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Assessment of forecast accuracy of weather parameters under GKMS: A comparative study of predicted and observed data

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Abstract

Weather-based agro-advisory services provide essential support for farmers to make better agricultural decisions about their work during periods of climate change. The study examined how accurate the GraminKrishiMausamSewa (GKMS) weather forecasts for Bulandshahr district of Uttar Pradesh proved during 2022 by comparing forecasted meteorological parameters with actual weather observations. Researchers used Standard Meteorological Weeks (SMWs) to analyze weekly weather data which included rainfall, maximum and minimum temperature, and relative humidity (morning and afternoon), and wind speed.

The results showed that temperature forecasts maintained high accuracy because they matched actual temperature measurements throughout all seasons, which makes these forecasts dependable for agricultural planning purposes. The rainfall forecasts experienced substantial forecast errors during monsoon season because the system wrongly predicted the intensity of extreme weather events. Relative humidity forecasts showed moderate accuracy which improved under stable atmospheric conditions but showed significant errors during high humidity periods. Wind speed forecasts showed low accuracy levels because they typically predicted values that were lower than what actually occurred throughout different times of the year.

Forecasts showed greater accuracy during winter and post-monsoon periods than they did during monsoon season because atmospheric conditions fluctuated during that time. The study results demonstrate that agrometeorological advisory services require better rainfall and wind prediction models to achieve successful operational results. Overall, the study highlights that while GKMS forecasts are reliable for temperature-based advisories, improvements in other parameters are essential for strengthening climate-resilient agricultural practices

Keywords: Agrometeorology, forecast accuracy, GKMS, weather forecast evaluation, and Bulandshahr

Introduction

Agricultural practices in India depend on weather and climate conditions which creates high vulnerability to changing patterns of rainfall and temperature and humidity and wind. Agricultural productivity depends on accurate weather predictions because they help reduce climate-related risks. Farmers need accurate meteorological data which includes rainfall and temperature and relative humidity and wind speed to make informed decisions and manage their resources effectively, (Nitha, *et al.*, 2025) ^[14].

The Government of India established weather-based agro-advisory services through its GraminKrishiMausamSewa (GKMS) program to help farmers deal with unpredictable weather conditions (Kailashbhai, 2023) ^[5]. The services provide medium-range weather forecasts at the district level which include crop-specific advisories to help farmers schedule their agricultural activities such as sowing and irrigation and fertilizer application and pest management. The advisory services achieve successful outcomes because their weather forecasts function as credible sources which enable farmers to follow the suggested farming practices, (Singh *et al.*, 2023) ^[17].

The agricultural practices of Bulandshahr district require precise weather predictions because the local farmers grow crops which depend on climate conditions and face challenges from seasonal

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weather changes. The weather conditions which affect crop development include the monsoon rainfall distribution, summer temperature extremes, and crop growth humidity levels. The forecast performance must be evaluated continuously through actual data comparison because it will lead to more accurate agro-advisory services, (Singh, *et al.*, 2018) ^[16].

The process of comparing forecasted weather data with actual weather data provides researchers with useful information about the accuracy of prediction models, which also enables them to find consistent forecasting mistakes. The researchers use statistical methods that include deviation, correlation, and error indices to measure forecast accuracy, which they use to evaluate the agricultural decision-making support systems. The evaluations play an essential role in establishing effective climate-smart agricultural practices while building trust between farmers and agrometeorological services, (Kumar, 2020) ^[10].

The present study aims to evaluate the accuracy of GKMS weather forecasts by comparing the predicted weather data with the actual weather data from 2022. The research investigates essential weather elements throughout Standard Meteorological Weeks (SMWs) to assess how seasonal changes affect forecasting results. The study uses forecasted and observed data comparison to determine how agro-advisory services can become more trustworthy while helping farmers practice sustainable agriculture methods, (Rathore, *et al.*, 2025) ^[15].

Materials and Methods

Study Area

The present study took place in Bulandshahr district which serves as a primary agricultural area in western Uttar Pradesh. The region has a subtropical climate which brings hot summers and a rainy monsoon season with unpredictable precipitation and chilly winter weather. The GraminKrishiMausamSewa (GKMS) programme which the India Meteorological Department operates through its Agrometeorological Field Unit (AMFU) at RRS Agwanpur provides weather forecasts for the study area. Farmers use these forecasts to receive agrometeorological advisory services.

