

# Climate Changes Endanger World's Food Output

By HAROLD M. SCHMECK Jr.

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Bad weather this summer and the threat of more of it to come hang ominously over every estimate of the world food situation.

It is a threat the world may have to face more often in the years ahead. Many weather scientists expect greater variability in the earth's weather and, consequently, greater risk of local disasters in places where conditions of recent years have become accepted as the norm.

Some experts believe that mankind is on the threshold

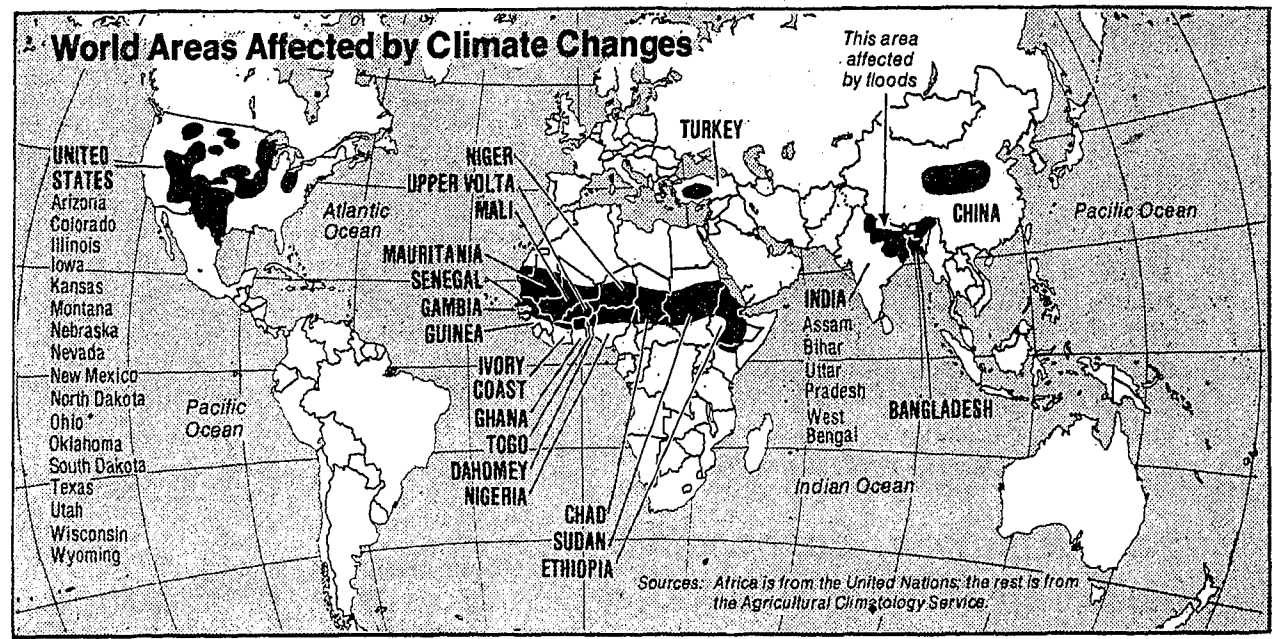
*This is another in a series of articles, which will appear from time to time, examining the world food situation.*

of a new pattern of adverse global climate for which it is ill-prepared.

A recent meeting of climate experts in Bonn, West Germany, produced the unanimous conclusion that the change in global weather patterns poses a severe threat to agriculture that could lead to major crop failures and mass starvation.

Others disagree, but are still concerned over the impact of weather on man's ability to feed the ever-increasing number of human beings.

Whether or not this year's events are harbingers of a major global trend, some of



Severe weather changes, ranging from floods to drought, have struck many of the world's major agricultural areas so far this year. Climate experts say that even

those events are, of themselves, causing concern.

The monsoon rains have been late and scant over agriculturally important regions of India, while Bangladesh has been having floods.

Parts of Europe and the Soviet Union have had problems at both ends of the weather spectrum this year—

too hot and dry at some times and places, too wet and cold at others.

