



New technologies, marketing strategies and public policy for traditional food crops: Millet in Niger ☆

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Received 4 August 2005; received in revised form 10 November 2005; accepted 29 December 2005

Abstract

New technology introduction in this semiarid region of the Sahel is hypothesized to be made more difficult by three price problems in the region. First, staple prices collapse annually at harvest. Secondly, there is a between year price collapse in good and very good years due to the inelastic demand for the principal staple, millet, and the large changes in supply from weather and other stochastic factors. Thirdly, government and NGOs intervene in adverse rainfall years to drive down the price increases. Marketing strategies were proposed for the first two price problems and a public policy change for the third. To analyze this question at the firm level a farm programming model was constructed. Based upon surveying in four countries, including Niger, farmers state that they have two primary objectives in agricultural production, first achieving a harvest income target and secondly achieving their family subsistence objective with production and purchases later in the year. Farmers are observed selling their millet at harvest and rebuying millet later in the year. So the first objective takes precedence over the second. A lexicographic utility function was used in which these primary objec-

☆ An earlier version of this paper was presented at the Annual American Agricultural Economics Association meeting, 27–30 July 2003, Montreal, Canada with the title “Improving Marketing Strategies to Accelerate Technological Change for the Basic Cereal: The Niger Case.”

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tives of the farmer are first satisfied and then profits are maximized. According to the model new technology would be introduced even without the marketing strategies. However, the marketing strategies accelerated the technology introduction process and further increased farmers' incomes. Of the three marketing-policy changes only a change in public policy with a reduction of the price depressing effect (cereal imports or stock releases) substantially increases farmers' incomes in the adverse years. In developed countries crop insurance and disaster assistance is used to protect farmers in semiarid regions during bad and very bad (disaster) rainfall years. In developing countries finding alternatives to the poverty-nutritional problems of urban residents and poor farmers to substitute for driving down food prices in adverse years could perform the same function as crop insurance in developed countries of facilitating technological introduction by increasing incomes in adverse rainfall years in developed countries.

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Keywords: Inventory credit; Marketing strategy; Inorganic fertilizers; Fertility depletion; Farm level programming; Micro-fertilization; Sidedressing

1. Introduction

A principal production requirement of agriculture is that to produce crops major and minor nutrients are required. Without sufficient nitrogen and phosphorus yields will stagnate and decline to low level equilibriums (for an estimate of this yield decline using simulation to take out weather effects see [Ahmed and Sanders, 1998, p. 258](#)). Providing adequate nutrients for crop production in Niger is not a risky option that farmers can avoid. It is a prerequisite for removing crop production from a downward cycle of fertility depletion and yield decline.

With continuing population pressure leading to the breakdown of traditional fertility replacement strategies, such as fallowing and migration to new areas, and the nutrient inadequacy of others, such as manure and rock phosphate, there needs to be a focus on increasing input purchases of nutrients (inorganic fertilizers, [Sanders, 1989](#)). For farmers to adopt these inputs, they need to be profitable. Moreover, the risks from low yields in adverse rainfall years need to be reduced with technology or policy.

In developed countries, such as the US, institutional development (availability of crop insurance managed by the private sector but with an important public sector subsidy plus disaster assistance for major drought years funded by the public sector—see [Dismukes and Glauber, 2005](#)) allows farmers in semiarid regions to lose fertilized wheat or sorghum or experience low yields in inadequate rainfall years without going bankrupt. Then in normal and good rainfall years these activities are often very profitable. Africa is more dependent upon semiarid crop systems than any continent except Australia ([Shapiro and Sanders, 2002, pp. 270–274](#)).

Using farm level programming we evaluate first whether farmers would adopt new technologies with higher fertilization levels. Secondly, we analyze the effects of the introduction of new marketing strategies and a public policy shift on farm level incomes and adoption. Finally, for an adverse rainfall year in which yields

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