

Crop Survey for Estimation/Assessment of Acreage, Crop Health and Expected Yield of Basmati Rice during Kharif-2023

Volume: IV



Submitted To:

Basmati Export Development Foundation

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Executive Summary:

Paddy rice is a staple crop for much of the world's population. The Paddy is grown world-wide mostly by hand transplanting of seedlings in puddled soil. The farmers in many parts of the world are using different types of paddy. Basmati is one of the most popular long-grain rice varieties due to its texture, nutty flavor, and popcorn-like aroma. Much of the basmati rice is cultivated in India and India is the major exporter of Basmati rice.

The scope of present report (Volume-IV) is to provide Field and Satellite Image-based variety wise acreage of Basmati Rice, Ground Survey-based state level production estimates and Climate based Yield Predictions in different states of study area. The report contains production estimates (State wise cumulative as well as Variety wise individually) and climate-based yield prediction framework.

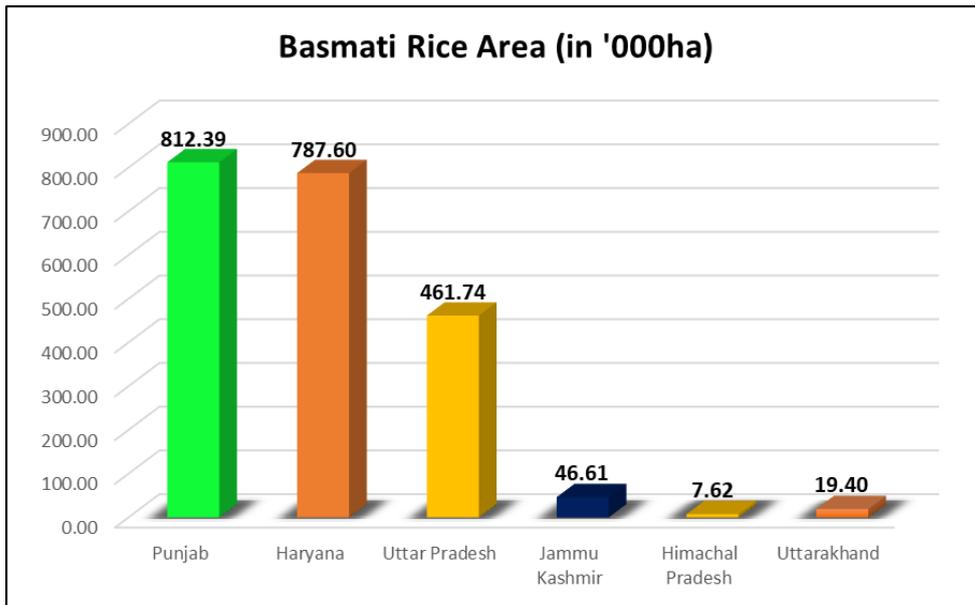
Based on the rainfall recorded so far, excessive rainfall is observed throughout the study area. In Punjab and Haryana states excess rainfall conditions are seen in districts located in north-east parts. Very few districts of Uttar Pradesh received normal rainfall while most of the districts received excess rainfall in Uttar Pradesh. Basmati districts of J&K and Uttarakhand also received excess rainfall during the cropping season. These extreme weather conditions may impact on the grain filling process during milking stage. The percentage of filled grains per panicle can be affected by several factors being occurred. Empty grains, or blanks, can be the result of sudden cold temperature during pollen formation. Later, temperatures above 104o F during flowering can dry the germinating pollen tube and cause blanking. Other factors like excess N, panicle blast and armyworms feeding on developing grains that can reduce the percentage of filled grains.

The crop condition is good in the study area except there may be an exception where re-transplanting of Basmati varieties has been done. No Major disease & Pest infestation is observed in the study area. The climate based yield prediction are given in the report though the crop yield model is in the continuous process of development and being refined on the basis of the extreme weather conditions and any anomalies reported from field.

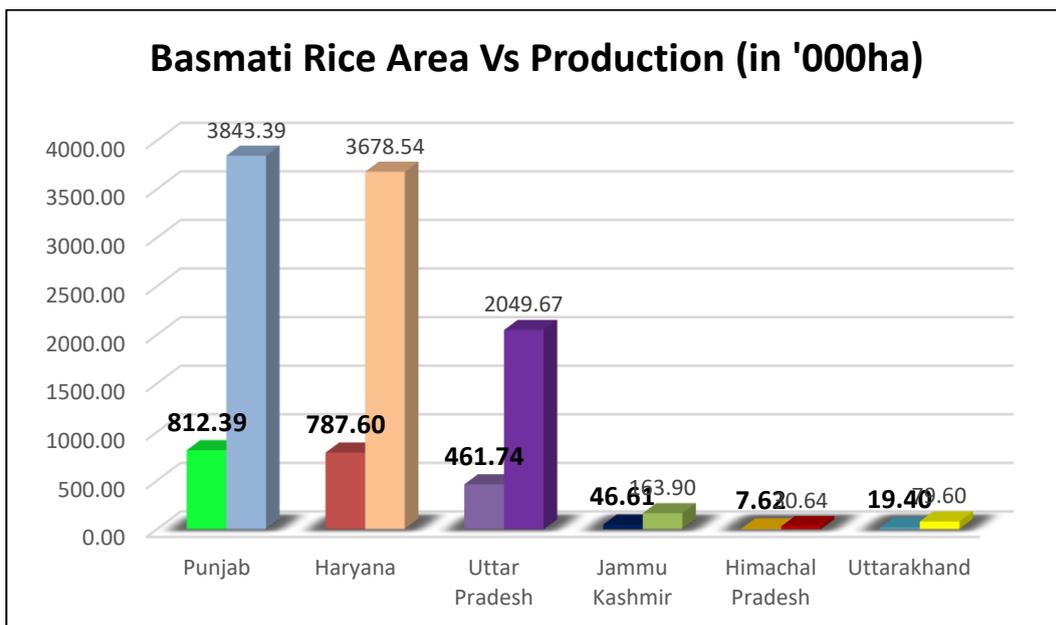
Satellite data and Field-based Basmati varieties Acreage & Production Details:

Satellite Data and Field-based Basmati Rice and Other Varieties Area Details (Area in '000 ha, Production ('000 tons)										
States	Total Acreage	Total Production	PB 1121, PB 1718, PB 1885		PB 1509, PB 1692, PB 1847		PB 1401, PB 01, PB 06, PB 1882		CSR 30, B370,HBC 19	
			Acreage	Production	Acreage	Production	Acreage	Production	Acreage	Production
Punjab	812.39	3843.39	477.39	2163.02	190.63	967.74	144.37	712.62		
Haryana	787.60	3678.54	476.73	2180.09	196.53	955.65	100.68	491.33	13.66	51.46
Uttar Pradesh	461.74	2049.67	207.29	894.23	248.10	1130.78	6.35	24.67		
Jammu Kashmir	46.61	163.90	4.76	17.18					41.85	146.71
Himachal Pradesh	7.62	30.64			6.37	26.70			1.25	3.94
Uttarakhand	19.40	79.60	12.71	51.76	5.46	23.98			1.23	3.86
Grand Total	2135.36	9845.73	1178.88	5306.29	647.09	3104.85	251.40	1228.62	57.99	205.97

Note: The Basmati Rice Area is being given excluding Sharbati and Sugandha Area



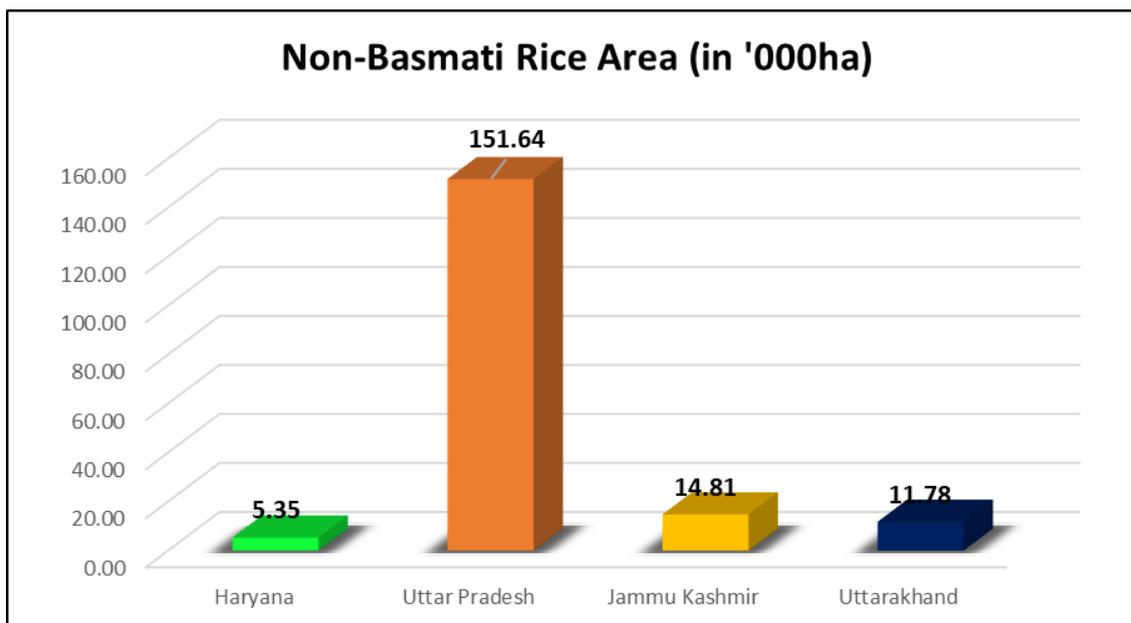
Satellite data and Field-based varieties Area & Production Details-2023:



Satellite data and Field-based non-Basmati varieties Acreage & Production Details-2023:

Satellite Data and Field-based Non-Basmati Rice Varieties Area Details (Area in '000 ha, Production ('000 tons)						
States	Total Acreage	Total Production	Sharbati		Sugandha	
			Acreage	Production	Acreage	Production
Haryana	5.35	22.86	5.35	22.86		
Uttar Pradesh	151.64	577.33	128.04	486.19	23.60	91.14
Jammu Kashmir	14.81	60.59	14.81	60.59		
Uttarakhand	11.78	47.33	11.78	47.33		
Grand Total	183.58	708.11	159.98	616.97	23.60	91.14

Note: The figures are for only non-Basmati varieties like Sharbati and Sugandha Area



Satellite Data and Field-based Basmati Rice Total Production Comparison 2023 Vs 2022:

Satellite Data and Field-based Basmati Rice Total Production Comparison 2023/2022 (Production ('000 tons))		
States	Total Production (2023)	Total Production (2022)
Punjab	3843.39	3119.43
Haryana	3678.54	3813.06
Uttar Pradesh	2049.67	1793.01
Jammu Kashmir	163.90	182.43
Himachal Pradesh	30.64	26.76
Uttarakhand	79.60	66.63
Grand Total	9845.73	9001.32

Paddy Acreage and Basmati Varieties Acreage & Production:

The Remote Sensing and Field Information based analysis shows that total Paddy Acreage is of about 6090 thousand ha in which the Basmati varieties covers 2135.36 thousand ha while 183.58 thousand ha area is covered by non-Basmati varieties like Sharbati and Sugandha in the GI notified areas. The total production of Basmati varieties is analyzed as 9845.73 thousand tons.

Haryana

Paddy acreages in Haryana are estimated at 1280 thousand hectares in which Basmati and Non- Basmati varieties shares 792.95 thousand hectares. The acreage of Basmati Rice is observed in Haryana which is 787.60 thousand hectares. In Haryana highest acreage of sown varieties are 1121, 1718 and 1885 collectively. The other varieties are found in comparatively lower quantity. The production of basmati varieties in Haryana is 3678 thousand tons. The Sharbati and Sugandha varieties area not found consistently across the state and reported from few districts only.

Punjab

The total area of Paddy coverage is about 2969 thousand hectares while Basmati varieties covers about 812.39 thousand hectares. In Punjab also the cropping pattern suggests that Basmati varieties are consistently spread in across the state and found in almost all the districts. In Punjab the highest acreage of sown varieties are 1121, 1718 and 1885 collectively followed by PB 1509, PB 1692, PB 1847 and PB 1401, PB 01, PB 06, PB 1882. The total production figures of the Basmati Varieties are 3843 thousand tons which is slightly higher than Haryana predicted production.

