Drought Adaptation Measures and Risk Tolerance of Commercial, Small-scale and Subsistence Corn Farmers in the Free State and Northwest Provinces of South Africa

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Introduction

Of the many crops grown in South Africa, corn (maize) is the most important grain crop. Approximately 90 percent of corn is produced under dry-land conditions. Sustained corn production is, however, dependent on favorable distribution of rainfall throughout the growing season but most critical during the flowering stage when soil water stress reduces yields more than during other growth phases.

In the domestic market, about 40 percent of the corn produced is used in the animal feed industry, 50 percent in the corn milling industry, and 10 percent for other processes such as seed, wet milling, and brewing. Under drought conditions, commercial corn farmers have to absorb the income shock which leads to loss of physical capital and subsistence agriculturists face the probability of poor nutrition in the future. The most important requirement for management of a sustainable farming enterprise is the ability to respond to, and develop adaptation mechanisms to changes in the natural environment such as an increased frequency of droughts.

Commercial agriculture

Both climate and soil characteristics influence the potential soil water content. Soil characteristics are largely influenced by tillage practices. Over the past decade, the Free State and North West provinces shifted from conventional tillage practices to conservation tillage systems. These systems include no-till, reduced till, and stubble-mulch cultivation. The advantage of these conservation tillage systems is increased soil water holding capacity due to a higher organic matter content and reduced runoff. During drought years, crops planted on soils that have not been tilled produced higher yields due to the better water-holding capacity. Additionally, no-till soils retain more moisture from the previous season than those fields tilled by conventional tillage practices.

Crop rotation is also employed to reduce risk in corn production systems. The yield and quality of corn is often better in a crop rotation system than under monoculture. In the northwestern Free State and North West provinces, corn is rotated on an annual basis with soybeans, sorghum, sunflower, cultivated pasture, or left fallow. However, in a fallow system no income is generated from the field except for the short period it is used for grazing. The extent of this loss, especially during a drought year, must be weighed against the possibility of a greater financial loss if the field had been planted and a poor yield obtained. A fallowed field, in which weeds have been effectively managed and is planted with corn in the next season, usually has a higher production potential, even if rainfall is low.

Commercial farmers usually plant corn varieties with a known production potential and yield reliability. New hybrids are usually phased in over
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Commercial corn plantings in South Africa have followed the international trend with increased plantings of genetically modified (GM) corn that are mainly herbicide tolerant (notably Roundup) or insect (notably stalk borer) resistant in order to reduce the use of herbicides and pesticides and to decrease production costs.

Commercial corn farmers in the Free State and North West Province plant at low planting densities of 10,000 to 40,000 plants per hectare and row spacings ranging from 0.75 to 2.8 meters (1 meter = 3.28 feet) under dry-land conditions. This practice ensures water conservation. To compensate for the low planting density and wider row spacing, farmers choose cultivars that have the capacity to produce a higher-than-average yield during wet years by producing two to three ears per plant.

Small-scale agriculture

The small-scale and subsistence farming sector in South Africa is more vulnerable to drought as most of it is located in regions that are sub-optimal for crop production due to poor soils and erratic climate. Two systems can be used by small-scale and subsistence farmers to effectively reduce runoff and evapotranspiration. The first is intercropping, which is often referred to as live mulching. An additional advantage of intercropping is increased nutritional value and efficient use of space and labor. Second, if rainwater is harvested and channeled to an arable land in a dry area, the risk for crop production with variable rainfall can be reduced. In 2000, researchers developed an in-field rain-water harvesting technique (IRWH) whereby runoff is captured in a no-till type of micro-catchment that is covered with mulch. Using IRWH in very low rainfall areas and poor soils resulted in a 70 percent probability that yields can increase from 1 ton per hectare under conventional tillage to 1.8 ton (1 metric ton = 2.204 million pounds) per hectare.

Other adaptations

South Africa’s 2005 Drought Management Plan (DMP) proposes the development of a risk management system of which the features are prevention or reduction of disasters, mitigation, preparedness, response, and rehabilitation. Drought management is the responsibility of national, provincial, and local governments, farming communities, the private sector and civil society. It is however, felt that the present disaster aid for drought is not particularly suited to the needs of the corn farming community, either commercial and sustainable or small-scale, as these assistance schemes do not cover insured or insurable assets such as infrastructure and crops. For commercial corn farmers this means that they are self responsible for incorrect investment, financing, marketing, and production decisions. The current assistance schemes proposed in the DMP are only vaguely described and are not designed to replace what farmers have lost, but rather to enable farmers to continue production in a coming season through financial assistance.

Policy recommendations

A clear policy framework is necessary because it provides the foundation on which further systems development and integration between institutions can occur. Farmers feel that the government is more focused on protecting consumers from high prices than on helping the producers. The commercial corn production industry wants government first to spend more on agricultural research to find methods that will lessen the impact of drought and, second, to set up drought insurance schemes.

The speedy implementation of the DMP plan and the development of a coordinated and easily accessible early warning system are of utmost importance to farmers. Government assistance and intervention should not only be applicable to the small-scale and subsistence farming sectors but must also be conclusive to the commercial farming sector. Although this sector has well adapted to the environmental constraints associated with droughts, its low financial risk tolerance due to high input cost and competitiveness in a highly subsidized global market makes it vulnerable. Each corn farmer who changes his farming practice from corn to pasture or another non-corn producing system has a large impact on the nation’s food security and self sufficiency.

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