THE DIFFUSION OF HYBRID MAIZE IN WESTERN KENYA

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ABSTRACT

This study analyzes the diffusion of hybrid maize technology in western Kenya as a case study in the spread of new agricultural technology among small-scale African farmers. The area covered in the study contains virtually all the medium and high potential land west of the Rift Valley in Kenya, containing about 40% of Kenya's population and 50% of its maize acreage. The main purpose of the study is to improve our understanding of factors affecting the adoption of new technology, with special attention devoted to the role of environmental factors and the perception of risk. A model including such factors as agroclimatic zone, perception of risk, imputed income from cash crops, farm size, off-farm income, work experience, credit availability, formal education, and various types of extension contact is constructed and used to analyze adoption and non-adoption as of 1973 as well as early and later adoption of hybrid maize over the period since the introduction of hybrids in 1963.

The study is based on a variety of sources including records of seed sales, marketed production, local sample surveys, interviews, historical studies, and documentary sources. In particular, the study analyzes the results of the 1973 Kitale/CIMMYT hybrid maize survey, a stratified sample of 360 farmers in an eleven district area. As of June 1973, roughly two thirds of farmers in western Kenya

had adopted hybrid maize seed, with varying percentages having adopted other portions of the recommended package of maize technology. Adoption, however, varied from 15% to 90% according to agroclimatic zones, and analysis is therefore conducted both within such zones and using the sample as a whole. Factors positively and significantly associated with adoption included cash crops, credit, education, extension contact, and location of the farm in a high rainfall or altitude zone. Factors negatively related to adoption included risk perception, off-farm work experience, and location of the farm in a moderate rainfall zone. Farm size, although the most important variable in influencing early adoption, was not significantly related to adoption ten years after the technology was first introduced. This may indicate that the ability of large-scale farmers to withstand risk, as well as their preferential access to agricultural services, rather than actual economies of scale are influential in the hybrid maize adoption process. Whereas off-farm work experience per se was negatively related to adoption, work experience on a large-scale mixed farm in the former scheduled areas of Kenya was positively related to early adoption. Although adoption of other recommended maize practices varied widely according to the practice and agroclimatic zone, users of hybrid maize seed significantly adopted more of the other recommendations than did non-users. No clear distinction was noted between the acceptance of cultural practices and the use of physical inputs.

Methodologically, the study is perhaps most interesting for its use of multivariate probit analysis, an as-yet little used method designed for carrying out regression-type analysis with a dichotomous or binary dependent variable, such as adoption and non-adoption. Probit avoids the deficiencies of regular regression analysis with a dichotomous dependent variable and gives valid significance tests for independent variables. Regular multiple regression was used for the analysis of early adoption where year of adoption provided a continuous dependent variable.

In addition, the thesis reviews the history of maize in Kenya and the importance of maize in the Kenyan economy and diet. It describes the supporting economic infrastructure of the maize industry, including maize breeding, agronomic research, seed production, input distribution, extension services, credit availability, pricing, and marketing policies, and attempts to place the diffusion of hybrid maize in the context of these services. The costs and benefits of the development of hybrid maize seed are considered, and are conservatively estimated to yield an internal rate of return of close to 50% on the research investment. The principal beneficiaries of hybrid maize development are considered, and conclusions are made about the reasons for the considerable success of hybrid varieties in Kenya, along with recommendations for further improvements in maize production.