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Crop Choices and Rotation Principles

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Dryland cropping systems must integrate planting sequences or rotations with the selection of a crop to minimize production risk, for example, crop failure, and protect the soil resource while competing within an aggressively contested world commodity market. Erratic precipitation common to semiarid climates and the volatile nature of commodity markets further exacerbate crop selection and rotation implementation that profitably meet the universal goal of protecting natural resources. In this chapter, we introduce and contrast various plant adaptations that permit a best crop choice for growth under dryland conditions based on the suitability of physiological and agronomic characteristics. Cropping systems used with dryland production in semiarid regions must optimize precipitation use and, therefore, implement the sequence of growing crops and intervening fallow (idle) periods to increase storage of precipitation as soil water. In addition, crop selections must produce rotations that optimize cropping intensity while ameliorating weed, insect, and disease pressures. We present various cropping systems to illustrate the mechanics of crop-fallow sequences to conserve soil and water resources in a semiarid climate and suitable crop rotations to enhance overall cropping system productivity, profitability, and production risk control. Although water conservation is a critical concern to crop production under semiarid dryland conditions, we describe and contrast several other rotation benefits, for example, dinitrogen ($N_2$) fixation.

PHYSIOLOGY OF CROPS ADAPTED TO DRYLAND PRODUCTION

Sustainability under dryland cropping conditions is often governed by how well crop water demands are matched by the water resources. That is, crops must be able to efficiently use precipitation and stored soil water, while cropping sequences or rotations must provide suitable opportunities for precipitation storage.