Economic Analysis of Diversity in Modern Wheat

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Dedication

This book is dedicated to Erika Ching-Huei Meng (1963-2008), whose intelligence contributed so much to our understanding of the value of plant genetic resources, and whose unmatched courage will endure in our memories. Economist, colleague, athlete, linguist, and our friend, Erika tackled insurmountable challenges with integrity and grace.

Staff at the Center for Chinese Agriculture Policy also express their admiration for Erika's corage and integrity. Her passion for her career and her concern for and contributions to China's agricultural development has left deep impressions.

Royalties from this book will be distributed to the Erika C.H. Meng Scholarship at the University of California, Davis, where Erika completed her PhD. The fund supports graduate students in bridging applied development research and policy, as Erika did so well in her life.

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Foreword

Economic Analysis of Diversity in Modern Wheat

The term "genetic diversity" with reference to food crops was coined in the 1960s, but humans have mindfully molded natural crop diversity since the advent of agriculture. Hexaploid wheat, used to make popular foods like bread and Chinese noodles, appears to have reached humanity through repeated chance crosses of tetraploid wheat with wild grasses thousands of years ago. Since then intense farmer selection has domesticated and refined both forms of wheat, making the crop a key source of carbohydrates and other nutrients for millions worldwide. Science-based breeding in the twentieth century greatly accelerated wheat's evolution, producing high-yielding varieties that helped avoid famine in many developing countries. Emerging scientific tools hold promise for identifying and tapping new, useful genetic diversity within wheat's primary and secondary gene pools and, through genetic engineering, beyond.

But the rapid replacement of many wheat landraces with relatively few improved varieties on large expanses has raised concerns that this narrows genetic diversity. Recent experience—the emergence and spread of a new, virulent strain of stem rust from eastern Africa—seems to underline the need for broad diversity, both within and among varieties, as a frontline defense against evolving pathogens. Wheat genetic diversity has also been cited as a potential source of traits like heat tolerance, which can help wheat adapt to changing climates.

For these and other reasons, few would question diversity's value in general terms. The real issue is how much society at large is willing to pay for it. After all, the central questions confronting agriculture and finance policy makers dealing with food crops, especially in developing countries, are economic: What is diversity worth? Must the conservation of crop genetic diversity—a medium-to-long-term prospect—always come at the cost of reduced crop productivity in the near term?

To address those and related issues, the editors of this book have elected to focus on the circumstances and uses for wheat in Australia and China. The rich contrasts and intriguing analogies surrounding wheat in those settings furnish a useful lens for such an analysis. The book describes generally how policy affects wheat genetic diversity; it looks at historical changes in wheat genetic diversity, as policy and priorities have evolved; it identifies factors that explain changes and differences in spatial diversity; and finally, it analyzes the productivity impacts of changes in diversity. As a basis for discussion, the opening chapters define various types of crop genetic diversity and ways to measure them, framing the definitions and metrics in the contexts for which they are most relevant.

Wheat genetic diversity has been the topic of numerous studies by the Australian Centre for International Agricultural Research (ACIAR), the International Maize and Wheat Improvement Center (CIMMYT), and organizations like the International Food Policy Research Institute (IFPRI). Authors of the various chapters in this book have participated in those studies, or come from other advanced research institutes of recognized authority or national research organizations that are particularly well placed to address the theme. The present work reflects their pooled knowledge and concerns, and should prove of interest to a diverse audience including crop breeders, agricultural socioeconomists, research directors, and policy makers. We hope you find it interesting and useful, and welcome any comments you might have.

Masa Iwanaga
Director General
CIMMYT, 2002-08

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