

## **Online Pest Management Information System**

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### **SUMMARY**

Integrated pest management (IPM) is a sustainable approach to manage different pest related problems in the field of agriculture by combining biological, cultural, physical and chemical tools in a way that minimize economic, health and environmental risks. However, information on IPM is not readily available to the end user, a farmer or an extension worker. With the rapid growth of Internet, it is now possible to put the information in electronic format so that users can access it anywhere any time. The present investigation was carried out with the idea of developing an Online Pest Management Information System (PMISNET) on major agricultural crops containing information on various aspects of IPM viz., general information, insect/pests, diseases and weeds on major crops, IPM strategies etc. PMISNET has a three layer client-server architecture. The software runs on HTTP server and serves the request of the client that may on any computer connected with Internet and having a graphic web browser. There is provision to browse, insert, update and delete the information through user friendly interface. It has in built help and indexing of information to facilitate smooth navigation. For demonstration purpose two crops viz., sugarcane and cucurbits are used. More crops can be added in PMISNET for which information on IPM is available.

*Key words* : Online information system, Integrated pest management, IPM, Pest management, Web-based application software.

### *1. Introduction*

Using new technologies and research efforts, it has become possible to minimize the losses in crop production due to infestation by the insects/pests, diseases, weeds and mites. In order to reduce yield losses due to pest and diseases, farmers go for calendar based chemical sprays rather than need based applications which lead to chemical residues and disturb the natural flora and fauna which act as natural defence. Integrated Pest Management (IPM), an environmentally sensitive approach to pest management, relies on a combination of common-sense practices. IPM program uses comprehensive information on the life cycles of pests and their interaction with the environment in combination

with available pest control methods to manage pest damage by the most economical means, and with the least possible hazard to people, property, and the environment. Thus, the IPM is a knowledge intensive process and requires information ranging from varieties, nutritional levels, irrigation, pests, their life cycle, their preys, predators, etc. One of the major constraints in adopting IPM is due to its knowledge intensity. The spread of the IPM messages has not reached the farmers yet due to the fact that most of the trainers who train farmers lack complete knowledge of IPM. Thus, the area of IPM gives immense potential to develop information system targeted at different levels such as trainers, users etc.

A stand-alone Pest Management Information System (PMIS) in cotton has been developed in Dhandapani *et al.* [1], which has limited features. With the spread of Internet and advancement of web-based software technologies now it is possible to develop an information system that can be accessed globally without any installation requirement on viewer's computer. These certainly broaden the scope and efficiency of viewer's computer. Keeping these trends in view, Online Pest Management Information System (PMISNET) on agricultural crops with an emphasis on IPM strategies has been developed.

2. Design and Development of the System

PMISNET is designed as a web-based application with centralized database. So it can be accessed from any computer that is connected to Internet. Any client on the network with a browser can have access to PMISNET.

2.1. Architecture of PMISNET

The implementation has been using the latest concepts of web-based client-server architecture. It has three independent layers (as shown in figure 1).



Figure 1: Three -tier model of PMISNET

2.1.1 Database layer

Down most layer is database layer which has been implemented using Microsoft's Access and provides database tables and queries. Two databases-PMISNET.mdb and Log. mdb have been developed. PMISNET.mdb is the main database consisting of information regarding crop, insects, diseases, weeds, mites and the IPM (chemical, non-chemical, trap crop) schedule. This database consists of 25 tables (as shown in figure 2). In this figure 1-M stands for one to many-relationships. Log.mdb consists of only one table, which contains information about the users of PMISNET.

2.1.2 Server side application layer

Above database layer is application layer, implemented in a server machine through the use of Java Servlets and Java Data Base Connectivity (JDBC). This is the layer, which performs all the complex interactions and links between user and database and is responsible for dynamic content of the web pages. Using JDBC, it is easy to send SQL statements to virtually any relational database. The combinations of Java and JDBC lets a programmer write it once and run it anywhere.

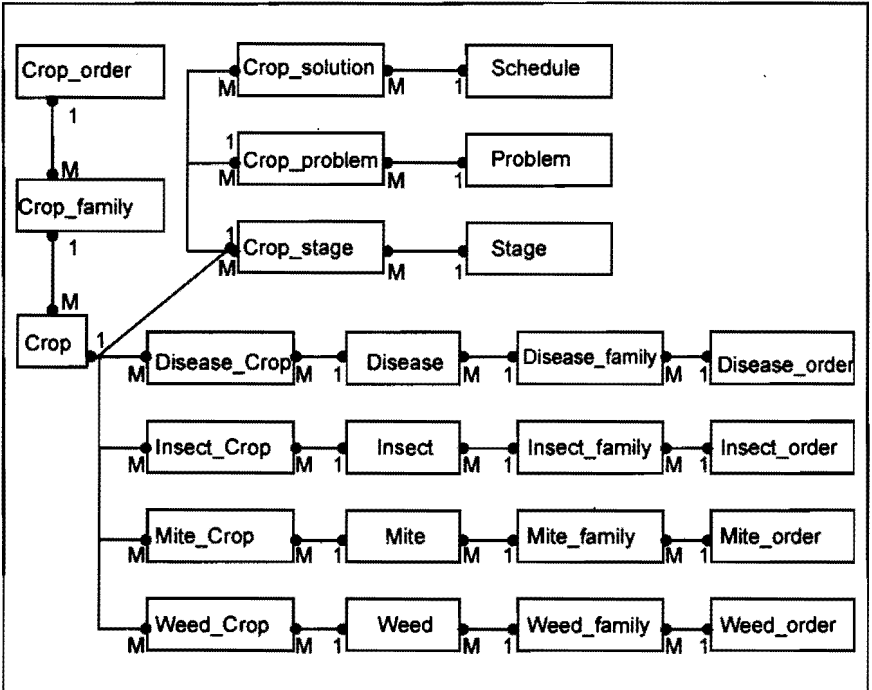


Figure 2: Relationship between different tables in database.

