



Wheat rust advisory - risk assessment from surveys and forecasts in Bhutan

Summary period: 11 May - 17 May 2025

Overall risk level:

Moderate (late crops) / Caution

Key messages

No new surveys, but leaf and stripe rust are present, with the possibility of stripe rust remaining in some fields in Punakha valley. Low levels of disease were detected in the east. Low levels of stripe rust in west, with crops at young growth stages (probably heading-flowering). Given continued very high suitability and presence of susceptible cultivars, stripe rust is likely to increase on these crops e.g., in western areas. There is the possibility of very low density stem rust spore dispersal into Bhutan, from a confirmed infected site in Nepal.

Suitability forecast (11 – 16 May) for leaf, stripe and stem rust indicates continued high infection efficiency across wheat growing areas. During the period 11 – 19 May, continued rain is forecast across Bhutan and this is likely to persist 19 - 27 May. Temperatures (11 – 19 May) are forecast to be mainly cooler than normal, but the Punakha/Wangdue valley and southern areas may be warmer.

Given the short term forecasts with continuing rain, conditions are likely to be increasingly suitable for continued disease development. Further development of stripe rust is considered likely. Monitoring for any appearance of stem rust is strongly advised, especially as stem rust has now been confirmed in Nepal.

Recommendations

Very close monitoring of fields, particularly for susceptible varieties at early growth stages, is recommended. Forecast weather conditions, indicate that disease development is increasingly likely. Stripe rust is likely to increase on early growth stage crops and care should be taken to monitor for any possible appearance of stem rust.

Scouting should be undertaken, especially in early stage crops, and farmers informed to be vigilant for the emergence of rust. Risk of stem rust appearance is increasing.

- Awareness should be raised amongst stakeholders at all levels, including farmers, to be vigilant for early appearance of rusts. **Early control to stop increased spread and further build-up of disease is very important.**
- Sampling should be undertaken to determine races of rust present.

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Field surveys

Surveys undertaken Feb 10 2025 - Apr 15 2025. A total of 178 fields surveyed. No stem rust detected.

Legend for severity and incidence intensity: Low: less than 20%; moderate: 20-40%; high: more than 40%.

Leaf Rust reported from 38 out of 178 fields surveyed (21%). Moderate to high incidence of leaf rust has been seen in 12 fields (32% of infected fields). Moderate to high severity of leaf rust has been seen in 1 fields (3% of infected fields).

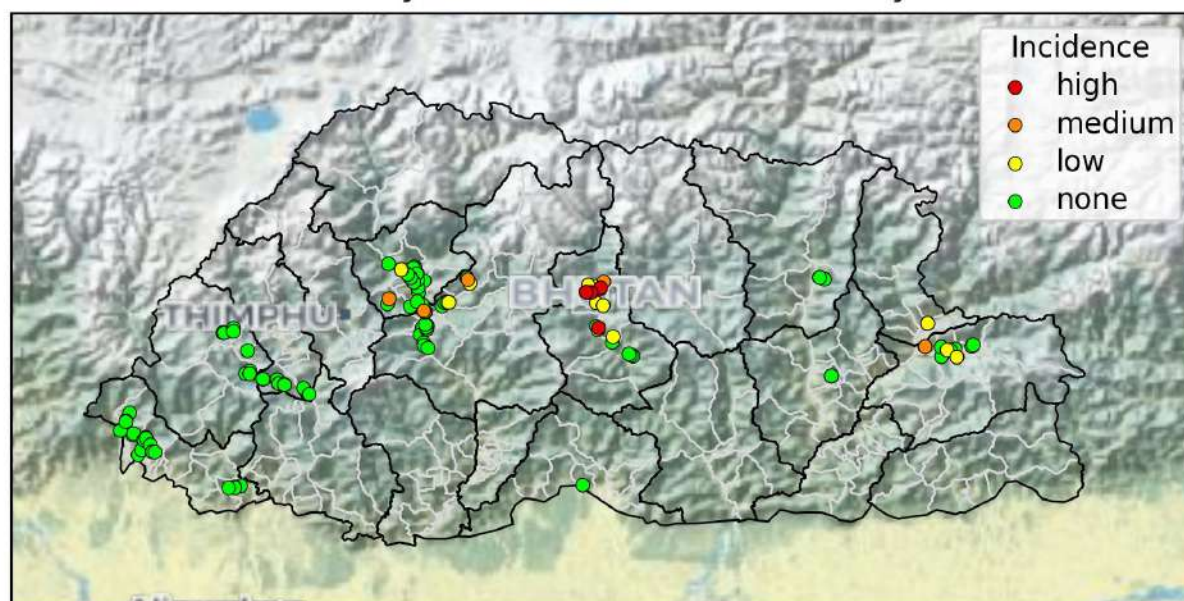
Stripe Rust reported from 83 out of 178 fields surveyed (47%). Moderate to high incidence of stripe rust has been seen in 51 fields (61% of infected fields). Moderate to high severity of stripe rust has been seen in 25 fields (30% of infected fields).

Table 1: Variety analysis of surveys.

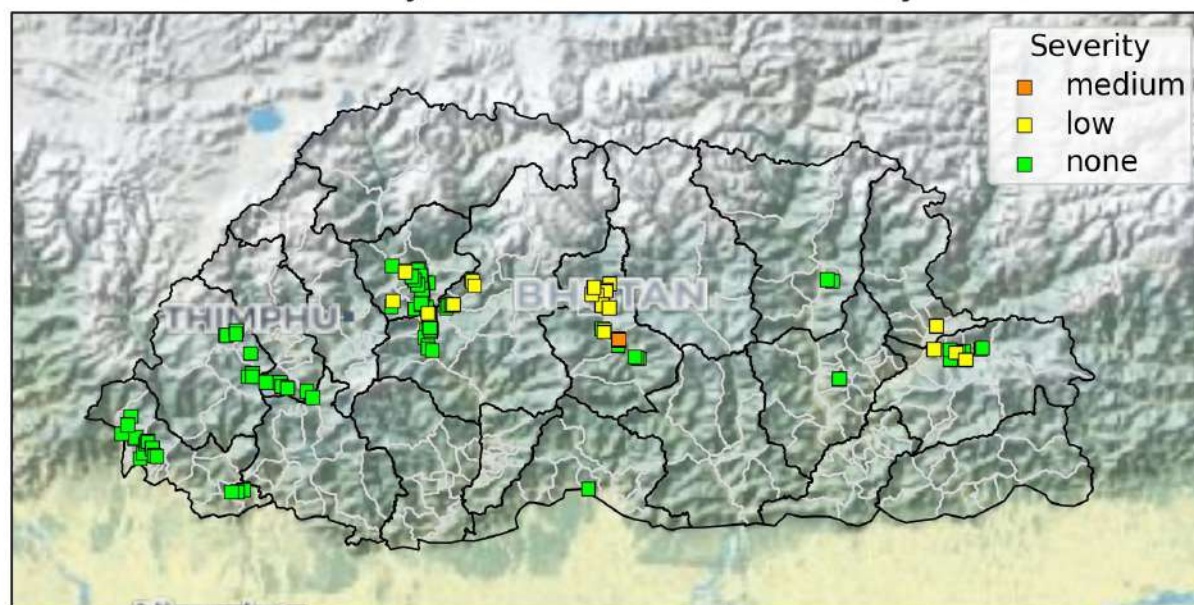
Variety	Number of surveys	Number of surveys reporting infection of		
		stem rust	stripe rust	leaf rust
Bajosokha	1	n/a	1	1
Guma Sokha	8	n/a	0	0
Indian Durum	2	n/a	2	0
Local	7	n/a	3	2
Local barley	1	n/a	0	0
Semolina	1	n/a	0	0
Unknown	158	n/a	77	35

