



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

Summary period: 11 Mar - 17 Mar 2025

Overall risk level:

Caution

Key messages

Surveys have been undertaken in the southwest of Bhutan, Trongsa and are on-going in Punakha. Leaf and stripe rust are present, with high incidence of strip rust in some fields in Punakha. Crops are still at an early stage (tillering - heading) of development.

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

Suitability forecast (11 – 16 Mar) for leaf, stripe and stem rust indicates a marked increase in infection efficiency. High / Moderate infection efficiency in southern areas and the main valleys. Some rain is forecast for Bhutan during the period 9 – 17 Mar and this is forecast to increase during 17 – 25 Mar. Temperatures are forecast to be warmer.

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

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.

- 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 - Mar 10 2025. A total of 40 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 4 out of 40 fields surveyed (10%). Moderate to high incidence of leaf rust has been seen in 2 fields (50% of infected fields). Moderate to high severity of leaf rust has been seen in 1 fields (25% of infected fields).

Stripe Rust reported from 10 out of 40 fields surveyed (25%). Moderate to high incidence of stripe rust has been seen in 6 fields (60% of infected fields). Moderate to high severity of stripe rust has been seen in 5 fields (50% of infected fields).

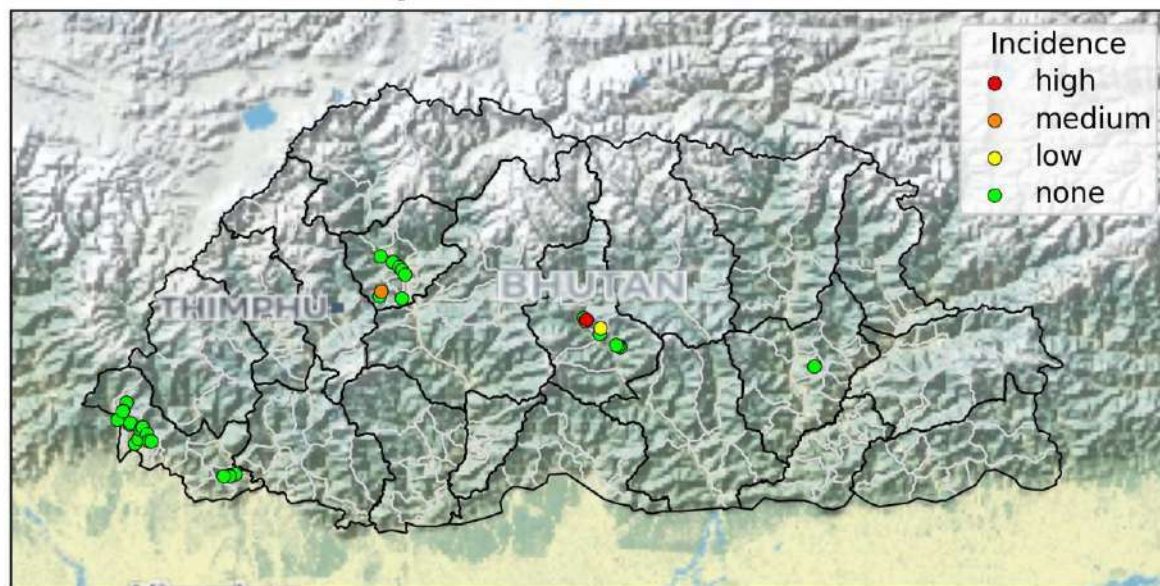
Table 1: Variety analysis of surveys.

Variety	Number of surveys	Number of surveys reporting infection of		
		stem rust	stripe rust	leaf rust
Guma Sokha	8	n/a	0	0
Unknown	32	n/a	10	4

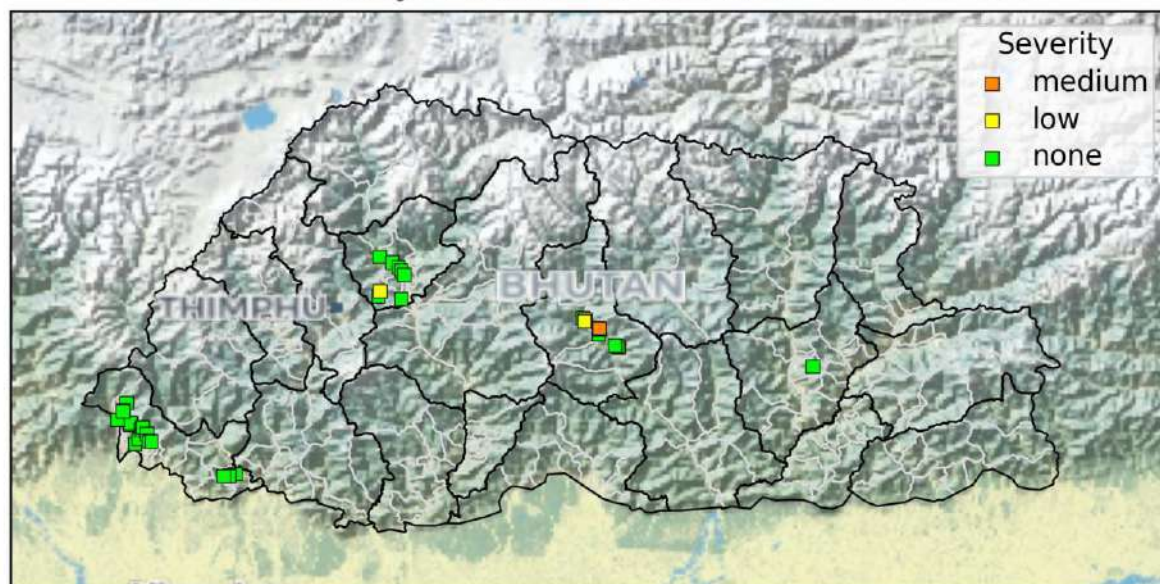
Table 2: Growth stage analysis of surveys conducted in the last week (since Mar 04 2025).

