IPM Fact Sheet Series

UMass Extension Fruit Team
Fact Sheet # AD-007

Decision Support Systems (*on-line crop forecasts*)

Overview

Decision Support Systems (DSS) are online tools meant to provide information to growers, researchers and other agricultural service providers for effective, timely and efficient crop production decisions. Models contained in these DSS range from pest forecasting to horticultural activity timing.

Models:

A model is a mathematical representation of a response variable to an explanatory- or independent- variable. Models are often used to describe the likelihood of a biological or climatic event's potential for occurrence and severity. Each DSS contains many different models. Often, risk forecast is determined by multiple models working in conjunction with one another.

Apple scab infection risk is assessed in a DSS using two different biological models. One, the ascospore maturity model, estimates when spores will be mature and ready to eject. The infection period model estimates, given inoculum in the orchard, when infection will occur. Both of these models rely on a biofix and weather information for risk assessment.
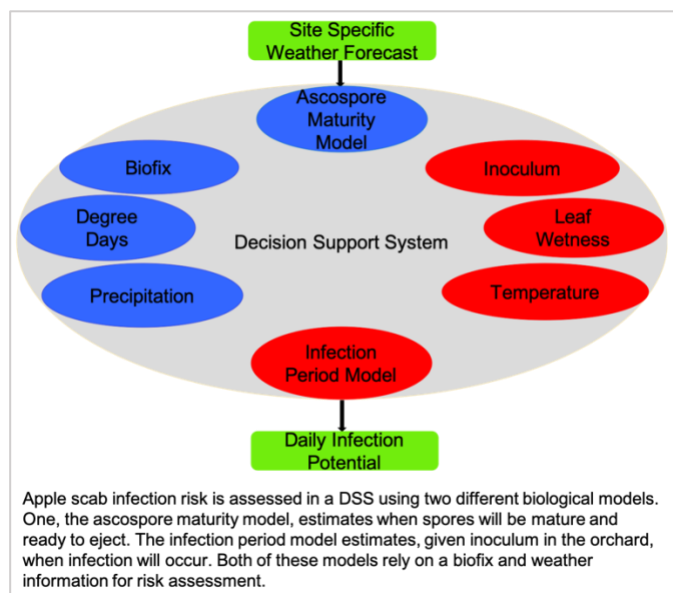
Weather:

Site-specific weather data are needed to run the models in a DSS. There are two ways in which weather data is implemented in a DSS:

(1) **Forecast** weather is used to estimate values of key climatic factors, such as temperature (degree day accumulations), precipitation and others that affect pest and horticultural activities. These forecast values are applied to the biological models and give the user an estimate of an upcoming event. This estimation allows the user to make a management decision based on the occurrence of an event rather than relying on a calendar-based approach which may not accurately represent events as they are occurring in the field.

(2) **Recorded** weather data- "pastcast"- is maintained in the DSS's database and used to keep track of events that have occurred. This past cast information can be a useful record keeping tool for the user. Additionally, there are two types of weather data that can be implemented to run models. The first is a physical on-site weather station. These weather stations consist of various sensors that monitor current conditions like leaf wetness, relative humidity, etc. These sensors communicate the data recorded to a host which then imports the data to the models being used. The other is "virtual" or "gridded" weather data. This virtual data is another form of model and uses historical weather data, satellite information, and nearby physical weather stations to generate both forecast and pastcast weather information.

![UMASS AMHERST logo]

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Model Elements

Biofix: A biofix is a significant biological event in either a pest organism or a host organism. This biofix requires astute human observation for accuracy of model output. The user records this biofix (for example, with apple scab, green tip is the biofix required) and inputs the information into the DSS. This information is then integrated into a model. Once this information integration occurs, the model in use begins to accumulate degree days and record and integrate other important weather considerations.

Degree days: Degree days (DD) are heat units used to define the timing of biological events in both host and pest. When certain DD benchmarks are met, a management decision may be necessary. DD can be used to estimate insect emergence, insect egg laying activity, fungal spore development and maturity, bacterial colony population growth and many other important biological factors influencing host and pest development.

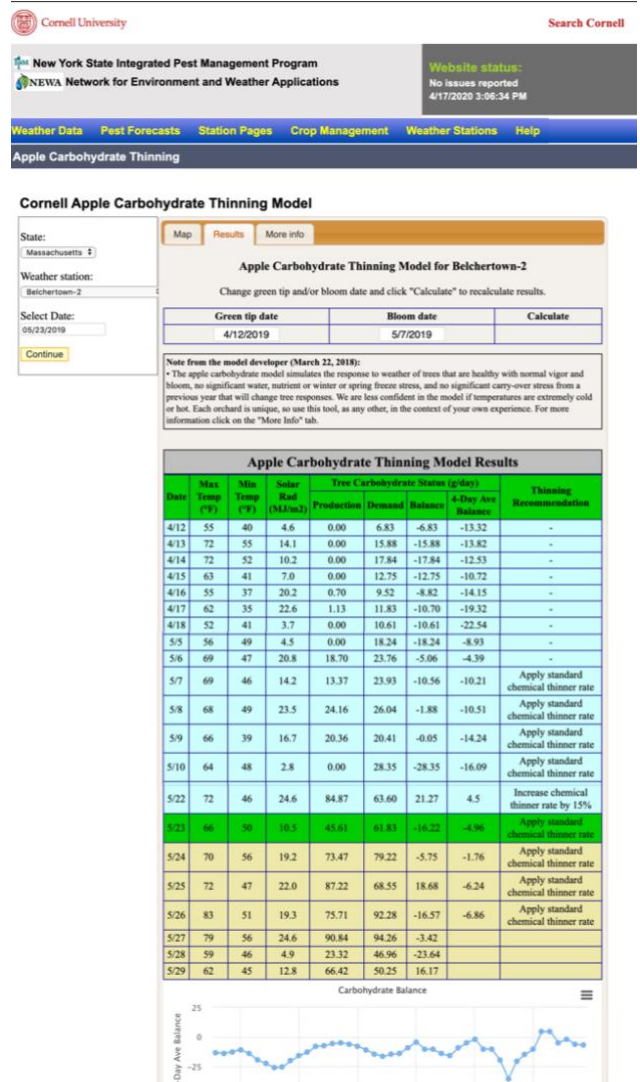Visit the New England Tree Fruit Management Guide for information on DSSs available for use.

Model output example shows how Cornell's NEWA uses temperature and solar radiation to provide estimates of when to make blossom thinning applications and suggests rates of application.

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Additional information available on the MYIPM app: https://apps.bugwood.org/apps/myipmseries/

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