Data Source and Description

The study used secondary data which researchers collected during 2022 to obtain both predicted meteorological parameters and actual meteorological parameters. The forecast data were obtained from GKMS-AMFU RRS Agwanpur, while the observed data were recorded from standard meteorological observatories in the study region.

The dataset included 52 Standard Meteorological Weeks (SMWs) and recorded the following weather parameters:

- Rainfall (mm) – Total weekly rainfall
- Maximum temperature (°C) – Weekly average
- Minimum temperature (°C) – Weekly average
- Relative humidity (%) – Morning (7:00 AM) and Afternoon (2:00 PM) averages
- Wind speed (km h⁻¹) – Weekly average

The dataset provided complete information which researchers used to compare forecasted weather patterns with actual weather patterns during the entire year.

Seasonal Classification

The researchers grouped their data into four main seasonal periods which used Standard Meteorological Weeks (SMWs) that agrometeorological studies typically employ. The Winter season extends from SMW 1 to SMW 8 which includes the

period between January and February. The pre-monsoon season extends from SMW 9 to SMW 21 which includes the period between March and May. The monsoon season extends from SMW 22 to SMW 39 which includes the period between June and September. The post-monsoon season extends from SMW 40 to SMW 52 which includes the period between October and December. The researchers used this classification system to test forecast accuracy when different weather patterns and seasonal changes occurred.

Variables and Parameters Analyzed

The present study conducted an extensive comparison between predicted weather conditions and actual weather conditions to determine the precision and dependability of GraminKrishiMausamSewa (GKMS) weather forecasts which the organization issued in Bulandshahr district. The study analyzed essential meteorological factors which directly impact agricultural development and farming decisions. The research team assessed these scientific elements through weekly studies which used Standard Meteorological Weeks (SMWs) to measure both time changes and seasonal patterns.

Rainfall

Rainfall represents a fundamental meteorological factor which exhibits high variability and acts as the primary meteorological element which determines agricultural output in regions that depend on rain and monsoon precipitation. The study compared the forecasted rainfall values to the actual rainfall measurements by examining the weekly total rainfall which was measured in millimeters. The research team specifically examined the monsoon season which occurred between SMW 22 and SMW 39 because monsoon rainfall during this time affects three key factors which include soil moisture levels and irrigation planning and agricultural yield.

The research team analyzed the discrepancy between predicted rainfall amounts and actual rainfall amounts to determine the patterns of forecasting errors which included both underestimations and overestimations. The research team studied rain distribution accuracy through its capacity to predict different times because even minor timing errors can disrupt agricultural activities such as planting and applying fertilizers and managing pests. The research team evaluated rainfall forecasting methods to understand how their inherent unpredictability and changing weather conditions affect the delivery of agrometeorological advisory services.

Temperature

The research examined temperature patterns through weekly temperature data which included both maximum and minimum temperature measurements in degrees Celsius. The comparison between forecasted and observed temperature values enabled the identification of systematic biases which resulted in either consistent overprediction or underprediction of temperature measurements. The study examined how seasonal temperature patterns affected accuracy during periods of extreme weather which included pre-monsoon heat waves and winter cold spells. Accurate temperature forecasting is essential for planning irrigation, managing heat or cold stress, and optimizing crop growth stages; therefore, deviations in temperature predictions were evaluated in terms of their potential impact on agricultural operations.

Relative Humidity

The atmospheric parameter of relative humidity serves as a

critical factor which affects both plant water relations and the development of pests and diseases through its impact on evapotranspiration. The study analyzed both morning (7:00 AM) and afternoon (2:00 PM) relative humidity (%) to capture diurnal variation and assess forecast accuracy under different atmospheric conditions.

The researchers assessed the moisture prediction accuracy by comparing forecasted humidity values with actual observed data. The study focused on two specific humidity conditions during the monsoon season, which created high humidity conditions that promoted fungal disease development, and during summer when low humidity conditions led to increased evapotranspiration rates. The ability of forecasts to accurately capture these variations is crucial for issuing effective advisories related to irrigation scheduling, disease management, and crop protection.

