



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

Summary period: 28 Feb - 06 Mar 2025

Overall risk level:

Caution / Low

Key messages

Surveys have been undertaken in the southwest of Bhutan and Trongsa. Leaf and stripe rust are now starting to appear in Trongsa. Crops are still at an early stage (tillering) of development, but at flowering in some places.

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

Suitability forecast (28 Feb – 3 Mar) for leaf, stripe and stem rust indicates a decrease in infection efficiency. Moderate infection efficiency in southern areas and parts of central-west. Small pockets of high infection efficiency (e.g., Punakha). Some rain is forecast for Bhutan during the period 28 Feb – 8 Mar and this may continue and increase during 8 – 16 Mar. Temperatures are forecast to remain relatively cool.

Given the short term forecasts with some rain, conditions are likely to become suitable for continued disease development.

Recommendations

Very close monitoring of fields, particularly for susceptible varieties, is recommended. Forecast weather conditions indicate that disease development could be possible.

Scouting should be undertaken, especially in southern areas, 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 - Feb 26 2025. A total of 31 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 3 out of 31 fields surveyed (10%). Moderate to high incidence of leaf rust has been seen in 1 fields (33% of infected fields). Moderate to high severity of leaf rust has been seen in 1 fields (33% of infected fields).

Stripe Rust reported from 4 out of 31 fields surveyed (13%). Moderate to high incidence of stripe rust has been seen in 2 fields (50% of infected fields). Moderate to high severity of stripe rust has been seen in 2 fields (50% of infected fields).

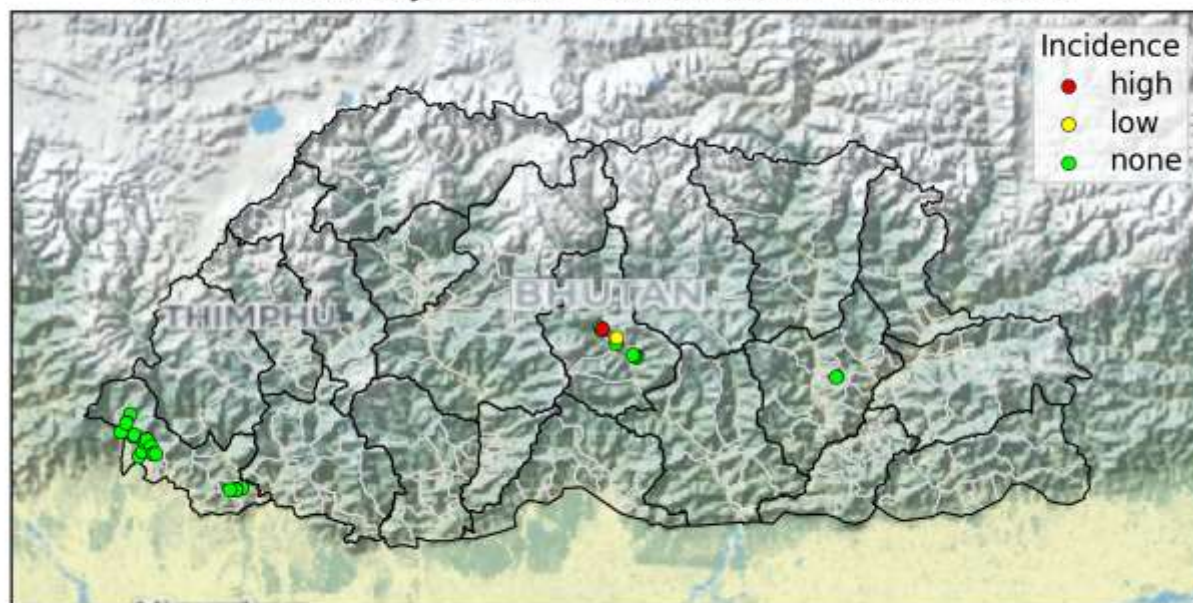
Table 1: Variety analysis of surveys.

Variety	Number of surveys	Number of surveys reporting infection of		
		stem rust	stripe rust	leaf rust
Guma Sokha	8	n/a	0	0
Unknown	23	n/a	4	3

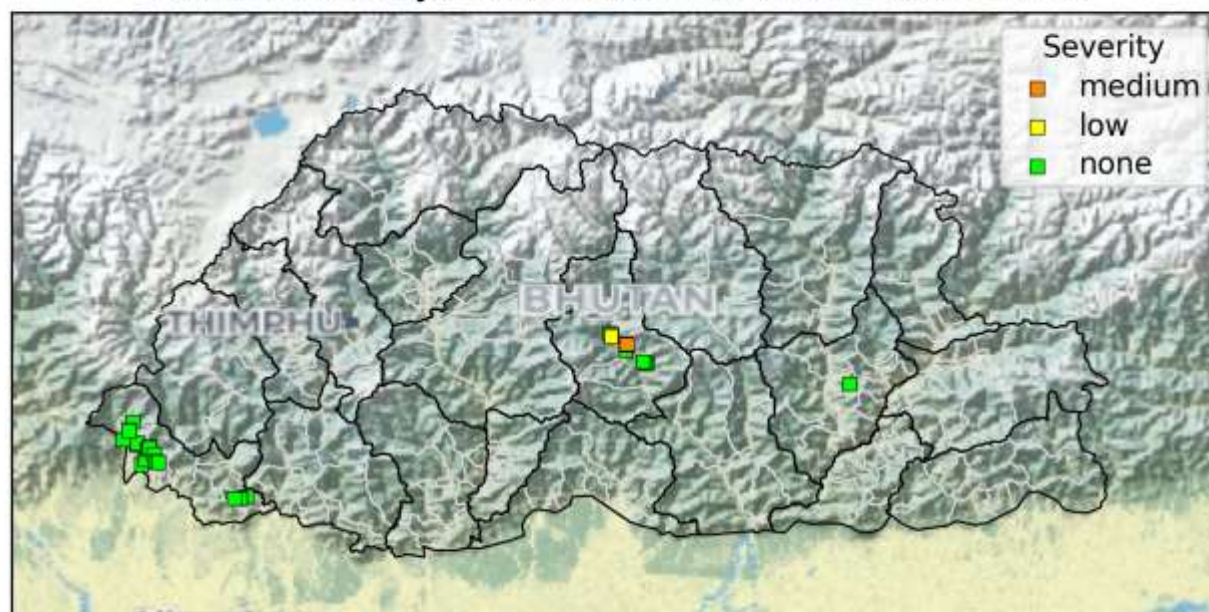
Table 2: Growth stage analysis of surveys conducted in the last week (since Feb 21 2025).

