A broader view of the adequacy of the water supply during a test period, 1955–58, is given in Table 5.3, where the amount of water actually available for the major crops planted (the "major" crops are those listed in Table 5.2) is compared with the evapotranspiration protentials applicable to those crops for the major canal systems of the Punjab. This table indicates that the area planted to the major crops is fairly well adjusted to the supplies of water normally available. In every instance studied at least 70 percent of the water required for maximum plant growth was available; in more than half the instances the water supply was fully up to the requirements for maximum growth.

In spite of the heavy investments that have been made all over the world in world in improving the supplies of agricultural water, the effects on plant growth of moderate deprivations of water are not fully understood, and we have not been able to resolve all the outstanding issues. The range of uncertainty remaining has no practical effect for the problem in hand. Nevertheless, it seems best to set forth the divergent points of view, for the issue is important for some problems of water management.

There is much evidence that indicates that the losses attributable to insufficient watering are less than proportional to the shortages of the water supply. For example, one authority has reported:

> "By plotting more than 2,500 determinations of the duty of water (including many multiple tests), it was determined that, if the quantity of water required to produce the maximum yields were known, it could be assumed that two-thirds of that water will produce yields of 90 percent; and one and one-half times that maximum quantity will only produce yields of 66 percent, or two thirds."(1)

This tendency of the water response curve to reach a peak at some definite level of water supply can be explained as follows. As we have stated, the amount of water that plants can use profitably is set by the evapotranspiration potential of the field in which they are growing, and this is determined primarily by local climatic conditions. The immediate effect of supplying less water than the evapotranspiration potential is to raise the moisture tension in the soil and thus to make it harder for plants to extract the water and dissolved nutrients from the soil surrounding their roots. The effect of raised moisture tension on plant growth depends on many factors, including the degree to which the moisture tension is raised, the duration of the periods of high moisture tension, and their timing in relation to the growth cycle of the plants. Most plants are

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(1) Charles Kirby Fox, Transactions, American Society of Civil Engineers, vol. 113 (1948), p. 571.