

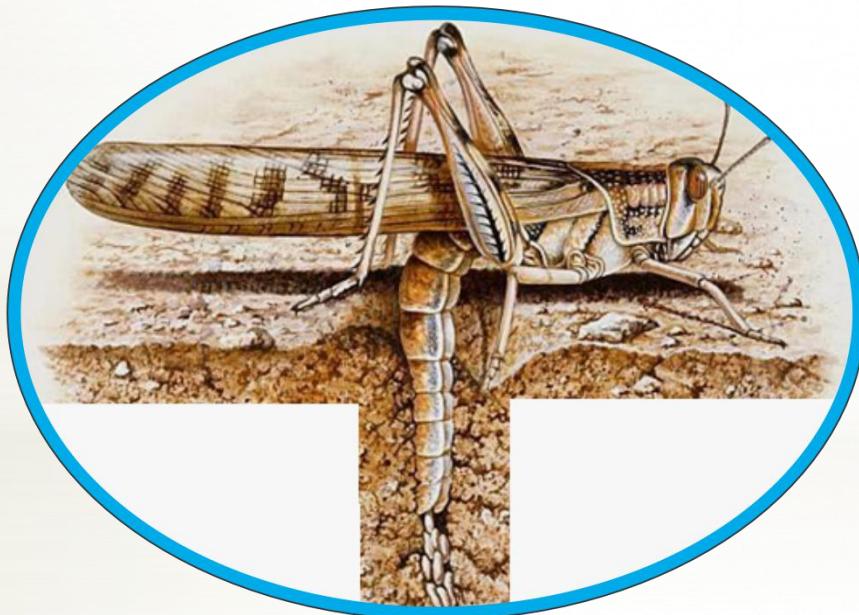
# Locust Surveillance Using Geospatial Technology

No. : 6 / 2020

Date : 03 July 2020

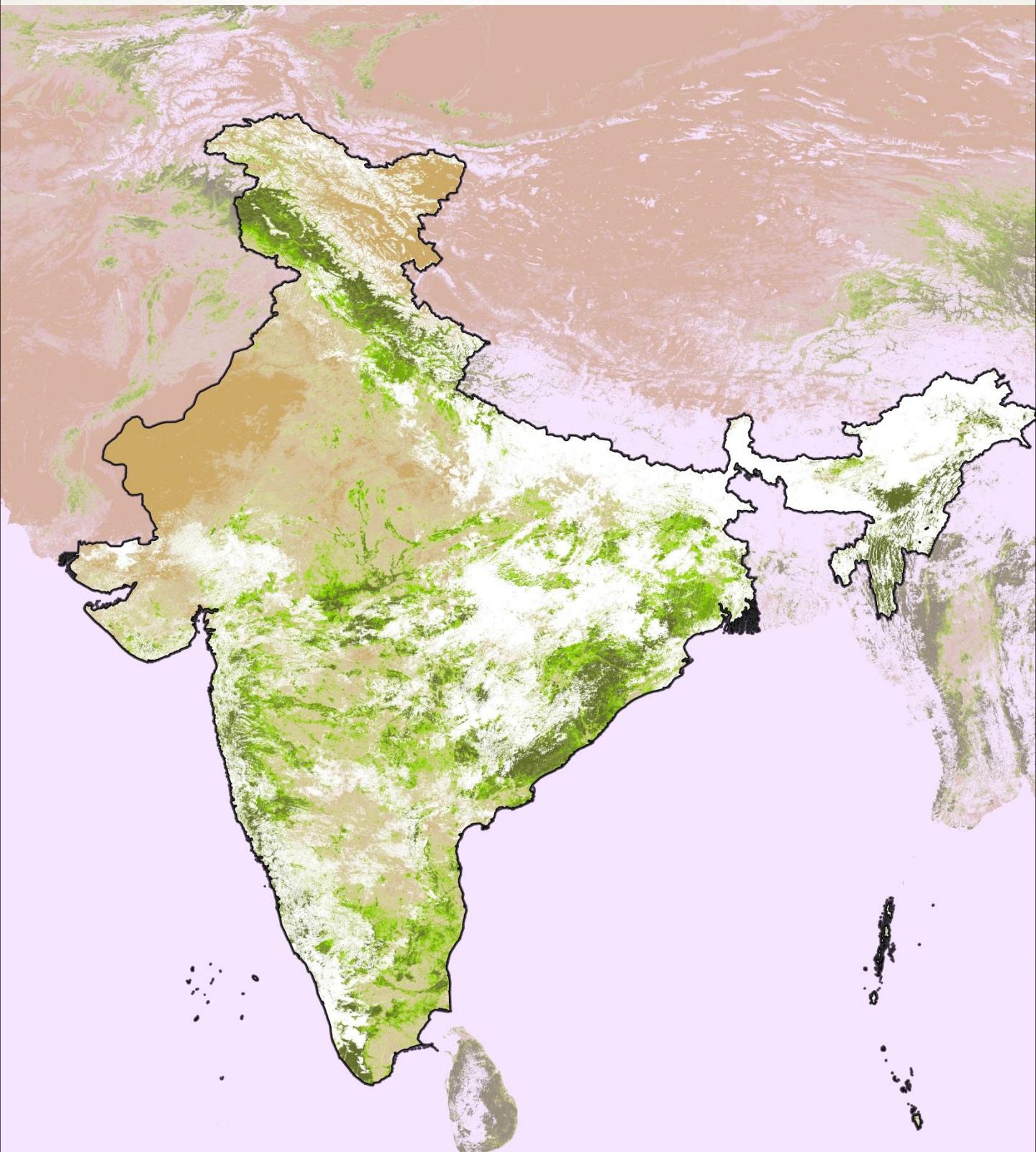


*Schistocerca Gregaria laying eggs*



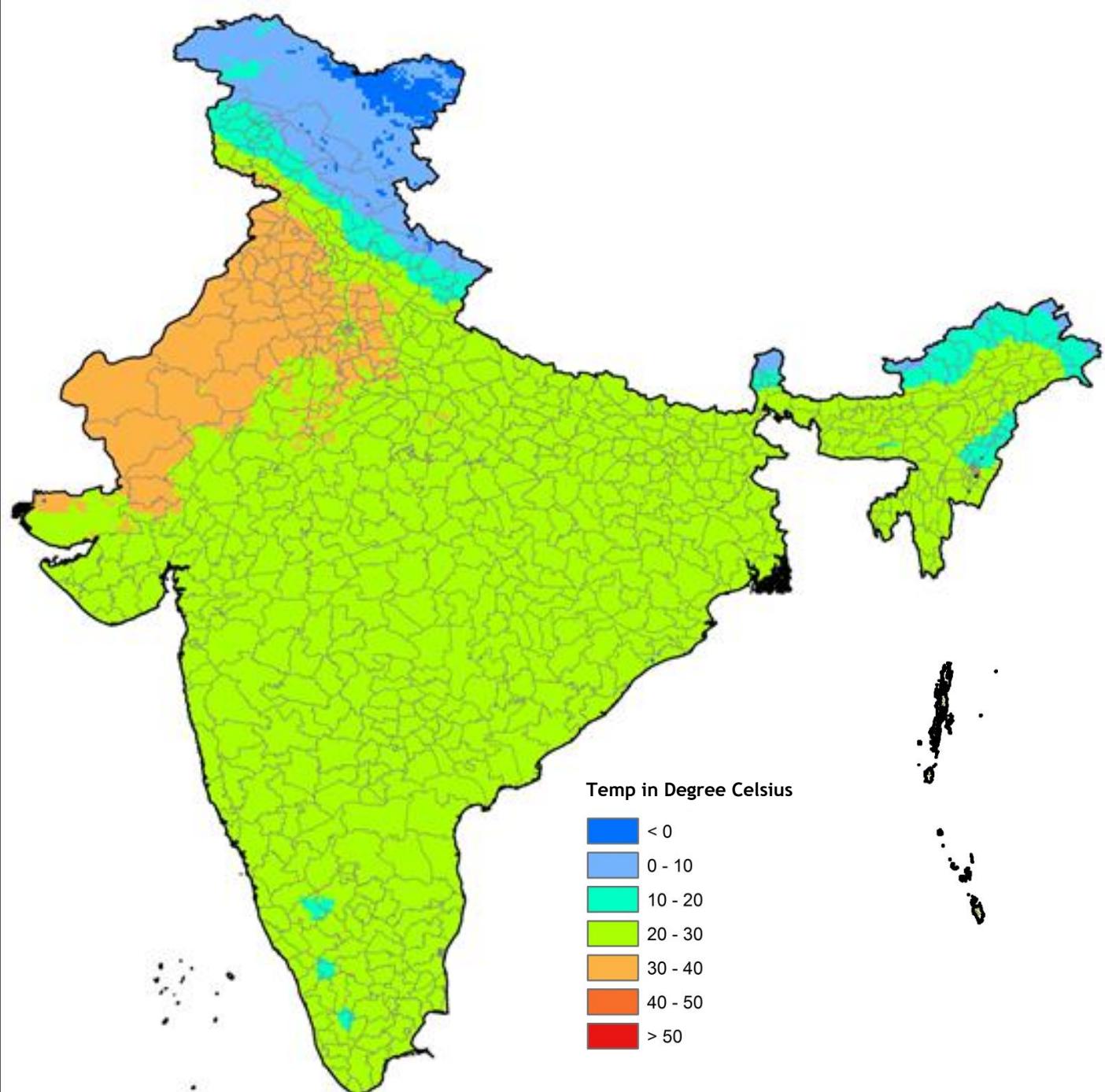
Regional Remote Sensing Centre - West  
NRSC/ISRO - Jodhpur

# Normalized Difference Vegetation Index Map

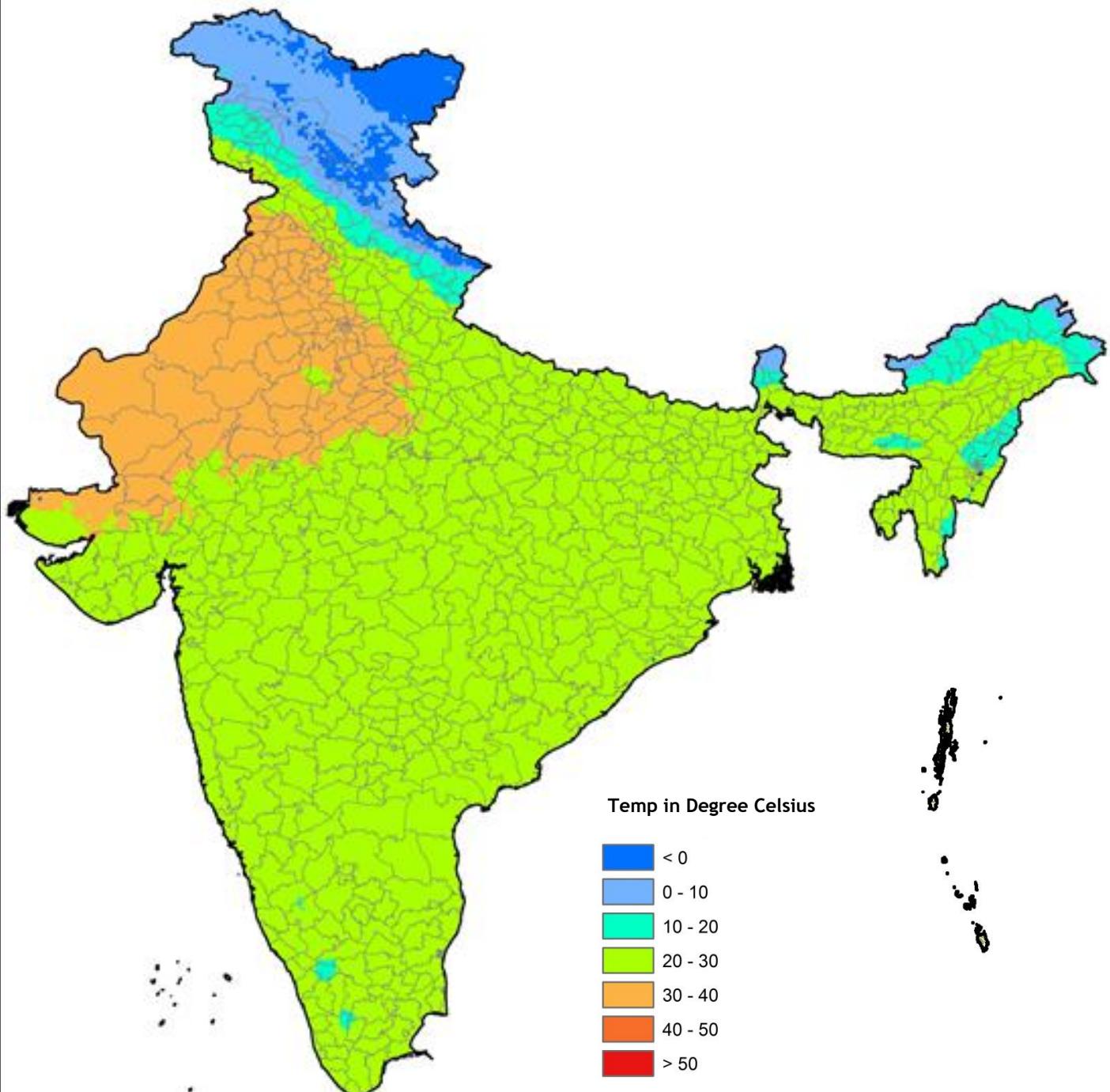


Source: Proba V | Copernicus Global Land Service  
NDVI Global 300m | 24 June - 02 July, 2020

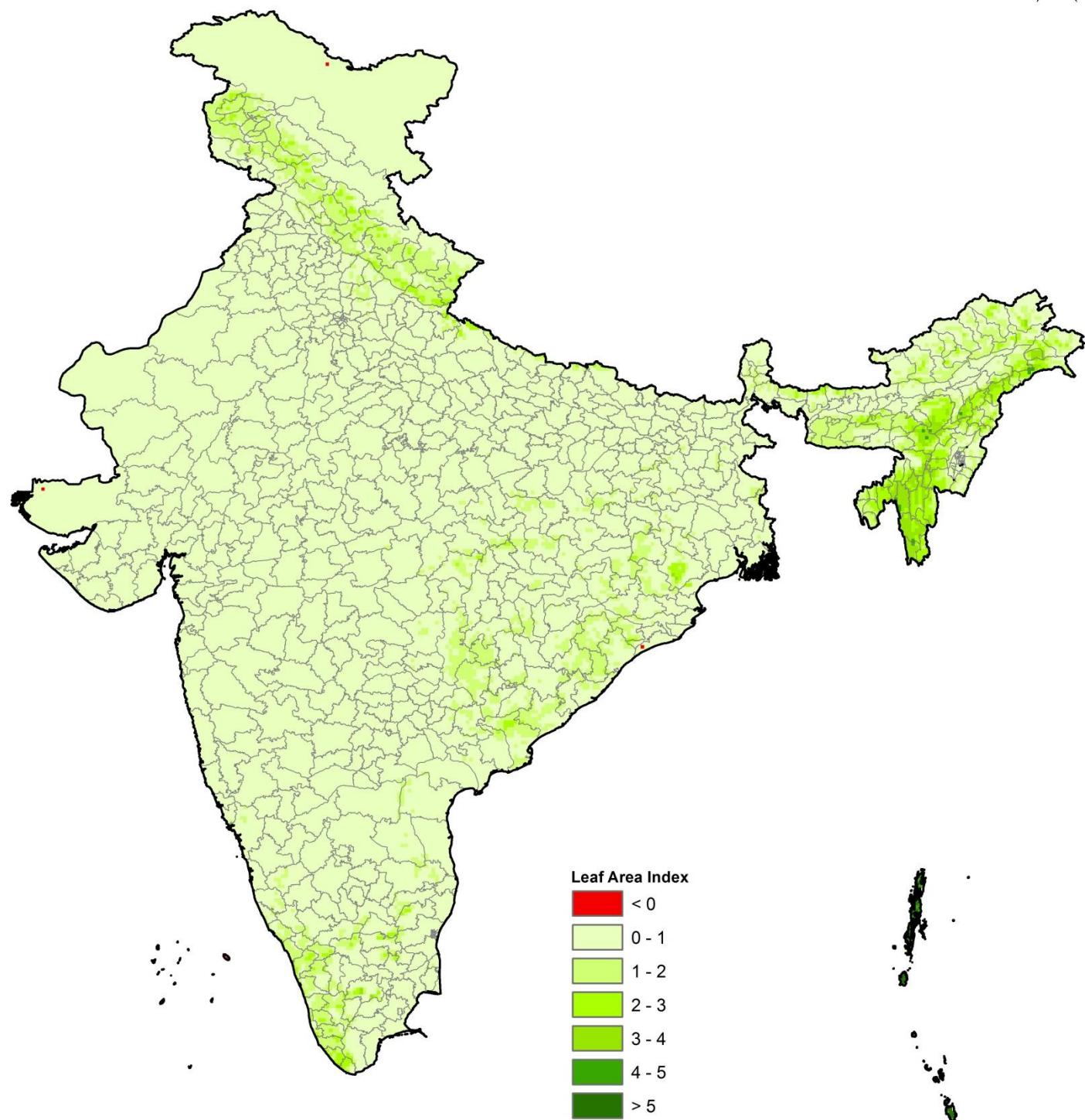
**Land Surface Temperature at 19:30 Hrs of 23 June 2020  
generated from SMAP Enhanced L4 Global  
3-hourly Daily 9 Km product**



