

# Chapter 1

## Introduction

Crop improvement research has had a record of spectacular success. The diffusion of “Green Revolution” wheat and rice varieties, accompanied by greater use of inputs such as fertilizer, has greatly improved national food security and enhanced the welfare of the poor, especially in developing countries.

As time goes on, however, the momentum favoring investments in crop breeding research has slackened. In both developing and industrialized countries, changes in the political economy of public finance, the introduction of new technologies, and privatization of agricultural research have undermined funding for public agricultural research organizations. The appearance of alternative development investments has also diverted resources away from agricultural research organizations. At the same time, these organizations have faced demands to broaden their research focus.

These changes have led to pressures on both national and international crop breeding programs. Is there still a role for these crop breeding programs? Are they still having a major impact on the economies and food security of developing countries? This report attempts to answer these and related questions. The short answer, at least in the case of wheat, is yes: the international wheat breeding effort undertaken by the International Maize and Wheat Improvement Center (CIMMYT) and its national program partners continues to generate tremendous benefits and to contribute significantly to social welfare.

In 1990, CIMMYT conducted a study to evaluate the impacts of international wheat breeding research in the developing world. The objectives of the study, which covered the period 1966-90, were to provide feedback to researchers on the acceptance or rejection of new technologies, explore the reasons behind farmers’ responses, and to document the benefits of wheat research (Byerlee and Moya 1993).

In 1997, CIMMYT launched a follow-up study to update the 1990 data and analysis. The objectives were quite similar to those of the initial study:

- document the use of CIMMYT-related and other improved wheat germplasm;
- document farm-level adoption of improved wheat germplasm;
- identify factors that affect adoption of modern varieties (MVs);
- generate information for research priority setting; and
- provide information to raise awareness of the importance and benefits of international wheat research.

Questionnaires were sent to 41 developing countries that produced more than 20,000 tons of wheat annually (the Central Asian and Caucasus states, however, were not included in either the 1990 or 1997 study). Responses were received from 36 countries, representing just under 99% of all wheat production in the developing world. On a regional basis, coverage ranged from 94% of production in West Asia/North Africa (WANA) to

nearly 100% in Latin America. The 1997 study differed from its predecessor in several respects. It included South Africa for the first time and had more complete coverage of China's wheat area.

Four other major sources of data were exploited to produce this report: information supplied by national agricultural research systems (NARS) and CIMMYT scientists, as well as some country-level secondary data available for larger countries; the comprehensive wheat pedigree database maintained by the CIMMYT Wheat Program; the CIMMYT wheat mega-environment database developed by CIMMYT's Wheat and Economics Programs;<sup>1</sup> and wheat area, production, and yield statistics maintained by the Food and Agriculture Organization of the United Nations (FAO).

This report is organized as follows. Chapter 2 describes the CIMMYT wheat breeding program and discusses CIMMYT's collaboration with the International Center for Agricultural Research in the Dry Areas (ICARDA) (also a member of the

Consultative Group on International Agricultural Research or CGIAR) and with NARSs. It also includes a summary of wheat breeding costs incurred by these institutions and a description of major wheat breeding environments in the developing world. Chapter 3 analyzes patterns of wheat varietal releases in developing countries from 1966 to 1997 by origin, time period, wheat type, growing environment, and region. Chapter 4 investigates the adoption of wheat varieties in farmers' fields in developing countries, using many of the same variables for categorization. Chapter 5 outlines various methods of calculating the benefits of wheat improvement research and discusses the conceptual assumptions necessary to apply them. Chapter 6 provides estimates of actual yield gains attributable to wheat breeding programs and discusses how experimentally measured yield gains relate to yield gains measured in farmers' fields. Chapter 7 describes several different attempts to calculate the economic benefits of the international wheat breeding effort. Chapter 8 highlights some important conclusions of the report.

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<sup>1</sup> This source was perhaps the weakest link in the overall data collection effort as much of the data in the mega-environment database was over 15 years old.