SECTION 4

Village-Level Farm Adjustment to Rainfall Variability

4.1. The Farmer Context

The preceding three sections described a broad framework, consisting of public policies and scientific approaches to manage and harness the agroclimatic environment of the dry tropics in India. However, the final agency to be affected by the issues and measures discussed is the farmer. Since the farmer's decisions and responses would largely determine the effectiveness of various measures discussed in the preceding sections, it is necessary to examine briefly the farmer's adaptation strategies against rainfall variability. The aims of this section are:

(1) To describe farmers' long-term and short-term adjustment mechanisms to deal with rainfall variability or the resultant instability and risk characterizing their occupation.
(2) To indicate the manner in which farmers' adaptation strategies could be potentially strengthened by improved understanding of the environment and by modifications of public policies and programs designed specifically for areas with high rainfall variability.

We will deal with these in turn. At the outset, however, it is important to recall the types of variability with which individual farmers must cope. Three such types are recognizable:

(1) Pronounced year-to-year variations in rainfall receipt, which may include substantial deficits from the seasonal normal.
(2) Less pronounced variations in the *distribution* of rainfall within the growing season, leading to important variations of soil moisture at certain critical stages of crop growth. Existing climatological data sets are rarely sufficiently detailed to identify this type of variability.
(3) The third dimension of rainfall variability relates to long-term pattern of rainfall, particularly the frequency of occurrence of droughts.

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In the following section we consider, first, farmers' adaptation strategies to the perceived long-term variability of rainfall.

4.2. Long-Term Adaptations

The measures adopted by the farmer to cope with rainfall variability are reflected through different structural and operational features of his farming systems (Jodha, 1978; Walker and Jodha, 1986).

The structural features of a farming system represent the farmer's adaptation to long-term patterns of rainfall in a region. These include:

(1) The degree of diversification through mixed-farming/mixed-cropping flexibility in farm operations and practices.
(2) The systems of self-provisioning, on-farm storage and recycling procedures for both input and output.
(3) The choice and combination of farm enterprises, assets, etc.

On the basis of the relative degree and nature of these responses, the long-term adaptation of the farming system in one region can be differentiated from that in another (Spitz, 1980). For instance, the greater the weather-induced risk in a region, the greater will be the extent of diversification and flexibility in the farming systems, and *vice versa*. Not only do the diversification and flexibility equip the farmer to exploit the benefit of good rain years and to protect against losses during poor rain years, but they also determine the farmer's preparedness to adjust to the short-term variability of rainfall. An indication of such long-term adaptation strategies can be obtained by comparison of relevant features of farming systems and associated factors in three agroclimatic regions discussed below.

It should be noted that since a variety of factors collectively or individually play their role in shaping farming systems, it is not easy to pinpoint the exact role of agroclimatic conditions, especially rainfall, in determining the farmer's adjustment strategies. However, since rainfall plays a crucial role in shaping farmers' activities in the seasonally dry tropics, the existing farming systems in diverse agroclimatic environments can be viewed as the consequences of adjustment strategies in response to the long-term pattern of rainfall. Juxtaposition of relevant features of the farming systems in different agroclimatic environments can illustrate this.

Table 4.1 presents such information for three areas. The three areas, Akola, Sholapur and Jodhpur, belong to three zones that can be differentiated on the basis of normal annual rainfall, length of growing season and frequency of drought-related crop failures. (For the location of zones and study areas, *see Figure 1.1.*) Accordingly, Akola belongs to the relatively stable and high rainfall zone. This zone accounts for more than 14% of the total area of arid and semi-arid tropical regions in India. Sholapur represents the zone where the drought frequency is once in four years. This is the largest dry zone, accounting for over 51% of the arid and semi-arid tropical region of the country. Jodhpur represents