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# Agricultural practices and sustainable livelihoods: Rural transformation within the Loess Plateau, China

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A B S T R A C T

Effective agricultural practices can enable and sustain rural livelihoods, particularly in rapidly developing and transforming areas such as the Chinese Loess Plateau. Drawing from the Sustainable Livelihoods Approach (SLA), a conceptual framework for agricultural practices and sustainable rural livelihoods for the Yangou watershed within the Chinese Loess Plateau is presented and discussed. It is found that agricultural practices that include building terraces, returning sloped farmlands to forestland and grassland, and expanding orchards all have had positive and significant impacts on farmers' livelihood assets, strategies, outcomes, and vulnerabilities. From 1997 to 2006, 48.4 ha (95%) sloped farmland in the Yangou watershed was converted to new land management, and the percentages of income from fruit sale and sale of labor to total income dramatically increased by 59% and 14%, respectively. The watershed community also experienced 159% raise in per capita net income from 1997 to 2003, while the watershed itself experienced a 99% decrease in sediment yield from 1998 to 2007. These positive and significant impacts of new agricultural practices on the sustainable rural livelihoods of the Yangou watershed are evident in the community's reduced dependence upon grain and subsidies income, the diversified strategies for livelihood, and the improved environmental indices. The successful implementation of new agricultural land management practices and policies in the Yangou watershed strongly suggest that similar transformations can be achieved in similar regions throughout China's vast rural areas of the Loess Plateau.



## Introduction

The concept of sustainable rural livelihoods has a wide generic meaning, encompassing the protection and assurance of the means of livelihood for people and society, and the current concerns and policy requirements pertaining to sustainable development (Singh & Hiremath, 2010). Chambers and Conway (1992) proposed the concept of sustainable rural livelihoods includes capability, equity, and sustainability. The term livelihood refers to a means of earning a living by an individual or household that is a combination of the individual or household's assets, including activities and resources and access to these, mediated by institutions and social relations. Since sustainable rural livelihoods implies the means of livelihood can be transformed by activities and policies, it is important to assess the impact of agricultural practices on sustainable rural livelihoods, especially in developing countries.

Individuals in rural communities may be either self-employed (typically in farming) or involved in multiple livelihood activities (including casual labor or entrepreneurship) without having steady employment or income (Cherni & Hill, 2009). Thus, conventional methods of wealth assessment are too broadly generalized when applied to rural livelihoods, which tend to be very heterogeneous and dynamic (Ellis, 2002). Many studies have examined the effects of agricultural practices on ecosystems (Dale & Polasky, 2007; Truu, Truu, & Ivask, 2008) and environment (Galan, Peschard, & Boizard, 2007; Rao et al, 2009). The modeling of land use/cover changes and threat to rural sustainability have been broadly discussed (Kamusoko, Aniya, Adi, & Manjoro, 2009; Su, Jiang, Zhang, & Zhang, 2011), and the assessment of cultivated land quality (Liu, Zhang, &

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Guo, 2010), land management practices (Paudel & Thapa, 2004), and linkages between traditional land use systems and agricultural change (Lopez & Sierra, 2010) have been of great concern to scholars. Few studies, however, have highlighted the relevance of a sustainable livelihoods approach (SLA) for assessing the impact of agricultural practices on rural communities. SLA addresses the objectives, scope, and priorities for development to expedite progress in eliminating poverty (Ashley & Carney, 1999). Since SLA aims to provide the means for satisfying the basic needs of rural residents, the positive impact of agricultural practices (e.g., reduced pressure on the environment) implies that it will be possible for more people to fulfill their livelihood needs in the future (Chambers, 1986).

To reduce rates of soil erosion, the Chinese government in 1999 launched the "Grain for Green" (GfG) program. The objective of this program was to increase the vegetative coverage on steep slopes by planting trees or establishing grasslands on former cropland (Zhou, Rompaey, & Wang, 2009). The GfG program is one of the world's largest conservation projects, implemented to alleviate the deterioration of natural ecosystems, to safeguard water resources, and to promote sustainable development in rural China (Yang, 2001; Zhang et al., 2000). The project attempts to convert agricultural lands on steep slopes or heavily degraded land to forest or grasslands (Peng, Cheng, Xu, Yin, & Xu, 2007). Since 2000, agricultural practices including the conversion of sloped farmlands to terraces and building farm dams have been implemented to promote the ecological restoration on the Chinese Loess Plateau (Xu, Tang, Zhang, & Yang, 2009). Studies on farming systems in this region have indicated that restricted access to capital and lack of technical agronomic support were serious impediments to the development of agriculture and the restoration of the environment (Nolan, Unkovich, Shen, Li, & Bellotti, 2008). The impact of agricultural practices on sustainable rural livelihoods, however, has not yet been adequately addressed.