Uttar Pradesh

The paddy acreages in study area of Uttar Pradesh are estimated at 1577 thousand hectares in which contribution of Basmati Varieties area 461.74 thousand hectares. The coverage of non-Basmati varieties like Sharbati and Sugandha is 151.64 thousand hectares only. The acreage of Basmati Rice is observed in Uttar Pradesh which is 461.74 thousand hectares. In UP the acreage of sown varieties of PB 1509, PB 1692, PB 1847 collectively is higher than PB 1121, PB 1718, PB 1885. The predicted production of Basmati Rice is 209.67 thousand hectares. The non-basmati varieties like Sharbati and Sugandha are found in quite noticeable quantities but not spread consistently across the state. This pattern is quite higher in Uttar Pradesh compared to other states.

Jammu & Kashmir

Total paddy acreages in Jammu & Kashmir during kharif 2023 are estimated at 99 thousand hectares in which share of Basmati Varieties area are about 46.61 thousand hectares. In J&K the acreage of Basmati

Rice is observed around 46.61 thousand hectares in which maximum area covered by CSR 30, HBC19, 370, varieties which are dominant in the state. The production estimates of Basmati Varieties are 163.90 thousand hectares. The next significant variety is, which is non- basmati variety, Sharbati which covers 14.81-thousand-hectare area.

Uttarakhand

In Uttarakhand the acreage of Basmati Rice is observed in Uttarakhand which is 19.40 thousand hectares. In Uttarakhand the acreage of sown varieties of PB 1121, PB 1718, PB 1885 collectively is higher than PB 1509, PB 1692, PB 1847. The other varieties like CSR 30, B 370, HBC 19 are also reported from the state, but its coverage is quite lower than others. The predicted production estimates of basmati varieties are 79.60 thousand hectares. The non- basmati varieties like Sharbati variety have 11.78-thousand-hectare coverage.

Himanchal Pradesh

The acreage of Basmati Rice is observed in Himachal Pradesh which is of 6.37thousand hectares in which PB 1509, PB 1692, PB 1847 varieties are dominantly reported. The production estimates of Basmati Varieties are 30.64 thousand hectares. The other varieties are found in comparatively lower quantity.

1. Introduction:

Basmati rice is an important export commodity among the food grains exported from India. In India, Basmati rice is mainly grown for exporting purpose. A huge amount of income generated from export of this aromatic Rice product. India is the largest producer and exporter of basmati rice in the world. It accounts 75% of global Basmati Rice production. Almost 132 countries have been importing Basmati from India every year. Out of which, Iran, Saudi Arabia, UAE and Iraq are the major importers. In this context timely information about crop acreage, crop health and its varietal distribution may be crucial for the exporters as well as Farmers. It helps exporters and other decision makers involved in Basmati trade to take decisions about the quantum and time.

LeadsConnect services Pvt. Ltd. is involved with BEDF for the estimation/assessment of acreage, crop health and expected yield of Basmati rice during 2023. Basmati occupies a special status in Rice cultivation. It is a variety of long, slender grained, aromatic rice. In India, Basmati rice is grown in the specific geographical area, at the Himalayan foot-hills confined into few states of India. As part of scope, Basmati survey to be carried out in seven area viz., Punjab, Haryana, Himachal Pradesh, Uttarakhand, Delhi, Western UP and J&K. These states are located at northern parts of our country.

Keeping this in view, the Basmati Export Development Foundation (BEDF), New Delhi awarded M/s. LeadsConnect services Pvt. Ltd. the work of Crop Survey for estimation/assessment of acreage, crop health and expected yield of Basmati rice during 2023. This will include the all basmati rice crop varieties differentiated in traditional and evolved varieties of Basmati rice and Sharbati and Sugandha varieties of Non- Basmati. Survey will be attempted through the satellite imageries and field based methods for assessment of acreage, crop health and yield of Basmati rice during Kharif 2023.

The use of Satellite Image based Remote Sensing and GIS technique offers an effective system for monitoring crops, its type, Crop health and acreage estimation at large spatial extent. The remotely sensed solution is comparatively fast, cost-efficient, and effective. In addition, the repetitive data acquisition capability of remote sensing sensors makes them an ideal choice for retrieving temporal information of crop phenology, plants health (stress), response to weather and soil nutrients (i.e., manure and fertilizer). The free availability of optical remote sensing data of Sentinel-2 satellites with multiple spectral bands in the red, red edge, and near infrared (NIR) is making Remote Sensing an ideal choice for monitoring agricultural crops, vegetation phenology of export.

The present report gives the detail analysis of variety wise Basmati acreage status in the designated districts of the project. In the line with scope of the project, Extensive app-based field survey was conducted by LeadsConnect during from 21st July to 26th October-2023. During the field survey, it is observed that transplanting of Basmati varieties was done during last week of June to 4th week of July in majority of area.

The most sown Basmati varieties in the study area are (PB1121, PB1718, PB1885), (PB1509, PB1692,

PB1847), and (PB1401, PB01, PB06). Sharbati and Sugandha majorly found in Some districts of UP and Haryana. (CSR 30, PB370, HBC19) is also observed at some places in study areas. During the field visit, a few traditional old varieties of Basmati are also observed, especially in Muktsar and Malarkot.

The report covers all the expected details related to Variety wise Basmati Rice acreage and its Production estimates based on the field observations and the Crop Yield predictions basic framework details. The detail analysis State as well District wise is being given in the concern headings.

2. Objective and Scope of work:

The major objective of the project can be listed as:

1. “Field based survey to be carried out on the basis of sample group of farmers selected at district level in seven GI area states viz., Punjab, Haryana, Himachal Pradesh, Uttarakhand, Delhi, Western UP and J&K”.
2. To provide Remote Sensing based estimation of Crop Area, Crop Health and Production estimate of notified Basmati Rice varieties.

The scope of work which included satellite imageries and field-based survey will cover the following activities:

1. Acreage estimation of all basmati rice crop varieties differentiated in traditional and evolved varieties of Basmati rice and Sharbati and Sugandha varieties of non-Basmati. Reports will be submitted on district level basis for each state.
2. Variety-wise Crop Health Monitoring and Analysis.
3. Variety-wise Crop maturity survey, describing the percentage of acreage under particular crop growth.
4. Climate based yield modeling using historical yield and climate data (10 years) in order to predict yield well in advance.
5. Questionnaire based sample survey of farmers for area/districts mentioned above with a suitable sample size covering all blocks of the respective districts. The sample size may be arrived at, taking in to view the crop density in the concerned block. The contact details of the farmers included in the survey may be provided. Reports to mention as to how many farmers and how much crop area has been covered from each block/district.
6. Percentage-wise sale/distribution of basmati seeds by different agencies including Govt. sources, private sector for each variety. This information should be contained in report for the month of July.
7. Crop cutting experiments in sample areas for yield estimation.

3. Study Area:

The study area includes a total of 85 districts of Basmati rice and non-Basmati rice (Sharbati and Sugandha), which includes.

- Punjab-23,
- Uttar Pradesh-30,
- Haryana-22,
- Jammu & Kashmir-3,
- Uttarakhand-4,
- Himachal Pradesh-2

The map of the entire study area including all districts in the designated States is being given below:

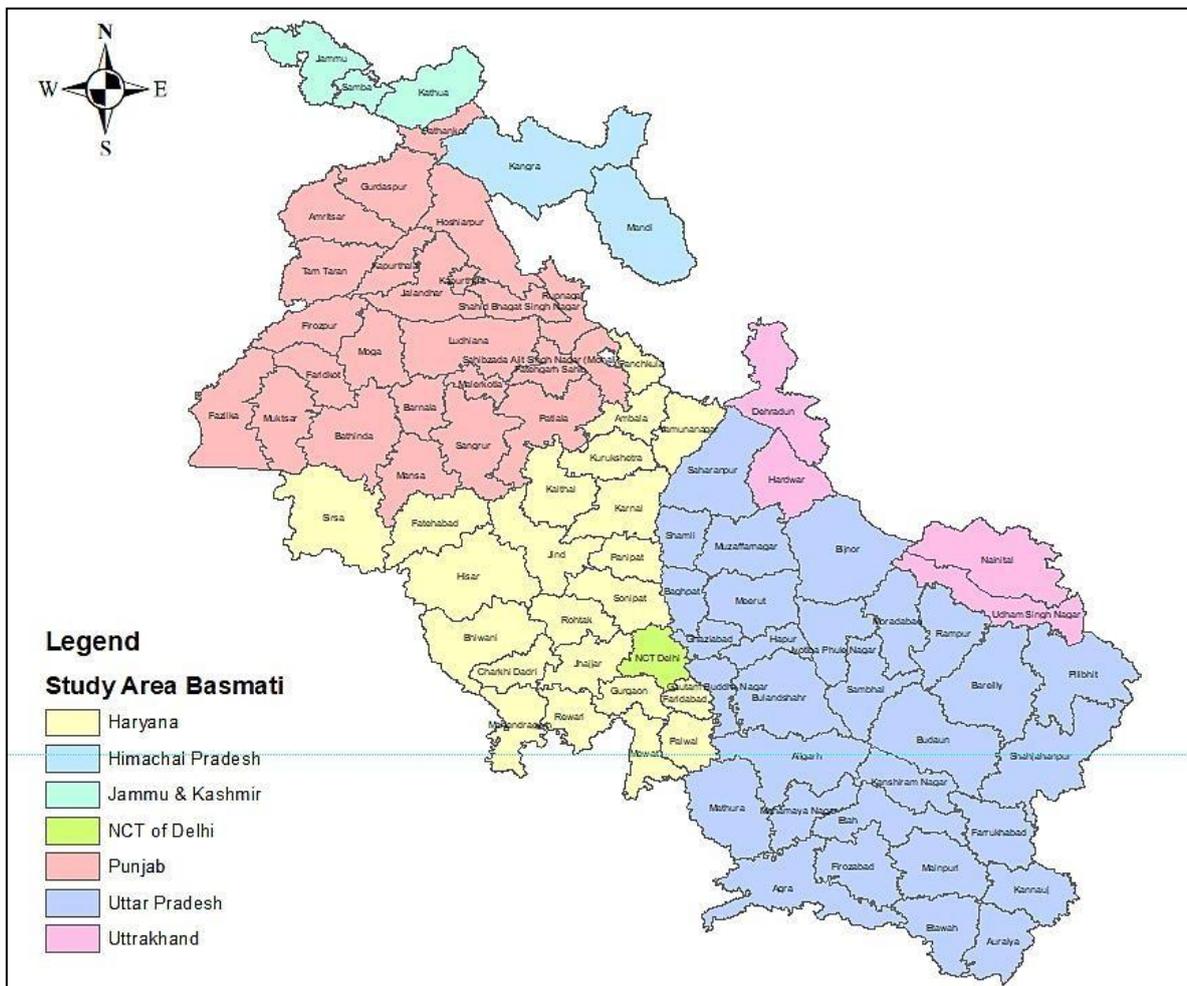


Fig. 1: Project Study area

4. Approach & Methodology:

4.1 Variety wise Basmati Rice Acreage Estimation:

Remote sensing-based approach supported with field-based survey input is used for current study. The following methodology is used for Basmati Rice acreage estimation which is depicted in the process flow given below:

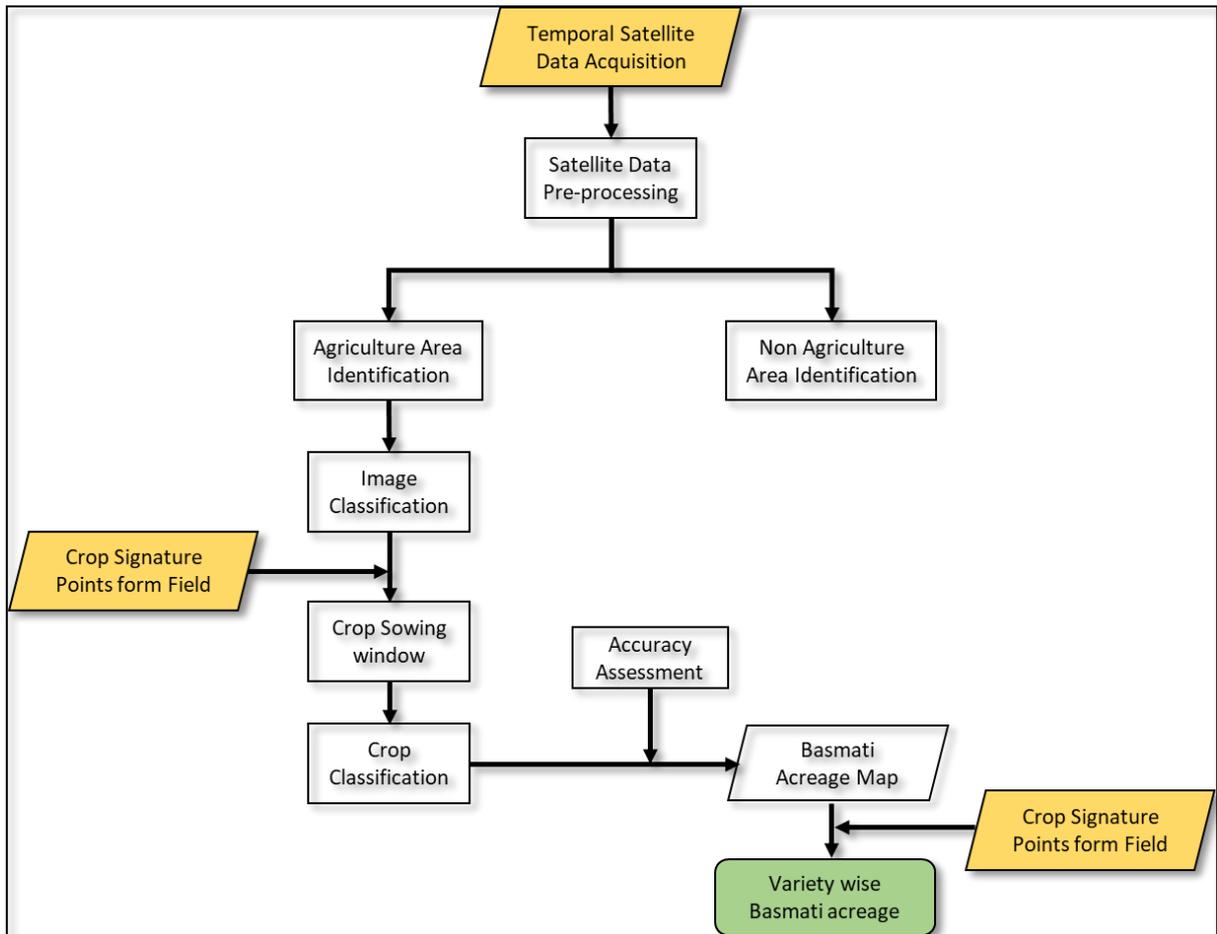


Fig. 2: Variety wise Basmati Acreage using remote sensing

The details of the adopted methodology can be summarized as below:

- Temporal data of sentinel-2 during the cropping period was used for remote sensing based sowing estimation and corresponding best available optical data was used for reference. Date range which is used for acreage estimation of variety wise Basmati rice is given in table:

State	Satellite Data Used	Data Duration	Reference Data & Duration
Punjab	Optical Sentinel-2 and Temporal Sentinel-1 SAR	28th June to 24th Sept	Optical Satellite Data (10th June – 21st Sept)
Haryana	Optical Sentinel-2 and Temporal Sentinel-1 SAR	27th June to 19th Sept	Optical Satellite Data (10th June – 21st Sept)
Uttar Pradesh	Optical Sentinel-2 and Temporal Sentinel-1 SAR	20th June to 26th Sept	Optical Satellite Data (13th June - 18th Sept)
Uttarakhand	Optical Sentinel-2 and Temporal Sentinel-1 SAR	29th June to 26th Sept	Optical Satellite Data (05th June -18th Sept))
Jammu & Kashmir	Optical Sentinel-2 and Temporal Sentinel-1 SAR	29th June to 19th Sept	Optical Satellite Data (10th June - 18th Sept))
Himachal Pradesh	Optical Sentinel-2 and Temporal Sentinel-1 SAR	22nd June to 26 Sept	Optical Satellite Data (10th June - 18th Sept))

- Pre-processing of satellite data was performed, and all necessary corrections applied to remove noise in satellite data. FCC was generated using temporal dates for better interpretation.
- Non- agriculture area was removed using latest available optical satellite data.
- To achieve the accuracy of crop classification, a field survey is conducted during 21st July to 26th October-2023 in different districts of Haryana, Punjab and Uttar Pradesh. During field survey, estimation of sowing, GCP point collection for crop signature, field photographs and discussion-based crop condition was assessed.
- This information was used for the finalization of variety wise acreage in study area.
- Image classification was performed using suitable software and reliable ground truth information to get the area statistics of rice.
- Ancillary data collected from different sources were also used for paddy area validation.
- During image classification, we came across the fact that in areas where crop signature is in less than 500 ha the varieties could not be interpreted and identified separately.

4.2 Field survey-based crop health observation:

A state-wise summary on crop health (Disease and insects / pests) is being presented here based on field observation.

Brown Spot, Neck blast and Brown Plant Hopper were noticed in some of the districts. However, it was below Economic Threshold Level (ETL). During the survey Farmers informed us that in some of the areas Grain Filling during the maturity may be affected.

The Neck Blast, Stem Rot and Brown Plant Hopper affected all the varieties of crop (majorly in PB 1121) may cause significant impact on yield in lower part of Haryana and upper part of Haryana. However, it was below Economic Threshold Level (ETL).

Brown plant hopper has affected the crop in several districts. Bakanae outbreak was observed in Pusa Basmati-1121 and Pusa Basmati-1509 in a few districts. Neck Blast was observed in PB 1509.

5. Results:

- Satellite Image and Field based variety wise Basmati Acreage & Production Estimates**

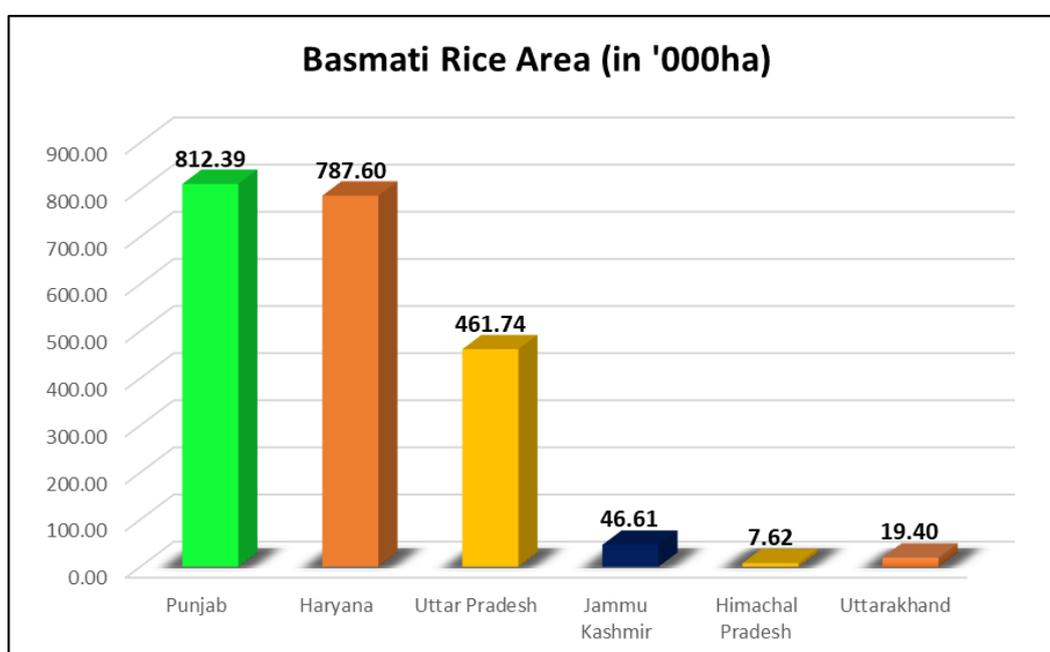
The variety wise Basmati acreage estimation was analyzed using hybrid approach. Sentinel-1 (SAR) data and Sentinel-2 Optical data were used for classification of varieties of Basmati Rice with the help of GCP, sowing period and other ground truth information collection during field in study area.

The estimated figures of Basmati acreage in Haryana are about 787.60 thousand hectares, in Punjab (812.39) and Uttar Pradesh (461.74). The basmati acreage in targeted districts of Jammu & Kashmir, Uttarakhand and Himachal Pradesh is 46.61, 19.40 and 7.62 thousand hectares respectively. A state wise acreage map and area statistics are given below for each state.

Satellite data and Field-based Basmati Rice varieties Acreage & Production Details:

Satellite Data and Field-based Basmati Rice and Other Varieties Area Details (Area in '000 ha, Production ('000 tons)										
States	Total Acreage	Total Production	PB 1121, PB 1718, PB 1885		PB 1509, PB 1692, PB 1847		PB 1401, PB 01, PB 06, PB 1882		CSR 30, B370, HBC 19	
			Acreage	Production	Acreage	Production	Acreage	Production	Acreage	Production
Punjab	812.39	3843.39	477.39	2163.02	190.63	967.74	144.37	712.62		
Haryana	787.60	3678.54	476.73	2180.09	196.53	955.65	100.68	491.33	13.66	51.46
Uttar Pradesh	461.74	2049.67	207.29	894.23	248.10	1130.78	6.35	24.67		
Jammu Kashmir	46.61	163.90	4.76	17.18					41.85	146.71
Himachal Pradesh	7.62	30.64			6.37	26.70			1.25	3.94
Uttarakhand	19.40	79.60	12.71	51.76	5.46	23.98			1.23	3.86
Grand Total	2135.36	9845.73	1178.88	5306.29	647.09	3104.85	251.40	1228.62	57.99	205.97

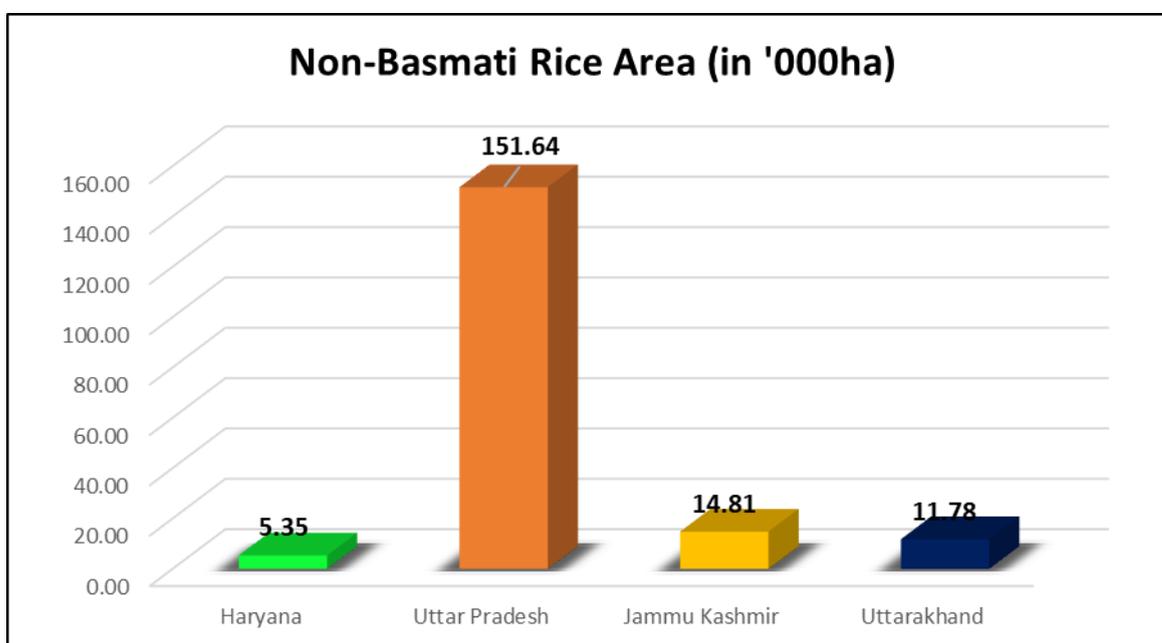
Note: The Basmati Rice Area is being given excluding Sharbati and Sugandha Area



Satellite data and Field-based non-Basmati varieties Acreage & Production Details:

Satellite Data and Field-based Non-Basmati Rice Varieties Area Details (Area in '000 ha, Production ('000 tons)						
States	Total Acreage	Total Production	Sharbati		Sugandha	
			Acreage	Production	Acreage	Production
Haryana	5.35	22.86	5.35	22.86		
Uttar Pradesh	151.64	577.33	128.04	486.19	23.60	91.14
Jammu Kashmir	14.81	60.59	14.81	60.59		
Uttarakhand	11.78	47.33	11.78	47.33		
Grand Total	183.58	708.11	159.98	616.97	23.60	91.14

