



Food and Agriculture  
Organization of the  
United Nations

# Save and Grow in practice maize · rice · wheat

A guide to sustainable cereal production

## OVERVIEW



This guide describes the practical application of FAO's 'Save and Grow' model of sustainable crop production intensification to the world's key food security crops: maize, rice and wheat. With examples from Africa, Asia and Latin America, it shows how ecosystem-based farming systems are helping smallholder farmers to boost cereal yields, strengthen their livelihoods, reduce pressure on the environment, and build resilience to climate change. The guide will be a valuable reference for policymakers and development practitioners during the global transition to sustainable food and agriculture.

## 1. Cereals and us: time to renew an ancient bond

*Climate change, environmental degradation and stagnating yields threaten cereal production and world food security. Sustainable crop production intensification can help to feed the world while protecting its natural resources*

**B**y 2050, world annual demand for maize, rice and wheat is expected to reach some 3.3 billion tonnes, or 800 million tonnes more than 2014's record combined harvest. Much of the increase in production will need to come from existing farmland. But one-third of that land is degraded, and farmers' share of water is under growing pressure from other sectors.

Climate change could have catastrophic effects on wheat yields and reduce maize yields in Africa by 20 percent. In Asia, rising sea levels threaten rice production in major river deltas. The potential for increases in cereal production is further constrained by stagnating yields and diminishing returns to high-input production systems.

‘Business as usual’ will affect disproportionately the developing world’s 500 million small-scale family farmers, as well as low-income urban populations. As climate change in Asia pushes wheat into less productive rainfed areas, consumers will face steep food price increases. Population growth could deepen Africa’s dependence on imported rice. Rising demand for maize and declining productivity could triple the developing world’s maize imports by 2050.

Sustainably increasing the productivity of existing farmland is the best option for averting large increases in food prices, improving rural economies and farmers’ livelihoods, and reducing the number of people at risk from hunger and malnutrition. The FAO ‘Save and Grow’ model of crop production intensification aims at increasing both yields and nutritional quality, while reducing costs to farmers and the environment.

This guide explains Save and Grow concepts and practices, presents examples of their practical application in the production of maize, rice and wheat, and outlines the policies, institutions, technologies and capacity-building needed to upscale lessons learned in national and regional programmes.

## 2. Toward sustainable cereal production

*Farming systems need to be reconfigured worldwide for sustainable intensification. Cereal growers have already begun that transition by adopting key Save and Grow components and practices*

### Conservation agriculture

By minimizing soil disturbance and using surface mulch and crop rotation, maize and wheat growers are reducing costs, boosting yields and conserving natural resources. Farmers in irrigated rice systems are shifting to dry-seeding without tillage. To increase their incomes and build resilience to climate change, cereal growers are diversifying crops and integrating trees, livestock and aquaculture into their production systems.

### Healthy soil

Conservation agriculture practices are improving the organic matter content and physical properties of the soil, which reduces erosion and enhances water-use efficiency. Nitrogen-fixing legumes improve soil fertility and reduce the need for mineral fertilizer. Matching crop nutrient demand and supply helps farmers to reduce fertilizer applications and harmful losses to the environment.

### Improved crops and varieties

Save and Grow systems use diverse, complementary groups of crops, and their improved varieties, to achieve higher productivity and strengthen food and nutrition security. Cereal varieties that are more resistant to biotic and abiotic stresses are

now grown in farmers’ fields. The development of more productive and nutritious cereals needs to be matched by systems for the rapid multiplication of quality seed.

### Efficient water management

To produce ‘more crop per drop’, many rice farmers have reduced the flooding of fields, which also lowers methane emissions. Growing rice without flooding cuts water use by up to 70 percent. Supplemental irrigation of wheat, using stored rainwater, has quadrupled water productivity. Furrow-irrigated, raised-bed planting saves water and produces higher yields of wheat and maize.

### Integrated pest management

The first line of defence against pests and diseases is a healthy agro-ecosystem. Rice farmers trained in IPM have greatly reduced insecticide applications – with no loss in yield. Planted together with maize, legumes help to smother weeds. Wheat growers have overcome rust epidemics with resistant varieties, and fight insect pests by rotating crops.

