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Crop modeling and its use in vegetable cultivation

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Abstract : Agricultural models are mathematical equations that represent the reactions that occur within the plant and the interactions between the plant and its environment. Owing to the complexity of the system and the incomplete status of present knowledge, it becomes impossible to completely represent the system in mathematical terms and hence, agricultural models are images of the reality. Unlike in the fields of physics and engineering, universal models do not exist within the agricultural sector. Models are built for specific purposes and the level of complexity is accordingly adopted. Inevitably, different models are built for different subsystems and several models may be built to simulate a particular crop or a particular aspect of the production system.

Key words : Crop modeling, Vegetable cultivation

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Model is a word that admits several connotations, among which the following can be mentioned: (i) the representation of some entity, usually in smaller size than the original; (ii) a simple description of a system, used to explain it or to perform calculations (Crowther, 1995; Procter, 1995) (iii) an equation or a set of equations that represents the behavior of a system. It can be noticed, based on the above definitions, that models can be a prototype, a simplified representation, as well as an abstraction of a reality (system). To simulate means to imitate, to reproduce, to appear similar (Pereira, 1987). In agriculture, the simulation is important to forecast the results of a certain system management or of a certain environmental condition (Wu *et al.*, 1996).

Why to use crop simulation models?:

Crop management challenges:

Agricultural producers, consultants, service providers, and industry representatives are faced with crop management and cropping system decisions throughout the growing season. The need of the agricultural person to manage and predict crop behavior over a wide range of planting dates, geographies and crops has become increasingly important as the need (value) for good, timely

decisions and a decision making process has greatly increased. Use of crop simulation models incorporating local climatic conditions with management operations may increase the agricultural person's ability to make more timely and educated decisions.

From the lab to the field:

Scientific crop growth simulation models have traditionally been used to address research problems, answer questions and most importantly, to increase knowledge on crop growth, development and yield. The time has finally arrived in which crop modeling tools are increasingly being deployed in producer fields to help address questions and problems on a larger, farm scale size. The full potential and value of crop models have not yet been realized in production agriculture.

In season management decisions affecting yield :

The emphasis in production agriculture has been placed on attaining the maximum yield possible, or obtaining the most economical yield. What is often not well understood is that yield is determined during the growing season when critical crop management decisions are being made on a daily basis. Final crop yield is often