



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

Summary period: 26 Mar - 01 Apr 2025

Overall risk level:

Caution

Key messages

Surveys have been undertaken in the southwest of Bhutan, Trongsa, Punakha / Wangdue and are on-going in the east. Leaf and stripe rust are present, with high incidence/ severity of stripe rust in some fields in Punakha valley. Crops are still at an early stage (tillering - flowering) of development. Given continuing suitability and presence of susceptible cultivars, stripe rust is likely to increase in Punakha/Wangdue and potentially other areas.

Increasing disease is starting to be detected in neighboring countries (Bangladesh (leaf rust) and Nepal Leaf and stripe rust)). Forecasts indicate continued possibility for spore dispersal into Bhutan, especially the western / southern (central) areas.

Suitability forecast (26 – 31 Mar) for leaf, stripe and stem rust indicates a marked increase in infection efficiency from the last advisory. High / moderate infection efficiency is forecast in southern areas and notably the main valleys. Light rain is forecast for Bhutan during the period 26 Mar – 3 Apr and this is likely to increase in most areas during 3 – 11 April. Temperatures are forecast to be notably warmer.

Given the short term forecasts with 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 advised.

Recommendations

Very close monitoring of fields, particularly for susceptible varieties, is recommended. Forecast weather conditions, and increased potential for spore deposition, indicate that disease development is increasingly likely. Stripe rust may increase and care should be taken to monitor for any possible appearance of stem rust.

Scouting should be undertaken, especially in southern areas and main valleys, and farmers informed to be vigilant for the emergence of rust. Control of stripe rust may be needed on susceptible cultivars in the Punakha/Wangdue valley.

Wheat rust advisory #7 2025

- 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.

Wheat rust advisory #7 2025

Field surveys

Surveys undertaken Feb 10 2025 - Mar 25 2025. A total of 72 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 6 out of 72 fields surveyed (8%). Moderate to high incidence of leaf rust has been seen in 3 fields (50% of infected fields). Moderate to high severity of leaf rust has been seen in 1 fields (17% of infected fields).

Stripe Rust reported from 31 out of 72 fields surveyed (43%). Moderate to high incidence of stripe rust has been seen in 20 fields (65% of infected fields). Moderate to high severity of stripe rust has been seen in 13 fields (42% of infected fields).

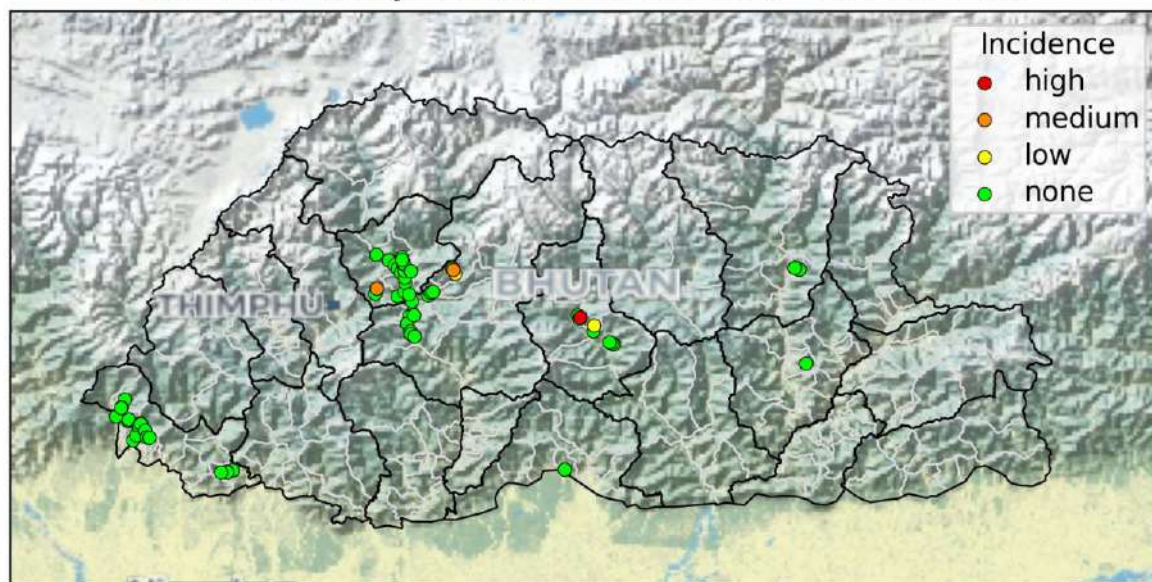
Table 1: Variety analysis of surveys.

Variety	Number of surveys	Number of surveys reporting infection of		
		stem rust	stripe rust	leaf rust
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	53	n/a	26	4

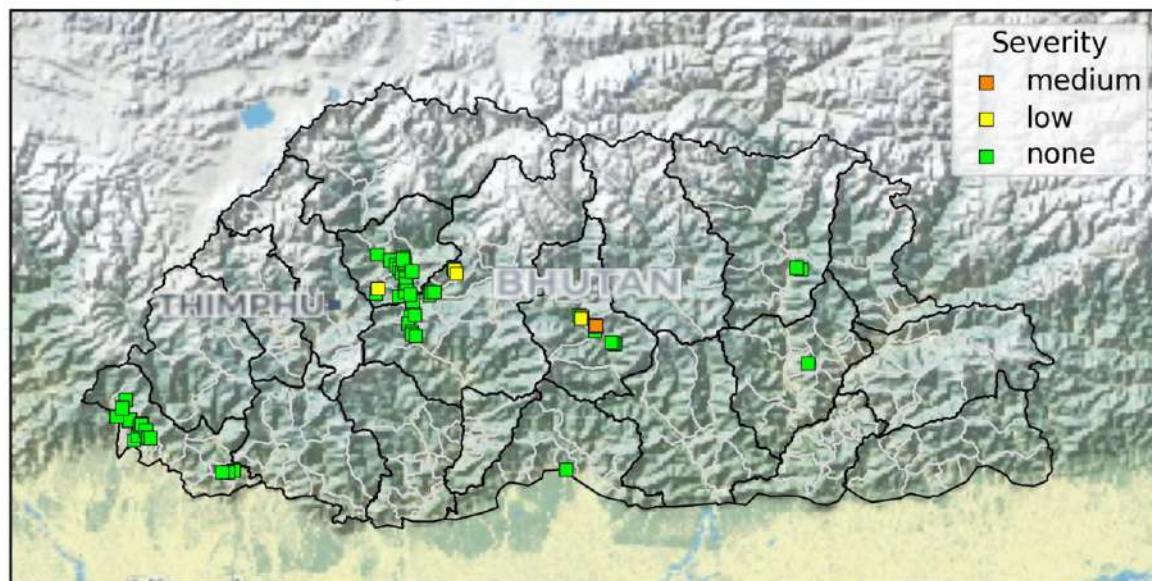
Table 2: Growth stage analysis of surveys conducted in the last week (since Mar 19 2025).

