

# Rice

## Nutrient Disorders & Nutrient Management



Rice ecosystems

Nutrient management

Nutrient deficiencies

Mineral toxicities

Tools and information

Achim Dobermann and Thomas Fairhurst

# **Rice: Nutrient Disorders & Nutrient Management**

Handbook Series

A. Dobermann

T.H. Fairhurst

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Typesetting & layout by Tham Sin Chee

First edition 2000

ISBN 981-04-2742-5

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# Rice

## Nutrient Disorders & Nutrient Management

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# Acknowledgments

We wish to acknowledge the following people and organizations:

Dr. Christian Witt (IRRI) for writing most of Sections 2.4–2.6, revising the chapters on N, P, and K, and many other fruitful discussions and comments.

Dr. Shaobing Peng (IRRI) and Dr. Helmut von Uexküll (Bonn, Germany) for reviewing the book and for their suggestions on improvements.

Mrs. Corintha Quijano (IRRI) for providing slides and revising all chapters on nutritional disorders.

Dr. V. Balasubramanian (IRRI) for contributing to Section 5.9, and reviewing an earlier draft of the book.

Dr. Kenneth G. Cassman (University of Nebraska–Lincoln, USA), who initiated much of the research on improving nutrient management and nitrogen efficiency in rice. The framework for assessing N efficiency described in Section 5.6 is largely based on his work.

All scientists, support staff and farmers participating in the *Reversing Trends of Declining Productivity in Intensive, Irrigated Rice Systems (RTDP)* project, for providing key data on N, P, and K efficiencies.

Dr. David Dawe (IRRI) for constantly reminding us that economists have a different view of the agricultural world.

Dr. Lawrence Datnoff (University of Florida, USA) for providing slides on Si deficiency.

Dr. Takeshi Shimizu (Osaka Prefecture Agriculture and Forestry Research Center, Japan) for contributing slides on various nutritional disorders.

Dr. Ernst Mutert (PPI-PPIC) for encouraging us to take on this task.

Bill Hardy, Katherine Lopez, and Arleen Rivera (IRRI), and Tham Sin Chee (PPI-PPIC) for editorial assistance.

Elsevier Science for permission to reprint the photograph from Crop Protection, Vol 16, Datnoff L, Silicon fertilization for disease management of rice in Florida; Dr. Helmut von Uexküll (PPI-PPIC), Dr. Pedro Sanchez (ICRAF) and Dr. Jose Espinosa (PPI-PPIC) for permission to reuse their photographs.

The following organizations for funding different components of the RTDP project, including financial support for the production of this book:

- ▶ Swiss Agency for Development and Cooperation (SDC),
- ▶ Potash and Phosphate Institute and Potash and Phosphate Institute of Canada (PPI-PPIC),
- ▶ International Fertilizer Industry Association (IFA),
- ▶ International Potash Institute (IPI), and
- ▶ International Rice Research Institute.

Finally, writing a book is impossible without family support and we were lucky to enjoy this at all stages. Thus, we thank Ilwa, Joan, and our kids for their hearty support and understanding.

Achim Dobermann and Thomas Fairhurst

# Foreword

Thirty years ago, persuading rice farmers to use modern varieties and their accompanying fertilizer inputs was easy because the results, in terms of yield increases, were often spectacular. At the same time, governments invested heavily in fertilizer subsidies, and made improvements to irrigation facilities, infrastructure, and rice price support mechanisms that made rice intensification (increased input use, increased number of crops per year) economically attractive.

Further improvements in rice productivity, however, are likely to be much more incremental and 'knowledge-based.' Future yield increases will mostly result from the positive interactions and simultaneous management of different agronomic aspects such as nutrient supply, pest and disease control, and water.

In many countries, fertilizer and other input subsidies have already been removed and it is likely that in the future, the maintenance of irrigation facilities will increasingly become the responsibility of farmers rather than governments. This means that to achieve the required future increases in rice production, extension services will need to switch from distributing prescriptive packets of production technology to a more participatory or client-based service function. Such an approach requires greater emphasis on interpreting farmers' problems and developing economically attractive solutions tailored to each farmer's objectives. Yet extension services are generally ill-prepared for such a change.

This handbook provides a guide for *detecting* nutrient deficiency and toxicity symptoms, and *managing* nutrients in rice grown in tropical and subtropical regions. Some background information on the function of nutrients in rice and the possible causes of nutrient deficiencies are included. Estimates of nutrient removal in grain and straw have been included to help researchers and extension workers calculate the amount of nutrients removed from the field under different management systems. Specific nutrients are discussed in Chapter 3 – Mineral Deficiencies.

In most tropical and subtropical regions, rice farms are small, nutrients are managed 'by hand' and farmers do not have access to more resource-demanding forms of nutrient management, such as soil and plant tissue testing. Therefore, we describe a new approach to calculating site-specific nutrient management recommendations for N, P, and K in lowland rice. The concept described is based on ongoing, on-farm research in the Mega Project on 'Reversing Trends in Declining Productivity in Intensive, Irrigated Rice Systems,' a collaborative project between IRRRI and researchers in China, India, Indonesia, the Philippines, Thailand, and Vietnam. As this work progresses, a more complete approach for site-specific nutrient management will evolve.

This handbook has been written primarily for irrigated and rainfed lowland rice systems, because these systems account for about 80% of the total harvested area of rice and 92% of global rice production. Where appropriate, we have included additional information particular to upland rice or rice grown in flood-prone conditions. We hope that this book will help increase the impact of new approaches to nutrient management at the farm level by bridging the gap between technology development and field implementation.

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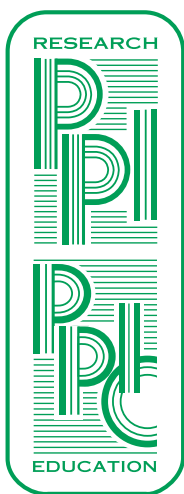
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ISBN 981-04-2742-5