Locust Surveillance using Geospatial Technology

No. : 4 / 2020

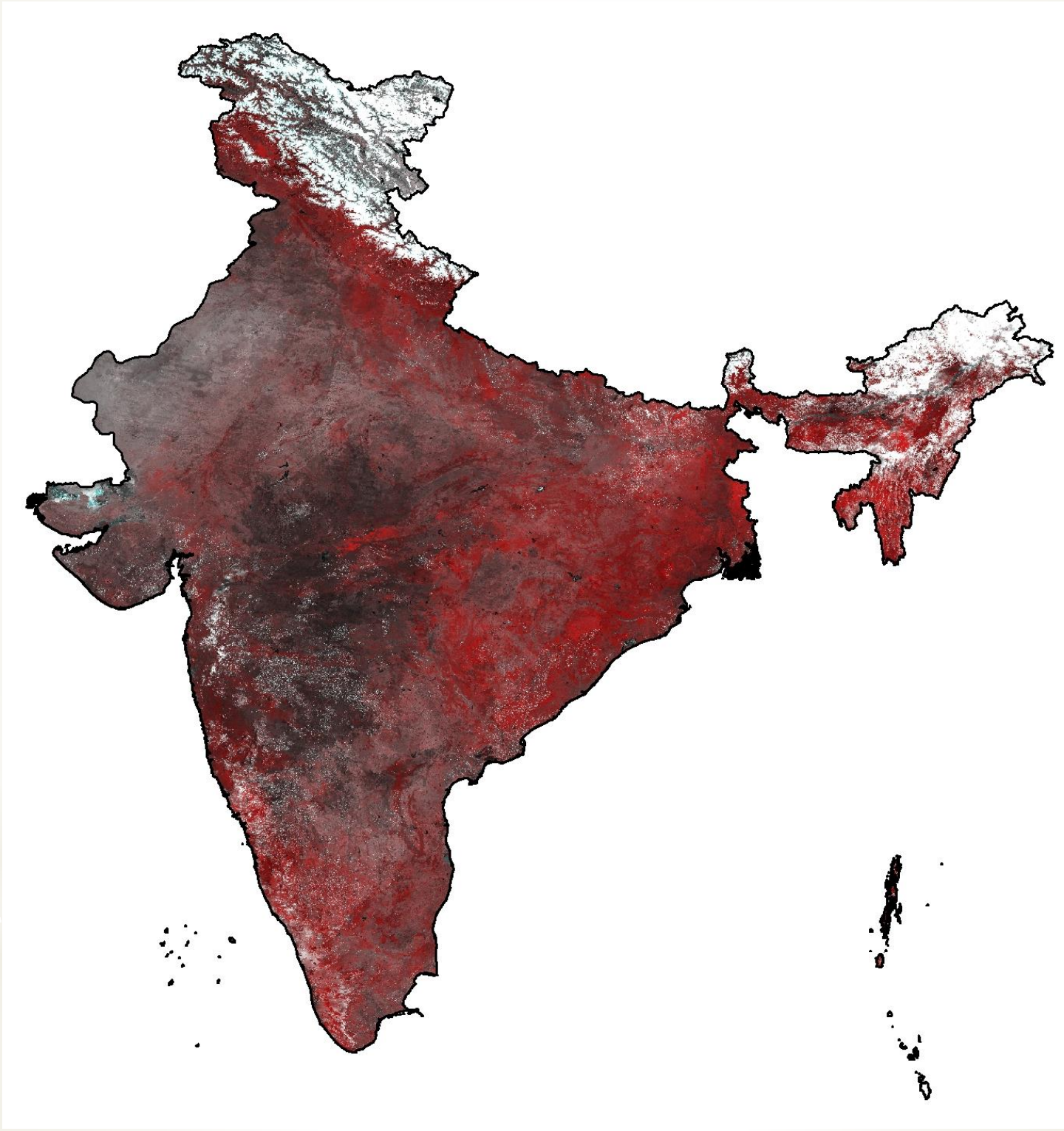
Date : 19 June 2020

Gregarious Male Desert Locust

Solitary Male Desert Locust

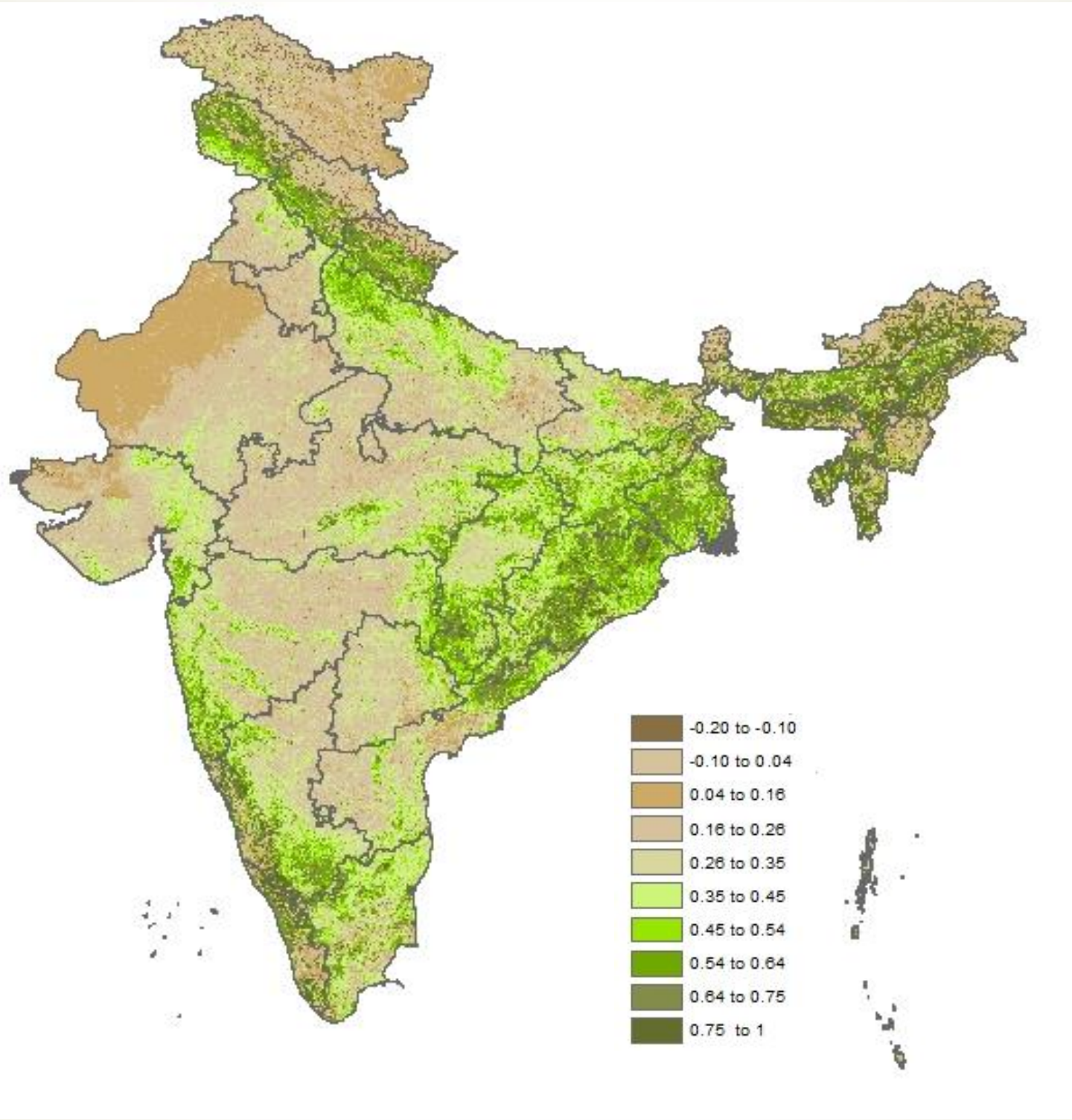
Regional Remote Sensing Centre - West
NRSC/ISRO - Jodhpur

False Colour Composite



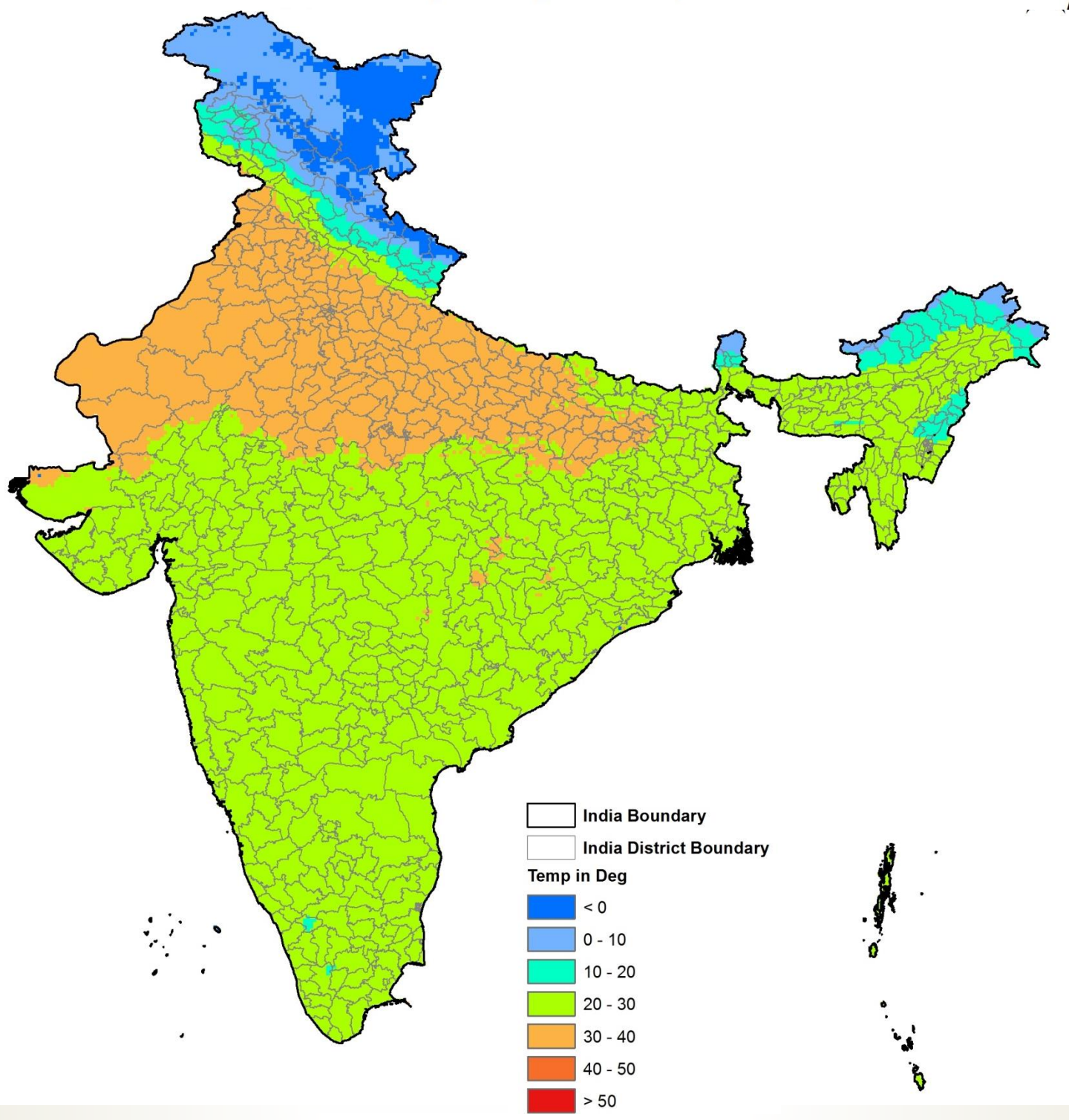
Source: MODIS 8day Composite
11 June -18 June, 2020

