Projected Effect of Droughts on Supply, Demand, and Prices of Crops in India

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This paper assesses the effect of monsoon droughts on the production, demand, and prices of seven major agricultural commodities – rice, sorghum, pearl millet, maize, pigeon pea, groundnut and cotton. A partial generalised equilibrium model is developed to simulate the effects of deficit rainfall on acreage, yield, production, demand, and prices of different agricultural commodities in India. It is used to project the effect of rain deficits on supply, demand, and prices of monsoon session crops.

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1 Introduction

Global climate change is causing different types of risks, which are adversely affecting agricultural production and farm incomes (Kumar and Parikh 2001). These risks are emanating from the increasing intensity and extent of droughts, floods, temperature rise and fall, and other calamities. India is vulnerable to climate shocks and associated risks, especially unpredicted and deficit rainfall despite impressive irrigation development. Historical analysis reveals that the frequency of extreme rainfall has increased over time during the south-west monsoon season, which is accompanied by a decreasing trend in smaller rainfall events. All agricultural commodities are sensitive to droughts, floods, tropical cyclones, and low and high temperatures, and this can have an adverse effect on agricultural production and farmers' livelihoods (Selvaraju 2003; Kumar et al 2004; Lahiri and Roy 1985). For example, foodgrain production in 2012 was estimated to be 10 million tonnes short because of deficit and delayed rainfall. There were significant shortfalls in agricultural production due to deficit rainfall in 1998, 2002 and 2009 as well. Indian agriculture is vulnerable to climate shocks such as drought, floods and extreme hot and cold temperatures. It is also likely that hot, extreme, and heavy precipitation events will become more frequent. The projected increase in droughts and floods could result in greater instability in food production and threats to the livelihood security of farmers, especially smallholders.

Rain-fed agriculture in India is more prone to climate risks; it is spread out over more than 100 million hectares. These areas did not figure in the green revolution of the 1970s and 1980s. They are still characterised as low yielding and high risk prone due to a fluctuating and uncertain rainfall pattern. However, these areas are projected as the potential sources for increasing agricultural production in future. At the same time, climate change is a major constraint on increasing agricultural production. To meet the future demand for agricultural commodities, it is important to know about past and future climatic trends and assess their implications on agricultural production. Earlier studies have assessed the effect of rainfall on crop yields and noted that the elasticity of yield with respect to rainfall was positive for most crops (Rao et al 1988; Kumar et al 2011). These studies have not incorporated the area response of different crops to climate change. These studies have also not assessed the effect of climate change on production, demand, and prices of agricultural commodities.