Photo: Natasha Pauli, University of Western Australia/ CIAT.

A well-trodden path winds through a typical QSMAS field in the Lempira region of Honduras. Maize plants are just starting to flower.

CGIAR Challenge Program on WATER & FOOD

Challenge Program on Water and Food Secretariat
P.O.Box 2075,Colombo,Sri Lanka
Tel:+94-11-2787404,2784080 Fax:+94-11-2786854
Email:cpsecretariat@waterforfood.org
Web:www.waterforfood.org

Contacts

Project leader: Dr Stefania Grando
Barley Breeder,MP2-Integrated Gene Management
ICARDA,P.O.Box 5466,Aleppo,Syria
Tel:+963-21-2213477/2210741
Fax:+963-21-2225105/2213490
Email:S.Grando@cgiar.org

Project information

Project title: Quesungual slash and mulch agroforestry system (QSMAS): improving crop water productivity, food security and resource quality in the sub-humid tropics

Partner organizations

- Tropical Soil Biology Fertility Institute of the Centro Internacional de Agricultura Tropical (TSBP-CIAT), Colombia
- MIS (Integrated Soil Management) Consortium, Nicaragua
- National School for Forestry Service (ESNACIFOR), Honduras
- INTA/CENIA (The National Institute for Agricultural Technology), Nicaragua

CIPASLA Consortium, Colombia

- Berlin University of Technology, Germany
- Food and Agriculture Organization (FAO) of the United Nations
- African Soil Fertility Network (AfNet)

Science navigates new routes to sustainable agroforestry

Crop breeding and management research is enabling farmers in Eritrea to develop and grow improved varieties of food crops that are particularly well adapted to the harsh conditions of their land.

Research Highlight #3

CGIAR Challenge Program on WATER & FOOD

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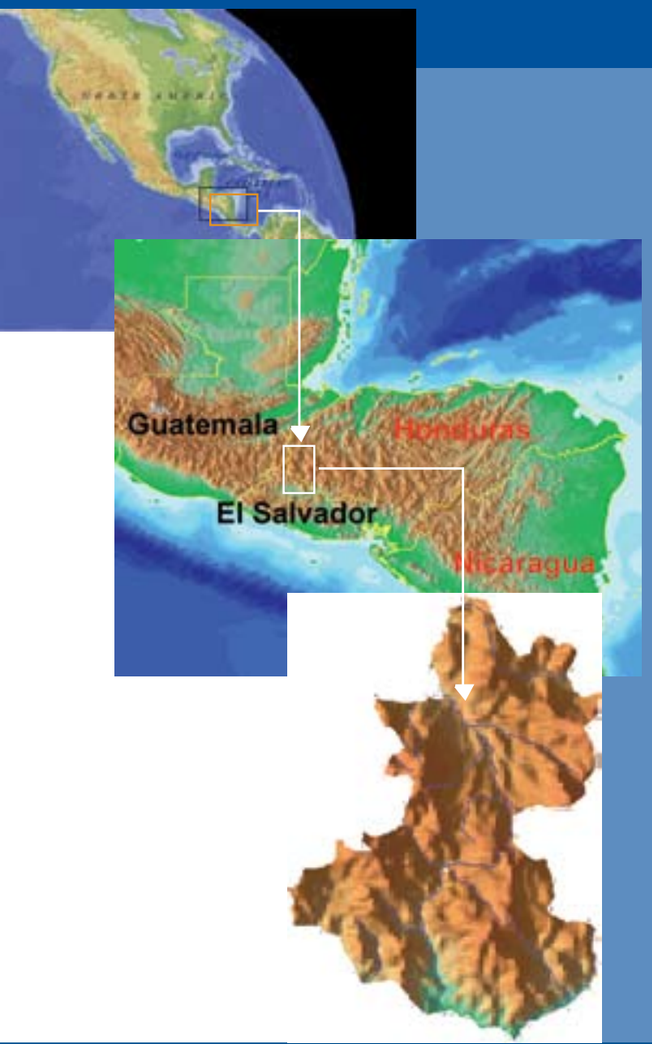
A ground-breaking, rural land and water management technique that sidesteps the 'slash and burn' approach has proved so successful in a mountainous area of Honduras that scientists on the Challenge Program for Water and Food (CPWF) are investigating its potential for introduction to other regions with similar topography.

The approach, termed 'slash and mulch,' affords dramatic improvements to the productivity of land and the water that feeds it. It is indigenous to a small group of hillside farmers in Honduras, who improved and extended it with help from the UN Food and Agriculture Organization (FAO) and others, so that farmers throughout the region could reap its benefits. See box.