Country	Number of surveys in the last week that observed wheat growth stage:									
	tillering	boot	heading	flowering	milk	dough	maturity	NA	na	n/a
Bhutan	0	1	0	3	0	0	1	0	0	0

Leaf rust surveys Bhutan Feb 10 2025 - Mar 25 2025

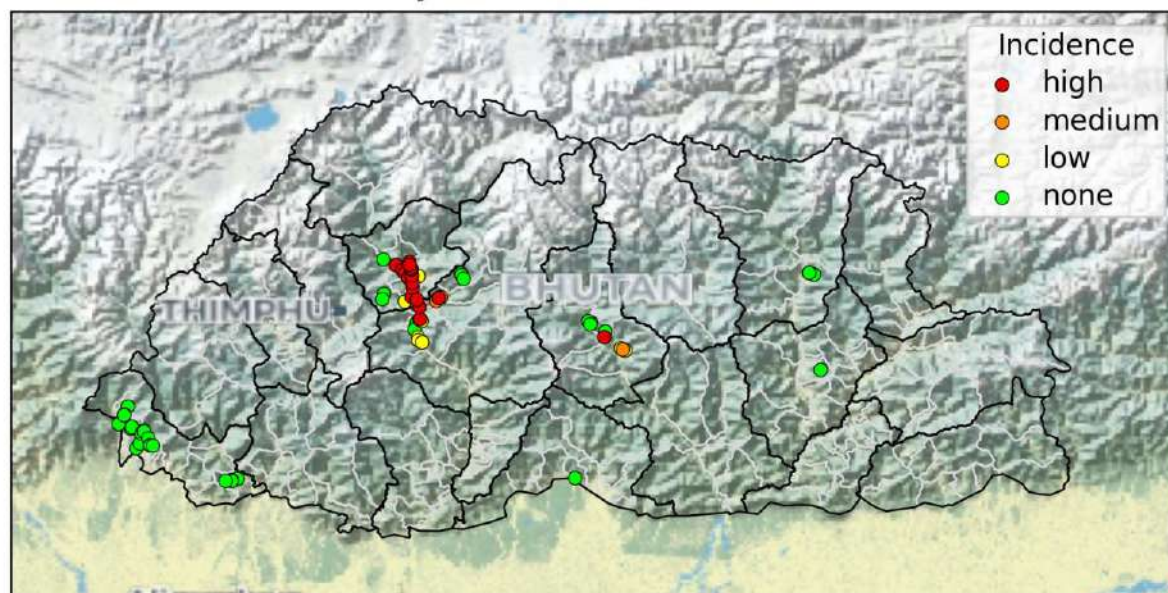


Leaf rust surveys Bhutan Feb 10 2025 - Mar 25 2025

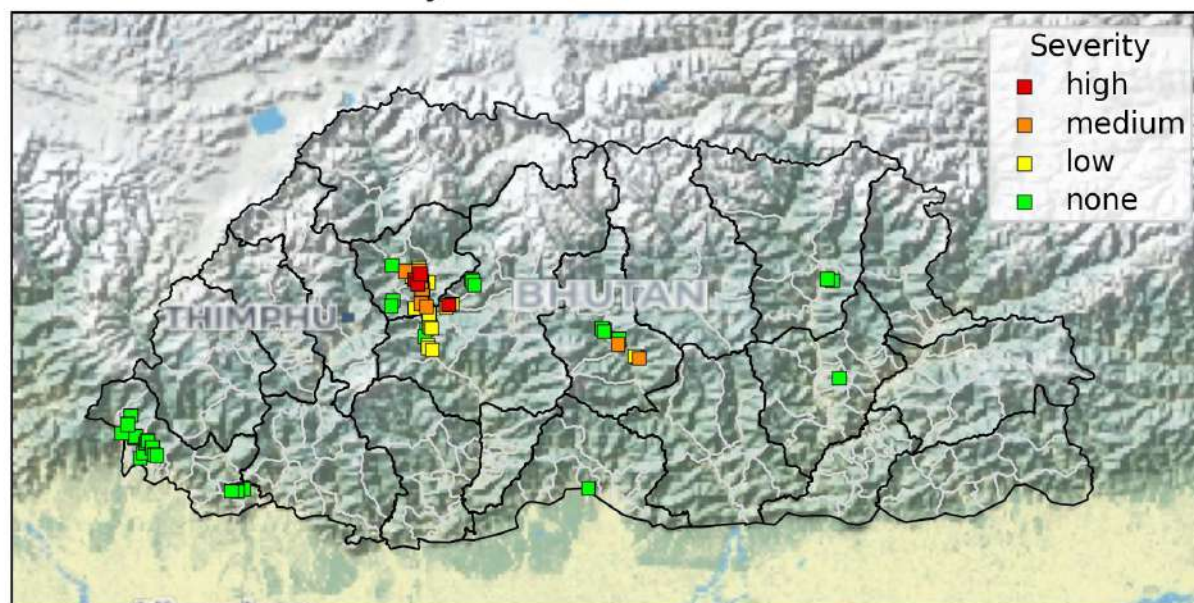


Map 1: Leaf Rust incidence (top) and severity (bottom) in Bhutan field surveys Feb 10 2025 - Mar 25 2025