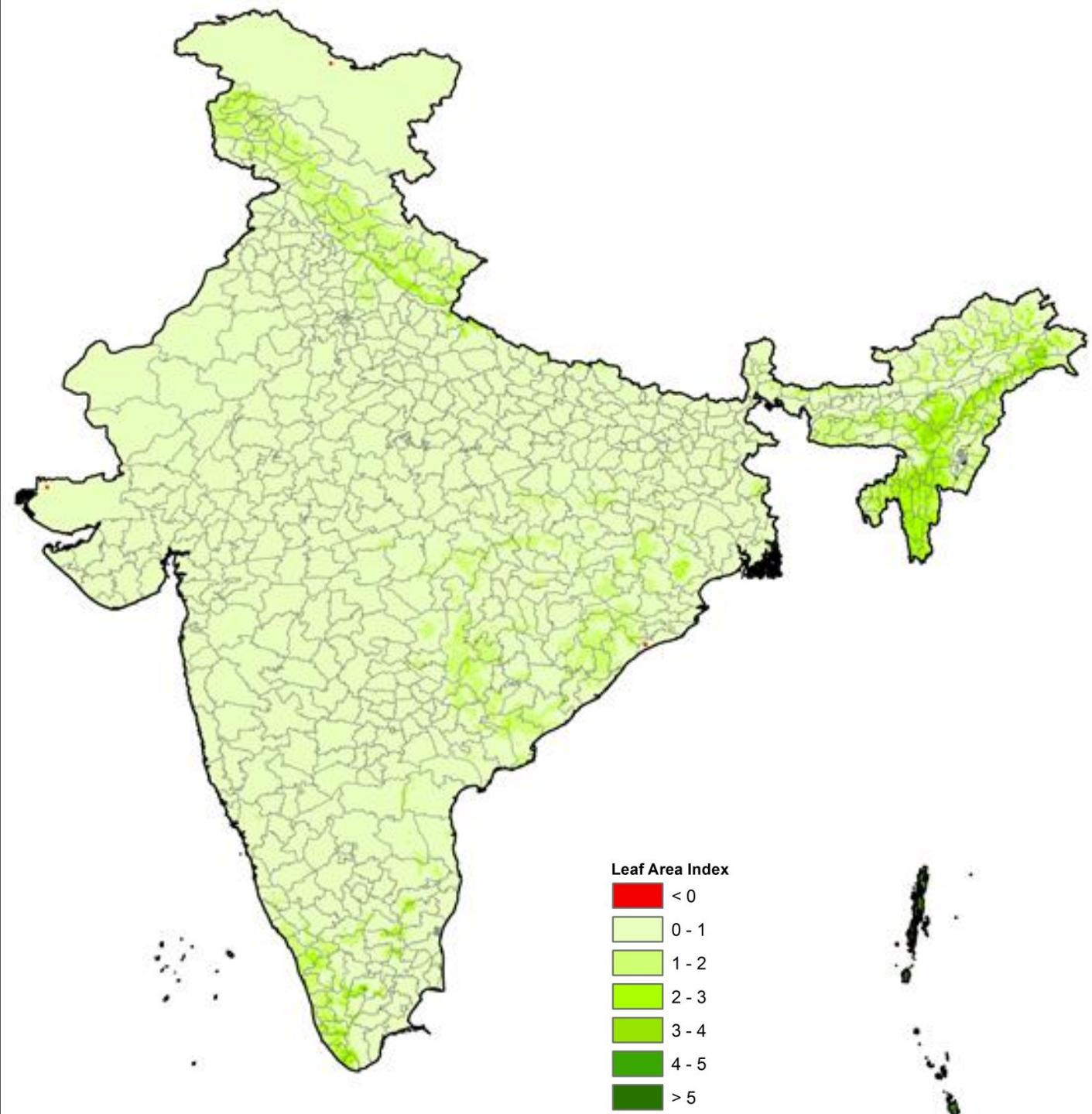
**Land Surface Temperature at 19:30 Hrs of 29 June 2020  
generated from SMAP Enhanced L4 Global  
3-hourly Daily 9 Km product**



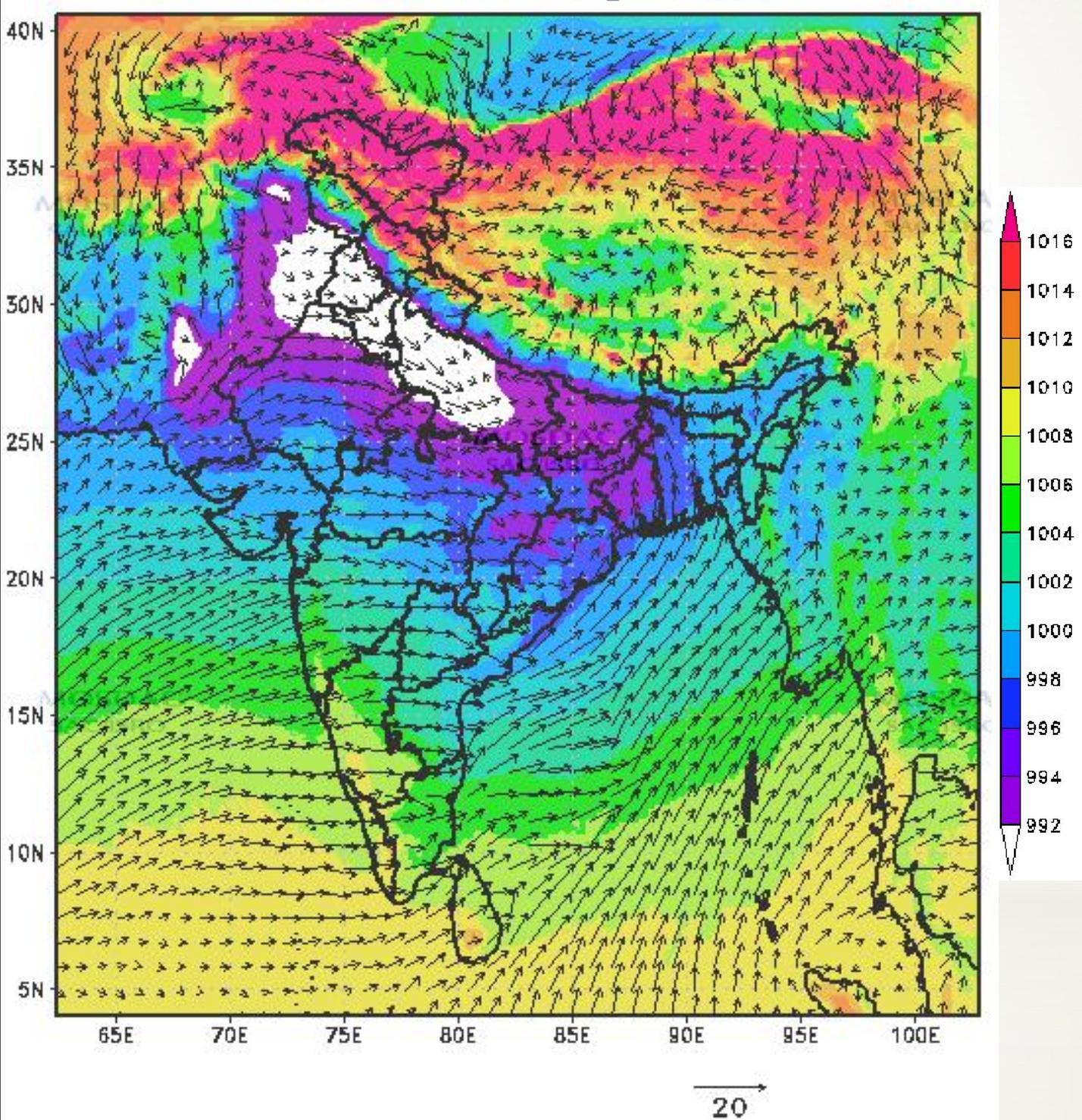
**Leaf Area Index (LAI) at 19:30 Hrs of 23 June 2020  
generated from SMAP Enhanced L4 Global  
3-hourly Daily 9 Km product**



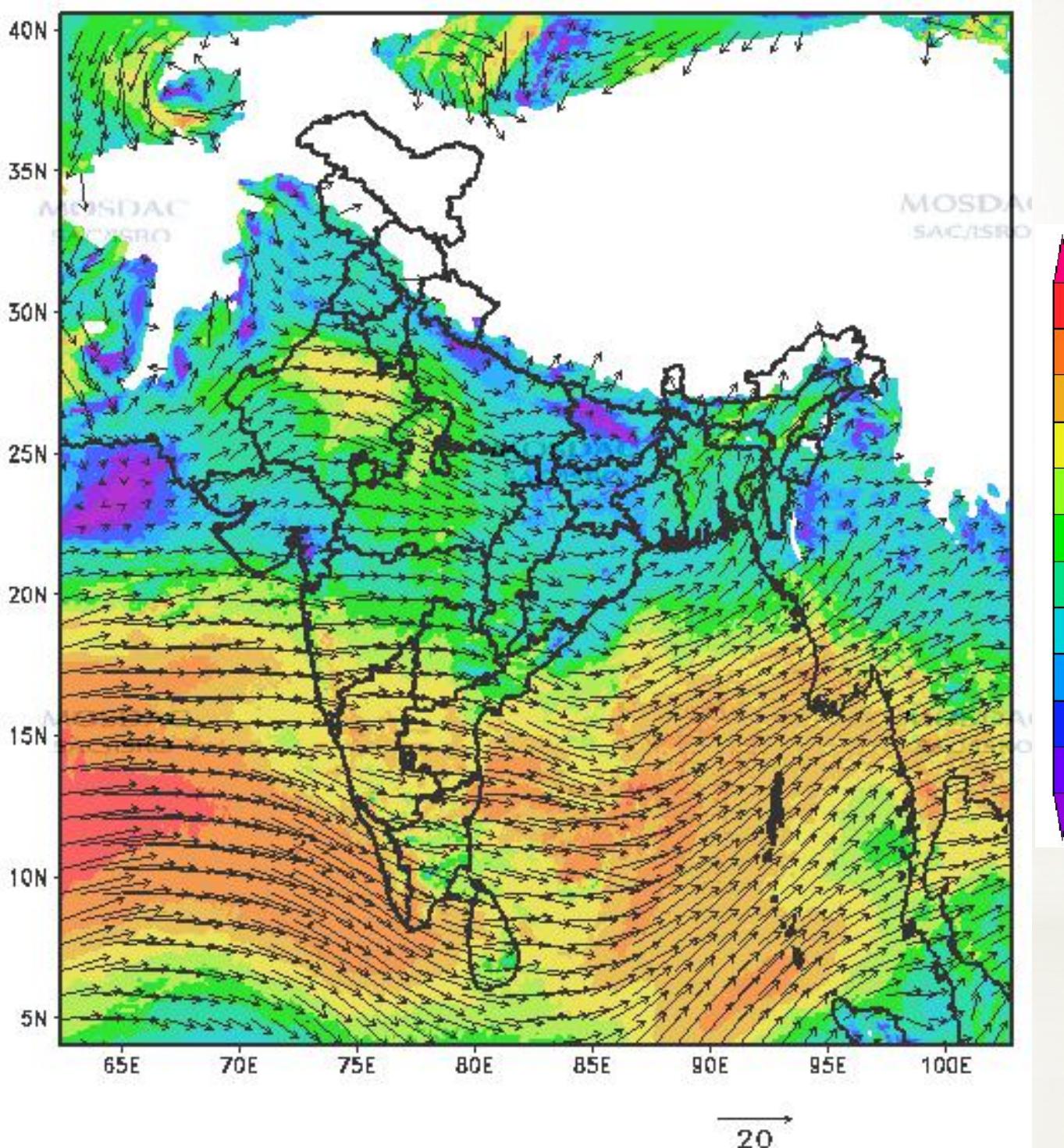
**Leaf Area Index (LAI) at 19:30 Hrs of 29 June 2020  
generated from SMAP Enhanced L4 Global  
3-hourly Daily 9 Km product**



