



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

Summary period: 24 Apr - 30 Apr 2025

Overall risk level:

Moderate (late crops)/ Caution

Key messages

Surveys have been undertaken across Bhutan, with most recent surveys in western areas (Haa). Leaf and stripe rust are present, with high incidence/ severity of stripe rust 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 (tillering -boot). Given continued very high suitability and presence of susceptible cultivars, stripe rust is likely to increase on these early growth stage crops e.g., in western areas.

Suitability forecast (24 – 29 Apr) for leaf, stripe and stem rust indicates a continued high infection efficiency across wheat growing areas (notably leaf and stem rust). During the period 23 Apr – 1 May, continued rain is forecast across Bhutan and this is likely to persist 1 – 9 May. Temperatures (23 Apr – 1 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 become increasingly suitable for continued disease development. Further development of stripe rust is considered likely. Monitoring for any appearance of stem rust is strongly advised.

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.

- 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).

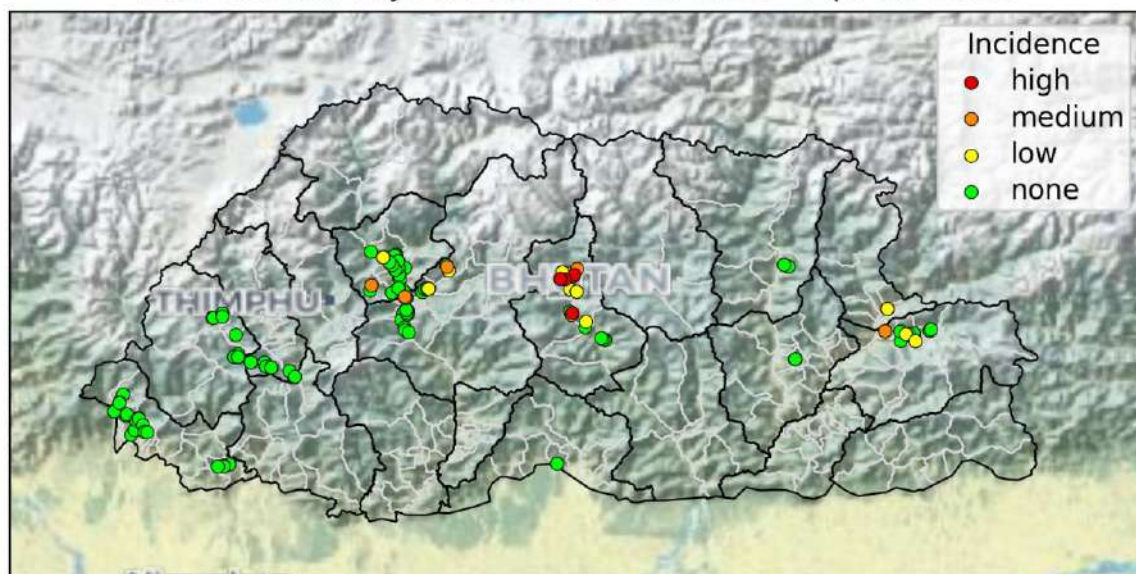
Stripe Rust reported from 83 out of 178 fields surveyed (47%). Moderate to high incidence of stripe rust has been seen in 51 fields (61% of infected fields). Moderate to high severity of stripe rust has been seen in 25 fields (30% of infected fields).

Table 1: Variety analysis of surveys.

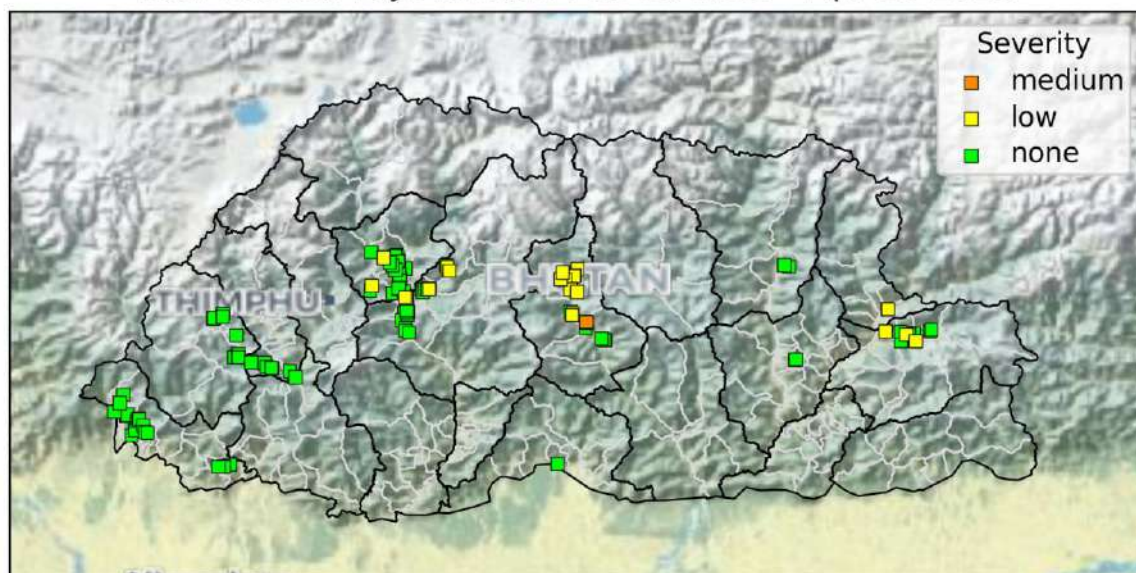
Variety	Number of surveys	Number of surveys reporting infection of		
		stem rust	stripe rust	leaf rust
Bajosokha	1	n/a	1	1
Guma Sokha	8	n/a	0	0
Indian Durum	2	n/a	2	0
Local	7	n/a	3	2
Local barley	1	n/a	0	0
Semolina	1	n/a	0	0
Unknown	158	n/a	77	35

Growth stage analysis of surveys unavailable because no surveys available from the last week (since Apr 17 2025).