Yellow rust surveys Bhutan Feb 10 2025 - Mar 25 2025

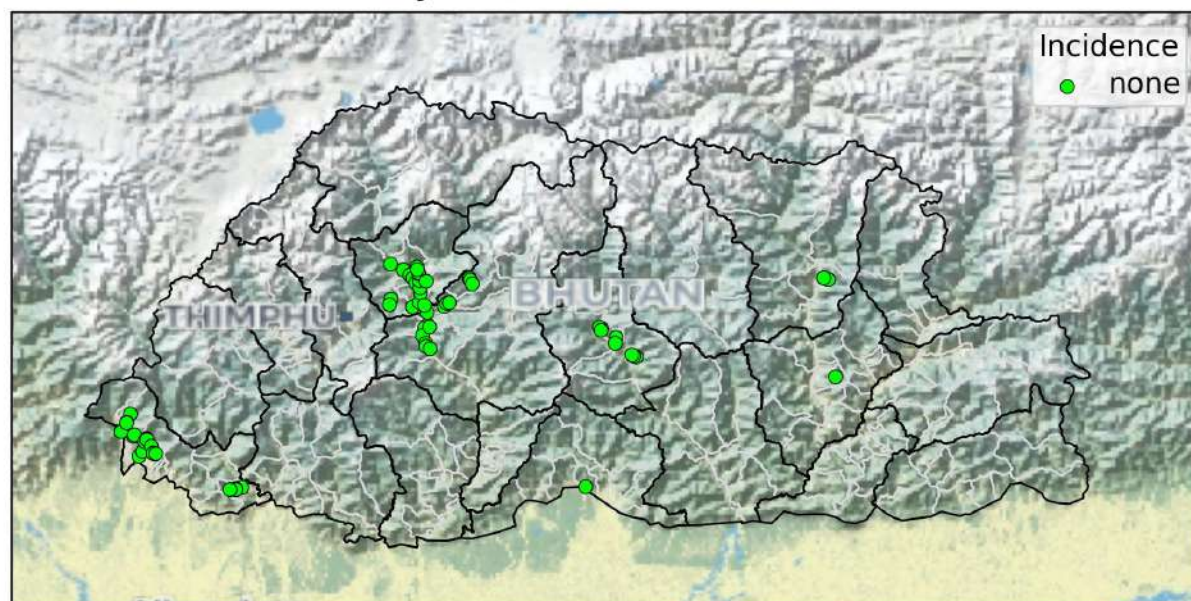


Yellow rust surveys Bhutan Feb 10 2025 - Mar 25 2025

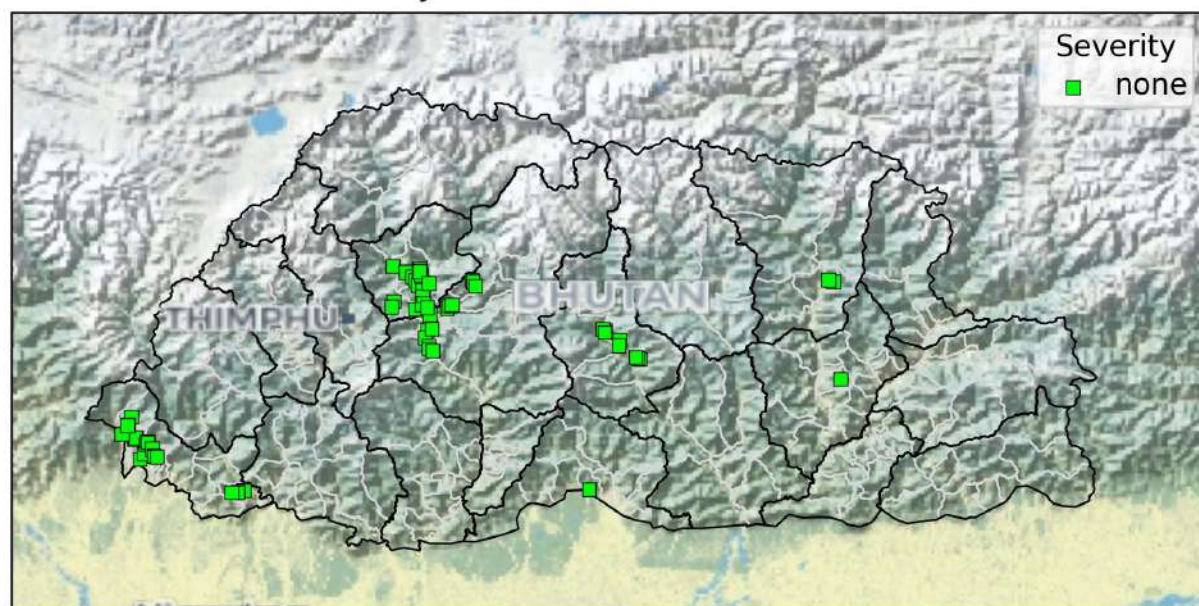


Map 2: Stripe Rust incidence (top) and severity (bottom) in Bhutan field surveys Feb 10 2025 - Mar 25 2025

Stem rust surveys Bhutan Feb 10 2025 - Mar 25 2025



Stem rust surveys Bhutan Feb 10 2025 - Mar 25 2025



Map 3: Stem Rust incidence (top) and severity (bottom) in Bhutan field surveys Feb 10 2025 - Mar 25 2025