Normalized Difference Vegetation Index Map

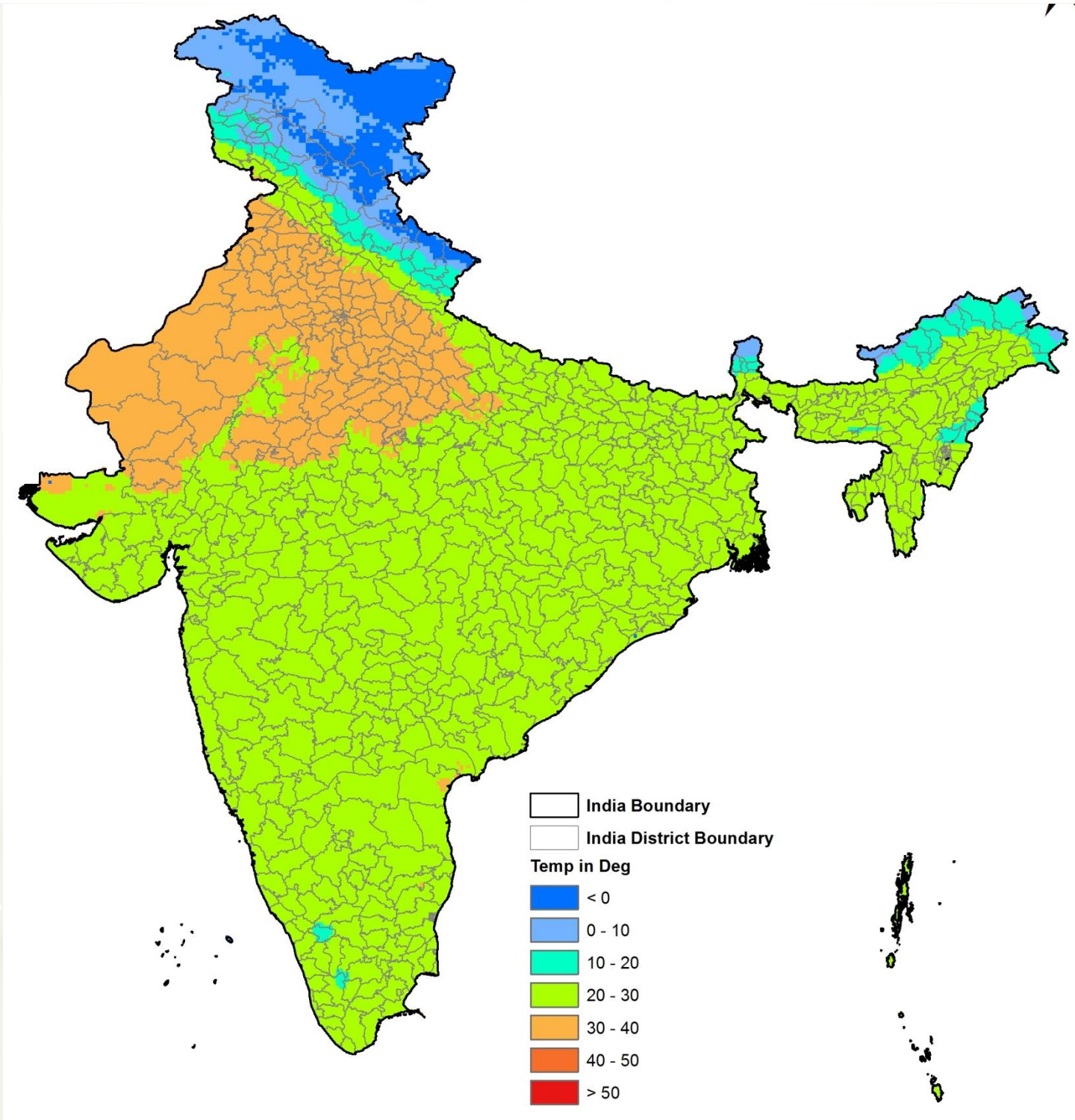


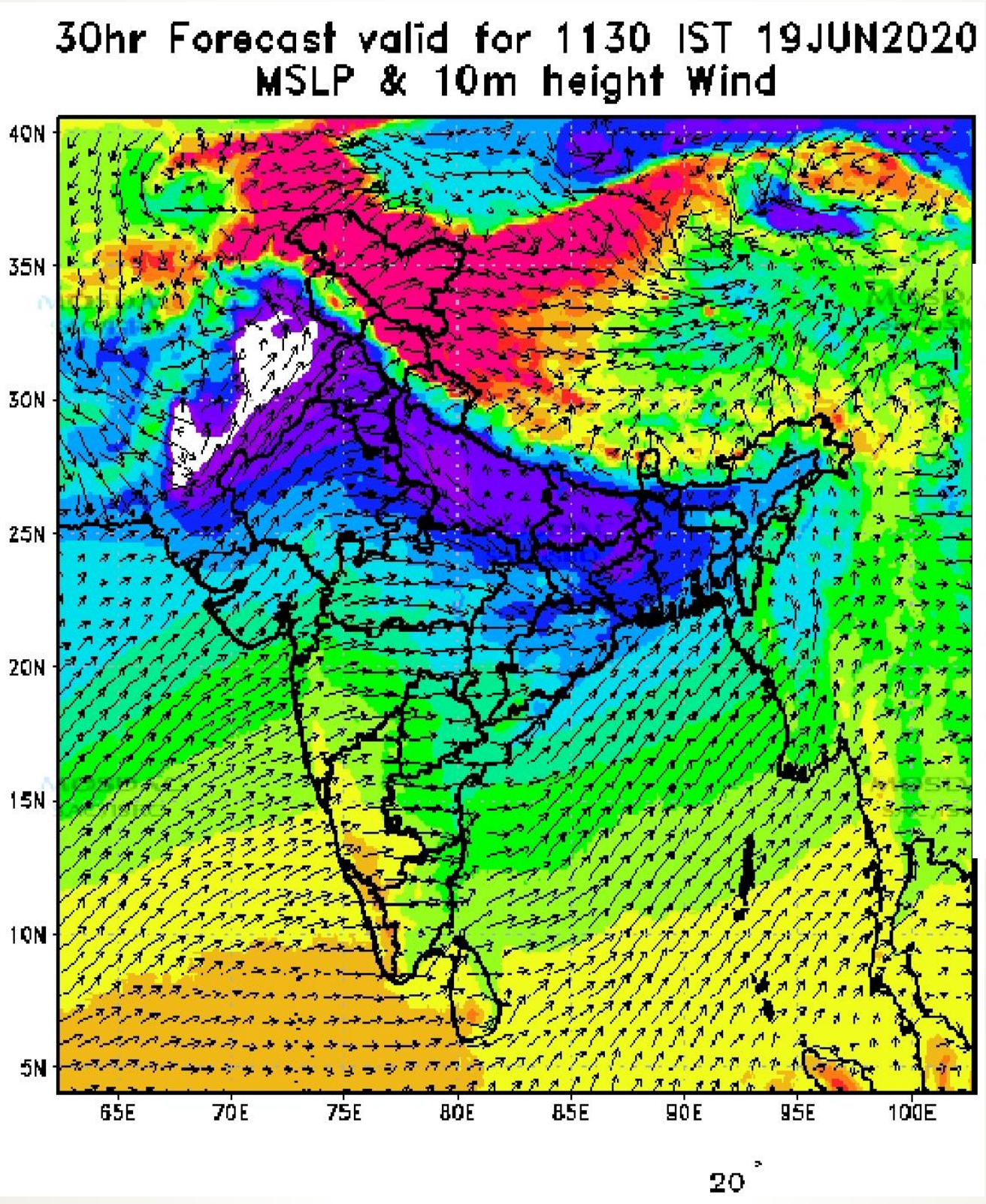
Source: MODIS 8day NDVI binned product
11 June: 18 June, 2020

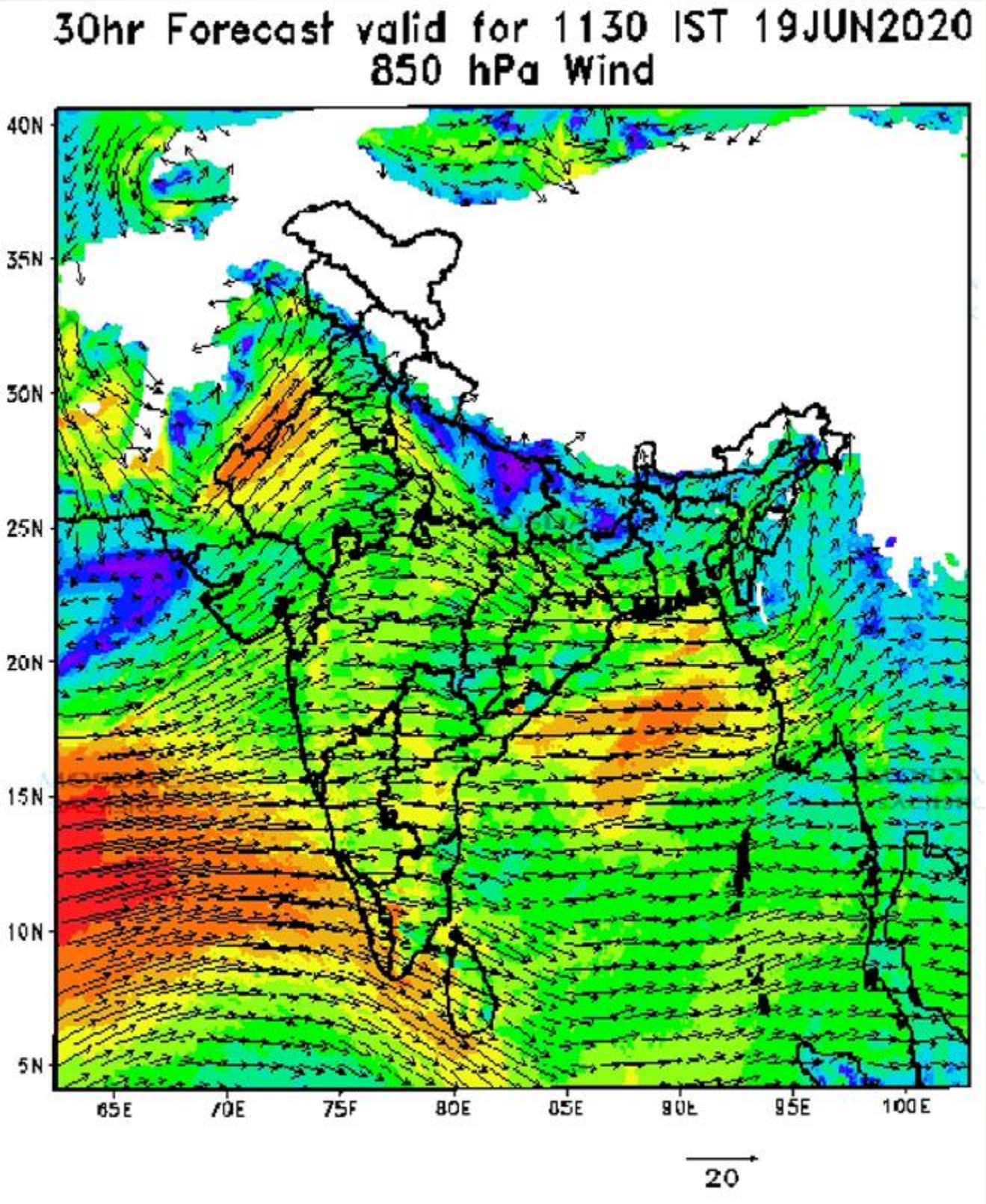
Land Surface Temperature at 19:30 Hrs of 10 June 2020 generated from SMAP Enhanced L4 Global 3-hourly Daily 9 Km product