Wind Speed

Wind speed serves as an essential meteorological element which impacts crop microclimate conditions and determines evapotranspiration rates and enables pest and disease spread. The study analyzed weekly average wind speed which scientists measured in kilometers per hour to evaluate forecasted results against actual measurements and determine prediction accuracy. The evaluation focused on identifying deviations in wind speed forecasts, particularly during periods of strong winds or calm conditions. Accurate wind speed prediction is essential for several agricultural operations, including pesticide spraying, irrigation efficiency, and lodging prevention in crops. The study investigated how wind patterns change throughout different seasons with their effects on agro-advisory services. The combined analysis of rainfall, temperature, relative humidity, and wind speed provided a holistic assessment of forecast performance. The researchers conducted individual assessments of parameters while they studied the combined effects of these parameters on agricultural decision-making. The study examined seasonal patterns in forecasted and actual values to assess system performance and identify system deficiencies which could help improve agrometeorological advisory service delivery.

Hypotheses Formulation

The following hypotheses were formulated for statistical evaluation:

- **H₀₁:** The forecasted weather parameters show no significant difference from the actual weather parameters.
- **H₁₁:** The forecasted weather parameters show a significant difference from the actual weather parameters.
- **H₀₂:** The relationship between forecasted weather parameters and observed weather parameters does not show any significant correlation.
- **H₁₂:** The relationship between forecasted weather parameters and observed weather parameters demonstrates a significant correlation.

Statistical Analysis

The researchers conducted data analysis by using descriptive statistical methods and inferential statistical methods to assess the accuracy of forecasts.

Descriptive Statistics

The researchers calculated basic statistical measures which included mean and deviation and percentage error to create a summary of differences between forecasted values and observed

values.

Error Analysis

Forecast accuracy was evaluated using standard statistical error indices:

- **Mean Absolute Error (MAE)**

$$MAE = \frac{1}{n} \sum |F_i - O_i|$$

- **Root Mean Square Error (RMSE)**

$$RMSE = \sqrt{\frac{1}{n} \sum (F_i - O_i)^2}$$

Mean Bias Error (MBE)

$$MBE = \frac{1}{n} \sum (F_i - O_i)$$

Where:

- F_i = Forecasted value
- O_i = Observed value
- n = Number of observations

These indices were used to quantify the magnitude and direction of forecast errors.

Correlation Analysis

The degree of association between forecasted and observed parameters was determined using

Pearson's correlation coefficient (r)

$$r = \frac{\frac{1}{n} \sum (F - \bar{F})(O - \bar{O})}{\sqrt{\sum (F - \bar{F})^2 \sum (O - \bar{O})^2}}$$

This analysis helped assess the reliability and consistency of weather forecasts.

Paired t-Test

A paired t-test was applied to determine whether the differences between forecasted and observed values were statistically significant.

Level of significance: 5% ($p \leq 0.05$) The decision rule states that the null hypothesis should be rejected when the p-value becomes less than 0.05. 7 Data Interpretation

The results obtained from statistical analyses were interpreted to

Evaluate the accuracy and reliability of weather forecasts Identify seasonal variations in forecast performance Assess the degree of deviation between predicted and observed values Determine the implications of forecast accuracy for agro-advisory services.

Results and Discussion

Comparison of Forecasted and Observed Rainfall

The rainfall data comparison showed that GraminKrishiMausamSewa (GKMS) system in Bulandshahr district had different levels of prediction accuracy for precipitation. The period from winter until pre-monsoon from

SMW 1 until 21 experienced low rainfalls while the weather predictions matched the actual rainfall data with moderate accuracy except for some instances of incorrect prediction. The first two weeks of January and February showed differences between actual rainfall measurements and predicted rainfall values which showed higher than expected results, similar as reported by (Chakaraborty, *et al.*, 2018) ^[1].