Spore dispersal forecasts

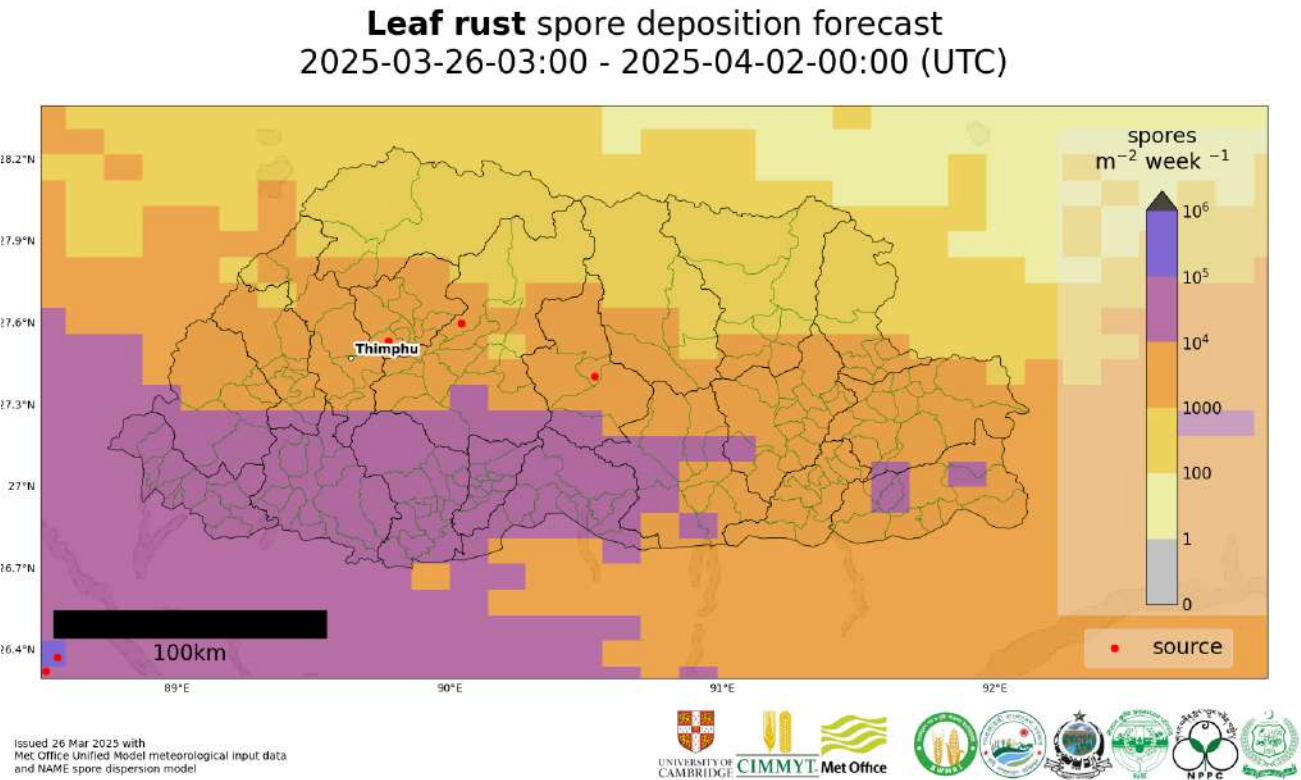
Spore dispersal forecasts run by the UK Met Office and Cambridge University are displayed for stem, stripe and leaf rusts for the forecasted period. Surveys in each district are gathered to provide a single source per administrative area for dispersal forecasts (red dots in figure).

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 (26 Mar - 01 Apr) indicates dispersal in an easterly direction. Considerable potential for spore deposition from infected sites in Nepal, especially in southwest of Bhutan.



Map 4: Leaf rust spore deposition forecast Bhutan 26 Mar - 01 Apr 2025

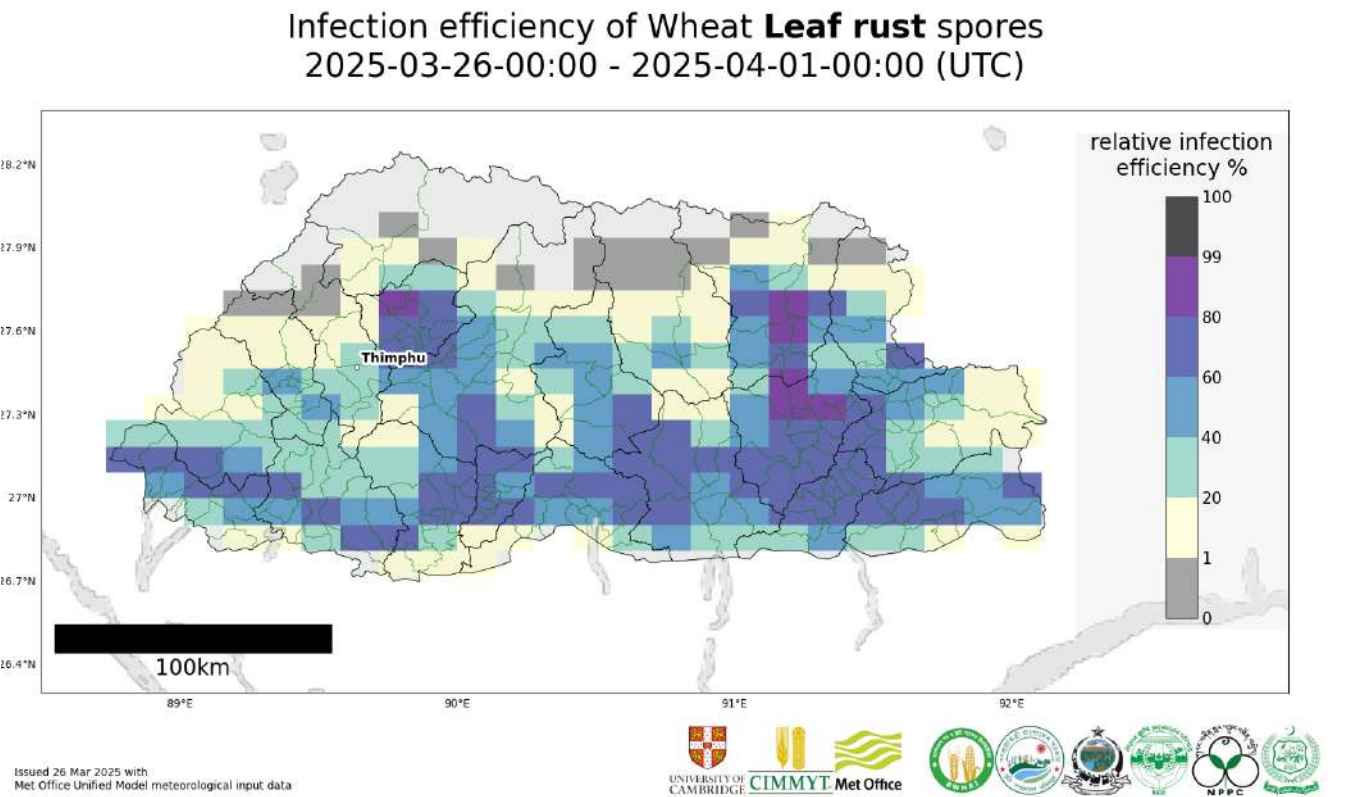
The 20 most impacted districts (spore deposition) per country are presented in the table below.