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	5	1	2	0	0	1	0	0	0	0

Leaf rust surveys Bhutan Feb 10 2025 - Mar 10 2025

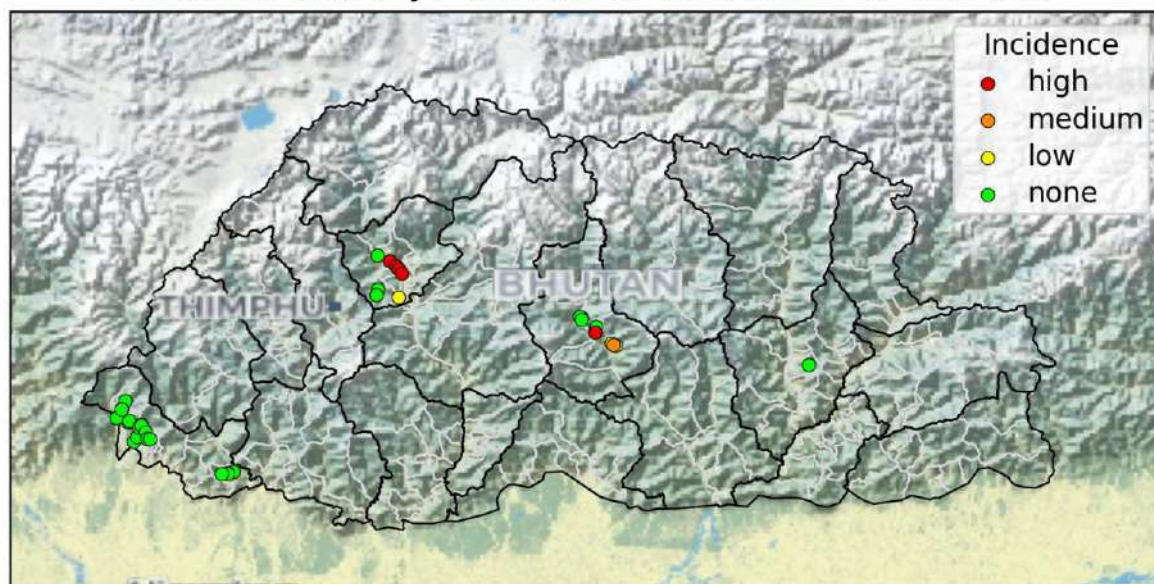


Leaf rust surveys Bhutan Feb 10 2025 - Mar 10 2025

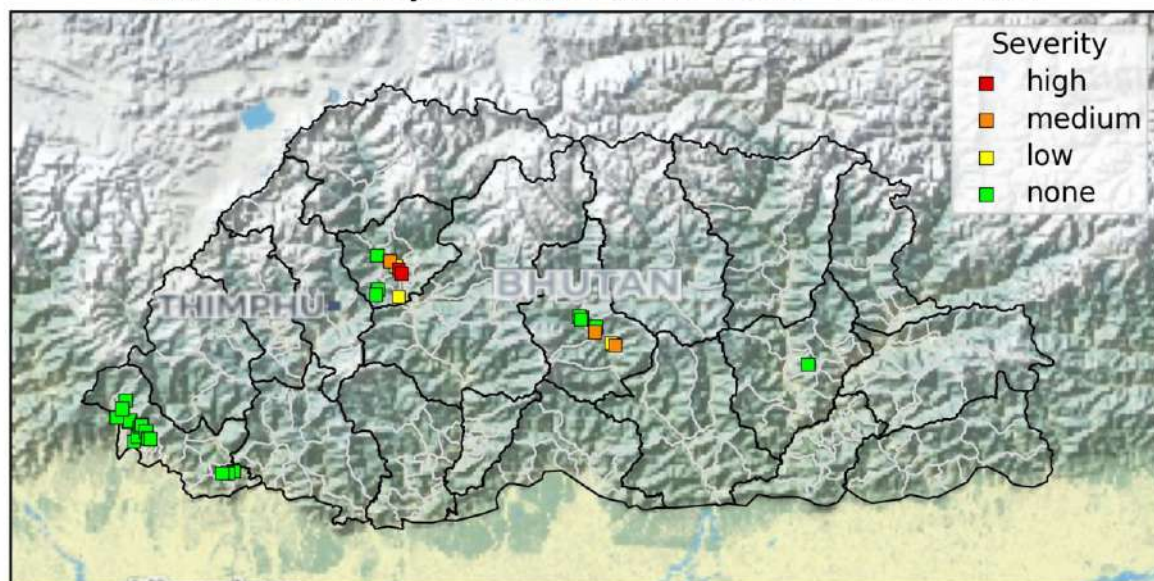


Map 1: Leaf Rust incidence (top) and severity (bottom) in Bhutan field surveys Feb 10 2025 - Mar 10 2025

