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Taiji Kawakatsu *Editor*

Rice

Methods and Protocols

Humana Press

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Preface

Rice is Life

Rice is one of the three major crops and accounts for 17% of the global food supply on a calorie basis in 2021. With the global population projected to surpass 9 billion by 2050, it is imperative that annual cereal production increases by 1.5-fold to meet this demand. Furthermore, the impact of climate change on grain yield necessitates the development of crops resilient to such changes.

Rice, with its compact and simple diploid genome, has been a widely studied model cereal crop. The advance of high-throughput sequencing and genome editing technologies over the past two decades has revolutionized the field. Resequencing thousands of rice genomes has provided invaluable resources for understanding genomic diversity, tracing the path of domestication, and studying evolution. Transcriptome analyses offer snapshots of cellular states, shedding light on various biological processes. Genome editing has empowered researchers to generate mutants for specific genes of interest. These advancements are integral to the field of molecular biology, particularly in accelerating functional genomics. This, in turn, paves the way for molecular breeding strategies that could significantly contribute to achieving the Sustainable Development Goals (SDGs).

The aim of this volume is to serve as a comprehensive guide to the field of rice molecular biology, encompassing both time-honored techniques and state-of-the-art methodologies. This book is divided into six parts: sample preparation, temporal and spatial analysis of RNA and protein expression, transformation and precise genome editing, scalable transcriptome analysis, epigenome analysis, and gene regulatory network analysis. They hold the promise of unlocking novel findings in rice science, paving the way for innovative solutions to global food security challenges.

All the authors and I hope that this volume will serve as a valuable resource for the rice research community and beyond. Our collective knowledge is our most potent weapon in the fight for global food security. We envision a future where these tools and techniques are widely adopted, driving advancements in crop science and bringing us one step closer to a world where food security is a reality for all.

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