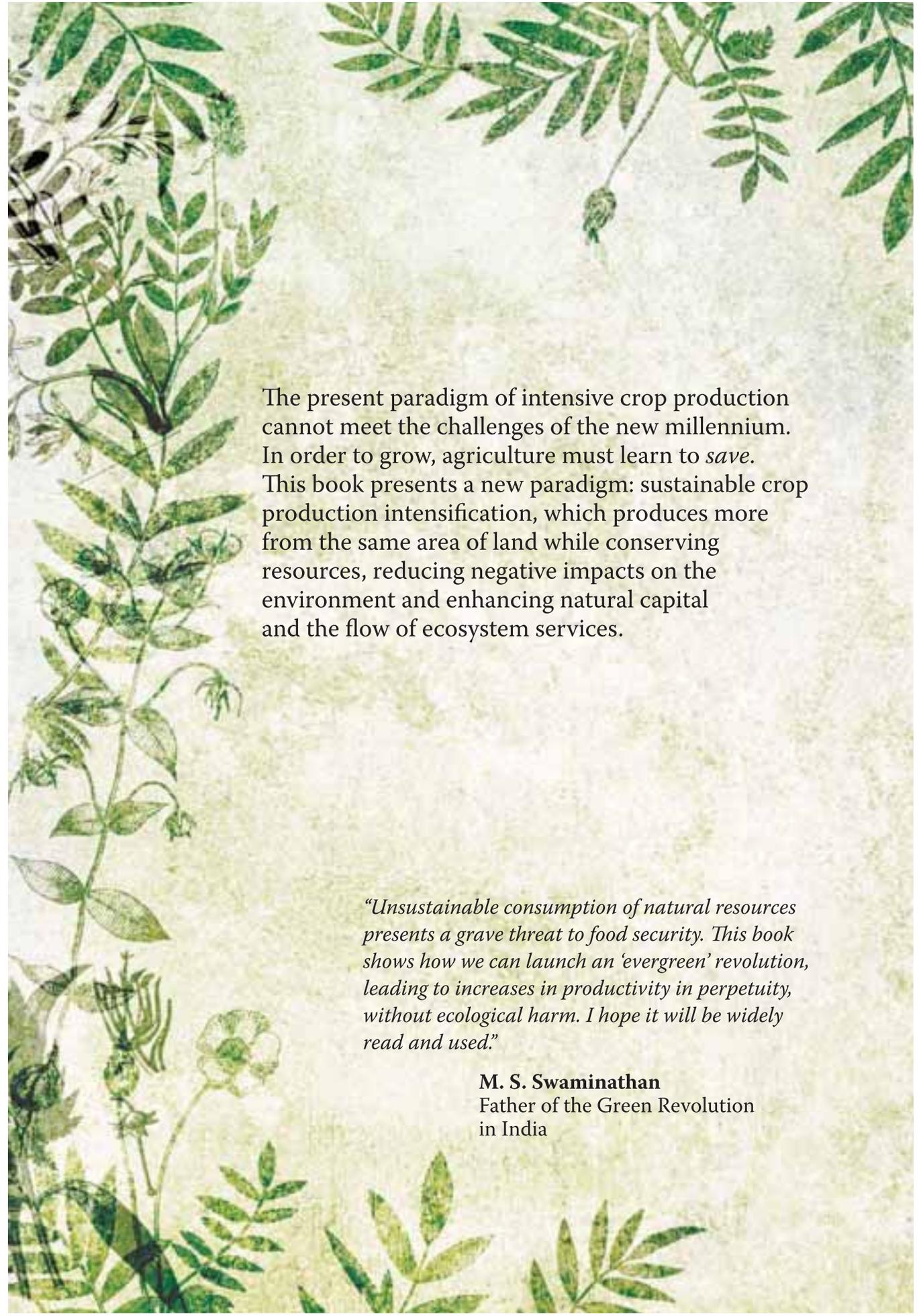


SAVE AND GROW

A POLICYMAKER'S GUIDE
TO THE SUSTAINABLE INTENSIFICATION
OF SMALLHOLDER CROP PRODUCTION





The present paradigm of intensive crop production cannot meet the challenges of the new millennium. In order to grow, agriculture must learn to *save*. This book presents a new paradigm: sustainable crop production intensification, which produces more from the same area of land while conserving resources, reducing negative impacts on the environment and enhancing natural capital and the flow of ecosystem services.

“Unsustainable consumption of natural resources presents a grave threat to food security. This book shows how we can launch an ‘evergreen’ revolution, leading to increases in productivity in perpetuity, without ecological harm. I hope it will be widely read and used.”