Land Surface Temperature at 19:30 Hrs of 15 June 2020 generated from SMAP Enhanced L4 Global 3-hourly Daily 9 Km product

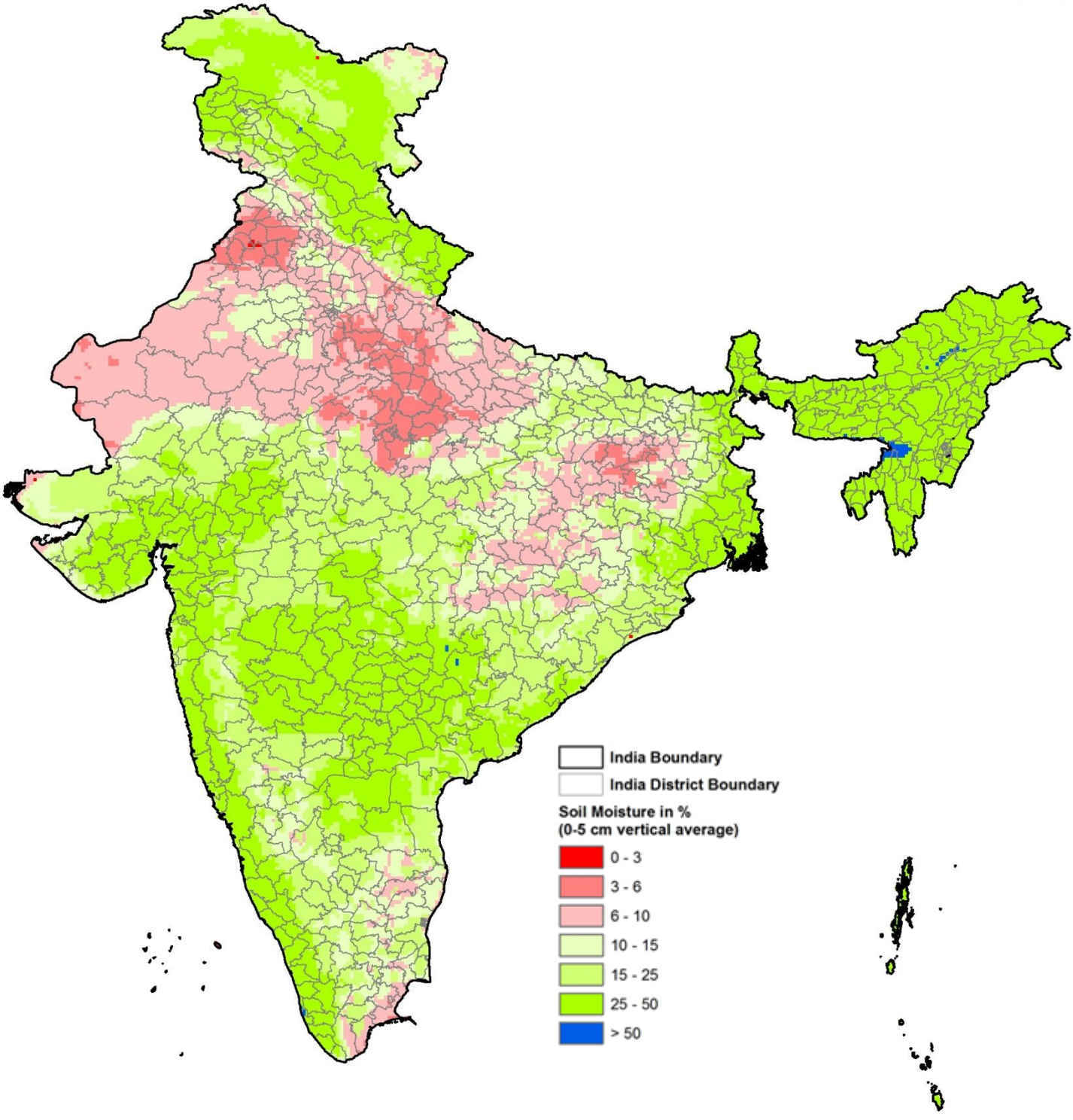



30hr Forecast valid for 1130 IST 19JUN2020
MSLP & 10m height Wind
40N
35N
30N
25N
20N
15N
10N
5N
65E
70E
75E
80E
85E
90E
95E
100E
1016
1014
1012
1010
1008
1006
1004
1002
1000
998
996
994
992
20

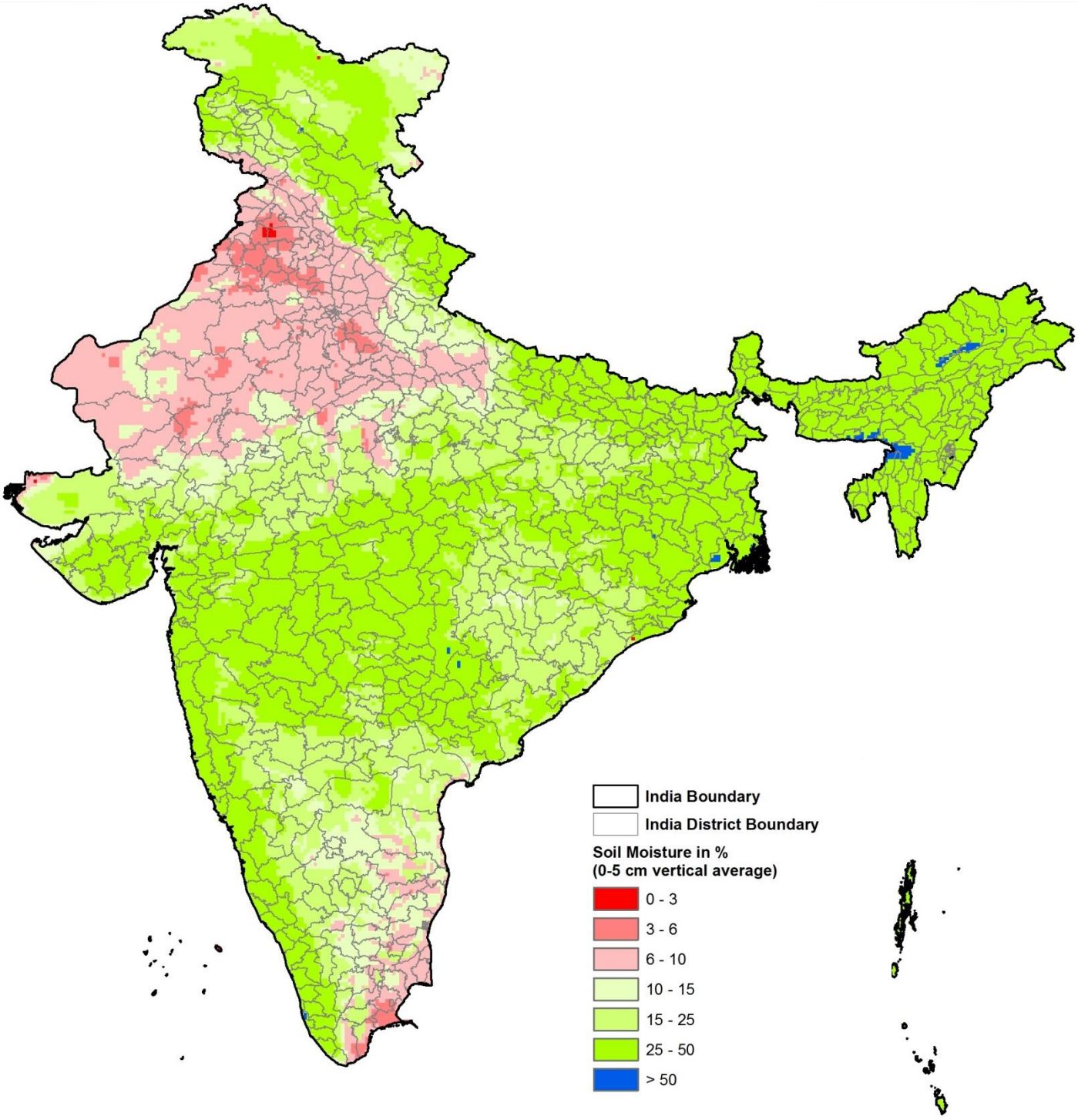


Wind speed @ 1.46 km from msl.

