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Extension Article

## The Value of Weather Forecasts for Agriculture<sup>1</sup>

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### INTRODUCTION

Healthy growth and normal yield of agricultural crops depends upon certain optimum conditions of weather such as rainfall, number of rainy days, cloudiness, temperature, wind and humidity, during the different phases of growth of the crops. Thus weather, as a single factor exercises as great a control on crop yield as all other factors put together. In India, which is predominantly an agricultural country, it is often said that the country's budget is a gamble on the monsoon, which brings most of the country's rainfall.

Man has not yet been able to control weather. He must, therefore, plan his activities in such a way that he can make the best possible use of what cannot be controlled. Even at the present time when the science of weather and its practical applications are so well developed in many countries, agriculture is carried on in many areas according to traditional methods and beliefs. In India (as perhaps in other countries also) there is a considerable store of weather lore covering a variety of rural activities including agriculture. The rural folk have such an abiding faith in time-honoured proverbs, particularly those concerning the coming weather and seasons that very often they are inclined to base their agricultural and other operations on these proverbs. A few years ago a committee set up by the India Meteorological Department examined critically a large number of folklores which were of interest from the agricultural and meteorological point of view, but found that only about 5 per cent of them had general support on the basis of recorded data (Basu, 1953).

#### *Effects of weather ;*

Reliable weather forecasts received sufficiently early are of value to agriculture since they would enable the farmer to time the various important agricultural operations like preparation of seed bed, sowing, interculture, harvesting, threshing, etc., with the minimum risk and utilising his available resources to the maximum advantage. There are some critical periods in the life history of a crop from the date of sowing to the date of harvesting. Sowing time is one of great anxiety to the farmer since he knows that a heavy shower just after sowing will wash away the seeds and seedlings and depress germination considerably. Again, if after sowing a prolonged drought follows, the seedlings may wither away. Weather at the sowing time might even determine the nature and variety of the crop that the farmer desires to grow in his field. If the conditions are favourable during the early part of its life the crop gets a good start. Thereafter intervals of clear weather are required for interculture and weeding. During the period of rapid vegetative growth the water requirement and the need for sunshine are maximum. During the period of flowering and grain formation, clear weather and minimum cloudiness are favourable. Cloudy weather during flowering period can sometimes

<sup>1</sup>Contribution from Meteorological Office, Poona.

ruin an otherwise promising crop. During the grain-formation period a spell of hot weather can shrivel up the grains. Even after the entire season has passed safely the crop is not free from the dangers of adverse and unexpected weather. A heavy shower of rain or hail can do incalculable damage to a standing crop ready for harvest. When the harvested crop is lying on the threshing floor a sudden shower can do great harm (Weather and the Indian Farmer—1962).

The weather has also an indirect influence in that it may lead to the incidence of plant pests and diseases.

*Common weather hazards and possible protective measures :*

Some of the common weather hazards and the ways in which advance information regarding them may help the farmer are briefly indicated below :

*Cyclonic storms :* The forecasting of the formation and movement of cyclonic storms is among the major activities of National Meteorological Services. The normal directions and speeds of movement of cyclonic storms and depressions can be forecast with a high degree of success. If a cyclonic storm is expected near about the normal sowing time or harvest time, these operations can either be postponed or advanced. At other times very little can perhaps be done to prevent damage to standing crops but loss of life to livestock and human beings can be avoided or at least minimised and stored food grains saved.

*Floods :* Flooding of agricultural fields can occur as a result of (1) very heavy rainfall even though they occur for short periods, (2) moderate to heavy rainfall continuing for long periods, (3) floods in rivers flowing through one region as a result of heavy rainfall in their upper catchment even though there may be no rain in the region flooded. The first one is sometimes highly localised. In this case the forecasting is difficult. On the other hand, if the very heavy rain is the result of well-defined synoptic situations, the forecasting is comparatively easy. The second type of floods usually occur only in connection with well defined synoptic situations and hence can be forecast with reasonable accuracy. The same is the case with the third type of floods. In all these cases advance information can help the farmer. In the case of irrigated crops, the irrigation can be postponed or done away with. Channels for draining away flood water can be opened out. Some of the agricultural operations can be postponed. Instances have also been reported of farmers irrigating their fields to a sufficient depth when warned about the occurrence of heavy rainfall so that the force of the falling heavy drops of rain is absorbed by the sheet of water and the soil and the roots of seedlings below are left undisturbed and hence unharmed.

*Droughts :* Among the long-term agricultural measures in areas which are liable to frequent droughts is the introduction of drought resistant varieties of crops. Regarding short-term measures, a farmer who has facilities for irrigation can advance his irrigation schedule on receipt of warning regarding a dry spell. In connection with operations like sowing or transplantation (in the case of paddy) drought warnings will enable the farmer to postpone the operation to a more favourable period.

*Frost :* Frost is so destructive a phenomenon that a single night's frost can destroy a fruit orchard or a vine yard. It is, however, generally possible to give the farmer prior warning regarding the incidence of cold waves and frosty conditions.