admin2Name	admin1Name	Leaf rust spores per m^2 per week
Sipsu	Samtse	57000
Ugentse	Samtse	56000
Yoeseltse	Samtse	54000
Chengmari	Samtse	54000
Biru	Samtse	54000
Chargharay	Samtse	53000
Tendu	Samtse	51000
Namgyel Chhoeling	Samtse	49000
Dungtoe	Samtse	49000
Dorokha	Samtse	48000
Samtse	Samtse	46000
Bara	Samtse	44000
Pagli	Samtse	40000
Tading	Samtse	38000
Denchhukha	Samtse	37000
Gakiling	Haa	37000

Wheat rust advisory #7 2025

Phuentsholing	Chhukha	35000
Logchina	Chhukha	34000
Samphelling	Chhukha	32000
Bongo	Chhukha	31000

Risk of infection: Current forecast (26 – 31 Mar) indicates increased suitability from the last advisory. High to moderate infection efficiency in southern areas and valleys of central-west and east.



Map 5: Leaf rust suitability for infection forecast Bhutan 26 Mar - 31 Mar 2025

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

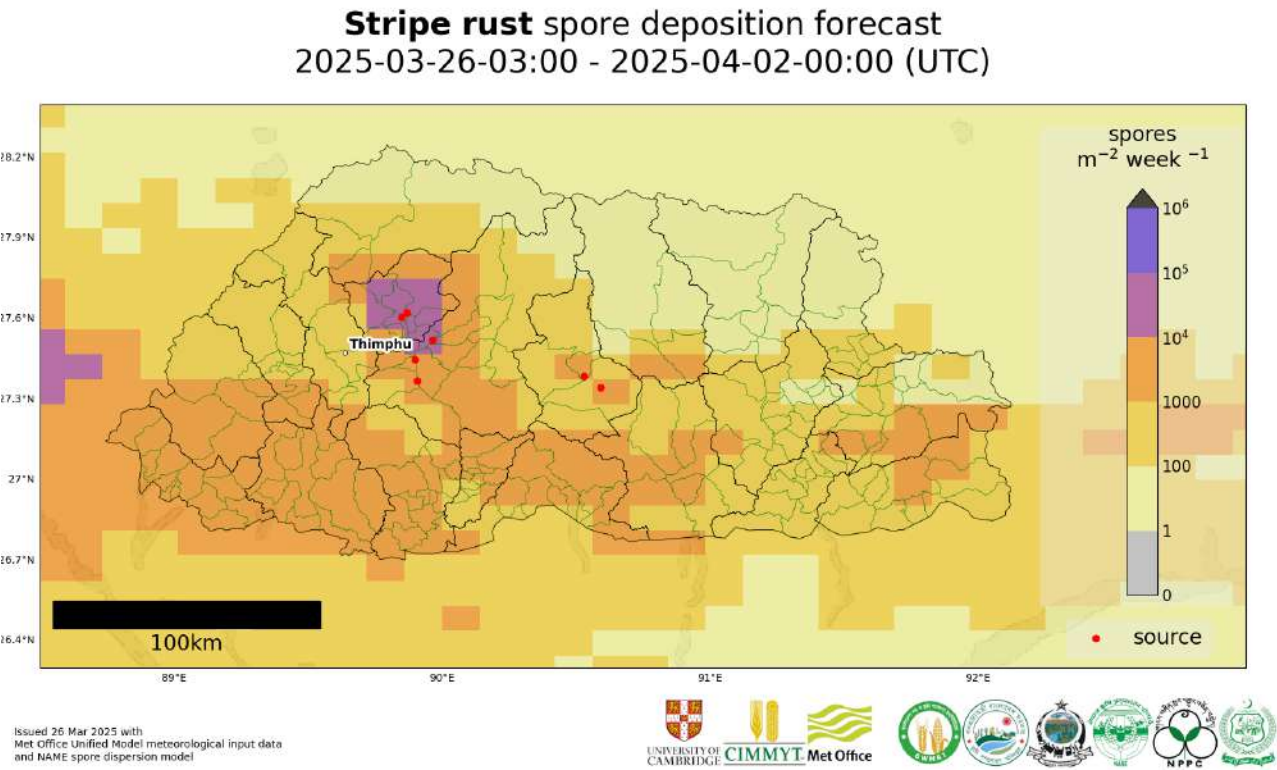
admin2Name	admin1Name	RIE_leaf_rust_%
Menbi	Lhuentse	83
Chhubu	Punakha	78
Chhali	Monggar	77
Mongar	Monggar	76
Tsakaling	Monggar	75
Chaskhar	Monggar	75
Kengkhar	Monggar	74
Thangrong	Monggar	74
Jurmey	Monggar	73
Drepung	Monggar	73
Ngatshang	Monggar	73
Narang	Monggar	73

Wheat rust advisory #7 2025

Talo	Punakha	71
Minjay	Lhuentse	71
Udzorong	Trashigang	70
Zobel	Pemagatshel	70
Yurung	Pemagatshel	70
Shumer	Pemagatshel	70
Guma	Punakha	68
Chongshing	Pemagatshel	68

Stripe rust

Dispersal: Current forecast (26 Mar - 01 Apr) indicates dispersal in an easterly direction. Highest spore deposition close to sources in Punakha. Potential for spore deposition from infected sites in Nepal, especially in West.