Leaf rust surveys Bhutan Feb 10 2025 - Apr 23 2025

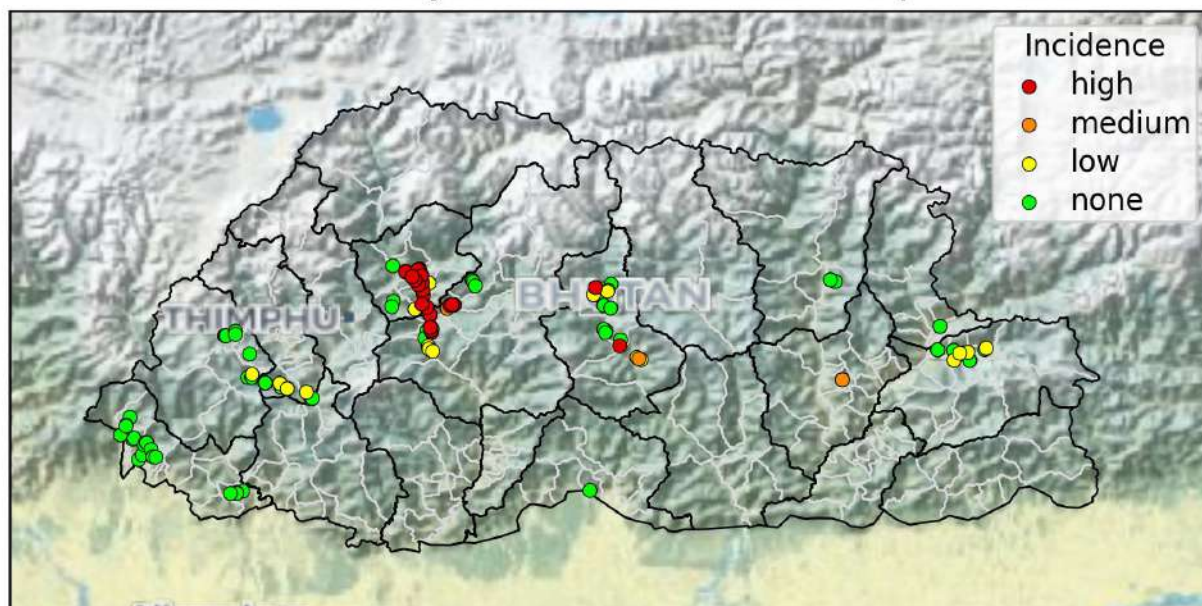


Leaf rust surveys Bhutan Feb 10 2025 - Apr 23 2025

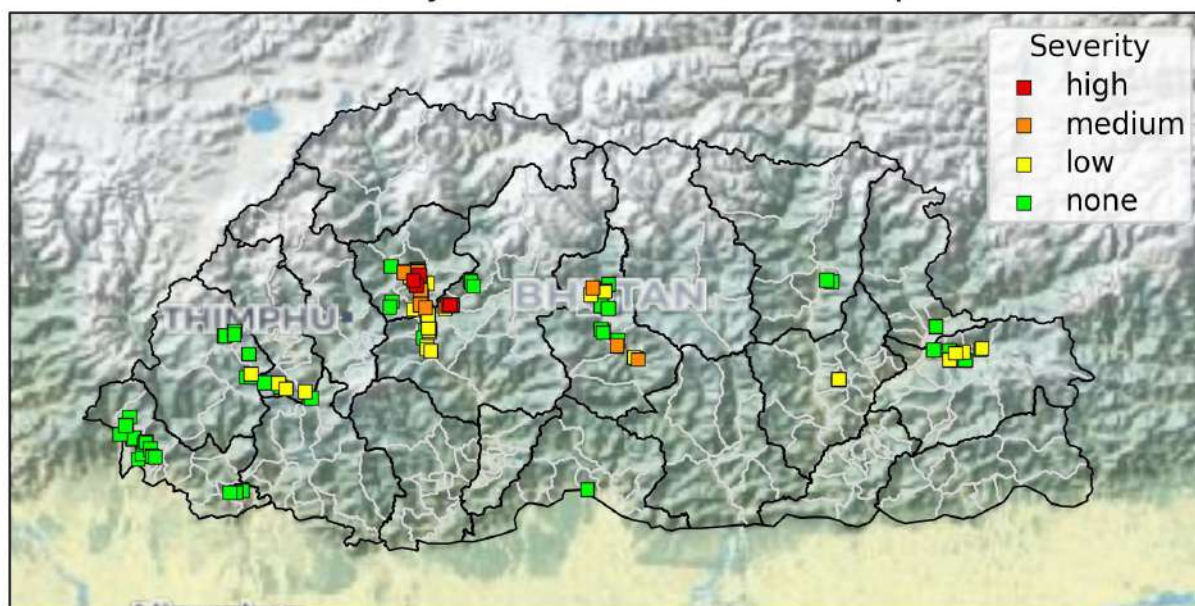


Map 1: Leaf Rust incidence (top) and severity (bottom) in Bhutan field surveys Feb 10 2025 - Apr 23 2025