This study links the impact of agricultural practices to sustainable rural livelihoods. Using the Yangou watershed on the Chinese Loess Plateau as a case study, this paper demonstrates how agricultural practices have impacted the livelihood assets, means, and outcomes of the community, and the environmental indices of the region. The objectives of the paper are: (1) to present a conceptual framework of agricultural practices and sustainable rural livelihoods on communities and the environment of the Chinese Loess Plateau; (2) to apply this framework to assess the impact of agricultural practices; and (3) to contrast agricultural practices and present potential means for rural residents to fulfill their future livelihood needs. The components of vulnerability context, livelihood assets, transforming structures and processes, and livelihood outcomes of the Yangou watershed are analyzed by applying this framework to the impact of agricultural practices. This study seeks to provide the evidence required in making sound development plans so that sustainable rural development on the Chinese Loess Plateau can be achieved.

## Study area

The Yangou watershed is located between 109°20′00″E-109°35′00″E and 36°28′00″N-36°32′00″N, in the middle of the Chinese Loess Plateau (Fig. 1). The mouth of the watershed is 3 km away from Yan'an and the main stream channel is 8.6 km long with a watershed area of 46.9 $km^2$. The Yangou river is a secondary branch of the Yan River and flows from southeast to northwest. The watershed slopes from southeast to northwest at elevations between 986 m and 1425 m. The gradient ratio of main channel is 2.41‰ and channel density is 4.8 km $km^{-2}$, which is typical for this region. The terrain gradient of the watershed is mostly composed of steep hill slopes (Xu, Tian, & Shen, 2002). The present land area lying within watershed gradients are as follows: 52% > 25°, 16% in 20°–25°, 13% in 15°–20°, 8% in 10°–15°, 6% in 5°–10°, 6% < 5°. The

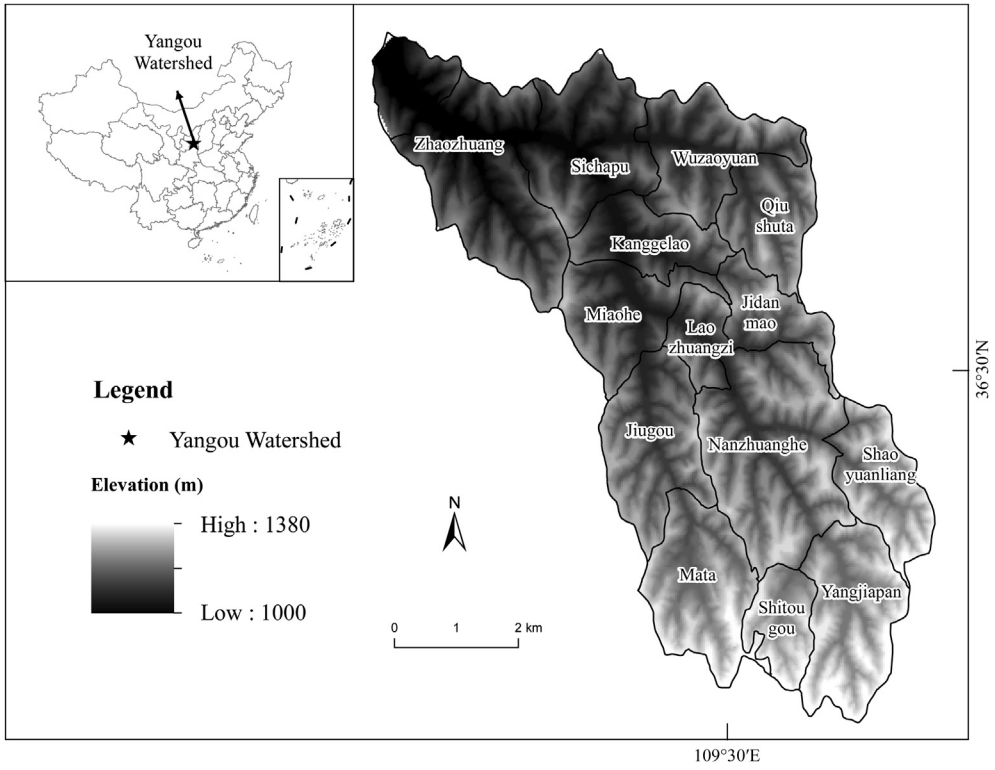


**Fig. 1.** Location of the Yangou watershed in China.