**30hr Forecast valid for 1130 IST 03JUL2020**  
**MSLP & 10m height Wind**

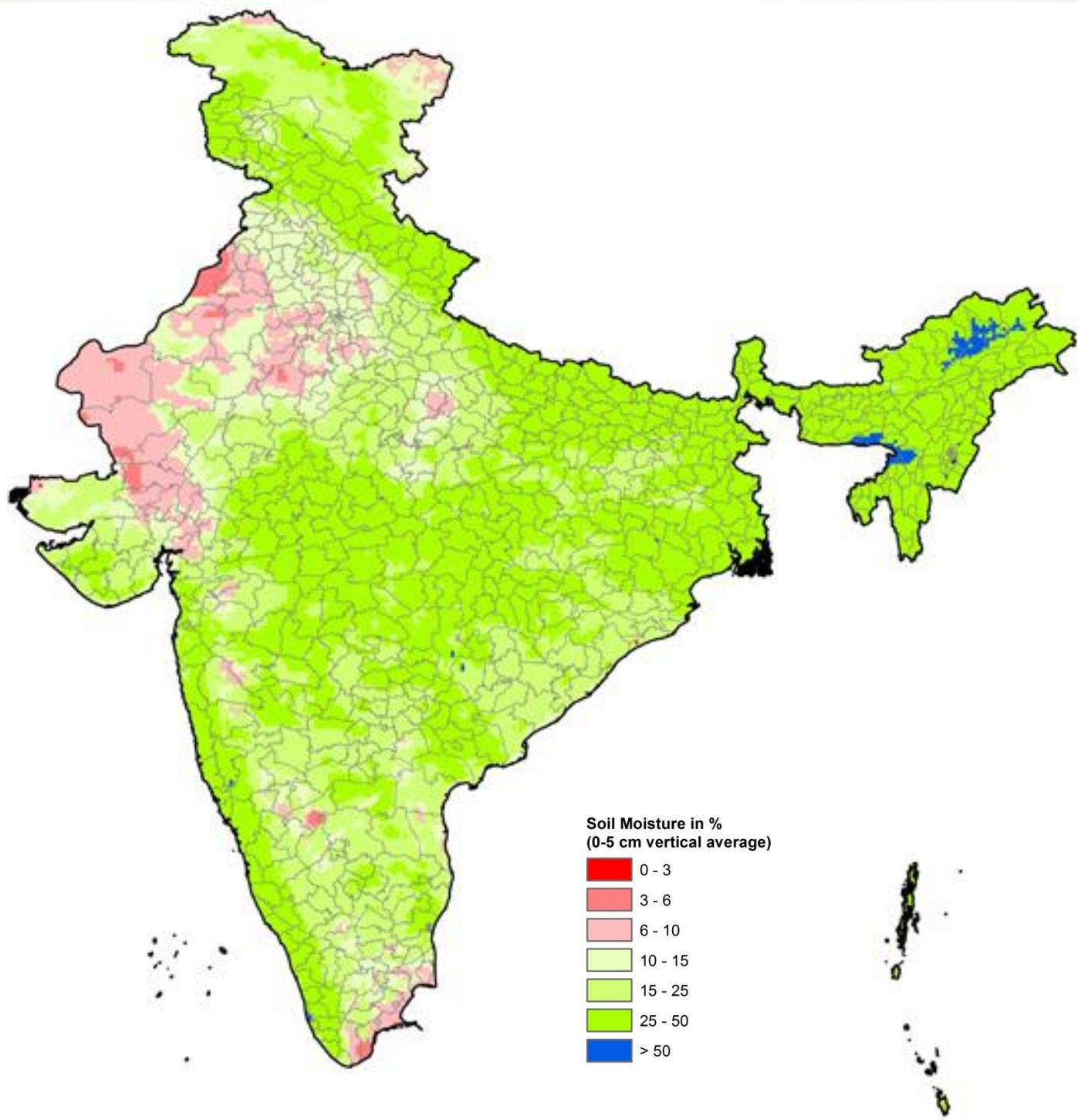


**30hr Forecast valid for 1130 IST 03JUL2020**  
**850 hPa Wind**

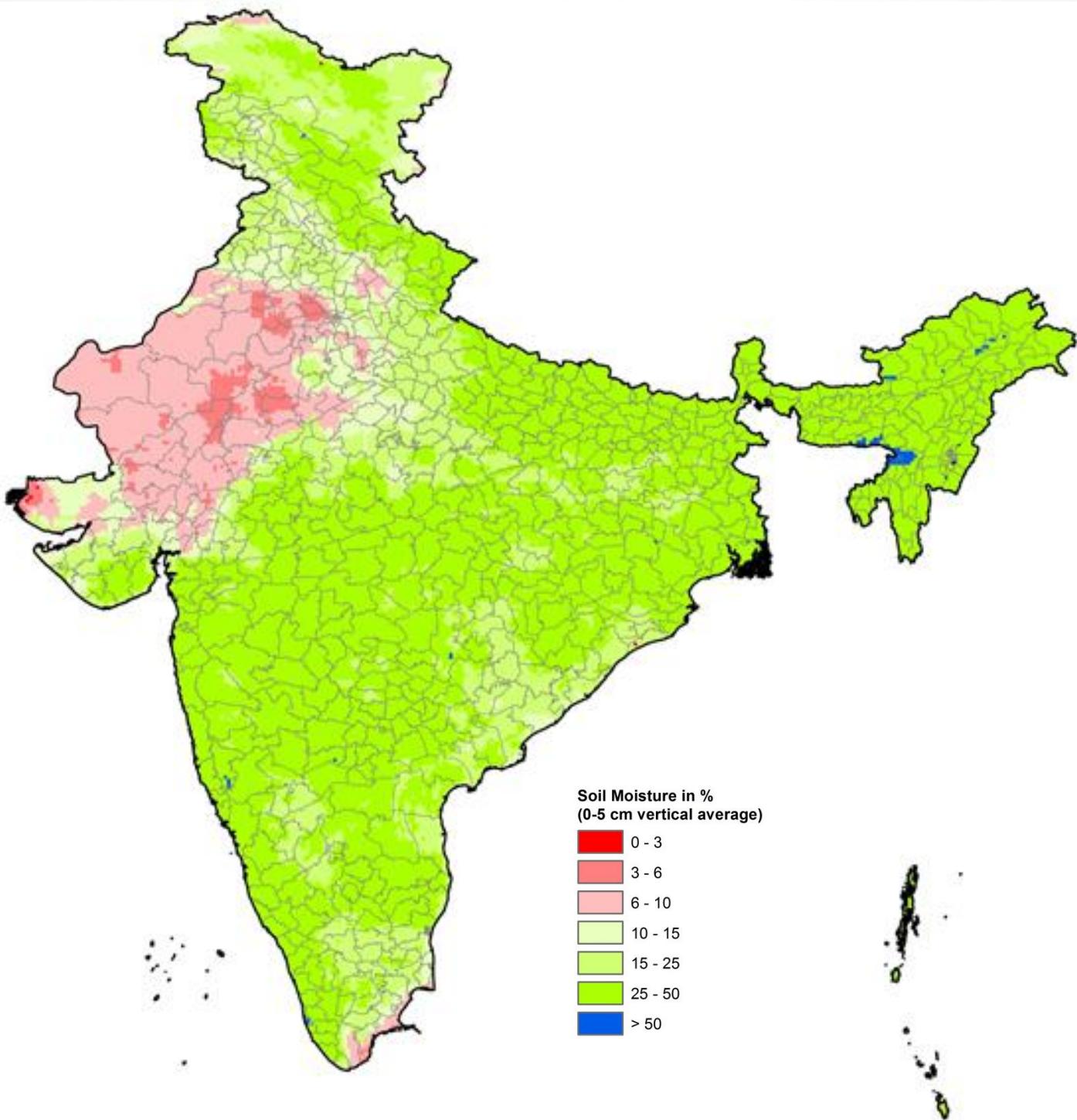


Wind speed @ 1.46 km from msl.

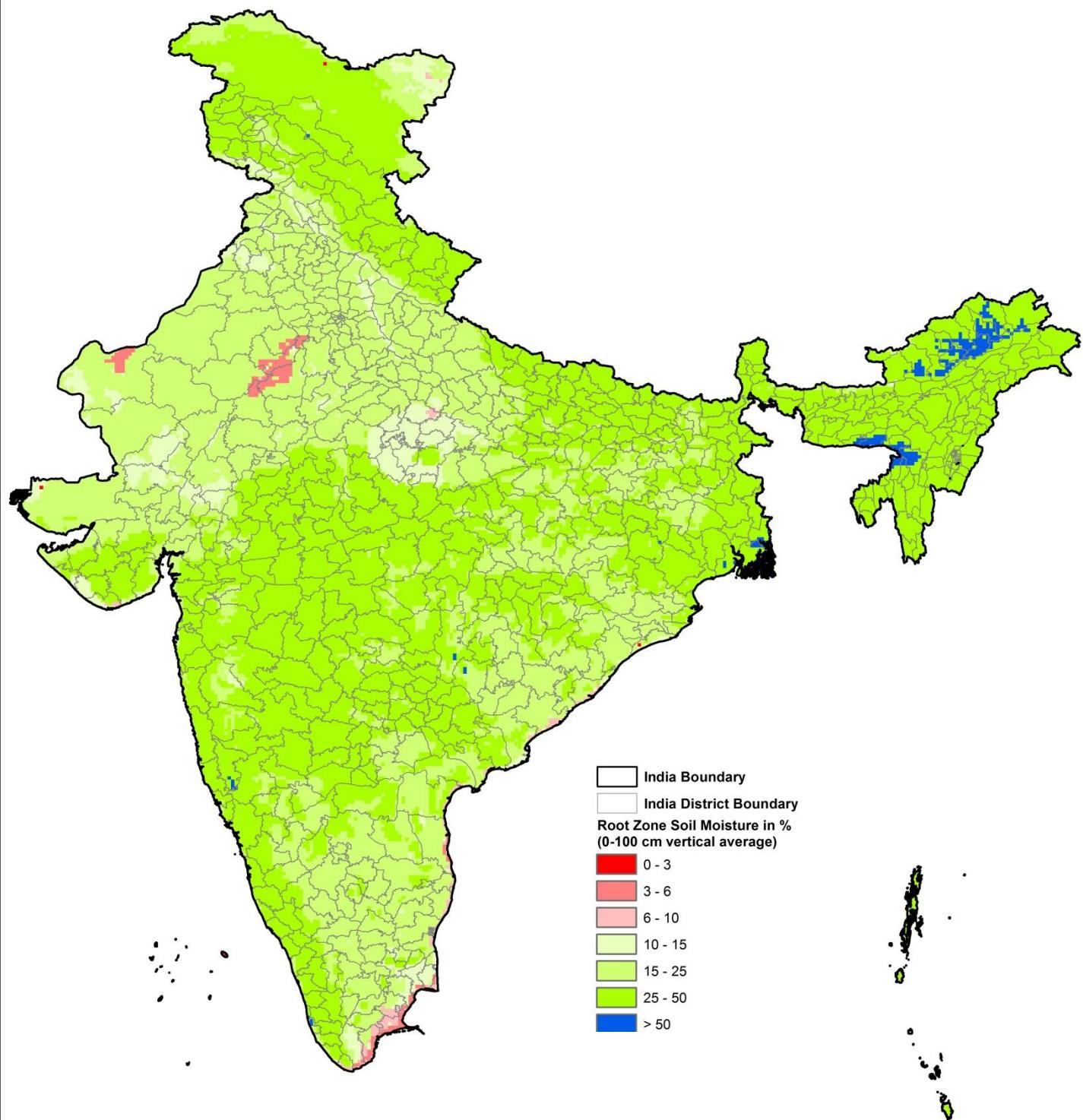
# **Soil Moisture at 19:30 Hrs of 23 June 2020 generated from SMAP Enhanced L4 Global 3-hourly Daily 9 Km product**



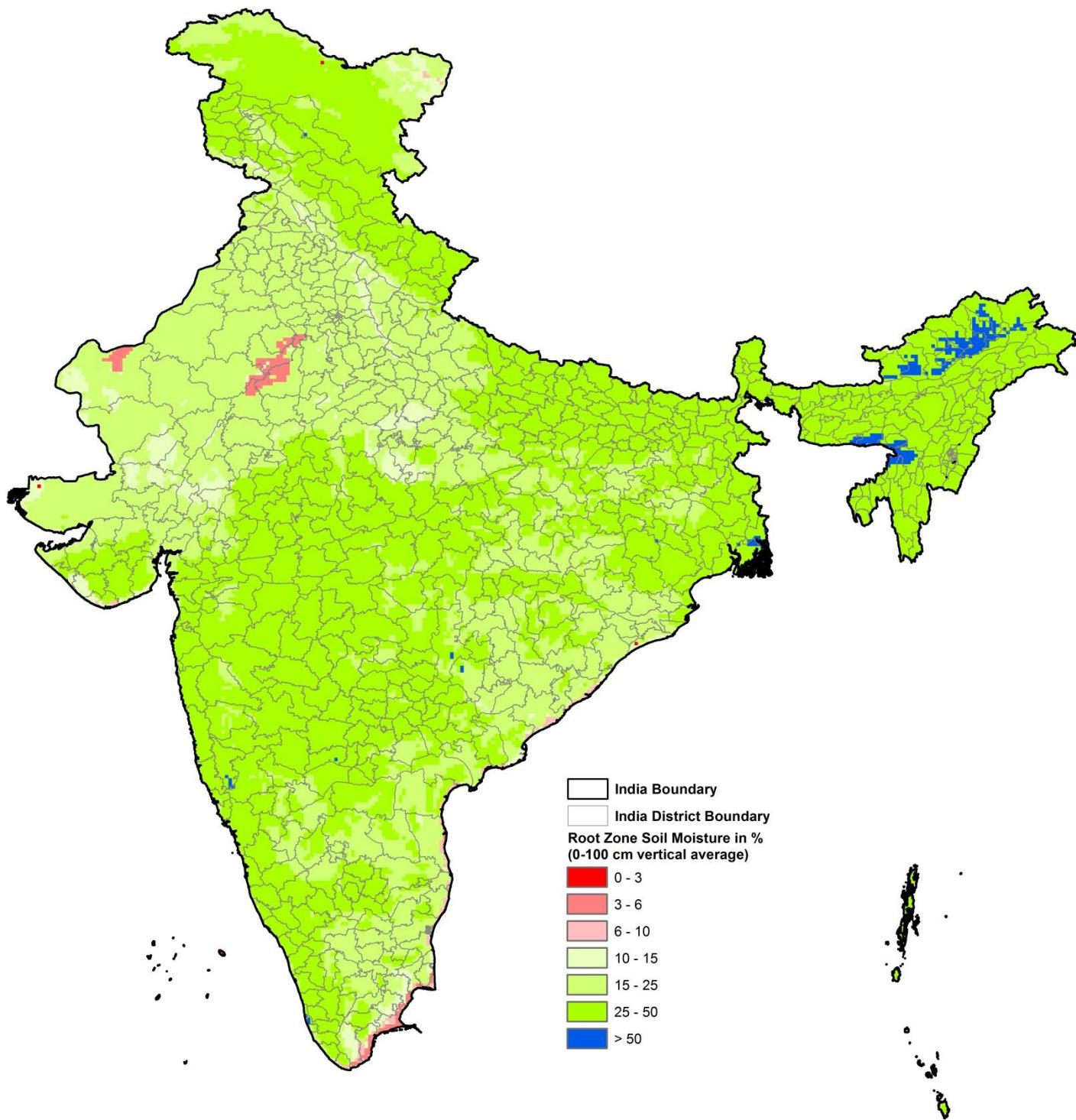
# **Soil Moisture at 19:30 Hrs of 29 June 2020 generated from SMAP Enhanced L4 Global 3-hourly Daily 9 Km product**



