Weather and Climate Monitoring and Prediction Systems in the Context of Agriculture

Weather contributes a lot to determining agricultural activities. It has a significant impact on the growth, progress, and harvesting of crops, the occurrence of pests and plant diseases, water demand, and fertilizer demand. Abnormal weather patterns may cause (a) physical destruction of crops and (b) soil erosion. From field transportation to storage and moving to the market, crop quality is hinged on the weather. Bad weather may compromise the produce quality during transportation and the vitality of seeds or planting supplies during storage. Therefore, there is no characteristic of crop cultivation that is not affected by the weather. Nevertheless, the optimal growth, development and harvest of crops, the rate of pest infestation and disease spread, and the requirements for susceptibility to weather-induced pests and diseases vary from crop to crop. Plant varieties may also have different growth periods. Even on the basis of climate, weather factors will show the spatial change within a given time zone, the time change of a given place, and the year-by-year change of a particular place and period. For planting reasons, the weather for a short period of time and yearly fluctuations in a certain location within the particular interval must be measured. For any particular time element, the percentage deviation of the limit value from the average or median (called the coefficient of variation) is a ratio of parameter variability. The briefer the time element, the greater the ratio of weather variability. In the short term, rainfall is a key variable among all parameters in time and distance. In fact, for rainfall, the short-term interannual variability is very large, which requires the variability to be expressed in terms of the percentage of probability of achieving a given rainfall amount, or to specify the least guaranteed rainfall under a particular probability level. In order to obtain the best productivity in a given location, crops and planting methods must be so that their main phased weather requirements equal the duration of relevant weather features, but to avoid the epidemic of pests, illnesses, and dangerous weather. In such crop strategic planning and planting practices, both predictable and processed short-term climate data (such as initial probabilities and conditional probabilities) play a vital role.

The influence of abnormal weather is not obvious. In nearly all years, regions and seasons, deviations from typical weather occur with greater frequency. The most typical one is the occurrence of rainy season fed crops (as witnessed in semi-arid tropical regions) and temperature fluctuations (as witnessed in tropical, temperate, and subtropical regions). Unpredictable rainfall causes delayed or prolonged crop irrigation and harvesting patterns. This volume discusses how weather and climate can be monitored and predicted in the context of agriculture. Chapter 1 mentions essentials for weather forecasts for agriculture, chapter 2: characteristics of weather forecasts, chapter 3: considerations related to agricultural weather forecasts, chapter 4: special agricultural weather forecasts, chapter 5: agrometeorological services, chapter 6: probability forecast, chapter 7: now-casting and very short-range forecasting, chapter 8: short and medium-range forecasts, chapter 9: long-range forecasts, and chapter 10: weather and climate forecasts for agriculture.

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