Growth stage analysis of surveys unavailable because no surveys available from the last week (since May 04 2025).

Leaf rust surveys Bhutan Feb 10 2025 - May 10 2025

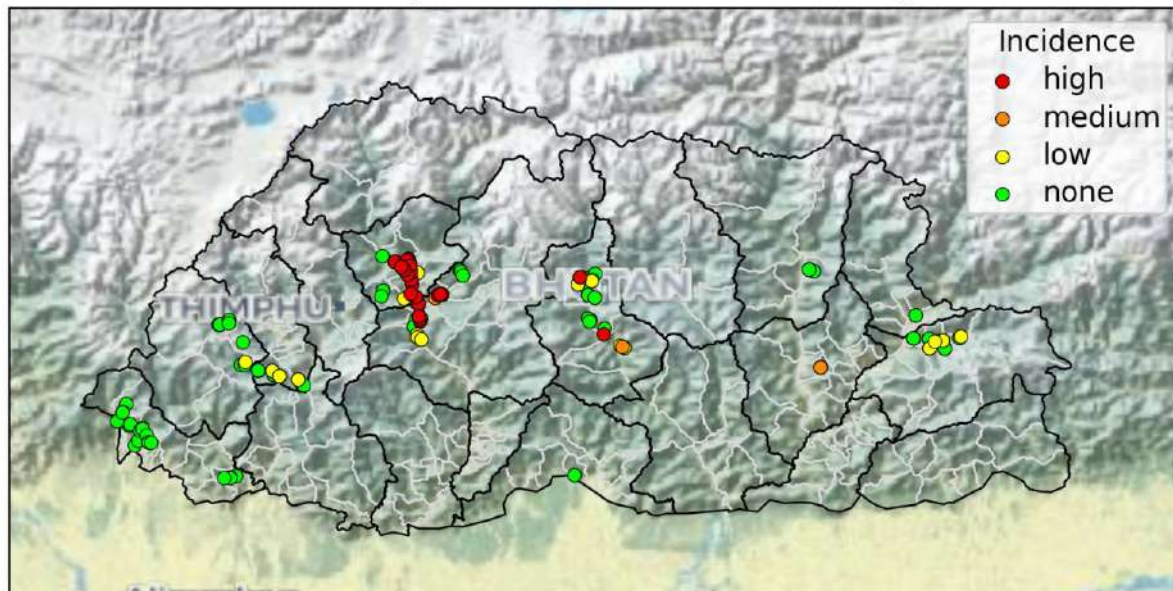


Leaf rust surveys Bhutan Feb 10 2025 - May 10 2025

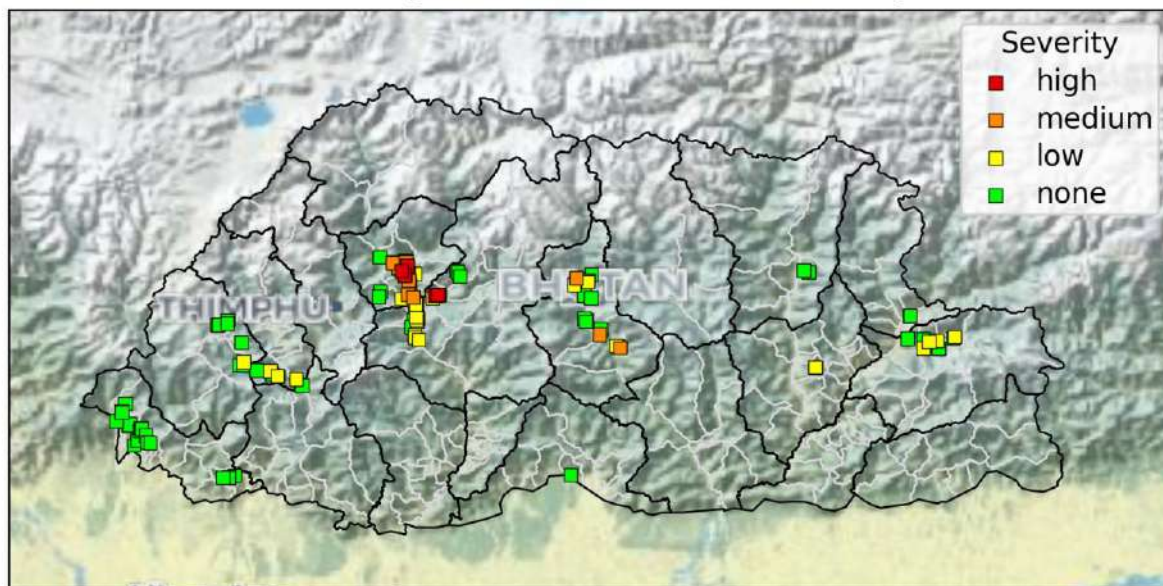


Map 1: Leaf Rust incidence (top) and severity (bottom) in Bhutan field surveys Feb 10 2025 - May 10 2025

