Crop yields are primarily water-limited under dryland production system in semiarid regions. This study was conducted to determine whether the growing season water balance could be manipulated through planting geometry. The effects of row spacing, row direction, and plant population on the water use, light interception, and growth on grain sorghum [Sorghum bicolor (L.) Moench] were investigated at Bushland, TX on a Pullman clay loam (fine, mixed, thermic Torertic Paleustoll). In 1983, which was a dry growing season, narrow-row spacing and higher population increased seasonal evapotranspiration (ET) by 7 and 9%, respectively, and shifted the partitioning of ET to the vegetative period. Medium population crops yielded 6.2 and 2.3 Mg/ha of dry matter and grain, respectively. High population resulted in high dry matter (6.1 Mg/ha) and low grain yield (1.6 Mg/ha), whereas low population resulted in low dry matter (5.4 Mg/ha) and high grain yield (2.3 Mg/ha). Row direction did not affect water use or yield. In 1984, dry matter production for a given amount of ET and light interception was higher in the narrow-row crops. Evapotranspiration was less for a given amount of light interception in the narrow-row crops and in the north-south row crops. Narrow-row planting geometry appears to increase the partitioning of ET to the transpiration component and may improve the efficiency of dryland cropping systems.