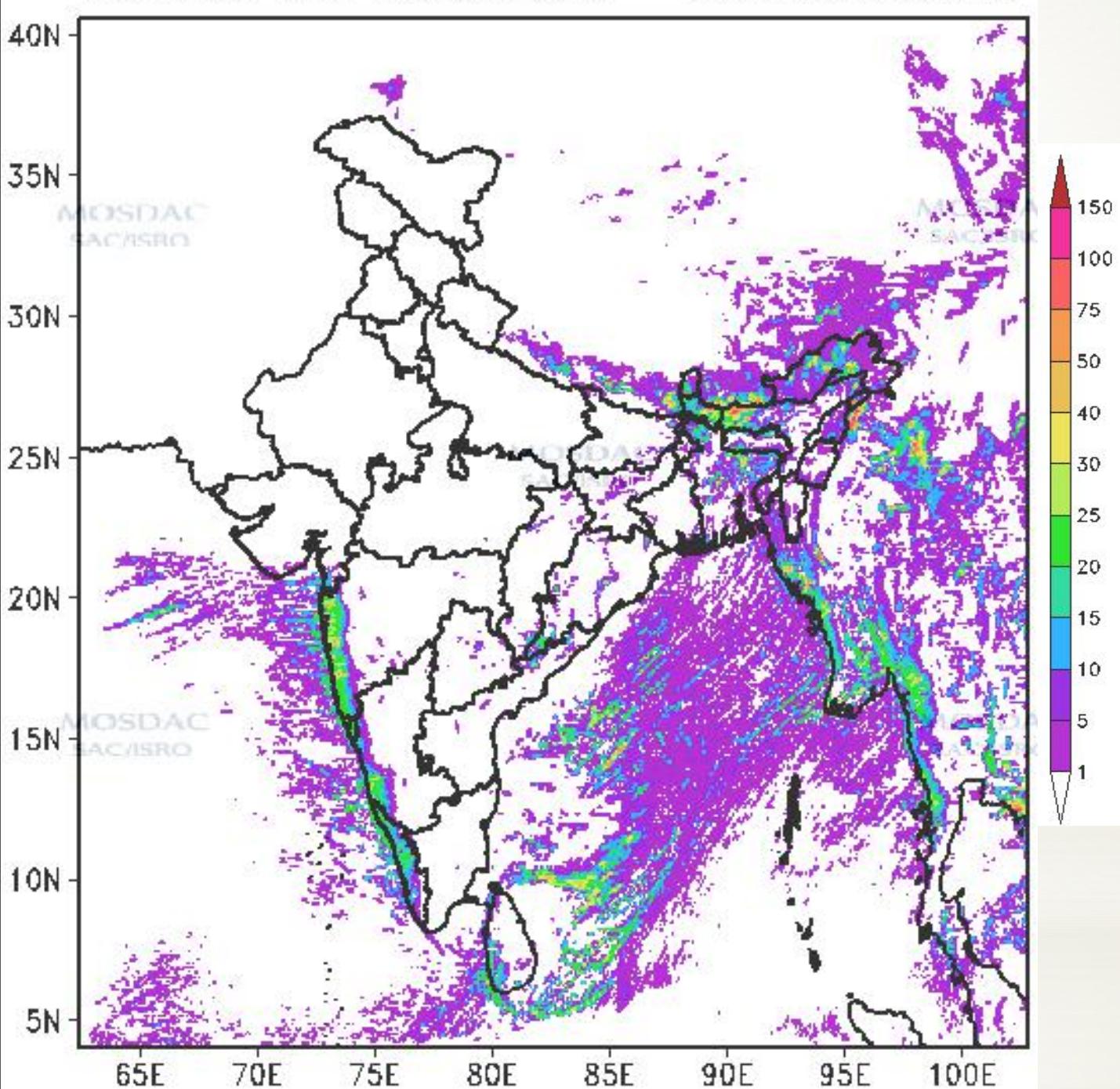
# **Root Zone Soil Moisture at 19:30 Hrs of 23 June 2020 generated from SMAP Enhanced L4 Global 3-hourly Daily 9 Km product**



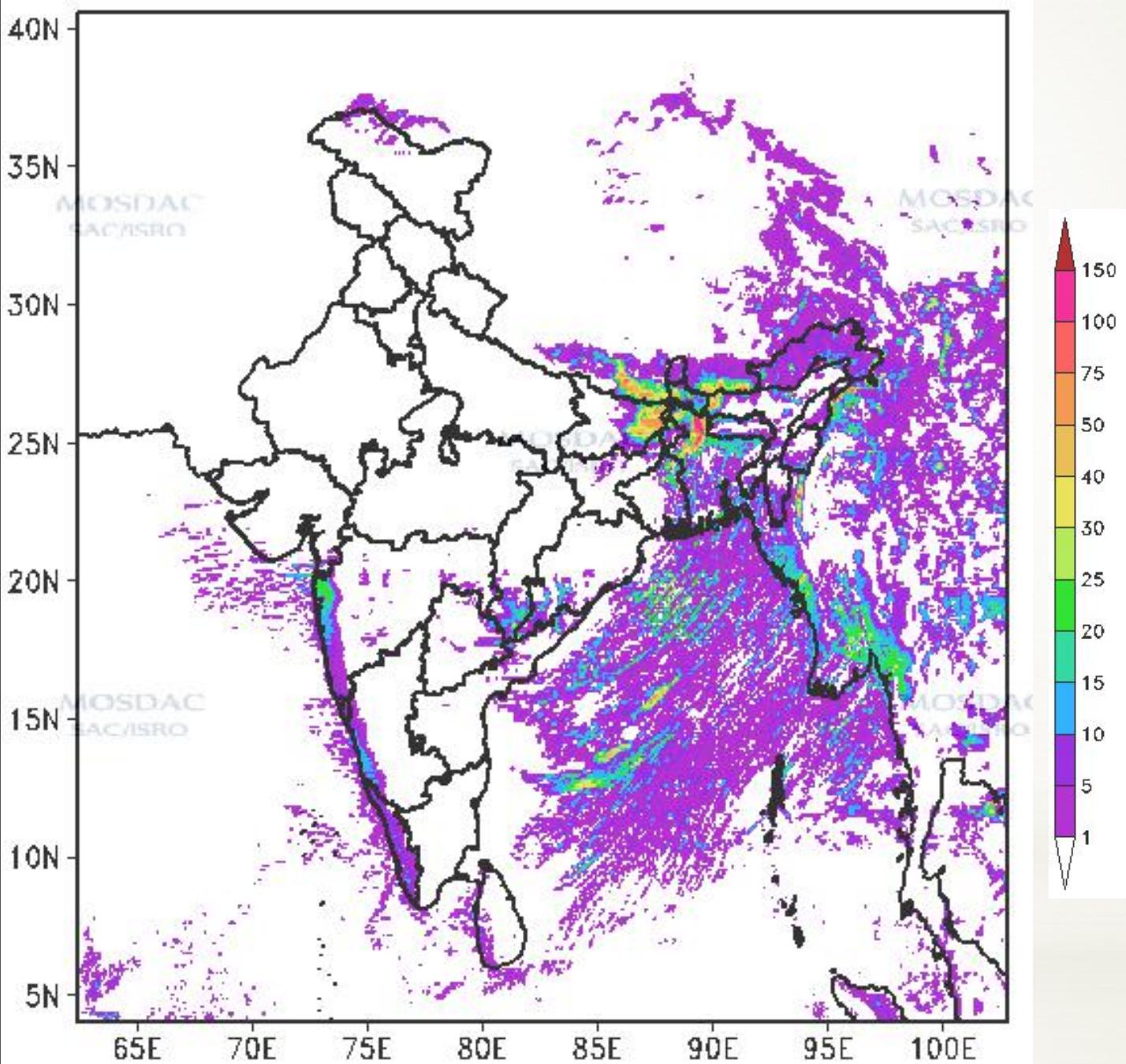
# Root Zone Soil Moisture at 19:30 Hrs of 29 June 2020 generated from SMAP Enhanced L4 Global 3-hourly Daily 9 Km product



03 hr accumulated rain (mm)  
between 03Z 03JUL2020 – 06Z 03JUL2020



03 hr accumulated rain (mm)  
between 03Z 04JUL2020 – 06Z 04JUL2020



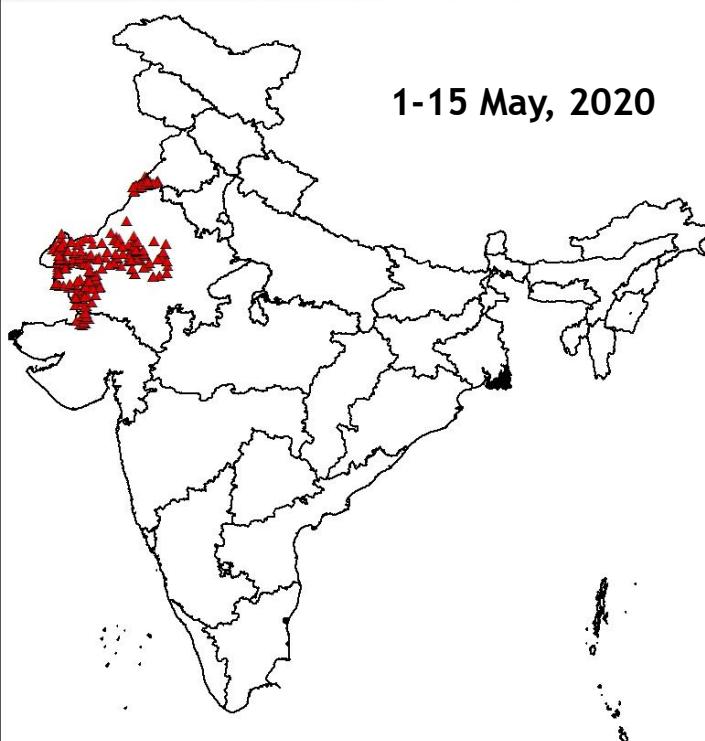
# Fortnightly Progression of Locust in Rajasthan and adjoining States



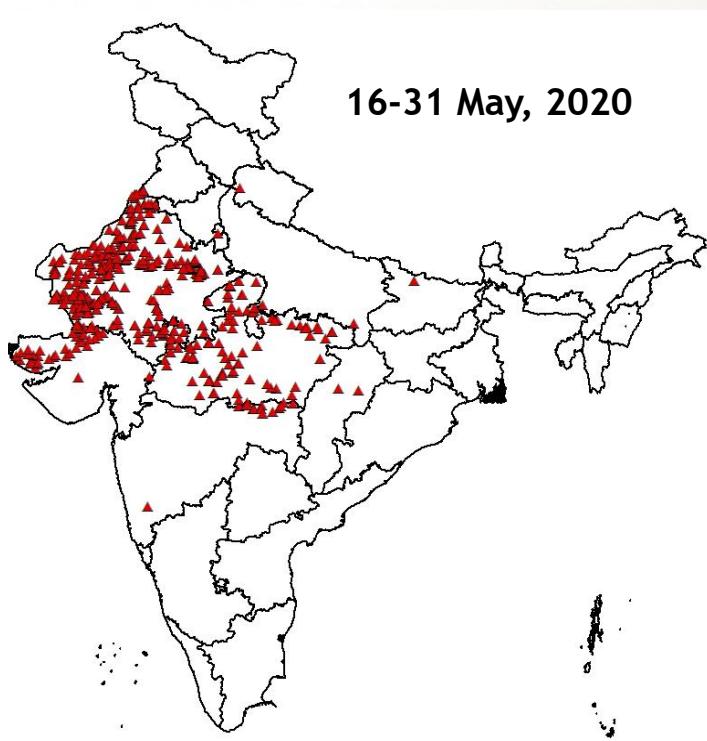
1-15 April, 2020



16-30 April, 2020



1-15 May, 2020



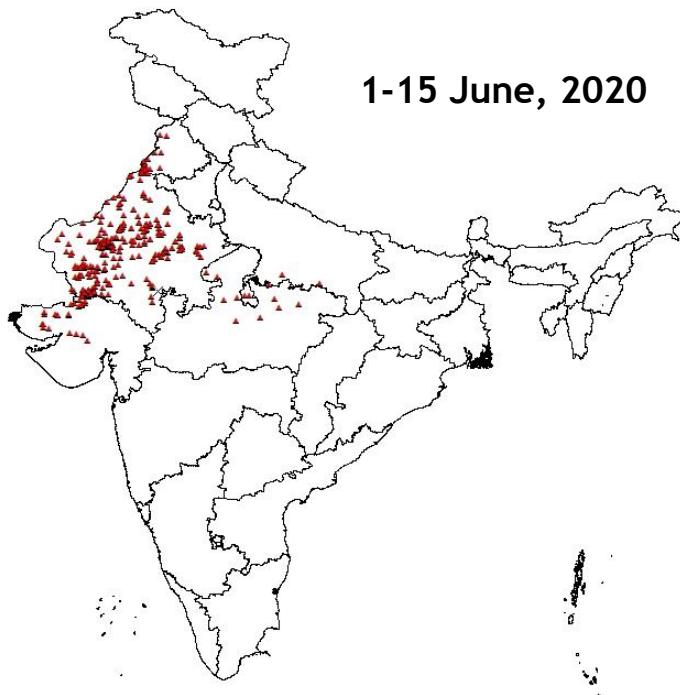
Locust Spread in India  
13604 sq.km.

Locust Spread in India  
74 sq.km.

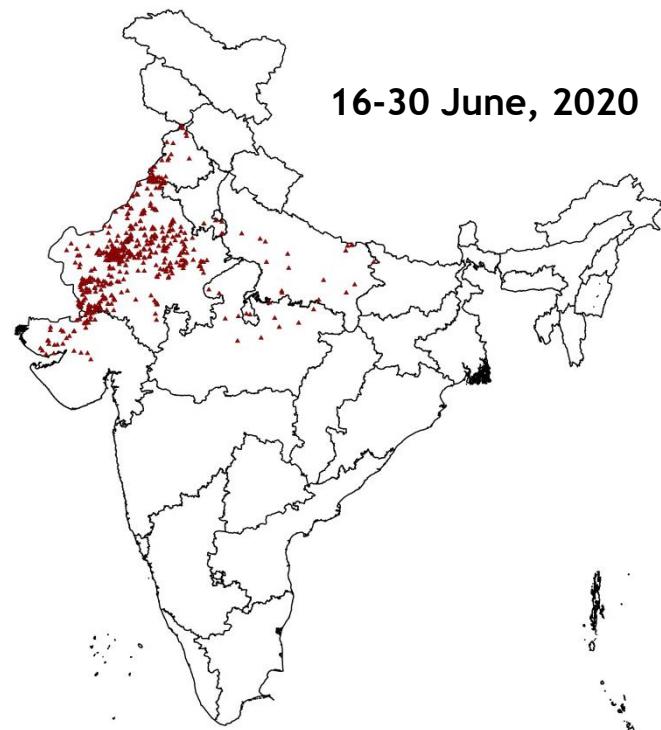
Locust Spread in India  
6,45,723 sq.km.

Locust Spread in India  
1,32,315 sq.km.

# Fortnightly Progression of Locust in Rajasthan and adjoining States



1-15 June, 2020



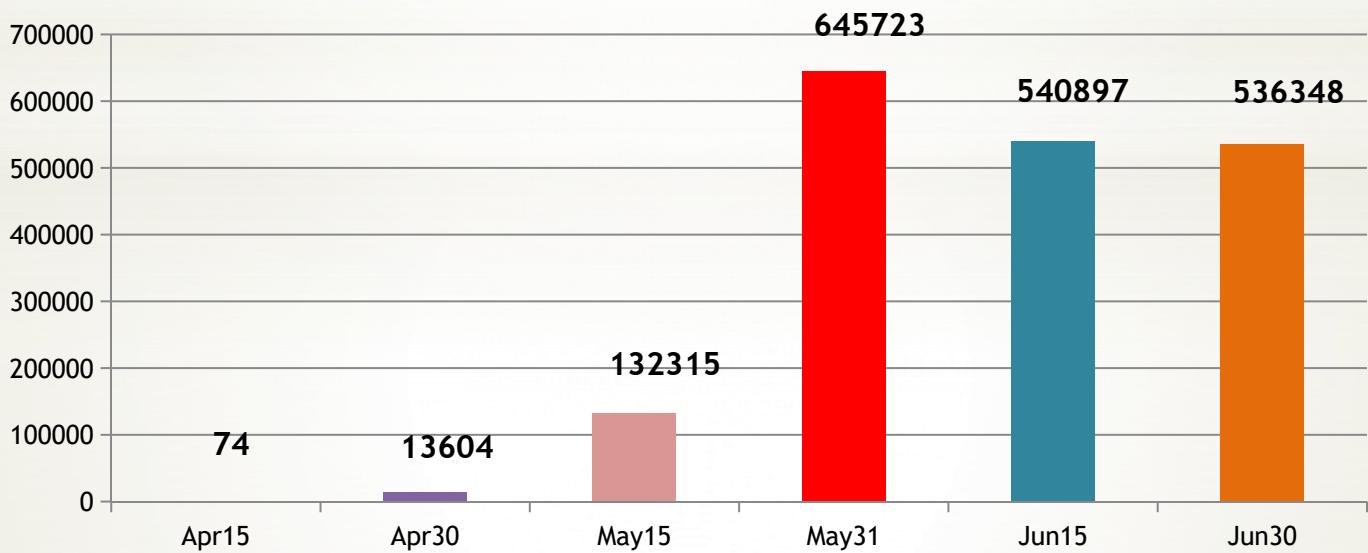
16-30 June, 2020

Locust Spread in India  
5,10,991 sq.km.

