

Submission for IRIS National Fair, New Delhi, 2002-23

# Maximising vegetable yield for small landholding farmers in Alibaug, Raigad (North Konkan Coast), Maharashtra

**Project Name: Upaj Badao**

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Category: [Plant Sciences]

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# Overview

- Majority of India's 93 million farmers are marginal farmers, those with a small landholding. The average size of the holding is estimated at 1.15 hectare and this has shown a steady declining trend over various Agriculture Censuses since 1970-71 which clearly shows the stress that marginal farmers undergo in India as agriculture is the primary source of livelihood for them.
- Research project is focused on economic upliftment of the small landholding farmers through enabling them with better knowledge and techniques which can maximise the vegetable yield in their small farms.
- The research and findings are based upon the year long Primary and Secondary Research at the project at at Kolgaon, Alibaug (Raigad, Maharashtra).
- The data from the research has been used to arrive at the most appropriate recommendation to the local farmers through an App for maximising the yield for vegetables.



# Primary Research



1. Interactions with local farmers at Kolgaon Village in Alibaug
1. Visits to the local agriculture shops and discussions with the shop owners over various products used by farmers
1. Visit to the Government soil testing lab for soil testing and discussion with the officials on typical issues faced by local farmers



# Secondary Research



1. Local government website (Krishi Vigyan Kendra) referred to for details on the weather data (rainfall, temperature, humidity) for Alibaug region
2. Information from Agriculture Research Station for Raigad was reviewed
3. Department of Agronomy data was studied for crop advisory based on weather forecast

The screenshot shows the Raigad District website with a navigation menu and a 'Rainfall and Weather' section. The section includes a list of links: 1. Regional Daily Forecast, 2. Fort Warning, 3. Fishermen warning, 4. Coastal Weather Bulletin, 5. Sea Area Bulletin, 6. Weekly Weather Report, and 7. Indian National Centre for Ocean Information Services (ISSO - INCOIS).

The screenshot shows the AGROMET ADVISORY SERVICE BULLETIN FOR RAIGAD DISTRICT, issued jointly by GKMS, Dr. B.S. Konkani Krishi Vidyaapeeth, & India Meteorological Department. The bulletin is dated 21/01/2022 and is for a duration of 5 days. It includes the names of the Head of Department of Agronomy and the Technical Officer. The bulletin contains a table of significant past weather for the preceding week, weather parameters, and weather forecast until 08.30 hrs of 26/01/2022. It also includes a weather summary/alert and a general advisory for the crop stage.

Significant past weather for the preceding week (Period -18/01/2022 to 21/01/2022) (Source: AWS, Kasajal)							Weather Parameters				Weather forecast until 08.30 hrs of 26/01/2022 (Source: Regional Meteorological Centre, Mumbai)			
18/01	19/01	20/01	21/01	22/01	23/01	24/01	25/01	26/01	27/01	28/01	29/01	30/01	31/01	
0.0	0.0	0.0	-	-	-	-	-	0	3	0	0	0	0	
33.9	34.6	35.7	-	-	-	-	-	27	27	26	27	30		
17.1	16.2	19.5	-	-	-	-	-	19	17	15	16	17		
-	-	-	-	-	-	-	-	1	2	1	0	1		
93	-	-	-	-	-	-	-	86	86	78	61	46		
67	68	67	-	-	-	-	-	35	53	44	24	21		
1.0	0.0	0.0	-	-	-	-	-	3	10	5	7	5		
ENE	NSW	NE	-	-	-	-	-	SE	NE	ENE	ENE	ENE		
Rainfall (mm) in last week							Rainfall (mm) from 01/01/2022 to till date				Total Rainfall (mm) in last year			
0.0							20.0				-			

**Weather summary/alert**

<b>Weather forecast</b>	As per RMC Mumbai forecast, there is possibility for partly cloudy weather with light rainfall at isolated places on 22 <sup>nd</sup> to 23 <sup>rd</sup> January, 2022 and gradual fall in maximum and minimum temp expected over Raigad district.
<b>ERFS</b>	As per ERFS products, dry weather with normal maximum & minimum temperature expected during 26 <sup>th</sup> January to 1 <sup>st</sup> February, 2022 over Konkani division.

**Agromet advisory based on weather forecast**

<b>Crop</b>		<b>Stage</b>	
<b>General advisory</b>	-		• Due to forecast for light rainfall at isolate places on 22 <sup>nd</sup> and 23 <sup>rd</sup> January 2022, keep the harvested turmeric, black pepper and arecanut at

The screenshot shows the Agricultural Research Station website for Raigad. It features a header with the station name and a navigation menu. The main content area includes a 'Research' section with a large image of a field. Below this, there is a 'Regional Agricultural Research Station' section with details about the station, including its location, area, and contact information. A 'Quick links' section is also present on the right side of the page.