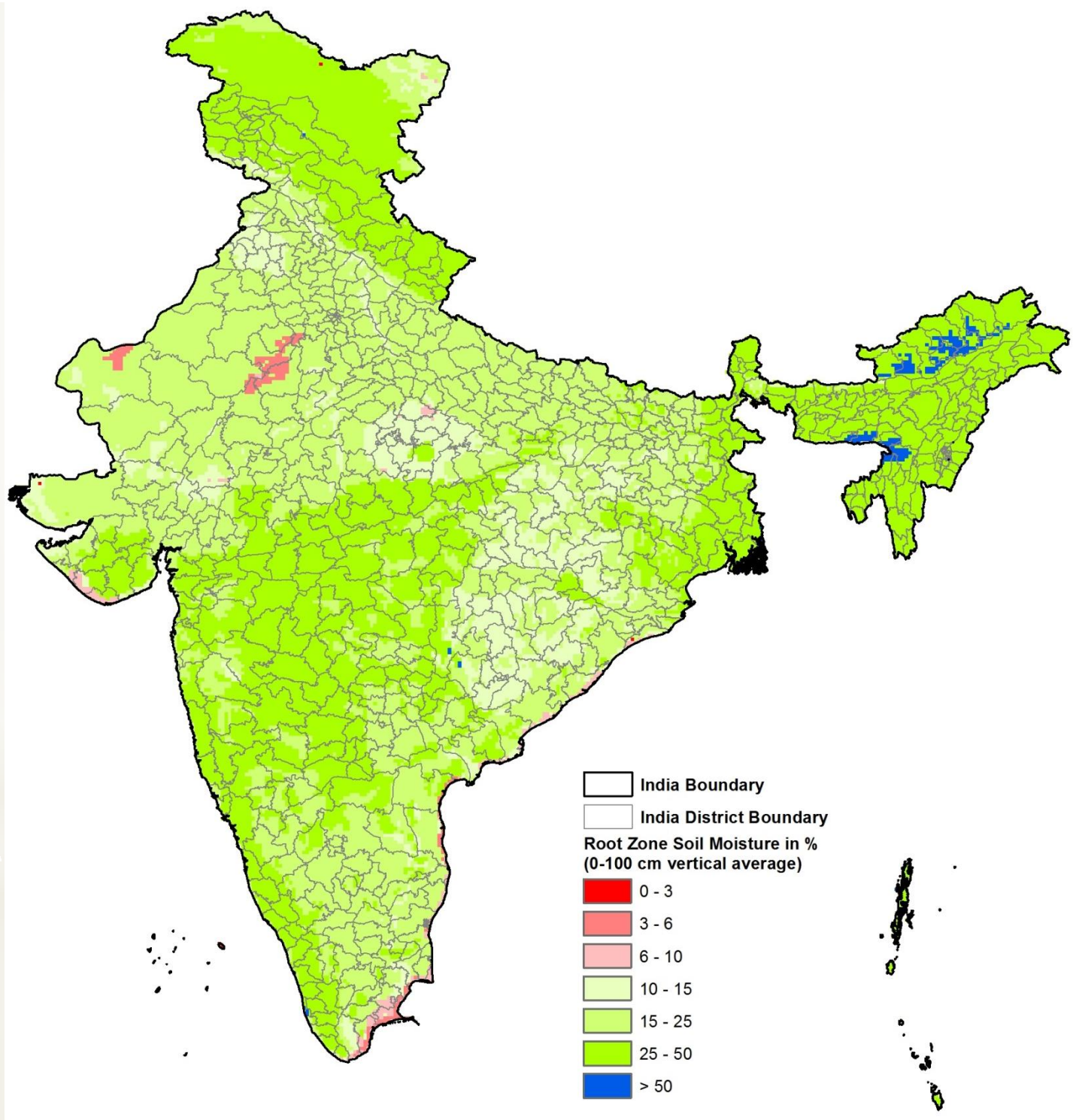
Soil Moisture at 19:30 Hrs of 10 June 2020 generated from SMAP Enhanced L4 Global 3-hourly Daily 9 Km product



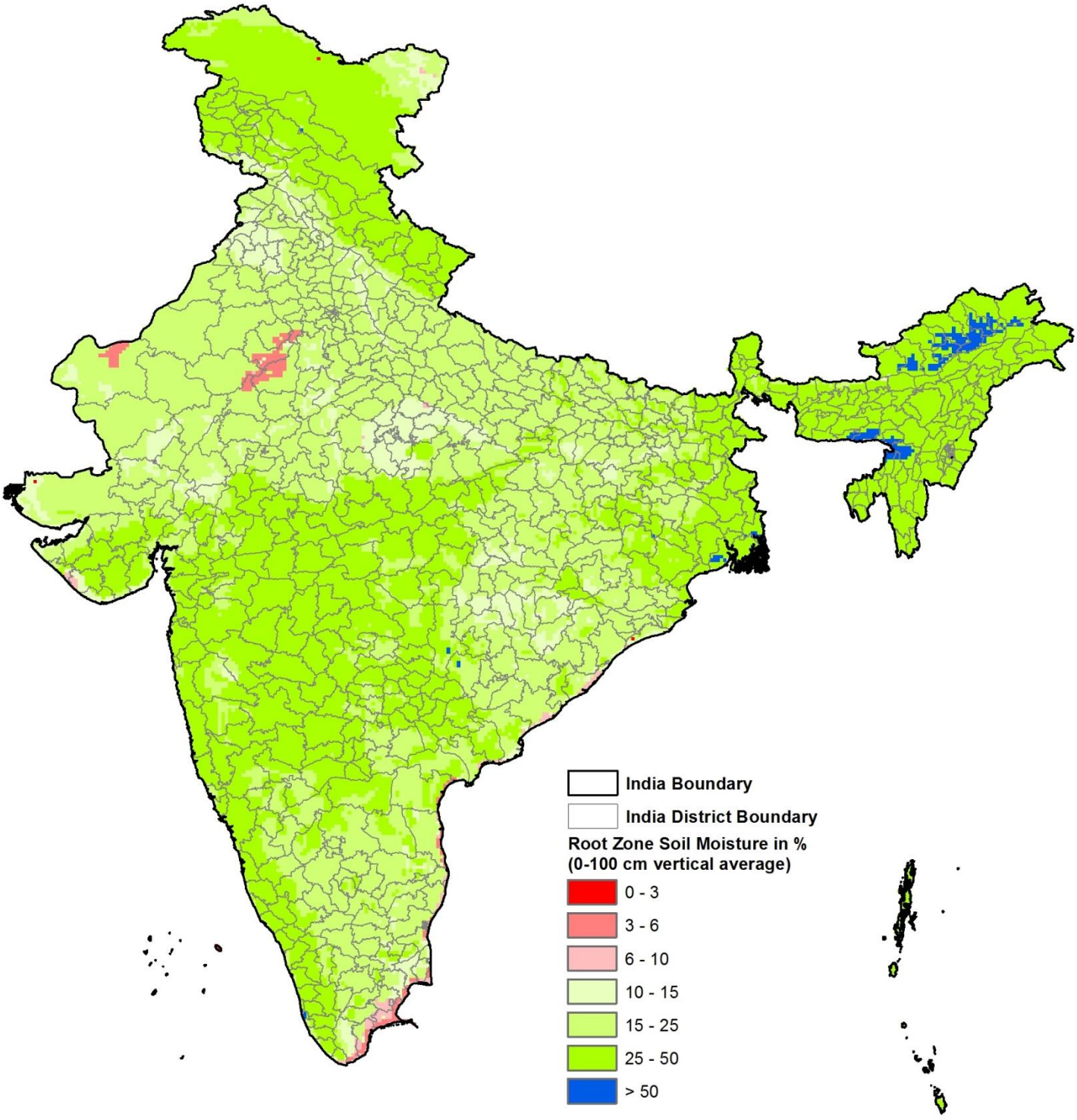
Soil Moisture at 19:30 Hrs of 15 June 2020 generated from SMAP Enhanced L4 Global 3-hourly Daily 9 Km product