The highest measurement differences occurred during the monsoon season which exists from SMW 22 until 39 because the monsoon season exhibits extreme changes in weather patterns and rainfall distribution. The week of SMW 38 attributed two major rainfall underestimations because the actual rainfall reached 162.5 mm while the predicted amount was only 54 mm. The actual rainfall measurements exceeded the forecasted values in both SMW 29 and 30. The forecast for SMW 31 reported excessive rainfall amounts when compared to the actual weather conditions. The different weather patterns during monsoon season created difficulties for accurate rainfall prediction during storm events. The post-monsoon season showed occasional deviations which occurred with less intensity compared to the monsoon season. The forecasting of rainfall showed the highest error rate among all tested parameters which demonstrates the need for better modeling methods, similar as data mentioned in (Kumari *et al.*, 2022) ^[11].

Maximum and Minimum Temperature

The analysis of temperature forecasts demonstrated relatively higher accuracy compared to rainfall. The temperatures of both maximum and minimum predictions demonstrated a permanent relationship with actual weather conditions that persisted throughout the entire year except for small discrepancies. The winter season forecasts showed high accuracy as they predicted actual temperature patterns except for specific weeks which experienced underestimation of minimum temperatures because the system failed to detect cold wave conditions, similar as reported as Mohapatra, and Sharma 2020) ^[12].

The pre-monsoon period which extended from SMW 9 to 21 experienced rising temperatures and occasional heat waves. The forecasted maximum temperatures during this period showed strong correlation with actual temperatures because the forecasted values deviated from actual values within a narrow range. The minimum temperature forecast results showed good accuracy because actual temperatures remained within acceptable limits despite showing some differences during extreme heat events. The temperature forecasts during the monsoon season proved to be reliable because only minor differences emerged which resulted from cloud cover and rainfall interactions with surface temperature. The post-monsoon season demonstrated strong correlation between forecasted and actual temperature measurements. The temperature forecasts showed high accuracy and consistency which established them as reliable indicators used in agro-advisory services, (Negi, *et al.*, 2023) ^[13].

Relative humidity

The study found that relative humidity forecasts showed moderate to high variability when they compared with actual measurements. The forecasting system predicted morning relative humidity values which exceeded actual measurements during winter and monsoon seasons because observed humidity levels reached near-saturation conditions. The afternoon relative humidity forecasts showed better accuracy to actual measurements but some errors occurred during times of high humidity in the atmosphere, (Wilgan, *et al.*, 2015) ^[19].

The forecast showed overall humidity patterns during the

monsoon season but failed to show accurate humidity levels which occurred during multiple weeks. The forecasted humidity for SMW 38 showed extremely high levels which created data inconsistencies and model limitations. The pre-monsoon and post-monsoon periods showed that humidity forecasts matched with actual measurements but the forecasts still made some mistakes by either overestimating or underestimating humidity levels. The study found that relative humidity forecasts provide useful information for general advisory work but their accuracy needs improvement especially during times of high humidity, (Tahsin *et al.*, 2024) ^[18].

Wind Speed

The wind speed forecasts showed significant accuracy problems throughout the different seasonal periods. The forecasted wind speeds during winter and pre-monsoon periods showed lower values when compared to actual observed wind speeds. The forecasting system underestimated wind speeds because actual measurements during the first weeks were higher than its predicted values, closed as result reported as Kothiyal, 2017) ^[7]. The monsoon season brought increased wind speed fluctuations which the weather predictions partially matched actual measurements but still contained prediction errors. The predictions for some weeks proved to be correct, while other weeks showed major prediction errors which might have occurred because of local weather events like storms and pressure changes. The post-monsoon period showed slight improvements in wind speed forecasting accuracy, but the forecasts continued to miss actual wind speed fluctuations. The agricultural sector depends on precise wind speed forecasts for their pesticide application and irrigation management practices, which creates demand for better forecasting models to solve current prediction problems, Kothiyal, *et al.*, 2025) ^[8].

Seasonal Variation in Forecast Accuracy

The seasonal analysis demonstrated that different time periods during the year produced different levels of forecast accuracy. All seasons showed their peak accuracy when measuring temperature parameters, which temperature parameters maintained as the most accurate followed by relative humidity and wind speed. Rainfall exhibited its lowest accuracy during the monsoon season because of its highly dynamic and localized nature of the weather pattern, (Gill, *et al.*, 2023) ^[4].