Yellow rust surveys Bhutan Feb 10 2025 - May 10 2025

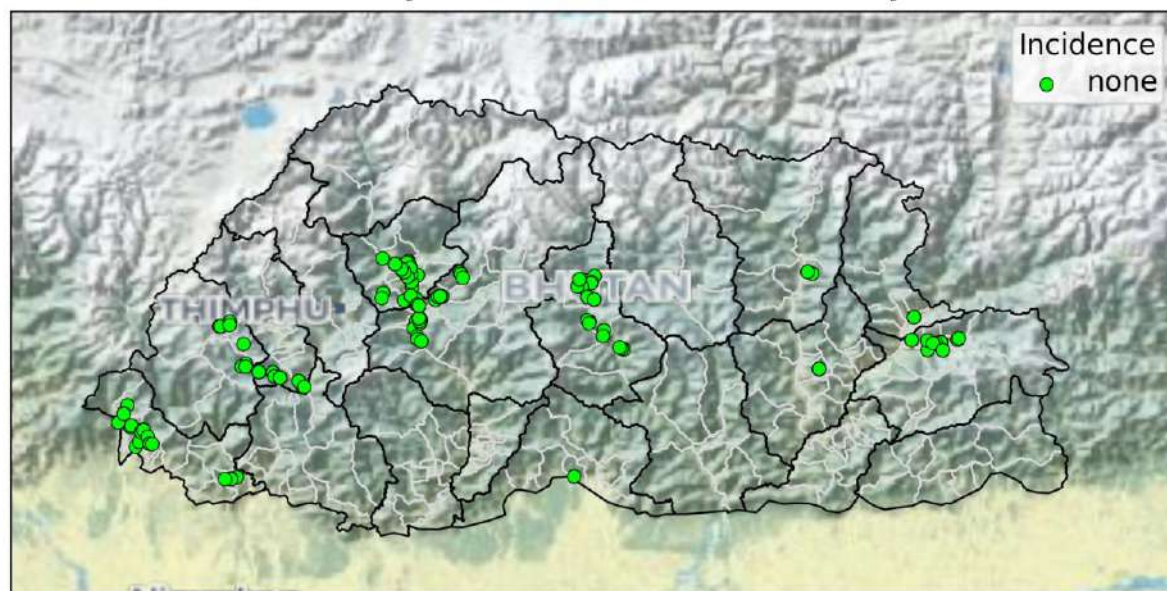


Yellow rust surveys Bhutan Feb 10 2025 - May 10 2025

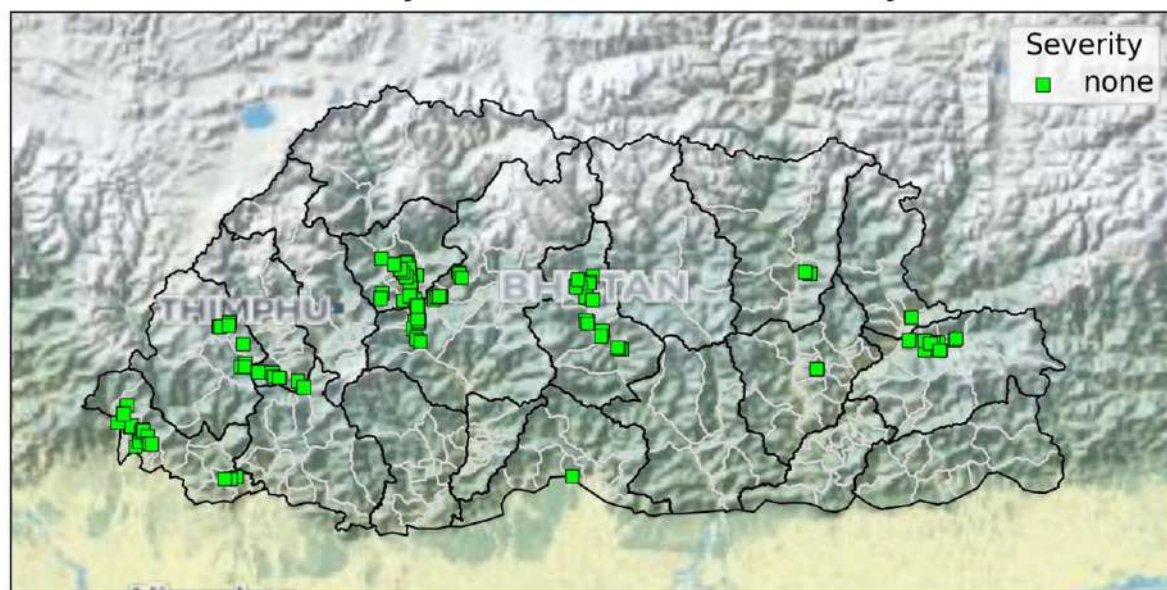


Map 2: Stripe Rust incidence (top) and severity (bottom) in Bhutan field surveys Feb 10 2025 - May 10 2025

Stem rust surveys Bhutan Feb 10 2025 - May 10 2025



Stem rust surveys Bhutan Feb 10 2025 - May 10 2025



Map 3: Stem Rust incidence (top) and severity (bottom) in Bhutan field surveys Feb 10 2025 - May 10 2025

Spore dispersal forecasts

Spore dispersal forecasts run by the UK Met Office and Cambridge University are displayed for stem, stripe and leaf rusts for the forecasted period. Surveys in each district are gathered to provide a single source per administrative area for dispersal forecasts (red dots in figure).

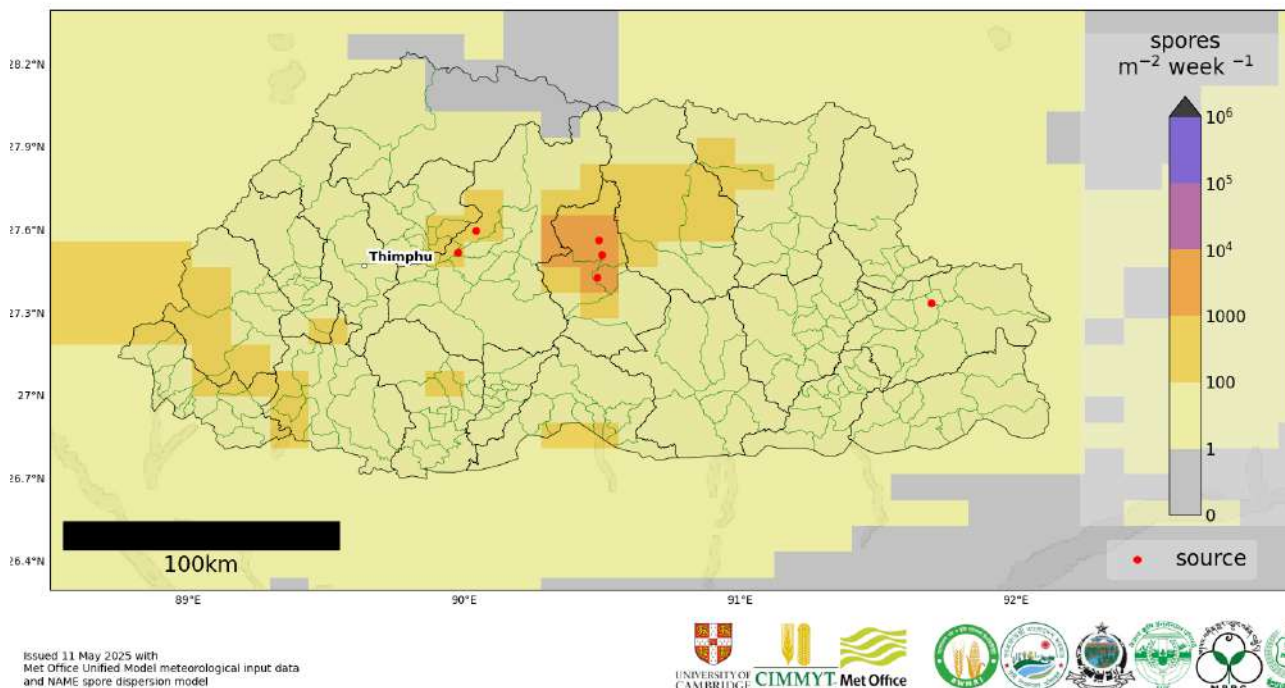
Environmental / climatic suitability for infection forecasts