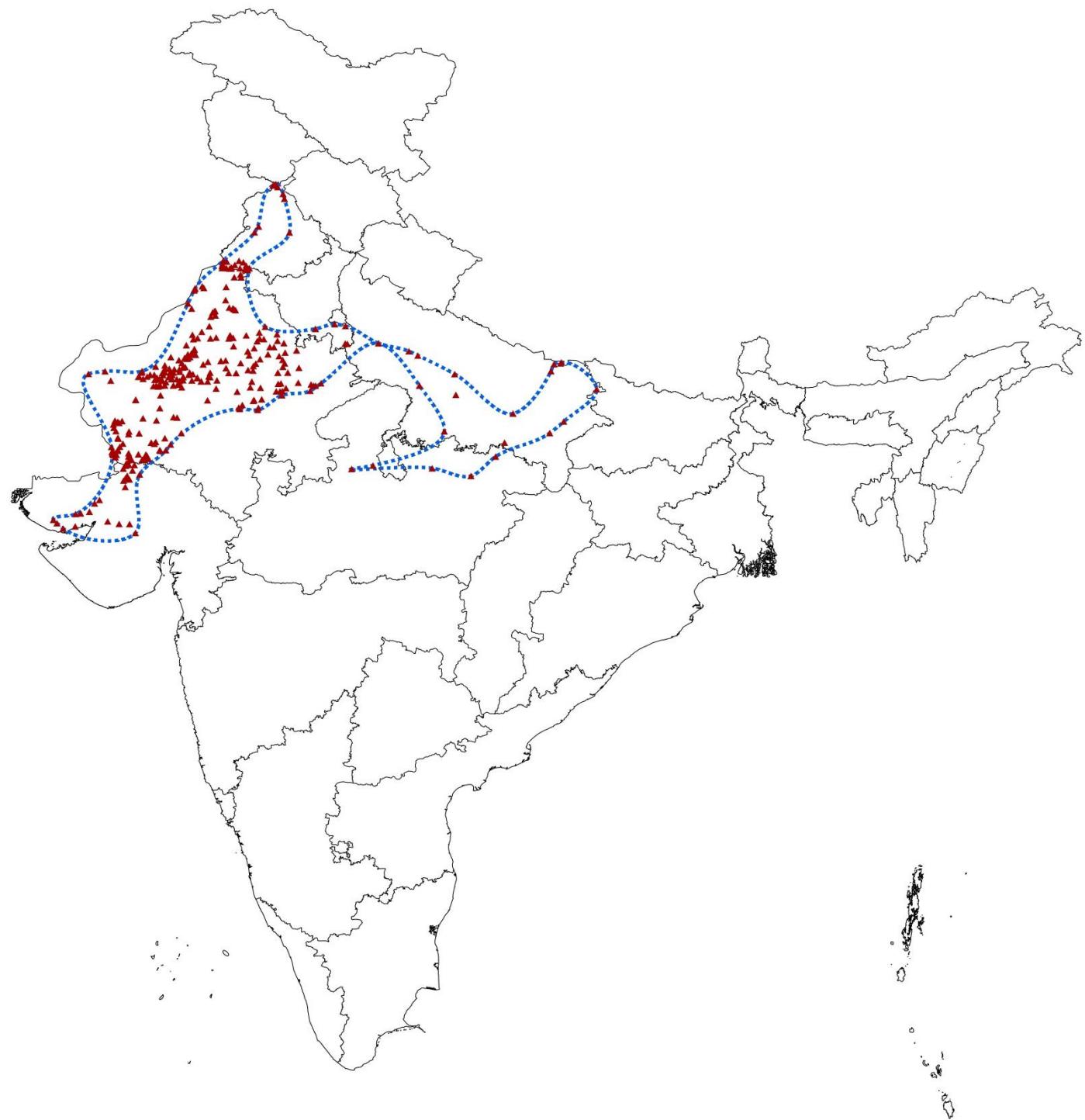
Locust Spread in India  
5,36,348 sq.km.

## Locust Swarm Spread Area in India

(1<sup>st</sup> April, 2020 till 30<sup>th</sup> June, 2020)  
Series 1



# Progression of Locust in Rajasthan and adjoining States

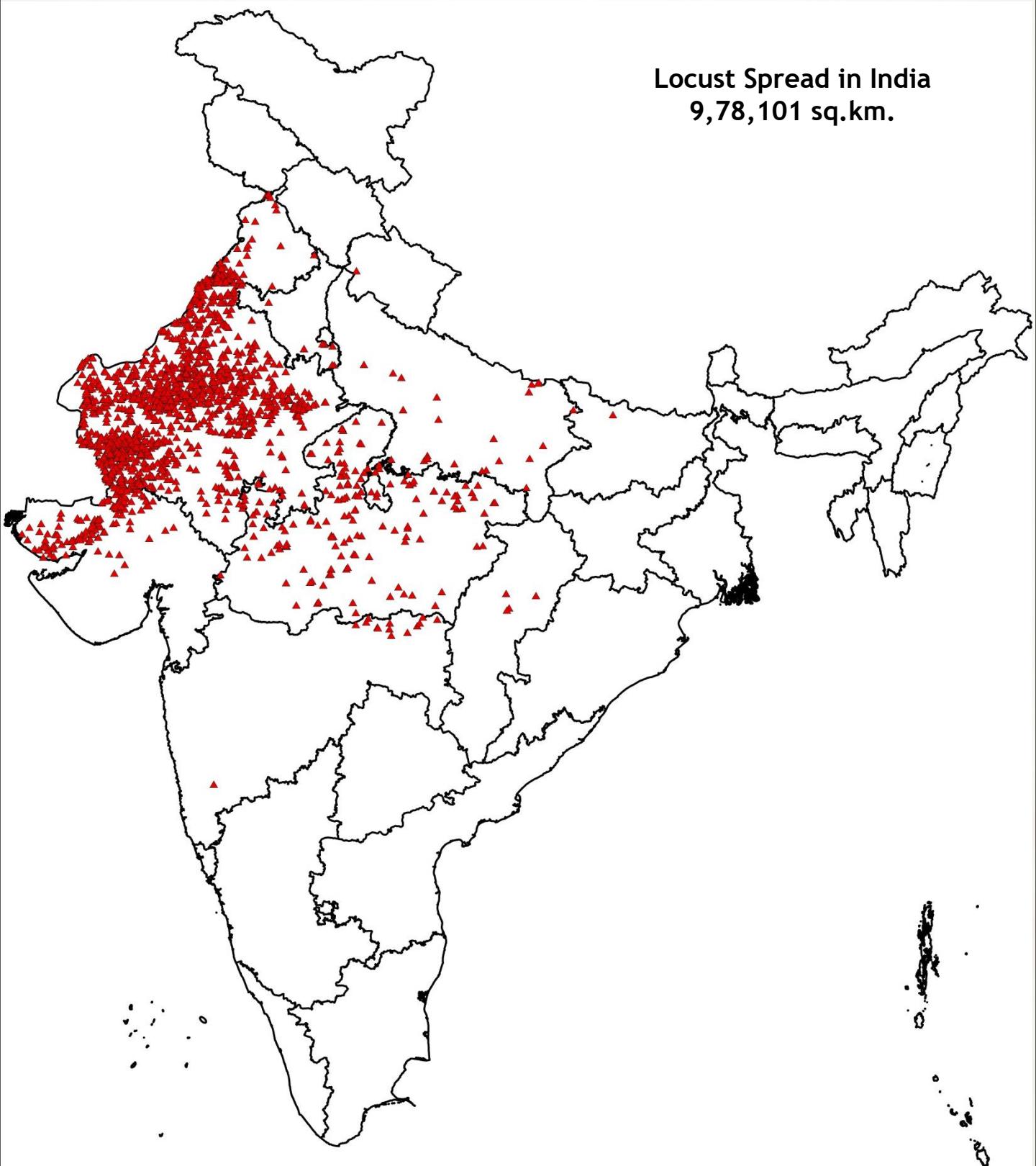


24-30 June, 2020

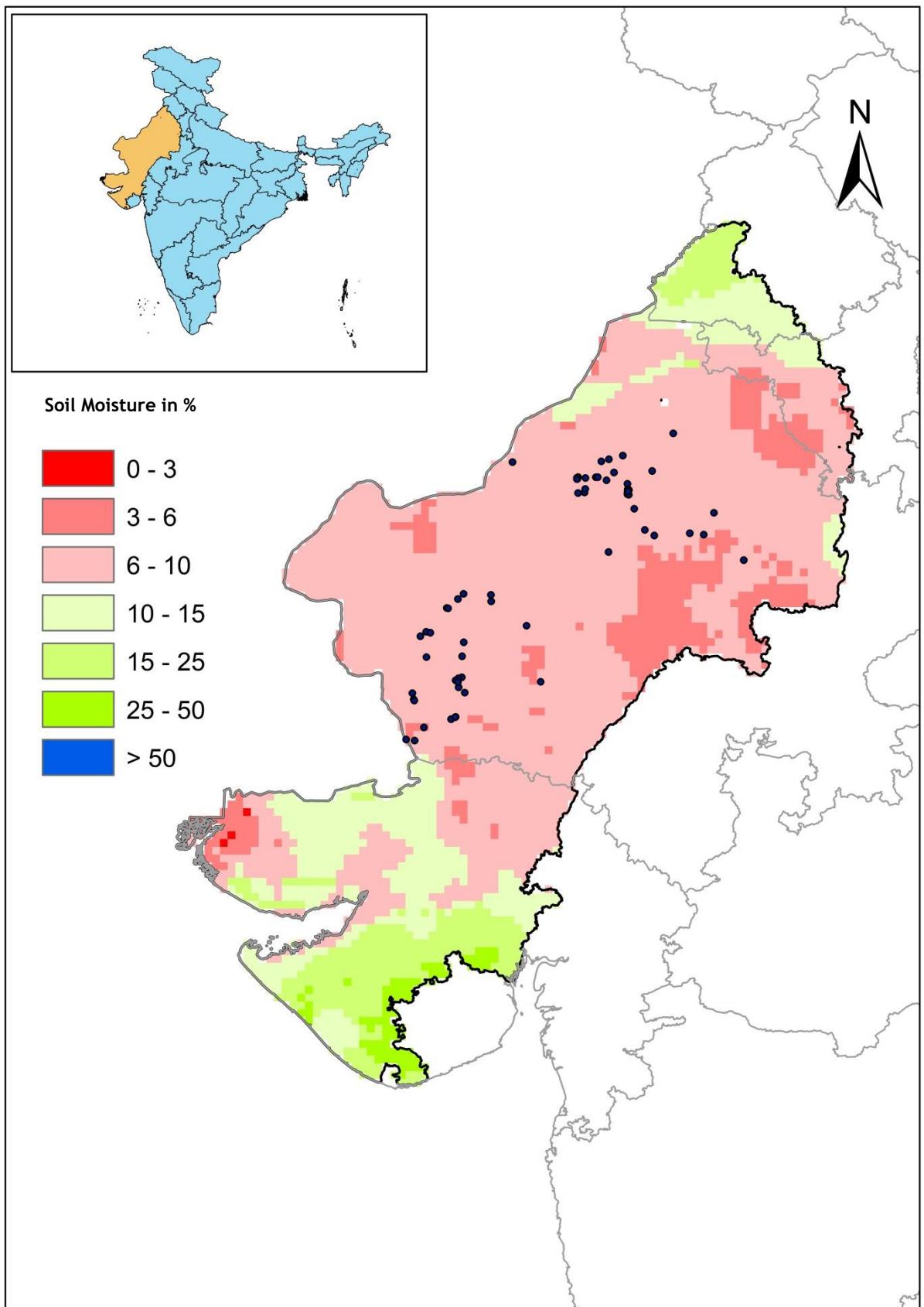
Spread Area: 3,42,547 sqkm

# Cumulative Progression of Locust in Rajasthan and adjoining States

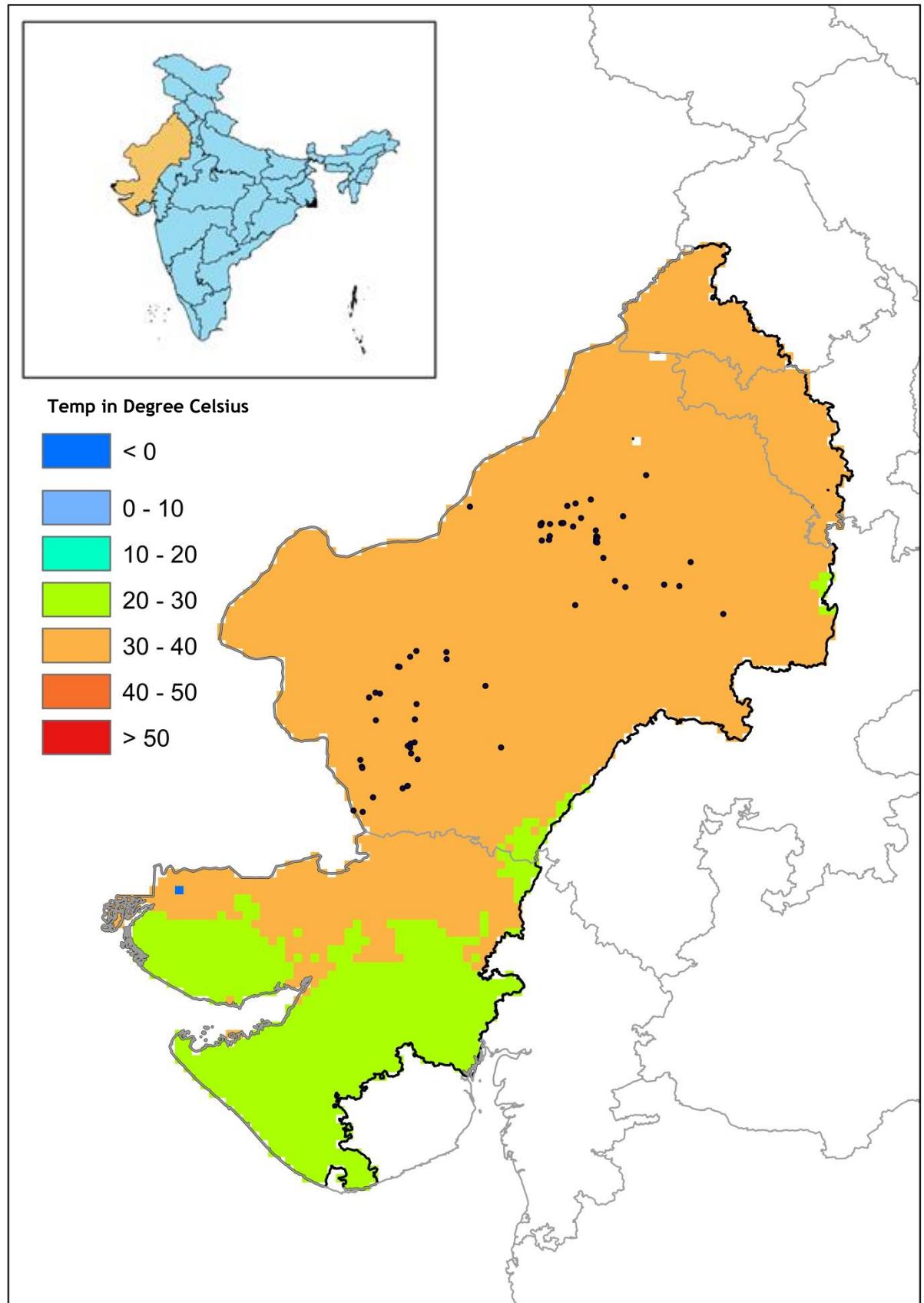
Locust Spread in India  
9,78,101 sq.km.



