Genetic Contributions to Yield Gains of Five Major Crop Plants

W. R. Fehr, Editor

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Foreword

The future of world food, feed, and fiber supplies may well depend on how successfully we manipulate the genetic characteristics of plant species. Natural selection is an age-old phenomenon, but crop improvement through the use of scientific principles is relatively new. The development of improved crop cultivars by plant breeding has provided the base for modern agricultural production in the USA.

The yield of crops involves many factors, and scientists must be able to separate genetic improvements from those due to favorable changes in the natural or man-made environment. Understanding the role of plant breeding for increasing crop production becomes even more essential as we begin to apply the scientific principles provided by research in molecular genetics. Breeding and genetic research programs of many private and public agencies continue to enlarge our stockpile of genetic material. Molecular genetics may contribute to the stockpile of genetic variability that the plant breeder can use to develop crop cultivars that have a significant impact on crop production. Agricultural products are influenced by the genetics of organisms from which they are produced. How well we understand and manipulate these organisms will eventually determine the fate of the agricultural enterprise.

All persons interested in providing the food, feed, and fiber supplies for the world will want to read the papers presented at the symposium entitled “Genetic Contributions to Yield Gains of Five Major Crop Plants in the United States.” The symposium brought together outstanding, highly qualified plant geneticists and breeders of five crop plants. They identified genetic contributions to yield improvement up to the present time as a means of understanding future possibilities. We are indebted to the organizers of the symposium, the authors, and to the editorial committee that made this timely and important publication available to persons interested in crop science.

C. F. Eno, President
American Society of Agronomy

W. L. Colville, President
Crop Science Society of America
Foreword

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Preface

Grain and fiber yields of our major field crops are a major concern of farmers, legislators, economists, and agronomists. These people are interested in long-term yield trends and would like to know what factors influence the trends and what projections can be made for the future.

Many factors interact to influence the yield of a crop. The list includes weather, soil, agronomic practices, and choice of cultivar. Some of the factors can be modified and some cannot. It is generally recognized that choice of cultivar has an important influence on crop yields. The yield potential of cultivars of some crops has increased over time. Other factors that could affect yields also have changed; these include increased use of fertilizers and pesticides, better tillage and harvesting machinery, and long-term changes in weather. We must know the relative importance of improvements in the yield potential of cultivars compared with improvements in other production inputs. Some researchers have speculated in recent years that improvements in yield potential cannot continue much longer or that yield increases have already ceased. Can that speculation be substantiated by appropriate scientific investigation?

A symposium on the subject, entitled “Genetic Contributions to Yield Gains of Five Major Crop Plants in the United States,” was presented at the 1981 annual meeting of the American Society of Agronomy. Its objective was to present a current summary of changes in the yield potential of cultivars and to quantify the proportion of yield gains that can be attributed to genetic improvements. The crops considered were cotton, maize, sorghum, soybean, and wheat. The symposium was sponsored by Division C-1, Crop Breeding, Genetics, and Cytology. The presentations were intended to identify new experimental data, to relate the new data to previous information, and to give a basis for prediction of future gains in the yield potential of cultivars. The five papers presented at the symposium are included in this publication.

The information generated by the symposium should give legislators, economists, and agronomists current estimates of the past and future role of plant breeding for improving crop yields in the USA. Decisions regarding allocation of funds for research and development, considerations of economic trends, and identification of worthwhile research problems can be influenced by the data and conclusions in this publication.

W. R. Fehr
Editor
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