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

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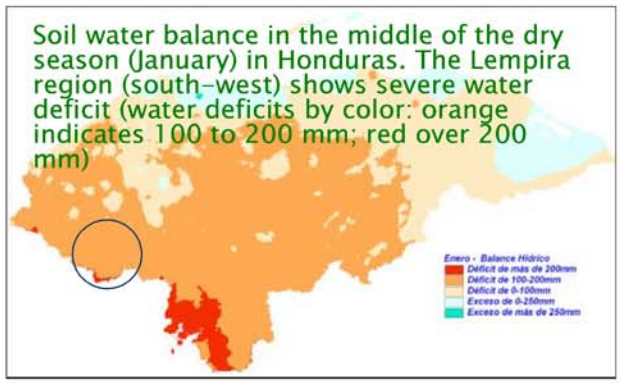
THE SYSTEM:

Quesungual Slash and Mulch Agroforestry System (QSMAS) has contributed to a successful development strategy in improving rural livelihoods in the Lempira Department, Honduras. This alternative to slash and burn agriculture strongly builds on local knowledge and has been a major production system to achieve food security by resource poor farmers. Farmers practicing this system reported less soil, water and crop losses as a consequence of the "El Niño" drought event in 1997 and the Hurricane Mitch in 1998.

THE PROBLEM:

- **Severe seasonal water scarcity.**
- **Decrease in water availability and water quality for human consumption and economic and social growth in sub-humid hillsides.**
- **Water scarcity is increasing because of deforestation and lack of adequate soil and crop management practices.**
- **Particularly acute for rural poor that need safe water to meet their daily requirements.**



Soil water balance in the middle of the dry season (January) in Honduras. The Lempira region (south-west) shows severe water deficit (water deficits by color: orange indicates 100 to 200 mm; red over 200 mm)

QSMAS AS A SOLUTION

The Hypothesis: Tree density, soil mulch, root distribution and biomass, soil organic matter quantity and quality, and soil biological activity contribute markedly to the resilience of QSMAS to environmental constraints while conserving the capacity to provide agricultural goods to local communities and clean water and other environmental services to downstream users.

PROJECT GOAL:

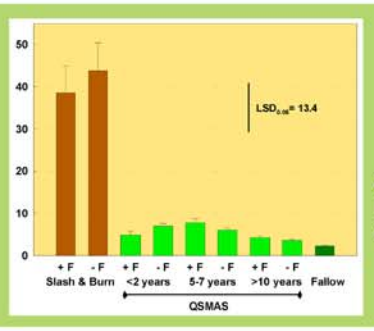
To improve livelihoods of rural poor through increased water resources and food security in sub-humid hillside areas, while maintaining the soil and plant genetic resources for future generations.

SPECIFIC OBJECTIVES:

- **To assess socioeconomic and biophysical context of QSMAS and to assemble information into database.**
- **To define QSMAS management concepts and principles and to develop relevant tools to monitor soil and water quality.**
- **To evaluate and document potential areas suitable to QSMAS.**
- **To develop tools for dissemination, adaptation and promotion of the QSMAS management strategies.**

RESEARCH ACCOMPLISHMENTS:

- **QSMAS is a production system inserted into the landscape to improve livelihoods while conserving the natural resource base.**
- **Local biodiversity is favored through the conservation of about 14 species (from 12 families) of trees and shrubs.**
- **Soil losses due to erosion are dramatically reduced compared with the slash-and-burn traditional system due to a combined effect of permanent soil cover and presence of stones in soil leading to improved water productivity and quality.**



Soil losses in three land use systems after 22 weeks

- **The presence of stones in the soil is one of the factors improving the performance of QSMAS system during the dry season. The presence of stones between 40 to 60 % volume of soil can markedly improve soil moisture retention and therefore improve maize plant growth under drought conditions.**
- **Pools of soil nutrients (N and P) are maintained or even increased while soil biodiversity and biological activity is enhanced and these improvements in resource quality were related to the spatial distribution of trees and organic resources.**
- **The system is an important source of firewood for domestic consumption and has no significant negative effects on greenhouse gas emissions.**

QSMAS as a sink for methane

- **Capacity of local farmers and technicians is being enhanced through field days and graduate and undergraduate students from the region through degree training.**
- **Validation of QSMAS in Nicaragua had advanced more than expected, with participating farmers extending the system to other regions.**

INSTITUTIONAL PARTNERSHIP:

Integrated Soil Management (MIS in Spanish) Consortium including INTA, Nicaragua; ESNACIFOR, Honduras; National University of Colombia - Palmira, Colombia; FAO, Honduras; CIAT-Nicaragua, Honduras and Colombia.

PROJECT BENEFICIARIES AND IMPACT:

Knowledge synthesized in the form of key principles and concepts of QSMAS would facilitate adoption by small farmers with a resulting change in natural resource management with benefits to water access and quality for upstream and downstream users in several regions across continents.

QSMAS IMPACTS

ACKNOWLEDGEMENTS: This work is partially supported by Water and Food Challenge Program. We thank Neuza Asakawa, Gonzalo Borrero, Juan G. Cobo, Luis F. Chavez, Jesus Galvis, Maria del Pilar Hurtado, Jenny Quintero, Jaumer Ricaurte, Marco T. Trejo, Arvey Alvarez, Odvin Ayala, Edilfonso Melo and Daniel Vasquez for their contribution to this work.

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