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	2	1	1	4	0	0	0	0	0	0

Leaf rust surveys Bhutan Feb 10 2025 - Feb 27 2025

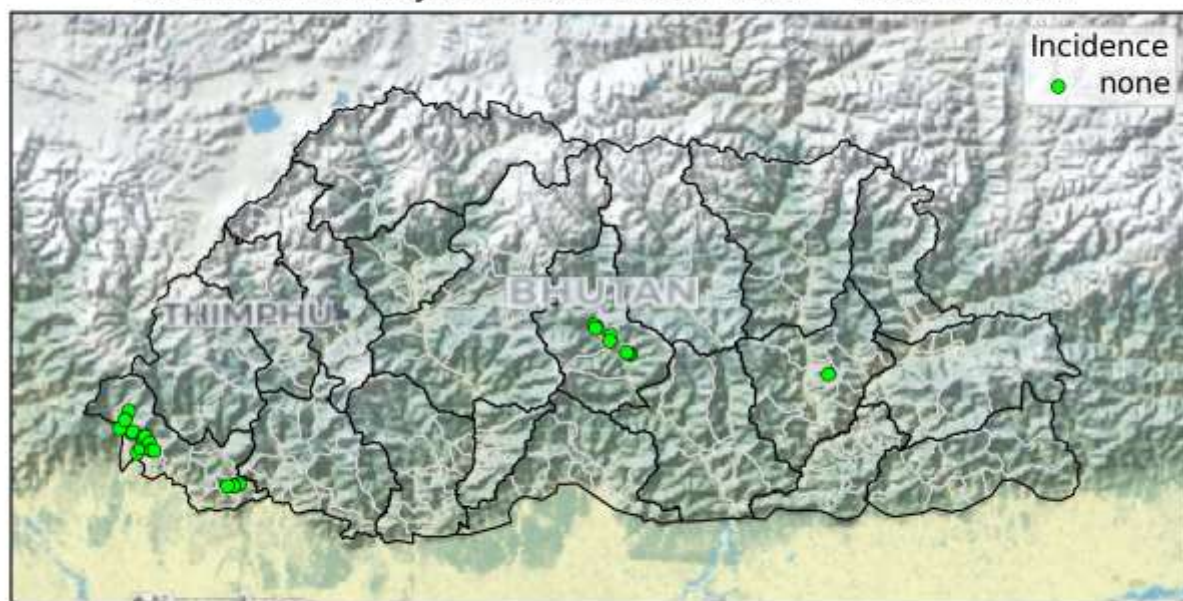


Leaf rust surveys Bhutan Feb 10 2025 - Feb 27 2025

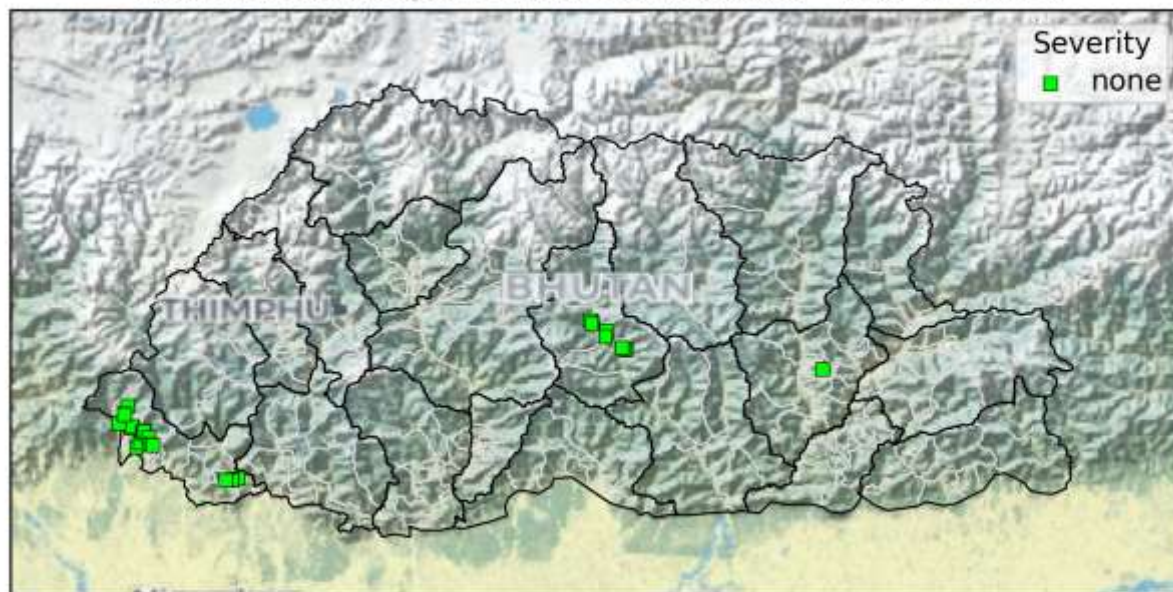


Map 1: Leaf Rust incidence (top) and severity (bottom) in Bhutan field surveys Feb 10 2025 - Feb 27 2025

