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Prof. SULOCHANA GADGIL
Chairman

21 June 2000

Prof N V Joshi

CES

I thought - you may
be interested in this -

Sulochana



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Sulochana Gadgil

CAS:SG

20 June, 2000

Dr. P. Goswami

Centre for Mathematical Modelling and Computer Simulation (CMMACS)

NAL Belur campus

Bangalore 560037

Dear Dr. Goswami,

The prediction of the all-India summer monsoon rainfall for 2000 by your group at CMMACS was reported in several newspapers and TV channels around the end of April. Several of the reports stated that a deficit monsoon has been predicted and suggested that this prediction is likely to be more correct than that of IMD since that was the case for the last two years.

We have a farmers network in the Pavgada region of Tumkur district. We have been working with these farmers for the past three years, have given them information on the rainfall variability of the region and have identified farming strategies which are tailored to the variability, in collaboration with them.

Many of the farmers were extremely concerned when they heard about your prediction. I enclose copies of two letters I received from them. Since they asked for my assessment, I have sent them a detailed reply. I enclose a copy of this letter for your information.

With best regards,

Sincerely yours,

Sulochana Gadgil
(SULOCHANA GADGIL)



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Prof. Sulochana Gadgil

Sub: Prediction of seasonal rainfall during 2000

Friends,

This is in response to your letter expressing your concern since reading in the newspapers about a prediction of deficit monsoon this year. I understand that specifically the prediction you refer to is the experimental prediction of the all-India summer monsoon (June-September) rainfall by scientists from Centre for Mathematical Modelling and Computer Simulation (CMMACS), which appeared in several newspapers about one month before the official forecast by India Meteorological Department on 25 May. The CMMACS forecast is 789 mms i.e. 92.6% of the long term average rainfall, whereas the IMD forecast is for 99% of the average.

The first question is, is there any reason to believe that CMMACS prediction is likely to be closer to reality than the IMD forecast. Again newspaper reports suggest this by comparison of predictions and observations of the last two years. It is important to note that there are several groups in the country, who are doing research on methods for predicting the all-India monsoon rainfall and have developed models. The CMMACS model is one of these models. Such studies of experimental forecasts with different models need to be carried out so that the operational model can be improved. However, since monsoon prediction has a large impact on the society, predictions by these experimental models are not released to the press.

We should note that all these models are statistical models. Some of them like the one of CMMACS, use only historical data on the all-India summer monsoon rainfall. Others also use some features of the atmospheric

circulation (such as those associated with El Nino), which are found to be correlated with monsoon rainfall. With the available record of performance, there is no reason to believe that one model is superior to another. In the long history of monsoon forecasting, conclusions about superiority of one model over another, by comparing predictions of very few years, could have been drawn on many earlier occasions. However, observations of the next few years often contradicted them. Hence it is important to test the skill for at least ten years before such conclusions are drawn.

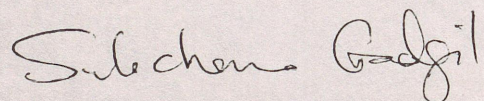
In fact, nowadays meteorologists often use an ensemble of models to generate forecasts of such complex phenomena, so as to minimize the uncertainties. The experimental forecast by CMMACS scientists, is based on a method called neural networks. The India meteorological Department (IMD) itself has five different types of experimental models, one of which is also based on neural networks. The forecast for this monsoon season, based on the operational model of IMD is for rainfall to very close to the long-term average viz. 99%. The experimental models in IMD predict the monsoon rainfall to be 104%, 103%, 103%, 96% and 93% of the long-term average. A neural network model developed by scientists from IITM, Pune has also predicted the monsoon rainfall to be above the average i.e 104%. Thus the CMMACS forecast is at the lower end of the eight forecasts now available. On considering all the predictions, I expect the all-India summer monsoon rainfall to be near the average this year.