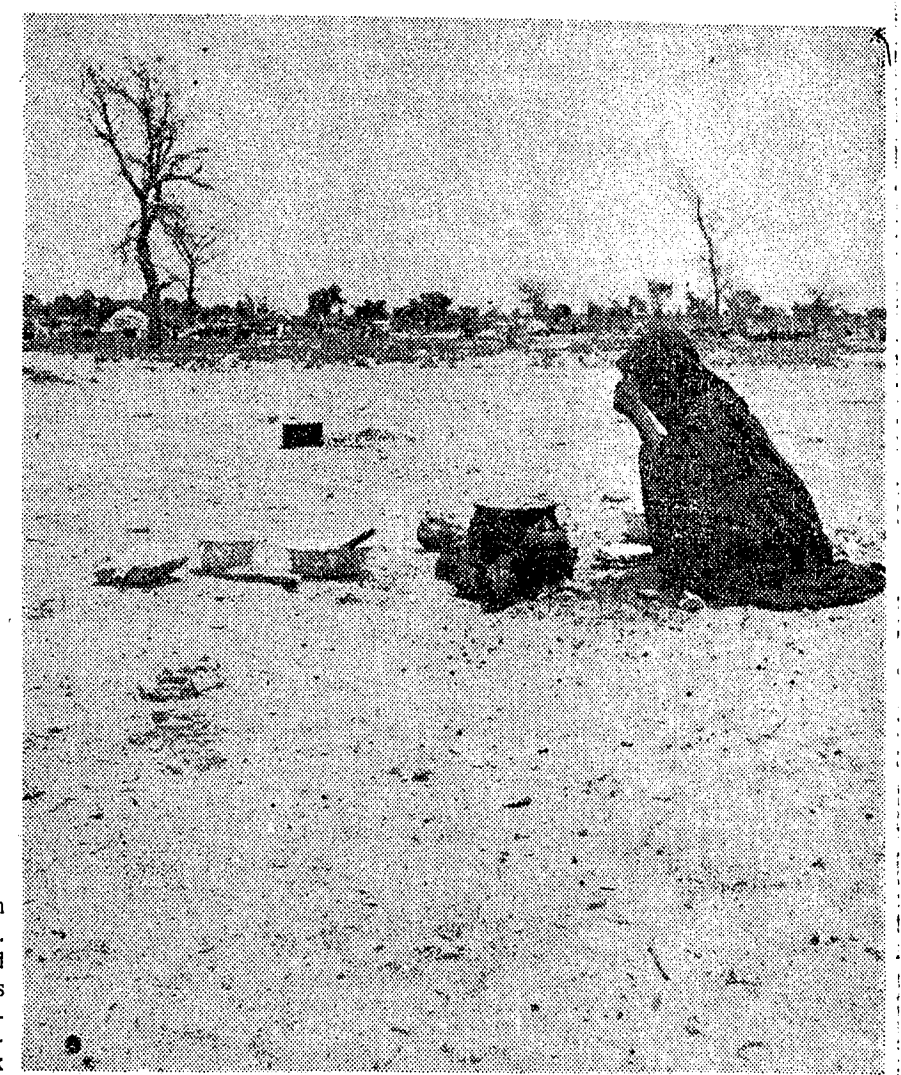
There have been similar problems in North America. An American weather expert recently received reports that ice was lingering abnormally on the coasts of Newfoundland and that new evidence showed that the Gulf Stream was fluctuating toward a more southerly course.

greater variability of weather can be expected in years to come, bringing changes to arable areas that have adjusted to past patterns, thus threatening future output.

in the United States has been badly hurt by hot, dry weather.

Earlier this year, there had been hopes of bumper crops in North America and elsewhere. But the weather's adverse impact has trimmed back some of these hopes.

The situation is not all bad, Continued on Page 66, Column 1



The New York Times/Thomas A. Johnson  
A Tuareg woman at a camp near Niamey, Niger, where tribespeople affected by the drought await food distribution by Care and Red Cross.

# Scientists View Global Climate Changes as Threat to World's Food Output

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by any means. Canada's prospects are said to be reasonably good, depending on what happens during the next few weeks. Aside from some floods, Australia has had no serious problems, according to experts in the United States. The Soviet Union has predicted a high grain yield, largely on the basis of a good winter wheat crop. But spring wheat, accounting for about 35 per cent of that nation's total wheat crop, may be suffering from persistent high temperatures and strong winds.

It appears that what is happening now and what will happen in the next few weeks in many areas of the world may be crucial for food production this year.

The Department of Agriculture's mid-July world grain outlook called the situation somewhat less favorable than it was a month earlier.

"The June 14 production estimate was 1,000.5 million metric tons," said the department's estimate, "but as of mid-July, the total output is estimated at only 983.8 million metric tons."