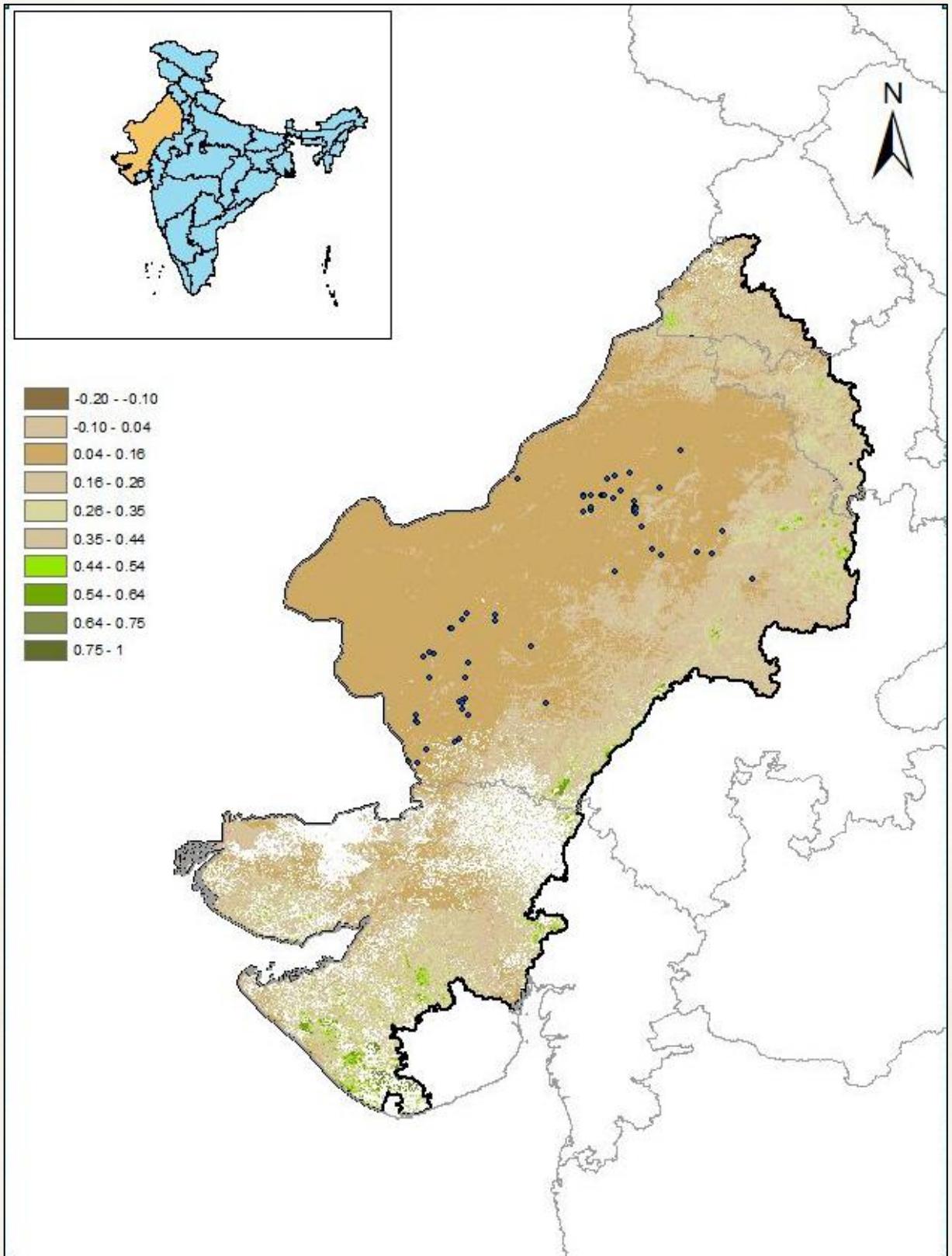
# Breeding Points overlaid on Soil Moisture Map - Thar Desert



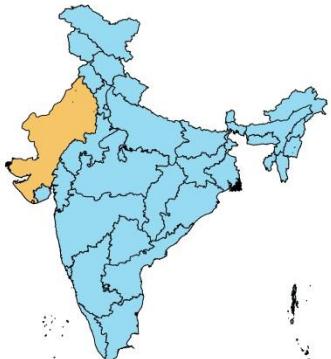
# Breeding Points overlaid on Land Surface Temperature Map - Thar Desert



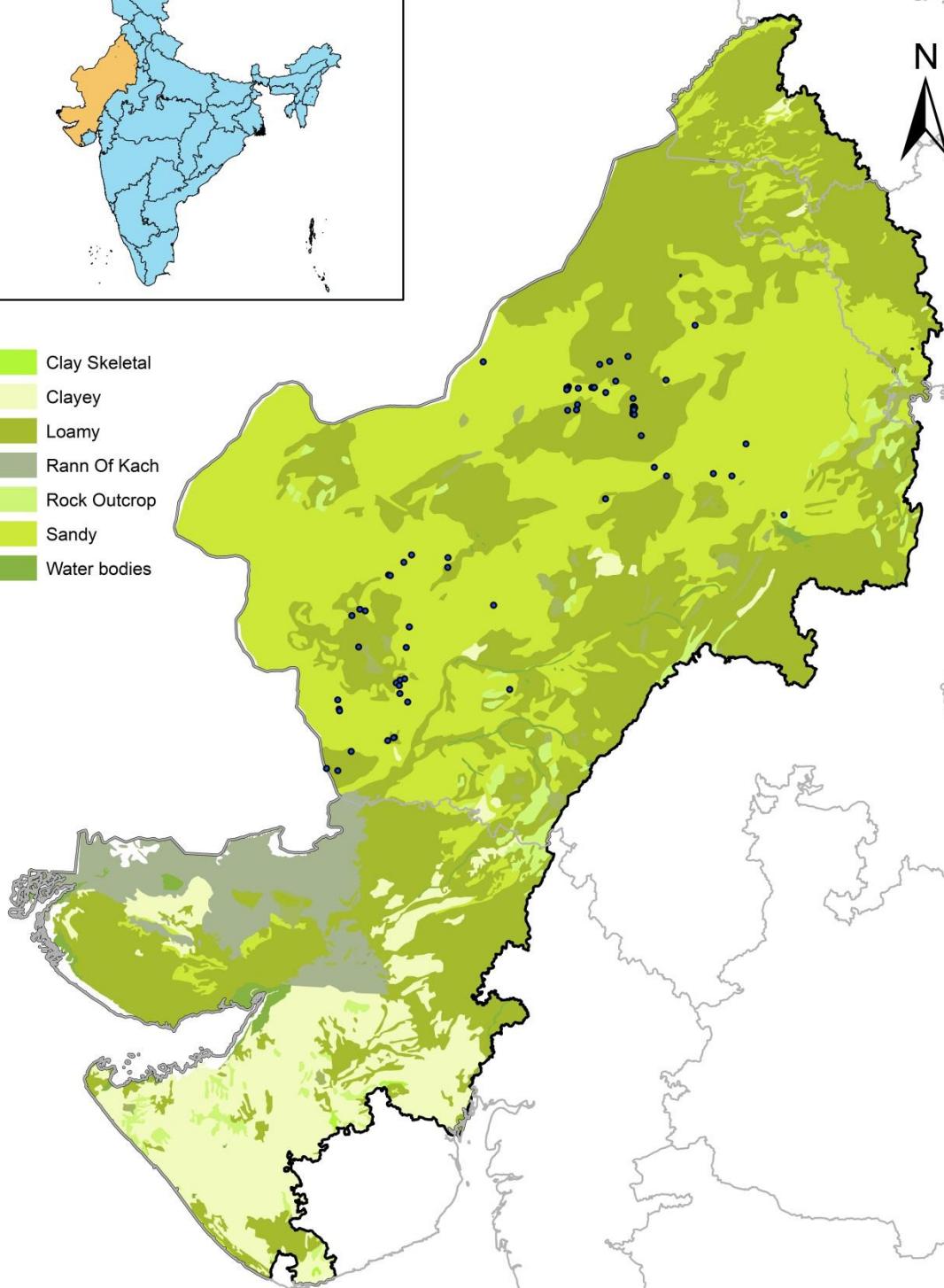
# Breeding Points overlaid on Normalized Difference Vegetation Index - Thar Desert



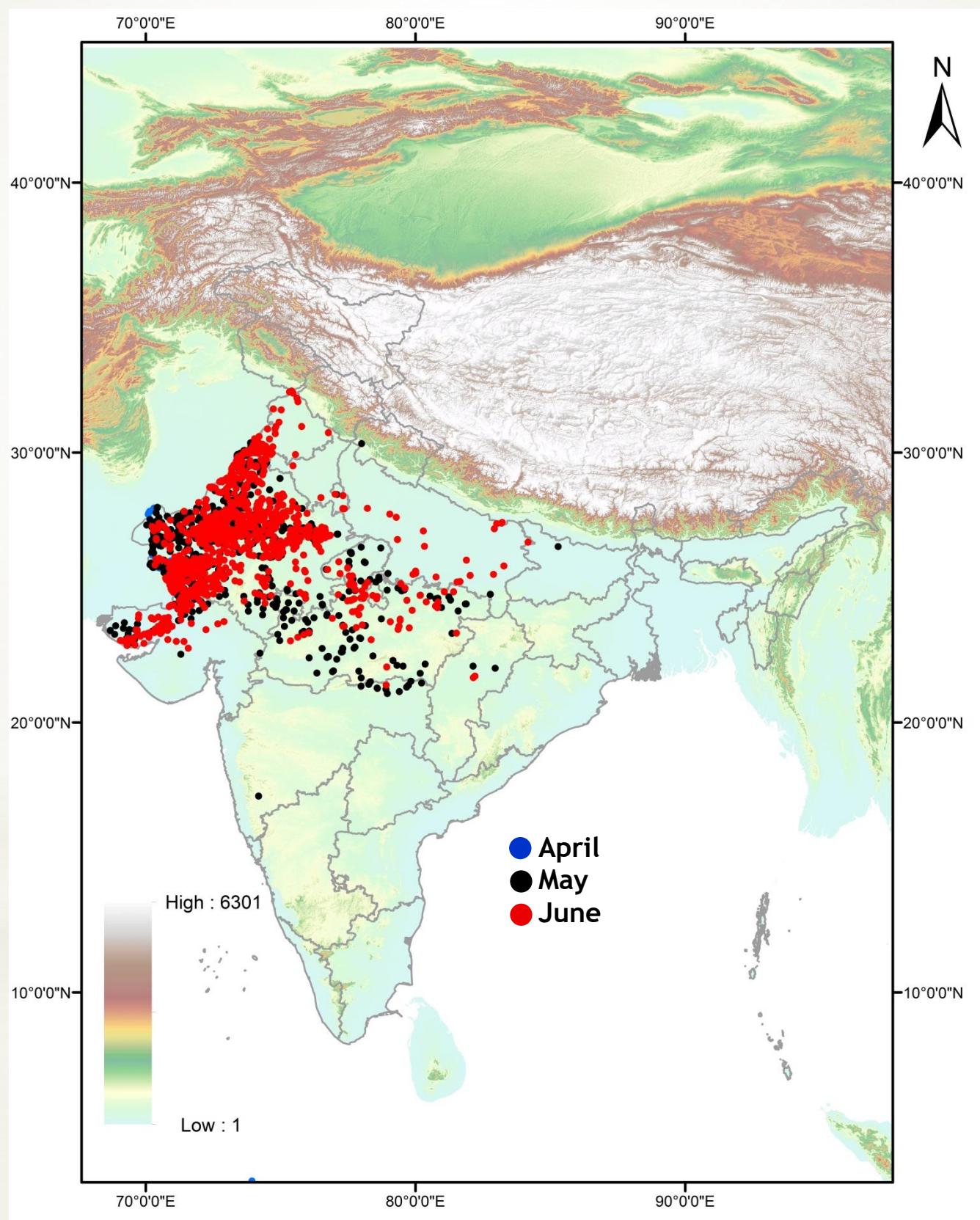
# Breeding Points overlaid on Soil Texture - Thar Desert



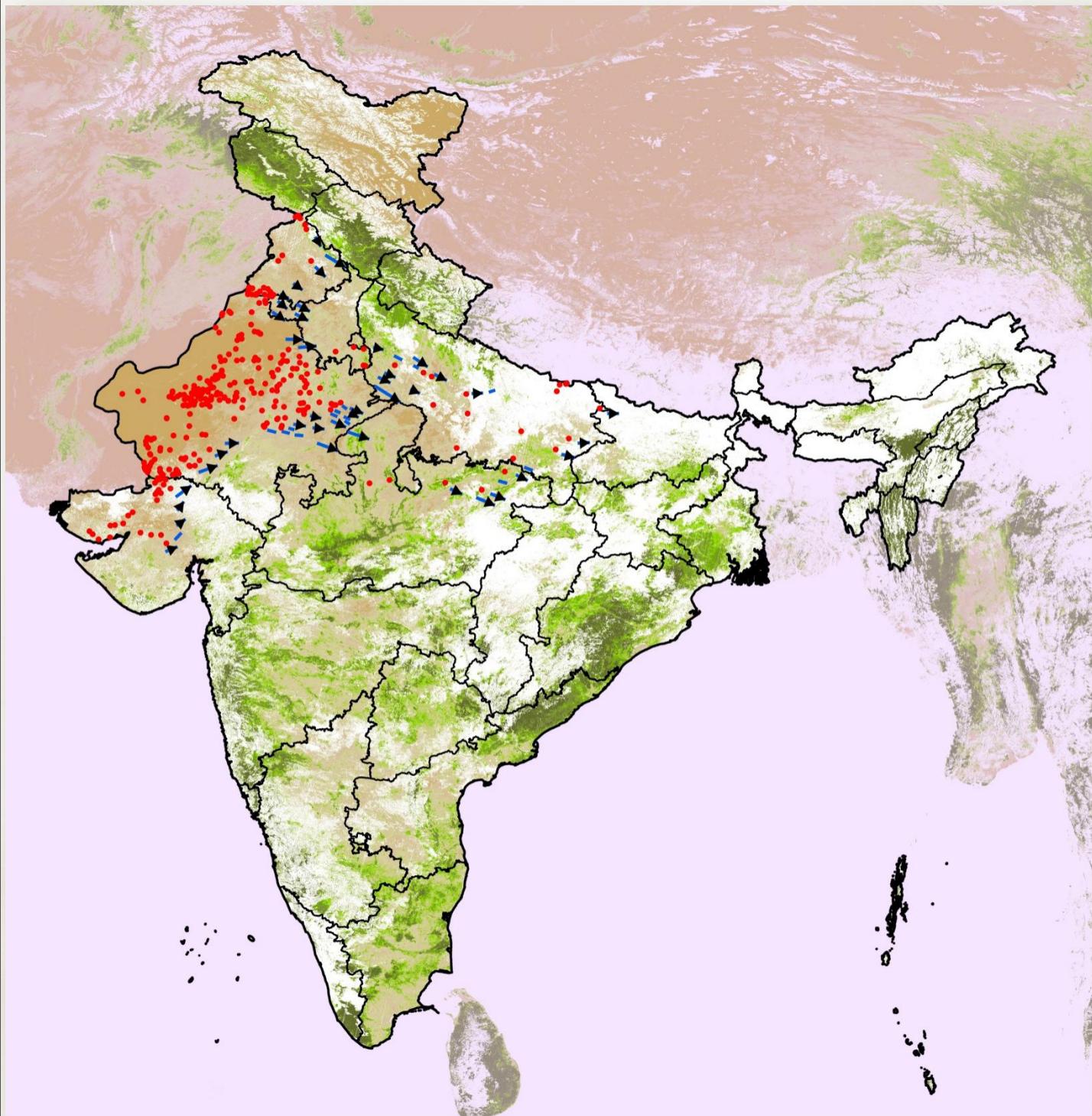
- Clay Skeletal
- Clayey
- Loamy
- Rann Of Kach
- Rock Outcrop
- Sandy
- Water bodies



