

## **Introduction to Volume**

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This volume reports on recent progress in potato and sweetpotato research in Indonesia. Most of the research reported in the volume is the result of collaboration between Indonesian agricultural research institutions and the International Potato Center (CIP), one of the Future Harvest Centers of the Consultative Group for International Agricultural Research (CGIAR). Previous publications have reported on collaborative research on potato in Indonesia between CIP and the Research Institute for Vegetables (RIV) in Lembang, Indonesia (Chujoy 1998, 1999). Also, Fuglie (2001) presented the results of a six-year project funded by the Asian Development Bank to develop and disseminate True Potato Seed in four Asian countries, including Indonesia. This volume updates progress on CIP-Indonesian collaborative potato research since that then and reviews progress on collaborative sweetpotato research as well.

Two papers in the volume report on research that has been done by Indonesian research institutions without direct involvement of CIP: Wattimena, Purwito, and Mattjik give an account of the innovative research in potato breeding and seed improvement at Bogor Agricultural University (IPB), while Herman Ambarwati, and Sisharmini describe biotechnology applications to sweetpotato carried out by the Research Institute for Agricultural Biotechnology and Genetic Resources (RIABGR) in Bogor. IPB's program in potato research has been especially instrumental in strengthening national capacity in potato research through its graduate training program. RIABGR is Indonesia's premier research institute for agricultural biotechnology, and has pursued genetically modified sweetpotato as one means of overcoming serious insect pest and viral disease constraints.

Three overview papers set the stage for the rest of the papers in the volume. Fuglie, Ilangantileke and Walker describe how CIP envisions using improved potato and sweetpotato technology to reduce poverty in Asia. In much of the continent these crops are produced primarily by poor households on small plots, and the economic benefits from productivity improvements in these commodities are likely to strongly benefit these poor. CIP has carefully chosen its research agenda in order to maximize the benefits to the poor by focusing on the productivity constraints of greatest significance to these farmers. For Indonesia, Dimiyati lays out the national vision for potato development and the research agenda needed to meet this vision. Potato has emerged as an important commercial crop and good income earner for small farms in Indonesia's highland areas. Sustainable growth in potato productivity can make an important contribution to the economic development of these rural areas and meet the growing market demand for horticultural commodities. Similarly, Hasanudin and Wargiono describe the national agenda for sweetpotato research. A critical aspect of sweetpotato research and development is to promote new markets for sweetpotato utilization to meet the rising demand for processed food products and animal feed. Together, the papers in this volume provide an overview of much of the current research efforts in Indonesia to improve productivity of these commodities.

### **Progress in Potato Research in Indonesia**

It is a good time to take stock of our progress in improving potato productivity in Indonesia. A very minor crop 20 years ago, potato has become one of the most important vegetable commodities produced in the country. Between the mid-1970s and the mid-1990s, annual potato production in Indonesia grew by six-fold, from about 150,000 tons to over 900,000 tons per year. Most of this growth was due to area expansion, but yield also significantly improved, doubling from 8 tons/hectare in the mid-1970s to 16 tons/hectare in the mid-1990s. Farmers adopted new varieties, learned to grow and use higher quality seed, intensified their use of inputs, and adopted improved management practices to achieve these productivity improvements. But there are still considerable opportunities for overcoming yield constraints, improving production efficiency, and responding better to market demands.

One of the disappointments of past potato research in Indonesia has been the lack of uptake by farmers of newly varieties released by the national agricultural research program. Most farmers continue to rely on a single European-bred potato variety, Granola, rather than Indonesian-bred varieties. The papers by Sinung-Basuki et al., and Gunadi et al. report on new and innovative methods of variety evaluation and selection in which various stakeholders (farmers, processors, consumers, etc.) are directly involved in the research process in order to assure success that new varieties will be accepted by users.

Another constraint of potato production in Indonesia (and in most developing countries around the world) is the available of quality, low-cost seed. The papers by Jayasinghe, Suri and Jayasinghe, and Sofian describe various aspects of the potato seed situation in Indonesia and suggest strategies for overcoming the seed quality constraint. One important new finding is the significance of potato root nematode in Central Java (Suri and Jayasinghe), a disease that is easily spread through seed if not properly controlled. Another aspect is the growing complexity of the potato seed system in Indonesia, and the need for good technique and appropriate regulations to achieve consistent quality in the formal seed system.

Potato is beset by a number of pest and diseases that constrain its high yield potential. Bacterial wilt remains one of the most important potato diseases for which neither resistant varieties nor chemical controls are readily available. Oni et al. describe continued efforts to develop components of integrated disease management of bacterial wilt. Farmers must practice good seed selection, crop rotation, and field sanitation if this disease is to be properly controlled.

Potato is a cash crop for most farmers in Indonesia, and complex marketing patterns have developed. Indonesia is both a major export of fresh table potatoes and an importer of potato seed and potato processed products. Witono, Fuglie and Rachman describe trends in potato trade giving particular attention to the potato export marketing system in North Sumatra. A major share of the crop from this province is marketed to Malaysia and Singapore. The recent decline in Indonesia's potato exports after more than a decade of rapid growth is attributed to the growth in domestic demand for potato and from growing competition from other countries in Asian potato markets. Fuglie, Rachman and Witono provide statistical evidence on the demand parameters for fresh and processed potato products for Indonesia and other countries in Southeast Asia. The phenomenal growth in demand for potato processed products (especially French fries) is strongly correlated with rising per capita income and urbanization in this part of the world. These factors also positively influence the demand for fresh table potatoes. The future market potential for potato in Southeast Asia is bright.