Yellow rust surveys Bhutan Feb 10 2025 - Mar 10 2025

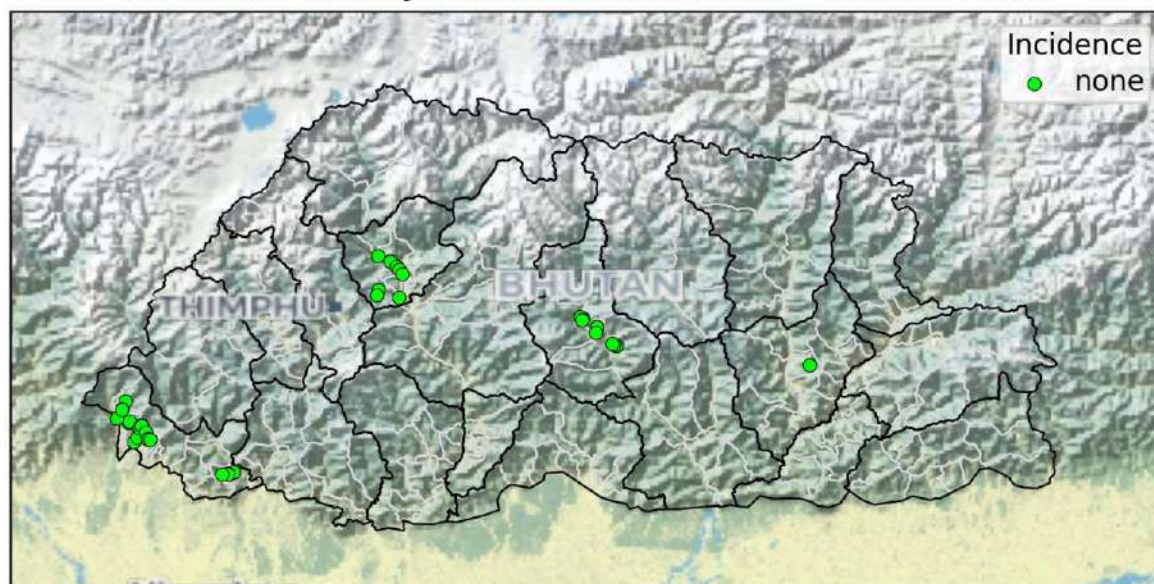


Yellow rust surveys Bhutan Feb 10 2025 - Mar 10 2025

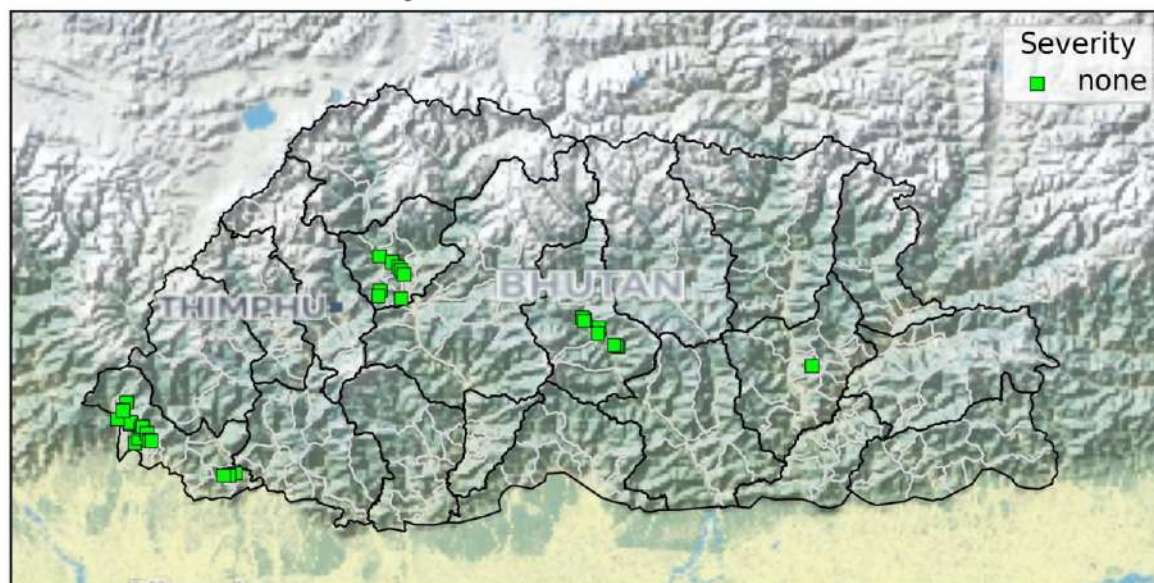


Map 2: Stripe Rust incidence (top) and severity (bottom) in Bhutan field surveys Feb 10 2025 - Mar 10 2025

