Book Review

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Title: Weather-Based Mathematical Models for Estimating Development and Ripening of Crops. Technical Note No. 180, WMO-No. 620.
Author: G. W. Robertson

The stated purpose of this technical note was to "review the literature on weather-based models of crop development and ripening" (from the foreward). Mr. Robertson has achieved that objective and more in this paper, which gives an excellent basic presentation about crop models, including their development and use.

The paper is divided into five sections: introduction, model formulation, operational models, applications, and conclusions. The presentation is very clear and logical, with each of the sections being summarized concisely in the conclusions section.

In the introduction the author discusses the fundamental difference between crop development and crop growth. Growth is the process of accumulating matter in the plant-producing photosynthate, translocating this, transforming it and, finally, storage. Development, on the other hand, is the length of time for each of these processes to take place. Since models are most often used for projects such as forecasting time of maturity or crop zonation, development models are the principal focus. Mr. Robertson shows how temperature and photoperiod are the overwhelming factors in crop development, whereas water stress is important only in the growth process.

From this foundation the succeeding three chapters discuss how these temperature and photoperiod models are derived, how they operate, and how they are used. The author does an excellent job of taking the reader from the elementary basis of models to some complex examples, such as the tri-quadratic model. A basic knowledge of algebraic functions and calculus is necessary for a full comprehension of the material he presents, but a general understanding of this paper can be attained even by persons lacking such training.

Numerous graphs and tables help to clarify his main points. Examples of the usefulness, applicability, and drawbacks with each type of crop model are presented. The fourth chapter, which deals with applications of models, is very practical and educational. The usefulness of crop models based on weather variables becomes quite clear—whether it is to determine where a particular variety of corn can be grown, or to determine when a food processing plant can expect a field of tomatoes to be ready for harvest. Many applications are discussed.

The conclusion is short (two pages) and to the point. In the conclusions section he lists some suggestions for research which he feels would improve crop models. All seem very plausible and worth investigation by crop modelers. Of particular note is his suggestion that research should be done to ascertain the relationship between crop temperature and shelter box temperature—often the only source of temperature data used as input to crop models. Such determinations for each crop could make models more realistic and useful.

Two additional items contained in this technical note are especially helpful to anyone interested in this subject. First is his thorough list of references at the end of each chapter and in a 16 page bibliography at the end of the report. Second is a list of the addresses of agencies and persons throughout the world interested in crop development modeling. While the author admits the list is not exhaustive, it is nonetheless a very useful source of information for those desiring to learn more.

This manual would be very useful as a text in teaching a course on this subject, and is a good basic reference for all person interested in agricultural meteorology. Its straight-forward approach and clear writing lends itself to fairly rapid reading, despite many mathematical equations. It should be of interest to all practicing meteorologists, especially to those involved with agriculture.

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