Yellow rust surveys Bhutan Feb 10 2025 - Apr 23 2025

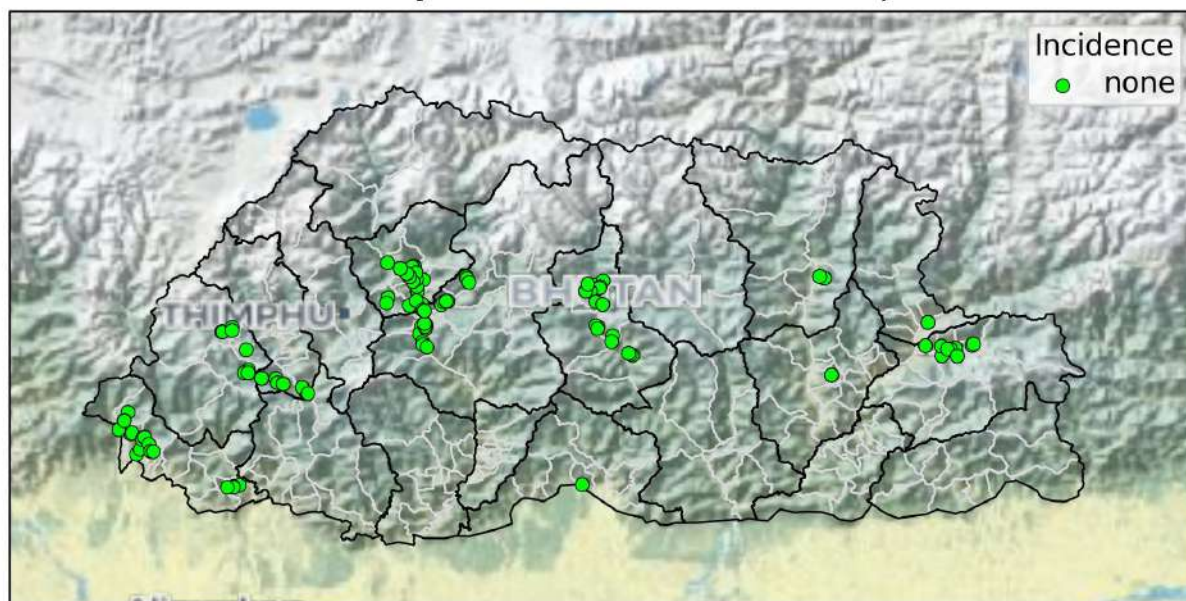


Yellow rust surveys Bhutan Feb 10 2025 - Apr 23 2025

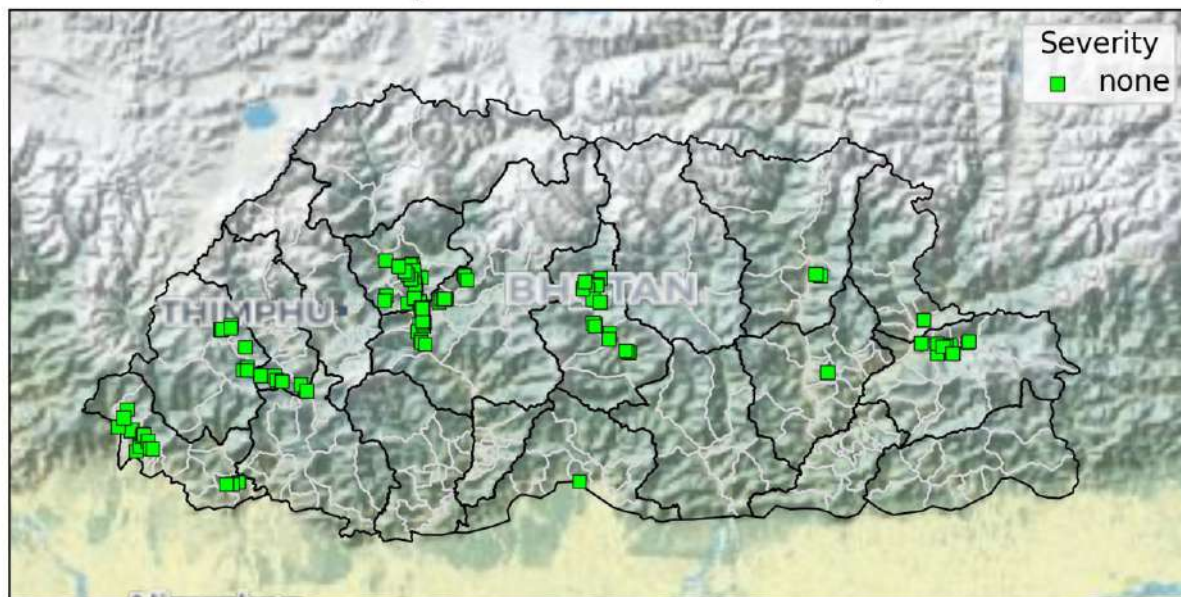


Map 2: Stripe Rust incidence (top) and severity (bottom) in Bhutan field surveys Feb 10 2025 - Apr 23 2025

Stem rust surveys Bhutan Feb 10 2025 - Apr 23 2025



Stem rust surveys Bhutan Feb 10 2025 - Apr 23 2025



Map 3: Stem Rust incidence (top) and severity (bottom) in Bhutan field surveys Feb 10 2025 - Apr 23 2025