Stem rust surveys Bhutan Feb 10 2025 - Mar 10 2025



Stem rust surveys Bhutan Feb 10 2025 - Mar 10 2025



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

Spore dispersal forecasts

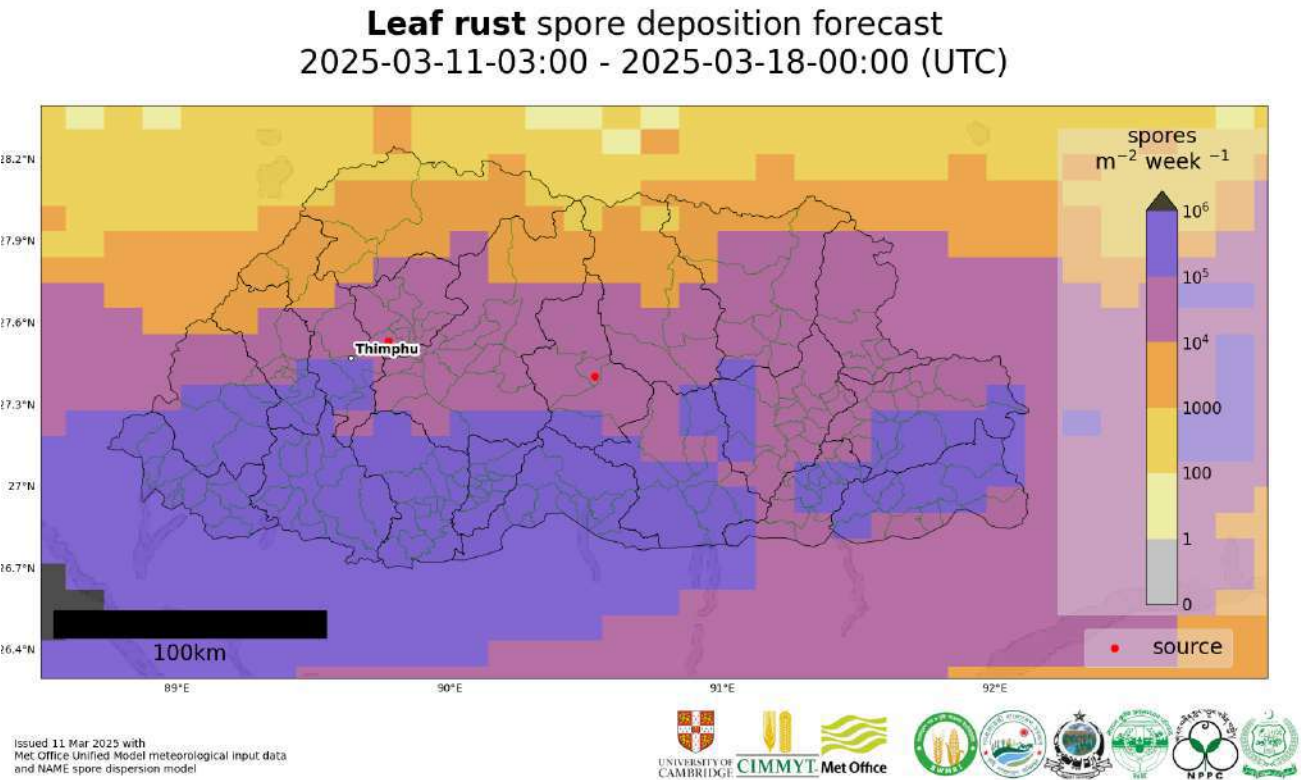
Spore dispersal forecasts run by the UK Met Office and Cambridge University are displayed for stem, stripe and leaf rusts for the forecasted period. Surveys in each district are gathered to provide a single source per administrative area for dispersal forecasts (red dots in figure).

Environmental / climatic suitability for infection forecasts

These forecasts 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 Mar - 17 Mar) indicates strong potential for spore deposition across Bhutan (highest in southern areas) from infected sites in Nepal and Bangladesh.



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

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

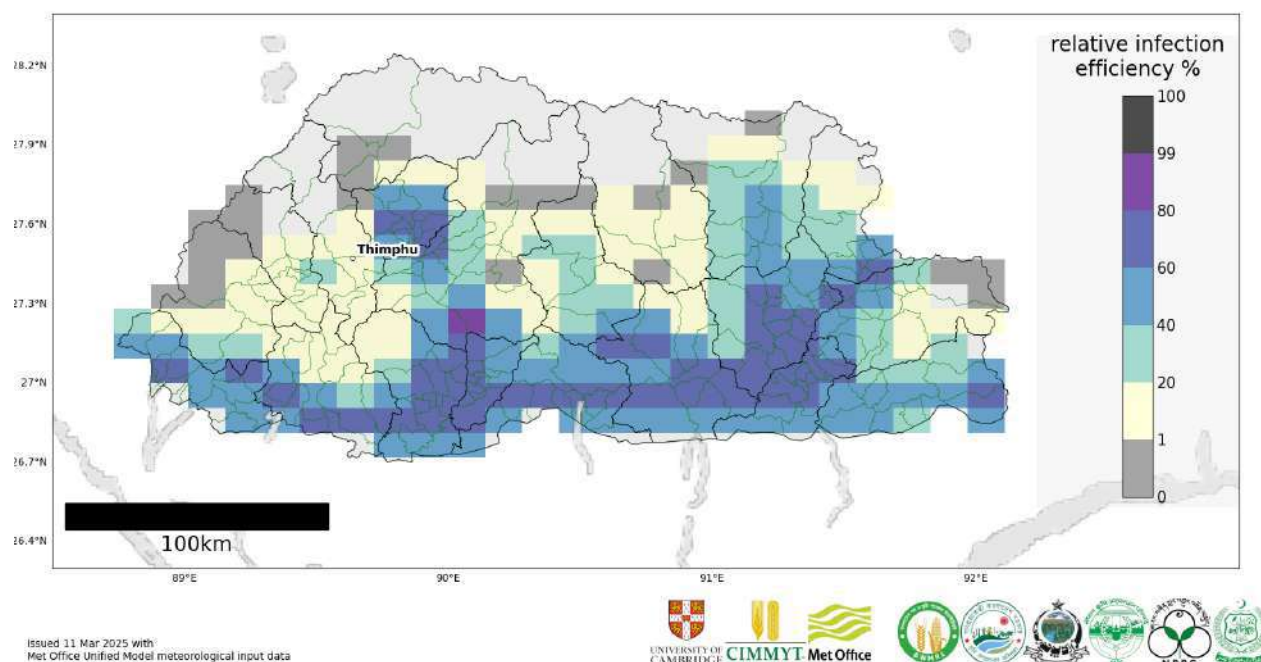
admin2Name	admin1Name	Leaf rust spores per m ² per week
Pagli	Samtse	510000
Chengmari	Samtse	500000
Yoeseltse	Samtse	490000
Chargharay	Samtse	480000
Samtse	Samtse	480000
Ugentse	Samtse	480000
Dorokha	Samtse	470000
Tading	Samtse	470000
Dungtoe	Samtse	440000
Phuentsholing	Chhukha	440000
Sipsu	Samtse	430000
Denchhukha	Samtse	420000
Logchina	Chhukha	400000
Namgyel Chhoeling	Samtse	400000
Biru	Samtse	390000
Samphelling	Chhukha	380000

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Dala	Chhukha	340000
Geling	Chhukha	330000
Bongo	Chhukha	330000
Getana	Chhukha	320000

Risk of infection: Current forecast (11 – 16 Mar) indicates increased suitability from the last advisory. High to moderate infection efficiency in southern areas and parts of central-west and east.