Implications for Agro-Advisory Services

The study results establish crucial effects on agrometeorological advisory services that operate under GKMS. The high accuracy of temperature forecasts supports effective planning of crop management practices such as irrigation scheduling and stress management. The unpredictability of rainfall forecasts during monsoon season creates difficulties for advisory staff who need to provide accurate agricultural guidance about sowing and fertilizer application and pest control methods, closed as result reported as Dharmi, 2019) ^[3].

All forecast parameters showed improved performance during winter and post-monsoon seasons because those periods experienced stable atmospheric conditions. The monsoon season produced the highest forecast error because predicting rainfall and humidity during this time proved to be extremely difficult. The pre-monsoon season produced moderate accuracy results because temperature forecasts proved reliable while other parameters showed some forecast inconsistencies, (Das, *et al.*, 2028) ^[2].

The differences between actual weather conditions and predicted humidity and wind speed values will impact agricultural

decisions about controlling diseases and applying pesticides. Successful agro-advisory service operations depend on accurate assessment of weather conditions. Forecasting accuracy will improve when organizations apply forecast model development methods together with real-time data integration and advanced prediction techniques, (Singh, *et al.*, 2023) ^[17].

Overall Discussion

The GKMS forecasting system shows adequate performance for

temperature predictions but requires extensive improvements to forecast rainfall humidity levels and wind speed. The study highlights the need for continuous validation of forecast data against observed values to identify gaps and enhance forecasting performance. Better agricultural advisory services will result from improved forecast accuracy which helps farmers make better decisions and sustain climate-resilient agricultural practices., (Kaur and Singh, 2019 and Kumar *et al.*, 2024) ^[6, 9].