## Soviet Estimate Rises

"The most important changes in crop prospects over the past month have been in the U.S.A. and the U.S.S.R.," said the report on wheat and feed grains. "The latest U. S. crop estimate is approximately 22 million tons below mid-June, whereas the U.S.S.R. estimate has been revised upward by about 11 million tons."

All of the signs, both good and bad, are being watched closely by specialists in weather and its effects on agriculture.

In the whole complex equation of food, resources and population, the element that is least controllable and probably least predictable is weather. Yet, weather can spell the difference between abundance and disaster almost anywhere.

This year, experts in weather, climate and agriculture have given much thought to the prospects for the coming years and decades.

The Rockefeller Foundation sponsored a conference on essentially this subject. A unit of the National Academy of Sciences is preparing a major report on climate change. The Environmental Data Service of the National Oceanic and Atmospheric Administration is organizing a special group of experts to keep close watch on global weather as it relates to food production. And a workshop sponsored by the International Federation of Institutes for Advanced Study prepared a detailed report on the impact of climate change on the quality and character of human life.

The summary statement of that report is one of the grimmest forecasts to be made in recent years. Dr. Walter Orr Roberts, one of the nation's foremost experts on climate, believes there is a growing consensus in his field that agrees with the workshop's assessment.

## New Pattern Emerging

"The studies of many scholars of climatic change attest that a new climatic pattern is now emerging," the workshop's summary said. "There is a growing consensus that the change will persist for several decades and that the current food-production systems of man cannot easily adjust. It is also expected that the climate will become more variable than in recent decades."

"We believe that this climatic change poses a threat to the people of the world," the summary continued. "The direction of climate change indicates major crop failures almost certainly within the decade. This, coinciding with a period of almost nonexistent grain reserves, can be ignored only at the risk of great suffering and mass starvation."

Dr. Roberts, who is program chairman of the federation, said that scientists of several nations participated in the workshop. Its conclusions were unanimous.

Although all scientists do not put the matter in such stark terms and many doubt that a clear change in climate is demonstrable, there is widespread agreement on one point: The weather patterns that have prevailed in recent decades are anything but normal when viewed against the history of the past several centuries.

The mean temperature of the northern hemisphere increased steadily from the early nineteenth-century through the early nineteenth-forties. Since then, it has been on its way downward toward the colder circumstances of the last century. The drop since the nineteenth-forties has only been about half a degree, but some scientists believe this is enough to trigger changes that could have important effects on the world's weather and agriculture.

In recent publications, Dr. Reid Bryson of the University of Wisconsin, one of the chief proponents of the view that climate change is overtaking mankind, has cited India as an example of the possible hazards.

Early in this century, severe droughts seemed to hit northern and northwestern India roughly once every three or four years. In more recent decades, the monsoon rains moved northward and the frequency of droughts declined to about once or twice in 20 years. Dr. Bryson and other scientists now believe that the



Associated Press

Workers at a collective farm near Krasnodar, in the Soviet Union, turning wheat over to dry it. The Soviet Union has predicted a high grain yield, mainly because of a good winter wheat crop. But spring wheat, accounting for about 35 per cent of the Soviet total, may be suffering from high temperatures and strong winds.

trend is back toward the less favorable conditions of the early nineteenth-century.

Meanwhile, the Indian population has greatly increased and demands on the nation's agriculture have risen accordingly.

Apart from that kind of long-range consideration, the situation in India this year is being watched with particular attention because, in the view of several experts, it is potentially serious.

The heavy monsoon rains vital to India's agriculture seem to be at least a month late, according to the latest world summary of the weekly weather and crop bulletin, published by the Departments of Commerce and Agriculture.

## 7th Year of Draught

Dr. Richard Felch, one of the weather experts involved in producing the bulletin, said the latest data available to them showed that three-fourths of the total grain-producing area of India was below normal in rainfall this year. Rainfall was normal at this time last year throughout most of the sub-continent.

The sub-Saharan region of Africa, another area of the world ultimately dependent on monsoon rains, is now in its seventh year of drought.

The region is currently experiencing a brief reprieve as the result of a somewhat wetter rainy season than has been the pattern in recent years. Some observers say the rains may even allow modest crops of sorghum and millet to be harvested.

Even so, most experts view the current rains as only a temporary fluctuation. Dr. Bryson and others believe that the sub-Sahara will continue to suffer the effects of a change in weather patterns that is likely to persist. This, like most other aspects of current climate, is subject to considerable debate among specialists.

One important reason that all of the world's weather signs are being watched closely this year is that the world does not have the margin of safety in food grains that it had a few decades ago.