M. S. Swaminathan
Father of the Green Revolution
in India



Save and grow

A policymaker's guide
to the sustainable intensification
of smallholder crop production

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Foreword

With the publication of *Save and Grow* in 2011, FAO proposed a new paradigm of intensive crop production, one that is both highly productive and environmentally sustainable. FAO recognized that, over the past half-century, agriculture based on the intensive use of inputs has increased global food production and average per capita food consumption. In the process, however, it has depleted the natural resources of many agro-ecosystems, jeopardizing future productivity, and added to the greenhouse gases responsible for climate change. Moreover, it has not significantly reduced the number of chronically hungry, which is currently estimated at 870 million people.

The challenge is to place food production and consumption on a truly sustainable footing. Between now and 2050, the global population is projected to rise from about 7 billion to 9.2 billion, demanding – if current trends continue – a 60 percent increase in global food production. Given the diminishing area of unused land with good agricultural potential, meeting that demand will require ever higher crop yields. Those increases, in turn, need to be achieved in the face of heightened competition for land and water, rising fuel and fertilizer prices, and the impact of climate change.

***Save and Grow* addresses** the crop production dimension of sustainable food management. In essence, it calls for “greening” the Green Revolution through an ecosystem approach that draws on nature’s contributions to crop growth, such as soil organic matter, water flow regulation, pollination and bio-control of insect pests and diseases. It offers a rich toolkit of relevant, adoptable and adaptable ecosystem-based practices that can help the world’s 500 million smallholder farm families to achieve higher productivity, profitability and resource use efficiency, while enhancing natural capital.

This eco-friendly farming often combines traditional knowledge with modern technologies that are adapted to the needs of small-scale producers. It also encourages the use of conservation agriculture, which boosts yields while restoring soil health. It controls insect pests by protecting their natural enemies rather than by spraying crops indiscriminately with pesticides. Through judicious use of mineral fertilizer, it avoids “collateral damage” to water quality. It uses precision irrigation to deliver the right amount of water when and where it is needed. The *Save and Grow* approach is fully consistent with

the principles of climate-smart agriculture – it builds resilience to climate change and reduces greenhouse gas emissions through, for example, increased sequestration of carbon in soil.

For such a holistic approach to be adopted, environmental virtue alone is not enough: farmers must see tangible advantages in terms of higher incomes, reduced costs and sustainable livelihoods, as well as compensation for the environmental benefits they generate. Policymakers need to provide incentives, such as rewarding good management of agro-ecosystems and expanding the scale of publicly funded and managed research. Action is needed to establish and protect rights to resources, especially for the most vulnerable. Developed countries can support sustainable intensification with relevant external assistance to the developing world. And there are huge opportunities for sharing experiences among developing countries through South-South Cooperation.

We also need to recognize that producing food sustainably is only part of the challenge. On the consumption side, there needs to be a shift to nutritious diets with a smaller environmental footprint, and a reduction in food losses and waste, currently estimated at almost 1.3 billion tonnes annually. Ultimately, success in ending hunger and making the transition to sustainable patterns of production and consumption requires transparent, participatory, results-focused and accountable systems of governance of food and agriculture, from global to local levels.

This third reprint of *Save and Grow* comes following the Rio+20 Conference in June 2012 and the launch of the Zero Hunger Challenge by the United Nations Secretary-General, Ban Ki-moon. The challenge has five elements: guarantee year-round access to adequate food, end stunting in children, double small farmer productivity, foster sustainable food production systems, and reduce food waste and loss to zero. In assisting countries to adopt *Save and Grow* policies and approaches, FAO is responding to that challenge and helping to build the hunger-free world we all want.



José Graziano da Silva
Director-General
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of the United Nations

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Overview

1. The challenge

To feed a growing world population, we have no option but to intensify crop production. But farmers face unprecedented constraints. In order to grow, agriculture must learn to save.

The Green Revolution led to a quantum leap in food production and bolstered world food security. In many countries, however, intensive crop production has depleted agriculture's natural resource base, jeopardizing future productivity. In order to meet projected demand over the next 40 years, farmers in the developing world must double food production, a challenge made even more daunting by the combined effects of climate change and growing competition for land, water and energy. This book presents a new paradigm: sustainable crop production intensification (SCPI), which produces more from the same area of land while conserving resources, reducing negative impacts on the environment and enhancing natural capital and the flow of ecosystem services.