Infection efficiency of Wheat **Leaf rust** spores 2025-03-11-00:00 - 2025-03-17-00:00 (UTC)



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

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

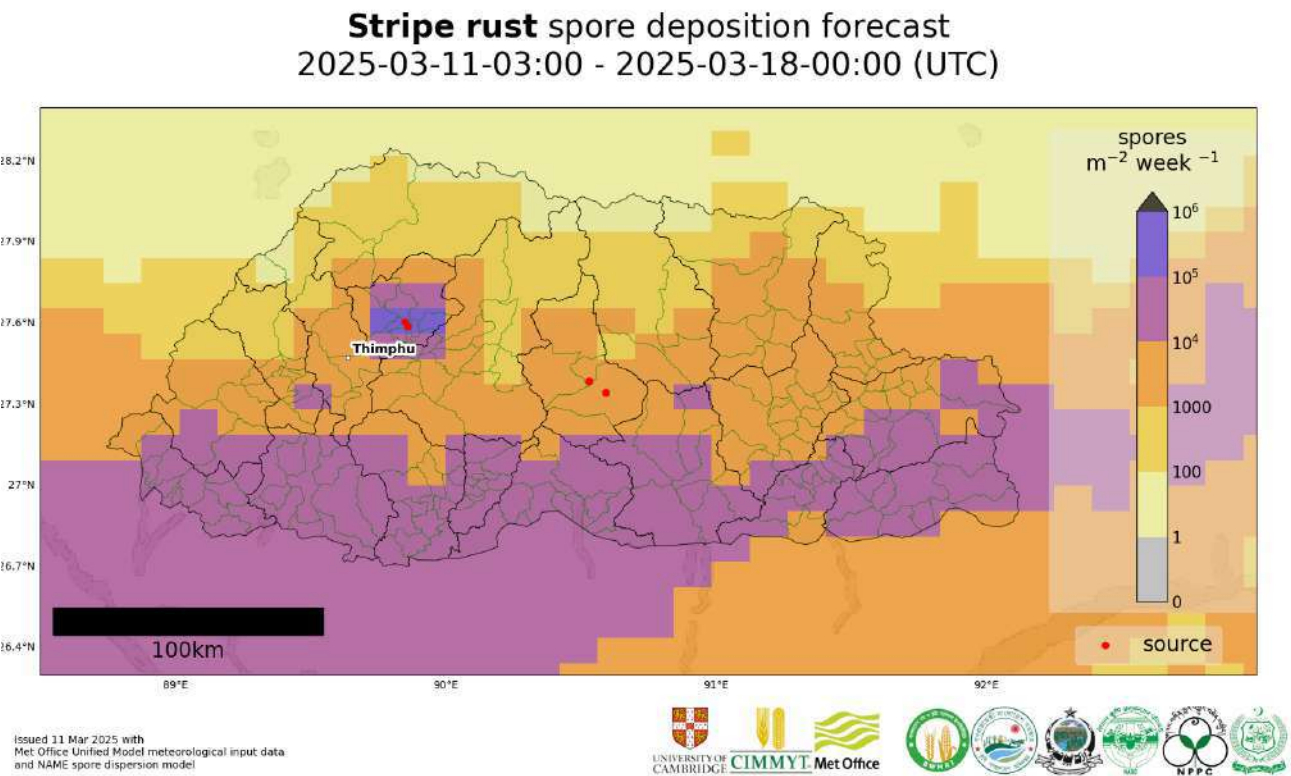
admin2Name	admin1Name	RIE_leaf_rust_%
Ramjar	Yangtse	70
Tsholingkhon	Tsirang	69
Tsangkhon	Dagona	69
Drugyelgang	Dagona	68
Chhali	Monggar	68
Thangrong	Monggar	68
Rangthangling	Tsirang	68
Lingmukha	Punakha	67
Mendrelgang	Tsirang	67
Barzhong	Tsirang	67
Dzoma	Punakha	67
Phangyuel	Wangduephodrang	67
Drepung	Monggar	67

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Jurmey	Monggar	66
Mongar	Monggar	66
Chhubu	Punakha	65
Patakla	Tsirang	65
Trashiding	Dagana	65
Kengkhar	Monggar	65
Gozhi	Dagana	65

Stripe rust

Dispersal: Current forecast (11 Mar - 17 Mar) indicates dispersal in an easterly direction with highest spore deposition forecast in southern areas from infected sites in Nepal. Localized high spore deposition close to infected sources in Punakha.