So far we have been discussing predictions for the average June-September rainfall for the country as a whole. We consider next what the implications of such a forecast are for the region of interest viz the Pavgada region of Karnataka. We have analysed the rainfall at Anantapur, which has a meteorological observatory with a long record of observations and

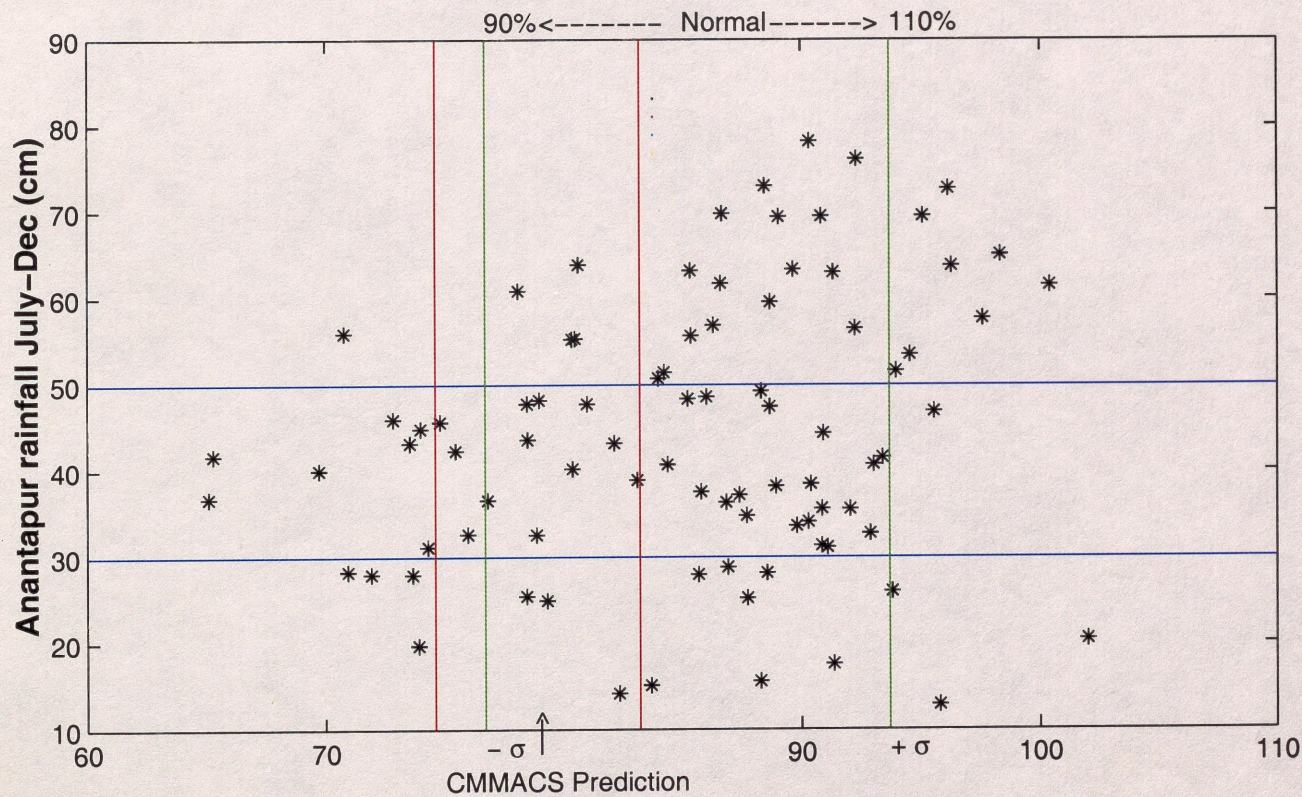
experiences similar rainfall variability as Pavagada. We find that the correlation between the rainfall for the kharif season at Anantapur (July-December) and all-India summer monsoon rainfall is not high. Particularly, when the all-India summer monsoon rainfall is normal i.e. between 90% to 110% of the long term average, there is a very large variation of the seasonal rainfall at Anantapur (see the enclosed figure). Even if we take the all-India monsoon rainfall as per the CMMACs prediction for this year, then the chance of intermediate level of rainfall i.e. between 30-50 cms is higher, while chance of low rainfall and high rainfall is less. Thus it does not seem appropriate to assume that the regional rainfall will be deficit and make farm-level decision accordingly (see the figure).

In summary, in my view, (i) there is no reason to expect that the all-India summer monsoon rainfall will be as much as 7% below the long-term average this year and (ii) even if the prediction by CMMACS for all-India monsoon rainfall turns out to be close to observations, there is no reason to expect that the probability of deficit rainfall over the Anantapur region will be larger than that for any other year. Hence changes in farming strategies on the expectation of deficit rainfall in Anantapur region are not recommended.