One specialist said that the world's total grain reserves were equal to the approximate difference between a good crop year and a bad one. Thus, it would take only one bad crop year to draw the safety margin in world food down close to the vanishing point.

That is why experts are keeping a close watch on such diverse phenomena as the tary monsoon rains over India, hot weather in the Soviet Union east of the Urals, and the moisture in the soil of sun-baked Iowa. Now, perhaps more than ever before in man's history, they all tie together.

Indeed, some scientists believe efforts to build up world food reserves ought to be a major international concern.

Although there is no prospect of a food shortage in North America, specialists are keeping a watchful eye on the Southwest, the Plains States and the Corn Belt because the United States is so important to the world's total food supply.

Lyle M. Denny, who helps Dr. Felch to produce the weekly weather and crop bulletin, said a drought began last fall in West Texas and adjoining areas of the Southwest and has since spread northward and eastward. He said ranchers have had to haul water to their cattle in New Mexico, Arizona and Utah.

## Problems in Iowa

Dr. Louis M. Thompson, associate dean of agriculture at Iowa State University in Ames, said hot, dry weather had reduced Iowa's potential corn and soybean crops by at least 10 per cent. A sophisticated statistical study of temperature, soil moisture and their effects on crops has led Dr. Thompson to a rough rule of

thumb relating temperature to crop yield.

According to this rule of thumb, he said in a recent interview, the corn crop will be reduced one bushel an acre for every cumulative 10 degrees that the temperature rises above 90. For example, if

the temperature rises to 95 on a given day, he would record that as a five. If it rises to 100 the next day, he would add 10. By the end of the third week in July, Dr. Thompson said, the cumulative total reached 114 degrees above 90. For both corn and soybeans, this would mean a reduction in yield of about 10 per cent, according to his calculations. But Dr. Thompson sees more potential significance to the number than the effect on this year's crop.

The record of 114 has not been approached since the drought year of 1954, when the total through July 21 was 96. The record has not been surpassed since the "dust bowl" drought year of 1936, when the cumulative degrees above 90 in Iowa totaled 236 through the first 21 days of July.

Dr. Thompson said records to 1800 show that the agriculturally important region in which he lives has been hit by a severe drought in a cycle that occurs roughly every two decades. The most recent cycles came in the mid-nineteen-thirties and the mid-fifties, according to his figures. And he notes with little complacency that the next drought would be "due" in the mid-seventies.

Dr. Thompson and those scientists who agree with him think the timing of the current harsh weather in the West may be more than coincidence.

But there is sharp disagreement among experts on this point. Some see no evidence of any cyclical 20-year pattern, and no logical or scientific basis for it.

Specialists in the Department of Agriculture, for example, are among those who disagree with Dr. Thompson. They believe that weather is a random variable, obeying no regular cyclic pattern over the years except, of course, the seasons.

Richard C. McArdle, an economist and climatologist in the Department of Agriculture, doubts the reality of a 20-year cycle and does not think that there will be a global run of bad weather this year or in the near future. The more likely pattern for any year, he believes, is one in which some areas of the world have good weather for crops while other areas do not. This year's pattern is like that, he says.

## Benefits of Technology

He and others in the department also argue that modern agricultural technology and irrigation are capable of mitigating the effects of drought in the United States. This, too, is an area of disagreement among experts. Some doubt that American agriculture, proficient as it is, can be "drought resistant" in any major sense.

Regardless of their views on the existence of a 20-year cycle and the drought resistance of modern agriculture, many scientists are agreed on one important point: The

United States has had a run of remarkably good weather during the last 15 years. And many think it foolhardy to expect that good fortune to continue indefinitely.

Dr. J. Murray Mitchell of the National Oceanic and Atmospheric Administration's Environmental Data Service is among the experts who believe that the world should be alert to the probability of change in weather patterns.

Dr. Mitchell, who is one of the nation's leading experts on climate change, says scientists have learned a great deal in the last five years about the fluctuations that have disturbed the earth's climate in the past. He also says there is no doubt that the earth is now at the peak of a very warm period. Change is to be expected.

The point made by many experts is this: World population has soared in the last few decades. World agriculture, adapting to the present norm, has only barely managed to stay ahead. The pressure of population and food need are so great now that the system has lost much of its flexibility. In such a situation, any change from the present "normal" weather could bring serious trouble.

"The normal period is normal only by definition," Dr. Bryson said in a recent article. "There appears to be nothing like it in the past 1,000 years."

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