Spore dispersal forecasts

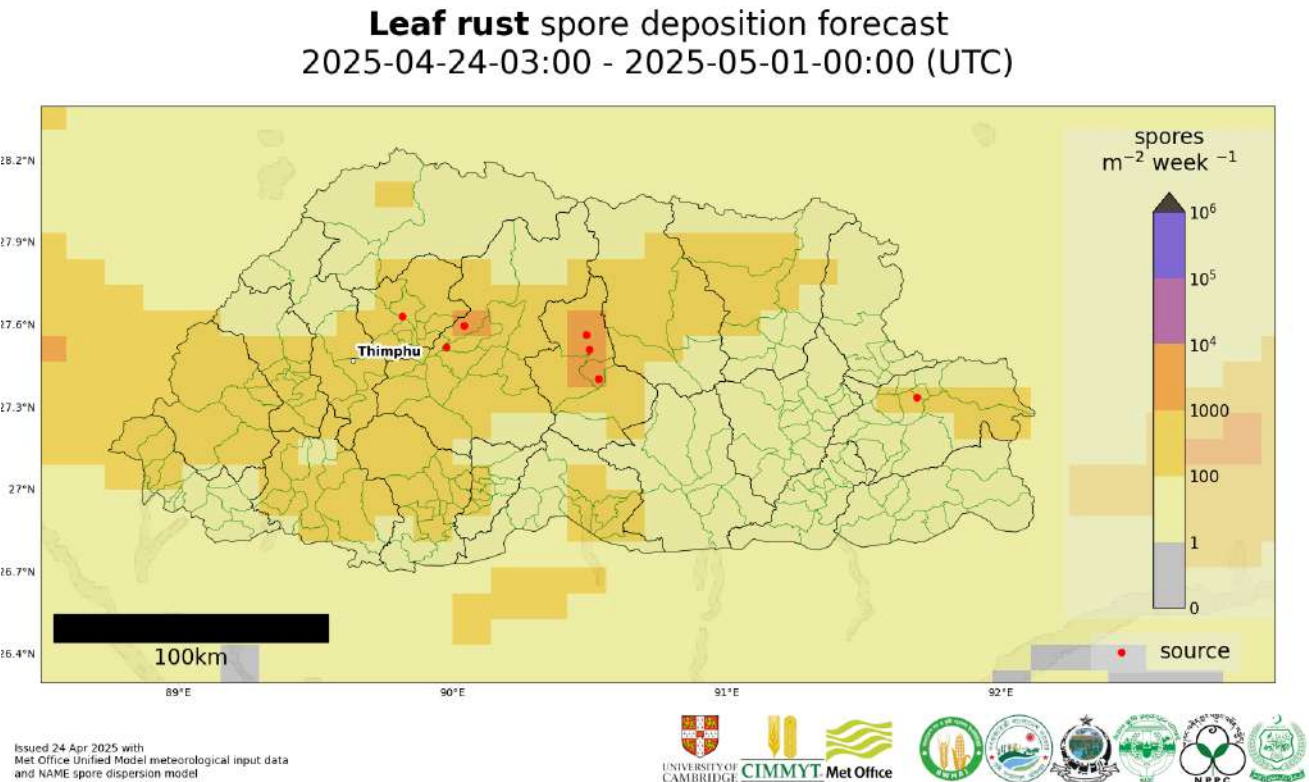
Spore dispersal forecasts run by the UK Met Office and Cambridge University are displayed for stem, stripe and leaf rusts for the forecasted period. Surveys in each district are gathered to provide a single source per administrative area for dispersal forecasts (red dots in figure).

Environmental / climatic suitability for infection forecasts

These forecasts 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 (24 Apr - 30 Apr) indicates dispersal in an easterly direction. Some spore deposition forecast from infected sites in Nepal .



Map 4: Leaf rust spore deposition forecast Bhutan 24 Apr - 30 Apr 2025

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

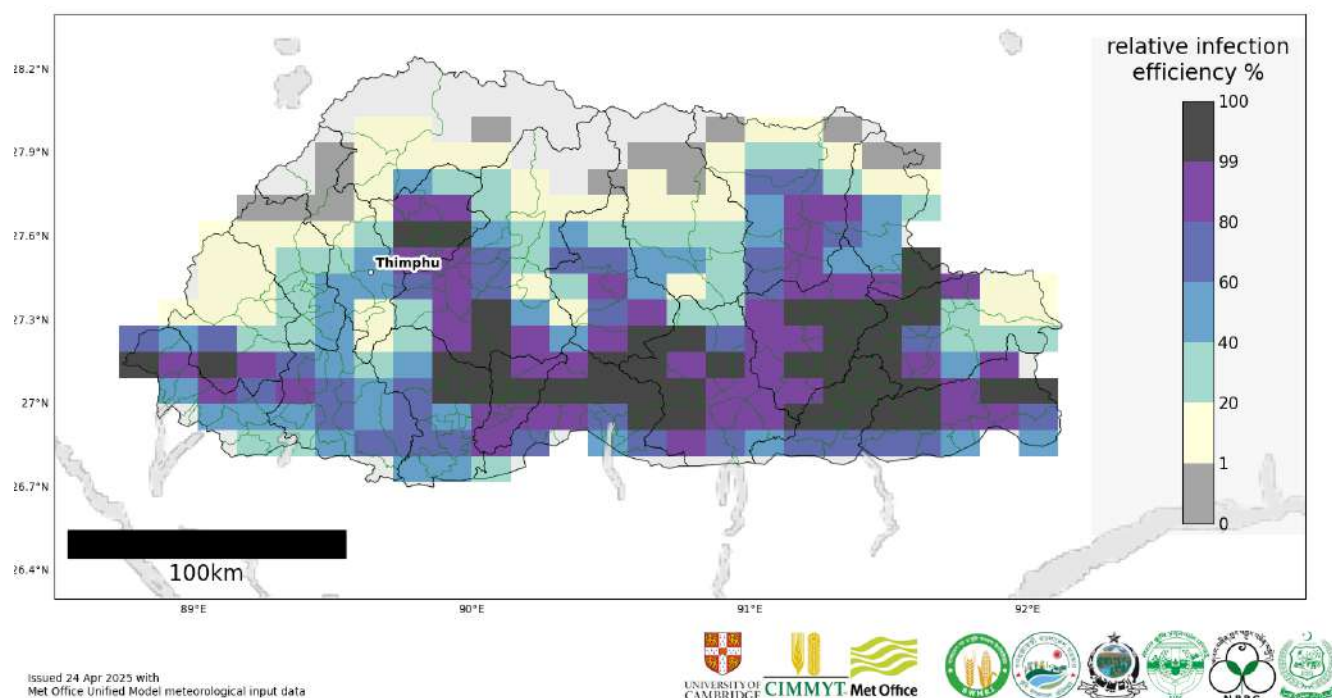
admin2Name	admin1Name	Leaf rust spores per m^2 per week
Dragteng	Trongsa	2700
Nubi	Trongsa	2000
Tangsibji	Trongsa	1800
Shengabjimi	Punakha	1000
Langthil	Trongsa	530
Nyisho	Wangduephodrang	480
Chhoekhor	Bumthang	430
Dangchhu	Wangduephodrang	430
Toewang	Punakha	340
Lingmukha	Punakha	330
Phangyuel	Wangduephodrang	330
Dzoma	Punakha	330
Chhubu	Punakha	310
Kazhi	Wangduephodrang	290
Guma	Punakha	270
Sephu	Wangduephodrang	250

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Bapisa	Punakha	240
Toepisa	Punakha	230
Talo	Punakha	220
Dagala	Thimphu	220

Risk of infection: Current forecast (24 – 29 Apr) indicates similar high suitability to the last advisory. Very high infection efficiency forecast in southern areas and valleys of central-west and east.