Stem rust surveys Bhutan Feb 10 2025 - Feb 27 2025



Stem rust surveys Bhutan Feb 10 2025 - Feb 27 2025



Map 3: Stem Rust incidence (left) and severity (right) in Bhutan field surveys Feb 10 2025 - Feb 27 2025

Spore dispersal forecasts

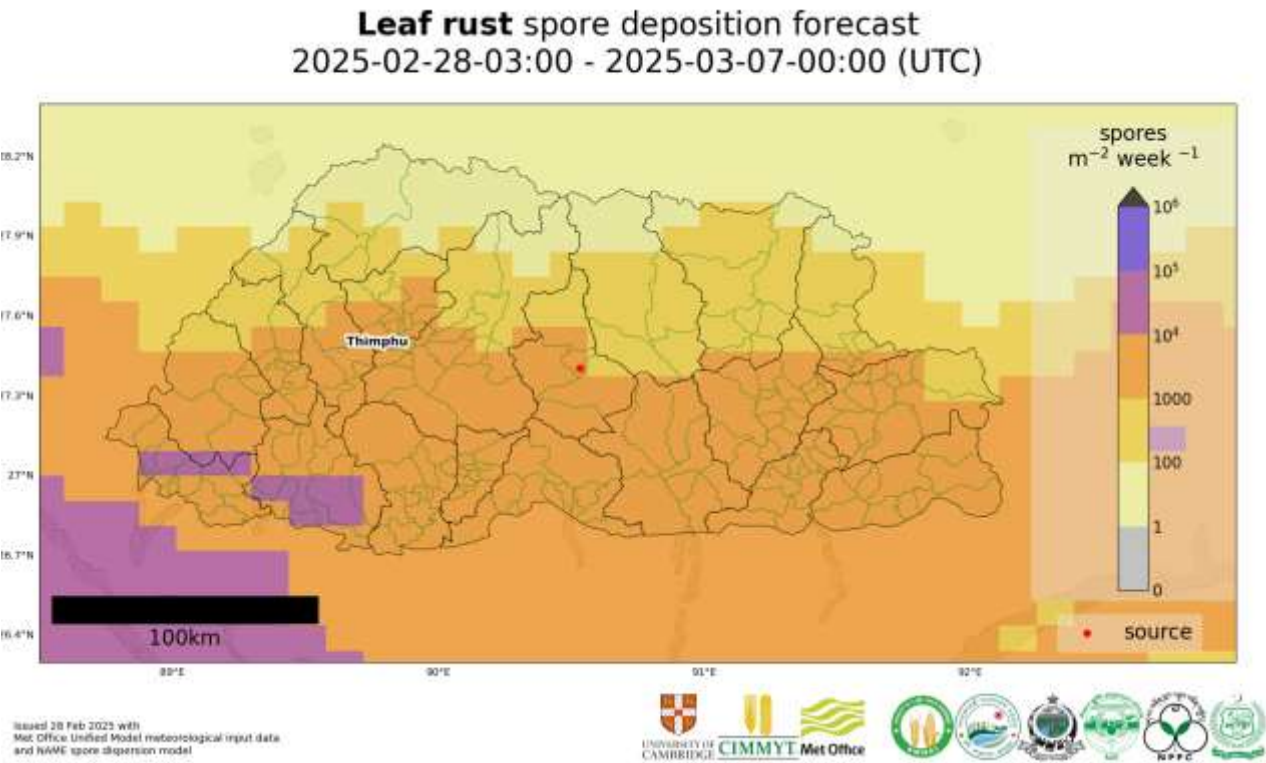
Spore dispersal forecasts run by the UK Met Office and Cambridge University are displayed for stem, stripe and leaf rusts for the forecasted period. Surveys in each district are gathered to provide a single source per administrative area for dispersal forecasts (red dots in figure).

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 (28 Feb - 06 Mar) indicates dispersal and some deposition across Bhutan, mainly from infected in Nepal / Bangladesh. Highest deposition forecast in Samtse and Chhukha.