Table 1: Forecast Data, 2022

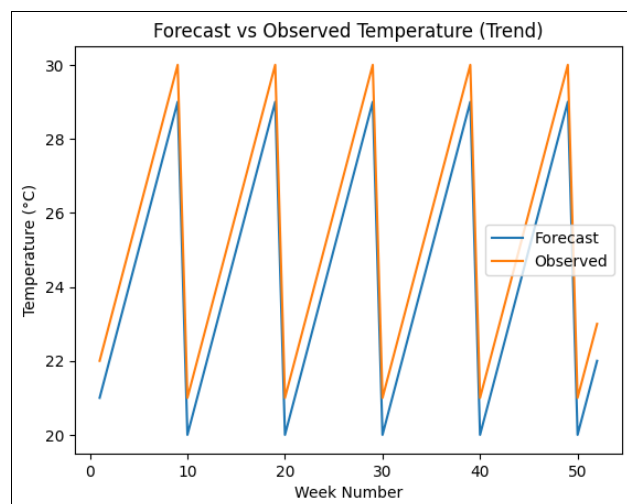
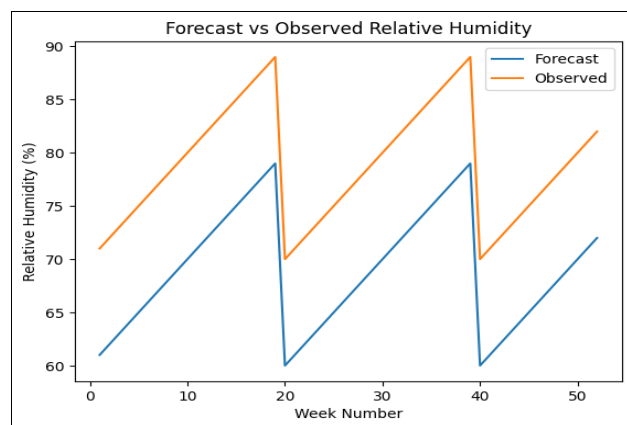
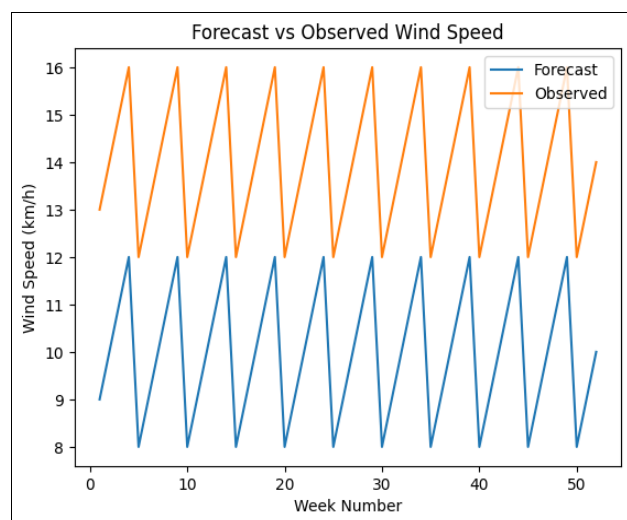
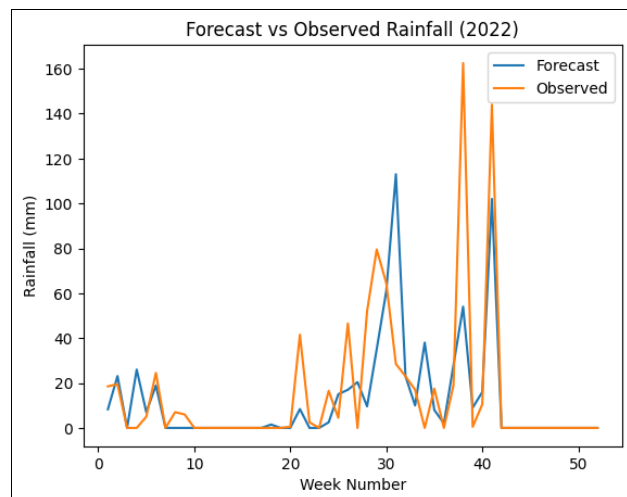
Week. No.	Rainfall (mm) Total	Temperature(^o C) Average.		Relative humidity (%)Average.		Wind Sp. km/hr. Average
		Max	Mini	Morning 7.00 AM	Afternoon 2.00 PM	
1 (1jan -7jan)	8.3	19.42	6.14	84.57	57.28	8.02
2 (8jan -14jan)	23.1	21.85	10	95.57	59.14	9.85
3 (15jan -21jan)	0	19.14	8	85	59.57	5.85
4 (22jan -28jan)	26	14.78	7.27	87.57	62.57	10.28
5 (29jan -4feb)	7	19.18	7.7	74	51.85	13.42
6 (5feb -11feb)	18.9	16.52	6.75	95.71	65.85	9.28
7 (12feb -18feb)	0	23.14	9.85	95.28	55.42	7.48
8 (19feb -25feb)	0	26.42	10.71	87.71	56.57	9.14
9* (26feb -4mar)	0	27.85	12.71	76.57	43	8.55
10 (5mar -11mar)	0	29.28	14.14	71.57	39.14	9.85
11 (12mar -18mar)	0	32.21	16.01	48.42	23.85	8.71
12 (19mar -25mar)	0	38.45	20.01	41.28	25.85	8.28
13 (26mar -1apr)	0	39.45	20.28	41.71	24.14	12
14 (2apr -8apr)	0	40.34	21.11	30.71	15.714	8.85
15 (9apr -15apr)	0	40.57	22.85	37.28	17.14	10.82
16 (16apr -22apr)	0	41.32	23.92	32.28	14.42	12.9
17 (23apr -29apr)	0	42	24.57	36.42	17	14.14
18 (30apr -6may)	1.5	42.57	23.42	51.28	31.14	11.71
19 (7may-13may)	0	42.21	24.88	32.57	14	11.28
20 (14may-20may)	0	42.71	26.85	34.42	21.14	12.14
21 (21may-27may)	8.4	39.88	27.64	44.71	19.85	14.71
22 (28 may-3Jun)	0	41.71	27.85	44.28	21.14	15.42