Map 6: Stripe rust spore deposition forecast Bhutan 26 Mar - 01 Apr 2025

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

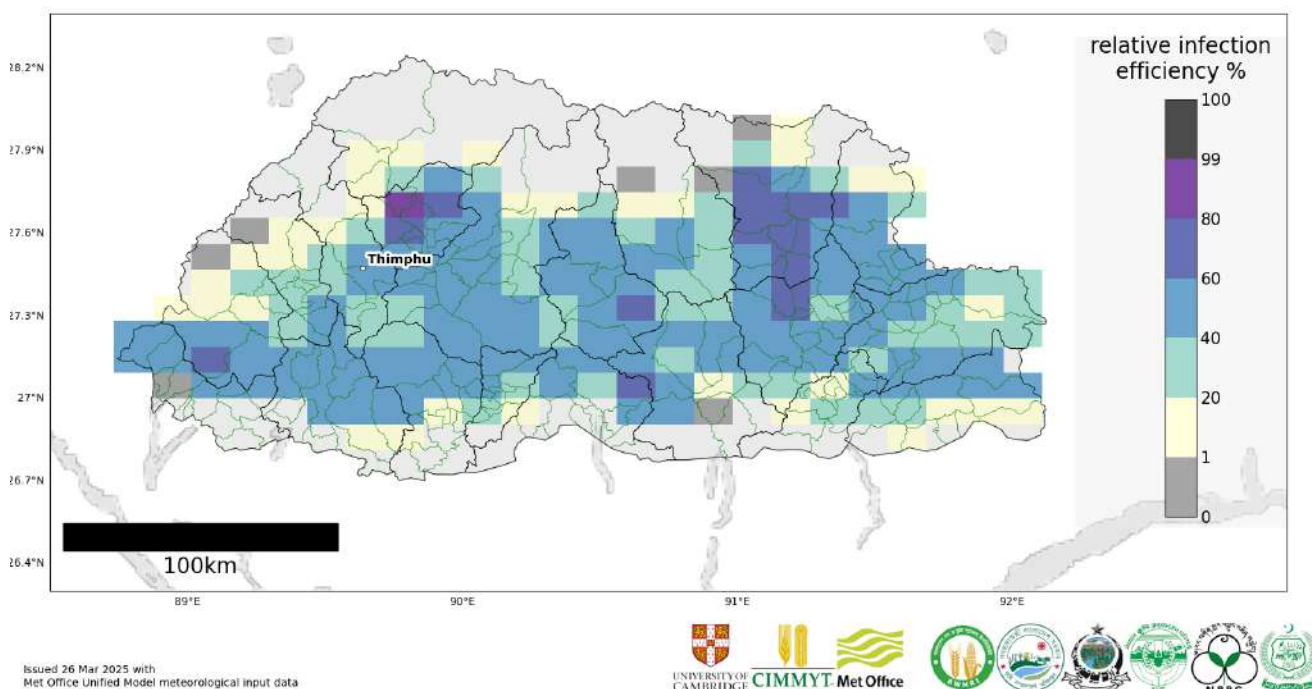
admin2Name	admin1Name	Stripe rust spores per m ² per week
Dzoma	Punakha	51000
Phangyuel	Wangduephodrang	51000
Lingmukha	Punakha	51000
Guma	Punakha	35000
Shengabjimi	Punakha	28000
Chhubu	Punakha	27000
Bapisa	Punakha	27000
Thedtsho	Wangduephodrang	19000
Talo	Punakha	18000
Nahi	Wangduephodrang	14000
Bjena	Wangduephodrang	14000
Ruepisa	Wangduephodrang	13000
Nyisho	Wangduephodrang	12000
Kazhi	Wangduephodrang	11000
Toepisa	Punakha	9400

Wheat rust advisory #7 2025

Toewang	Punakha	9400
Kabjisa	Punakha	8500
Goenshari	Punakha	6100
Biru	Samtse	5700
Geling	Chhukha	5700

Risk of infection: Current forecast (26 – 31 Mar) indicates increased suitability since the last advisory. High to moderate infection efficiency in the main valleys. Highest infection efficiency forecast in Punakha/ Wangdue valley. And in the east.

Infection efficiency of Wheat **Stripe rust** spores 2025-03-26-00:00 - 2025-04-01-00:00 (UTC)



Map 7: Stripe rust suitability for infection forecast Bhutan 26 Mar - 31 Mar 2025

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

admin2Name	admin1Name	RIE_stripe_rust_%
Chhubu	Punakha	73
Menbi	Lhuentse	68
Talo	Punakha	66
Guma	Punakha	62
Minjay	Lhuentse	62
Tsenkhar	Lhuentse	59
Theedtsho	Wangduephodrang	59
Tsamang	Monggar	59
Bapisa	Punakha	59
Lingmukha	Punakha	58

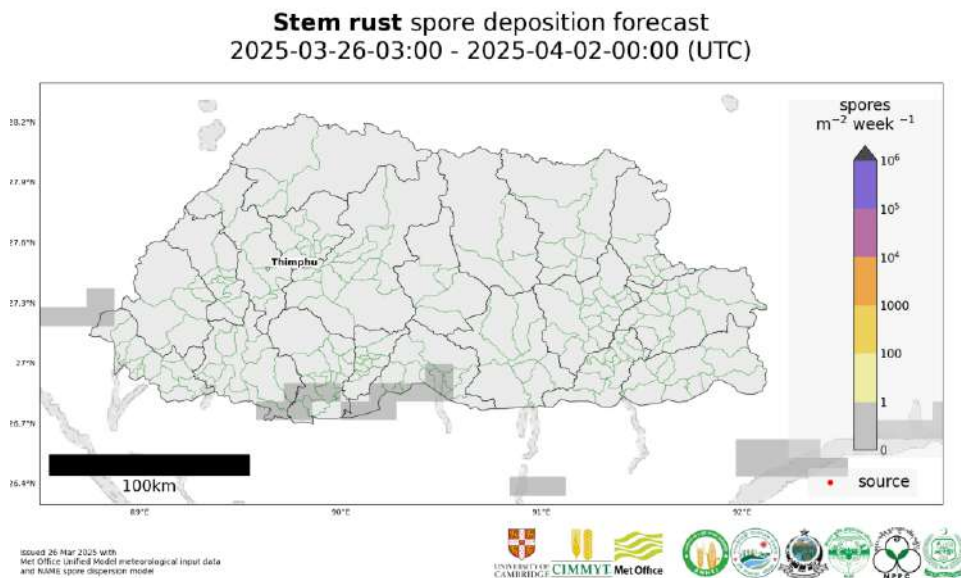
Wheat rust advisory #7 2025

Phangyuel	Wangduephodrang	58
Dzoma	Punakha	58
Nahi	Wangduephodrang	57
Lajab	Dagana	57
Ruepisa	Wangduephodrang	57
Dungtoe	Samtse	57
Toepisa	Punakha	57
Tsakaling	Monggar	55
Gasetsho Gom	Wangduephodrang	55
Bjena	Wangduephodrang	54

Wheat rust advisory #7 2025

Stem rust

Dispersal: Current forecast (26 Mar - 01 Apr) indicates no dispersal as of reports of stem rust.