Map 4: Leaf rust spore deposition forecast Bhutan 28 Feb - 06 Mar 2025

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

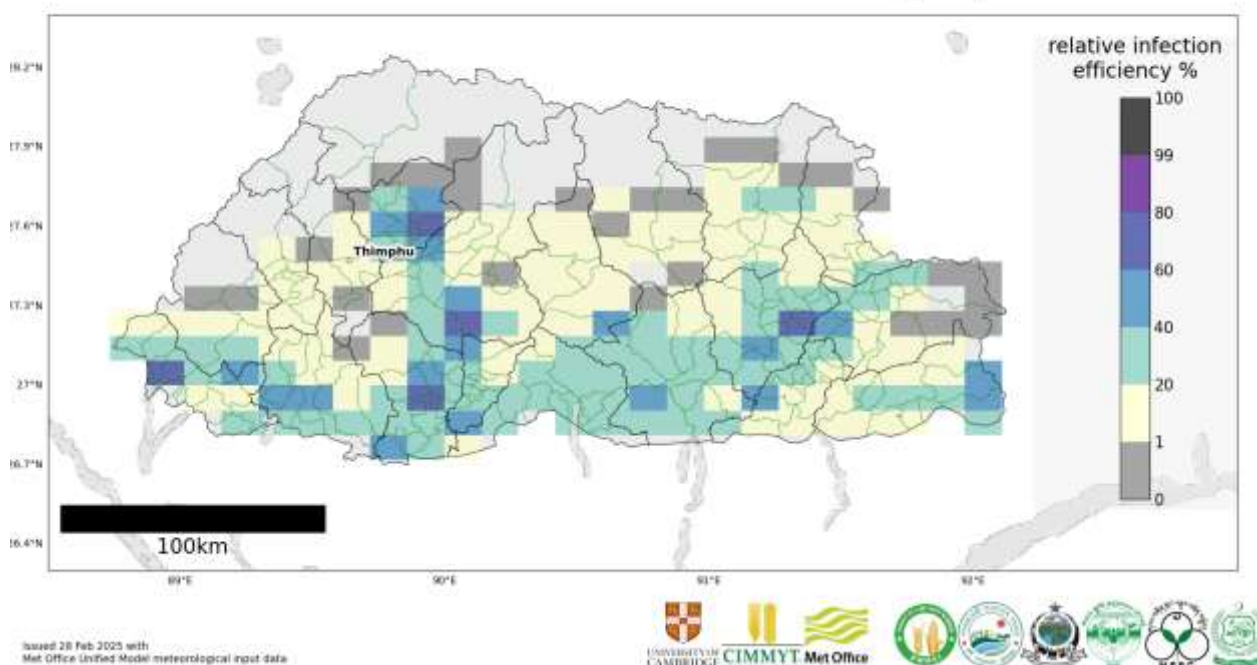
admin2Name	admin1Name	Leaf rust spores per m ² per week
Dungtse	Samtse	11000
Chengmari	Samtse	11000
Chargharay	Samtse	11000
Phuentsholing	Chhukha	10000
Yoeseltse	Samtse	10000
Dorokha	Samtse	10000
Namgyel Chhoeling	Samtse	9900
Biru	Samtse	9900
Denchhukha	Samtse	9800
Logchina	Chhukha	9700
Tading	Samtse	9500
Sipsu	Samtse	9400
Ugentse	Samtse	9100
Bongo	Chhukha	9100
Samtse	Samtse	8900
Samphelling	Chhukha	8700
Dala	Chhukha	8700

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Pagli	Samtse	8500
Tendu	Samtse	8400
Getana	Chhukha	8400

Risk of infection: Current forecast (28 Feb – 5 Mar) indicates decreased suitability from the last advisory. Moderate infection efficiency in southern areas and parts of central-west. Small pockets of high infection efficiency. Low or no suitability forecast in other areas.

Infection efficiency of Wheat **Leaf rust** spores 2025-02-28-00:00 - 2025-03-06-00:00 (UTC)



Map 5: Leaf rust suitability for infection forecast Bhutan 28 Feb - 05 Mar 2025

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

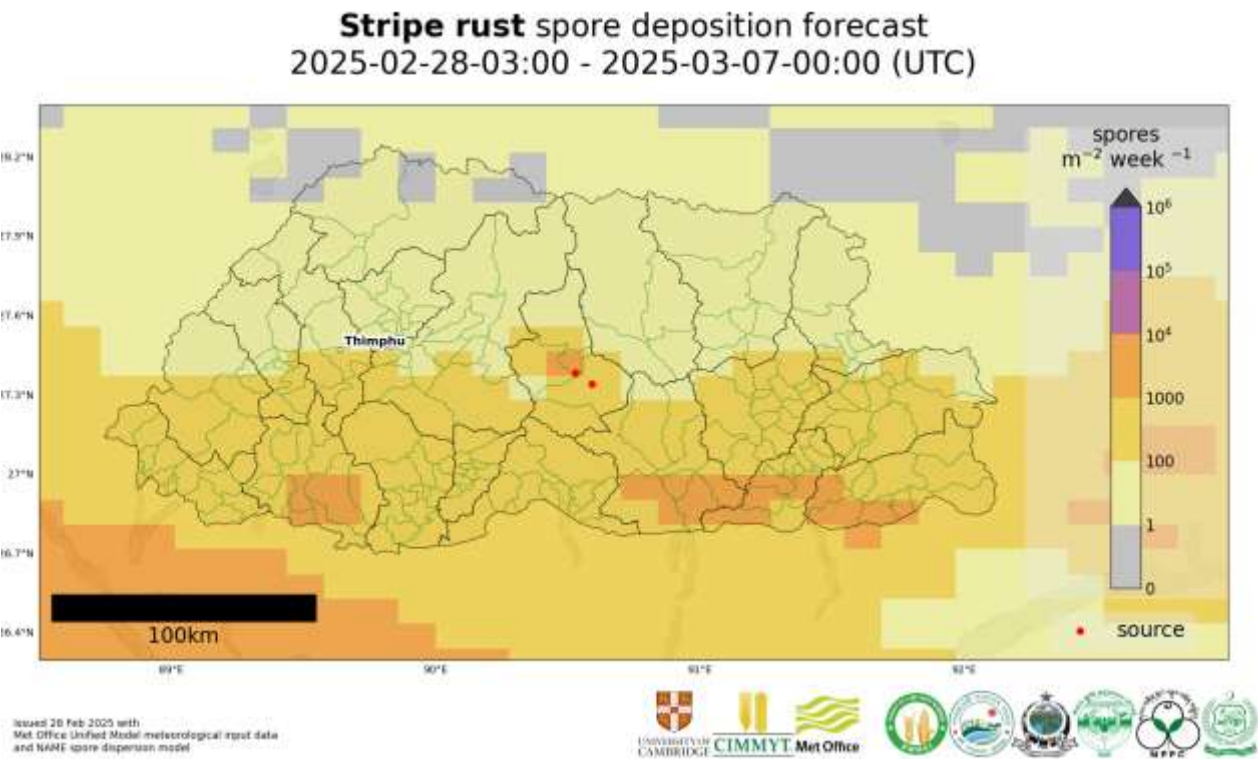
admin2Name	admin1Name	RIE_leaf_rust_%
Sipsu	Samtse	65
Phangyuel	Wangduephodrang	57
Lingmukha	Punakha	57
Dzoma	Punakha	57
Biru	Samtse	52
Guma	Punakha	51
Chhubu	Punakha	51
Chargharay	Samtse	50
Thangrong	Monggar	50
Drugyelgang	Dagana	50
Gozhi	Dagana	49
Trashiding	Dagana	47
Chaskhar	Monggar	47