While each of those components contributes to sustainability, the maximum benefits will only be realized when all of them are integrated fully into Save and Grow farming systems.

### 3. Farming systems that save and grow

*What does sustainable crop production intensification 'look like'? These examples, drawn from developing countries around the world, describe Save and Grow farming systems in practice*

1. **In East Africa**, two of the region's most serious maize pests have been overcome by growing two local plants in maize fields. The 'push-pull' system produces other benefits, including high quality cattle feed.
2. **From Madagascar**, System of Rice Intensification practices have spread to Asia, where they are helping farmers produce more rice and income using less water, less fertilizer and less seed.
3. **In Central America**, farmers have developed a 'slash-and-mulch' production system that preserves trees and shrubs, conserves soil and water, doubles yields of maize and beans, and even resists hurricanes.
4. **Worldwide**, wheat farmers grow legumes to provide a natural source of nitrogen, which boosts their wheat yields. Conservation agriculture can help realize the full benefits of wheat-legume rotation.
5. **In Latin America**, a grass native to tropical Africa has dramatically improved livestock productivity. Brazilian farmers have integrated *Brachiaria* in a direct-seeded maize system that is replacing soybean monocropping.
6. **On South Asia's Indo-Gangetic Plains**, resource-conserving technologies produce high wheat yields while reducing farmers' costs by 20 percent. A shift to conservation agriculture in rice would create positive synergies in the production of both crops.



7. **Across the developing world**, pigeon peas, cowpeas, groundnuts, soybeans and jack beans are familiar sights in farmers' maize fields. The high productivity of maize-legume systems make them especially suitable for smallholders.
8. **In Asia**, raising fish in and around paddy fields helps to control rice pests and fertilize the rice crop. Higher yields, income from fish sales and savings on agrochemicals boost farmers' income by 50 percent.
9. **In Southern Africa**, leguminous trees and shrubs grown with maize provide high-quality, nitrogen-rich residues that increase soil fertility, boost yields and provide new sources of income.
10. **In Central Asia**, zero-tillage, soil cover and crop rotation would help many countries to reverse soil erosion and produce more food. Kazakhstan's wheat growers are already well advanced in the transition to full conservation agriculture.
11. **In South and Southeast Asia**, millions of rice farmers now grow maize in the dry season, using high-yielding hybrids that consume less water and generate higher incomes. Close-up: Bangladesh.

## 4. The way forward

*The adoption of Save and Grow by smallholder farmers requires concerted action at all levels, with the participation of governments, international organizations, the private sector and civil society*

Using Save and Grow, cereal growers, in often difficult farming conditions, have increased production and improved their livelihoods and income, while conserving natural resources and building resilience to climate change. But the adoption rate of sustainable practices is still relatively low, and much more needs to be done if agriculture is to deliver Save and Grow's full benefits.

The transition to sustainable crop production intensification requires fundamental changes in the governance of food and agriculture. Making those changes depends on a realistic assessment of the full costs of making the necessary transitions. It also requires the careful adaptation of sustainable farming practices and technologies to site-specific conditions.

An enabling policy, legal and institutional environment should strike the right balance between private, public and civil society initiatives, and ensure accountability, equity, transparency and the rule of law. FAO's vision of sustainable food and agriculture can guide the framing of

national policies, strategies and programmes aimed at facilitating the transition to cereal production intensification that is highly productive, economically viable, environmentally sound, and based on equity and social justice.

Key challenges for policymakers, therefore, include facilitating the transition to Save and Grow within broader structural transformations; making policies that support farmer adoption of sustainable production systems; focusing investment in agriculture on the provision of public goods and encouraging farmer investment in sustainable crop production; establishing and protecting producers' rights to resources; promoting fairer and more efficient markets and value chains; increasing support to long-term agricultural research and development; promoting technological innovations adapted to smallholder needs; revitalizing agricultural education and training; strengthening formal and informal seed systems; and increasing collaboration with international organizations, instruments and mechanisms.



**Save and Grow in practice: maize, rice, wheat.**  
**A guide to sustainable cereal production** (FAO, 2016)  
 ISBN 978-92-5-108519-6  
<http://www.fao.org/3/a-i4009e.pdf>  
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