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Strategies for Managing Livestock under Environmental Stresses in Drylands of India

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Abstract: Many factors affect livestock production in drylands. Variability in climate is one of the main limiting factors of production efficiency. The important environmental stressors include (i) heat stress due to direct effects of high temperature and solar radiation on animals, and (ii) nutritional stress due to adverse effects of low rainfall and frequent droughts on crops and rangelands. Heat stress is one of the major causes that can negatively affect both production and reproduction in livestock, especially in animals of high genetic merit. Sustainable development in drylands can only be achieved through optimum utilization of its natural resources. Major advances in management strategies, including improved housing and feeding manipulations, can attenuate the effect of thermal stress on livestock performance. The efficiency of these management strategies depends on several factors related to the animal (species, physiological stage and breed) and the livestock production system (intensive vs. extensive systems). Maximizing the production level and the efficiency of livestock enterprises is important; however, economic considerations largely determine the level of environmental manipulation selected for livestock production systems.

Key words: Drylands, environmental/heat stress, livestock, management strategies.

About 69% of India's total geographical area is under drylands (arid, semi-arid and dry sub-humid). India's drylands contribute 44% of the food grain production and support 40% of the human and 65% of the livestock population (Singh *et al.*, 2004). The farming systems in dryland are quite diverse with a variety of crops and cropping systems, agroforestry and livestock production. Drylands, besides being water deficient, are characterized by high evaporation rates, exceptionally high day temperature during summer, low humidity, high run off and soil erosion. The dryland areas of India suffer from the problems of (i) frequent droughts due to high variability in the quantum and distribution of rainfall, (ii) poor soil health due to continued degradation and inadequate replenishment of nutrient exhaustion, (iii) low animal productivity due to an acute scarcity of fodder and (iv) low risk bearing capacity of farmers due to poor socio-economic base, credit availability and infrastructure. However, the nature has endowed drayland areas with some of the best breeds of cattle (Tharparkar, Kankrej, Rathi, etc.), sheep (Marwari, Chokla, Magra, Malpura, etc.), goats (Sirohi, Marwari, Kutchi, etc.) and other species of livestock. It is also endowed with nutritious perennial grasses and shrubs (Singh *et al.*, 2004).

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Livestock production is an integral part of dryland agriculture in India. Livestock plays multiple roles in drylands livelihood system and economy, and have a strong human dimension, as manifested through socio-cultural link and involvement of women (Rangnekar, 2006). Besides their well-established role in agriculture, livestock have crucial role in food security and as risk aversion mechanism for sustaining family, whenever there is crop failure (Misra *et al.*, 2006). They enable poor and landless farmers to earn income using common-property resources, and provide a constant flow of income and reduce the vulnerability of agricultural production (Holmann *et al.*, 2005). The poor natural resource base of drylands makes the people and livestock vulnerable to environmental stresses and directly impacts livelihoods of people.

Many factors affect livestock production in dryland areas. Climatic environment is one of the main limiting factors of production efficiency in these areas. The extreme climatic conditions will impose various stresses on animals, which will adversely affect their