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“Bridging the gap between increasing knowledge and decreasing resources”

## Conservation Agriculture: An Alternative for Soil Erosion Control in Steep-Slope Regions Cultivated by Small-Scale Farmers

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### Abstract

Agricultural activities in steep-slope regions of the world have been increasing in recent years. When cyclical crops are produced in these regions, high soil erosion rates become a constant threat. There is an extended body of literature that proposes reforestation or plantations with perennial crops as potential solutions. However, such approaches fail to meet the needs of the small-scale farmers in these regions who rely on cyclical crops to produce the lion's share of their food.

Another commonly used measure to tackle erosion is the construction of physical barriers – a solution that demands substantial investment, for both for its implementation and maintenance. One alternative solution is conservation agriculture (CA), which is a cropping system based on three principles: 1) minimal soil disturbance; 2) crop rotations and/or intercropping, and 3) permanent soil cover through crop residue management.

Using longitudinal statistical analysis and controlling for climatic factors, this research – based on survey data (154 observations) collected in 1994 and 2008 within two *ejidos* of Motozintla in the state of Chiapas, Mexico – found that under CA, maize (*Zea mays*) and bean (*Phaseolus vulgaris*) yields had remained at minimum consistent, and in some cases had increased over time. The maize yields reached 3.3 ton ha<sup>-1</sup>, whilst bean reached 262 kg ha<sup>-1</sup>. The maize yields were also consistently higher than the long-term state's average from 1987 to 2012 of 2.3 ton ha<sup>-1</sup>. Moreover, 99% of the farmers also perceived that CA had improved soil fertility; 93% noted that CA had increased soil moisture content, and 99% observed that CA had effectively controlled erosion.

The traditional system in these two *ejidos* presented a number of positive characteristics for facilitating CA implementation: no mechanisation was being utilized, intercropping was already a common practice, and the main competitor for crop residue use (ruminants) could eventually be substituted for other livestock such as pigs. This research provides evidence to demonstrate that long-term adoption of CA in a steep-slope region cultivated by small-scale farmers can help to control soil erosion whilst allowing the farmers to produce their staple crops.

**Keywords:** Chiapas, conservation agriculture, Mexico, soil erosion, steep-slopes