A SIMPLE METHOD FOR THE EVALUATION OF WEATHER FORECASTS

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The well known "joke" behind all weather forecasts is universal. Although most of the people don't mean it still we can find some people who really mean it. It is difficult to confine them to a certain group. When a forecast goes wrong then there are lots of people to criticise it but most of the people do not appreciate it when it comes true. This may be due to the fact that those who do not appreciate it either do not have the time to appreciate it or they do not care because the forecast has been correct.

A method was developed to evaluate the weather forecasts issued by the Department of Meteorology and it was applied to evaluate the forecasts issued for the Western province during the month of August 1992.

The results revealed that the average (for 31 days) accuracy of the forecasts issued for the said period is 73.5%.

Introduction

A notable public response to the daily weather forecasts issued by the Department of Meteorology has been observed during the past couple of years. There are two basic reasons for this.

1. **Reliability of forecasts issued**

   If the general public finds that all forecasts go wrong, they will no longer be intersted in the weather forecasts.

2. **Effective dissemination of weather forecasts**

   Thanks to the Media (local Press, Radio and Television) the Weather Forecasts are disseminated to the general public through the media.

   The most powerful medium of communication in Sri Lanka is Television. This has largely contributed to the dissemination of the Weather forecasts to the general Public.

3. **The economic effectiveness of the work of the Meteorological Service.**

The increasing importance placed on assessing meteorological factors in planning and implementation various measures associated with many aspects of human activities.

TECHNIQUE EVALUATION FORECASTS

The well known "joke" behind all weather forecasts is universal. Although most of the people don't mean it still we can find some people who really mean it. It is difficult to confine them to a certain group. When a forecast goes wrong then there are lots of people to criticise it but most of the people do not appreciate it when it comes true. This may be due to the fact that those who do not appreciate it either do not have the time to appreciate it or they do not care because the forecast has been correct. This is natural. The way the forecasts are evaluated is not reasonable and a 'forecast' by definition need not be 100% accurate. Some people do not like the language used in weather forecasting but it has to be pointed out that there are certain special words which have to be used when writing a weather forecast.

Those who had been lucky enough to travel abroad, specially to temperate regions such as United Kingdom, USA and Canada etc. very often comment on the accuracy of the weather forecasts issued in those countries, but they fail to realize, probably through ignorance, the difference in the weather systems in tropical countries such as Sri Lanka and these temperate countries. In the middle latitudes frontal weather systems are well behaved. Not only the direction of motion but also the amount of precipitation due to these frontal weather systems can be estimated well ahead of time. More detailed weather forecasts can be prepared by studying these well behaved frontal weather systems. This is not so in tropical weather systems.

With the advancement of communication technology people in Sri Lanka get the opportunity to watch on TV Wether Forecasts with World News and other international programmes which are telecast by some international agencies via satellites. There is a tendency to believe that these forecasts are superior to the local forecasts. The method of presentation using high technology and the interactive nature of presentation may be the reason for this belief. It must however be pointed out that World Weather Forecasting centres have no capability of forecasting local weather over countries like Sri Lanka.

The local weather situation is determined by analyzing the observations done every 3 hours by the local observatories scattered throughout the Island. A good knowledge of topography and the climatology of the country is very necessary as additional tools for local forecasting purposes. Weather forecasting in Sri Lanka is mostly subjective. Climatology and Persistence Techniques are commonly used in forecasting. No forecasting models and Numerical Analysis packages are currently available. Besides the above constraints the nature of the Tropical Weather is very complex. The weather systems in the tropics are not well behaved and not yet properly understood unlike those in the mid latitudes.

Another important aspect to be stressed is the scarcity of meteorological data in the area surrounding Sri Lanka. This is mainly due to the geographical location of the Island. We are surrounded by the Indian Ocean where only a handful of land stations, (such as Male, Gan,...) exists.

With all these limitations the Department of Meteorology issues the main daily weather forecasts on a provincial

basis. Verification of these forecasts can be done only by the

Meteorologistsworking at the National Meteorological Centre (NMC) where all past and present weather information is available. Also this should be done scientifically, based on Objective techniques. The general public have very limited information available to them to carry out an evaluation of this nature.
In this short article, a simple method of evaluation of forecasts is described and the forecasts issued for the Month of August 1992 for the Western province by the Sri Lanka Department of Meteorology is evaluated using this method.

The common words used in forecasting and their meaning with respect to rainfall are explained with the following tabulations.

Rainfall Forecast

Mainly the spatial temporal distribution of rainfall is included in the daily forecast issued by Sri Lanka Meteorological Department to the general public since the rainfall is the most sensitive weather element in a tropical island such as Sri Lanka.