The permanent measures for frost protection are the avoidance of the bottom of valleys, which are more susceptible to frost than slopes for growing crops susceptible to frost, provision of windbreaks on the windward side etc. The remedial measures that can be adopted on receipt of a forecast of frost are heating the garden by means of artificial heaters. In places where the farmers cannot afford to use oil heaters, as they do in western countries, he can light as many country fires as he can by using dried leaves, twigs, dungcakes, etc. It has been found that it is possible to heat up a vine garden by as much as 5°C by using about 400 such country fires per acre when the garden is protected by windbreaks. A simple frost alarm has been designed by the Agricultural Meteorology Division of the India Meteorological Department. This device rings a bell and wakes up the farmer as soon as the temperature in the garden begins to approach freezing point (or any other pre-determined temperature). By making use of this device the farmer can make the best use of his available resources of heating material and make use of them only when the occurrence of a frost is more or less certain. In some cases, the use of irrigation to fight frost damage can be effective if the cold spells are expected to be of short duration. However, in prolonged cold spells when the irrigated water itself gets frozen, irreparable damage can occur, if the field is irrigated.

*Heat waves* : Spells of abnormal heat are also harmful to crops. There is perhaps very little that a farmer can do on receipt of a heat wave warning except in cases where he can postpone or advance an agricultural operation. The warnings can, however, be utilised by him for regulating his outdoor activities like work in the field, protection of his cattle and livestock.

*Liaison between farmer and forecaster :*

For weather forecasts to be useful to agriculture (1) the forecaster should be familiar with the farmers' needs, (2) the farmer should be familiar with the language of the forecaster and how to interpret the forecasts and (3) the forecasts should reach the farmer sufficiently early enabling him to take whatever action is possible.

In India, the first problem has been solved to a large extent by the preparation of district-wise and crop-wise Crop-Weather Calendars. These have been prepared on the basis of the replies received from the different State Departments of Agriculture in reply to questionnaires seeking information, issued by the Agricultural Meteorology Division. These are diagrams showing (1) the life history of the crop from the date of sowing to the date of harvest and threshing (such as sowing, germination, tillering, elongation, flowering, grain formation); (2) the normal weather requirements as far as the agriculturists have been able to state; (3) the details of the weather warnings; and (4) the periods during which they are to be issued by the forecasting office. These enable the weather forecaster to see, at a glance, what warnings are to be issued for any particular district during a given weather situation and during a particular phase of the crop. There are at present about 500 such calendars and they are subjected to periodical checking and revision. Figure 1 gives a typical Crop Weather Calendar.

Besides the indirect contact that we have with the farmers through the State Departments of Agriculture, particularly their extension wings, the India Meteorological Department has also taken steps for establishing direct contact with

CALENDAR NO. M.R. (K) - 2

**CROP WEATHER CALENDAR**

PROVINCE : MADRAS.  
DISTRICT : Malabar.

CROP : RICE (Rain-fed)

INDEX NO OF DISTRICT :- 5202

MONTHS	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY				
	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7
LIFE HISTORY AND IMPORTANT EPOCHS OF CROP GROWTH																									
	<p>3 TO 4 GOOD SHOWERS EVERY MONTH</p> <p>BRIGHT WEATHER</p>																								
MEAN DATES OF IMPORTANT EPOCHS	3-00		8-00		31-22		32-24		16-69		9-22		10-57		5-50		1-11		0-31		0-27				
STANDARD WINDS	4-4		8-6		23-3		25-4		19-7		12-7		12-7		6-7		1-6		0-5		0-4				
WEATHER WARNINGS	<p>Exceeding 3" per day</p> <p>Exceeding 5 days</p> <p>Exceeding 7 days</p> <p>Exceeding 20 m.p.h.</p>																								
OTHER WEATHER	<p>&gt; 2" per day</p> <p>&gt; 2 days</p> <p>Cloudy weather</p> <p>Any rain</p>																								

AGRI. MET. METEOROLOGICAL OFFICE, POONA

Fig. 1. A typical Crop Weather Calendar

the farmer through the Community Project Centres. Weather forecasts and warnings are being issued to a selected number (about 400) Community Project Centres in the country out of a total of about 3000 blocks, by high priority landline telegrams for dissemination to the agriculturists in their respective areas. Officers of the Department periodically visit these Centres and explain to groups of farmers the nature and contents of the forecasts issued to them and the uses to which the forecasts can be put. When this scheme is extended to cover the whole country, it may be expected that our direct contact with the farmers will increase considerably.

The Farmers' Weather Bulletins which are issued in India contain district-wise information. They include a forecast for the next 36 hours together with an outlook for the subsequent two days. These are broadcast through the Regional Stations of All India Radio in their rural programmes and supplied to newspapers and sent by high priority landline telegrams to the selected Community Project Centres if they contain information useful to any Community Development Block. The number of rural receiving sets in the country (present number about 65,000) is increasing rapidly year after year but is still not sufficient to cover all the villages. It is hoped that before long their numbers will increase sufficiently to serve most of the rural areas. When this is realised, weather information may be expected to reach the farmer much earlier than at present.

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