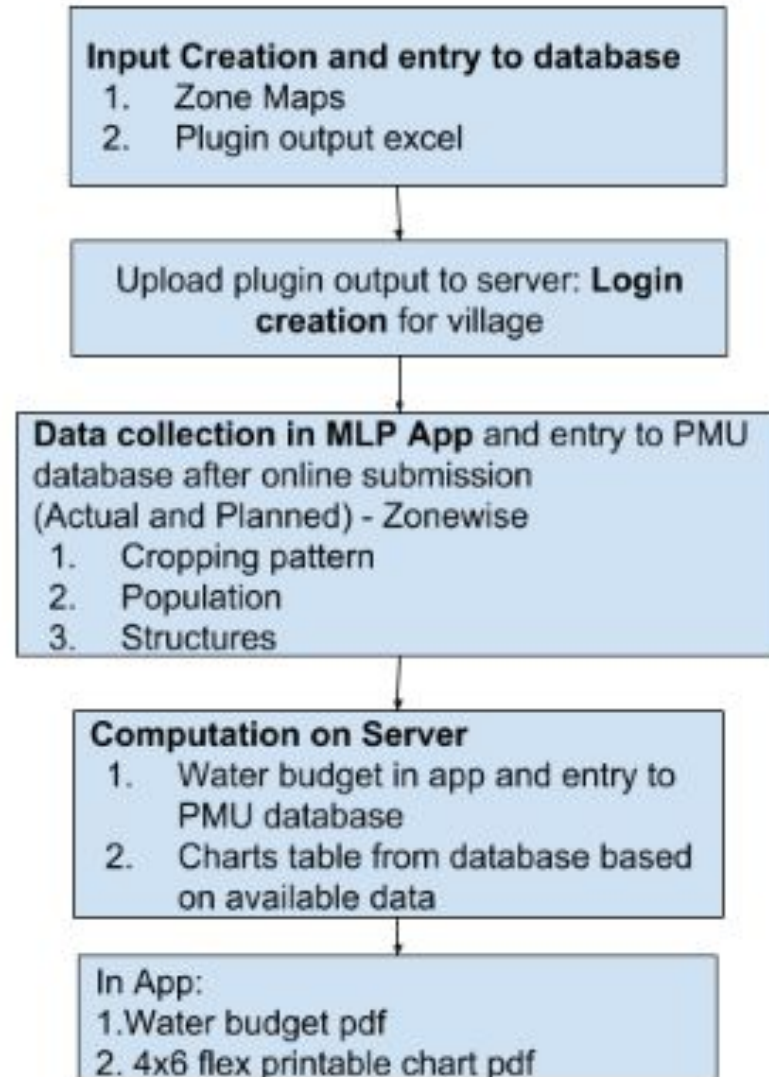
Village level

1. crop sowing report
2. APMC market data
3. Average input costs for crops
4. Total crop yield for main crops

Overall process

1. Backend queries for village level chart – output village-wise year-wise table with numbers (IITB)
2. Design of Front end display – printable pdf format in marathi for flex (Runtime)
3. Front end automation for numeric entries in chart – graph formation, village name etc (Runtime)
4. Zone maps for village(PMU)

Process flow



Backend process: IITB

1. Data collection (done)
 1. Plugin outputs (106 villages) - run plugin for 6 years
 2. Master lists (village, crop, structure, rainfall)
 3. MLP data (cropping pattern, structures, population) Actual and Planned
2. Data Issues and cleaning (ongoing)
 1. Null and duplicate entries – master lists, MLP data (decisions)
3. Building queries (done)
 1. Village water balance charts
 2. Water Balance
4. Validation (ongoing)
 1. Validation for correctness of queries
 2. Report Issue villages – issues in MLP app data

Database Schema

Sr.no.	Data Table Name	Data Source	Fixed/Variable data	Primary key attributes	Generation sequence
1	master_village_list	PMU	Fixed	census_code	I
2	master_crop_list	IITB-PMU	Fixed	crop_id, crop_name_in_english	I
3	master_structure_list	IITB-PMU	Fixed	Structure_id, structure_name_english	I
4	rainfall_data_updated	IITB-PMU	Fixed-Variable (appended yearly)	district_name, taluka_name, circle_name_maharain, year	I
5	kharif_model_zonewise_budget_2013	Plugin	Variable (will get appended)	Census_code, zone_number, crops_in_english	II
6	mlp_input_crop_data	MLP_App	Variable (will get appended)	census_code, zone_number,status, crop_id	III
7	mlp_input_population_data	MLP_App	Variable (will get appended)	census_code	III
8	mlp_structure_data	MLP_App	Variable (will get appended)	Census_code,zone_number,status,structure_id	III
9	water_balance_zone_level	Postgress query	Variable (will get appended)	census_code,water_balance_year,zone_number,date_created	IV
10	water_balance_village_level	Postgress query	Variable (will get appended)	census_code,water_balance_year,date_created	IV
11	master_output_attributes_chart	Postgress query	Variable (will get appended)	census_code,chart_year,date_created	V

Detailed schema for each table will be available in database

Database: Sample Inputs and Outputs in Postgress

Crop data

village_name character varying(100)	census_code numeric	crop_area_count numeric	crop_name character varying(100)	zone_number numeric	zone_area numeric	status character varying(100)	date_of_creation character varying(100)	crop_id character varying(100)	crop_season_and_landuse character varying(100)
Antargaon	542600	0	sugarcane	1	199.62	Actual		C16	Annual
Balapur	548881	9	gram	3		Planned		C41	Rabi
Bhatkheda	547836	1	wasteland	1		Planned		C47	Landuse
Bhokarbari	527581	48	sorghum	2		Planned		C26	Kharif_Main
Chakwa	530743	0	rabi_chilly	1	257.87	Actual		C39	Rabi