The format which is used to issue the daily weather forecast for the general public can be classified into three groups.

Format I:

Includes only spatial distribution of rainfall. The words used in this format and their definitions are tabulated in Table 2. Sometimes, the type of rain is also included (see Table 1).

Format II:

Includes both spatial and temporal distribution of rainfall. The definitions of the words used in this format are tabulated in the Table 3.

Symbols used & their Definitions:

A. Rainfall Types

Table 1

Symbol	Word	Definition
A1	Heavy	24 Hour Rainfall > 100 mm
A2	Fairly heavy	100 mm > 24 Hr. Rainfall > 50 mm
A3	Moderate	50 mm > 24 Hr. Rainfall 25 mm
A4	Light to Moderate	25 mm > 24 Hr. Rainfall > 12.5 mm
A5	Light	12.5 mm > 24 Hr. Rainfall > 0
A6	No rain	24 Hr. Rainfall ~ 0

B. Rainfall (Spatial Distribution)

Table 2

Symbol	Word	Definition
B1	Widespread	80% of Stations reports A2-A1 type rain
B2	Fairly Widespread	60% of Stations reports A2-A1 type rain
B3	Scattered	at least 50% of Stations reports any type rain
B4	Isolated	less than 50% of Stations reports any type rain

C. Rainfall (Temporal distribution)

Table 3

Symbol	Word	Definition
C1	Frequent	Continuous rain through out the day
C2	Intermittent	Rain with short intermissions
C3	Occasional	More than 3 Light to Moderate falls

Type of rain is also included occasionally.

Format III:

Includes the cause for the current weather. This is indicated whenever there is a significant weather systems such as a Cyclone, depression etc. in the vicinity of Sri Lanka. This is in addition to the general weather forecast given in the format I or II or both.

This table was constructed by the author

Analysis

Accuracy of the forecasts issued was determined by using the Table 4. The criteria were developed by the author.

B1 to B5 indicate the spatial distribution of rainfall which is self explanatory in the Table 2 while C1 to C3 indicate the temporal distribution of rainfall. It is also explained in the Table 3.

For an instance, when the forecast weather is B5 and the actual weather observed in following day is B4 then the accuracy would be 80% according to the accuracy determination table (Table 4).

The accuracy of the weather forecasts issued for the western province during the month August 1992 was determined using the above tables. Final evaluation was tabulated in Table 5. Analysis was summarized in the Table 6. Figure 1 shows the graphical quantification of the accuracy ranges. All the Tables used to evaluate the accuracy of forecasts for the month of August 1992 are available with the author.

Out of 30 forecasts evaluated only one forecast has been fully out. Fourteen forecasts found to be 100% accurate. Average accuracy of forecasts issued for the month August 1992 (31 forecasts) was 73.45%.

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References

1. Dobryshman, E.M., 1972. Review of Forecast Verification Techniques WMO No. 303, Technical Note No. 120, *World Meteorological Organization.*

Table 4

Accuracy Determination Chart

Forecast / Actual	B1	B2	B3	B4	B5	C1	C2	C3
B1	100%	80%	60%	20%	0%	90%	85%	80%
B2	80%	100%	60%	30%	0%	70%	75%	85%
B3	60%	60%	100%	60%	20%	40%	40%	80%
B4	20%	30%	60%	100%	80%	20%	20%	10%
B5	0%	0%	20%	60%	100%	0%	0%	0%
C1	90%	70%	40%	20%	0%	100%	90%	80%
C2	85%	75%	40%	0%	20%	90%	100%	90%

Table 5

Results for the Month of August 1992 : Western Province

	Weather				Weather		
Date	Forecast	Actual	Accuracy	Date	Forecast	Actual	Accuracy
01	C3	B4	10%	16	B4	B4	100%
02	C3	B4	10%	17	B3	B4	60%
03	B3	B3	100%	18	B3	B5	20%
04	B3	B3	100%	19	B4	B3	60%
05	C3	B5	0%	20	B4	B3	60%
06	B3	B2	60%	21	B4	B5	60%
07	B3	B3	100%	22	B4	B4	100%
08	B3	B2	60%	23	B5	B4	60%
09	B3	B3	100%	24	B4	B4	100%
10	B3	B4	60%	25	C3	B3	80%
11	B3	B3	100%	26	C3	B3	80%
12	B3	B4	60%	27	B3	B3	100%
13	B3	B3	100%	28	B4	B3	60%
14	B4	B4	100%	29	B3	B3	100%
15	B4	B4	100%	30	C3	C3	100%
				31	B3	B3	100%
Average Accuracy of Forecasts							73.45