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Khipisa	Dagana	46
Gesarling	Dagana	45
Talo	Punakha	45
Dungtoe	Samtse	44
Drepung	Monggar	44
Narang	Monggar	44
Kalidzingkha	Dagana	44

Stripe rust

Dispersal: Current forecast (28 Feb - 06 Mar) indicates dispersal and spore deposition in an easterly direction from infected sites in Nepal. Highest deposition forecast in southern areas.



Map 6: Stripe rust spore deposition forecast Bhutan 28 Feb - 06 Mar 2025

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

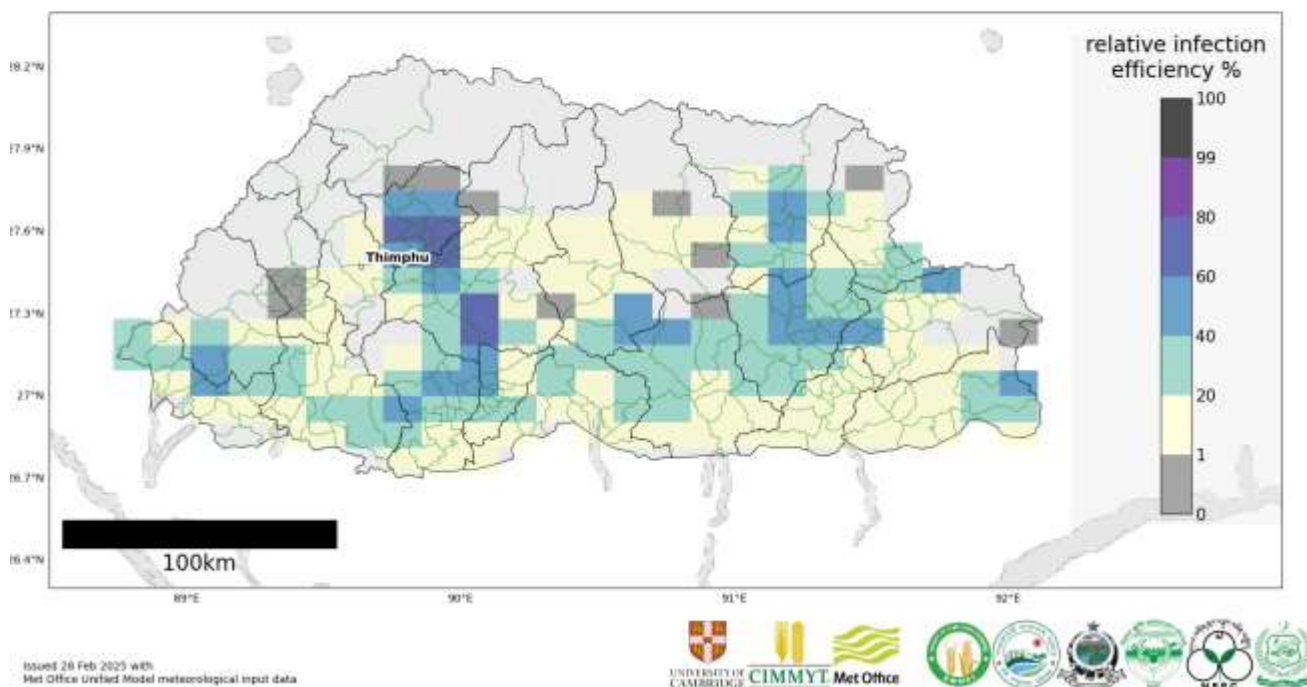
admin2Name	admin1Name	Stripe rust spores per m ² per week
Dewathang	Samdrupjongkhar	1100
Phuntsthothang	Samdrupjongkhar	1000
Dechhenling	Pemagatshel	1000
Gozhing	Zhemgang	970
Wangphu	Samdrupjongkhar	970
Bjoka	Zhemgang	970
Samphelling	Chhukha	930
Phuentsholing	Chhukha	920
Dala	Chhukha	920
Jangchhubling	Samdrupjongkhar	920
Khar	Pemagatshel	910
Pemathang	Samdrupjongkhar	900
Bongo	Chhukha	890
Ngangla	Zhemgang	890
Chongshing	Pemagatshel	870
Chokhorling	Pemagatshel	840
Chhimung	Pemagatshel	830

