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32

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Evapotranspiration from Corn, Sorghum, Soybean, and Winter Wheat[1]

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Information on evapotranspiration (ET) rates is important to many agricultural and water-related problems. The ET rates are regulated largely by potential evapotranspiration (Keeping Up With Research 30), soil texture, crop cover, and water stress. Therefore, both total seasonal ET and seasonal trends in ET vary with climate, crop species and variety, disease, fertility, and other management practices.

Figs. 1-3 show the trends in actual evapotranspiration (ET) and potential evapotranspiration (PET) throughout the 1976 growing season for corn, sorghum, and soybeans at Manhattan, Kansas. Because the fields were not irrigated and droughty conditions existed, the seasonal ET values are slightly lower than normal. Wa-

[1] Contribution no. 1643-s, Agronomy Department

ter stress at the end of the season (late in August) hastened maturity; therefore, the leaves dried earlier and ET was less than PET. PET and ET were equal from July through mid-August for all three crops. ET can exceed PET (Fig. 2 soybeans) because of soybeans' ability to take heat from hot air.

Periods of highest water use by crops are during their reproductive stages—half bloom for sorghum, tassel-silk for corn, and full bloom for soybeans. Because spring rains are our common

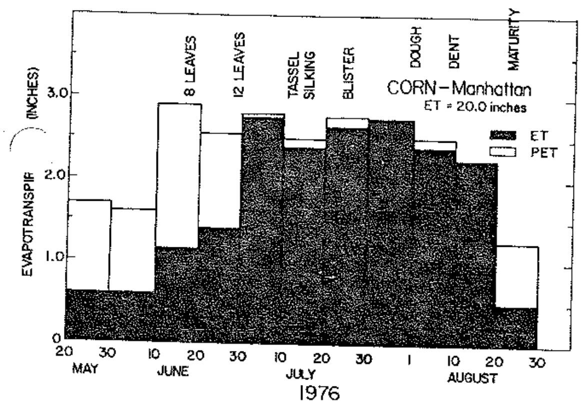

Fig. 1.—Seasonal trends in evapotranspiration (ET) and potential evapotranspiration (PET) of corn at Manhattan, Kansas, 1976.

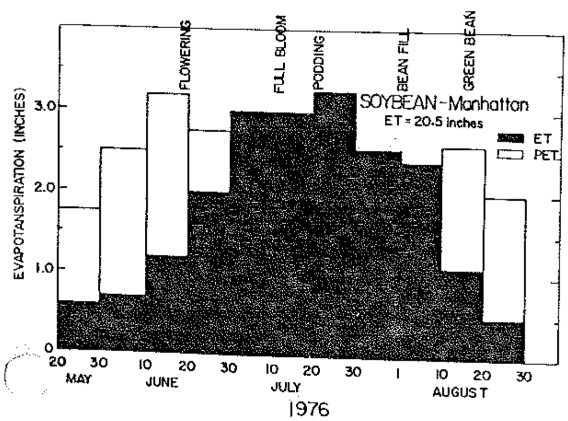

Fig. 2.—Seasonal trends in evapotranspiration (ET) and pot... ...al evapotranspiration ... ...nsas, 1976

rainfall pattern at Manhattan, the period of highest water use (mid to late July) is about when the soil-water reservoir (root zone) is depleted enough to cause water stress. Our silt loam soil holds about 10 inches of available water. Adding ET values in Figs. 1-3 from planting to the reproductive stages of each of the

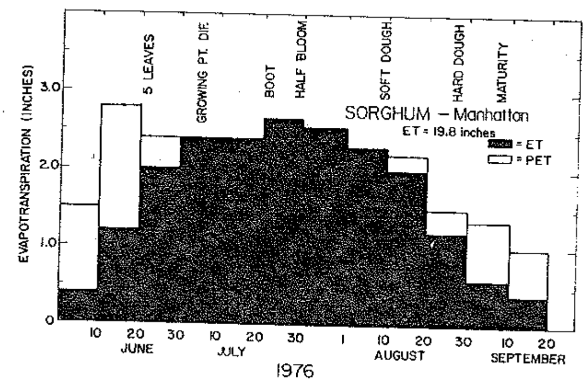

Fig. 3.—Seasonal trends in evapotranspiration (ET) and potential evapotranspiration (PET) of sorghum at Manhattan, Kansas, 1976.

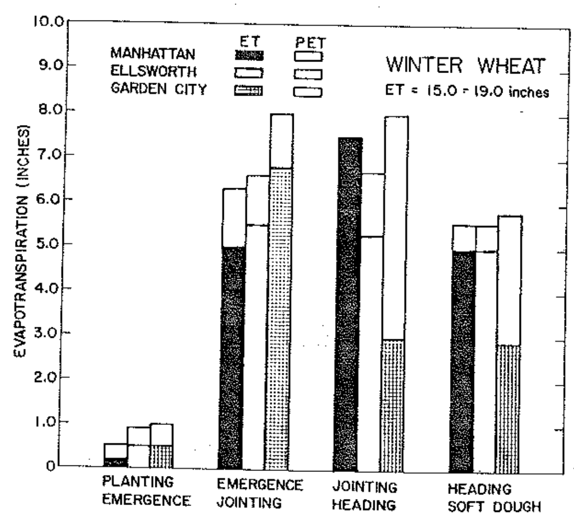

Fig. 4.—Evapotranspiration (ET) and potential evapotranspiration (PET) of winter wheat at various stages

crops shows that about 7 to 9 inches of water has been lost. If no significant rains have fallen, the yield from the crops can be reduced by water stress unless irrigation is available. During July, the crops use about 0.25 inch per day; thus, a 1-inch rain is used up in 4 days.

Fig. 4 shows the ET and PET pattern for winter wheat at Kansas locations: Manhattan, Ellsworth, and Garden City. Manhattan had the highest ET and Garden City the lowest ET. Because of the difference in seeding rates across the state, crop cover is greater in the east than in the west.

Only at Manhattan during the joint-heading growth stage does the ET equal the PET. In western Kansas, the wheat requires about 6 inches of water after jointing (after mid-April); therefore, rains during March and April are critical to wheat yields. Irrigation during "off-season" (late fall and early spring) can reduce the effect of a dry spring.