supply water fast enough to maintain the PT_p rate. In order to prevent leaf dessication, the plant has a feedback control system that causes stomatal closure, thereby decreasing actual transpiration below the potential rate. Thus, the transpiration process can also be discussed in two stages: (1) potential transpiration stage, and (2) soil water limiting stage.

The reduction in transpiration during Stage 2 depends on various soil characteristics, the extent and density of plant roots, and on potential transpiration. For soil-plant systems exposed to natural rainfall-drought cycles, plant transpiration goes through cycles of being in Stage 1 or 2, with the overall result that PT is less than PT_p. However, the plant potential T (Stage 1) is generally much longer than the soil potential E (Stage 1), because of the bulk soil water holding capacity and the availability of that water for transpiration through the root system. Again, these factors depend on the crop and its root system, the soil, management practices, and the potential rate of evaporation or transpiration.

2.2.2 Seasonal Evapotranspiration of Crops

During the time course of a seasonal crop, the crop system changes from one in which ET is entirely soil evaporation to one in which ET is mostly plant transpiration, and finally to one in which both plant transpiration and soil evaporation are affected by crop senescence. Just after planting a crop, the soil surface is bare and soil water evaporation may go through cycles of Stages 1 and 2. The net result over time is that actual ET would be less than potential ET when soil cover is minimal.

As plants emerge, their leaves begin to shade the soil surface. During the time when both plants and soil are exposed to direct radiation, both soil evaporation and plant transpiration contribute to ET. As plants grow and shade a larger fraction of the soil surface, the contribution of PT to ET increases. Since actual PT is affected less than actual E by rainfall frequencies, actual ET approaches ET_p as the season progresses and as the soil becomes completely covered by the crop.

When ground cover is complete, ET is mostly PT. During this period, if ET drops below potential ET, it would likely be due to stomatal closure and decreased PT in reaction to reduced soil water availability in the root zone. This drop would represent a stress on the crop and cause growth to be reduced because of less carbon dioxide uptake and reduced leaf and stem growth.

As the crop matures, leaves (especially lower leaves) begin to die and become nonfunctional. In some crops such as corn, the dead leaves might remain on the crop, but contribute little to transpiration. However, the soil is still shaded and the soil water evaporation rate would be lower than that of a bare soil. The net result is that actual ET decreases during this maturing stage of crop growth and becomes lower than ET_p.