

# Foreword

Rice is the principal food of nearly half of mankind and more than 90% of it is grown in developing countries where problems of food supply are more acute. Over the last 30 yr, world rice production has more than doubled—from 257 million t to 534 million t. This phenomenal increase can be attributed to the large-scale introduction of improved rice varieties and technology developed at IRRI and national rice improvement programs through the application of Mendelian genetics and conventional breeding approaches.

These approaches to increasing rice production averted the large-scale famines predicted by some experts. However, the specter of food shortages looms once again. The annual rate of increase of rice production has slowed down to where it is lower than the rate of increase of rice consumers. There are no new areas that can be used for rice farming. Agricultural economists estimate that we will have to produce 70% more rice by 2025 from less land with less labor, less water, and fewer chemicals. New rice varieties that combine higher yield potential with excellent grain quality, resistance to biotic and abiotic stresses, and input use efficiency are desperately needed.

Recent advances in cellular and molecular genetics of rice have come perhaps in the “nick of time” to provide us with new tools to develop the rice varieties of the future. Only 10 yr ago, the status of rice genetics was considered far behind that of other food crops such as maize, wheat, barley, and tomato. However, the last decade has seen a knowledge explosion in this arena and rice is now considered a model plant for such research on cereal crops. Several fortunate developments have led to this happy turn of events.

First, the Rice Genetics Cooperative (RGC) was established in 1985 during the first international rice genetics symposium at IRRI. It has greatly enhanced international collaboration in rice genetics. The RGC has formulated the rules for gene symbolization and nomenclature in rice and monitors the gene symbols and coordinates linkage mapping. It has established two genetic stock centers for preservation and distribution of gene marker stocks and chromosomal variants. It publishes the *Rice genetics newsletter* annually and organizes this prestigious gathering every 5 yr. Perhaps the RGC's most significant achievement to date was the establishment, in 1990, of an

agreed upon system of numbering rice chromosomes and linkage groups—without it, rice genetics would not be where it is today.

Second, the Rockefeller Foundation (RF) established the International Program on Rice Biotechnology, also in 1985, which has contributed greatly in moving the frontiers of knowledge on rice cellular and molecular genetics. Since rice is not an important crop in developed countries, except Japan, there had been very little investment in studying rice genetics in advanced country laboratories. RF has been funding research on rice biotechnology in carefully selected laboratories in developed countries and is also working to build the capacity of developing countries to use rice biotechnology techniques, particularly through the training of scientists. Over the last decade, RF's program has led to many breakthroughs in rice genetics.

Third, the establishment of the Rice Genome Research Program (RGRP) at the Society for Techno-innovation of Agriculture, Forestry, and Fisheries (STAFF) Institute in Japan has moved the frontiers of our knowledge on the rice genome far beyond anyone's expectations. A high-density map of about 2,000 molecular markers has been prepared and numerous genes have been sequenced. The physical map, whose preparation is now under way, will facilitate the cloning of important genes not only from rice but also from other cereals because of the small size of the rice genome and its synteny with those of other cereals.

IRRI's rice biotechnology program fully supports and participates in the activities of the RGC and has strong linkages with the RF and Japanese programs mentioned above. Like the first two symposia in this series, IRRI was pleased to host the third international rice genetics symposium. Around 200 rice scientists attended the first symposium in May 1985, and more than 300 participated in the second symposium in May 1990. More than 500 scientists from 31 countries were attracted to this third symposium.

Along with the dramatic increase in attendance has come a major shift in the complexion of the program. During the first symposium, around 90% of the papers were on classical genetics. About half the papers presented at the second symposium were devoted to classical genetics and half to cellular and molecular genetics. About 80% of the papers in these proceedings and the posters, which are appearing in the three 1996 issues of the *International rice research notes*, address cellular and molecular genetics topics.

I would like to thank my colleagues at IRRI who have devoted a great deal of time in organizing this symposium. Most of the preparation at IRRI was done by Dr. G.S. Khush, who served as organizing secretary. Drs. D.S. Brar, T. Kinoshita, K. Toriyama, and G. Toenniessen contributed advice and support in the preparation and implementation of the symposium plans. Critical review of the plenary papers was done by Drs. R.K. Aggarwal, O. Azzam, J. Bennett, D.S. Brar, M.B. Cohen, S.K. Datta, N. Huang, R.J. Nelson, J.-L. Pham, and S.S. Virmani. The plenary and concurrent papers in the proceedings were edited by G.P. Hettel, T. Rola, S. Siar, and G. Goss.

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