These forecasts run by the UK Met Office and Cambridge University give the probability of wheat rust infection occurring based on meteorological factors. The maximum infection efficiency that can occur is 100%. This means that 100% of the spores deposited on susceptible wheat plants could complete the infection process. Therefore, a forecast Infection Efficiency of 100% indicates the highest risk of wheat rust infection occurring in susceptible wheat varieties.

Leaf rust

Dispersal: Current forecast (11 May - 17 May) indicates dispersal in a mainly easterly direction.

Leaf rust spore deposition forecast 2025-05-11-03:00 - 2025-05-18-00:00 (UTC)



Map 4: Leaf rust spore deposition forecast Bhutan 11 May - 17 May 2025

The 20 most impacted districts (spore deposition) per country are presented in the table below.

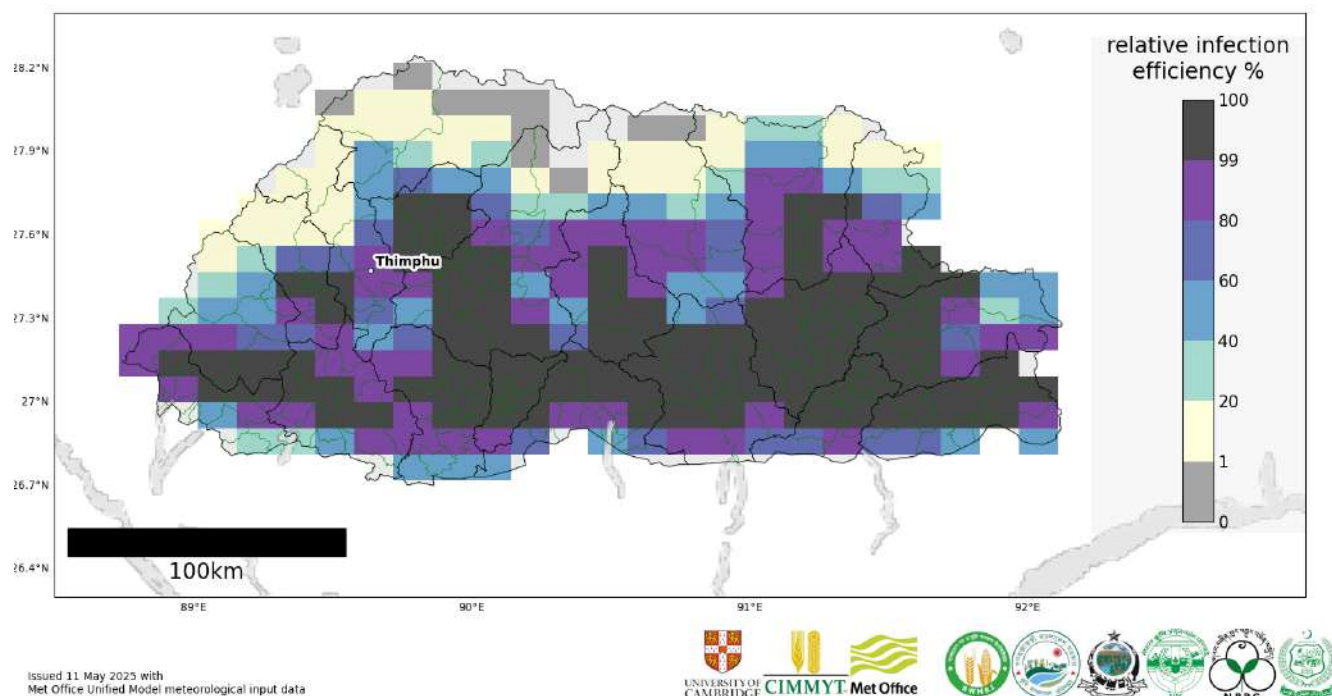
admin2Name	admin1Name	Leaf rust spores per m^2 per week
Dragteng	Trongsa	2100
Nubi	Trongsa	1900
Tangsibji	Trongsa	1500
Chhoekhor	Bumthang	440
Shengabjimi	Punakha	360
Langthil	Trongsa	290
Sephu	Wangduephodrang	230
Nyisho	Wangduephodrang	200
Lingmukha	Punakha	180
Phangyuel	Wangduephodrang	180
Dzoma	Punakha	180
Tang	Bumthang	150
Dangchhu	Wangduephodrang	150
Dungtoe	Samtse	140
Denchhukha	Samtse	130
Bapisa	Punakha	130
Chhume	Bumthang	120

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Sombey	Haa	120
Gakiling	Haa	120
Logchina	Chhukha	120

Risk of infection: Current forecast (11 – 16 May) indicates slightly increased suitability to the last advisory. Very high infection efficiency forecast across most areas – especially southern areas and valleys of central-west and east.

Infection efficiency of Wheat **Leaf rust** spores 2025-05-11-00:00 - 2025-05-17-00:00 (UTC)



Map 5: Leaf rust suitability for infection forecast Bhutan 11 May - 16 May 2025

The 20 most impacted (infection efficiency) districts per country are presented in the table below.