Infection efficiency of Wheat **Leaf rust** spores 2025-04-24-00:00 - 2025-04-30-00:00 (UTC)



Map 5: Leaf rust suitability for infection forecast Bhutan 24 Apr - 29 Apr 2025

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

admin2Name	admin1Name	RIE_leaf_rust_%
Zobel	Pemagatshel	100
Kengkhar	Monggar	100
Chongshing	Pemagatshel	100
Thangrong	Monggar	100
Shumer	Pemagatshel	100
Gomdar	Samdrupjongkhar	100
Tsirangtoe	Tsirang	100
Chaskhar	Monggar	100
Gosarling	Tsirang	100
Udzorong	Trashigang	100
Shemjong	Tsirang	100
Toetsho	Yangtse	100

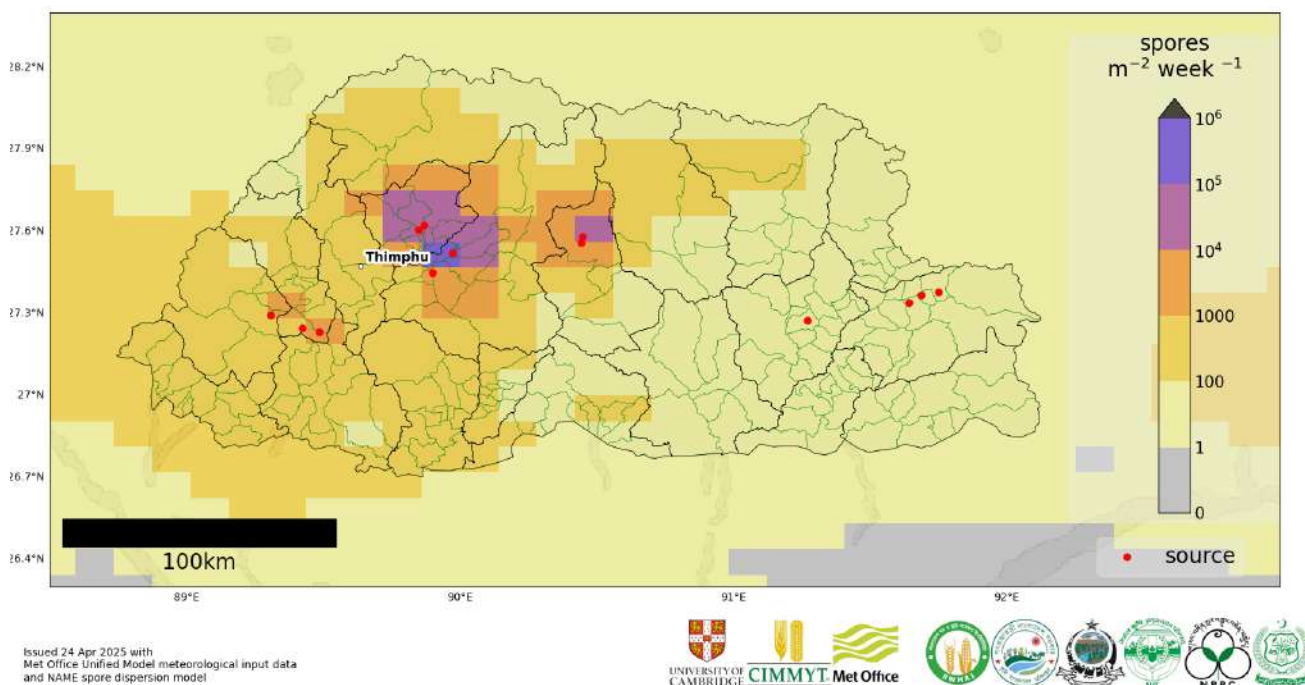
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Yurung	Pemagatshel	100
Ramjar	Yangtse	100
Narang	Monggar	100
Nanong	Pemagatshel	100
Lajab	Dagana	100
Bartsham	Trashigang	100
Lingmukha	Punakha	99
Phangyuel	Wangduephodrang	99

Stripe rust

Dispersal: Current forecast (24 Apr - 30 Apr) indicates dispersal in an easterly direction. Some spore deposition forecast from infected in Nepal. Highest spore deposition close to sources, especially Punakha.

Stripe rust spore deposition forecast 2025-04-24-03:00 - 2025-05-01-00:00 (UTC)