# Methodology

## Site Preparation

- 1) Scouting and cleaning
- 2) Fencing
- 3) Divide the site into Control and Non-Control area

## Planting and Monitoring

- 1) Area, layout, distance between rows based on vegetable type
- 2) Monitoring with regular watering
- 3) Pests and Weeds

## Soil Review and Testing

- 1) Collect Soil for Composite Samples
- 2) Filter the soil and dry the samples
- 3) Submit Samples at the Local Government run Laboratory and at a city Laboratory

## Measuring Yield

- 1) Measure number of fruits per plant, tecture, size and weight
- 2) Total yield for Control and Non Control sites

## Soil Treatment

- 1) Review Soil Test results for any macro and micronutrient deficiencies
- 2) Select suitable products for application to soil

## App Development

- 1) Android platform based App easily accessible to farmers
- 2) Java Script and Python
- 3) Make the App vernacular



# Site Preparation



Site identification → Removal of wild plants/weeds/stones → Levelling → Fencing



# Soil Review and Testing



जिल्हा मृद सव्येक्षण व मृद चाचणी प्रयोग शाळा, रामगड-अलिबाग  
महाराष्ट्र नवयुवा शोकाश्रम अखिलीय मन्त्रिणी पाठ्याची  
(वैजना : वा.कृ.शि.मो./द्वार/वैजनात्मिक शोकाश्रम)

1) नमुना घेतल्याचा दिनांक 11/08/2021  
2) शेतकऱ्याचे संपूर्ण नाव Kamlesh / Nash / Shastri  
3) शेतकऱ्याचा मोबाईल क्र. 9820127935  
4) गाव Kolgaon ६) पोस्ट  
5) तालुका Akhola ८) जिल्हा : रामगड  
७) सर्व्हेगट नंबर N/A ९) क्षेत्र (हे.) : 5.000 ३२/४८

१) जमिनीची वर्गीवारी  
२) मृदमात्राचे नाव  
३) मृदपरिणामाचे नाव  
४) जमिनीचा उतार सपाट/उतारही  
५) पाण्याचा निचरा बांगला/बाग/बाईट  
६) बागायत/जिरायत  
७) मागील हंगामातील पीक व जात (खरीप / रब्बी)  
८) पुढील हंगामातील पीक व जात (खरीप / रब्बी)  
९) अक्षांश - N  डिग्री, मिनिट, सेकंद, आकार कोनात कोनोपट कर  
१०) रेखांश - E  डिग्री, मिनिट, सेकंद, आकार कोनात कोनोपट कर

पदनाम  
स्वाक्षरी

महाराष्ट्र शासन  
कृषि विभाग  
जिल्हा अधीक्षक कृषि अधिकारी  
रामगड-अलिबाग  
दूरध्वनि २२२२२२२२  
फोन २२२२२२२२२२

मृद नमुना घेताराची रसी

Soil Samples taken as Composite Samples → Drying of Samples and Filtration of any foreign particles → Composite Soil Samples submitted at the local Government Soil Test Laboratory



# Analysis of Soil Test Results

Parameter	Unit	Ideal Range	Test Reading	Comments
pH		6.5-7.5	5.87	Medium
EC	dS/m	0-1	0.08	Sufficient
Organic Carbon (OC)		0.40-0.60	2.16	Excess
Nitrogen	Kg/Ha	280-420	568.24	Sufficient
Phosphorous	Kg/Ha	14-21	2.97	Very low
Potassium	Kg/Ha	150-200	139.94	Low
CaCO <sub>3</sub>		2.5-5.0	2.5	Medium
Calcium (Ca)	%	4-9.99	23.08	Excess
Magnesium (Mg)	%	0.50-3.99	0.49	Low
Sodium (Na)	%	5-15	0.73	Low

1. The local soil contains adequate amount of Nitrogen (N) with low Potassium (K) levels and severe deficiency of Phosphorus (P).
2. The pH level shows slightly acidic property, but this may not be sufficient for growing vegetables like tomatoes which require a good degree of acidity in the soil.
3. Lack of sufficient micronutrients (Mg and Na) which is likely to restrict the growth and quality of the vegetables.
4. Soil electrical conductivity (EC) which is a measure of the amount of salts in soil (salinity of soil) indicates good nutrient availability, soil texture, and available water capacity.





# Soil Treatment



Soil treatment plan prepared based on the soil test results → Application of manure rich with beneficial bacteria that convert soil nutrients into readily available forms for the tender plant → Application of organic soil conditioner to improve the soil pH and the water holding capacity and particle size of soil



*Soil conditioner contains natural elements like Bone meal, Seaweed extract, Amino acid, Humic acid, Dolomite, Bentonite, Vermo-Wash, Goumutra Arc.*

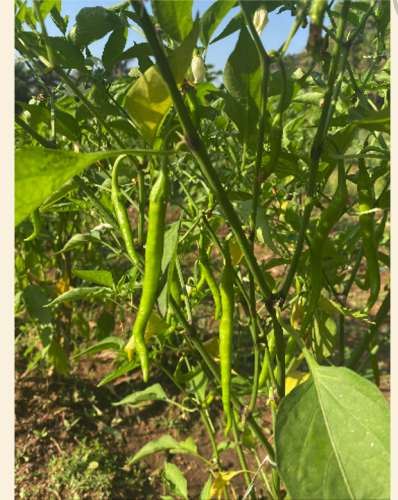
# Planting and Monitoring



Preparation of test beds contain a control site and a control site (test beds with rows with mounds for cucumber and rows for tomato) → Seed plantation in a well planned format → regular watering and monitoring of plant health



