

AGRONOMIC SOIL CONSERVATION MEASURES AND THEIR EFFECTS ON CROP PRODUCTIVITY IN YUNNAN PROVINCE, CHINA.

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Total soil loss in China is estimated at 5500 million tonnes, 20% of the world total. Land degradation has accelerated, as population pressure has increased, as has the demand for higher crop yields. Yunnan Province, southwest China, has a long history of soil erosion problems due to soil type, climate, anthropogenic influence and the fact that 95% of the Province is mountainous. The practice of cultivating steep slopes ($\leq 40^\circ$) is the norm, due to the lack of available flat land and this has led to serious erosion problems. Yunnan Provincial Government passed a law to prevent farmers cultivating slopes $> 25^\circ$. However, such laws are, in practice, unenforceable. For the Province to maintain current levels of agricultural output and self-sufficiency, cropping systems that prevent erosion, need to be devised and implemented.

From 1993–1999 experiments were carried out on runoff and erosion plots at Yunnan Agricultural University, to evaluate the effects of different cropping techniques on soil loss and crop productivity. Three sets of 10 plots were located on three different slope angles (3, 10 and 27°). From 1993 – 1996 five maize cultivation treatments were evaluated: conventional tillage, no-tillage, straw mulch, polythene mulch and intercropping with soybean, all in combination with both downslope or contour cultivation. Polythene mulch led to increased maize productivity, but to increased soil loss. The two most effective treatments in terms of erosion control and crop productivity were straw mulch and contour cultivation. In 1998 and 1999, contour cultivation and straw mulch were studied in more detail. Straw mulch plus contour cultivation reduced soil loss by 99% compared with downslope cultivation on the 27° slope, in the wettest year, (1998), with downslope, contour and contour cultivation plus straw mulch producing 6.92, 6.29 and 0.04 t ha⁻¹ respectively. Straw mulch plus contour cultivation yielded 5.99 t ha⁻¹ of maize grain and downslope cultivation 3.99 t ha⁻¹, in 1999 on the 10° slope, a yield increase of 50%. Yield increases in 1999 were attributed to increased soil moisture caused by straw mulching. In several study years, evidence was found of soil nutrient conservation, in particular N and K, under straw mulch.

Several conclusions can be drawn from the experiment: The traditional method of maize cultivation in Yunnan Province is to plant up and down the slope. This method causes a large amount of soil erosion. Contour cultivation plus straw mulch can reduce soil loss, however its effectiveness varies with rainfall conditions and slope angle. Contour cultivation plus straw mulch can increase soil moisture during periods of water stress. This can lead to increased crop yields.

Keywords: Yunnan, maize, straw mulch, contour cultivation, soil erosion, crop yield

**RESEAU
EROSION**



Référence bibliographique Bulletin du RESEAU EROSION

Pour citer cet article / How to cite this article

Milne, E.; Barton, A. P.; Fullen, M. A.; Hocking, T. J.; Mitchell, D. J.; Wu, B.; Liu, L. - Agronomic soil conservation measures and their effects on crop productivity in Yunnan province, China, pp. 636-636, Bulletin du RESEAU EROSION n° 23, 2004.

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