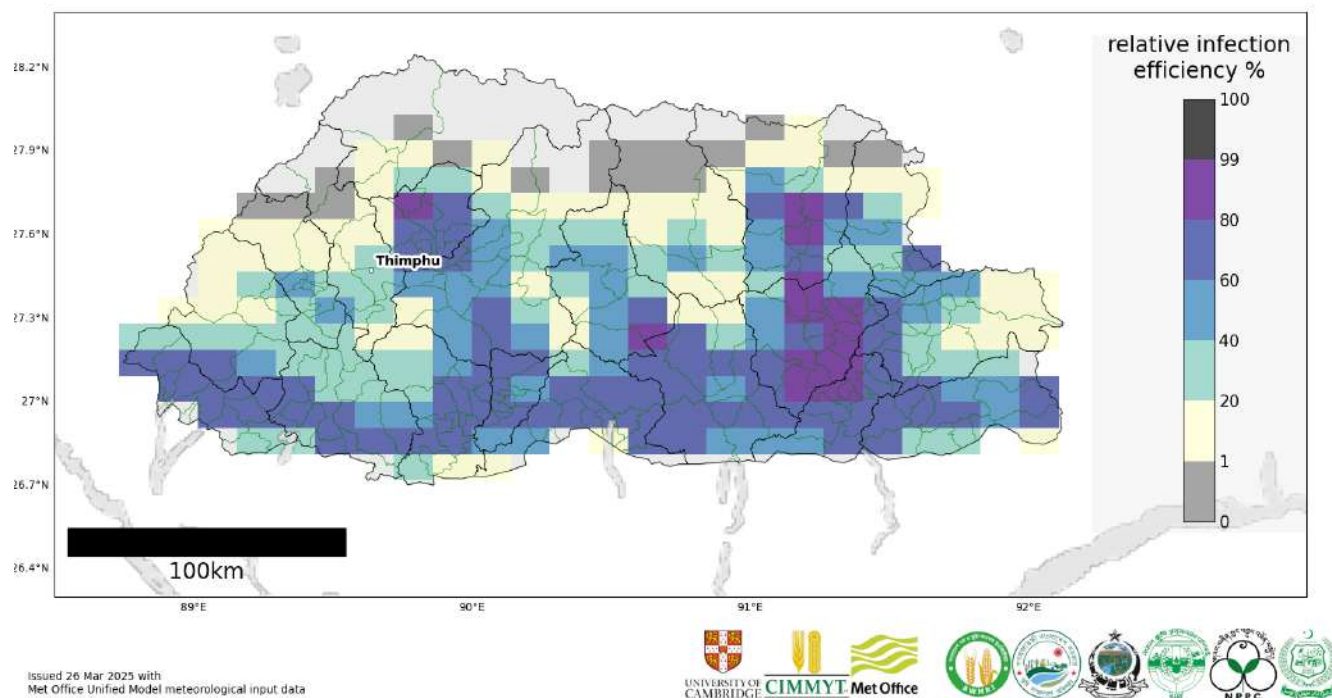


Map 8: Stem rust spore deposition forecast Bhutan 26 Mar - 01 Apr 2025

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

Risk of infection: Current forecast (26 - 31 Mar) indicates increased suitability since the last advisory. High to moderate infection efficiency across southern areas, and the main valleys.

Infection efficiency of Wheat **Stem rust** spores 2025-03-26-00:00 - 2025-04-01-00:00 (UTC)



Map 9: Stem rust suitability for infection forecast Bhutan 26 Mar - 31 Mar 2025

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

admin2Name	admin1Name	RIE_stem_rust_%
Menbi	Lhuentse	83
Kengkhar	Monggar	82
Thangrong	Monggar	82
Jurmey	Monggar	82
Yurung	Pemagatshel	81
Mongar	Monggar	79
Chaskhar	Monggar	78
Drepung	Monggar	78
Chhubu	Punakha	78
Dungmin	Pemagatshel	77
Chhimung	Pemagatshel	77
Chhali	Monggar	77
Zobel	Pemagatshel	76
Tsakaling	Monggar	76
Shumer	Pemagatshel	76
Ngatshang	Monggar	75
Narang	Monggar	75
Chongshing	Pemagatshel	74
Udzorong	Trashigang	74
Gongdue	Monggar	71

