In the Chhattisgarh plains in the agroclimatic region of central India (Figure 1), farms may be characterized by one of the following: unbunded lathyritic soils, bunded rice fields (rainfed), bunded rice fields (irrigated), unbunded black soils, or rice bunds. Under these five farming situations, different crop sequences have been in vogue. New crops and crop sequences are recommended by the Agricultural University from time to time based on experimental results.

Effects of Water Stress on Soybean Productivity in Central India

Indira Gandhi Agricultural University
Raipur, India

In the Chhattisgarh plains in the agroclimatic region of central India (Figure 1), farms may be characterized by one of the following: unbunded lathyritic soils, bunded rice fields (rainfed), bunded rice fields (irrigated), unbunded black soils, or rice bunds. Under these five farming situations, different crop sequences have been in vogue. New crops and crop sequences are recommended by the Agricultural University from time to time based on experimental results.

Figure 1. The five farming situations in Chhattisgarh plains, central India.

In the unbunded black soils, farmers usually plant small millets and pigeon pea. However, based on experimental results, the University has recommended soybean followed by chickpea crop sequence under rainfed conditions during monsoon and post-monsoon (winter) seasons, respectively. In the two to three years since that recommendation, the area under soybeans has increased from 3,000 ha to more than 70,000 ha.

It can be seen from Figure 3 that there was water stress during the mid seedling and end of the reproductive stages of the soybean crop in 1995, but there was very little water stress during the end of the reproductive stage in 1994. Thus, the water stress conditions during 1995 were more intensive than in 1994. As a result of this, the productivity of soybeans has decreased from 2.3 t/ha to 1.75 t/ha (a decrease of 0.55 t/ha). However, an examination of total biomass of soybeans indicated that the total biomass during 1994 was 5.51 t/ha, compared to 6.19 t/ha during 1995. This is the result of waterlogging conditions during 1994 in seedling and vegetative stages, which resulted in decreased biomass. However, the grain yield (productivity) was higher...
because there was no water stress during the reproductive stage of soybeans in 1994. This implies that although the biomass may decrease because of waterlogging conditions during initial stages of crop growth, the productivity increases if evapotranspiration is at potential rate during the reproductive stage for soybeans under Raipur conditions. A small stress (about 15% less than minimum MAI) can reduce productivity by at least 20% in soybeans. In view of this, soybeans are recommended only in heavy soils with good water retention capacity in the Chhattisgarh region of central India.

References