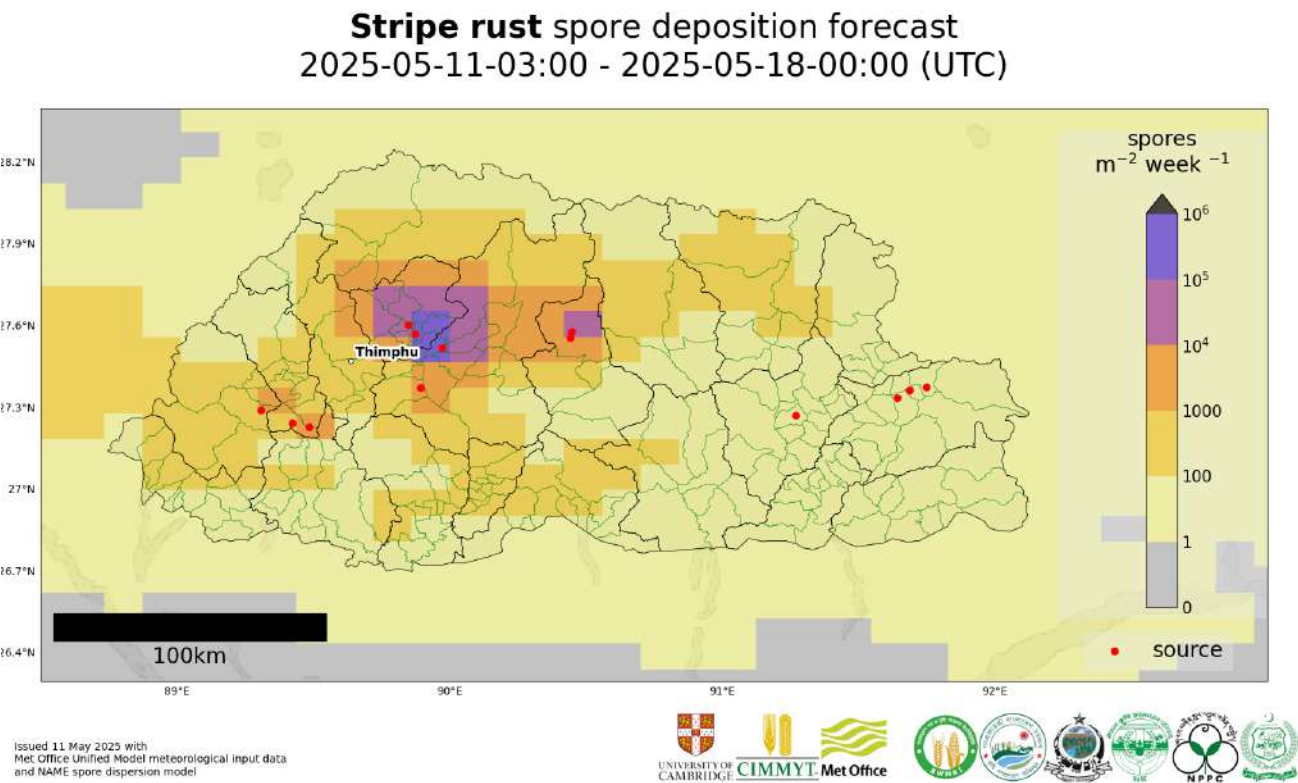
admin2Name	admin1Name	RIE_leaf_rust_%
Zobel	Pemagatshel	100
Hungrel	Paro	100
Khaling	Trashigang	100
Kengkhar	Monggar	100
Thangrong	Monggar	100
Theedtsho	Wangduephodrang	100
Thrimshing	Trashigang	100
Kanglung	Trashigang	100
Jurmey	Monggar	100
Jamkhar	Yangtse	100
Guma	Punakha	100
Drametse	Monggar	100

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Gomdar	Samdrupjongkhar	100
Toetsho	Yangtse	100
Tsakaling	Monggar	100
Dzoma	Punakha	100
Dungtoe	Samtse	100
Dungmin	Pemagatshel	100
Dunglegang	Tsirang	100
Drugyelgang	Dagana	100

Stripe rust

Dispersal: Current forecast (11 May - 17 May) indicates dispersal in a mainly easterly direction.



Map 6: Stripe rust spore deposition forecast Bhutan 11 May - 17 May 2025

The 20 most impacted districts (spore deposition) per country are presented in the table below.

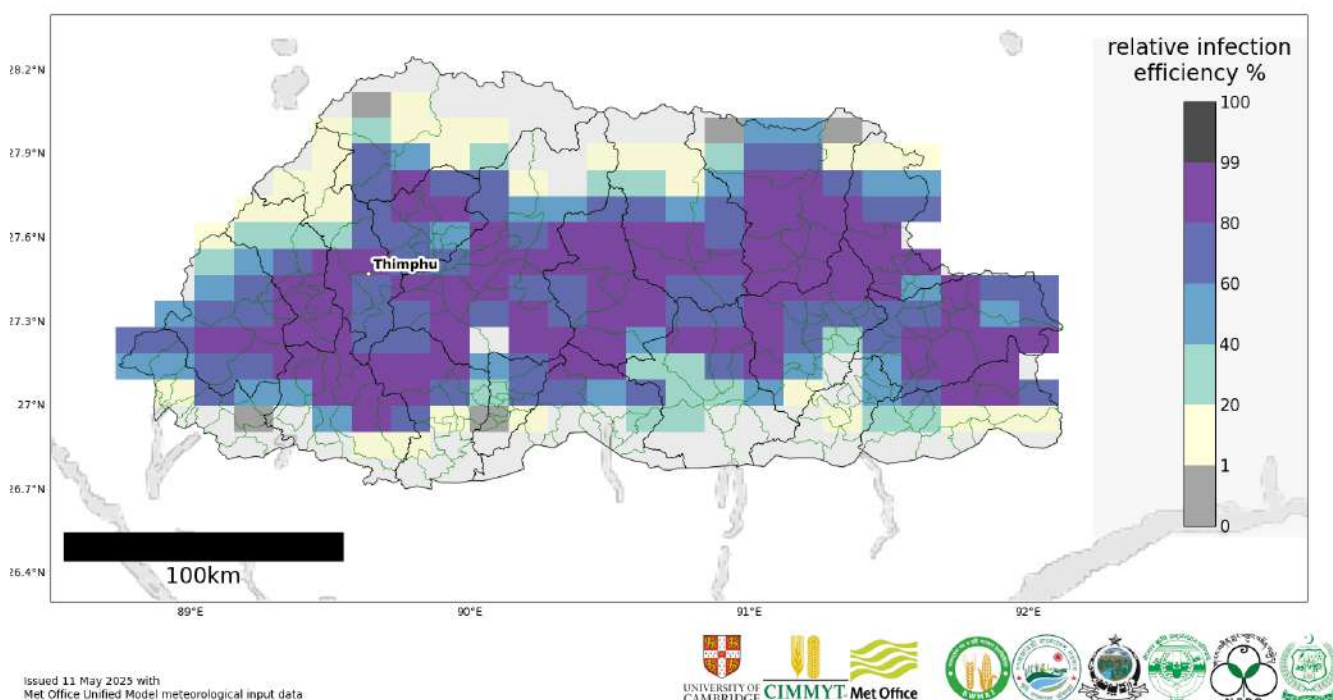
admin2Name	admin1Name	Stripe rust spores per m ² per week
Phangyuel	Wangduephodrang	270000
Dzoma	Punakha	270000
Lingmukha	Punakha	270000
Bapisa	Punakha	200000
Guma	Punakha	150000
Thedtsho	Wangduephodrang	140000
Bjena	Wangduephodrang	110000
Nahi	Wangduephodrang	100000
Nyisho	Wangduephodrang	90000
Shengabjimi	Punakha	87000
Ruepisa	Wangduephodrang	82000
Chhubu	Punakha	55000
Kazhi	Wangduephodrang	53000
Toewang	Punakha	25000
Talo	Punakha	19000
Dangchhu	Wangduephodrang	10000
Toepisa	Punakha	9900

