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## Performance of four intercropping systems under variable monsoon onset conditions in rainfed semi-arid region of Rajasthan

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### ABSTRACT

To provide a contingency cropping plan for the rainfed areas of hot semi-arid region of south-eastern Rajasthan a four seasons (2003 to 2007) kharif field experiment evaluated four intercropping systems viz. sorghum [*Sorghum bicolor* (L.) Monech] + pigeon pea [*Cajanus cajan* (L.) Millsp] (1:1), pigeon pea + black gram (*Vigna mungo* L.) (1:2), castor (*Ricinus communis* L.) + green gram [*Vigna radiata* (L.) Wilczek] (1:2) and soybean [*Glycine max* (L.) Merr.] + pigeon pea (4:1) under three dates of sowing, viz. first (normal) and third week of July, and first week of August. Four years mean pigeon pea grain equivalent data showed that sorghum + pigeon pea is the most remunerative cropping system under normal monsoon conditions but the crop yields sharply decline with the delayed onset of monsoon. The two week delayed planting of castor + green gram system did not show any yield reduction while four weeks delayed planting reduced yield by 16% only as against corresponding yield reduction by 9 and 54%, 25 and 46% and 28 and 57% for sorghum + pigeon pea, pigeon pea + black gram and soybean + pigeon pea intercropping systems respectively. Results indicated that if the monsoon onset is delayed by two weeks either castor + green gram or sorghum + pigeon pea should be the preferred cropping systems, whereas under four week delayed onset of monsoon situation only castor + green gram intercropping system has potential to maintain acceptable yield levels.

**Key words:** Aberrant monsoon, Delayed planting, Intercropping, Livelihood security, Rainfed, Subsistence farming, Water use efficiency.

One of the major concern in crop planning is uncertainties associated with monsoon behavior in rainfed semi-arid regions. There is need to understand common aberrations in monsoon behavior and develop contingency cropping plans accordingly to minimize the economic losses and ensure a minimum level of production under adverse circumstances. Delayed onset of monsoon for few days to several weeks is common in rainfed region of south-eastern Rajasthan which often leads to partial or complete failure of crops (Ali *et al.*, 2004 and Singh *et al.*, 2004). The normal date of monsoon onset in south-eastern Rajasthan is 2 July (Ali *et al.*, 2007). During preceding 20 years (1989 to 2008) the region has recorded normal onset of monsoon only for 9 years while for remaining years it was delayed by 1 to 5 weeks. In spite of Chambal canal network in the region, about 44% area continues to be under rain fed agriculture where crop yields are generally low and unstable. With average annual rainfall of 750 mm and good soil water retention capacity (>30 cm/m profile) the medium deep black soils of the region offer excellent

scope of intercropping to maximize production by efficient utilization of resources (Prasad *et al.*, 1997).

Earlier studies on sorghum, pigeon pea, castor and soybean based intercropping systems showed that these intercropping systems were more productive and remunerative when compared with sole cropping of component crops and therefore can provide biological insurance against total crop failure in the region (Prasad *et al.*, 1997 and Porwal *et al.*, 2006). Intercrop row combinations were standardized for south-eastern Rajasthan in a series of independent investigations. These studies suggested that sorghum + pigeon pea with (1:1), castor + green gram (1:2), pigeon pea + black gram (1:2) and soybean + pigeon pea (4:1) rows were the optimum row combinations with the land equivalent ratio (LER) values of 1.83, 1.76, 1.6 and 1.26 (Verma and Prasad, 1988; Prasad and Verma, 1986; Verma *et al.*, 1986 and Prasad *et al.*, 1997). However, these studies were staggered over different growing seasons and simultaneous performance of recommended intercropping systems under variable monsoon situations had not been investigated earlier. Especially the information on promising intercropping systems under delayed

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