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Gomdar	Samdrupjongkhar	830
Dungmin	Pemagatshel	830
Logchina	Chhukha	820

Risk of infection: Current forecast (28 Feb – 5 Mar) indicates a decrease in suitability since the last advisory. Moderate to high infection efficiency across southern areas, some infection efficiency in the main valleys. Highest infection efficiency forecast in Punakha area. Little or no suitability forecast in other areas.

Infection efficiency of Wheat **Stripe rust** spores 2025-02-28-00:00 - 2025-03-06-00:00 (UTC)



Map 7: Stripe rust suitability for infection forecast Bhutan 28 Feb - 05 Mar 2025

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

admin2Name	admin1Name	RIE_stripe_rust_%
Lingmukha	Punakha	68
Dzoma	Punakha	68
Phangyuel	Wangduephodrang	68
Guma	Punakha	63
Chhubu	Punakha	62
Talo	Punakha	59
Bapisa	Punakha	58
Thedtsho	Wangduephodrang	52
Ruepisa	Wangduephodrang	50
Lajab	Dagana	48
Nahi	Wangduephodrang	44
Mongar	Monggar	42

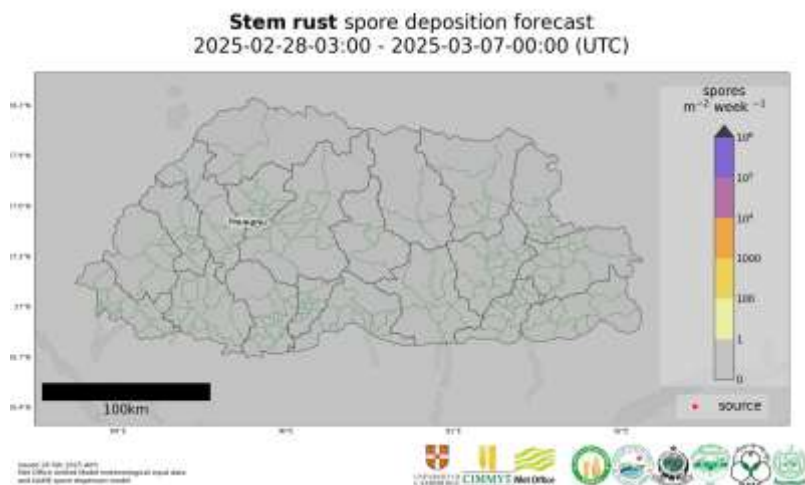
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Tsakaling	Monggar	41
Shengabjimi	Punakha	41
Chaskhar	Monggar	41
Dungtoe	Samtse	41
Chhali	Monggar	40
Drugyelgang	Dagana	40
Drepung	Monggar	40
Kalidzingkha	Dagana	39

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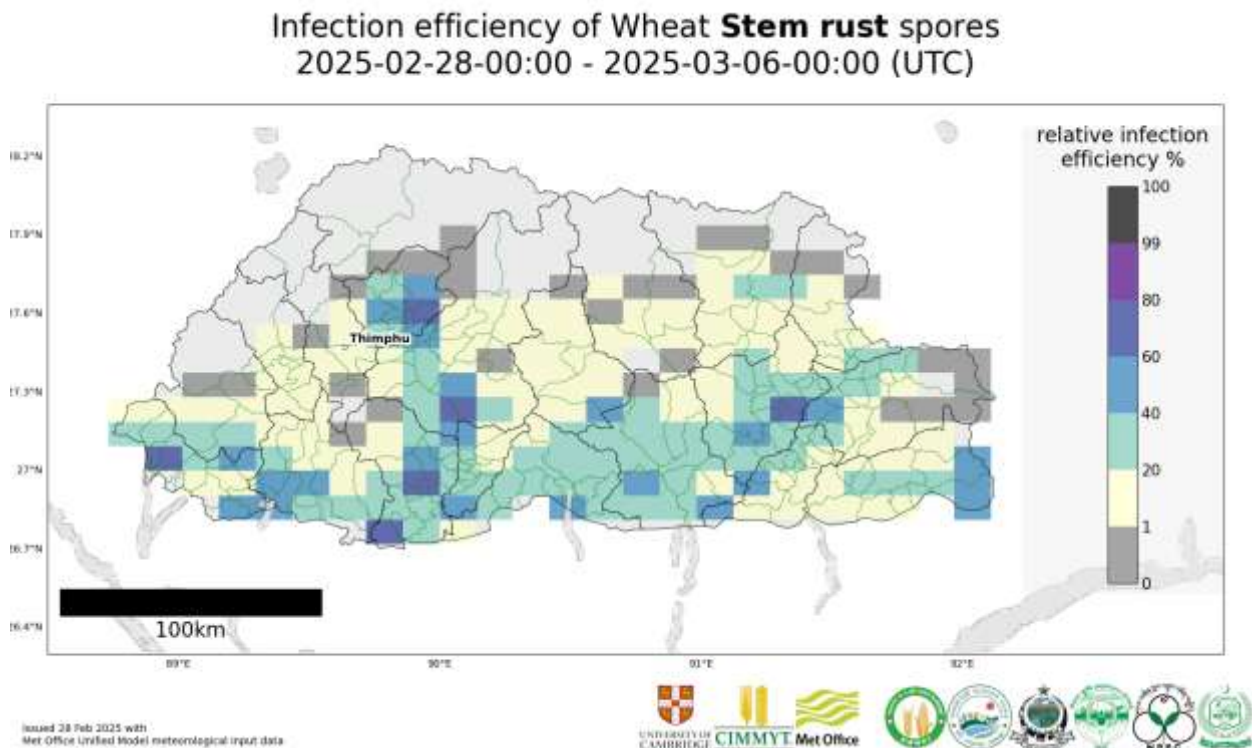
Stem rust