# Progression of Locust in the Months of April, May and June 2020

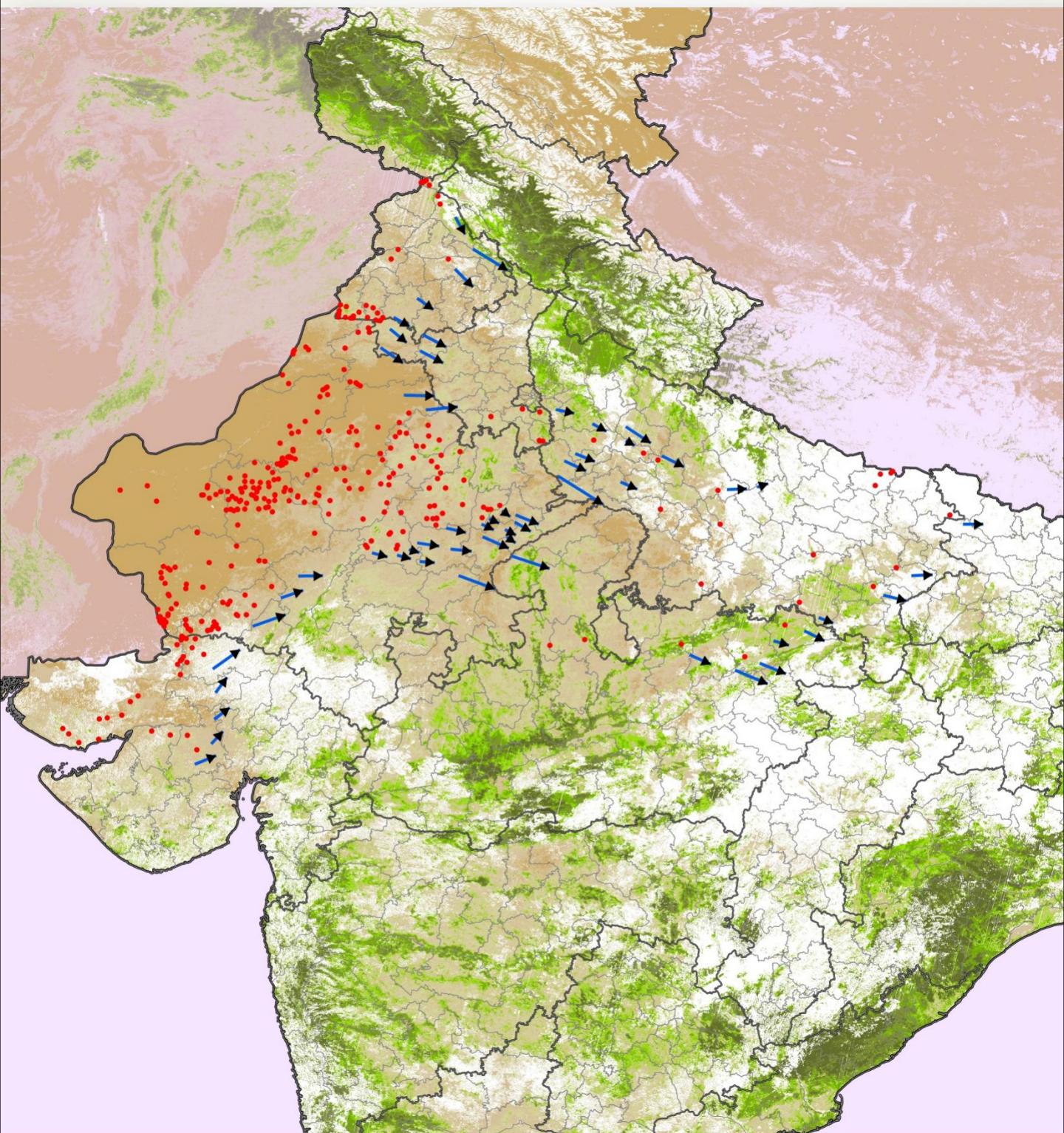


# Probable Direction of Locust Migration Based on Vegetation Status & Wind Direction



3rd July, 2020 onwards

# Probable Direction of Locust Migration Based on Vegetation Status & Wind Direction



27 June, 2020 onwards

# Analysing the Damage Due to Locust Swarms in Gurugram & Surroundings

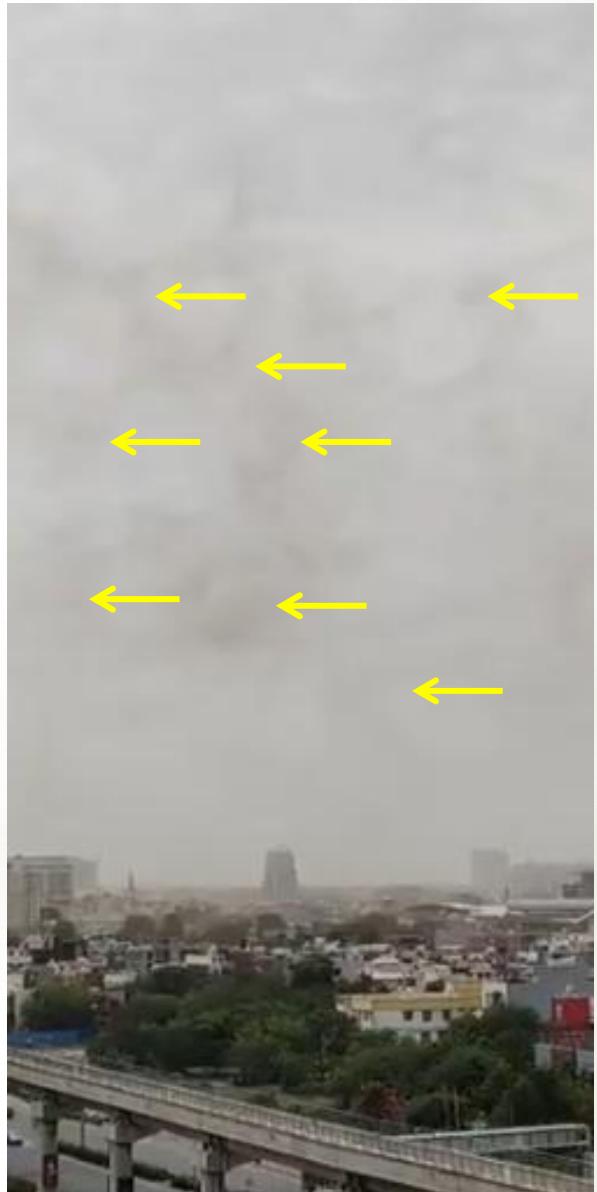
Huge swarms of locust entered Gurugram on 27-06-2020 and 28-06-2020. Several area including plush residential complexes and high-rise buildings witnessed large swarms of locust covering the skies. Later part of the day, the locusts have settled on trees rooftops and plant. Locals in Gurgaon have now resorted to banging utensils, tin, bursting crackers and making loud noises in all possible ways to scare the locust swarms away. The skies over many parts of Gurugram turned dark on Saturday as swarms of locusts descended on the town. The dark cloud of locusts, spread across two kilometres, crossed the suburban city, touched the Delhi-Gurugram border (thehindu, 29-06-2020;ndtv.com, 30-06-2020;IndiaToday: 30-06-2020). Subsequent section shows the damage caused by locust at agriculture areas in the satellite data.



Locusts as seen in Delhi-Gurugram border on 28-06-2020

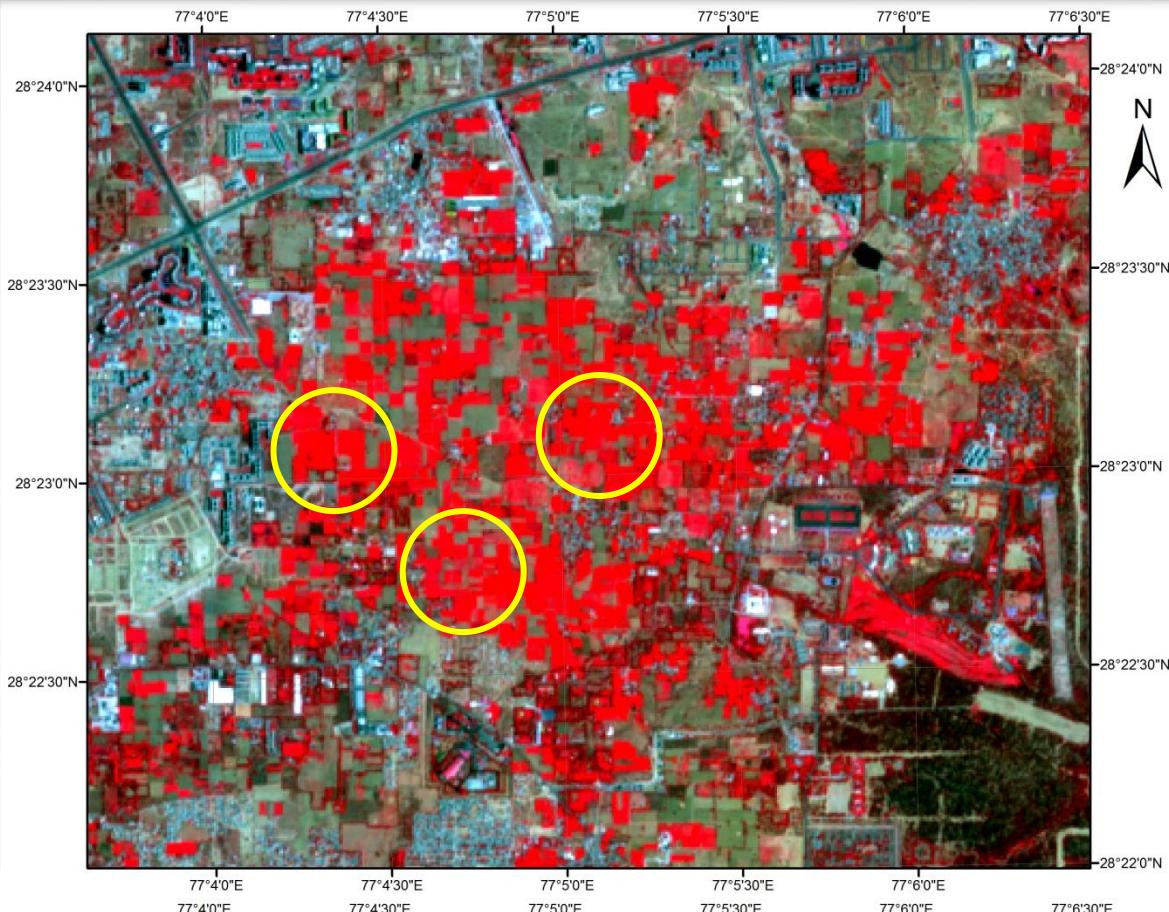


Locusts as seen in agriculture lands in Gurugram on 28-06-2020



Large swarms of locust at 800m to 1200m height from ground as seen in Gurugram on 27-06-2020