With best regards,

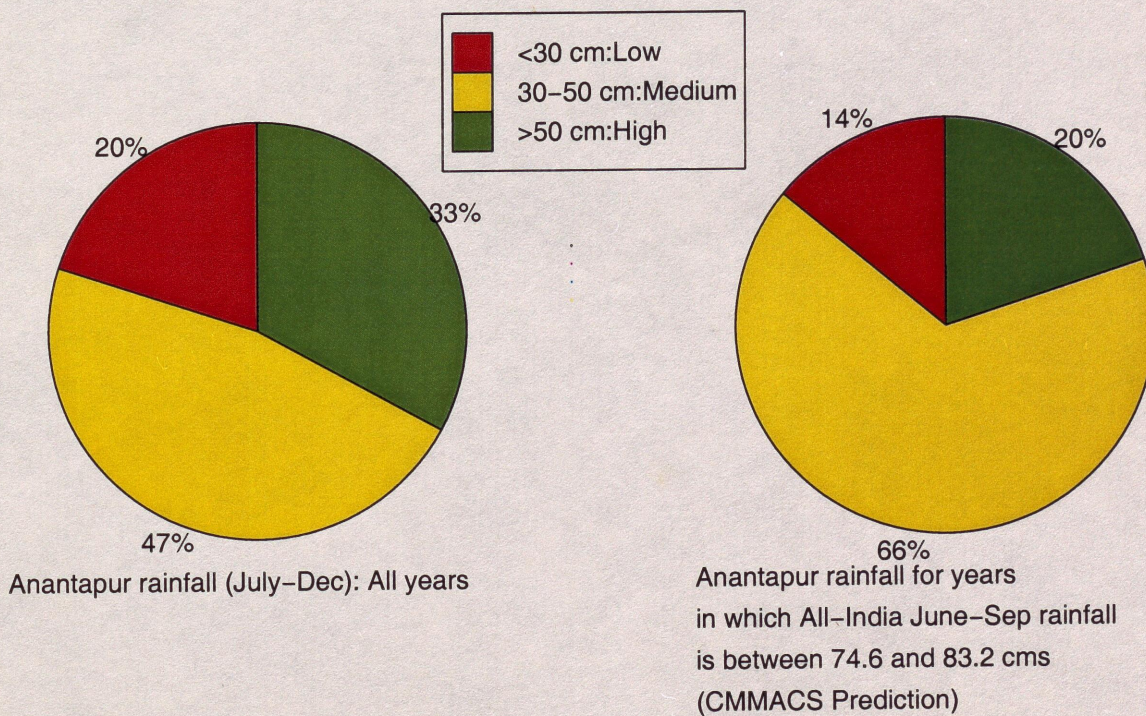


SULOCHANA GADGIL



All-India June-Sep rainfall (cm)

The range for "normal" All India June-Sep rainfall indicated by green lines, CMMACS prediction range indicated by red lines



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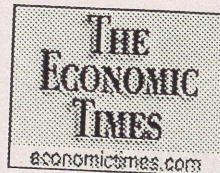
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Is our luck with monsoon over?

By Seema Singh

The Times of India News Service

BANGALORE: It seems the country's run of luck with good monsoons is over. After 12 consecutive good monsoons, the country is poised for a deficit south-west monsoon this year which can play havoc with the food security.

According to the Centre for Mathematical Modelling and Computer Simulation (C-MMACS) here, which has been making accurate, long-range forecasts for the summer monsoon during the last four years, this year will have deficit rainfall in the entire country. The prediction is 789 mm of rain this year against the actual 840 mm last year.

The India Meteorology Department (IMD) discloses the annual forecast for the summer monsoon only in the last week of May based on a 16-parameter model.

C-MMACS has been predicting rainfall based on a neural network model which it calls experimental as it is not authorised by the Union government. The neural network makes use of a processing device, either an algorithm or actual hardware, whose design is inspired by the design and functioning of animal brains and components thereof. Like the brain, the neural network consists of a large number of simple processors that are densely interconnected.