Map 6: Stripe rust spore deposition forecast Bhutan 24 Apr - 30 Apr 2025

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

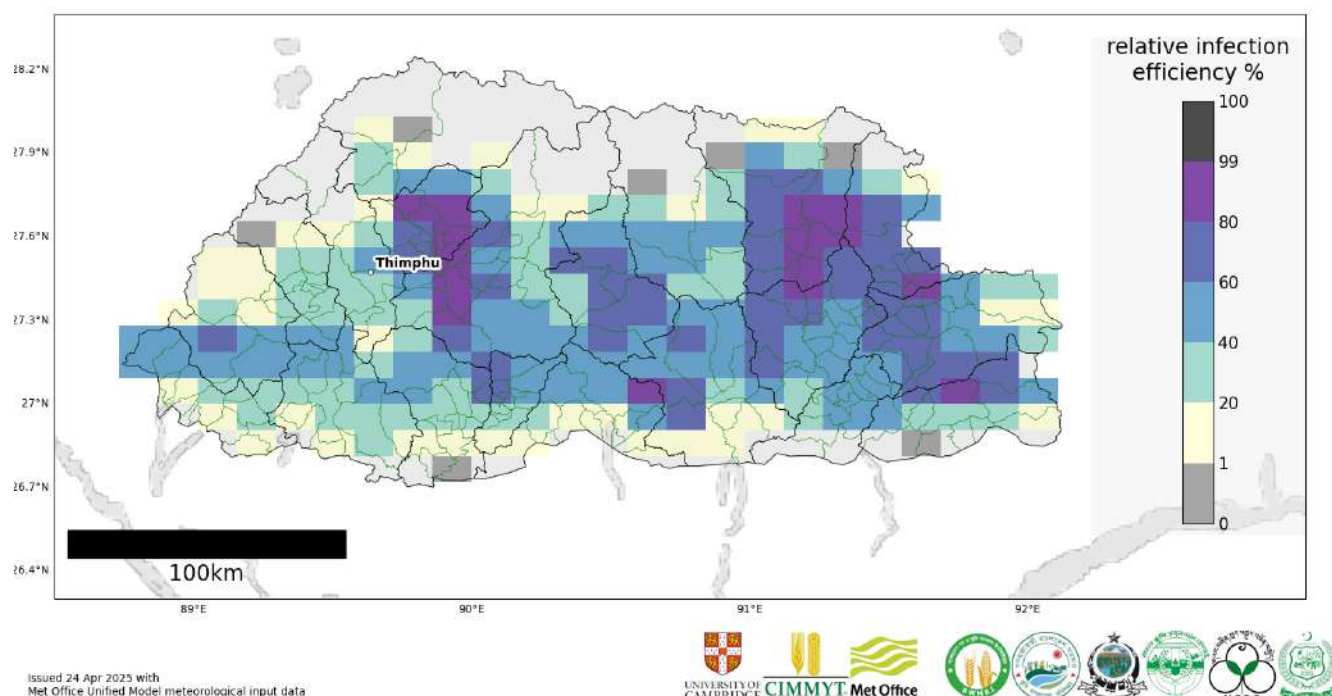
admin2Name	admin1Name	Stripe rust spores per m ² per week
Dzoma	Punakha	120000
Lingmukha	Punakha	120000
Phangyuel	Wangduephodrang	120000
Bapisa	Punakha	81000
Guma	Punakha	68000
Thedtsho	Wangduephodrang	56000
Shengabjimi	Punakha	47000
Bjena	Wangduephodrang	46000
Nahi	Wangduephodrang	42000
Nyisho	Wangduephodrang	37000
Ruepisa	Wangduephodrang	34000
Chhubu	Punakha	33000
Kazhi	Wangduephodrang	24000
Talo	Punakha	16000
Toewang	Punakha	13000
Toepisa	Punakha	8200

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Kabjisa	Punakha	7500
Dangchhu	Wangduephodrang	5500
Gangte	Wangduephodrang	4800
Goenshari	Punakha	4700

Risk of infection: Current forecast (24 – 29 Apr) indicates similar / slightly decreased suitability since the last advisory. High to moderate infection efficiency across most/all of the wheat growing areas.

Infection efficiency of Wheat **Stripe rust** spores 2025-04-24-00:00 - 2025-04-30-00:00 (UTC)



Map 7: Stripe rust suitability for infection forecast Bhutan 24 Apr - 29 Apr 2025

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

admin2Name	admin1Name	RIE_stripe_rust_%
Ramjar	Yangtse	84
Lingmukha	Punakha	83
Dzoma	Punakha	83
Phangyuel	Wangduephodrang	83
Minjay	Lhuentse	82
Menbi	Lhuentse	81
Chhubu	Punakha	80
Tsenkhar	Lhuentse	80
Theedtsho	Wangduephodrang	78
Toetsho	Yangtse	77
Tsamang	Monggar	76
Ruepisa	Wangduephodrang	75

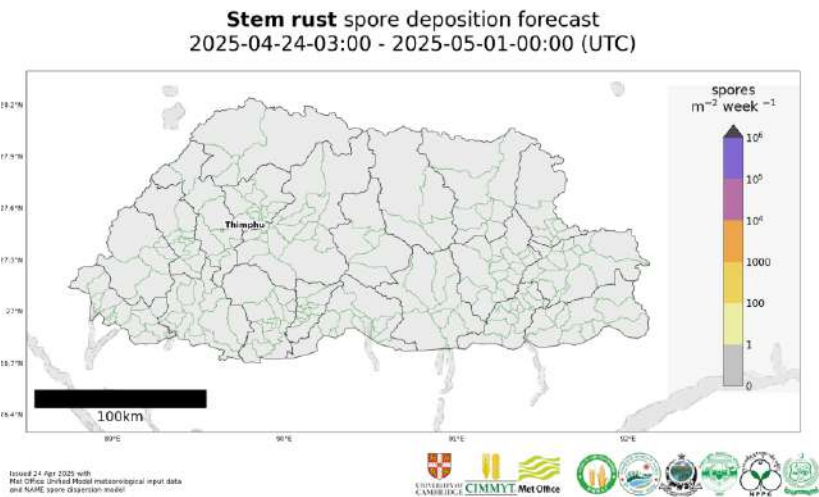
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Tsakaling	Monggar	75
Tomzhangtshen	Yangtse	75
Khamdang	Yangtse	75
Jamkhar	Yangtse	75
Bjena	Wangduephodrang	74
Bartsham	Trashigang	74
Bapisa	Punakha	74
Guma	Punakha	74