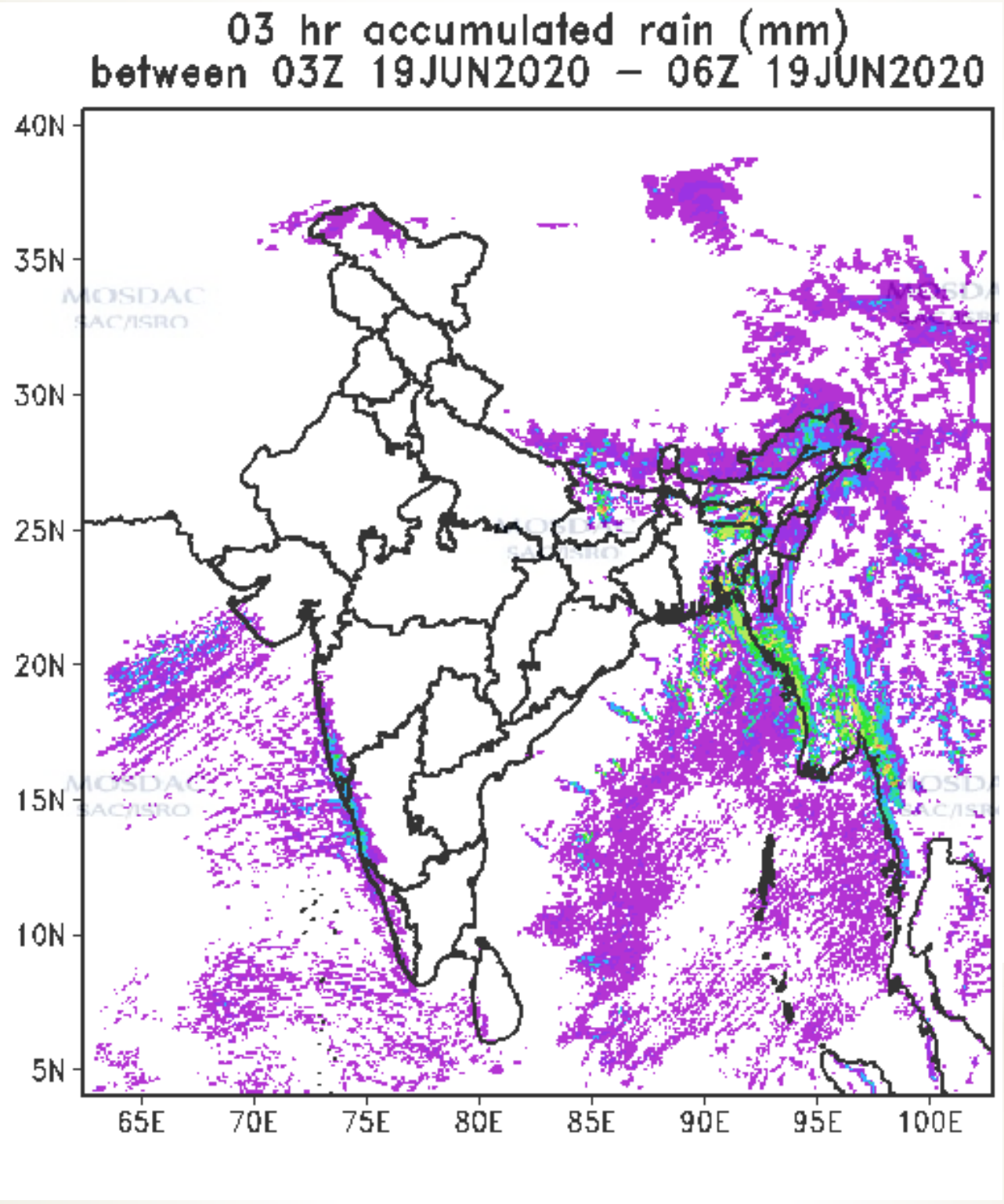


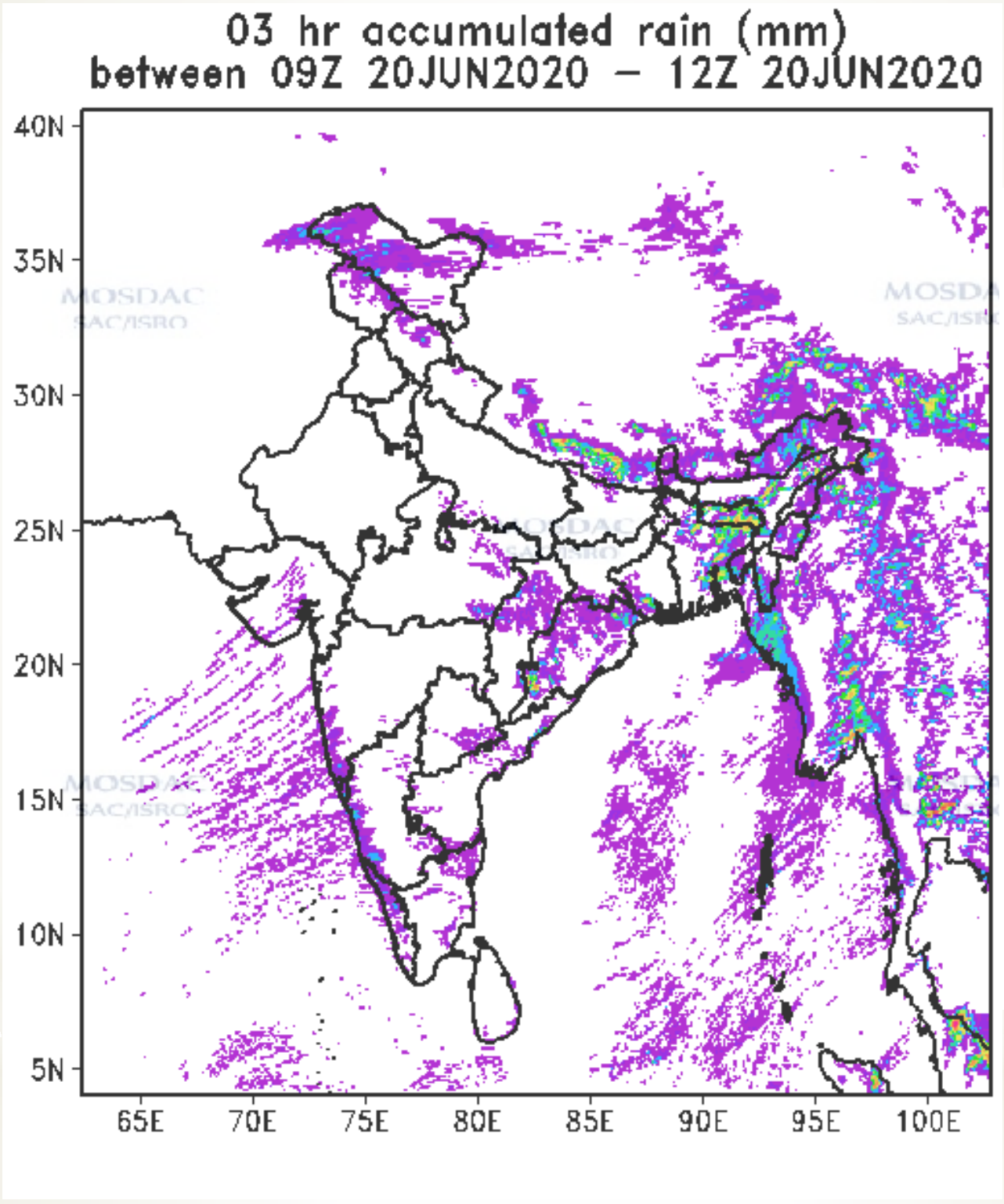
Root Zone Soil Moisture at 19:30 Hrs of 10 June 2020 generated from SMAP Enhanced L4 Global 3-hourly Daily 9 Km product



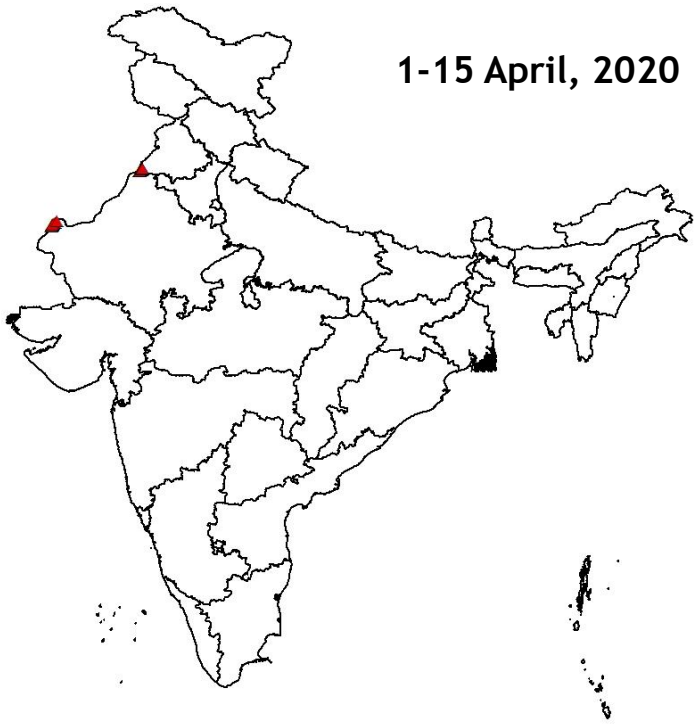
Root Zone Soil Moisture at 19:30 Hrs of 15 June 2020 generated from SMAP Enhanced L4 Global 3-hourly Daily 9 Km product




03 hr accumulated rain (mm)
between 03Z 19JUN2020 – 06Z 19JUN2020
40N
35N
30N
25N
20N
15N
10N
5N
65E
70E
75E
80E
85E
90E
95E
100E
150
100
75
50
40
30
25
20
15
10
5
1

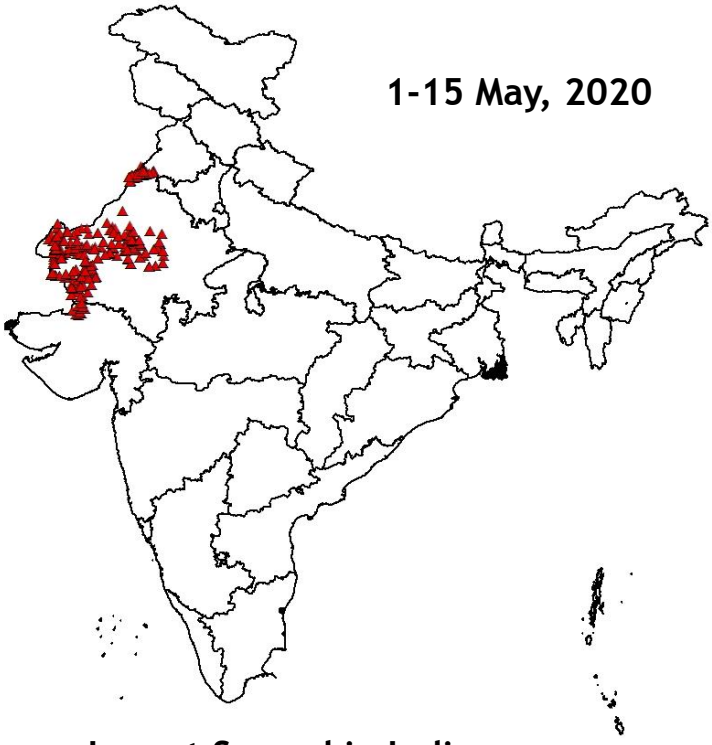

03 hr accumulated rain (mm)
between 09Z 20JUN2020 – 12Z 20JUN2020
40N
35N
30N
25N
20N
15N
10N
5N
65E
70E
75E
80E
85E
90E
95E
100E
150
100
75
50
40
30
25
20
15
10
5
1

Fortnightly Progression of Locust in Rajasthan and adjoining States

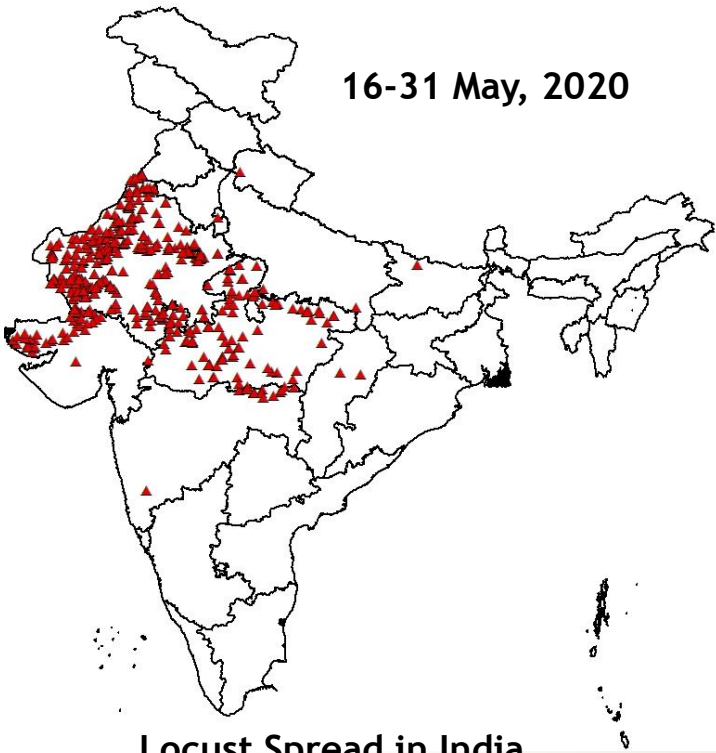


Locust Spread in India
74 sq.km.

Locust Spread in India
13604 sq.km.

