

The world's population is growing rapidly. It reached 6 billion people in 1999 and is anticipated to reach 8.1 billion in 2025 and 9.6 billion in 2050 (Alexandratos et al., 2012). Our long-term ability to meet growing needs for food seems uncertain. Thus, one of the greatest challenges is increasing food production in a sustainable way so that everyone can have adequate food and proper nutrition without over-exploiting the Earth's ecosystems.

Rice is predominantly produced in Asia, so much so that thirty-one percent of the rice harvested globally comes from Southeast Asia alone (OECD/FAO, 2012). The highest levels of productivity are found in irrigated areas, the most intensified rice production systems. Farmers can grow more than one rice crop per year here. Approximately 45 percent of the rice growing country in Southeast Asia is irrigated, with the largest irrigated areas been found in Indonesia, Vietnam, Philippines and Thailand (Mutert & Fairhurst, 2002). In South Asia, the two major rice-growing countries are India and Bangladesh. India has the largest rice growing area globally, about 43 million hectares, and contributes 25 percent of global rice production. Combined, rice production in South and Southeast Asia contributes around half of global rice production. If rice production in South and Southeast Asia is threatened, it will significantly affect global rice production.

Pests in rice production are significant yield reducing factors globally. Oerke (2005) estimated that weeds, animal pests, and disease caused losses around 10.2,

15.1 and 12.2 percent of global rice production, respectively. In most Asian countries, rice yields average 3-5 t/ha. One recent survey estimated that between 120 and 200 million tons of grain are lost yearly to insects, diseases, and weeds in rice fields in tropical Asia (Willocquet et al., 2004). The mean region-wide rice yield loss due to pests was estimated at 37 percent (Savary et al., 2000).

In crop fields, pests or so-called biotic constraints can be defined as organisms that cause plant injuries and lead potentially to economic losses. Among the pests that attack rice are microorganisms (viruses, mycoplasmas, phytoplasmas, bacteria, oomycetes, and fungi) that can cause diseases, parasitic plants, weeds, invertebrates (insects, mollusks), and even vertebrates such as rats and birds can cause serious damages.

LITERATURE CITED

- ALEXANDRATOS, N., BRUINSMA, J., ET AL. (2012). World agriculture towards 2030/2050: the 2012 revision. ESA Work. Pap, 3.
- MUTERT, E. & FAIRHURST, T. (2002). Developments in rice production in Southeast Asia. Better Crops International, 15:12–17.
- OECD/FAO (2012). OECD and FAO Report – Agricultural Outlook 2012-2021. Management of Env Quality, 24(1).
- OERKE, E. C. (2005). Crop losses to pests. J. Agric. Sci., 144(01):31.
- SAVARY, S., WILLOCQUET, L., ELAZEGUI, F. A., CASTILLA, N. P., & TENG, P. S. (2000). Rice Pest Constraints in Tropical Asia: Quantification of Yield Losses Due to Rice Pests in a Range of Production Situations. Plant Disease, 84(3):357–369.
- WILLOCQUET, L., ELAZEGUI, F. A., CASTILLA, N., FERNANDEZ, L., FISCHER, K. S., PENG, S., TENG, P. S., SRIVASTAVA, R. K., SINGH, H. M., ZHU, D., & SAVARY, S. (2004). Research Priorities for Rice Pest Management in Tropical Asia: A Simulation Analysis of Yield Losses and Management Efficiencies. Phytopathology, 94(7):672–682.