Agroclimatology: 
Linking Agriculture to Climate

Jerry L. Hatfield, Mannava V.K. Sivakumar, and John H. Prueger, editors

Agronomy Monographs 60
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Agroclimatology encompasses the study of the interactions between climatic parameters and biological systems (plants and animals) and is closely allied with agrometeorology which deals with the shorter time scale responses associated with meteorological conditions. Given the concern about the potential impacts of climate change on crop and animal production there is a renewed interest in agroclimatology and how an improved understanding of the linkages between the environment and biological systems could develop adaptive management strategies which would lead to increased food security.

There is a large range in agroclimatic indices designed to quantify how plants fit within their growing region. The most recognizable of these is the growing degree day (GDD) concept for plants that has been employed to determine the rate of phenological development of crops. For perennial crops, the use of the chilling hours represents how climate may impact productivity and distribution of different tree species. In animals, the use of the temperature humidity index (THI) has proven valuable in assessing the level of stress an animal may be exposed to at any time. The modifications of these indices have incorporated additional climatic parameters, e.g., solar radiation, precipitation, wind speed, and humidity because all of these factors directly affect plants, animals, insects, diseases, and humans. Understanding the changes in these climatic parameters builds the foundation for how we begin to understand and quantify agroclimatology. It is also important to understand how climatic variables are collected and analyzed so that anyone can understand how to effectively evaluate climatic data.

The importance of agroclimatology is linked to how different plant systems; field crops, vegetables, perennial crops, and pastures respond to the climate. This monograph includes chapters on these different crops and the effect of climate on the geographic distribution of these different plant systems and how climate affects their productivity. Development of simulation models makes it possible to link climatic data into short-term meteorological data to evaluate the potential impacts on the soil, plants, and pests over time. As we go forward in science, it will be imperative that we take a long-term view of our agricultural systems by using agroclimatic principles and linkages with our biological systems. If we are to achieve the goal of feeding the world while enhancing or environmental quality we need to understand the role of climate in these processes. This monograph is assembled to provide that understanding to foster discussion about the value of the agroclimatic time and space scales.

We express our deep gratitude to the authors who have contributed their expertise and energy to make this work a contribution to science. We value your contributions and insights into this topic. We thank the American Society of Agronomy, Crop Science society of America, and Soil Science Society of America for offering us this opportunity to develop this monograph and bring it publication. This would not be possible without the dedicated staff at headquarters who provide valuable efforts in making our efforts a reality.

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