# Vegetable Output



Vegetable yield for the selected vegetables recorded → Fruit size, texture and weight recorded for both control and non control sites (results on the next slide)



# Analysis of Vegetable Yields

## Cucumber (“Kakadi”)

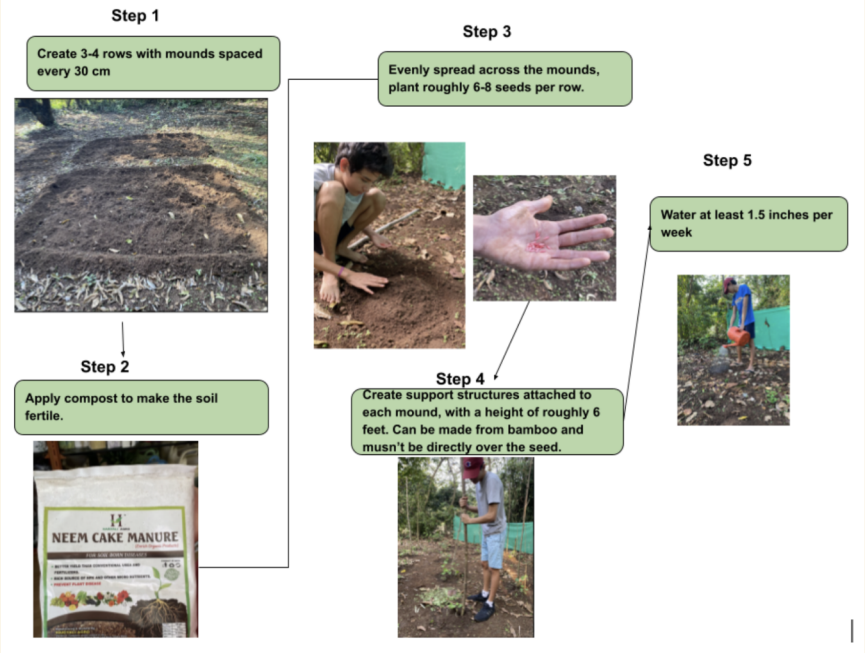
		Control Site	Non Control Site	Comments
Test Area	sq ft	400	400	
Site Configuration		4 Rows, 5 mounds each	4 Rows, 5 mounds each	
Seeds Planted	total site	80	80	4 seeds per mound
Total Plants		45	40	
Yield	per plant	6	5-6	Cucumbers per plant
Size and weight	cm / kg	15-18 / 0.300	12-15 / 0.275	Taken as average
Vegetable Characteristics		Dark green and long	Light green and short	
Total Yield	kg	81	66	
Variance		+23%		

## Bottle Gourd (“Lauki/Dudhi”)

		Control Site	Non Control Site	Comments
Test Area	sq ft	350	350	
Site Configuration		4 rows, spacing of approx. 200cm Plant spacing of 30cm	4 rows, spacing of approx. 200cm Plant spacing of 30cm	More row spacing for plants to grow
Seeds Planted	total site	24	24	6 seeds per row
Total Plants		16	16	4 plants per row
Yield	per plant	4-5	3-4	Average reading
Size and weight	cm / kg	20-24 / 0.650	18-20 / 0.625	Average reading
Vegetable Characteristics		Light Green and yellow	Light to dark green	
Total Yield	kg	52	40	
Variance		+30.0%		



# Flowcharts used for App Development



Bottle Gourd Flowchart

## Cucumber Flowchart



# App Development

“Upaj Badao” is an Android based App developed using Javascript - the App offers simple functionality and pictorial guidance making it quick and easy for farmers to navigate and understand.



Note: Vegetable screens are scrollable to view all the steps shown in the flowcharts on previous slide.



Note: My next step is to make the App Vernacular so that it is scalable and flexible to incorporate local languages.

# My Working Pipeline



- Enhancing soil health to deal with any adverse impact of climate change (as was seen during at my Project Site with a adverse impact seen on tomato plants). The coastal soil has high salinity and requires adequate amount of sunlight during the year which may be impacted due to changes in the weather. I would like to evaluate this further by working closely with the local Krishi Vigyan Kendra (Agriculture Centre) and identify key steps to prepare a health soil.
- Management of Pests and Diseases: Pests like stem borer, army worm, leaf folder, brown pant hopper, land crab and diseases like bacterial leaf blight and blights are the major pests and diseases observed in coastal saline soils. I would like to understand the process for surveillance and monitoring the pest population and timely diagnosis and need based application of bio pesticides.
- Make my App Vernacular so that it is scalable and flexible to incorporate local languages so more and more small farmers can benefit from the App.





# Thank you.

For any suggestions or queries, please contact me at:

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