A quick look at the C-MMACS' predictions in the

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- ▶ Cities
- ▶ World
- ▶ Sports
- ▶ Business
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- ▶ Lifestyle
- ▶ Top stories across papers
- ▶ Photo gallery
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past: the forecast for 1998 was 945 mm and the actual rainfall was 932.5 mm (IMD had predicted only 871 mm); in 1999 the C-MMACS forecast was 861 mm with a standard deviation of 43 mm and the actual recorded was 840 mm, much within the error zone.

Says the research scientist at C-MMACS, Prashant Goswami: "Such long range forecasts can have a tremendous impact on areas like agricultural planning. In fact, even a moderate success in the all-India monthly rainfall forecast can help farmers as well as the agriculture departments. For instance, the monthly forecast for this year is seen to peak in July and August." The low value for the summer monsoon is due to significant deficit in the monthly forecast for September.

These features have practical and significant implications for issues like crop choice, irrigation planning and sowing schedule, he adds.

However, the pre-monsoon rainfall beginning March 1 was better in 23 of the 35 meteorological sub-divisions than in the corresponding period last year.

The forecast of a deficit monsoon no doubt casts a shadow in the drought-prone areas, especially with semi-arid states like Rajasthan and Gujarat and parts of Andhra Pradesh already reeling under severe heat and water-scarcity. For the dry districts of Karnataka like Gulbarga, Bijapur, Raichur, Bellary and Chitradurga, meteorologists predict it's going to be a hard summer.

»TOP

» Previous Article Next Article »

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Sulochana ammayya namaskara

Hope that you all are well with god's grace. Upto now we have received reasonable rainfall. Few days back, we were told that in a Kannada newspaper it was reported that some scientists from Bangalore have predicted that this the monsoon rainfall will be deficit. When we asked Seshagiri Rao for more information on this, he told us to write to you since he did not know more about it. If you tell us with confidence, in advance, that in fact the rainfall will be less, we can in this season, we will invest less in groundnut and more in irrigated lands and trade. Instead of giving money and seeds to other farmers on loan, I will keep the money with me.

This time the price of groundnut is low, unlike earlier seasons, the price has not gone up during sowing season. I understand from traders that this is because of the availability of cheap imported oil. In this situation, getting 750 kg/ha is essential for making at least a little profit. We are most worried about the market price of groundnut and how the rainfall will be. We do not know how other crops will fare in our soil.

From when we were children to now, there have been changes in rainfall patterns, crops/varieties and fertility of the soil. Price has become unpredictable. We are used to cultivating groundnut. Now we are thinking about what to do next. I would like from you, any useful input you can give on this.

This time, when you came to our region, please visit our farm and discuss about rainfall and crop cultivation

Please excuse any mistake in writing.

Namaskara
Yours faithfully
Rangappa
Kattalepalya

(Translation of a letter from a farmer with large land holding)

Professor Sulochana Gadgil,
Namaskara,

Many days have lapsed since you came to our place. Now we have had enough rain and we are ready to sow. Last month some people told us that there was a report in Prajavani that some Bangalore scientists had predicted that monsoon rainfall would be deficit. We are very much worried about this. Last year, we had severe deficit rainfall resulting in large losses. Since in the previous year (1998) we had good rains and good profits, we invested a lot in fertilizers and in leasing land for cultivation from other farmers. All of this was a loss.

This year, they are saying that again we will have deficit rainfall. What is your view on this? If you also say that rainfall will be deficit as reported in the paper, we will not invest much in fertilizer etc. for this year's cultivation. We will not take any loan. We will not barrow seeds from the money lenders. If we get a good price, we will lease out our land. If by all this, we save money, we will buy lambs or piglets. This year it did not rain in Ashwini and rained in Bharani. So tamarind crop is very good. We will invest in taking these trees on contract. Please let us know whether you expect good or poor rainfall this season.

After your visit here, in February, we have started a chit-fund. Fifteen of us have put Rs. 100/- each and now it has become Rs. 3000/-. We are paying interest of Rs. 15-16 for Rs. 100 per month. The good part of this is that instead of paying such interest to others we ourselves are gaining.

This time when you come to our village, please visit our land. If there is any new information on rainfall or crops, please let us know.

Namaskara
R. N. Prabhakar
M. Rangappa
Machappa
Poojarappa
Kariyanna
Channakeshava Pura

Translation of a letter from a group of fourteen marginal farmers (only those who could, have signed)