

Factor Analysis on Cropland Potential Productivity in Hilly

Loess Area, Northwest China

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The Loess Plateau, lying in the Northwest of China, is located in an intercontinental semi-arid area. It is a natural geographical unit and a special region of the world. It covers 5 provinces, which are Shanxi, Gansu, Shaanxi, Henan, Qinghai provinces and 2 autonomous regions, Ningxia and Inner Mongolia, with a population of 81.036 million. The Plateau is the largest Loess collection area covering 620,000 km². The soil depth is 50-200 m.

There are serious ecological and environmental problems that obstacle the local economic development. There is 340,000 km² of the region suffered from serious soil and water erosion with an average soil loss of 3720 t·km⁻²·yr⁻¹. It is one of the most serious soil and water erosion areas in the world. Deterioration of soil fertility and drought strongly limits agricultural development. About 18 million tons of organic matter and 1.54 million tons of nitrogen are washed away every year. There are low economic and technological levels and a low capacity for self development, which is typical for undeveloped areas in China.

In the past 20 years, the Chinese government has attached special importance to the integrated control of soil erosion and development of sustainable agriculture on the Plateau. A lot of work has already done about the soil erosion control and the productivity improvement, but few of them is about potential productivity and the effected factors on the productivity of crops in the small watershed in hilly loess area. This paper analyses factors that affect the cropland potential productivity in hilly Loess area.

We take Huang Jiaercha in Xiji county of Ningxia Hui Autonomous Region in Loess hilly area, as the field of research. It lies between longitude 105° 29'~111° 31'E and latitude 35° 17'~35°

58°N, with annual average precipitation of 402.2 mm, annual average temperature of 5.8°C, and annual average no-frost day of about 121 days. It is a typical small watershed of hilly area on Loess Plateau with elevation of 1860-2135 m.

We conducted a series of trials with 72 research plots growing wheat, potato, pea and flax on three levels of selected slopes in the Huangjia Ercha small watershed on the Plateau. The temperature, soil moisture was recorded. Potential productivities of the four crops growing in all the plots were calculated with modelling and their practical outputs were measured correspondingly. The TOC, total N, P and available N, P, K of the sample soil were analysed. Data were analysed with SPSS 10.0 version.

Factors limiting the productivity of crops in the tested small watershed in hilly loess area were identified. The results show that nutrient availability, moisture, and temperature were the main factors limiting crop growth in the area. Light is not limiting. The three factors' affecting coefficient to wheat is 85.7%, 53.1%, and 36.9%, to potato 91.6%, 33.2%, and 50.4%, to pea 81.65, 52.4%, and 39.2%, to flax 73.1%, 41.85%, and 52.1% respectively. It was also found that the position on the slopes was an important factor. All nutrients limited crop growth, but P was the most important in one trial with fertilizer (N, P, K) addition. This is of great significance to guide the current agricultural management in the watershed in hilly loess area.