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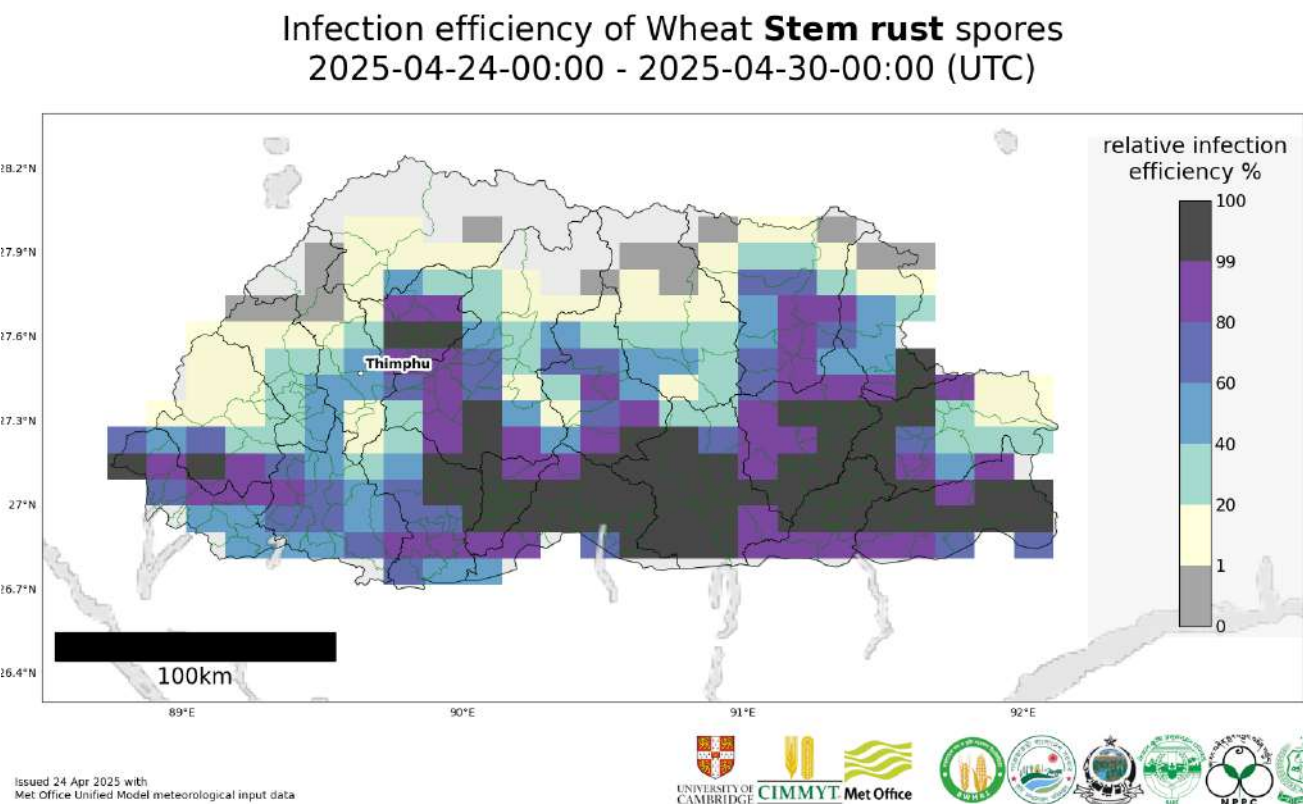
Stem rust

Dispersal: Current forecast (24 Apr - 30 Apr) indicates no dispersal as no reports of stem rust.



Map 8: Stem rust spore deposition forecast Bhutan 24 Apr - 30 Apr 2025

Risk of infection: Current forecast (24 - 29 Apr) indicates similar high suitability to the last advisory. Very high infection efficiency across southern areas, and the main valleys.



Map 9: Stem rust suitability for infection forecast Bhutan 24 Apr - 29 Apr 2025

The 20 most impacted districts per country are presented in the table below.

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admin2Name	admin1Name	RIE_stem_rust_%
Zobel	Pemagatshel	100
Gosarling	Tsirang	100
Chongshing	Pemagatshel	100
Tsangkha	Dagana	100
Toetsho	Yangtse	100
Dunglegang	Tsirang	100
Dungmin	Pemagatshel	100
Thangrong	Monggar	100
Narang	Monggar	100
Shumer	Pemagatshel	100
Gomdar	Samdrupjongkhar	100
Gozhing	Zhemgang	100
Chhimung	Pemagatshel	100
Shemjong	Tsirang	100
Jurmey	Monggar	100
Kengkhar	Monggar	100
Kikorthang	Tsirang	100
Rangthangling	Tsirang	100
Lajab	Dagana	100
Ramjar	Yangtse	100