Note: The figures are for only non-Basmati varieties like Sharbati and Sugandha Area



Variety Wise Basmati Rice Acreage- Punjab:

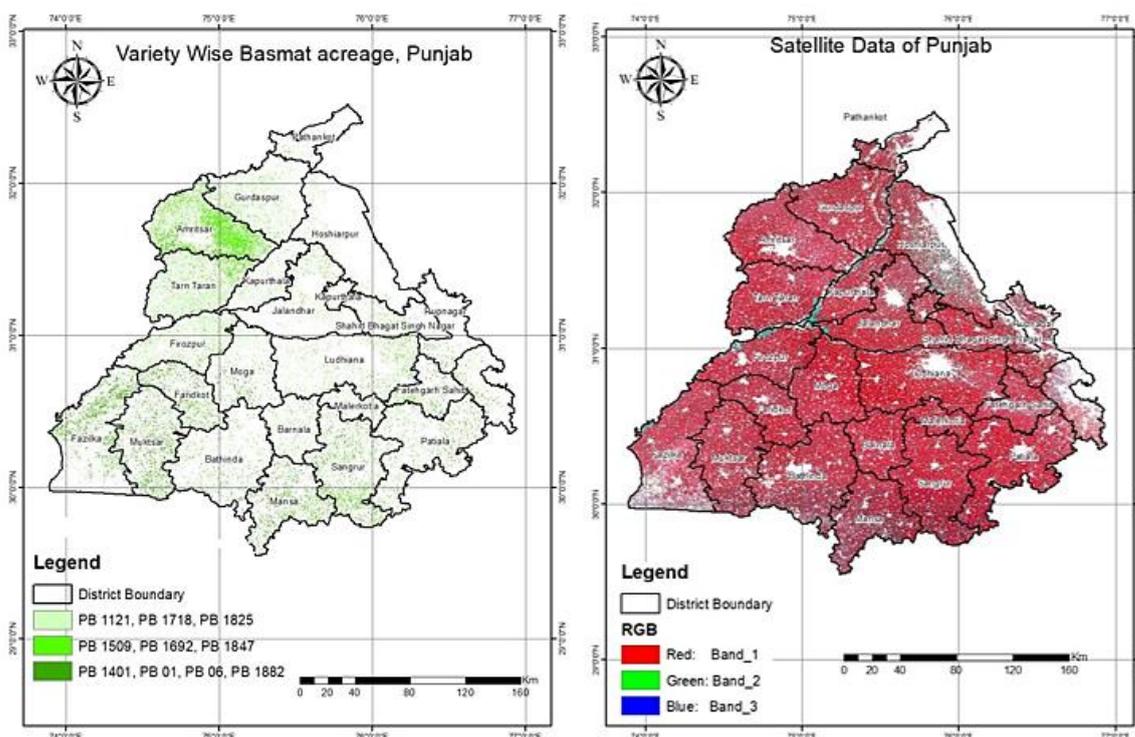


Fig. 4: Variety wise Basmati Rice Acreage map and satellite data, Punjab

Satellite data and field-based Variety wise Basmati acreage (000' ha) and production (000'tons) detail of Punjab									
S. No.	State Name	District Name	Basmati Acreage (000' ha)	PB 1121, PB 1718, PB 1885		PB 1509, PB 1692, PB 1847		PB 1401, PB 01, PB 06, PB 1882	
				Area	Prod.	Area	Prod.	Area	Prod.
1	Punjab	Amritsar	131.84	58.72	282.26	65.87	329.22	7.25	34.92
2		Barnala	20.5	16.33	69.95	2.34	11.60	1.83	9.22
3		Bathinda	14.46	1.39	5.89	7.19	34.63	5.88	28.61
4		Faridkot	37.56	19.82	91.17	3.89	21.59	13.85	65.72
5		Fatehgarh Sahib	15.28	6.57	30.44	4.29	21.75	4.42	23.61
6		Fazilka	68.84	37.53	175.08	2.45	13.11	28.86	141.68
7		Firozpur	56.82	47.82	224.13	6.23	32.24	2.77	14.83
8		Gurdaspur	37.28	35.59	148.97	1.69	8.30		
9		Hoshiarpur	12.27	9.44	41.57	2.83	15.17		
10		Jalandhar	21.28	15.34	66.72	5.94	29.70		
11		Kapurthala	20.87	17.23	73.43	3.64	18.31		
12		Ludhiana	38.84	22.38	102.21	14.29	70.84	2.17	9.71
13		Malerkotla	10.93	8.45	37.58	2.48	11.93		
14		Mansa	36.06	13.65	59.81	6.74	32.95	15.67	74.53
15		Moga	12.32	2.61	11.10	2.75	13.59	6.96	27.22
16		Muktsar	55.73	27.72	134.46	2.16	11.04	25.85	137.28
17		Pathankot	3.8	2.27	9.28	1.53	6.99		
18		Patiala	35.46	14.70	66.82	11.39	60.36	9.37	48.84
19		Rupnagar	6.69	3.56	16.45	0.78	4.04	2.35	11.89
20		SAS Nagar (Mohali)	11.25	6.39	28.77	2.92	13.47	1.94	9.81
21		Sangrur	60.16	31.33	132.84	16.54	84.65	12.29	59.77
22		Shahid Bhagat Singh Nagar	11.65	6.48	29.67	5.17	27.89		
23		Tarn Taran	92.5	72.07	324.44	17.52	94.36	2.91	15.00
Total			812.39	477.39	2163.02	190.63	967.74	144.37	712.62

The acreage of Basmati Rice is observed in Punjab which is of 812.39 thousand hectares. In Punjab highest acreage of sown varieties are **1121, 1718 and 1885** collectively followed by **PB 1509, PB 1692, PB 1847 and PB 1401, PB 01, PB 06, PB 1882**. The Non-Basmati varieties like Sharbati and Sugandha is not reported noticeable amount.

Variety Wise Basmati Rice Acreage -Haryana:

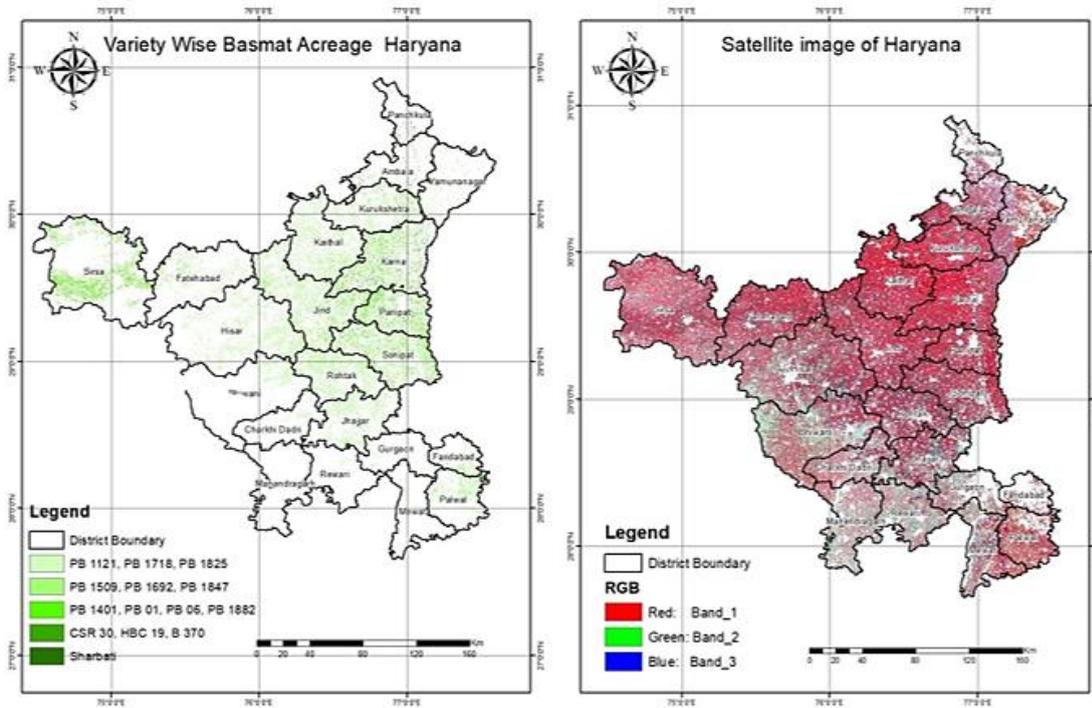


Fig. 5: Variety wise Basmati Rice Acreage map and satellite data, Haryana

Satellite data and field-based Variety wise Basmati acreage (000' ha) and production (000'tons) detail of Haryana														
S. No.	State Name	District Name	Basmati Acreage (000' ha)	PB 1121, PB 1718, PB 1885		PB 1509, PB 1692, PB 1847		PB 1401, PB 01, PB 06, PB 1882		CSR 30, HBC 19, B 370		Sharbati		
				Area	Prod.	Area	Prod.	Area	Prod.	Area	Prod.	Area	Prod.	
1	Haryana	Ambala	13.59	8.88	40.32	4.71	27.17					1.83	8.29	
2		Bhiwani	21.73	21.73	89.96									
3		Charkhi Dadri	7.13	5.94	26.37	1.19	5.37							
4		Faridabad	9.02	3.53	14.65	5.49	25.67							
5		Fatehabad	13.67	1.38	6.57	7.48	36.27	4.81	25.78					
6		Gurgaon	3.32	1.73	7.66	1.59	7.26							
7		Hisar	67.23	47.95	220.57	15.74	77.43	3.54	11.82					
8		Jhajjar	46.78	41.11	183.76	5.67	23.52							
9		Jind	100.66	71.04	326.07	14.38	70.49	15.24	53.48					
10		Kaithal	58.61	28.77	130.33	26.57	134.76	3.27	18.17					
11		Karnal	75.64	34.33	169.93	21.92	113.13	14.24	70.59	5.15	20.49			
12		Kurukshetra	44.56	28.67	138.76	9.46	48.31	3.76	19.35	2.67	9.94			
13		Mewat	5.16	3.86	16.68	1.3	5.99					0.57	2.27	
14		Palwal	22.24	12.34	53.43	9.9	45.37							
15		Panchkula	0.30								0.3	0.98	0.76	3.44
16		Panipat	63.92	37.46	179.06	17.72	89.17	5.15	25.75	3.59	13.78			
17		Rewari	3.90	3.22	13.49	0.68	2.54							
18		Rohtak	67.96	52.43	223.35	15.53	62.69							
19		Sirsa	75.91	28.32	136.50	8.36	44.83	39.23	211.88					
20		Sonipat	80.88	43.26	199.43	25.91	122.50	9.76	46.74	1.95	6.28			
21		Yamunanagar	5.39	0.78	3.19	2.93	13.17	1.68	7.78			2.19	8.86	
		Total	787.60	476.73	2180.09	196.53	955.65	100.68	491.33	13.66	51.46	5.35	22.86	

The acreage of Basmati Rice is observed in Haryana which is 787.60 thousand hectares. In Haryana highest acreage of sown varieties are 1121, 1718 and 1885 collectively. The other varieties are found in comparatively lower quantity. The Sharbati and Sugandha varieties area not found consistently across the state and reported from few districts only.