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Kabjisa	Punakha	9500
Goenshari	Punakha	7600
Gangte	Wangduephodrang	4500

Risk of infection: Current forecast (11 – 16 May) indicates slightly increased suitability since the last advisory. High infection efficiency across most/all of the wheat growing areas.

Infection efficiency of Wheat **Stripe rust** spores 2025-05-11-00:00 - 2025-05-17-00:00 (UTC)



Map 7: Stripe rust suitability for infection forecast Bhutan 11 May - 16 May 2025

The 20 most impacted districts (infection efficiency) per country are presented in the table below.

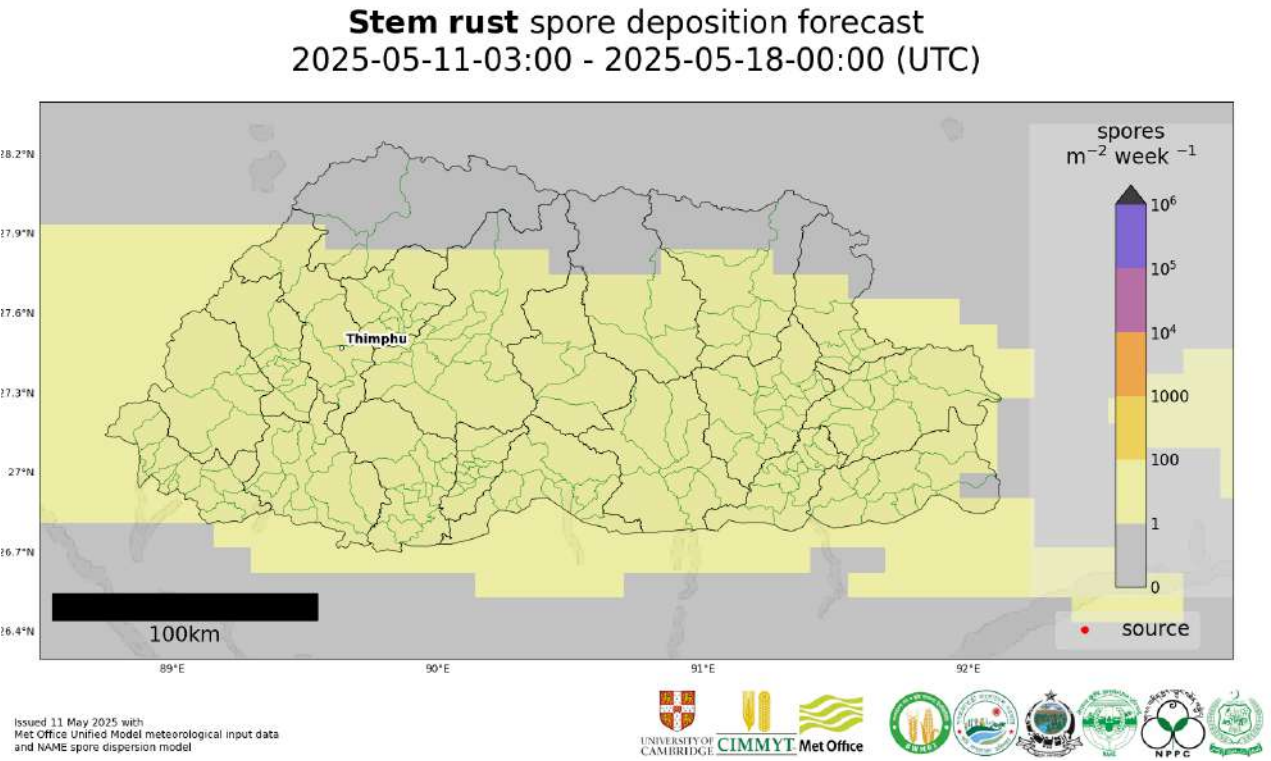
admin2Name	admin1Name	RIE_stripe_rust_%
Minjay	Lhuentse	90
Menbi	Lhuentse	90
Wangchang	Paro	90
Hungrel	Paro	90
Dragteng	Trongsa	89
Tsenkhar	Lhuentse	89
Shapa	Paro	89
Trashiyangtse	Yangtse	88
Lungnyi	Paro	88
Tsamang	Monggar	87
Kangpara	Trashigang	87
Doga	Paro	87
Gasetsho Gom	Wangduephodrang	87

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Metsho	Lhuentse	87
Shongphu	Trashigang	86
Bjachho	Chhukha	86
Jaray	Lhuentse	86
Bjena	Wangduephodrang	85
Chapchha	Chhukha	85
Naja	Paro	85

Stem rust

Dispersal: Current forecast (11 May - 17 May) indicates low density spore dispersal / deposition from infected site in Nepal. Dispersal in an easterly direction.



Map 8: Stem rust spore deposition forecast Bhutan 11 May - 17 May 2025

The 20 most impacted districts (spore deposition) per country are presented in the table below.

