Quesungual Slash and Mulch Agroforestry System (QSMAS) is a smallholder production system with a group of technologies for the sustainable management of soil, water and nutrients in drought-prone areas of hillsides agroecosystems of the sub-humid tropics. QSMAS is practiced by resource-poor smallholders in southwest Honduras (Central America), where the system has been successfully disseminated due to its benefits, including resilience even to extreme climatic events such as El Niño (1997) and hurricane Mitch (1998). QSMAS integrates local and technical knowledge and provides resource-poor farmers an alternative to replace the non-sustainable, environmentally unfriendly slash and burn (SB) traditional production system.

The main objective of this CPWF funded project was to determine the key principles behind the social acceptance and biophysical resilience of QSMAS by defining the role of the management components of the system and QSMAS’ capacity to sustain crop production and alleviate water deficits on steeper slopes with high risk of soil erosion. Activities included the evaluation of QSMAS performance compared to the traditional slash-and-burn system, in the reference site (Honduras) and the validation sites (Nicaragua and Colombia).

Here we describe four basic principles and a brief technical explanation of their impacts, and the science behind those principles that support the recommendation of QSMAS as an option to achieve a number of social, agricultural and environmental benefits in rainfed systems of the sub-humid tropics.

The four basic principles...

1. **No slash & burn**
   - Management (partial, selective, and progressive slash-and-prune) of natural vegetation.

2. **Permanent soil cover**
   - Continual deposition of biomass from trees, shrubs and weeds, and through crop residues.

3. **Minimal disturbance of soil**
   - No tillage, direct seedling, and reduced soil disturbance during agronomic practices.

4. **Efficient use of fertilizer**
   - Appropriate application (type, amount, location) of fertilizers.

...& the science behind them

**IMPARTS of the PRINCIPLES:**
- **Soil-plant-atmosphere continuum:** Reduced impact of raindrops, reduced runoff and soil losses through erosion, increased infiltration and water holding capacity, reduced evaporation and increased use of green water, and improved crop water productivity.
- **Soil physical quality:** Improved soil aggregation and therefore improved soil structure.
- **Soil chemical-biological quality:** Improved soil organic matter, soil biological activity, source of nutrients and fertilizer use efficiency; and minimized risk for crop failure.
- **Green house gases (GHG):** Reduced carbon emissions.

The above can be summarized as increased C synthesis and accumulation, accelerated nutrient cycling and improved crop water productivity in a resilient production system, thereby enhancing support for livelihoods in rural areas.

**Soil quality:** QSMAS improves soil nutrient status and soil organic matter (SOM) content (0-20 cm soil depth) compared to SB system (after one year).

**GHG emission:** QSMAS reduces the risk (42%) for global warming potential (GWP) compared to slash and burn (SB) system (20 year scenario).

**Runoff (mm h⁻¹) Infiltration (mm h⁻¹)**

**Honduras (2005-06): Productivity is higher in QSMAS than in SB system (F = no fertilizer).**

**Validation plots nearby Satejona Gm, Suárez, Caucía, Colombia (Jan. 2008).**

**Honduras (2007): value of environmental services**

**US$ 2,240 per hectare considering:**
- (i) Soil and water runoff, infiltration, water holding capacity, and soil losses attributes; and (ii) C capture (soil organic carbon)

Suitability of QSMAS for adoption by small farmers:
Experience over three years of on-farm participatory validation in Nicaragua (Somotillo) and Colombia (Suárez) suggests that QSMAS will be readily accepted and adopted by smallholders in similar agroecosystems (sub-humid tropics). It also received strong support from local authorities and policy makers.