Variety Wise Basmati Rice Acreage - Uttar Pradesh:

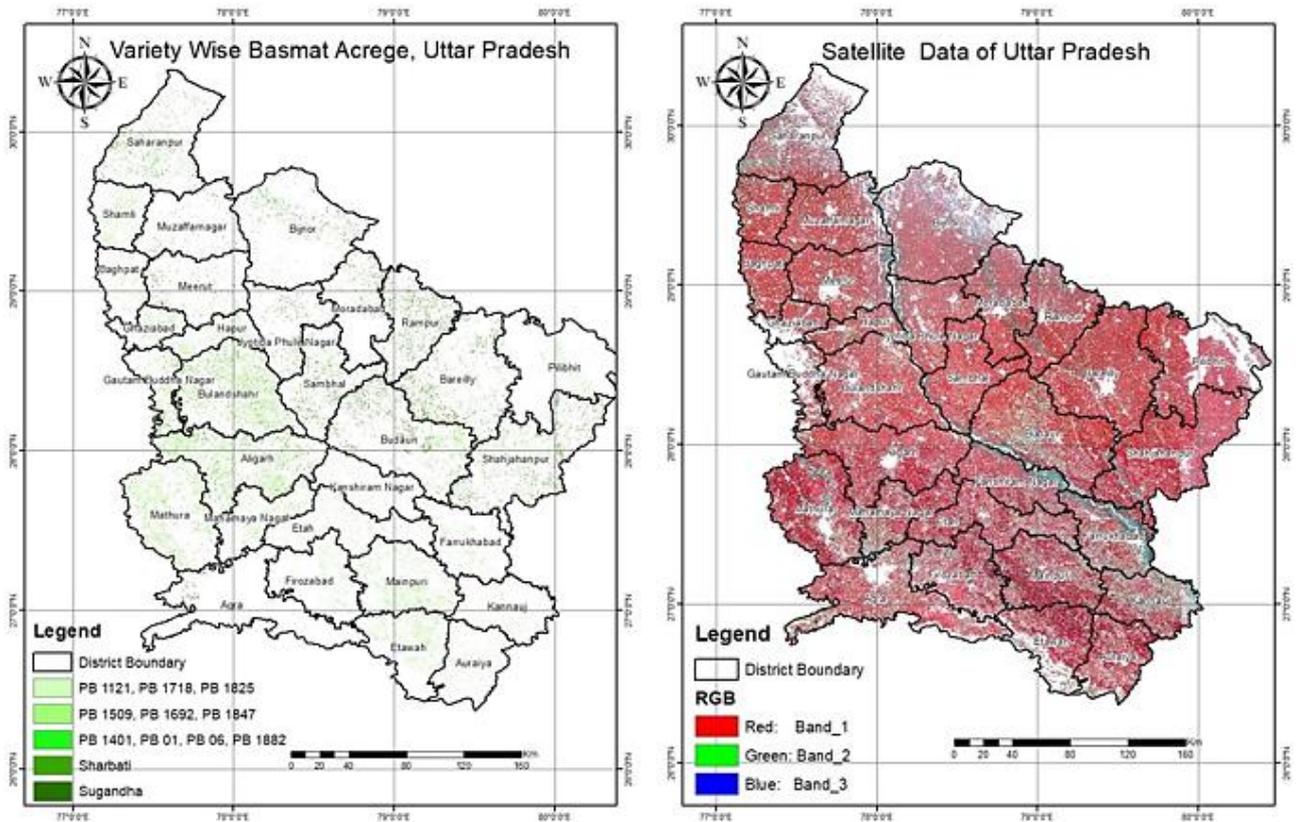


Fig. 6: Variety wise Basmati Rice Acreage map and satellite data, Uttar Pradesh

Satellite data and field-based Variety wise Basmati acreage (000' ha) and production (000'tons) detail of Uttar Pradesh													
S. No.	State Name	District Name	Basmati Acreage (000' ha)	PB 1121, PB 1718, PB 1885		PB 1509, PB 1692, PB 1847		PB 1401, PB 01, PB 06, PB 1882		Sharbati		Sugandha	
				Area	Prod.	Area	Prod.	Area	Prod.	Area	Prod.	Area	Prod.
1	UP	Agra	1.69	1.69	6.27							1.41	5.11
2		Aligarh	52.62	38.63	171.52	13.99	70.93			9.88	37.98		
3		Auraiya	10.02	4.7	16.69	5.32	25.26						
4		Baghpat	6.48	2.37	11.55	4.11	21.79						
5		Bareilly	10.33	4.18	17.45	6.15	28.06			18.54	72.68		
6		Bijnor	5.14	1.32	5.51	2.24	9.96	1.58	6.50	6.47	24.55	3.25	12.17
7		Budaun	12.23			12.23	49.26			9.12	34.04		
8		Bulandshahr	71.27	27.85	124.89	43.42	188.73			9.95	36.25	7.54	29.94
9		Etah	16.13	11.45	51.60	4.68	21.39						
10		Etawah	20.03	4.65	17.60	15.38	65.60						
11		Farrukhabad	9.88	4.15	15.39	5.73	23.82						
12		Firozabad	11.42	7.9	31.66	3.52	15.50						
13		Gautam Buddha Nagar	17.85	13.46	67.38	4.39	20.88			3.17	13.65	1.13	4.69
14		Ghaziabad	12.29	7.12	35.17	5.17	27.47			0.52	2.02		
15		Hapur	15.22	5.85	27.66	9.37	47.70						
16		Jyotiba Phule Nagar	2.58	1.25	4.04	1.33	5.77			6.36	23.92	2.15	7.46
17		Kannauj	6.26	4.73	16.70	1.53	5.99						
18		Kanshiram Nagar	8.18	5.62	23.39	2.56	9.62						
19		Mahamaya Nagar	18.65	5.2	21.99	13.45	59.16						
20		Mainpuri	40.14	22.27	84.54	17.87	74.98						
21		Mathura	33.19	5.6	25.55	27.59	134.87			1.46	5.29	3.58	14.61
22		Meerut	9.47	6.61	31.04	2.37	12.34	0.49	1.57	0.99	3.37	2.39	9.87
23		Moradabad	2.44			2.44	11.05			4.74	18.43		
24		Muzaffarnagar	3.94	0.88	2.47	1.77	8.34	1.29	5.14	1.77	6.60		
25		Pilibhit	10.01	1.89	7.87	8.12	37.11						
26		Rampur	5.26	1.13	5.17	4.13	19.41			15.40	62.99		
27		Saharanpur	12.7	2.76	8.18	6.95	29.60	2.99	11.45	6.46	23.33		
28		Sambhal	7.61			7.61	33.98			9.99	34.98		
29		Shahjahanpur	14.69	8.59	37.19	6.10	27.38			21.39	79.27	2.15	7.29
30		Shamli	14.02	5.44	25.78	8.58	44.83			1.83	6.85		
Total			461.74	207.29	894.23	248.10	1130.78	6.35	24.67	128.04	486.19	23.60	91.14

The acreage of Basmati Rice is observed in Uttar Pradesh which is of 461.74 thousand hectares. In UP the acreage of sown varieties of PB 1509, PB 1692, PB 1847 collectively is higher than PB 1121, PB 1718, PB 1885. The other notified Basmati Varieties are not reported in noticeable quantities. The non-basmati varieties like Sharbati and Sugandha is found in quite noticeable quantities but not spread consistently in across the state.

Variety Wise Basmati Rice Acreage-Jammu & Kashmir:

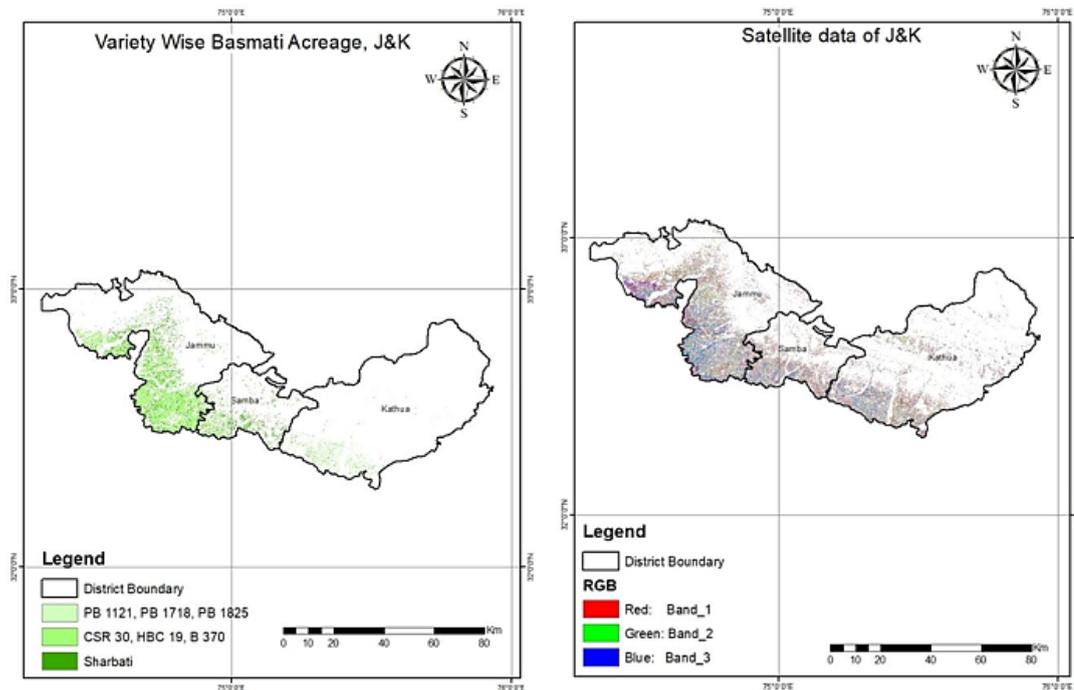


Fig. 8: Variety wise Basmati Rice Acreage map and satellite data, Jammu & Kashmir

Satellite data and field-based Variety wise Basmati acreage (000' ha) and production (000'tons) detail of Jammu & Kashmir											
S. No.	State Name	District Name	Basmati Acreage (000' ha)	PB 1121, PB 1718, PB 1885		PB 1509, PB 1692, PB 1847		CSR 30, HBC 19, B 370		Sharbati	
				Area	Prod.	Area	Prod.	Area	Prod.	Area	Prod.
1	J&K	Jammu	35.66					35.66	125.42	9.65	39.75
2		Kathua	6.42	4.76	17.18			1.66	5.59	0.69	2.93
3		Samba	4.53					4.53	15.71	4.47	17.92
Total			46.61	4.76	17.18			41.85	146.71	14.81	60.59

In J&K the acreage of Basmati Rice is observed around 46.61 thousand hectares in which maximum area covered by CSR 30, HBC19, 370, varieties which are dominant in the state. The PB-1121 is reported from Kathua district only. The next significant variety is, which is non- basmati variety, Sharbati which covers 14.81-thousand-hectare area.

Variety Wise Basmati Rice Acreage-Uttarakhand:

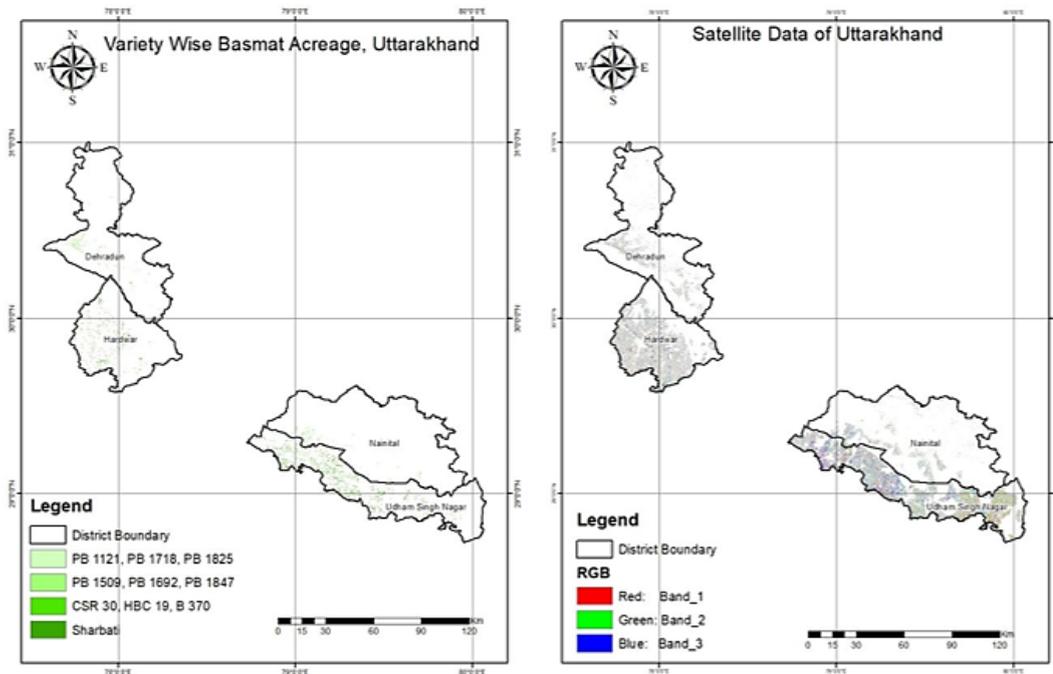


Fig. 7: Variety wise Basmati Rice Acreage map and satellite data, Uttarakhand

Satellite data and field-based Variety wise Basmati acreage (000' ha) and production (000'tons) detail of Uttarakhand											
S. No.	State Name	District Name	Basmati Acreage (000' ha)	PB 1121, PB 1718, PB 1885		PB 1509, PB 1692, PB 1847		CSR 30, HBC 19, B 370		Sharbati	
				Area	Prod.	Area	Prod.	Area	Prod.	Area	Prod.
1	Uttarakhand	Dehradun	2.15			1.67	7.44	0.48	1.38		
2		Hardwar	3.65	2.66	10.16	0.99	4.11			3.66	14.27
3		Nainital	2.97	2.22	9.10			0.75	2.47		
4		Udham Singh Nagar	10.63	7.83	32.49	2.80	12.43			8.12	33.06
Total			19.40	12.71	51.76	5.46	23.98	1.23	3.86	11.78	47.33

The acreage of Basmati Rice is observed in Uttarakhand which is **19.40** thousand hectares. In Uttarakhand the acreage of sown varieties of PB 1121, PB 1718, PB 1885 collectively is higher than PB 1509, PB 1692, PB 1847. The other varieties like CSR 30, B 370, HBC 19 is also reported from the state but its coverage is quite lower than others. The non-basmati varieties like Sharbati variety have **11.78-thousand-hectare coverage while** Sugandha variety is not found in noticeable amount in the state.