Structure data

	village_name character varying(100)	census_code numeric	zone_number numeric	status character varying(100)	total_capacity numeric	total_water numeric	structure_name character varying(100)	strcuture_count numeric	structure_name_english character varying(100)
1	Yelda	560013	2	Actual	10	7	माती नाला बांध	1	MNB
2	AndhleWadi	559728	1	Actual	0	0	बोरवेल	20	borewells
3	Tornala	531176	2	Actual	0	0	वैयक्तिक विहिरी	18	wells
4	Shivni	559607	3	Proposed	0	0	वैयक्तिक विहिरी	5	wells
5	Arni	561628	1	Actual	24	16.8	सिमेंट नाला बांध	2	CNB
6	Chapadgaon	547905	1	Actual	0	0	बोरवेल	8	borewells

Village chart output data

	census_code integer	village_name character varying(100)	chart_year integer	village_area_hectare numeric	rainfall_crorelitres numeric	runoff_crorelitres numeric	kharif_area_hectare numeric	longkharif_area_hectare numeric
1	530131	Pach Pimpal	2013	242.08	247.99	0	0	0
2	527026	Manegaon	2013	919.21	710.55	286.27	68.49	408.18
3	527027	Kothali	2013	684.25	528.93	221.92	57.99	333.42
4	527032	Salbardi	2013	365.50	282.53	105.46	28.42	157
5	527034	Hartale	2013	3541.04	2737.22	1157.80	520.79	1155.11

Sample Queries and Issues

	village_name character varying(100)	census_code integer	village_name_marathi character varying(100)	district_code numeric	district_name character varying(100)
1	Khanapur		रीकत	501	akola
2	Chandrapur		रीकत	503	amravati
3	Aki		रीकत	501	akola
4	Akot		रीकत	501	akola
5	Dewarda		रीकत	501	akola
6	Kaulkhed Gumase		रीकत	501	akola
7	Isapur		रीकत	500	Buldana
8	Paturda Bk		रीकत	500	Buldana
9	Pimpri Wanerkhed		रीकत	500	Buldana
10	Daryapur Banosa (MCI)		रीकत	503	amravati
11	Jasapur		रीकत	503	amravati
12	Kinholi		रीकत	503	amravati

Villages with no census code

	village_name character varying(100)	census_code integer	poultry_farming numeric	small_animals numeric	people numeric	cattle numeric
1	Majalapur	528466				
2	Majalapur	528466				
3	Majalapur	528466			0	0
4	Majalapur	528466				
5	Majalapur	528466				
6	Majalapur	528466				

Villages with multiple entries in population data

Decisions taken –

1. Villages with no census code data deleted for now to set primary key in table
2. Duplicate population entries deleted
3. Multiple crop entries will be considered (matched the cropping pattern to village area)
4. Duplicate entries in structure table considered and primary key not set due to duplicate entries

Villages with multiple entries in crop data

	census_code numeric	zone_number numeric	status character varying(100)	crop_id character varying(100)	count bigint
1	560887		4 Actual	C49	2
2	560809		3 Actual	C29	2
3	560887		3 Actual	C26	2
4	560807		3 Actual	C22	2
5	560889		2 Actual	C28	2
6	560809		4 Actual	C36	2
7	544877		4 Actual	C21	2
8	560807		2 Actual	C12	2

Intermediate Queries

village_name	chart_year	village_area_hectare	rainfall_crorelitres	agricultural_pet_crorelitres	pet_monsoon	pet_post_monsoon	aet_monsoon
Pach Pimpal	2013	242.08	247.99	0	0	0	0
Manegaon	2013	919.21	710.55	474.77	246.37	228.4	218.74
Kothali	2013	684.25	528.93	314.67	185.35	129.32	167.09
Salbardi	2013	365.5	282.53	180.08	86.42	93.66	75.2
Hartale	2013	3541.04	2737.22	1246.71	795.11	451.6	682.57

Compute total water requirement for village according to crop duration

census_code	village_name	chart_year	currently_impounded_runoff	runoff_impounded_after_proposed_structures
530131	Pach Pimpal	2013	0	0
527026	Manegaon	2013	4.16	6.84
527027	Kothali	2013	2.3	0
527032	Salbardi	2013	10.76	12.73
527034	Hartale	2013	92.68	0

Compute total storage Actual and Planned for village in crore liters

- **Water Budget Computation Now Available as a Query for Building MLP app**

Front End process

1. Design of Front end display – Working on solution for font Issue. To give a printable sample chart pdf by tomorrow for trail. (Runtime)
2. Front end automation for numeric entries in chart – ongoing (Runtime)
3. Zone maps for village (format to be finalized by Runtime yet –PMU)

Agenda

1. Monitoring and Evaluation framework
 - a. Sampling method and size for village and farmer selection
 - b. Farm level data collection formats for measurement
 - c. Additions in DBT format required for M&E
 - d. Indices measurement framework - farm and village level
2. Linkage with DBT schema - input data requirements for baseline and further (current cropping, current assets, pocra assets)
3. Linkage with Water Budget Applet/ MLP database - for village level

Continued..

1. **Beneficiary issues** - information such as presence of electricity connection/pump set or other norms required while approving new intervention - needs to be taken during MLP itself in DBT (this information not present in DBT schema)
 - component wise addition of fields with norms in DBT will be useful during technical approval
 - reduce double processing of beneficiary documents
2. **Guidelines on DPR, DPR format automation through MLP App**
 - Targeting vulnerable/rainfed beneficiaries
 - Approved beneficiary list with baseline beneficiary information
 - appropriate mapping of existing structures and new structures