

## *Attaining Food and Environmental Security in an Era of Globalization*

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### **Abstract:**

Attaining the twin goals of food and environmental security in the coming decades poses a significant sustainability challenge. While providing affordable food for the world's growing population might suggest a strategy of cropland expansion, the conversion of natural lands to agriculture has been a major source of greenhouse gas emissions, as well as biodiversity loss. Improving agricultural productivity on existing croplands is therefore often advocated as an important option for meeting food security objectives. However, in the presence of smoothly functioning international trade, isolated improvements in productivity can lead to dramatic cropland area response and potential environmental degradation in the innovating region as producers expand production for exports.

Historically, agricultural policy interventions have limited the role of international trade for many farm products in many countries. This has led to the segmentation of crop commodity markets – a situation whereby consumers are not able to freely access global markets, and domestic and international prices are not constrained to move in tandem. This has meant that domestic sources of demand growth have been disproportionately important for local producers, and this market segmentation has served to insulate agricultural producers with below-average productivity growth rates. In contrast, in the context of perfectly integrated world markets, all regions share the same global demand drivers and it is the relative rate of agricultural productivity growth that determines which regions expand to meet this growing demand. The goal of this paper is to examine the food and environmental security implications of a range of shocks to the global food system, first in the context of historically segmented markets, and secondly in a world of a fully integrated world crop commodity market. While the latter scenario is unlikely to materialize in the near future, it is not impossible to imagine the emergence of a more smoothly functioning world agricultural marketplace by 2050 – the focal point for our forward-looking analysis.

The shocks to the global food system considered in this paper include: (a) revisiting the historical green revolution, (b) reducing post-harvest losses in Africa, (c) reducing food waste in Europe, (d) coping with climate change impacts, and (e) the consequences of an ambitious climate mitigation program aimed at sequestration of forest carbon (REDD+). We find that, in a globalized world, the implications of these interventions for food and environmental security can be quite different from the consequences in today's segmented crop markets. For example, while reducing post-harvest losses in Africa in the current trade environment is expected to sharply reduce malnutrition, while also reducing cropland expansion on that continent, in the context of fully integrated global markets, the reduction in malnutrition is quite small, and the consequence is an expansion – not a contraction -- of cropland area in Africa.

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