Variety Wise Basmati Rice Acreage-Himachal Pradesh:

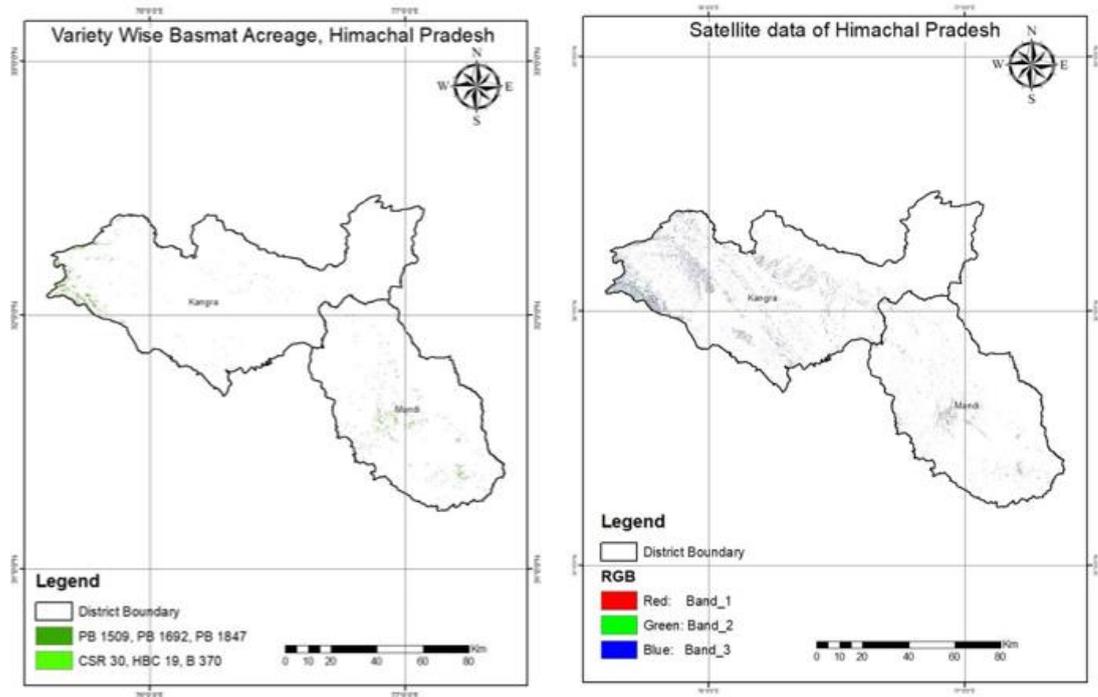


Fig. 9: Variety wise Basmati Rice Acreage map and satellite data, Himachal Pradesh

Satellite data and field-based Variety wise Basmati acreage (000' ha) and production (000'tons) detail of Himachal Pradesh							
S. No.	State Name	District Name	Basmati Acreage (000' ha)	PB 1509, PB 1692, PB 1847		CSR 30, HBC 19, B 370	
				Area	Prod.	Area	Prod.
1	Himachal Pradesh	Kangra	3.97	2.72	10.36	1.25	3.94
2		Mandi	3.65	3.65	16.34		
Total			7.62	6.37	26.70	1.25	3.94

The acreage of Basmati Rice is observed in Himachal Pradesh which is of **7.62** thousand hectares in which PB 1509, PB 1692, PB 1847 varieties are dominantly reported. The other varieties are found in comparatively lower quantity while Sharbati and Sugandha varieties are not reported in the state.

7. Rainfall Status:

- As per the weekly rainfall observed it can be concluded that the initial week is devoid of any rainfall and no incidence has been witnessed but in the 3rd week of the month excess rainfall is witnessed. The impact is under the evaluation stage. The last week of the month shows the departure of the monsoon.
- Excess rainfall has been observed in all districts of Uttar Pradesh. Very few districts received normal rainfall while most of the districts have excess rainfall condition in Uttar Pradesh.
- In the first and third week of August heavy rainfall was observed in many districts of Uttar Pradesh. Overall normal to excess rainfall conditions are seen in the State.
- In Uttarakhand, <500 mm rainfall is departed in area of basmati districts. Basmati districts of Himachal Pradesh is showing excess rainfall conditions.
- As per the rainfall received till date, excess rainfall conditions were observed in Basmati districts of J&K.
- In September month, a good amount of rainfall departed in Uttar Pradesh and Uttarakhand during 2nd week. Punjab and Himachal Pradesh also witnessed rainfall departure in 3rd week of September.
- Cumulative rainfall conditions from 1st of June to 27th of September 30, 2023, are presented in the figures below.
- The details of October month rainfall pattern are being given after the cumulative Rainfall Map.

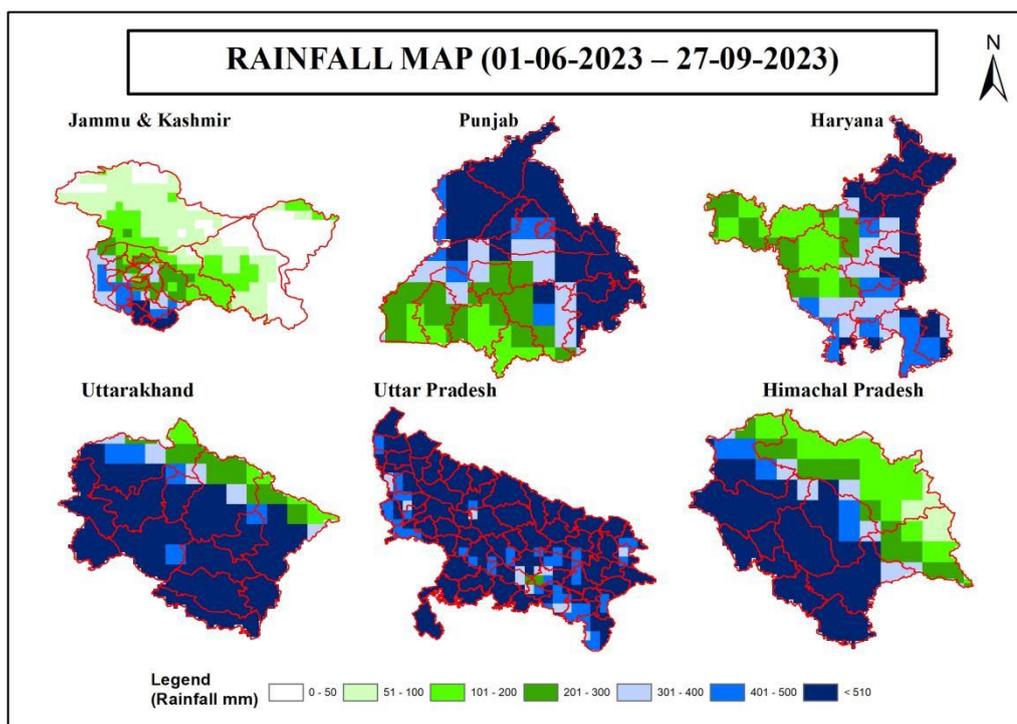
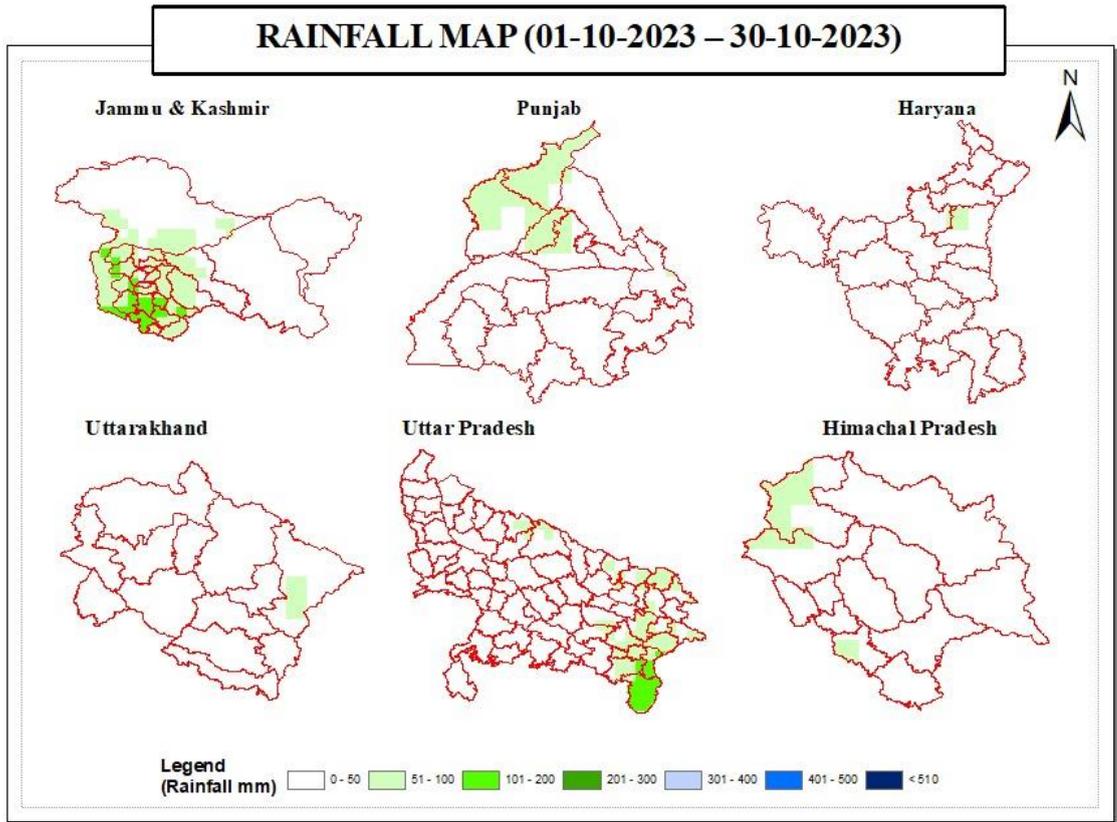
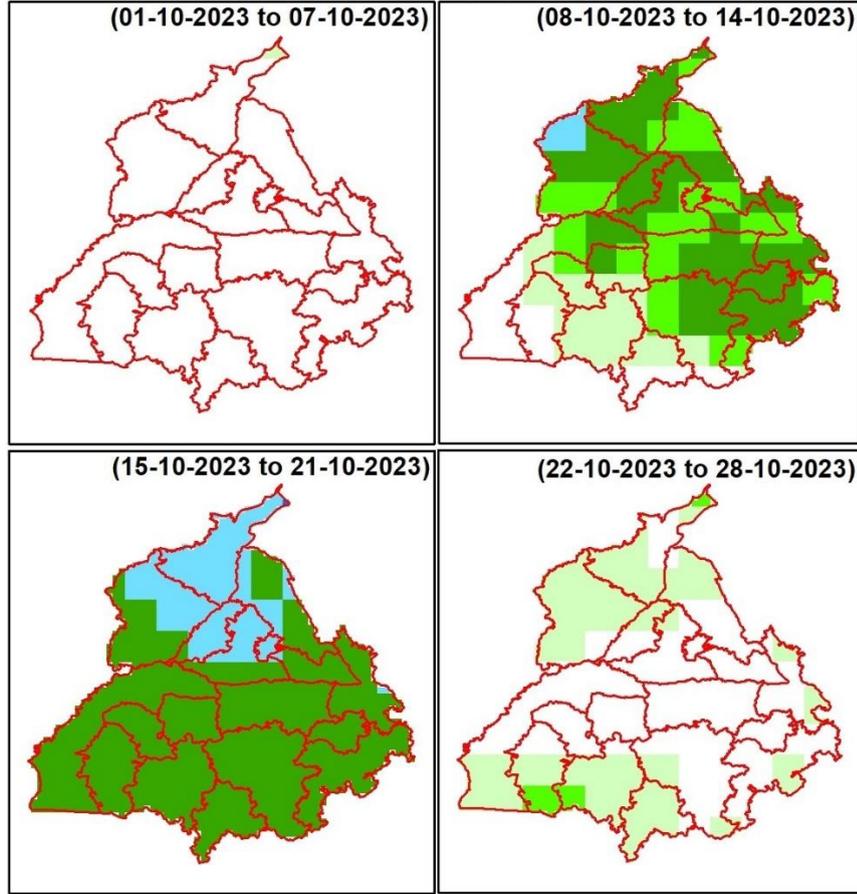