Dispersal: Current forecast (28 Feb - 06 Mar) indicates no dispersal as no reports of stem rust.



Map 8: Stem rust spore deposition forecast Bhutan 28 Feb - 06 Mar 2025

Risk of infection: Current forecast (28 Feb – 5 Mar) indicates a decrease in suitability since the last advisory. Moderate infection efficiency in southern areas and parts of central-west. Small pockets of high infection efficiency (Punakha). Low or no suitability forecast in other areas.



Map 9: Stem rust suitability for infection forecast Bhutan 28 Feb - 05 Mar 2025

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

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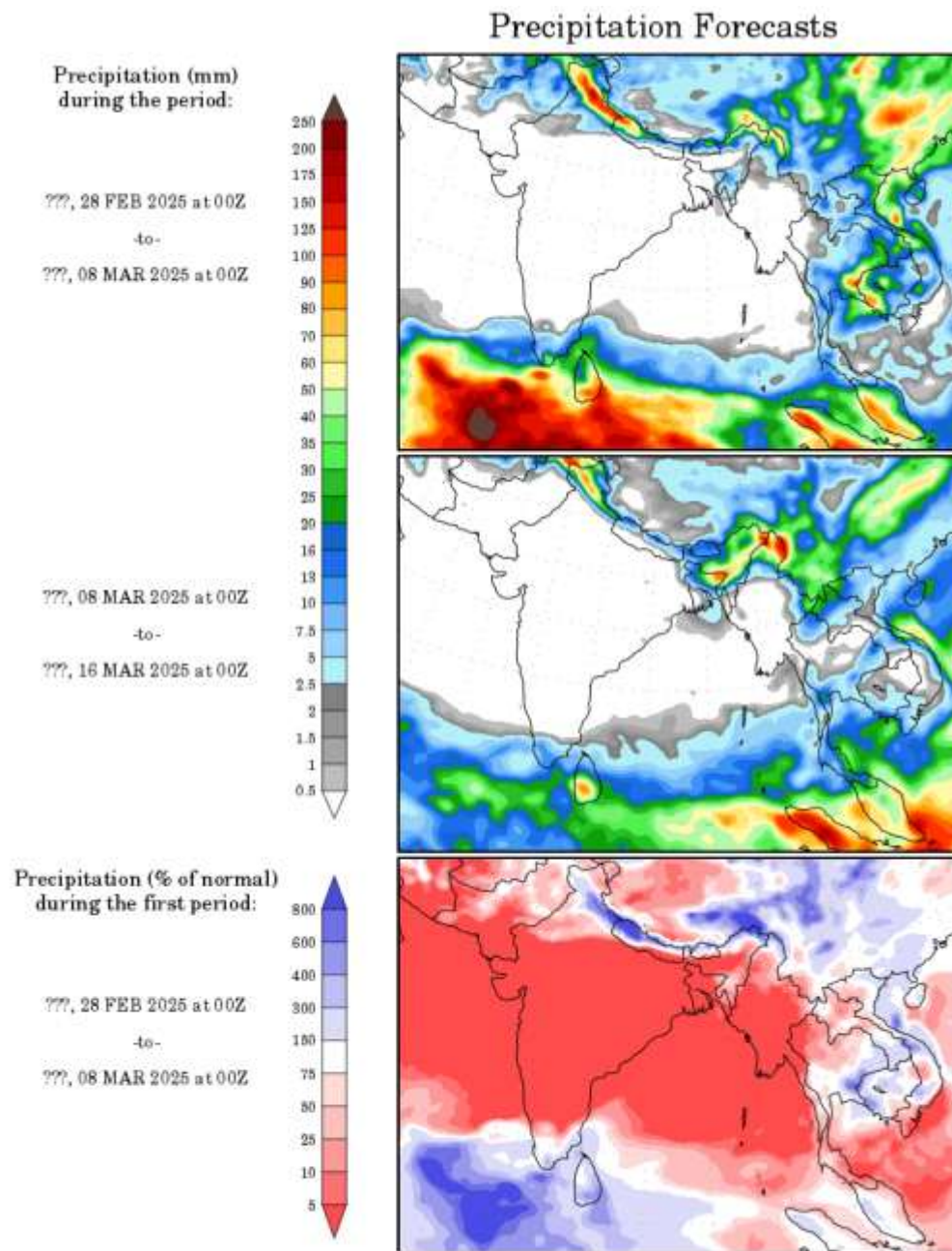
admin2Name	admin1Name	RIE_stem_rust_%
Sipsu	Samtse	65
Phangyuel	Wangduephodrang	57
Lingmukha	Punakha	57
Dzoma	Punakha	57
Biru	Samtse	52
Chhubu	Punakha	51
Guma	Punakha	51
Pagli	Samtse	50
Chargharay	Samtse	50
Drugyelgang	Dagana	50
Thangrong	Monggar	50
Gozhi	Dagana	49
Tsendagang	Dagana	49
Trashiding	Dagana	47
Chaskhar	Monggar	47
Dorona	Dagana	46
Khipisa	Dagana	46
Gesarling	Dagana	45
Talo	Punakha	45
Dungtoe	Samtse	44

