

Agriculture

AGRICULTURAL WEATHER PROGRAM

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Agriculture is made up of many complex and interrelated biological systems. Weather drives these biological systems and is one of the most important variables faced by farmers. Understanding the weather and its effects on these biological systems opens up vast possibilities for great breakthroughs in controlling pests and optimizing the efficiency of agricultural production.

The Agricultural Weather Program being conducted jointly by the National Weather Service and the Cooperative Extension Service combines the expertise of both agencies to provide farmers with the latest weather and weather-related agricultural information. The National Weather Service has the legal responsibility of gathering information and providing weather information through the various segments of our society. One of those important segments, of course, is agriculture. The Extension Service has the responsibility to provide farmers with agricultural information.

Entomologists know insects require certain weather conditions for development. By monitoring weather near fields where crops are grown, it is possible to model an insect's development and predict when and where it can be present. This information can be used as an important input for pest control programs.

Each year farmers spend \$7 billion for pesticides -- insecticides, bactericides, fungicides, and nematocides. Researchers estimate that a fully implemented agricultural weather program to support efforts in integrated pest management could result in a 20 percent reduction in the amount of the pesticides used each year in the U.S.

About one-quarter of the herbicides applied by farmers in the U.S. each year, at a cost of \$10.5 billion, are ineffective because of incorrect timing of application in relation to existing weather conditions.

Irrigation is a critical component in the Nation's agriculture. Research shows

irrigation efficiency can be improved by some 35 percent through use of rural weather data in irrigation scheduling.

Early in the 1976 growing season, the National Weather Service (NWS) and the Extension Service reallocated resources and initiated a joint exploration of the need for better weather information to agriculture and the alternatives for providing that information. This effort was designed to answer a critical need within agriculture--real-time localized weather information to be used by farmers for day-to-day decisionmaking.

Through this close working relationship between Extension and NWS, a coordinated agricultural weather program was developed. This overall program has four closely interrelated parts: (1) gathering of rural weather observations; (2) development of specialized weather and weather-related agricultural information; (3) dissemination directly to farmers when they want it; and (4) a comprehensive educational program to teach farmers how to get maximum benefit from the program.

As a result of the joint NWS-Extension effort, a pilot project was initiated in Maryland with each agency taking responsibility for those areas in which it had the most expertise -- Extension working with the people and NWS providing the needed weather related support. The experience gained by this effort provided a good basis for expansion to additional States wishing to cooperate.

Extension recruited volunteer observers by blanketing Maryland with information about the program, the observer's responsibility, and the possible benefits to the State's agriculture. The response exceeded the number needed to conduct the program.

After recording his observation, the volunteer calls a toll-free number and sends his data directly to a NWS computer by using a touch-tone pad. Keying in an observation

takes less than a minute. The data include precipitation, type of precipitation, maximum or minimum temperatures over the past 24 hours, temperature and weather conditions at the time of observations, estimated wind direction and velocity, snowfall and snow pack, and in some cases maximum and minimum soil temperatures.

In addition to daily observations, volunteers call in special reports when they believe they have something significant to report -- when they hear thunder, when the storm hits, when it starts hailing, or when the rain turns to snow. Such data provides valuable "ground truth" to weather offices making short-term forecasts.

Word of the success of this pilot project spread rapidly and other States asked to take part in the project. NWS provided two nationwide incoming WATTS lines to enable additional States to enter weather data into the computer. In addition to Maryland, information is now being received from Connecticut, New York, Delaware, Virginia, North Carolina, Florida, Ohio, Michigan, Wisconsin, Illinois, Kansas, and California.

The Green Thumb Dissemination System was designed to provide farmers with the latest weather and weather-related agricultural information that they can use to make day-to-day decisions. The key to this dissemination system is the "Green Thumb Box" which will be purchased or leased by farmers. One set of wires connects to the antenna terminals of the home television receiver and the other plugs into the telephone line. In effect, this device turns the television receiver into a computer terminal.

The Green Thumb Box will give the farmer access to any 8 screens of information of nearly 1,000 that will be available. It is expected this menu will be disseminated either in publications, leaflets, or the public press. If the farmer does not have access to a menu, he can request the total menu. To access the system, the farmer will key in the desired screens he wishes to receive and then calls a special telephone number at his local county Extension agent's office where he will be connected to a small computer. The information he has requested will then be loaded into the memory of his green thumb box and the telephone connection will be terminated. He can then view this information at leisure. If he wants another set of information, he will have to call the county computer again.

