

The Road of Eco-Agricultural Construction in Zhifanggou Watershed

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The ecological environment construction is an important part in the Development of West China. The loess plateau, especially the loess hilly and gully region, is closely linked with the permanent control of the Yellow River because of its serious soil and water loss, so it occupies a peculiar position in the ecological environment construction of West China. People from government officials to scientific researchers are always concerned about finding a road that could conform to reality, have the function of demonstration and extension, and make the society-economy-ecology to be coordinately developed.

The national key project from 1996 to 2000, the topic of which was sustainable development of conservational eco-agriculture in the loess hilly and gully region of North Shaanxi (Ansai), was carried out in Zhifanggou watershed with an area of 8.27 km² and gully density 8.06km/km², located in the middle part of the loess plateau, Ansai County, Yanan Municipality, Shaanxi Province. The watershed of Zhifanggou is in the juncture of semi-arid and semi-humid climates. Its annual precipitation was 504.3mm and annual mean temperature 8.8°C in 1970—2000. Its population density was 64 persons per square kilometer in 1996—2000. It represents No.2 sub-section of the loess hilly and gully region, located in Yanan Municipality mainly. The non-rational land utilization, the sparse trees and grass, the serious loss of soil and water, the degenerated ecological system, the lower grain yield per unit area, and the poor living standards of the masses are major problems in No.2 subsection of the loess hilly and gully region.

The Institute of Soil and Water Conservation of CAS set up a scientific research base in 1973, and conducted experiments of soil and water conservation with supporting from the government of Ansai County. The watershed of Zhifanggou has been taken as an experimental area of national and provincial key projects from 1986. The sustainable development has been the topic of the Zhifanggou project from 1996. So, the guiding ideology of the project from 1996 to 2000 was to take a moderate conservation and efficient use of water resources in the loess hilly and gully region, coordinate and optimize the directions and interrelations of three kinds of water resources (spring water, channel runoff, rainfall and soil water), persist in converting steep cropland into woodland and grassland, adjust the land use structure of cropland, woodland, orchard and grassland further, devote major efforts to exploit the potentiality of grain production in the basic cropland, take vigorous action to develop the industries of fruit and vegetables, and realize green hills and bumper harvest of grain and rich farmers so that the conservational eco-agriculture system of watershed could be sustainably developed.

The advances of the Zhifanggou project in 1996—2000 were summarized as follows, three major technical systems had been formed, including construction and restoration of woods and grass vegetation, efficient use of soil water and nutrient in croplands, and good quality and high output of fruit trees and vegetables; the model of sustainable development of conservational eco-agriculture with a main input from farmers of themselves had been deepened; a group of indicators on ecological system health of a small watershed had been put forward; and the planning of ecological environment construction of Ansai County had been worked out on the basis of concrete practices of Zhifanggou watershed so that the conservational eco-agriculture construction could be pushed on a county scale.

In 2000, the effective covering percentage of woods and grass vegetation in Zhifanggou watershed was 58.2%, trees and grass grew lushly. Species community of plant and animal increased because of improved environment and lush vegetation. The combination of nature vegetation in many micro-gullies and slopelands had been changed, and took a succession to the original phytocoeneses of the North Shaanxi prairie-timber zone. For an example, a large number of *Rosa xanthina* Lindl, *Caragana arborescens* (Amm.) Lam, *Cotoneaster acutifolius* Turcz, *Spiraea pubescens* Turcz, and other dominant

species on north slopes had come out, which formed a community with mixed shrubs. *Bothriochloa ischaemum* (L.) Keng + *Artemisia giraldii* Pamp took a succession to a community of *Sophora viciifolia* Hance - *Bothriochloa ischaemum* (L.) Keng on south slopes. The number of birds, snakes and other animals increased. Measured soil erosion modulus in Zhifanggou watershed decreased gradually very markedly, reached to 2,200 t/(a • km²) in 1996—2000 from 14,000 t/(a • km²) before 1980, in which the comprehensive control played 2/3 of a role and decreasing of precipitation 1/3. The ratio of flood runoff to base runoff changed to 1.9:1 in 1996—2000 from 2.3:1 before 1980, and the share of base runoff increased; however, the absolute values of both flood runoff and base runoff decreased because annual precipitation went down markedly in the last ten years. After adjusting the land use structure for many years, the area of cropland decreased gradually, the area of woodland increased gradually, and the area of grassland kept steady and went up a little. The ratio of three kinds of land reached to 1:4.1:4.7 in 2000, tending towards rationalization. The grain yield per unit area in 1996—2000 reached to 2,370 kg/ha, which was 2.96 times of one in 1986—1990, 1.65 times of one in 1991—1995. Each person had 544.8 kg of grain per year in 1996—2000. The annual net income per person was RMB 2033 yuan in 2000, 3.6 times of the average in 1986—1990, and 1.6 times of the average in 1991—1996. The embryonic form of healthy ecological environment on a small watershed scale, with characteristics of green hills and bumper harvest of grain and rich farmers, has appeared in the loess hilly and gully region, and a good cycling of watershed eco-economical system has preliminarily formed.