Food and Agriculture Organization of the United Nations

SAVE AND GROW FARMING SYSTEMS
FACT SHEET 3

MAIZE/FORESTRY

Agro-ecological zone
Tropical hillside, rainfed
Main cereal Maize
Other crops/products
Meat, milk, timber, fuelwood, fruit, legumes, vegetables

More maize, less erosion on tropical hillsides

On the steep hillsides of south-western Honduras, traditional 'slash-and-burn' cultivation of maize, beans and other food crops has led to widespread deforestation and land degradation. Many farmers have abandoned the age-old practice of allowing cleared fields to lie fallow long enough for tree cover to grow back and for the soil to recover. Without trees to anchor the depleted soil, erosion has increased, reducing the quality of water and its availability to downstream users. As agricultural productivity declines, rates of rural poverty and malnutrition have risen.

Recognizing that slash-and-burn cultivation was unsustainable, farmers in the Honduran department of Lempira developed a low-cost, resource-conserving system for growing their crops. Instead of clearing the forest and burning vegetation, they adopted a 'slash-and-mulch' approach. They begin by broadcasting sorghum or beans in an area of well-developed, naturally regenerated secondary forest. After planting, they selectively cut and prune the trees and shrubs, and spread the leaves and small branches on the soil surface to create a layer of mulch. High-value timber, fruit and fuelwood trees are left to grow.

Once the sorghum and beans have been harvested, maize is planted (maize is not used as a 'pioneer crop' because mulch slows the emergence of its seedlings). Farmers continue to prune trees so the crops have sufficient sunlight, while leaves, branches and crop residues are used to maintain a semi-permanent soil cover. The soil is not tilled, and fertilizer is applied only when needed.

In the early 1990s, the Food and Agriculture Organization began working closely with local farmers and farmers' groups to develop and disseminate those practices, which have become known as the Quezungual Slash-and-Mulch Agroforestry System, or QSMAS. The system has since been adopted by more than 6 000 low-income farmers in southwestern Honduras.

Using QSMAS, those farmers have been able to double the productivity of shifting cultivation – maize yields have risen from 1.2 tonnes to 2.5 tonnes per ha, and bean yields from 325 to 800 kg. Increased productivity has improved food security and has allowed farmers to set aside space in their fields to explore different options for producing food. Almost half of the farmers who have

KEY POINTS

'Slash-and-mulch' cultivates beans and maize on untilled soil enriched with tree prunings.

The system builds up soil nutrient stocks, and produces **maize yields double** those of traditional shifting cultivation.

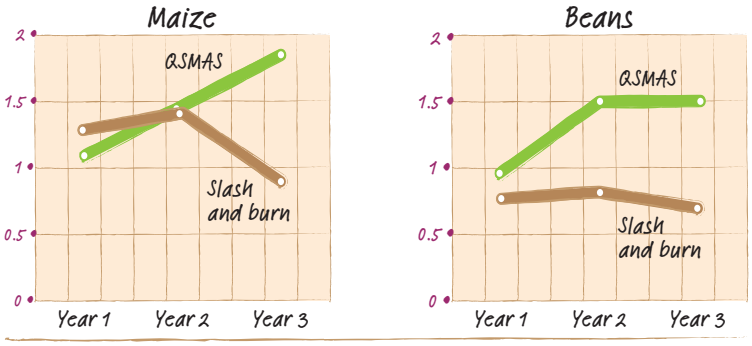
It reduces the time needed for land preparation, prevents soil erosion, and **improves the supply and quality of water** for downstream consumers.

Many 'slash-and-mulch' farmers have **diversified production**, primarily into home gardens and livestock.

The system **enhances ecosystem services**, including carbon sequestration, and reduces methane emissions.

It is is seen as a **promising alternative to slash-and-burn** agriculture for sub-humid hillside areas of the tropics.

Average grain yields obtained under slash-and-burn and QSMAS systems, Somotillo, Nicaragua (t/ha)



adopted Qsmas use some part of their land, and their additional income, to diversify production, primarily to home gardens and livestock.

Honduran farmers have embraced the system because it is founded on familiar, indigenous farming practices, is more productive and profitable than slash-and-burn agriculture, and delivers many other benefits. By retaining soil moisture and preventing erosion, Qsmas has made farms more resilient to extreme weather events, such as Hurricane Mitch in 1998. The system also reduces the time required to prepare the land and control weeds. Rural communities benefit from improved water quality, as well as increased water availability during the November to April dry season. The trees retained on Qsmas farms meet around 40 percent of households' fuelwood needs.

The success of Qsmas was also due to the fact that local communities and extension workers were encouraged to share ideas and learn from each other. Thanks to that participatory process, the impact of Qsmas has reached beyond the farmers' fields. Once they became more aware of the problems created by deforestation, community institutions banned the use of slash-and-burn.

In 2005, the International Center for Tropical Agriculture (Ciat) undertook a four-year project to identify the main principles behind Qsmas management, the biophysical benefits that make the system resilient, the social factors that lead to its acceptance, and other maize-producing areas where it could be adopted.

During trials on 15 plots, the differences between slash-and-burn and slash-and-mulch emerged clearly in measures of sustainability and resilience. A Qsmas production cycle allows for around 10 to 12 years of cultivation of annual crops, followed by seven years of fallow. In contrast, slash-and-burn yields begin to decline from the second year of cropping. In slash-and-burn agriculture, the nitrogen content of the soil decreases over time, but it increases significantly on Qsmas plots. By measuring methane and nitrous oxide emissions and carbon stocks sequestered in the soil and trees, Ciat also found that the global warming potential of Qsmas is only a quarter that of slash-and-burn agriculture.

The maize production system has spread to other regions of Honduras and to El Salvador, Guatemala and Nicaragua. In trials in Guatemala, maize yields rose by 11 to 25 percent in soils enriched with the prunings of *Gliricidia sepium* trees. Adoption rates reached 88 percent in areas where the system was promoted. In Nicaragua, where farmers learned about slash-and-mulch from visiting Honduran farmers, maize yields were more than double those under slash-and-burn. As a result, by 2010 more than half of the farmers in one Nicaraguan community had adopted Qsmas.

The Quezungual Slash-and-Mulch Agroforestry System is seen as an alternative to slash-and-burn agriculture for sub-humid hillside areas of the tropics. It is estimated that in 18 countries of Africa, Asia and Latin America there is a 50 percent probability of finding similar conditions to Qsmas test sites, with the largest areas in Brazil, El Salvador and the Democratic Republic of the Congo.

Adapted from:
Save and Grow in practice: maize, rice, wheat. A guide to sustainable cereal production (FAO, 2016).
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