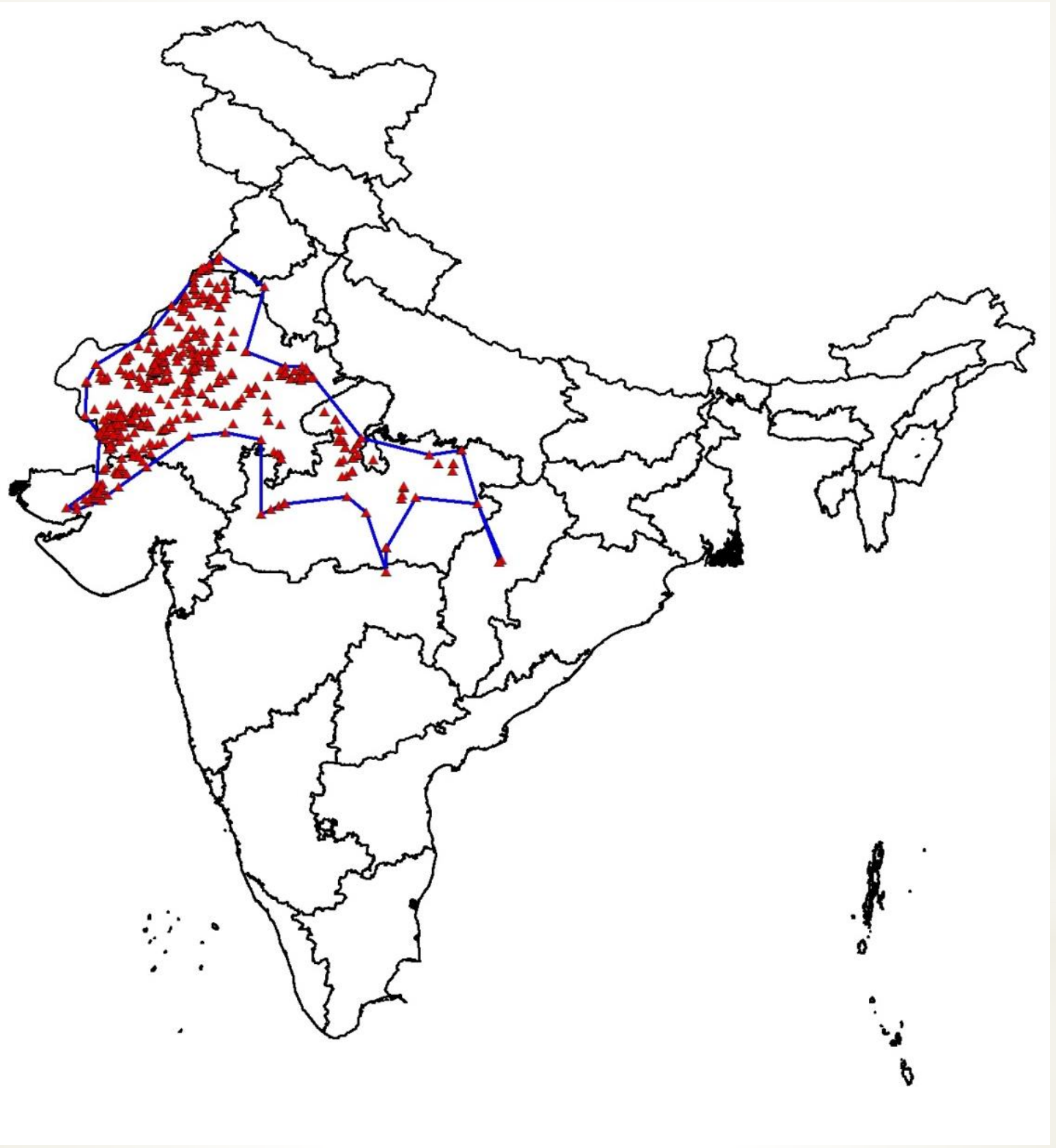


Locust Spread in India
1,32,315 sq.km.



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

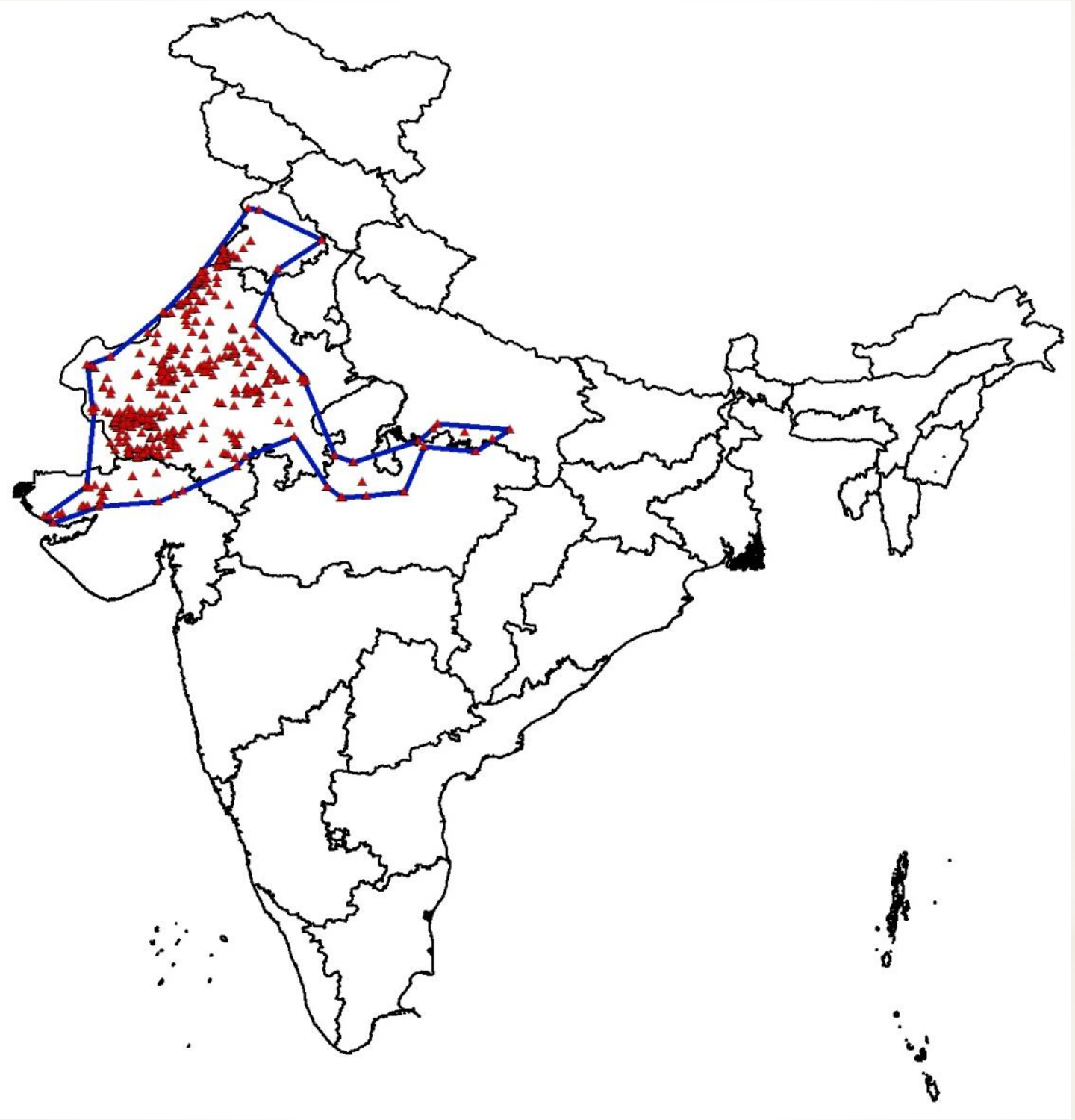
Progression of Locust in Rajasthan and adjoining States



1-10 June, 2020

Spread Area: 442800 sqkm

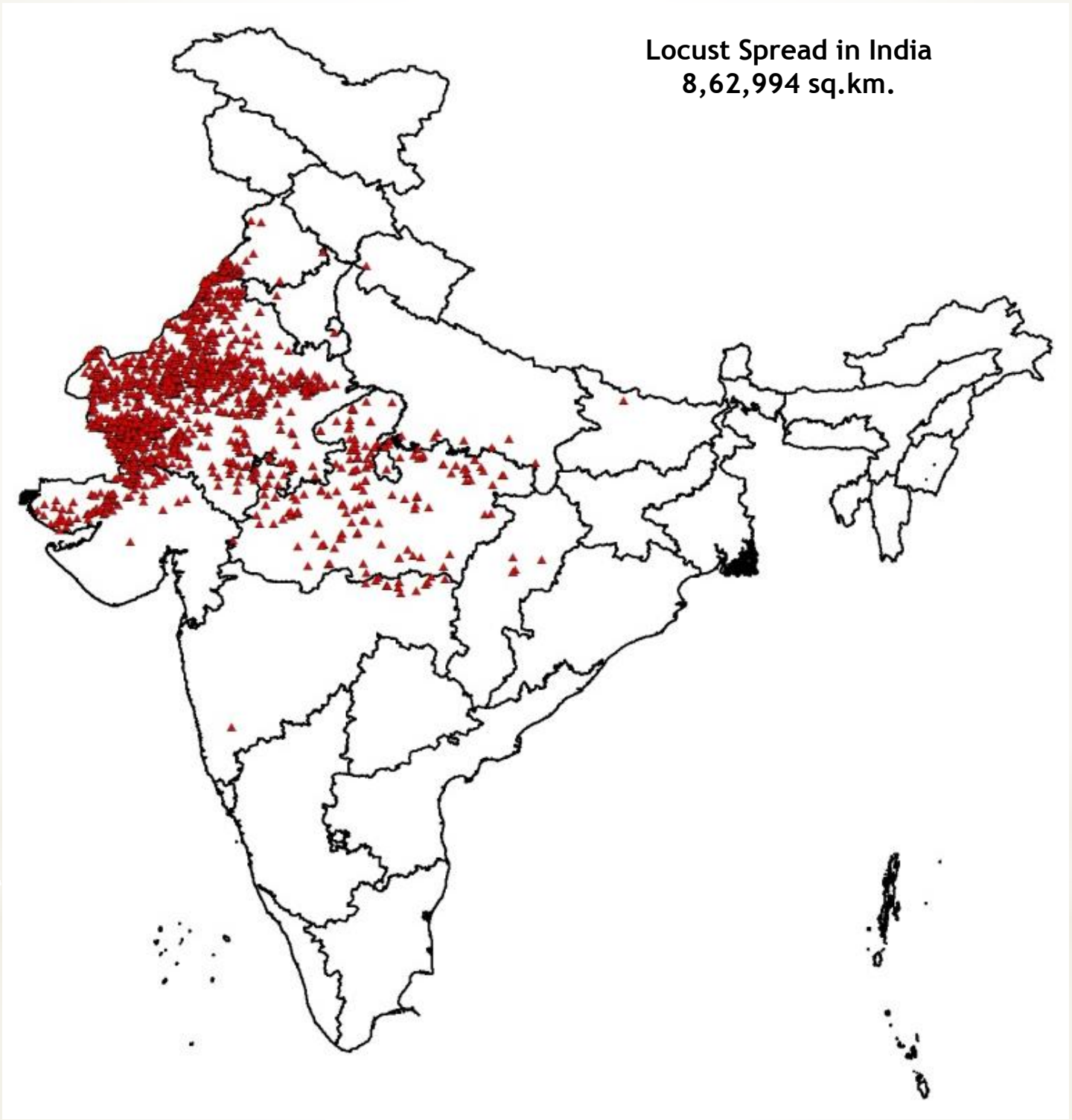
Progression of Locust in Rajasthan and adjoining States