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

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

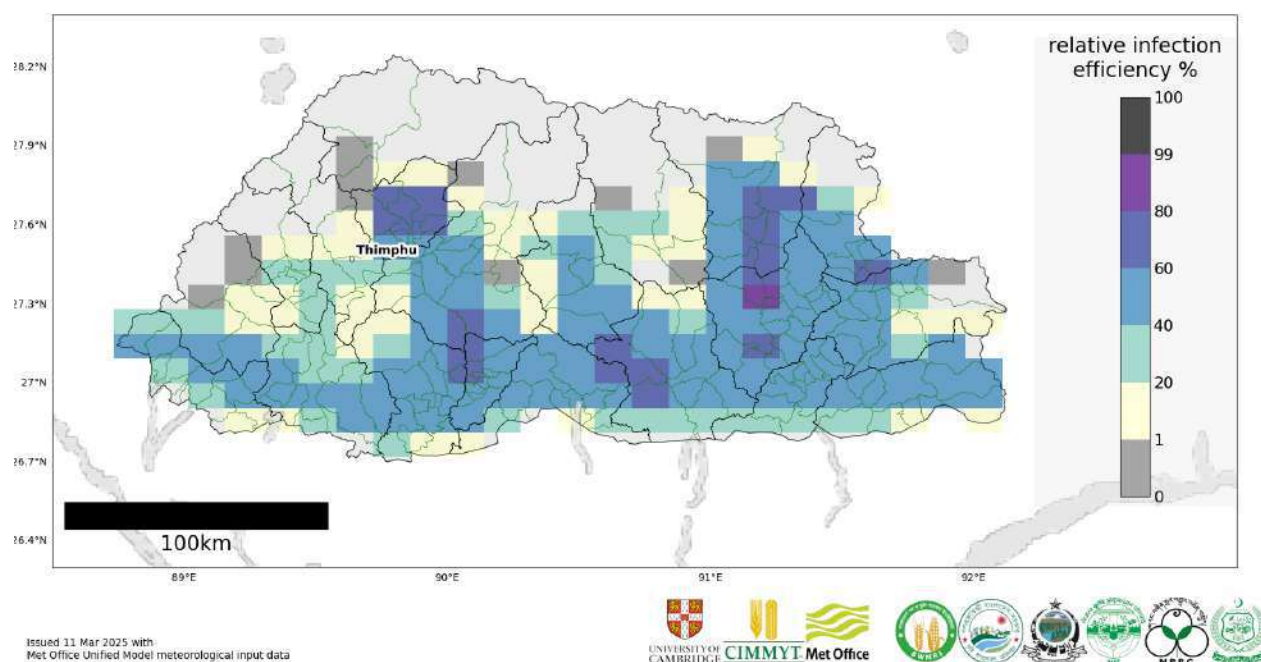
admin2Name	admin1Name	Stripe rust spores per m^2 per week
Talo	Punakha	79000
Guma	Punakha	73000
Chhubu	Punakha	73000
Lingmukha	Punakha	68000
Dzoma	Punakha	68000
Phangyuel	Wangduephodrang	68000
Shengabjimi	Punakha	62000
Toepisa	Punakha	41000
Phuentsholing	Chhukha	39000
Tading	Samtse	37000
Samphelling	Chhukha	36000
Logchina	Chhukha	34000
Denchhukha	Samtse	33000
Dala	Chhukha	32000
Kabjisa	Punakha	30000

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Bongo	Chhukha	30000
Pagli	Samtse	30000
Gesarling	Dagana	29000
Geling	Chhukha	28000
Getana	Chhukha	28000

Risk of infection: Current forecast (11 – 16 Mar) indicates increased suitability since the last advisory. Moderate to high infection efficiency across southern areas, and the main valleys. Highest infection efficiency forecast in Punakha area.

Infection efficiency of Wheat **Stripe rust** spores 2025-03-11-00:00 - 2025-03-17-00:00 (UTC)



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

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

admin2Name	admin1Name	RIE_stripe_rust_%
Chhubu	Punakha	75
Tsakaling	Monggar	69
Ramjar	Yangtse	69
Menbi	Lhuentse	68
Chhali	Monggar	67
Dzoma	Punakha	66
Phangyuel	Wangduephodrang	66
Lingmukha	Punakha	66
Mongar	Monggar	65
Tsamang	Monggar	65
Ngatshang	Monggar	64

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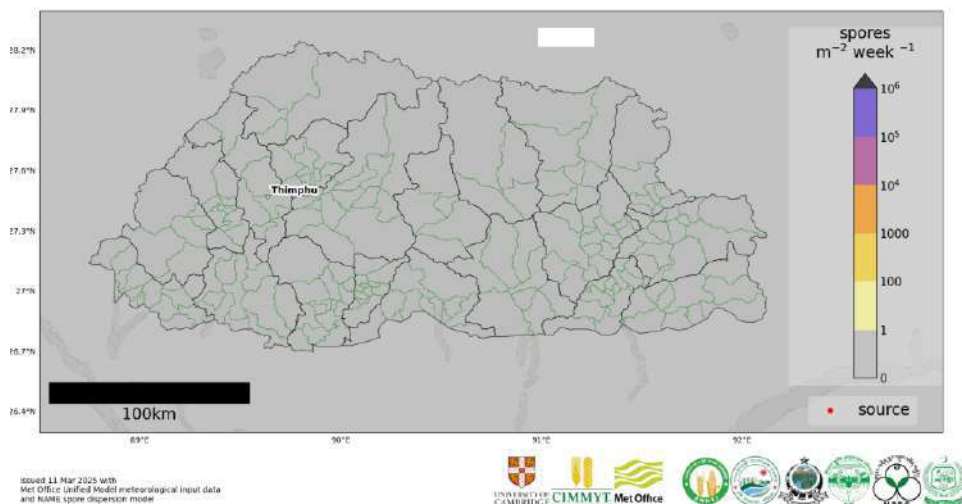
Minjay	Lhuentse	64
Patakla	Tsirang	63
Toetsho	Yangtse	63
Guma	Punakha	62
Bartsham	Trashigang	62
Tsenkhar	Lhuentse	61
Jamkhar	Yangtse	60
Lajab	Dagana	60
Tsangkha	Dagana	60

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Stem rust

Dispersal: Current forecast (11 Mar - 17 Mar) indicates no dispersal as o reports of stem rust.