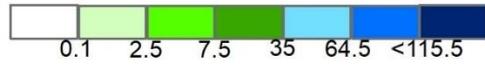
Fig. 11: Cumulative rainfall map starting from 1st June 2023



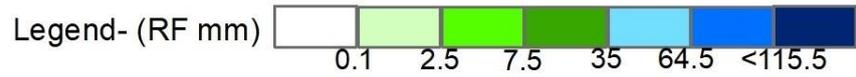
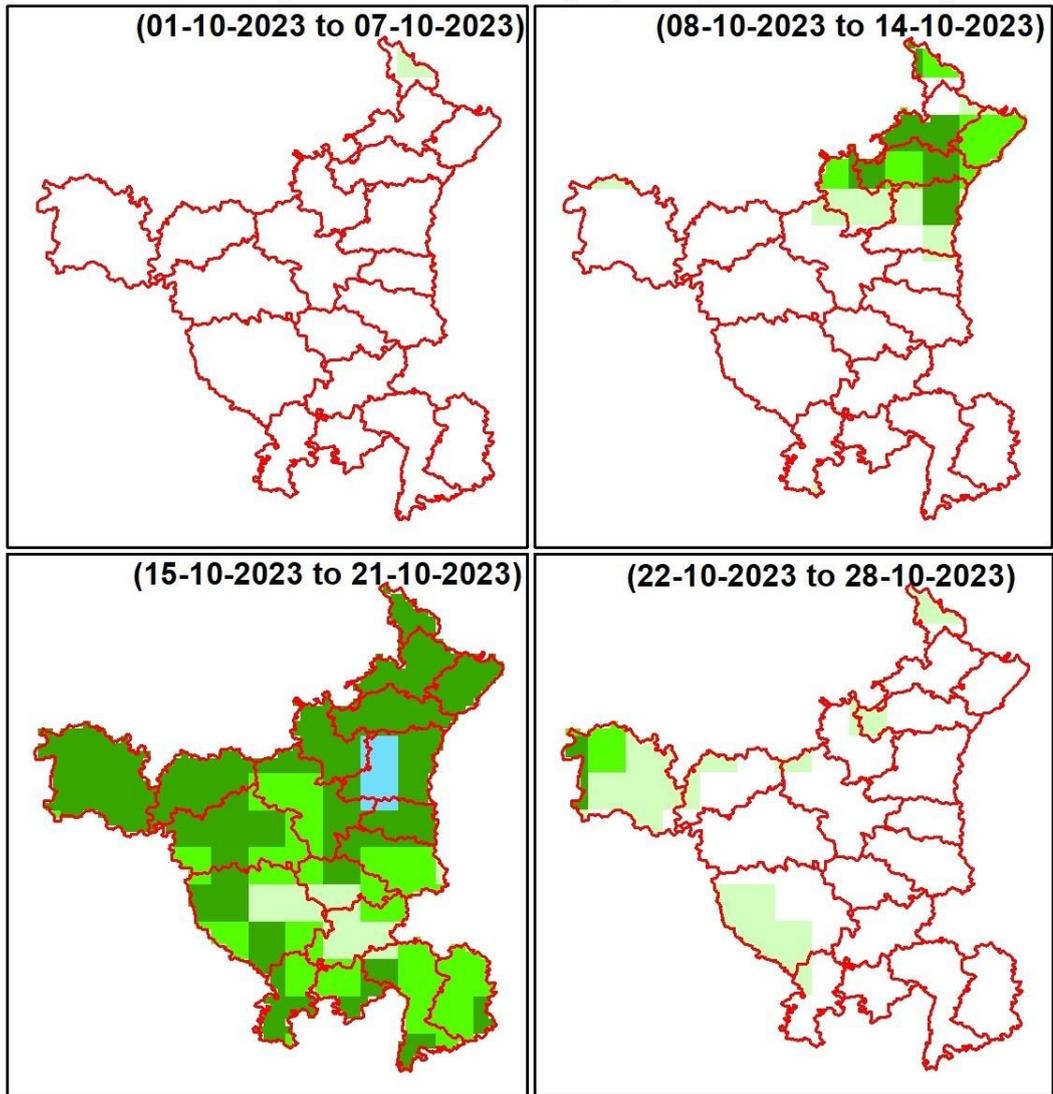
Weekly Rainfall Map (Punjab, India)



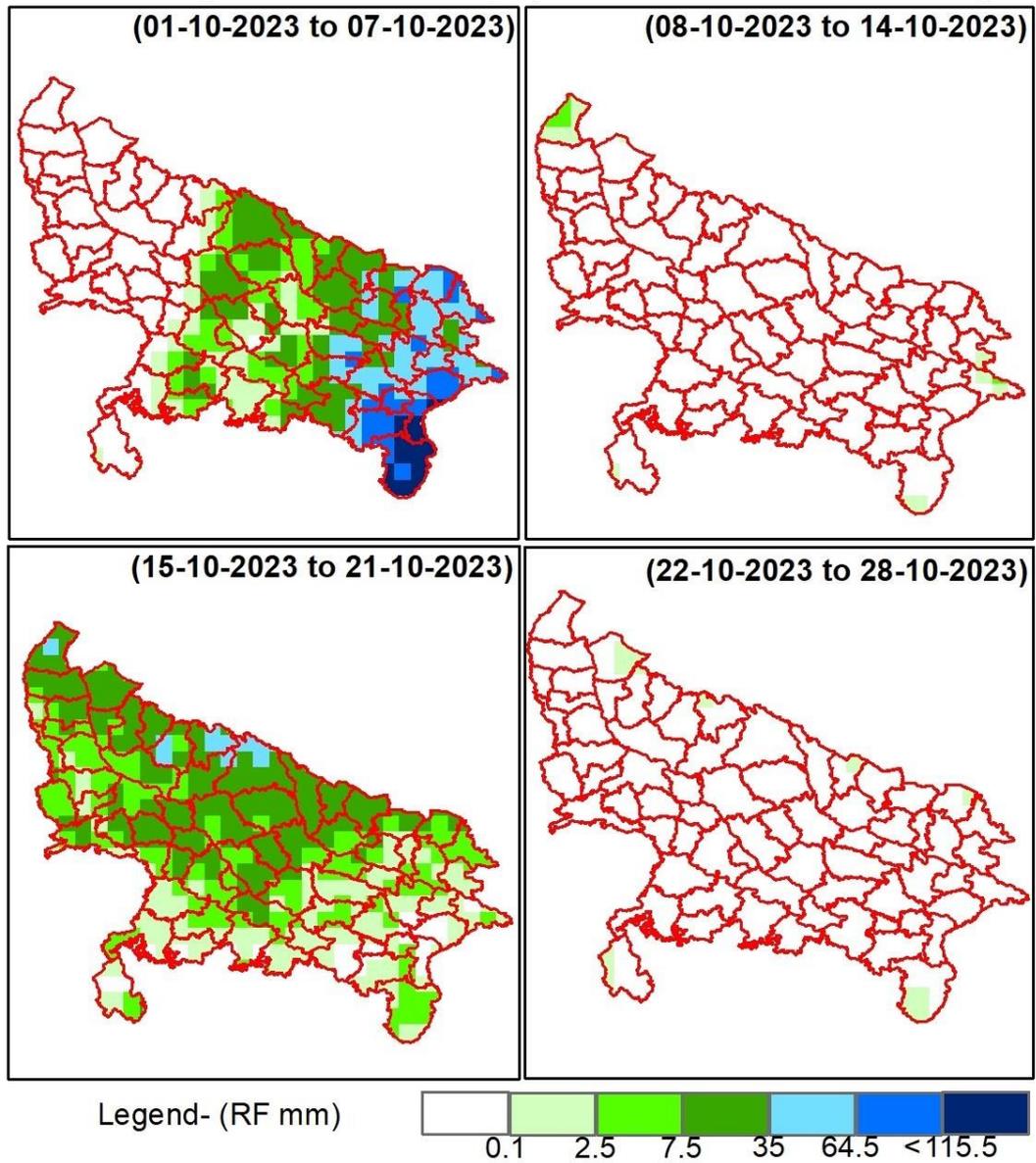
Legend- (RF mm)



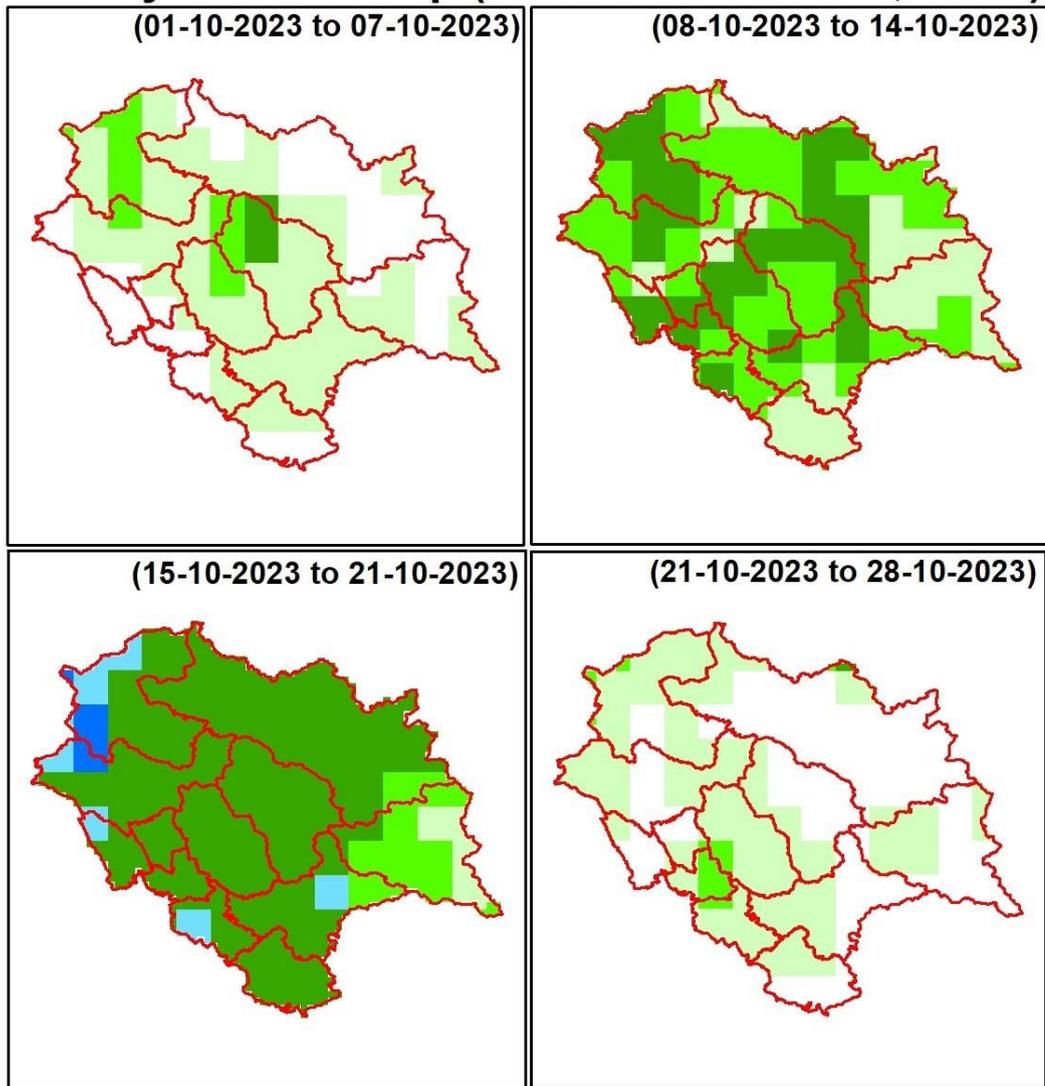
Weekly Rainfall Map (Haryana, India)