# Analysing the Damage Due to Locust Swarms in Gurugram & Surroundings

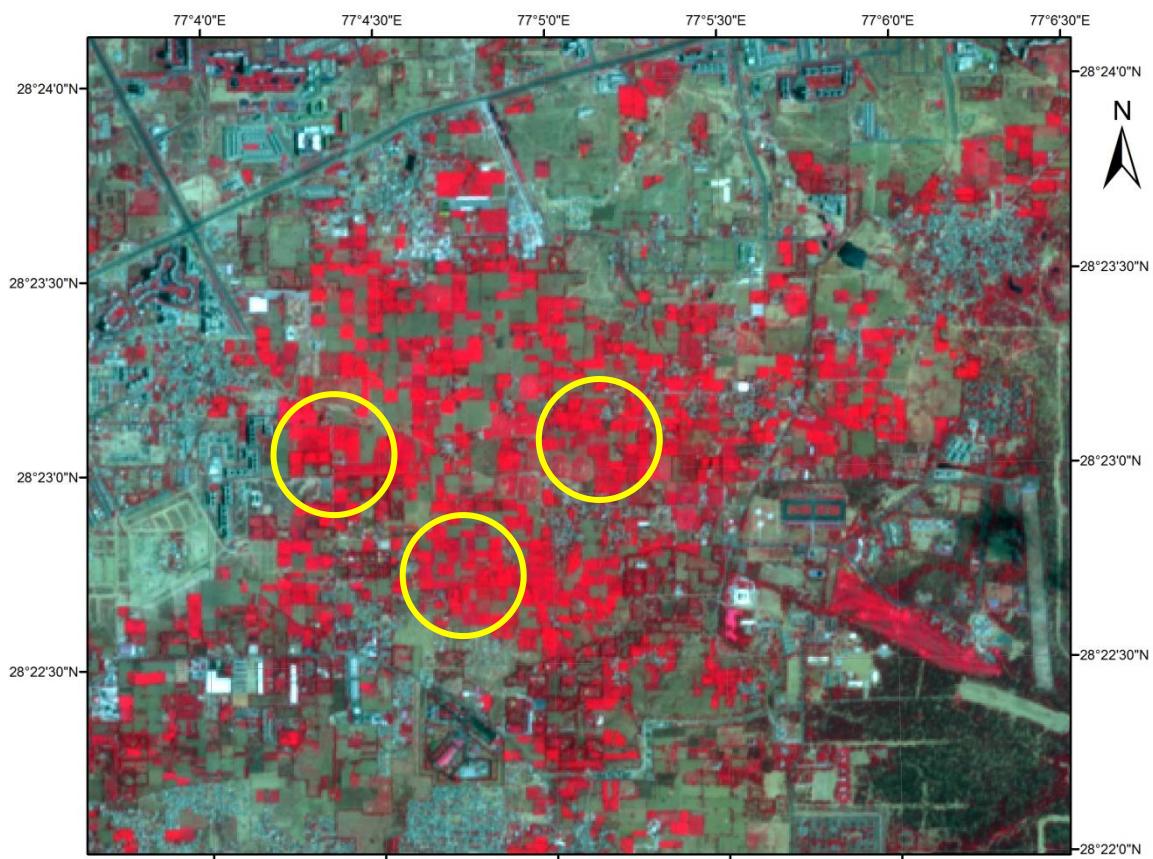


Satellite data dated 18<sup>th</sup> June, 2020

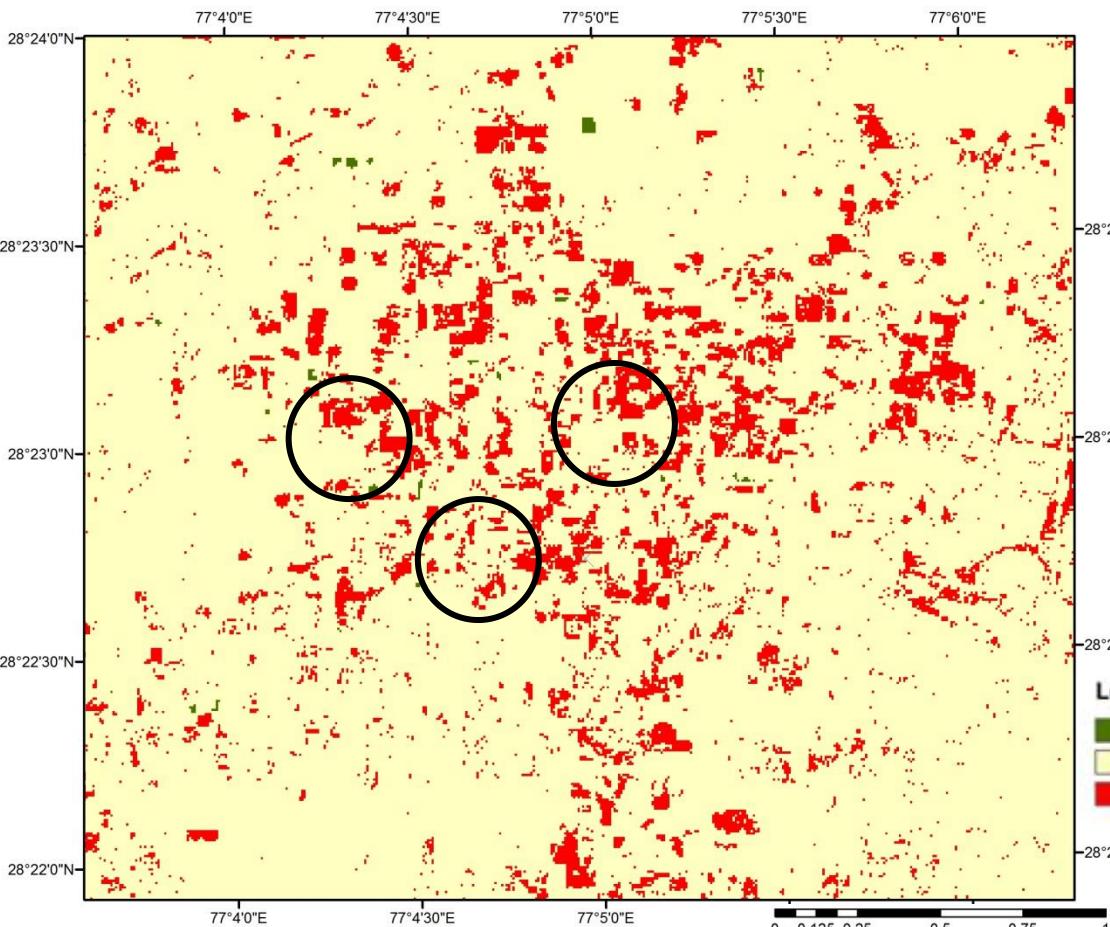


Satellite data dated 28<sup>th</sup> June, 2020

# Analysing the Damage Due to Locust Swarms in Gurugram & Surroundings



Satellite data dated 28<sup>th</sup> June, 2020



The decrease in the vegetation intensity is a function of crop harvesting and locust damage

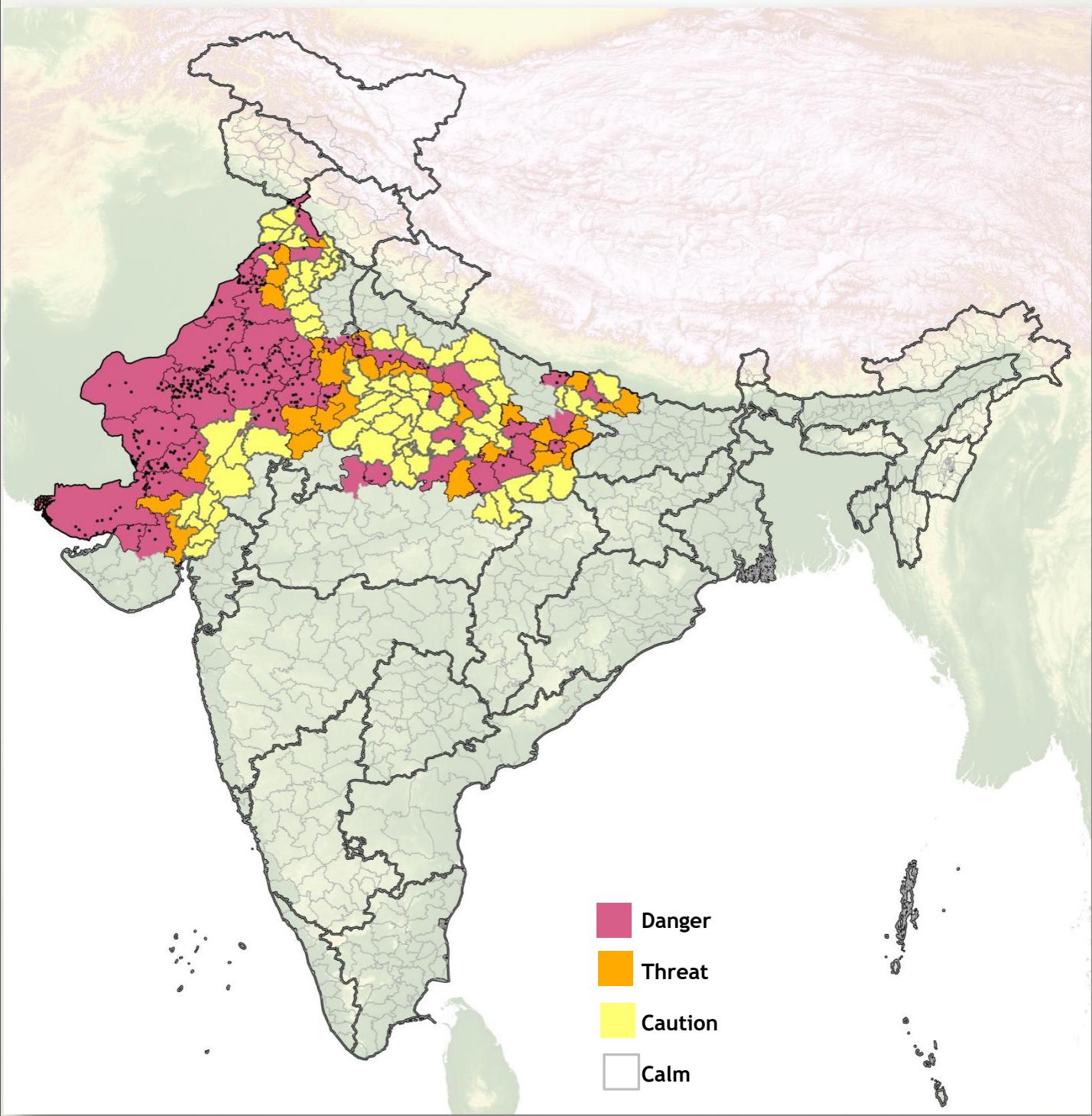
## Legend

Increase in VI
No change in VI
Decrease in VI

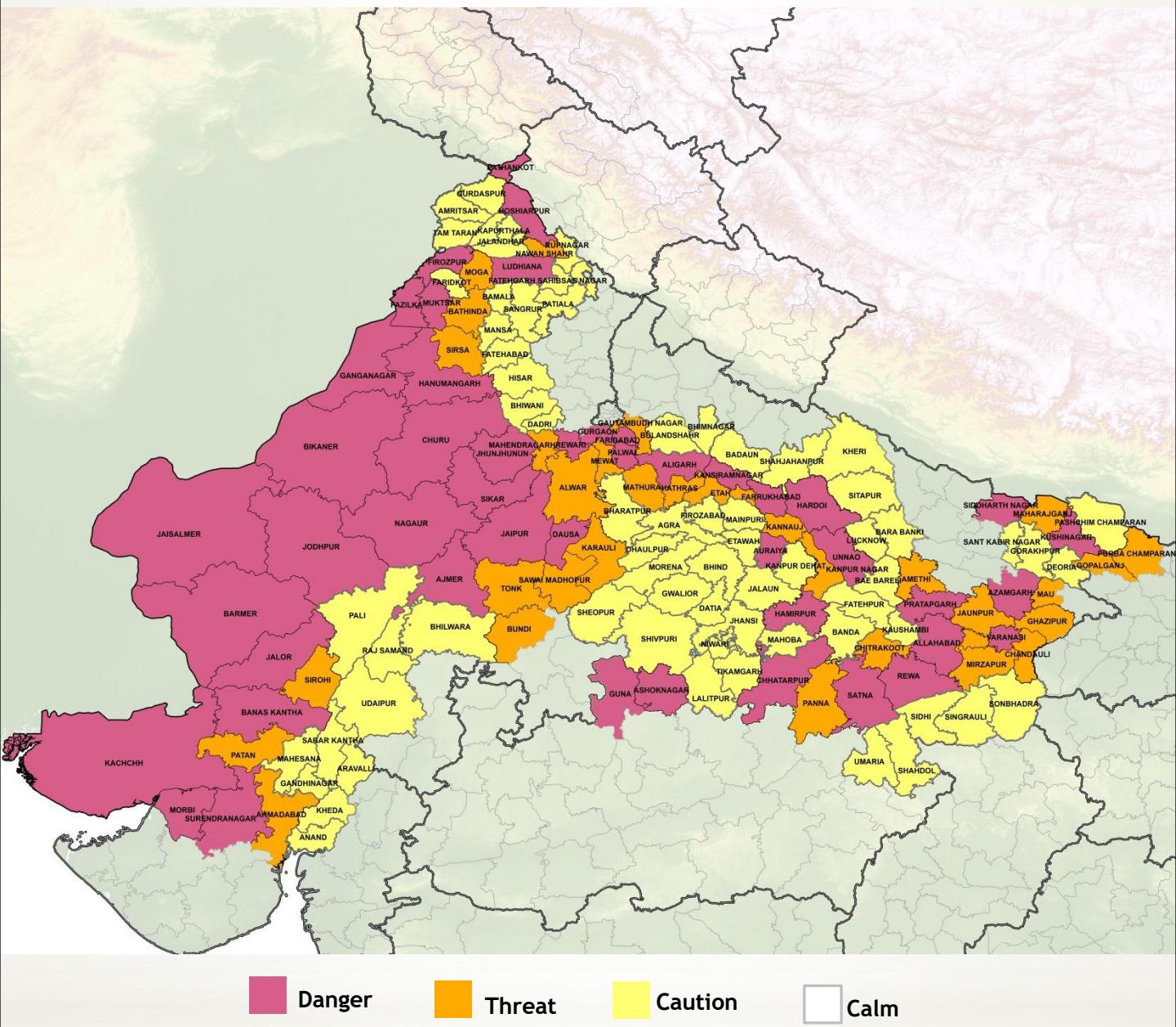
# Locust Swarm Sightings Reported by NEWS Media

Source	Headline	Date	Reported Areas
BBC News	India locusts: Swarm sweeps into Delhi suburb Gurgaon	27 June 2020	Gurgaon
Times of India	Swarms of locust cloud over Gurugram; parts of Delhi on high alert.	27 June 2020	Gurgaon
The Hindu	Locusts enter few border areas of Delhi, leave towards Haryana	27 June 2020	Gurgaon, Delhi
The Hindu	Swarms of locusts reach Gurugram.	27 June 2020	Gurgaon
Navbharat Times	यूपी के 10 जिलों में टिड्डियों का आतंक, 16 जिलों में अलर्ट	27 June 2020	Jhansi, Chitrakoot, Prayagraj, Pratapgarh, Bhadohi, Jaunpur, Azamgarh, Ambedkar nagar, Sultanpur and Gaurakhpur.
Times of India	'Swarmageddon' looks like this: Locusts fly into NCR	28 June 2020	Gurgaon
The Indian Express	Rainfall, humidity in North India provide fertile ground for locust swarms	28 June 2020	Rajasthan, Haryana, Uttar Pradesh
The Indian Express	Locusts keep Delhi, Gurgaon officials on their toes	28 June 2020	Gurgaon, Faridabad, and Jhajjar
Times of India	Locust Attack: Several Districts in Uttar Pradesh Put on Alert; Drones to Help Control Swarms	29 June 2020	Jhansi, Chitrakoot, Prayagraj, Pratapgarh, Bhadohi, Azamgarh and Ambedkar Nagar of Uttar Pradesh
Amar Ujala	پاکیستانی تیڈیوں سے پرےشان ہوئے کیسان، تاسوریوں میں دेखنے اس جुگاڈ سے بچا رہے ہیں اپنی فसال	29 June 2020	Mahranganj, Kushinagar, Devriya, Sant Kabir Nagar (Uttar Pradesh)
India Today	Locust swarm reaches Agra, attacks 35 villages in district	30 June 2020	Bah and Pinahat tehsils of Agra , Firozabad, Mathura.
Livemint	Locust attacks pose a threat to kharif crops	01 July 2020	Jaipur, Bhopal
Amar Ujala	दमकोरा के باڈ لालावास में दिखाई दिया टिड्डियों का झूँड	02 July 2020	Loharu, Lalawas (Haryana)
The Indian Express	Panchkula gears up for locust attacks, but authorities say desert thriving pest not likely to migrate to district	02 July 2020	Panchkula, Haryana
Dainik Jagran	Tiddi Dal Attack in Agra: फिर मंडराने लगी आफत, टिड्डी दल कभी भी कर सकता है जिले में प्रवेश	03 July 2020	Agra, kheragarh (Uttar Pradesh)
Dainik Jagran	उत्तरी भारत में टिड्डियों के घूम रहे हैं 58 दल	03 July 2020	Rajasthan, Punjab, Gujarat, Haryana

# Threat Map of Locust Based on the Heuristic Prediction Model



# Threat Map of Locust Based on the Heuristic Prediction Model



## Space Based Inputs and Field Data of Locust Control Survey

- Vegetation status maps (Proba –V Vegetation product, 300 m spatial resolution)
- Soil moisture (Surface and root zone) - SMAP; 9 km spatial resolution
- Wind direction (MOSDAC; Experimental 24 hour, 48 hour and 72 hour forecast for India WRF model; measured at 1.46 km/850hPa, 5 km X 5 km grid)
- Land Surface Temperature (LST) - SMAP Enhanced L3 Radiometer Global Daily 9 km product
- Locust incidences location in the field (LWO, Jodhpur)
- 3 Hours accumulated rainfall product – MOSDAC

## Heuristics Prediction of locust Migration

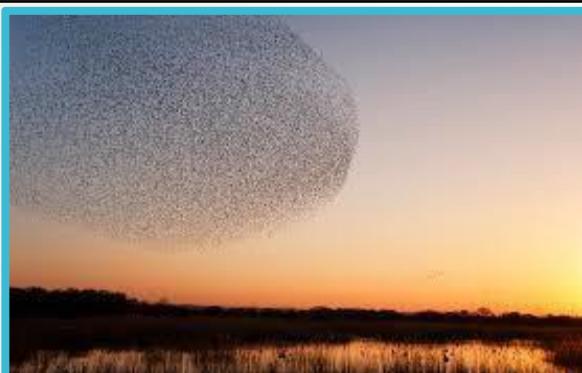
- Vegetation cover status in terms of Normalized Difference Vegetation Index (NDVI) provides valuable information which could be the potential habitat of locust.
- Wind directions show direct linkage to possible locust movement paths.
- Heuristic prediction has been done by considering all the key input factors

## FAO Update: 27<sup>th</sup> June, 2020

- Swarms and adults groups are mainly present in Rajasthan west of Jaipur but some infestations continue to be reported in parts of Madhya Pradesh & Uttar Pradesh
- Forecast for India: Spring breeding as nearly ended in Iran and Pakistan, some adult groups/swarms are expected to arrive along the Indo-Pak border. Ecological conditions may become favourable for Locust breeding in next fortnight with the onset of monsoon

## Bulletin Updates

- Locust bulletin is shared with the stake holders consisting Locust Warning Organisation, state remote sensing centres of Rajasthan, Haryana, Punjab and Gujarat; Central Arid Zone Research Institute, Arid Forest Research Institute, DRDO – Gwalior,
- NEW: From this edition of the bulletin, threat maps depicting districts with classes ‘Danger’, ‘Threat’, ‘Caution’ and ‘Calm’ have been incorporated



### Contact

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E-mail: ssrao@nrsc.gov.in