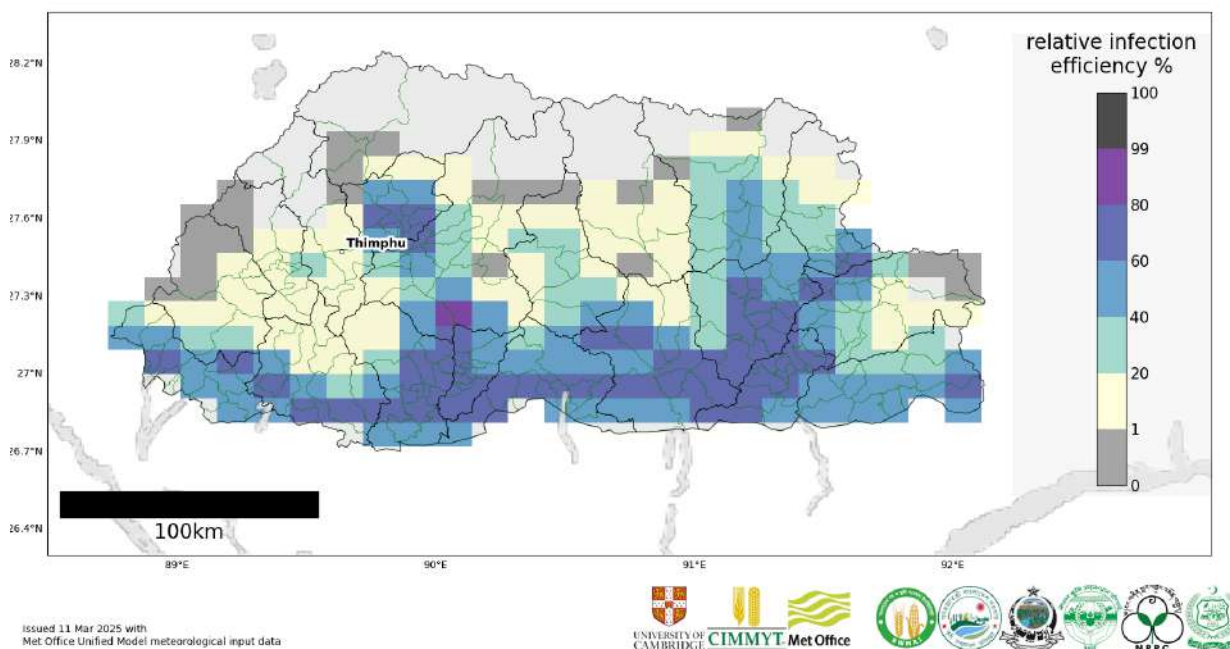
Stem rust spore deposition forecast 2025-03-11-03:00 - 2025-03-18-00:00 (UTC)



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

Risk of infection: Current forecast (11 – 16 Mar) indicates increased suitability from the last advisory. High to moderate infection efficiency in southern areas and parts of central-west and east.

Infection efficiency of Wheat **Stem rust** spores 2025-03-11-00:00 - 2025-03-17-00:00 (UTC)



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

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

admin2Name	admin1Name	RIE_stem_rust_%
Ramjar	Yangtse	70
Tsholingkhor	Tsirang	69
Tsangkha	Dagana	69
Drugyelgang	Dagana	68
Chhali	Monggar	68
Thangrong	Monggar	68
Rangthangling	Tsirang	68
Phangyuel	Wangduephodrang	67
Drepung	Monggar	67
Shompangkha	Sarpang	67
Dzoma	Punakha	67
Mendrelgang	Tsirang	67
Lingmukha	Punakha	67
Barzhong	Tsirang	67
Beteni	Tsirang	67
Trashiding	Dagana	66
Gozhi	Dagana	66
Jurmey	Monggar	66
Mongar	Monggar	66
Chhubu	Punakha	65