The county computer feeding the green thumb boxes can be readily updated by the local county Extension staff to meet local needs. In addition, it will be updated hourly on a dial-up basis by a computer at the State Land-Grant University.

The State computer will serve as a "post office" for the State. It will be loaded by the State Extension staff, the State National Weather Service Forecast Office, the appropriate office of the Agricultural Marketing Service, and on a dial-up basis hourly by computer at the National Meteorological Center near Washington, D.C. This national computer will call each State once an hour and provide specialized weather information that is generated at the national location.

This system will provide farmers with vast array of highly perishable information that they need to operate their business each day. Among the weather information to be delivered will be the State forecast, the county forecast, an hourly plot of the radar, local weather observations around the State, and the specialized agricultural weather elements forecast. This "weather elements forecast" is presented as a chart showing predicted conditions every six hours such as 6:00 a.m., 12:00 noon, 6:00 p.m., and midnight out as far as four days. These weather elements for a point in every county include air temperature, soil temperature, possibility of precipitation, possibility of thunderstorms, possibility of frozen precipitation, cloud cover, wind direction and velocity, and other special elements as may be required. To accompany this weather information will be agricultural recommendations that will help farmers optimize their operations under the predicted weather conditions. Included would be predictions of insect and disease outbreaks, the need for irrigation scheduling, information on drying of grains, and how to best meet current environmental regulations.

The system also has the ability to collect information. For example, a limited number of farmers recruited as weather observers will be able to enter their data into their green thumb boxes before they enter their request for information. When they call the county computer, their data will be accepted by the computer before it dumps its chosen information. The same system could be used for obtaining market information.

The green thumb dissemination system will be tested in two counties of Kentucky during calendar year 1980 as a joint effort of the Department of Commerce's National Weather Service, USDA's Science and Education Administration-Extension, and the Kentucky Extension Service.

The concept of the green thumb dissemination system can also be applied to provide other types of information to a wide range of users. For example, anyone with a data base can make it available to owners of a green thumb box at a lower cost than would be encountered using the normal interactive computer terminal. Such uses could include arrival and departure information for

airlines, real estate listings, banking, advertising, and library information.

region, including being a forecaster at Washington, DC, and Meteorologist in Charge at Baltimore. He moved to National Weather Service Headquarters, where he concentrated in agricultural meteorology before retiring.

FOOTNOTES

1. Mr. Scott received his BS from New York University and his MS from Rutgers. After a tour as aviation forecaster for the Army Air Force in World War II, he worked for the U.S. Weather Bureau in the mid-Atlantic

2. Mr. Lehnert is the National Program Leader for Agricultural Weather in the U.S. Department of Agriculture's Extension Service. He has worked for the Department of Agriculture for 25 years.

List of articles scheduled for the November 1981 issue:

"Best of Luck in Your Future Endeavors", by Harold Bernard, Jr.

"Investigation of Heavy Snow Situations at Albuquerque, NM", by Gary K. Grice.

"The Coldest February", by R. Fiscner and A. Prechtel.

"Weather and the Military: A Historical Perspective", by Samson Brand.

"Use of Enhanced Infrared Satellite Imagery for Short-Term Thunderstorm Advisories to Aviation", by Donald W. McCann.

"A Record Arkansas Rainfall; The El Dorado Deluge", by Kenneth M. Labas.

"Nature's Executioner", by Esther W. Hankins.

"Maximum Temperature Biases at WSFO Washington", by Cliff Crowley.

"Alaska Interior Thunderstorms," by Hugh D. Watson

ERRATA

In the February 1981 issue of the Digest, the article by Reiss and Broccoli contained a misprint. On p. 62, a group of lines in the computer program listing was transposed. The lines numbered 0131 through 016D belong at the top of the page, ahead of line 0170. Line 01C6 is the last line of the program.

And, in the May 1981 Digest (pp. 42-43), the name of the reviewer of "Weather Modification, Prospects and Problems" was omitted. The reviewer was Dr. Vin K. Saxena, Associate Professor of Meteorology, Department of Marine, Earth, and Atmospheric Sciences, North Carolina State University, Raleigh, NC. We regret the omission. Ed.