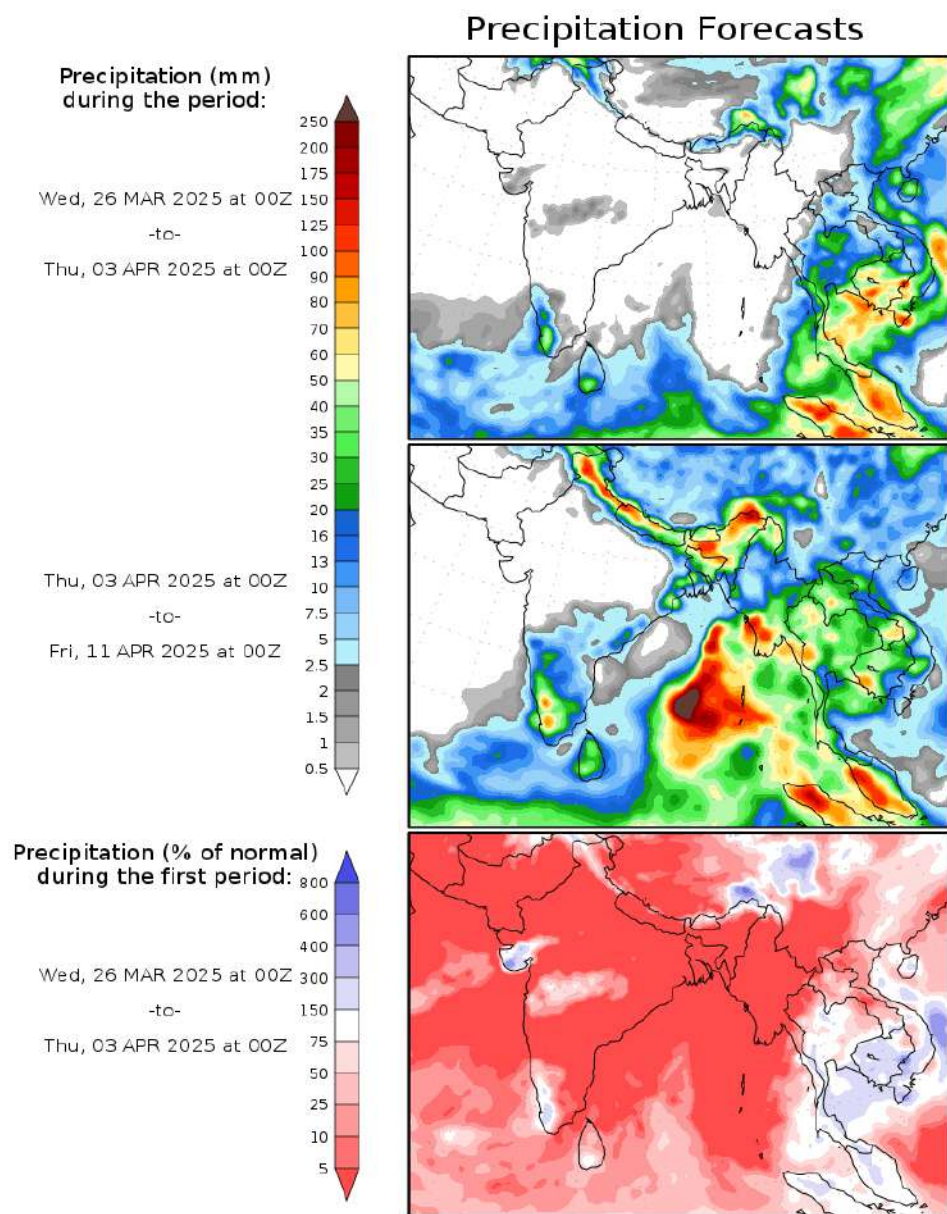
Wheat rust advisory #7 2025

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 26 Mar – 3 Apr, light rain across Bhutan, far north west India and north Pakistan. During 3 –11 April, rain forecast for Bhutan , Bangladesh, Nepal, northwest India northern Pakistan.



Precipitation forecasts from the National Centers for Environmental Prediction.
Normal rainfall derived from Xie-Arkin (CMAP) Monthly Climatology for 1979-2003.
Forecast Initialization Time: 00Z26MAR2025

Wheat rust advisory #7 2025

Temperature: During the period 26 Mar – 3 Apr temperatures are warming considerably across the entire region. Warmer than normal across the region, except for northern Pakistan, north west India, high hills of Nepal.

Temperature Forecasts

Mean Surface Temperature (°C)
during the period:

Wed, 26 MAR 2025 at 00Z

-to-

Thu, 03 APR 2025 at 00Z

Thu, 03 APR 2025 at 00Z

-to-

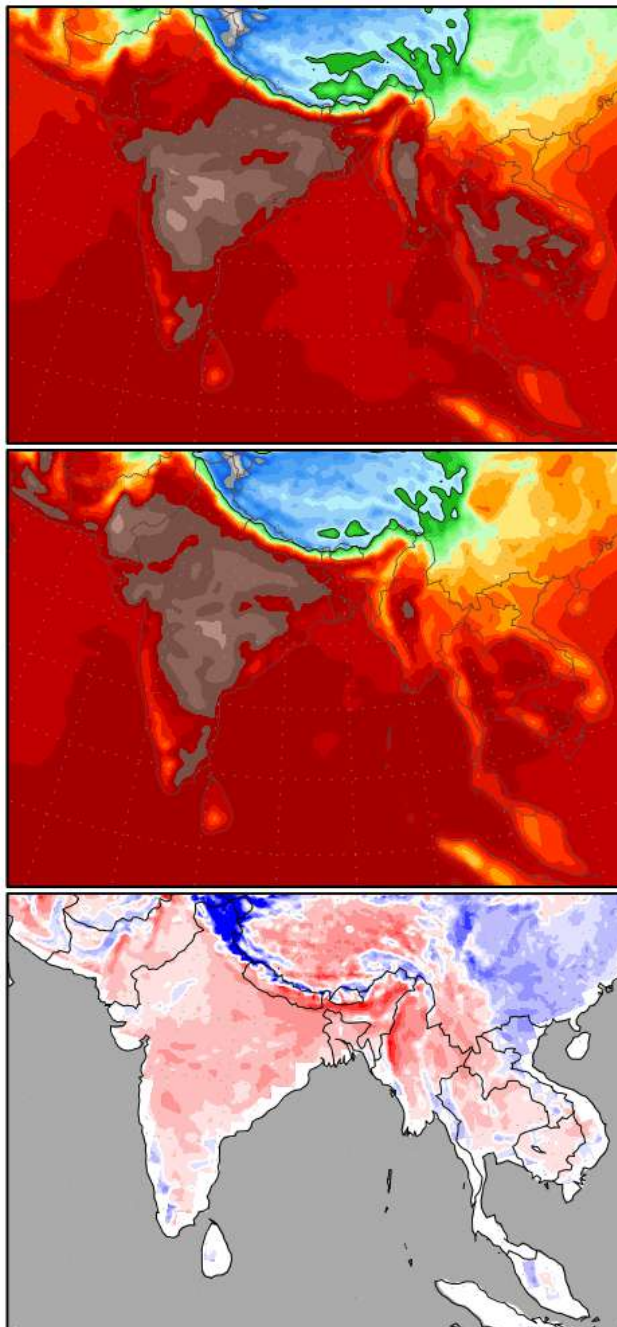
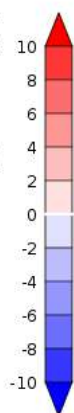
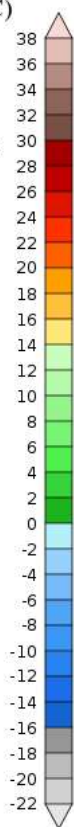
Fri, 11 APR 2025 at 00Z

Temperature Anomaly
during the first period:

Wed, 26 MAR 2025 at 00Z

-to-

Thu, 03 APR 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: 00Z26MAR2025