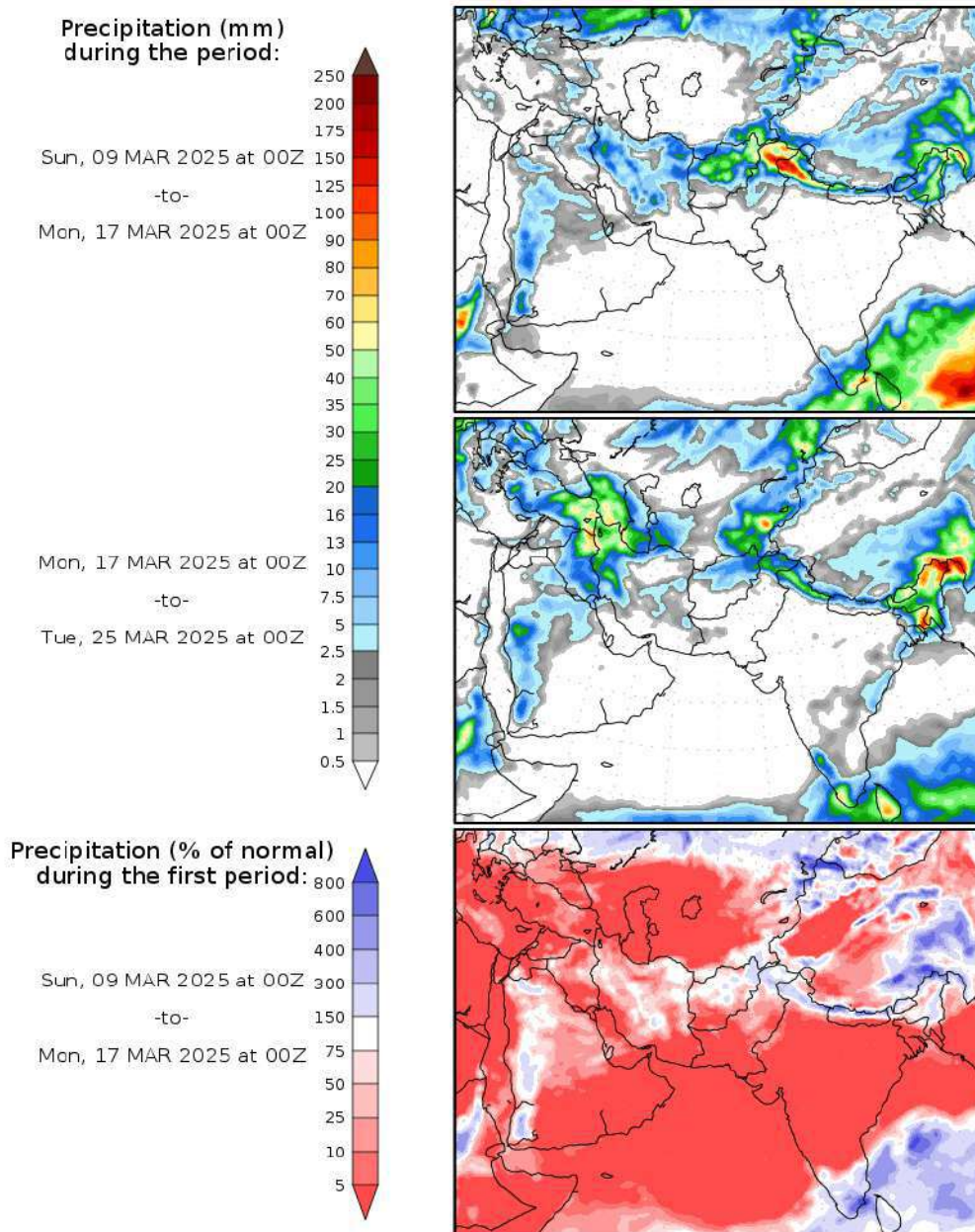
Region-wide Forecasts

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 9 - 17 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 17 – 25 Mar, for Bangladesh, Bhutan. Continued rain, but lighter, north west India and northern Pakistan and some light rain for the high hills of Nepal.

Precipitation Forecasts



Precipitation forecasts from the National Centers for Environmental Prediction.
Normal rainfall derived from Xie-Arkin (CMAP) Monthly Climatology for 1979-2003.
Forecast Initialization Time: 00Z09MAR2025

Temperature: During the period 9 – 17 Mar 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 and hills of Bhutan.

Temperature Forecasts

Mean Surface Temperature (°C)
during the period:

Sun, 09 MAR 2025 at 00Z

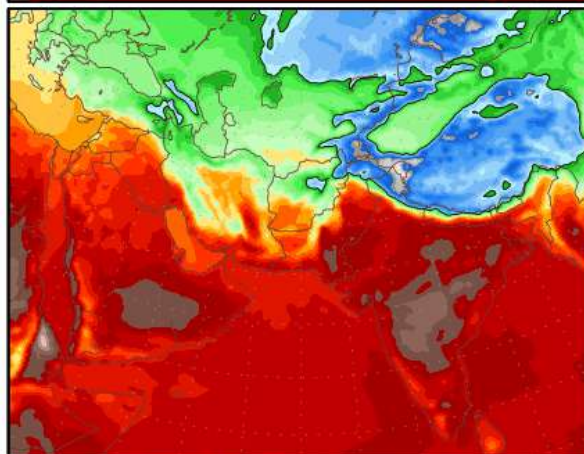
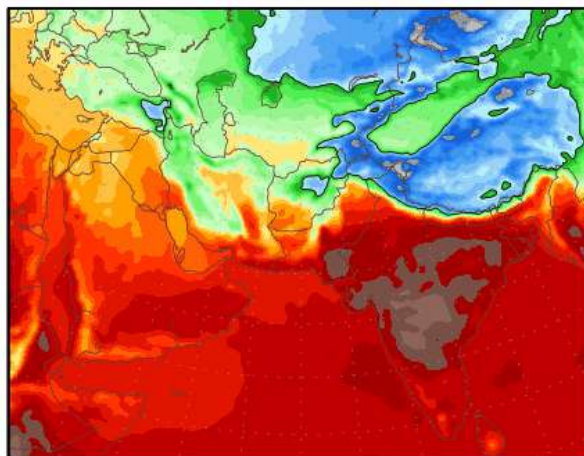
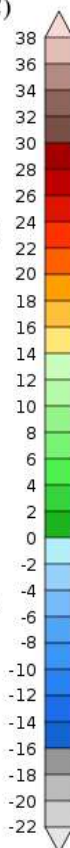
-to-

Mon, 17 MAR 2025 at 00Z

Mon, 17 MAR 2025 at 00Z

-to-

Tue, 25 MAR 2025 at 00Z

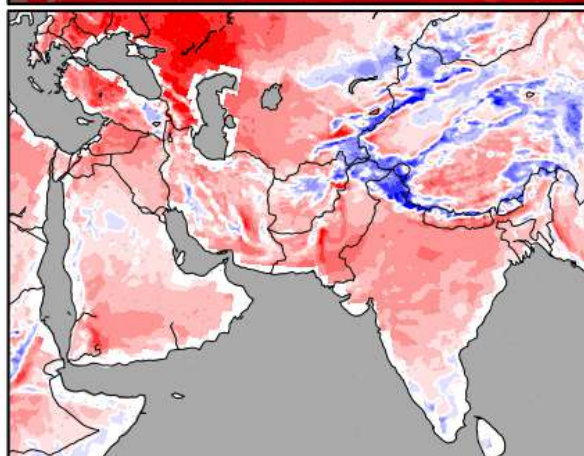
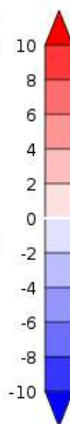


Temperature Anomaly
during the first period:

Sun, 09 MAR 2025 at 00Z

-to-

Mon, 17 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: 00Z09MAR2025