11-17 June, 2020

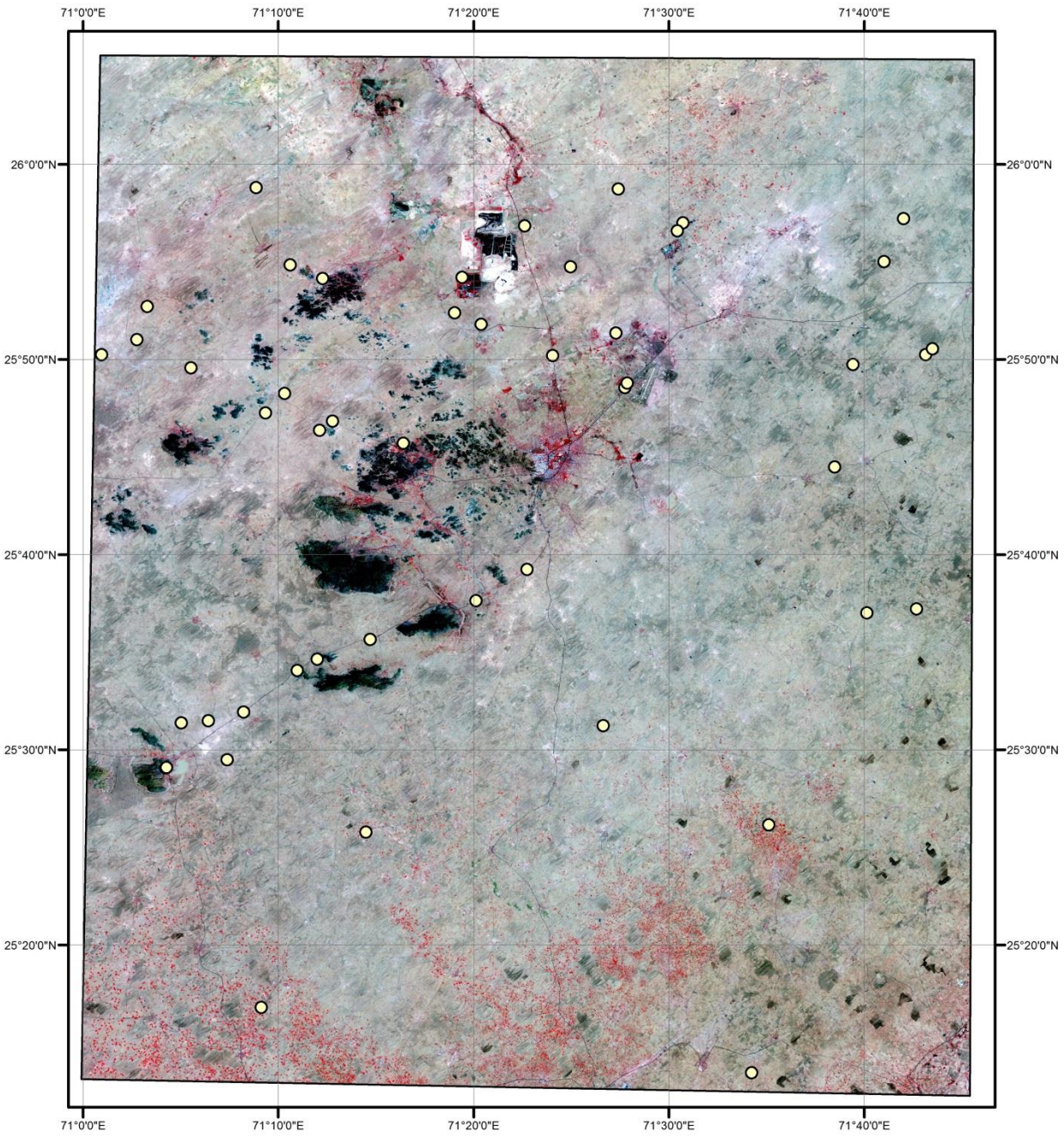
Spread Area: 420311 sqkm

Cumulative Progression of Locust in Rajasthan and adjoining States



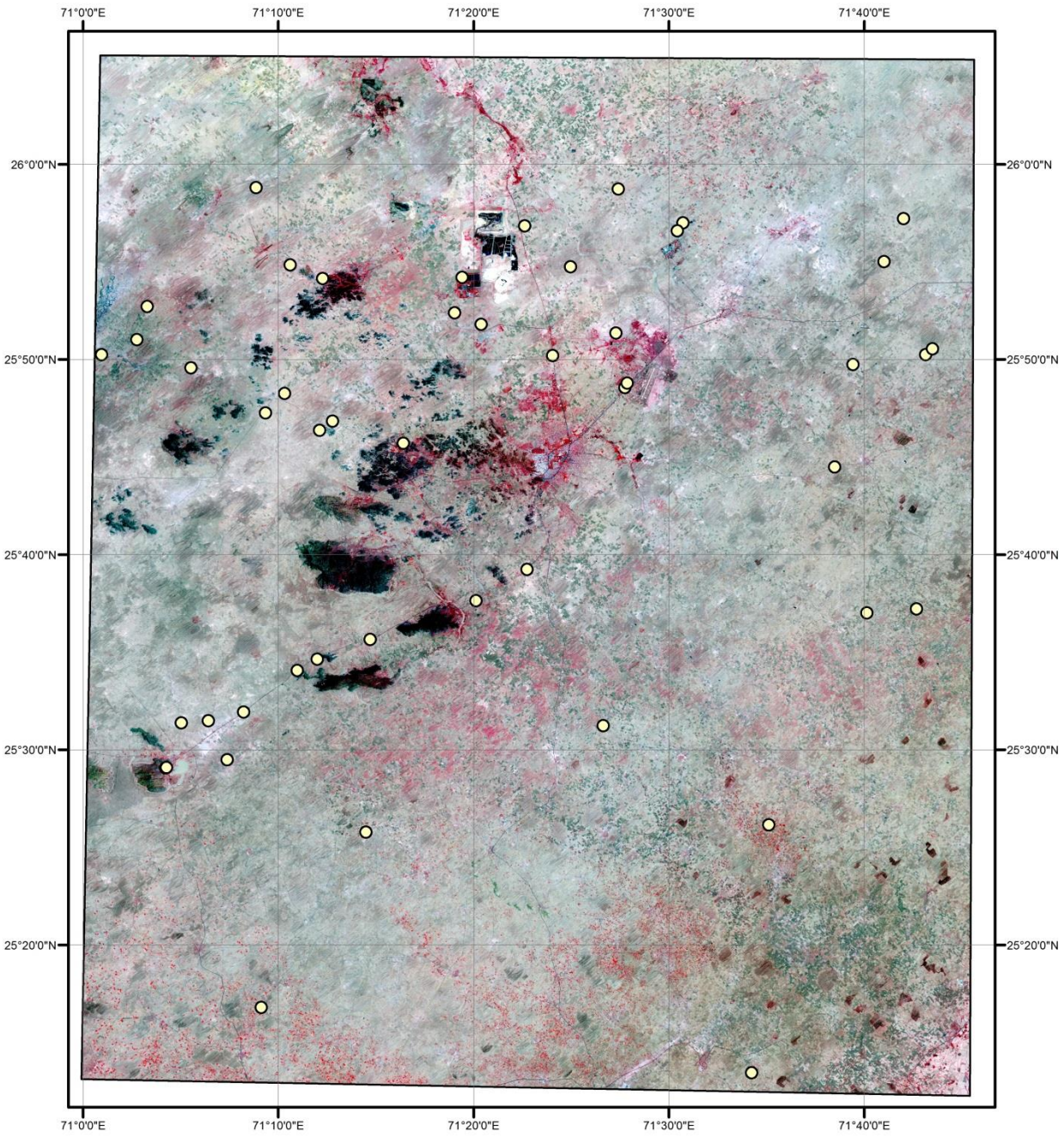
1 April -17 June, 2020

Locust Impact Assessment by showing FCC of 25 May 2020 in parts of Barmer District of Rajasthan



Source: Sentinel 2

Locust Impact Assessment by showing FCC of 09 June 2020 in parts of Barmer District of Rajasthan



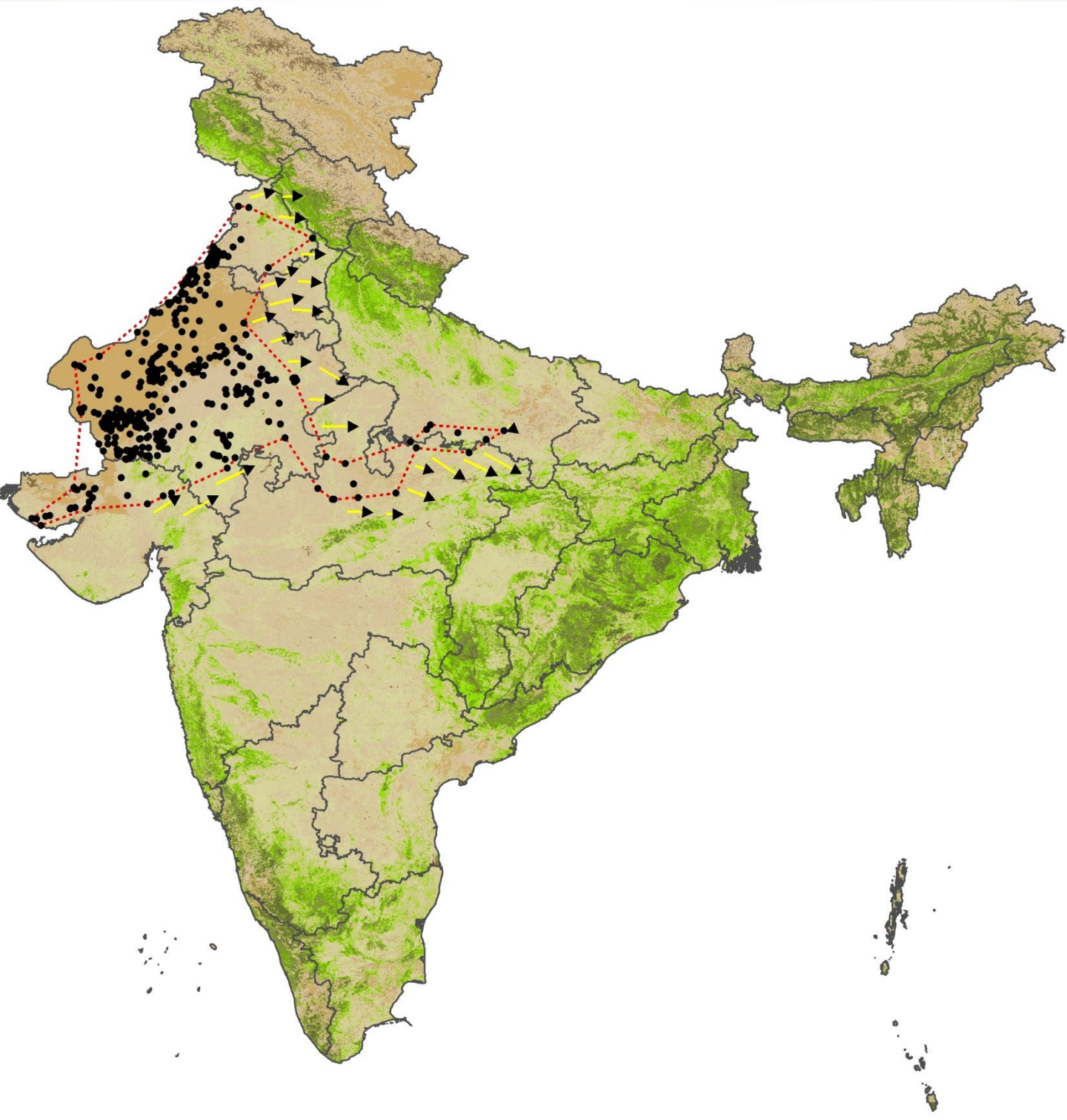
Locust Location between 25 May 2020 and 09 June 2020