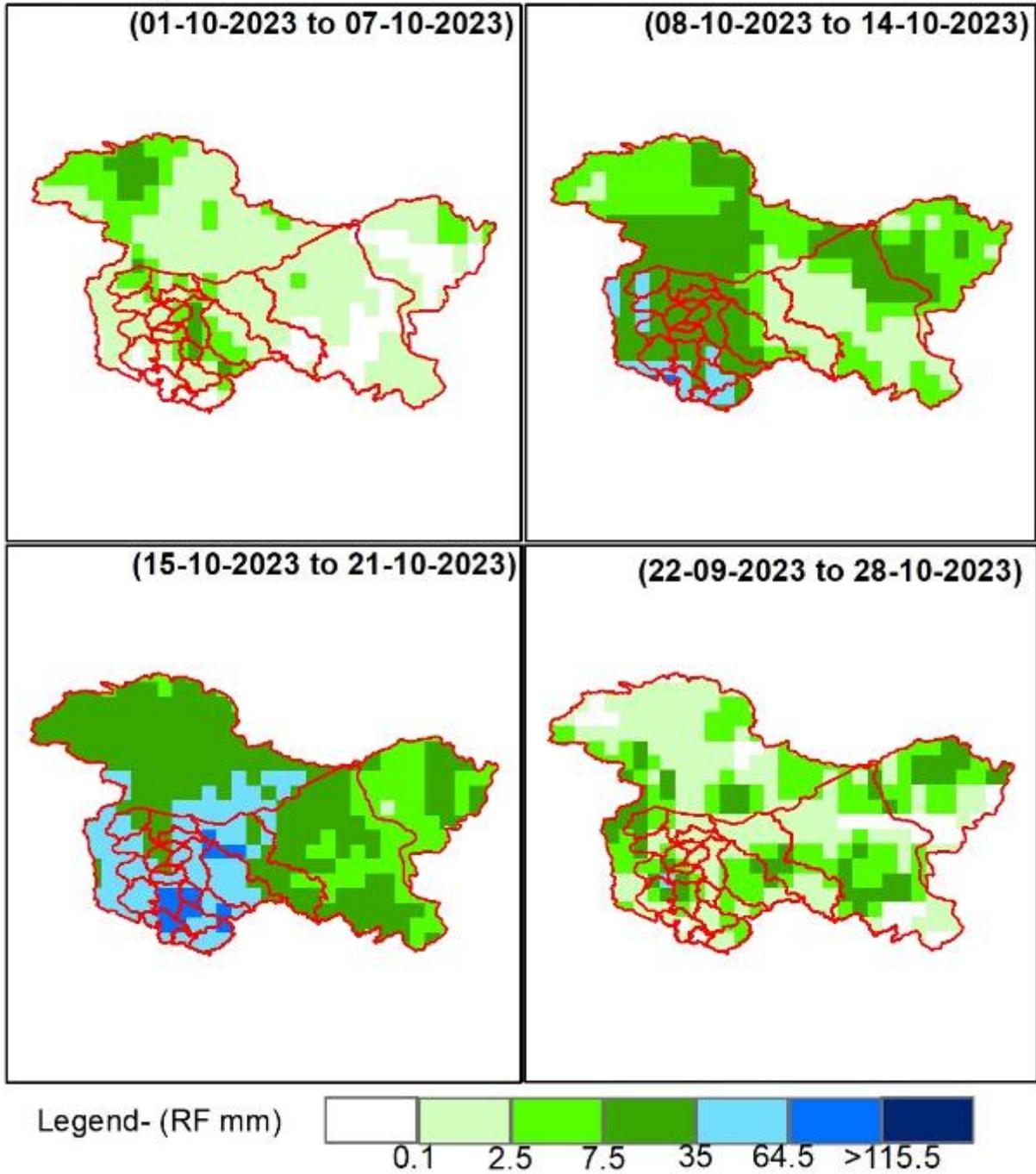
Weekly Rainfall Map (Uttar Pradesh, India)



Weekly Rainfall Map (Himachal Pradesh, India)



Weekly Rainfall Map (Jammu & Kashmir, India)



Note: The data which are being shown above is sourced from Indian Meteorological Department.

8. Field Survey:

For Field based Basmati acreage and production estimation third field visits were done from 16th October to 25th October 2023 covering majority of the districts in study area of Punjab, Haryana, Uttarakhand, Jammu & Kashmir and Uttar Pradesh. During the field visit it is observed that major transplanting of Basmati varieties was done between 1st fortnight of July to 1st week of August. During the survey it was observed that the major sown Basmati varieties in the study area are (PB1121, PB1718, PB1885), (PB1509, PB1692, PB1847), and (PB1401, PB01, PB06). Sugandha variety was observed in Aligarh, Kasganj and Sharbati variety majorly observed in Moradabad and Bijnor districts of Uttar Pradesh. Varieties (CSR 30, B370, HBC19) are mostly sown in J&K and Haryana. During the field visit, a few traditional old varieties of Basmati are also observed specially in Muktsar and Malarkot.

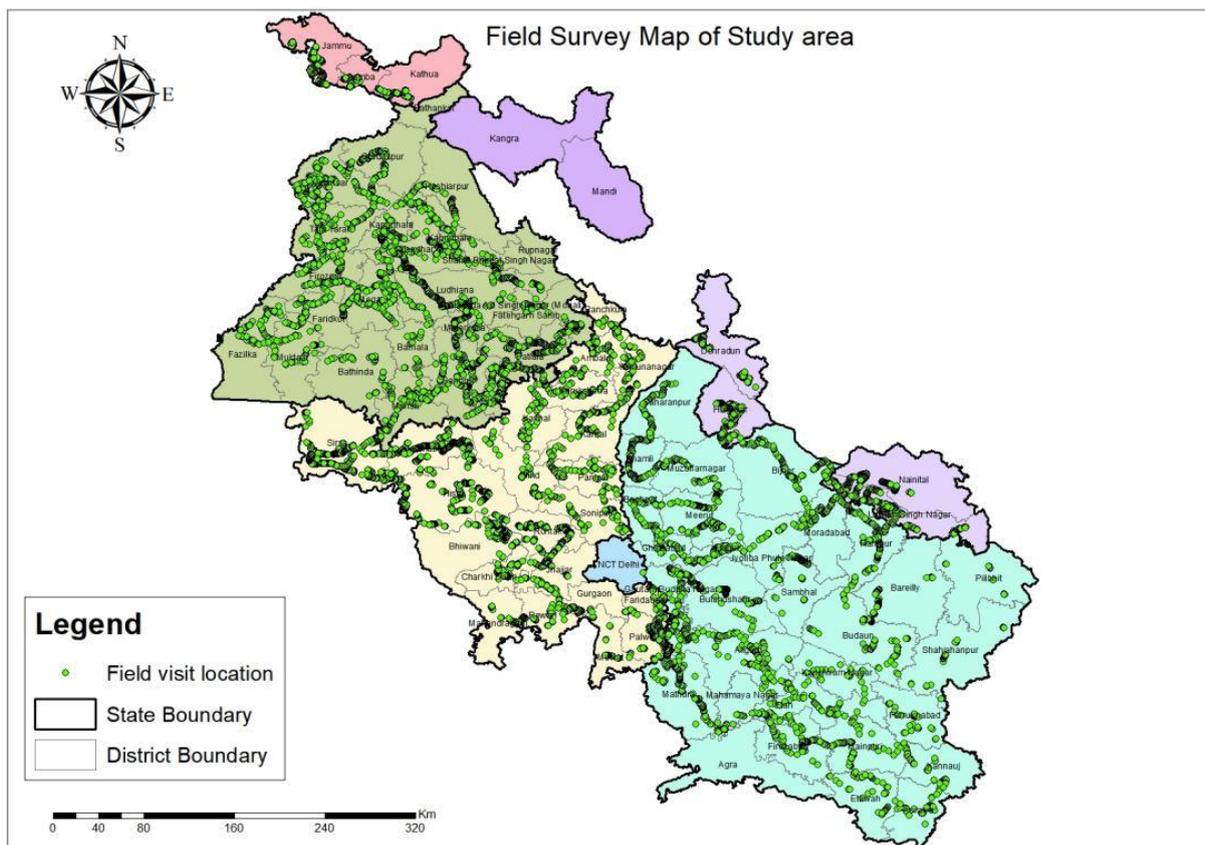


Fig. 11: Field Survey Points distribution in the study Area.

Field Photographs collected during Field Survey:

The state wise field observations on the basis of field survey can be summarized as below:

Punjab:

- Major transplanting of Basmati rice was completed in 1st and 2nd fortnight of July except the areas in which late sowing or re-transplanting has occurred till end of August.
- Major Basmati varieties observed are (PB1121, PB1718, PB1885), (PB1509, PB1692, PB1847) and (PB1401, PB01, PB06, PB 1886)
- In some part of Muktsar and Malerkotli traditional variety Basmati 386 (Pakistani Basmati) was also found.
- In the Sangrur and Patiala districts Basmati area has increased in comparison to last year.
- Basmati varieties of group (PB1509, PB1692, PB1847) were harvested while other groups (PB1121, PB1718, PB1885) and (PB1401, PB01, PB06) are being harvested rapidly.
- It is also observed that by replacing the cotton, Punjab state is seeing an increase in paddy acres.

Haryana:

- Major transplanting of Basmati rice was completed in 1st and 2nd fortnight of July except the areas in which late sowing or re-transplanting has occurred till end of August.
- Major Basmati varieties observed are (PB1121, PB1718, PB1885), (PB1509, PB1692, PB1847), (PB1401, PB01, PB06, PB1882) and (CSR 30, B370, HBC19).
- In some parts of Haryana state Sharbati variety was also seen.
- Basmati varieties of group (PB1509, PB1692, PB1847) were harvested while other groups (PB1121, PB1718, PB1885) and (PB1401, PB01, PB06) are being harvested rapidly.
- Major Basmati acreage districts are Karnal, Kaithal, Sirsa and Hisar.
- In Haryana, Basmati crops were also affected by Nematode disease, Bacterial Leaf Blight, and Leaf Blas but it was limited in some areas only.

Uttar Pradesh:

- Major transplanting of Basmati rice was completed in 1st and 2nd fortnight of July except the areas in which late sowing or re-transplanting has occurred till end of August.
- Major Basmati varieties observed are (PB1509, PB1692, PB1847), (PB1121, PB1718, PB1885), (PB1401, PB01, PB06), Sharbati and Sugandha.
- Other crops like Jowar, Bajra, and Sugarcane were observed in the field.
- Major Basmati sowing districts were Hapur, Saharanpur, Mainpuri, Etawa, Bulandsahar and Gautambudh nagar.
- Basmati varieties of group (PB1509, PB1692, PB1847) were harvested while other groups (PB1121, PB1718, PB1885) and (PB1401, PB01, PB06) are being harvested rapidly.

Punjab

Basmati Variety – 1121		
		
Basmati Variety – 1509		
		
Basmati - 1401		
		
Basmati Variety - 1718		
		
Basmati Variety - 1692		
		

Haryana

Basmati Variety – 1121		
		
Basmati Variety – 1509		
		
Basmati Variety - 1718		
		
Basmati Variety – 1692		
		
Basmati Variety – 1401		
		

Uttar Pradesh

Basmati Variety – 1121		
		
Basmati Variety – 1509		
		
Basmati Variety - 1718		
		
Sharbati		
		
Sugandha		
		

9. Schedule wise Report Status:

The present report is second volume in series of reports which is being delivered. This report covers district wise total Basmati Rice area, details. The status of Schedule wise report is being given for the reference below.

Report Schedule				
S. No.	Report	Report Content	Submission Date	Status
1	1 st Report	District wise total rice area (Basmati + Rice) Basmati seed sale distribution (in percent)	31 st July 2023	Submitted
2	2 nd Report	Basmati rice acreage and health monitoring	31 st August 2023	Submitted
3	3 rd Report	Basmati rice acreage estimation (Variety wise evolved Sarwati and Sugandha)	30 th September 2023	Submitted
4	4 th Report	Climate based Basmati rice yield model and production	31 st October 2023	Submitted
5	5 th Report	Questionnaire based farmer survey report of Basmati rice	30 th November 2023	In Process
6	6 th Report	Final Report (All statistics and maps)	30 th December 2023	In Process

Note: The Green Highlighted rows show reports are submitted.