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 28 Feb -8 Mar, generally forecast to be dry across Bangladesh, some rain is forecast for Bhutan, north west India, western Nepal and northern/central Pakistan. Increased chance of rain forecast for 8 – 16 Mar, for Bangladesh, Bhutan. Continued rain north west India and northern Pakistan and some light rain for the high hills of Nepal.



Precipitation forecasts from the National Centers for Environmental Prediction.
Normal rainfall derived from Xie-Arkin (CMAP) Monthly Climatology for 1979-2003.
Forecast Initialization Time: 00Z28FEB2025

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Temperature: During the period 28 Feb – 8 Mar temperatures are warming across the entire region. Warmer than normal across the region, except for northern Pakistan, north west India, high hills of Nepal and most of Bhutan.

Temperature Forecasts

Mean Surface Temperature (°C)
during the period:

???, 28 FEB 2025 at 00Z

-to-

???, 08 MAR 2025 at 00Z

???, 08 MAR 2025 at 00Z

-to-

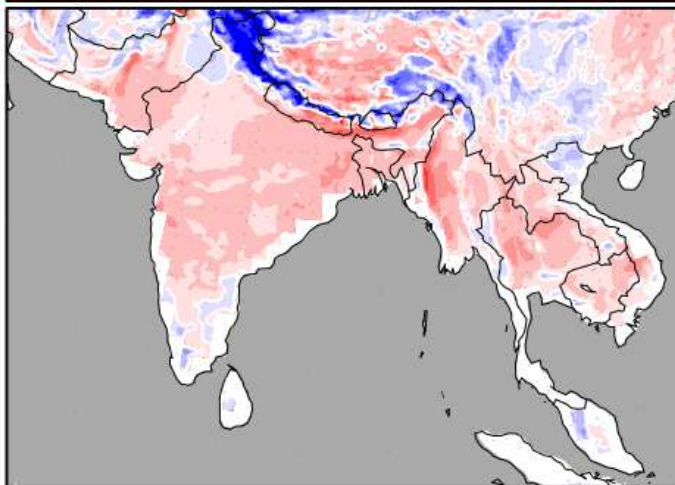
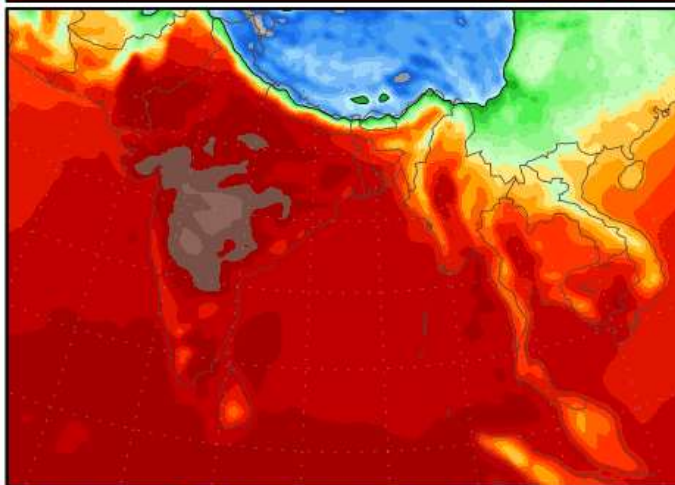
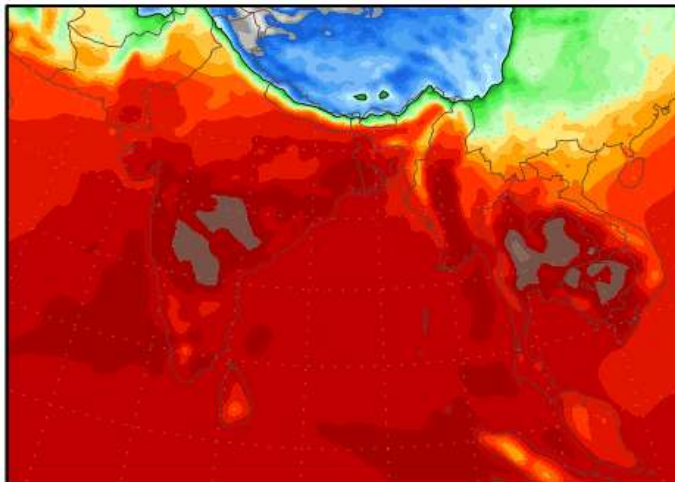
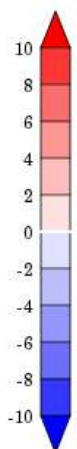
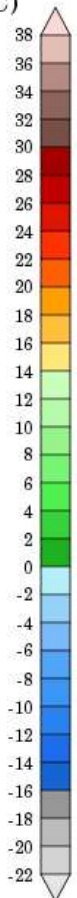
???, 16 MAR 2025 at 00Z

Temperature Anomaly
during the first period:

???, 28 FEB 2025 at 00Z

-to-

???, 08 MAR 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: 00Z28FEB2025