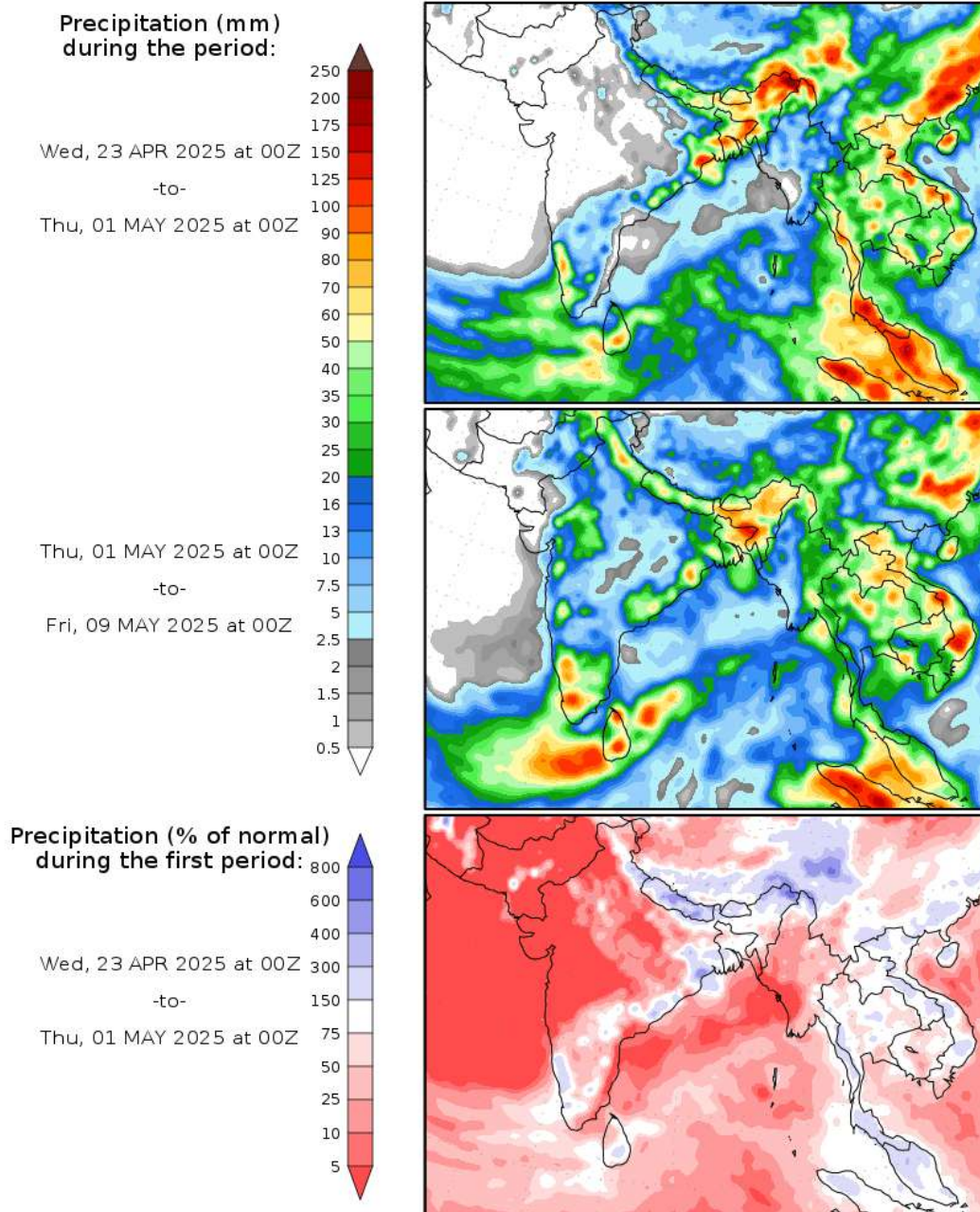
Region-wide Forecasts

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 23 Apr – 1 May, rain forecast across Bhutan, Bangladesh, Nepal, north west India, southern/eastern India and northern Pakistan. During 1 – 9 May, continued rain forecast for same areas, plus all of India and most of Pakistan (except south).

Precipitation Forecasts



Precipitation forecasts from the National Centers for Environmental Prediction.
Normal rainfall derived from Xie-Arkin (CMA) Monthly Climatology for 1979-2003.
Forecast Initialization Time: 00Z23APR2025

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Temperature: During the period 23 Apr – 1 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.

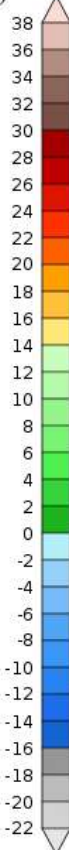
Temperature Forecasts

Mean Surface Temperature (°C)
during the period:

Wed, 23 APR 2025 at 00Z

-to-

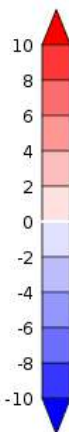
Thu, 01 MAY 2025 at 00Z



Thu, 01 MAY 2025 at 00Z

-to-

Fri, 09 MAY 2025 at 00Z

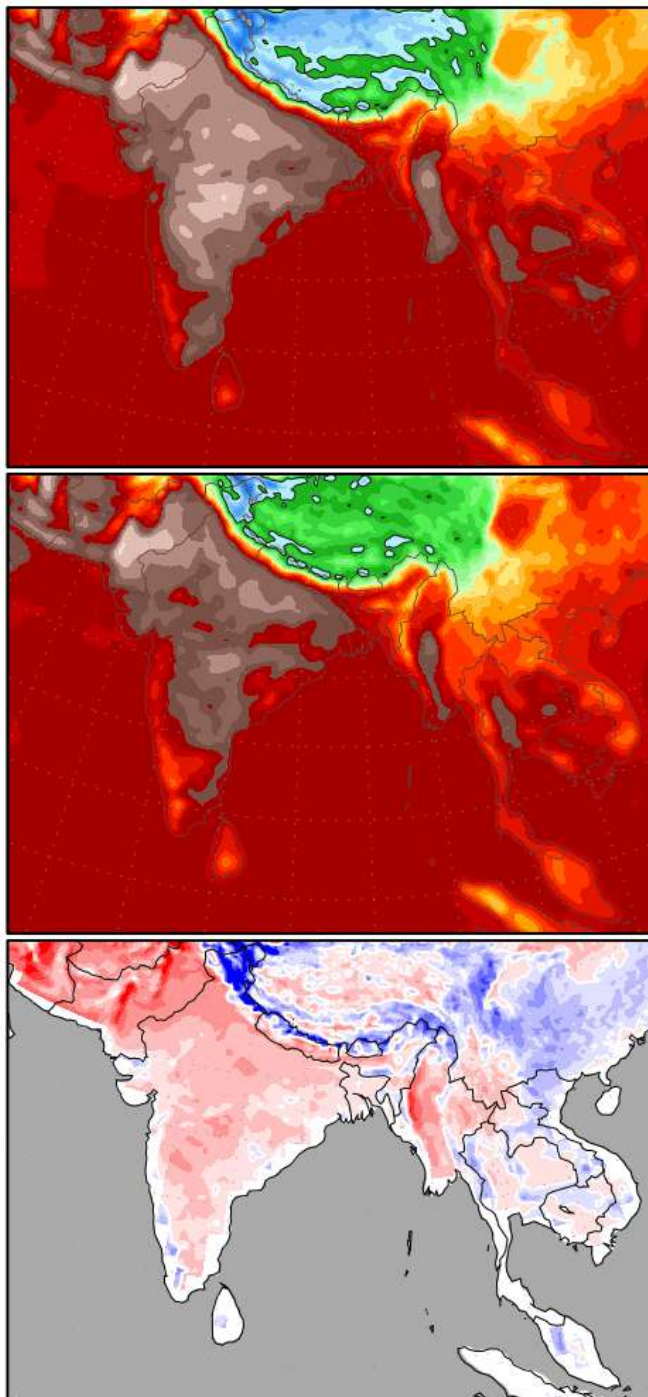


Temperature Anomaly
during the first period:

Wed, 23 APR 2025 at 00Z

-to-

Thu, 01 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: 00Z23APR2025