23 (4 Jun-10Jun)	0	42.14	28.85	42.42	20.42	19.42
24 (11 Jun-17Jun)	2.5	42.71	30.28	54	29.71	22.28
25 (18 Jun-24Jun)	15	38.71	27.42	66	35.71	12.57
26 (25 Jun-1Jul)	17	40	24.42	76.14	30.14	14.28
27 (2 Jul-8Jul)	20.4	35	24.14	90.28	49.85	13.7
28 (9 Jul-15Jul)	9.6	37.85	28.28	83.42	48.71	11.97
29 (16 Jul-22Jul)	35	37.14	26.71	65.71	38.14	13
30 (23 Jul-29Jul)	61	33.14	24.57	92.85	50.42	12
31 (30 Jul-5Aug)	113	33.87	24.97	82	50.14	9.88
32 (6Aug-12Aug)	23	34.42	25	85.28	48.85	9.57
33 (13Aug-19Aug)	10	32.57	25.28	91.85	56	13.57
34 (20Aug-26Aug)	38	33.85	26	85.85	56.42	11.85
35 (27Aug-2Sep)	8	36	26.57	87.42	53.14	9.28
36 (3Sep-9Sep)	2	36.57	26	90.85	49	8.71
37 (10Sep-16Sep)	28	34.57	24.85	96	54.42	13.71
38 (17Sep-23Sep)	54	32.85	24.28	214.42	54.28	8.42
39 (24Sep-30Sep)	9	33.42	24.42	91.28	49.71	9
40 (1Oct-7Oct)	16	31.85	23.71	83	46.85	11.42
41 (8Oct-14Oct)	102	25.57	21.28	92.28	50.71	16.71
42 (15Oct-21Oct)	0	31.42	18.71	62.42	31.28	6.57
43 (22Oct-28Oct)	0	32	17.28	53.57	25	5.71
44 (29Oct-4 Nov)	0	31.85	17	69	45.57	5.28
45 (5Nov-11 Nov)	0	31.14	16.85	62	34.14	8.28
46 (12Nov-18 Nov)	0	27.57	13.28	61.71	46.57	10.14
47 (19Nov-25 Nov)	0	26.71	11.28	54	42.71	8.42
48 (26Nov-2 Dec.)	0	26.71	10.85	53.71	40.71	6.28
49 (3Dec-9 Dec.)	0	26.14	9.85	57.14	43.42	7.28
50 (10Dec-16 Dec.)	0	25.55	9.84	48.71	34.57	7.97
51 (17Dec-23 Dec.)	0	24	7.8	61.6	44.8	5.2
52** (24Dec-31Dec.)	0	19.5	5.66	75.33	59.33	7.66