Output 1.
Socioeconomic an biophysical context assessed
- Land use dynamics
Socioeconomic and adaphic constraints
Definition off-farm typologies
Data bases

Output 2.
Management concepts, principles and tools developed
- Water and nutrient dynamics
- Biomass production and gas fluxes
- Soil and water quality
- Crop water productivity

Output 3.
Potential areas suitable to QSMAS evaluated, analyzed and documented
- Analysis of environmental and socioeconomic similarities for potential extrapolation
- Validation of the QSMAS in drought-prone areas of Nicaragua
- Validation of the QSMAS in the Colombian hillsides

Output 4.
Tools for dissemination, adaptation and promotion of QSMAS
- Methodologies and data sets
- Scenarios of impact
- Methods for socieconomic evaluation
- Knowledge sharing mechanisms

Outputs of the QSMAS project

Unravelling the mysteries

Scientists from Centro Internacional de Agricultura Tropical (CIAT) in Colombia, the FAO and others have embarked on research under the CPWF to gain a detailed understanding of the reasons why QSMAS works and to establish a plan for applying the system else where. The CPWF project responsible for the research, 'Quesungualslash and mulch agroforestry system (QSMAS): improving crop water productivity, food security and resource quality in the sub-humid tropics,' aims to answer six main questions: How does the system work? What are the driving factors behind its adoption? Is it sustainable? How can it be improved? What environmental services does it provide? Can the system or its components be extrapolated to other tropical areas?

The project is also looking at the socio-economic context of QSMAS's success, setting out the management principles that make it work and developing tools to monitor soil and water quality. Ultimately the project is expected to identify new areas that could be suitable for QSMAS and to provide the tools for adapting and promoting the systems in these areas.

Tangible outcomes

Soil scientists, agronomists and socio-economists have already established that QSMAS is a complex system with many biophysical and socioeconomic variables. They have identified and quantified a number of key success factors including minimal soil disturbance, the value of limited (spot) fertilization, the benefits of mulch, and the effects of the relatively high stone content of the soils, which results in virtually clear runoff water. They have also determined the factors critical to optimum production: altitude, phosphorus input, labor in puts and the density of timber trees.

The project has established the farm types and socioeconomic conditions that are conducive to the adoption of QSMAS. The system, it transpires, is of most benefit when it is practised on small farms (two to five hectares), where it allows families to produce staple food crops on a sustainable basis. Research is ongoing to ascertain the year-to-year variability in its outputs.

QSMAS is now under test for the first time outside Quesungual, in neighboring Nicaragua. So far the system has met widespread interest and appreciation. A farmer exchange program, in which Nicaraguan farmers visited their Honduran counterparts to learn about it, resulted in the Nicaraguans implementing the methods in several farm fields.

Nicaragua is just the start. The CPWF project plans to spread this simple yet effective system to highland areas throughout Africa, Asia, and Latin America. If taken up widely, benefits to food and water security will be accompanied by important reductions in carbon emissions as well as improvements in public health and conservation, because trees are no longer being burned.

A typical QSMAS field just after the main yearly pruning of trees and placing of mulch on the soil.

Photo: Natasha Pauli, University of Western Australia/CIAT.

Slash and mulch

Until 1990, hill farmers in the Lempira district of Honduras had been using the slash and burn method to prepare their steeply sloping land for crops. This left the land depleted of moisture and fertility, susceptible to ruin by landslides and unable to support crops for more than three years before a fallow period.

But a group of farmers around the village of Quesungual had developed a different agroforestry farming system, based on the effective management of natural tree regeneration. Distinguished by the absence of burning or tilling, the system had remarkable positive effects on soil conservation, water retention and crop yields. The FAO worked with these farmers to improve this method and extend it throughout the area. Instead of burning, farmers now clear old vegetation with a machete. They keep the tallest trees – because these provide fruit and timber, anchor the soil and deflect the rain from tropical storms – and allow smaller trees and shrubs to grow up between them. They intersperse food crops such as maize, sorghum, millet and beans between the trees. The smaller trees and shrubs are pruned annually to allow light to reach the crops. Their twigs are left on the larger branches are kept for firewood.

The Quesungual farmers found that their crop yields more than doubled (maize from 1200 to 2500 kg/ha, beans from 325 to 800 kg/ha); that less labour was required to establish and maintain the plots; and that the soil retained markedly more moisture, enabling crops to withstand for the first time the regular droughts, and minimising erosion and landslides. The growing season was extended by twenty days. Within ten years, more than 6000 families farming 7000 hectares of land in the area had adopted the practice.

While the success of the Quesungual Slash and Mulch Agroforestry System (QSMAS) was never in dispute, the factors behind it were less well understood. These aspects include the properties of the land and soil required for QSMAS to work and the social and economic conditions that make it attractive and viable for rural communities.