Part 1: Benefits and Required Inputs

This is first of a two-part series on Weather-related forecasting models and pest management in agriculture. This part discusses the benefits of these models and the information required to develop the models. Part 2 will outline how the models are used, their development and implementation.

● INTRODUCTION

Agriculture is highly vulnerable to year-to-year climatic variability. Farmers and other decision makers in agriculture make decisions based on their understanding of general climatic patterns for their regions.

Crops are constantly threatened by pests such as insects and nematodes, as well as diseases caused by fungi, bacteria, viruses and other microorganisms. However, depending on weather conditions, the severity is very variable from year to year and often control strategies are applied without considering this variability. Moreover, following the global climate change predictions, meteorological conditions triggering pest population/disease infection cycles are destined to increase, leading to consequent increase of the pests/diseases pressure.

Sustainable plant protection strategies rely on weather and climate related pest and disease forecasting models in order to:

- take timely action regarding pests and diseases control and for assessing losses.
- avoid unnecessary treatments.

● BENEFITS

In the Caribbean, due to presence of climatic conditions favourable to insect pests and fungus growth, the plant protection measures are mainly chemically controlled with regular applications scheduled in a preventive manner. The application of weather-related pest and disease forecasting models can effect a reduction of pesticide application, with consequent benefits from an economical and environmental point of view.

The decision-support systems and application of agrometeorological simulation models which provide the users with specific information concerning “real time” pests/diseases development could represent a valid alternative to regular application scheduling. The creation of a decision-support system based on models may further increase the potential benefit to farmers, allowing them more user-friendly application of complex technical knowledge to their crops.
At the same time many indirect benefits exist: reduction of chemical inputs in the ecosystem; soil fertility conservation; smaller amount of pesticides residues in food; work quality improvement; reduction in the development of resistant forms; safeguarding of natural predators/parasites; more acceptance of the farmers' work in public.

**REQUIRED INPUTS**

The development of pests and diseases is most successfully predicted if the microclimate of the immediate environment (habitat) of the causative organisms can be simulated.

Plate 1: Pest and disease interaction with susceptible host and conducive environment

Timely control measures can be taken even if the information on pest population/disease severity is not available but merely their epidemic status is accessible. This information can be obtained through modeling qualitative data. Such models have the added advantage that they can be obtained even if the detailed and exact information on pest count/disease severity is not available but only the qualitative status such as epidemic or no epidemic – low, medium or high is known. Such a situation arises quite often in pests/diseases data.

Some of the required meteorological data and biological data inputs are listed in Figure 1. Meteorological data are generally required with hourly time step during all the growing season, but sometimes also historical data are needed to define the climatic characteristics of the agricultural environment.
The series on Weather-related forecasting models and pest management in agriculture continues in the next Factsheet, Weather-related forecasting models and pest management in agriculture Part 2: Application, Model Development and Implementation.
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