As we look to the future (and as agricultural scientists we need to be thinking today about what will be the needs five to ten years ahead), potato production in Indonesia will continue to grow rapidly in order to meet rising market demand. A greater share of the increase in production will likely come from yield increases, but area expansion will continue

to play an important role. As we look to new promising areas for expanding potato area, highland areas of West Sumatra and neighbor Jambi Province look especially promising. In the paper by Nurdin, the current potato situation in West Sumatra is described. About 2,000 hectares are currently sown to potatoes each year, but the technical level of farmers is generally low. With improved technology, especially more suitable varieties, better seed quality, and integrated crop management, potato production in this part of Indonesia could rapidly expand in both area and yield.

### **Progress in Sweetpotato Research in Indonesia**

A different set of challenges face the future of sweetpotato in Indonesia. Sweetpotato production in the Indonesian and Melanesian island groups dates back to pre-Colombian times, and Indonesia possess a rich set of indigenous sweetpotato genetic resources. Traditional, sweetpotato has been a staple food in the eastern part of the country (Papua Province especially) and an important food security crop in the densely populated island of Java. But technical progress in sweetpotato in Indonesia has been slow, and production has remained stagnant at around two million tons per year over the past two decades. A key challenge facing sweetpotato is to develop new uses for the crop, especially in starch and flour processing. The trend toward greater utilization of sweetpotato for agro-processing is slowing taking place. But one critical requirement is new and improved production technology to raise yields and reduce unit production costs in order to make sweetpotato a competitive source of raw material in agro-processing.

The paper by Saleh and Hartojo provide a review of sweetpotato research in Indonesia over the past twenty years. Although research investment in sweetpotato in Indonesia has been modest, an impressive body of knowledge has accumulated and steady improvements have been made in genetic resource conservation, varietal development, and crop management methods. Sweetpotato marketing and market development are areas where significant research gaps remain. The paper by Fuglie on economic prospects for root crop utilization in this volume helps to fill this gap. Fuglie examines which commodities are currently most competitive in providing the least-cost source of raw materials for starch industries and for animal feed in East and Southeast Asia. For starch, cassava is currently the most competitive raw material in Southeast Asia, but sweetpotato is economical in parts of China and for food products requiring specific functional properties of starch found in sweetpotato. New, high starch-yielding varieties of sweetpotato just now becoming available will improve sweetpotato's competitiveness in regional starch markets. For animal feed, sweetpotato is most competitive in mixed crop-livestock systems where the high protein content of sweetpotato vines can be added to animal feed along with the energy-rich roots. Since protein is a major constraint to livestock productivity in Asia, the potential of sweetpotato to supply protein for animal feed rations needs further attention

Jusuf reviews progress and achievements in sweetpotato breeding in Indonesia. Of the fourteen new varieties released in Indonesia since 1982, seven were released since 1998. Most of the latest releases were the result of collaborative breeding between the Indonesian national program and CIP. The newest releases were especially selected for their high productivity and potential for agro-processing (starch and flour, especially). At least one large private company has already invested in a new agro-enterprise making use of these new varieties as the source of raw material for processing. More investments of this kind will open up significant new markets for sweetpotato farmers in Indonesia.

Constraints to the diffusion of new varieties are an on-going concern. So far, no formal system has been established in Indonesia for disseminating improved sweetpotato varieties to farmers. In order to better understand farmers' choice and sources of sweetpotato planting material, Saleh, Jayasinghe and Rahayuningsih report the results of a farm survey in East Java on sweetpotato seed flows. Farmers obtain most of their planting material locally, with very little exchange of planting materials between districts. One reason is the site-specificity of preferred varieties, with different varieties dominating in each different locality.

Besides new high-yielding varieties, another approach to increasing sweetpotato productivity is to improve crop management practices. Through better fertilization, plant spacing, hilling up, post-harvest handling, etc., farmers can increase crop yield and reduce production costs. Van de Fliert et al. report on an evaluation of the impact of sweetpotato Farmer Field Schools carried out in several locations in Java. The Farmer Field School method is an intensive, season-long field learning activity through which farmers can improve their crop management and decision-making capacities. Survey results indicate that Farmer Field Schools significantly improved the profitability of growing sweetpotatoes among participating farmers.

Even as we emphasize transforming sweetpotato from a food crop to an industrial and feed crop, it is important not to forget that sweetpotato is still and will continue to be a staple food for Indonesia's eastern citizens, especially those in Papua Province. This is the least developed of Indonesia's provinces, and there has been little prior work in trying to improve the subsistence sweetpotato production systems found here. In 2001, CIP together with Indonesian partner institutions embarked on a three-year project with support from the Australian Center for International Agricultural Research (ACIAR) to develop improvements to the sweetpotato and pig production systems in the highlands of Papua. Peters describes the objectives of this project and the work carried out to date. This is a challenging project, not only to do the isolation of the project site but also due to the continued political instability in this part of Indonesia. Nevertheless, it is an important project, and CIP and our Indonesian partners are committed to try to bring improvements through agricultural research to the lives of the people residing here.

## References

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