1 cm = 5 km

0 4 8 16 24 Kilometers

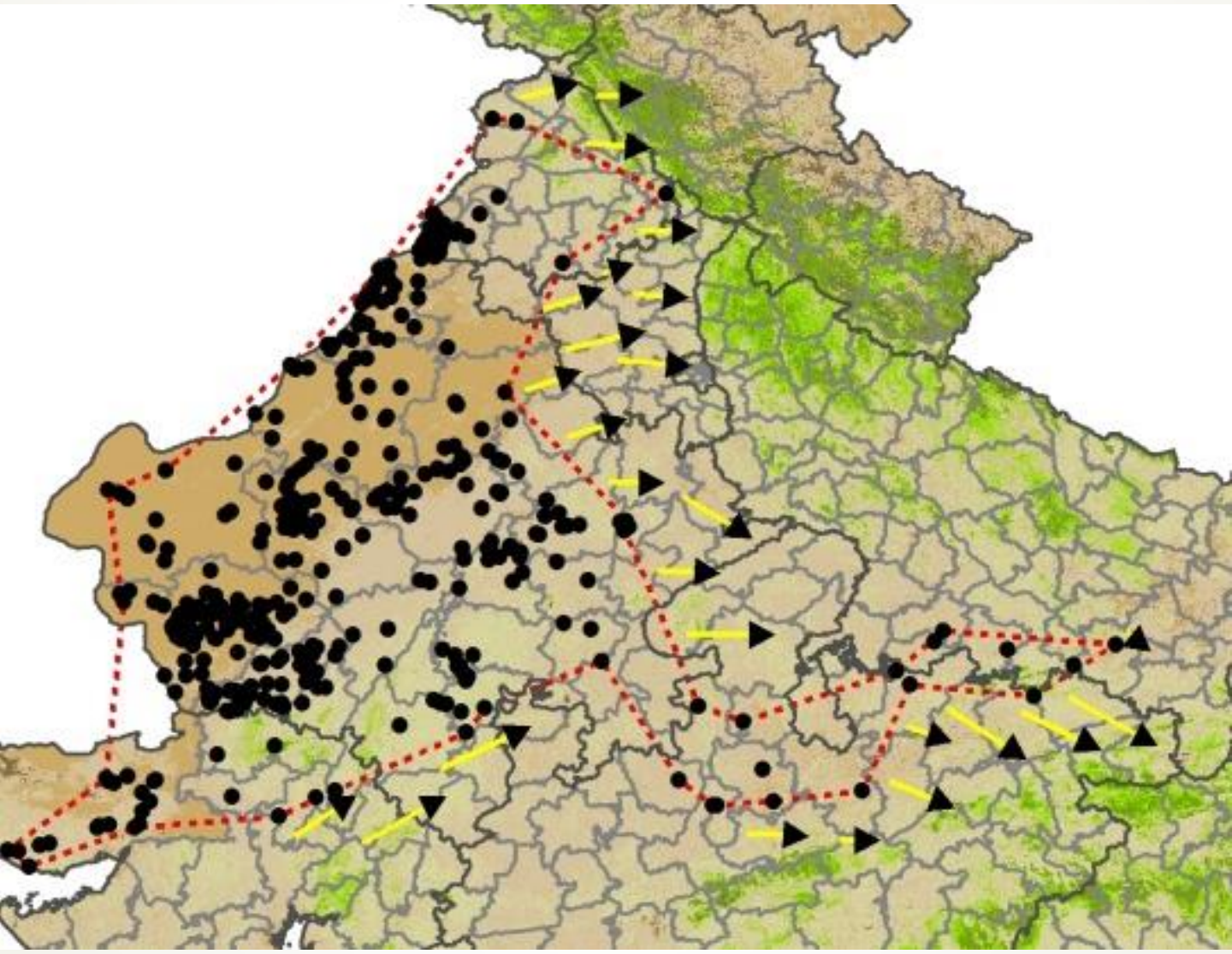
Source: Sentinel 2

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



12 June onwards, 2020

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



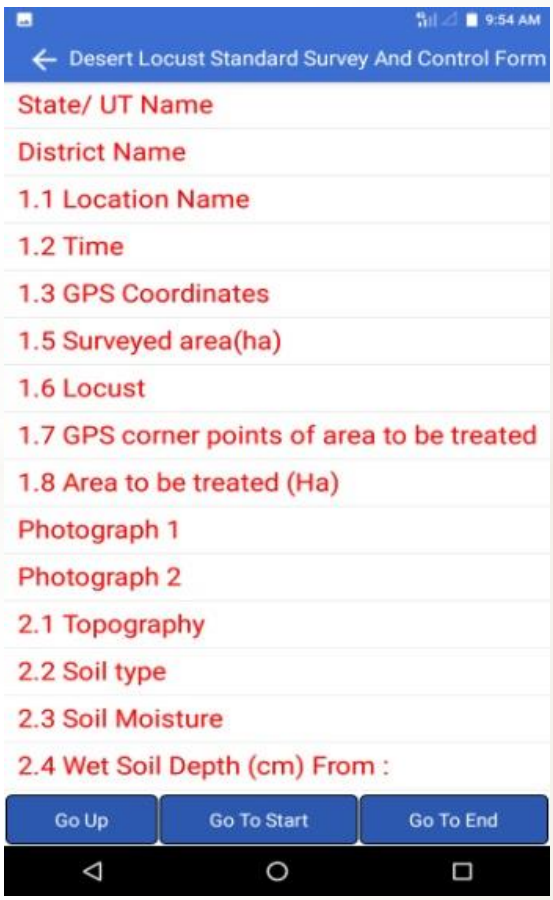
19 June onwards, 2020

Bhuvan-Locust Mobile App

- Bhuvan-Locust Mobile App is developed for mapping the locations, ecology, characteristics of desert locust and along with the details of control measures
- Bhuvan-Locust developed in consultation with Locust Warning Organization (LWO), Jodhpur

Mobile App has been developed based on the design recommendation from FAO with the following features

- A user-friendly mobile application
- Facilitates the collection of the following attributes
- Location details along with geo-tagged photographs
- Ecology including habitant, vegetation and weather parameters
- Locust details including Hoppers/Bands/Adults/Swarms
- Control and Safety measures



Space Based Inputs and Field Data of Locust Control Survey

- FCC and Vegetation status maps (MODIS Level 1B product; 250 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
- Locust Impact Assessment in parts of Barmer District using Sentinal-2 Data of 10 m resolution

Heuristics Prediction of locust Migration

- Vegetation cover status in terms of Normalized Difference Vegetation Index (NDVI) provides valuable information for identifying the potential habitat of locust.
- Surface/Root zone soil moisture status is a very good indicator highlighting the potential breeding ground as locust females need moist area to lay their eggs.
- Wind directions show direct linkage to possible locust movement paths.
- Considering all the key input factors, it has been suggested that desert locust swarms are likely to move in the following districts

  Rajasthan: Jaisalmer, Bikaner, Ganganagar, Hanumangarh, Churu, Nagore , Sihar, Jhunjhunu, Alwar, Bharatpur, Dholpur and Karauli

  Gujarat: Gandhinagar**,** Mahesana, Mahisagar and Aravali

  Madhya Pradesh: Chhatarpur, Jabalpur, Sheopur, Shivpuri, Vidhisha, Satna , Rewa , Jabalpur, Damoh, Katni

  Uttar Pradesh: Mahoba, Hamirpur, Banda, Kaushambi, Allahabad and Varanasi

  Haryana: Fatehabad, Hisar, Bhiwani, Mahendragarh, Dadri, Rewari , Kaithal and Ambala

  Punjab: Mansa, Sangrur, Muktsar, Faridkot, Moga, Ferozepur, Amritsar and Gurdaspur

Update from FAO (10th June)

- Spring breeding has nearly ended in Iran and Pakistan
- Some adult groups/swarms are expected to arrive alongside the Indo-Pak border.
- Hopper emergence may be reported at Bikaner during third week of June where breeding has been reported

Interactions and Updates

- A mobile app, Bhuvan-Locust has been developed and demonstrated to LWO – Jodhpur
- Series of meetings happed in RRSC-West involving Joint Directors and Technical Officer from LWO- Jodhpur, SRSAC-Jodhpur, ISRO Hq, Bangalore, RRSC-E, Kolkata and RRSC-N, Delhi and RRSC-W, Jodhpur
- A way forward has been for establishing Locust Surveillance system using Space inputs is being planned
- Most of the new locust locations identified in the field confirms the heuristics prediction of locust migration mentioned in Bulletin No. 3 dated 12 June, 2020
- Bhuvan–Loucst Web portal for isolations of ground information and satellite based inputs and further analysis is being initiated at RRSC-W, Jodhpur

Interaction with Shri Sanjay Arya, Joint Director, LWO, Jodhpur, Dr. J.R Sharma, Fmr. CGM, NRSC - Hyderabad

Interaction with Shri Rajiv Jain, Project Director, SRSAC and Shri Chandrasekhar Sharma, LWO, Jodhpur

Interaction with Dr. J. P. Singh, Jt. Director, LWO

Contact

Dr. S Srinivasa Rao
General Manager
Regional Remote Sensing Centre (RRSC-W)
NRSC, ISRO, Sector 9, K B Housing Board,
Bypass road, Jodhpur
Ph.: 0291-2796394
E-mail: ssrao@nrsc.gov.in