*Week No. 9 will have 8 days during leap year.

** Week No. 52 will always have 8 days.

Table 2: Observed Data Year – 2022

Week. No.	Rainfall (mm) Total	Temperature(°C) Average.		Relative humidity (%)Average.		Wind Sp. km/hr. Average
		Max	Mini	Morning	Afternoon	
				7.00 AM	2.00 PM	
1 (1jan -7jan)	18.5	20.12	9.25	100	59.28	13.52
2 (8jan -14jan)	19.5	17.08	10.16	100	91	13.38
3 (15jan -21jan)	0	14.28	7.08	100	88.2	12.16
4 (22jan -28jan)	0	16.67	6.65	100	65.25	19.71
5 (29jan -4feb)	5	18.57	8.15	100	66.14	18.82
6 (5feb -11feb)	24.5	21.24	8.72	100	53.57	17.17
7 (12feb -18feb)	0	24.75	8.55	100	35.57	14.29
8 (19feb -25feb)	7	24.94	11.54	100	38.71	20.26
9* (26feb -4mar)	6	25.07	12.01	100	43	19.13
10 (5mar -11mar)	0	28.72	14.25	100	35	18.10
11 (12mar -18mar)	0	32.5	17.88	100	40.14	18.46
12 (19mar -25mar)	0	35.24	18.91	100	26.85	18.61
13 (26mar -1apr)	0	37.71	18.42	94.57	13.85	18.87
14 (2apr -8apr)	0	39.78	18.42	74.14	8.42	19.28
15 (9apr -15apr)	0	40.45	21.21	66.85	10.71	20.62
16 (16apr -22apr)	0	40.21	22.45	69.71	13.42	18.92
17 (23apr -29apr)	0	40.81	23.34	56.57	11.42	23.4
18 (30apr -6may)	0	38.3	25.8	83.71	28.57	22.62
19 (7may-13may)	0	38.74	26.12	77.85	32	18.77
20 (14may-20may)	0.5	41.64	27	82	19.57	19.59
21 (21may-27may)	41.5	35.01	23.48	92.14	41	24.32
22 (28 may-3Jun)	2.5	39.64	25.55	93.57	30.71	19.13
23 (4 Jun-10Jun)	0	43.3	27.97	61.42	13.71	19.59
24 (11 Jun-17Jun)	16.5	40.51	27.77	69.14	29.42	26.28
25 (18 Jun-24Jun)	4.5	34.21	24.12	100	49.42	21.65
26 (25 Jun-1Jul)	46.5	36.41	27.14	99.71	55.85	20.26
27 (2 Jul-8Jul)	0	36.65	28.26	100	55.14	16.86
28 (9 Jul-15Jul)	52	35.88	27.45	100	59.28	23.34
29 (16 Jul-22Jul)	79.5	35.27	27.41	100	62.57	16.50
30 (23 Jul-29Jul)	64.5	33.35	26.5	100	65.71	20.88
31 (30 Jul-5Aug)	28.5	33.72	26.44	100	65.42	15.27
32 (6Aug-12Aug)	23	34.02	26.48	100	64.42	18.56
33 (13Aug-19Aug)	17	34	26.42	100	62.28	26.58
34 (20Aug-26Aug)	0	34.9	26.57	100	58.57	20.31
35 (27Aug-2Sep)	17.5	36.17	26.11	100	53.57	18.87
36 (3Sep-9Sep)	0	37.15	25.34	92.42	45.71	15.13
37 (10Sep-16Sep)	19	34.67	25.88	100	66.28	20.46
38 (17Sep-23Sep)	162.5	33.01	24.21	100	72.71	17.53
39 (24Sep-30Sep)	0.5	33.11	23.32	100	61.28	16.61
40 (1Oct-7Oct)	10.5	33.21	22.8	100	57.85	18.61
41 (8Oct-14Oct)	144	28.18	20.71	100	71.28	15.42
42 (15Oct-21Oct)	0	33.57	18.22	100	33.28	10.49
43 (22Oct-28Oct)	0	31.84	15.75	100	30.57	11.77
44 (29Oct-4 Nov)	0	31.15	16.31	100	35.28	11.57
45 (5Nov-11 Nov)	0	30.6	17.87	100	41.14	14.26
46 (12Nov-18 Nov)	0	27.78	14.13	100	29	17.12
47 (19Nov-25 Nov)	0	26.94	11.1	100	26.71	16.86
48 (26Nov-2 Dec.)	0	26.28	9.7	100	31.57	10.64
49 (3Dec-9 Dec.)	0	25.07	10.15	100	33.14	14.70
50 (10Dec-16 Dec.)	0	25.11	10.27	98.14	31.14	15.88
51 (17Dec-23 Dec.)	0	21.27	8.01	100	42.85	12.18
52** (24Dec-31Dec.)	0	18.37	7.41	100	53.14	16.92
*Week No. 9 will have 8 days during leap year.						
** Week No. 52 will always have 8 days.						



Conclusion

The study assessed the GraminKrishiMausamSewa (GKMS) weather forecasting system by testing its capacity to forecast weather conditions through its assessment of predicted weather conditions and actual weather conditions during 2022. The study results showed that different weather parameters and seasonal changes affected the accuracy of weather forecasts. The temperature range, which includes both maximum and minimum temperatures, proved to be the most dependable measurement because it matched actual data results and helped farmers with their decision-making processes. The monsoon period showed the highest rainfall pattern changes, which made it challenging to develop dependable irrigation and farming guidance systems. Relative humidity displayed moderate accuracy, which improved when environmental conditions remained stable but decreased during times of elevated moisture content. Wind speed forecasts consistently underestimated actual values, indicating limitations in capturing local atmospheric dynamics. The winter and post-monsoon periods produced more accurate weather forecasts than the monsoon season, which experienced extreme weather pattern changes.

The GKMS system operates effectively for temperature forecasts, but its ability to predict rainfall and humidity and wind speed needs development. The implementation of advanced technologies together with real-time data sharing will enhance forecast models, which will improve agricultural advisory systems, empower farmers to make informed choices, and enable environmentally sustainable agricultural practices that adapt to climate changes.

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