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Development of the Computerized State-Federal Pest Reporting System

The use of computers in research and in research applications to agriculture is now an established fact. One of the capabilities of a computerized system is dealing effectively with large volumes of data. When seeking a solution to the problems of sharing and sorting large amounts of plant pest information, the Animal and Plant Health Inspection Service (APHIS) of the U.S. Department of Agriculture (USDA) naturally began to look for a computerized system.

In August 1980, Plant Protection and Quarantine (PPQ) of APHIS met with the Intersociety Consortium for Plant Protection (ICPP) to explore and analyze the plant pest information needs of PPQ-APHIS, other federal and state agencies, and various national and international organizations. The ICPP represents the major professional societies covering the disciplines of entomology, plant pathology, nematology, and weed science. The consensus was that an effective interdisciplinary pest monitoring system is essential to a sound survey and detection program. More specifically, the ICPP and various PPQ-APHIS representatives identified the need for a centralized, national effort to collect, summarize, and disseminate plant pest information in a standardized format.

In 1981, PPQ initiated the Cooperative National Plant Pest Survey and Detection Program (CNPPSDP). The general aim of this program is to build on what the

states are already doing with respect to surveys and to coordinate the surveys into an electronically based survey and detection system that allows for rapid collection, storage, retrieval, and distribution of pest survey and detection data.

Structure of the Program

The establishment within each state of a survey committee with multiagency and multidisciplinary representation is a critical link in the development of the CNPPSDP. This committee provides overall program guidance within the state and should include representatives from the land-grant university, the state department of agriculture, PPQ, and possibly other agencies or groups interested or involved in survey activities. The major scientific disciplines of entomology, plant pathology, weed science, and nematology should be included.

The approach taken by APHIS has been to foster a genuine cooperative relationship with each state (Fig. 1). The state establishes a survey committee with membership from as many of the appropriate disciplines and agencies as possible and appoints a survey coordinator. PPQ provides a small amount of funding to assist in coordinating the program. The state develops an annual work plan detailing its activities in the program. On the federal side, APHIS provides the computer coordination and overall program guidance on those aspects of pest information that are beneficial on an interstate level. The program is coordinated through the national survey coordinator's office at APHIS headquarters in Hyattsville, Maryland.

In 1982, 16 pilot states transmitted pest information data to the USDA departmental computer center at Fort Collins, Colorado. The data were reprocessed, and a weekly report summary was generated. Any state in the program could retrieve this report. In 1983, 44 states were participating in the program, and almost all were transmitting pest data to the central computer. In 1983, approximately 800,000 pest records were put into the system; in 1984, approximately 1.2 million records were entered by 48 states; and in 1985, 969,000 records were entered by 47 states.

In 1984 and 1985, the system generated nine fixed-format reports (Table 1, Fig. 2) and had the capability to download all the data records from an entire state or group of states. The reports are designed to include information helpful to state cooperators and are available to county level. The user selects location, crop, pest, date or date range, and other factors.

Speed and data extraction are attributes of a computerized system that are useful for pest information systems. Both attributes provide capabilities not realizable by the paper-and-pencil systems of the past. APHIS is attempting to utilize these capabilities for tracking migratory pests, establishing nationwide distribution data, and recording introductions of new pests in a timely fashion.

PPQ-APHIS is specifically concerned with identifying exotics that may enter the country and with supporting export certification programs by having data on the pests of concern for commodities involved in export trade. The states also have concerns; they want to know more

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Table 1. Fixed-format reports available from the Cooperative National Plant Pest Survey and Detection Program

Type	Content
New pest	All records marked by cooperator as new for the county, state, or United States, giving name of pest, host, and date detected
First-of-season occurrence	Date of first positive record for the year and information about abundance/incidence and crop
Trap data	Information derived from special trap input record, e.g., number of records, number of pests caught, average catch per trap for the county
Pests-by-crop	All pests for which there are data in the computer on a specific crop, including number of observations of each pest
Crops-by-single-pest	All crops for which there are data in the computer on a specific pest, including number of observations on each crop
Diagnostics laboratory Pest distribution	All records using special diagnostic laboratory input Summary for a state listing each county and number of records for a pest (both positive and negative) for the report's date range
Pest and crop development over time	Abundance/incidence levels of a pest by crop life stage
Abundance/incidence	Summary of abundance/incidence level of a pest for date range of report

250 sites within the country. The type of equipment used at each site varies considerably, and we have overcome the compatibility problems to some extent by using a commercial network. The USDA had previously contracted with GTE Telenet for use of its services in what is called the Departmental Network (DEPNET). Each user needs only to log onto the DEPNET node. The central computer system then accesses DEPNET to complete the link. Line noise has been a fairly rare problem, and telecommunications have on the whole been very satisfactory.

The problem of variation in data formats from state to state has been solved in a number of ways. Many cooperators have automated the process of converting data from their local format to the national format, and some states use the national format or something similar for collecting and entering data.

The CNPPSDP is promoting standardization meetings in which a group of states work together to develop common survey methods, reporting units, etc., compatible or identical with those in the national system. So far, this approach has succeeded for a small number of pests.

Improving survey methodology and technology is a specific objective for the CNPPSDP. A number of manuals used locally or regionally concerning survey methods for particular crops are being evaluated for use as national standards. PPQ recognizes the need to expand these manuals and to encourage the development of new manuals for additional crops.

Determining user needs in the face of complexity of agricultural environments in each state is a much more difficult problem, one we have partially solved by

implementing a DBMS that permits ad hoc query generation. Users can tailor their information retrievals to suit their needs. We developed the standard report formats after much consultation with our cooperators, so these should be of general use to a large segment of the user community. We also permit the downloading of raw data for a state or group of states so a user can send this information to its own computer and manipulate it locally.

An Additional Feature

A historical data base that would provide the distribution of plant pathogens, insects, and other pest groups on a national basis is an additional module being developed for the system. The computer advantage is especially relevant in that frequent updating of this data base as more records are found would be quite easy. The data to be entered will come from a number of sources, such as the current year's reports, records from the historical files of a state, and special surveys.

Consumer Usage

Analysis of the usage of the system by state cooperators and PPQ is helpful in projecting future needs for the national survey program. While exact figures on the number of reports requested by users are not available, in general it can be said that a high percentage of the reports were requested by APHIS headquarters in Hyattsville. Report generation by state users varied considerably. Some states requested reports as background for information disseminated in their state survey newsletters. Quite often, a state would download a segment of the raw data of a state's input.

Access to the system is relatively easy. Current plans are for each state to have two sites for data entry and retrieval. PPQ will also have sites. The state survey committee will be contacted to determine where the current sites are and consulted about possible locations for new sites; the national survey coordinator will assist in this selection. Currently, the user is not charged for accessing the computer system. Plans are being developed to determine user costs for the data retrieval portion of the usage.

The Biological Component

The great advances in computer technology during the last decade have made the computer component of the national pest reporting system fairly straightforward. It is the biological component, i.e., the pest information itself, that will need continual refining as the system is used. The possibilities for utilization of the computerized data are very great. APHIS is committed to the operation of this system. We are now looking to the community of plant pathologists and others for the full utilization of this computerized data.



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