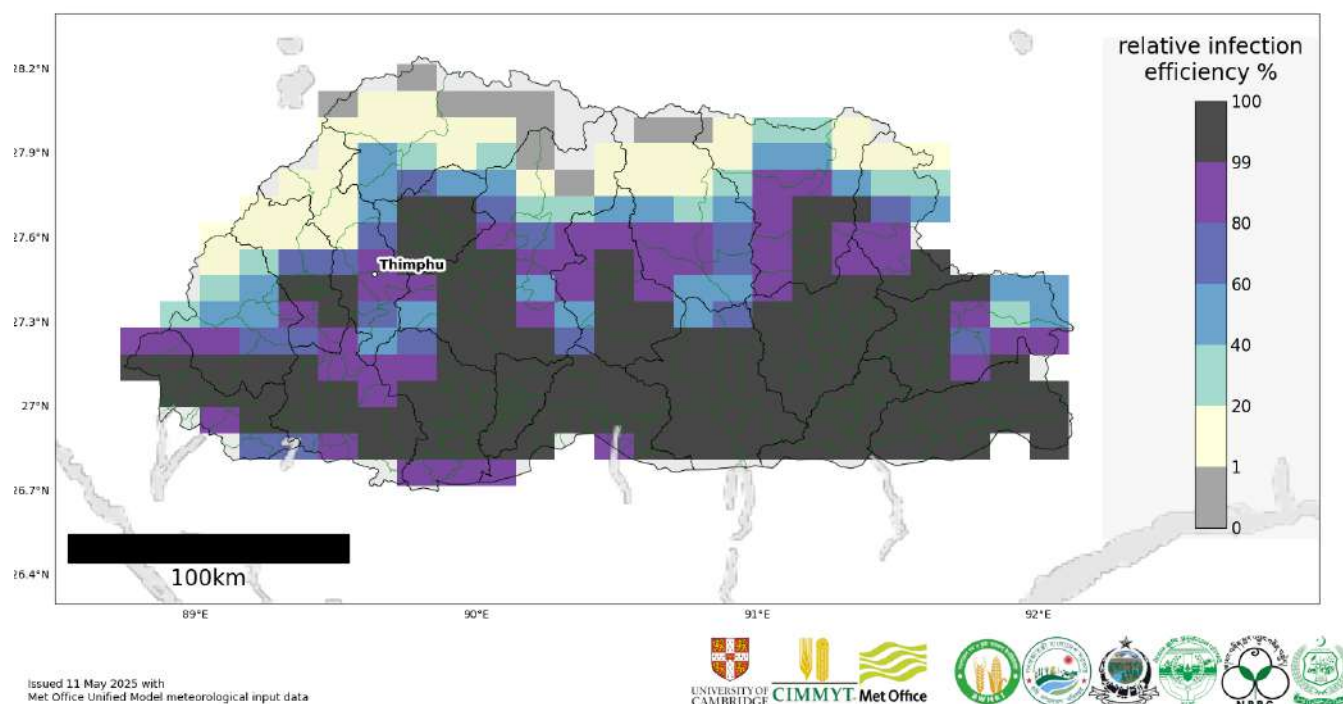
admin2Name	admin1Name	Stem rust spores per m ² per week
Patakla	Tsirang	25
Shemjong	Tsirang	24
Tsangkhha	Dagana	24
Gosarling	Tsirang	24
Tsholingkhor	Tsirang	24
Tsirangtoe	Tsirang	24
Rangthangling	Tsirang	23
Kikorthang	Tsirang	23
Barzhong	Tsirang	23
Dunglegang	Tsirang	22
Mendrelgang	Tsirang	22
Phuentenchhu	Tsirang	19
Drugyelgang	Dagana	19
Hiley	Sarpang	18
Gesarling	Dagana	18
Lajab	Dagana	18
Gozhi	Dagana	18

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Doban	Sarpang	18
Trashiding	Dagana	18
Beteni	Tsirang	17

Risk of infection: Current forecast (11 - 16 May) indicates slightly increased suitability to the last advisory. Very high infection efficiency across southern areas, and the main valleys.

Infection efficiency of Wheat **Stem rust** spores 2025-05-11-00:00 - 2025-05-17-00:00 (UTC)



Map 9: Stem rust suitability for infection forecast Bhutan 11 May - 16 May 2025

The 20 most impacted districts (infection efficiency) per country are presented in the table below.

admin2Name	admin1Name	RIE_stem_rust_%
Zobel	Pemagatshel	100
Gosarling	Tsirang	100
Phuntsthothang	Samdrupjongkhar	100
Jurmey	Monggar	100
Ramjar	Yangtse	100
Jangchhubling	Samdrupjongkhar	100
Jamkhar	Yangtse	100
Hungrel	Paro	100
Hiley	Sarpang	100
Guma	Punakha	100
Gozhing	Zhemgang	100
Gozhi	Dagana	100
Gongdue	Monggar	100

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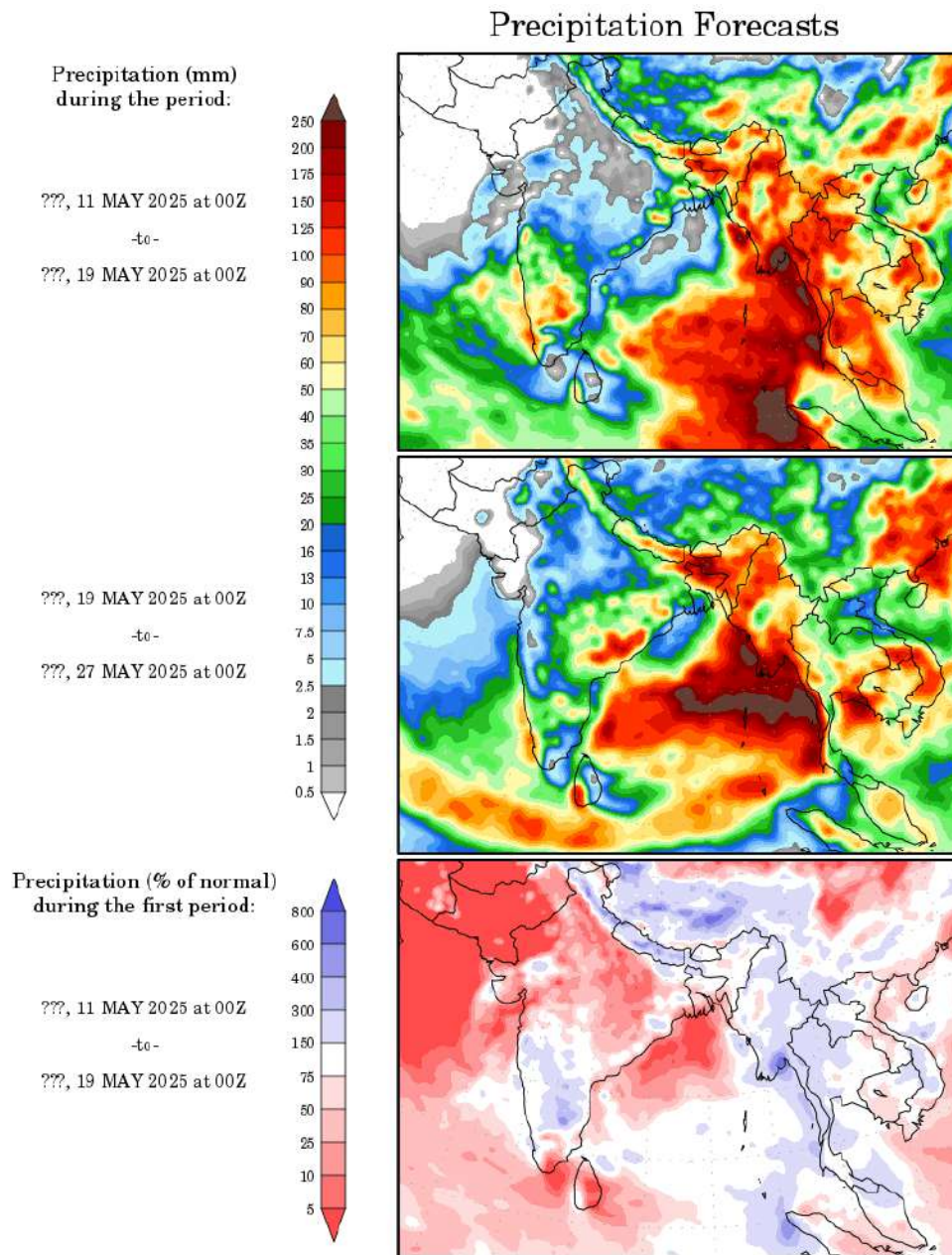
Kanglung	Trashigang	100
Gomdar	Samdrupjongkhar	100
Rangthangling	Tsirang	100
Ruepisa	Wangduephodrang	100
Samkhar	Trashigang	100
Samrang	Samdrupjongkhar	100
Gesarling	Dagana	100