2.1.3 Client side presentation layer

Third and upper most layer is implemented using Java Script and Hyper Text Markup Language (HTML). Since it is written in script and HTML it will run on browsers, which are the front runners in the network era.

2.2 Security features

To maintain authentication and authorization, three types of user level viz., end user, expert and administrator have been created. End users will have minimum capabilities. They can only access the information. An expert has to register himself to PMISNET. Once the administrator accepts his credentials as

expert, he can add information about a new crop or pest to the database. The administrator has all the rights to update the present contents of the database or delete an irrelevant information from the database.

### 3. Features of PMISNET

The main objective of PMISNET is to provide proper IPM solution for different crops. The user can consult IPM module of PMISNET and apply the recommendations in field level or in lab conditions. Apart from IPM, PMISNET also provides other information about major crops, mainly detailed information on all major pests affecting those crops. Any one can go to welcome page of PMISNET by invoking default address in web browser and login to the system (as shown in figure 3). The users can access any particular information either through the contents or through index.

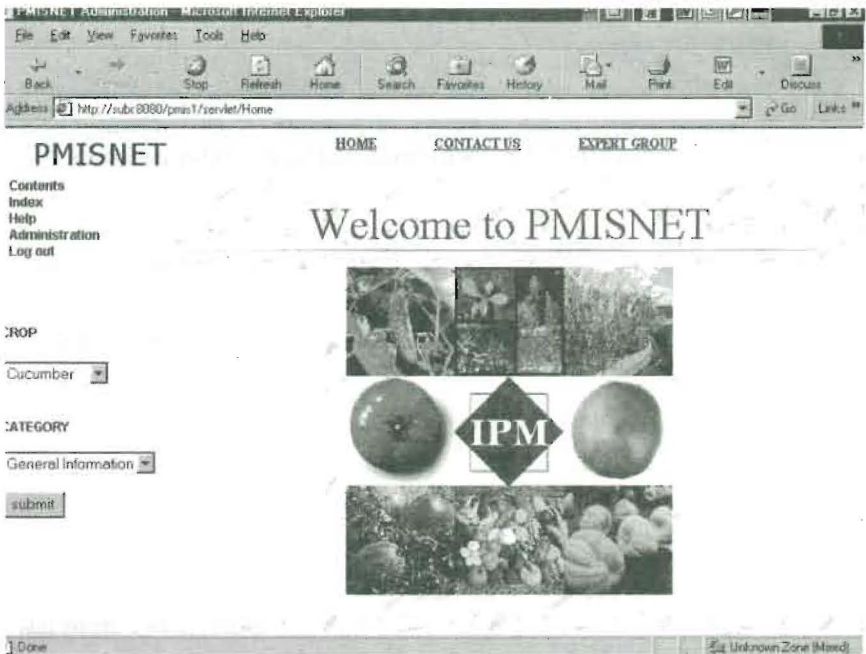


Figure 3: Home page of PMISNET

The prominent features of PMISNET are highlighted below

- General information about crops, pests (insect, disease, weed and mite) have been provided. For a crop its detailed information like origin, sowing/planting, manurè, fertilizer etc. has been provided. For each pest its description, life cycle, nature and symptoms of damage and management have been given.

- IPM wizard provides step by step diagnosis of a symptom. User has to choose a crop, stage, problem and type of IPM solution (chemical, non-chemical or trap-crop) in a step by step manner to find desirable solution.
- Images of crop, pest and symptoms are included in the software for easy identification.
- Clear distinction between levels, scope and authentication of each type of user.
- User friendly interface has been provided for any kind of administration of the database even from remote place.
- Indexing of basic information about all pests in the database.
- Any other information about any crop, insect, disease, weed, mite and IPM can be very easily added with the existing ones provided by PMISNET online.
- PMISNET comes with Expert Forum. Each category of information is supported by a group of experts responsible for the contents. Users can also contact them for clarification and further information on any topic.
- PMISNET is vendor independent i.e., with an appropriate web server or plug-in the software can be hosted on any operating, on any existing infrastructure of Intranet or Internet system.
- Separate help pages and other contact information has been provided.

#### 4. Implementation

PMISNET has been tested and implemented with Tomcat web server (version 3.1), an open source implementation of Java Servlet API from Apache software. It can also be installed in any web server on any operating system provided that operating system has its JRE (ver 1.2 or above) and a servlet container. Two crops namely sugarcane and cucurbits are chosen after consulting experts in the field of IPM and information about these two crops has been incorporated in PMISNET.

#### REFERENCES

- [1] Dhandapani A., Singh, N. and Sharma O.P. (2001). Development of user-friendly software in the area of IPM. Paper presented at the *XIII National Conference of Agricultural Research Statisticians of ICAR Institutes and Agricultural Universities*, Punjab Agricultural University, Ludhiana, Punjab, 6-8 November, 2001.