2. Farming systems

Crop production intensification will be built on farming systems that offer a range of productivity, socio-economic and environmental benefits to producers and to society at large.

The ecosystem approach to crop production regenerates and sustains the health of farmland. Farming systems for SCPI will be based on conservation agriculture practices, the use of good seed of high-yielding adapted varieties, integrated pest management, plant nutrition based on healthy soils, efficient water management, and the integration of crops, pastures, trees and livestock. The very nature of sustainable production systems is dynamic: they should offer farmers many possible combinations of practices to choose from and adapt, according to their local production conditions and constraints. Such systems are knowledge-intensive. Policies for SCPI should build capacity through extension approaches such as farmer field schools, and facilitate local production of specialized farm tools.

3. Soil health

Agriculture must, literally, return to its roots by rediscovering the importance of healthy soil, drawing on natural sources of plant nutrition, and using mineral fertilizer wisely.

Soils rich in biota and organic matter are the foundation of increased crop productivity. The best yields are achieved when nutrients come from a mix of mineral fertilizers and natural sources, such as manure and nitrogen-fixing crops and trees. Judicious use of mineral fertilizers saves money and ensures that nutrients reach the plant and do not pollute air, soil and waterways. Policies to promote soil health should encourage conservation agriculture and mixed crop-livestock and agro-forestry systems that enhance soil fertility. They should remove incentives that encourage mechanical tillage and the wasteful use of fertilizers, and transfer to farmers precision approaches such as urea deep placement and site-specific nutrient management.

4. Crops and varieties

Farmers will need a genetically diverse portfolio of improved crop varieties that are suited to a range of agro-ecosystems and farming practices, and resilient to climate change.

Genetically improved cereal varieties accounted for some 50 percent of the increase in yields over the past few decades. Plant breeders must achieve similar results in the future. However, timely delivery to farmers of high-yielding varieties requires big improvements in the system that connects plant germplasm collections, plant breeding and seed delivery. Over the past century, about 75 percent of plant genetic resources (PGR) has been lost and a third of today's diversity could disappear by 2050. Increased support to PGR collection, conservation and utilization is crucial. Funding is also needed to revitalize public plant breeding programmes. Policies should help to link formal and farmer-saved seed systems, and foster the emergence of local seed enterprises.

5. Water management

Sustainable intensification requires smarter, precision technologies for irrigation and farming practices that use ecosystem approaches to conserve water.

Cities and industries are competing intensely with agriculture for the use of water. Despite its high productivity, irrigation is under growing pressure to reduce its environmental impact, including soil salinization and nitrate contamination of aquifers. Knowledge-based precision irrigation that provides reliable and flexible water application, along with deficit irrigation and wastewater-reuse, will be a major platform for sustainable intensification. Policies will need to eliminate perverse subsidies that encourage farmers to waste water. In rainfed areas, climate change threatens millions of small farms. Increasing rainfed productivity will depend on the use of improved, drought tolerant varieties and management practices that save water.

6. Plant protection

Pesticides kill pests, but also pests' natural enemies, and their overuse can harm farmers, consumers and the environment. The first line of defence is a healthy agro-ecosystem.

In well managed farming systems, crop losses to insects can often be kept to an acceptable minimum by deploying resistant varieties, conserving predators and managing crop nutrient levels to reduce insect reproduction. Recommended measures against diseases include use of clean planting material, crop rotations to suppress pathogens, and eliminating infected host plants. Effective weed management entails timely manual weeding, minimized tillage and the use of surface residues. When necessary, lower risk synthetic pesticides should be used for targeted control, in the right quantity and at the right time. Integrated pest management can be promoted through farmer field schools, local production of biocontrol agents, strict pesticide regulations, and removal of pesticide subsidies.

7. Policies and institutions

To encourage smallholders to adopt sustainable crop production intensification, fundamental changes are needed in agricultural development policies and institutions.

First, farming needs to be profitable: smallholders must be able to afford inputs and be sure of earning a reasonable price for their crops. Some countries protect income by fixing minimum prices for commodities; others are exploring “smart subsidies” on inputs, targeted to low-income producers. Policymakers also need to devise incentives for small-scale farmers to use natural resources wisely – for example, through payments for environmental services and land tenure that entitles them to benefit from increases in the value of natural capital – and reduce the transaction costs of access to credit, which is urgently needed for investment. In many countries, regulations are needed to protect farmers from unscrupulous dealers selling bogus seed and other inputs. Major investment will be needed to rebuild research and technology transfer capacity in developing countries in order to provide farmers with appropriate technologies and to enhance their skills through farmer field schools.