Region-wide Forecasts

Forecasts from the National Centers for Environmental Prediction NCEP <http://wxmaps.org/pix/clim>

These indicate possible general conditions across South Asia, with likely decreasing prediction accuracy in the second forecast period.

Precipitation: During the period 11 – 19 May, rain forecast across most of region except central/south Pakistan. Forecast rain heaviest in Bhutan, eastern Bangladesh, Nepal (hills), and southern India. During 19 – 27 May, increased and heavier rain forecast for Bangladesh and Eastern/ Central Nepal continued light rain elsewhere except southern Pakistan.



Precipitation forecasts from the National Centers for Environmental Prediction.
Normal rainfall derived from Xie-Arkin (CMA) Monthly Climatology for 1979-2003.
Forecast Initialization Time: 00Z11MAY2025

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Temperature: During the period 11 – 19 May temperatures are warming across the entire region (especially India and Pakistan). Warmer than normal across the region, except for northern Pakistan, north west India, high hills of Nepal, Bhutan. Temperatures forecast to remain very high during 19 – 27 May.

Temperature Forecasts

Mean Surface Temperature (°C)
during the period:

???, 11 MAY 2025 at 00Z

-to-

???, 19 MAY 2025 at 00Z

???, 19 MAY 2025 at 00Z

-to-

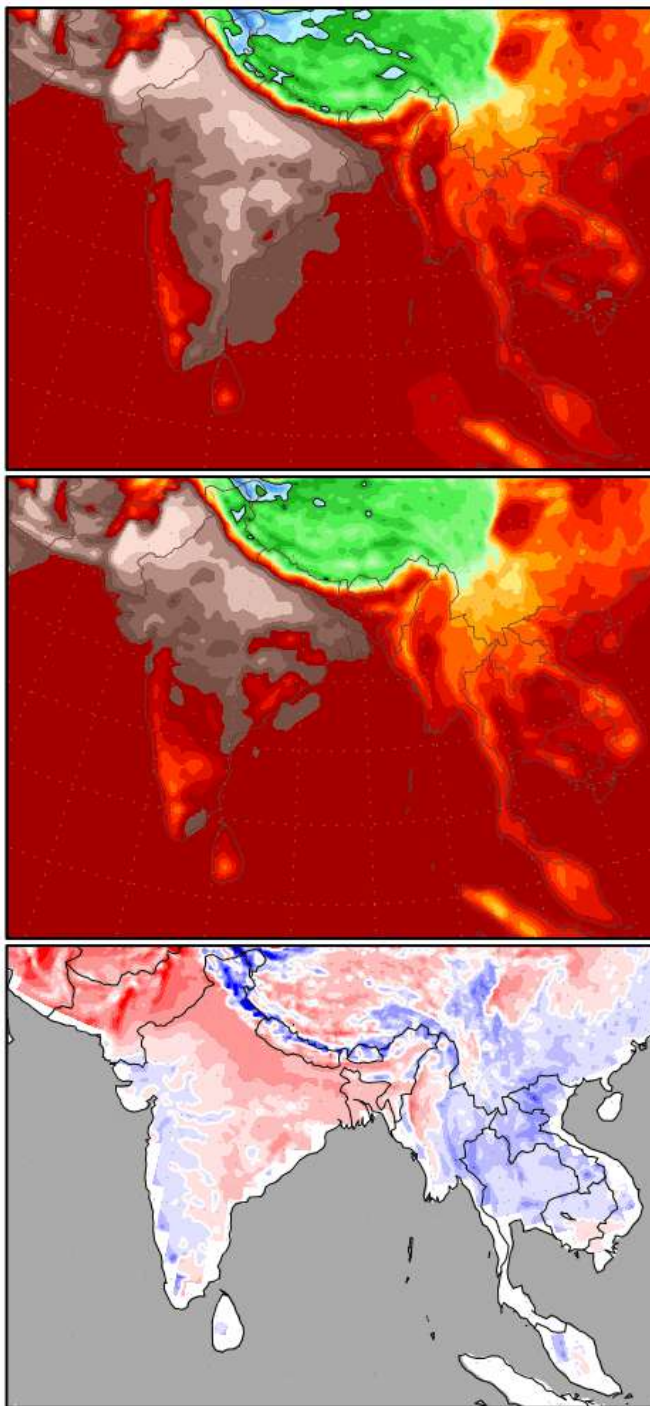
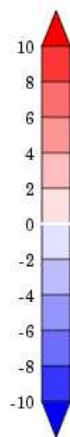
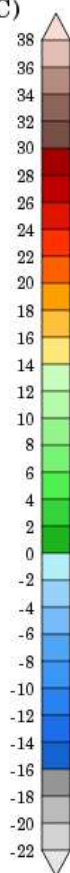
???, 27 MAY 2025 at 00Z

Temperature Anomaly
during the first period:

???, 11 MAY 2025 at 00Z

-to-

???, 19 MAY 2025 at 00Z



Temperature forecasts from the National Centers for Environmental Prediction.
Normal Temperature derived from CRU monthly climatology for 1901-2000
Forecast Initialization Time: 00Z11MAY2025