The Tactics and Measures for Land Improvement in Soil Loss Area of Henan Province

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Abstract: The land resource is the essential for human beings and the base for the development of Society and economy. The natural, geographical and social effects, especially of the unreasonable land use and the exploit of nature resources in history, resulted in the serious soil erosion, the large area of the nature land disturbed, the productivity of land decreased, the ecological environment being fragile and local people getting into more poverty. Soil erosion has been become one main reason of which restrained sustainable developing of society and economy. This paper focused on the harmful effects of erosion on land resources of Henan Province, proved the importance role of water and soil conservation in land improvement and discussed the tactics and counter-measures in the different zone divided according to various erosion manner.
Keywords: soil erosion, water and soil conservation, land improvement, tactics, measures

1 The hrmful effects of erosion on land resources

The Henan Province is located at the cross of the changing belt of climate from south to north and the shifting belt of mountain to plain, that determines that Henan is a province which has a complicated ecological environment, disasters of flood and drought frequently and heavy soil erosion. According to the Second National Remote Survey of Soil Erosion in 1999, the area with soil erosion is 29,800km^2 and the eroded soil reached 120 million t. The heavy erosion caused large area of land resources loss and brought about great damage to society and economy of Henan, which mainly appeared as:

1.1 To break the integrated land surface, to nibble the farmland, to reduce the land productivity

As the surface erosion is becoming the gully erosion it's damage is getting heavy and the land surface is broken. For instance in western Henan the gullied area account for 12%—6% of total area and the figure reaches 22%—6% in some part, which resulted in loss of farm land by 30,000 hm^2. In mountain area when rainstorm comes the surface soil is brushed away and then the base rock appeared and those land become valueless, the typical case is the land between the Jiudian village of Sunxian county and Baishu village of Ruyang county, which is called the "25 km rocked slope". It is not all, the erosion take away the nutrient of soil too, exactly about 1,000,000 t of NPK from the 120 million tons soil eroded in Henan, that exceeds the total chemical nutrient used in Henan's mountain area.

1.2 To silt up the reservoirs, rivers and farm Lands

The plot data at four reservoirs in Luhong, Yahekou, Baisha and Zhaopingtai shows that the total deposited sediment in them is more than 110 million m^3, which is equal to the capacity of one of the four large reservoirs. In Shanxian county there were 16 small reservoirs constructed in 1956 had been full with silt. The deposit on riverbed detained flood discharging that makes flood level higher and more dangerous. The root cause is erosion.

1.3 To damage ecological Environment, to frequent the Nature Disaster, to bring in poverty of local people

During 1950—990, in the 41 years there was drought in 16 years and flood in 15 years, which heavily stopped the agriculture and economy and brought mainly in poverty of Henan, among the 34 destitute counties in Henan the 29 counties have very severe soil erosion.

2 The tactics and counter-measures in improvement of land in different zone

Water and soil conservation is such a comprehensive work to prevent soil from erosion, protect and rationally use of water and soil resources, to lower the disasters of flood and drought as well as wind and to improve ecological environment. Up to the end of the 2000 the total d area controlled is 30,800 km^2 and a great number engineering facility such as terrace, dam and so on have been constructed, which controlled the erosion significantly and improved the economy and society. The data from the statistics indicate that about 100 million tons of silt had been stopped and so did about 1,600 million m^3 runoff. 867,000 hm^2 of terrace or the same kind have been built and therefore about 975 million kg additional food have been obtained annually since 1949. The practice proved that water and soil conservation is the lifeline of development, the good way to escape from poverty in mountain area as well as fundamental work of improvement of ecological environment, national land and rivers.

Considering the nature condition, the erosion type, the status of harness and the situation of society and economy in present and combining the successful experiences in comprehensive rehabilitation, we classified five typical zones and work out counter-measures accordingly. (See Table 1)

Table 1 The zone and its' specification

Zone		Specification					Density (Person/ km^2)	Characteristic of erosion
		Elevation (m)	Topography and landforms	>25 ° slope (%)	Vegetation covering (%)	Erosion modulus (t/(km^2 • y))		
Ⅰ	The light erosion zone in middle high mountain area	>1,000	Steep slope，cross section of gullies appears as "V"	45.0	65.0	2,000	97	Predominated by gravity erosion
Ⅱ	The medium erosion zone in low mountain area	500—1,000	Not so steep of slope，cross section of gullies changing from "V" to "U"	36.0	38.3	3,300	210	Predominated by surface or gully erosion, gravity erosion in some part
Ⅲ	The medium or heavy one in hilly area	200—500	Gentle slope, cross section of gullies appears as "U"	13.0	23.5	4,000	328	Predominated by surface or gully erosion
Ⅳ	The medium or heavy one in hilly area of loess plateau	200—500	Land surface is broken by gullies	18.9	13.5	5,000	342	Predominated by surface or gully erosion and landslide
Ⅴ	The light erosion zone in hilly area	50—200	Surface of land is not so plain but slope is gentle	3.0	7.4	2,250	520	Predominated by surface

2.1 The light erosion zone in middle high mountain area

This zone includes the Taihangshan in north, the Funiushan, the Xunershan, the Songshan, the Xiaoshan and the Waifangshan in west as well as the areas with elevation over 1,000 m on the mountaions of the Tongbaishan and the Dabieshan in south of Henan. The elevation is high, the slope is steep, the gully is deep, the farmland is little, the resident is few and the vegetation cover ratio is high in the zone hence the erosion is slight.

The tactics for the zone is that the preventing should be primary the harness should be the second. The counter-measure, for steep farm land is to stop farming then to plant tree or grass, for farm land with deep soil layer is to change it into terrace so that to raise the output per unit to compensate the food shortage because of the decrease of steep farm land, for gully is to build small dam using the rocks of which is plenty in gully to stop the sediment and stream. Now the slope-gully preventing system is formed.

2.2 The medium erosion zone in low mountain area

This zone includes the end of south-western Taihangshan in north-west, the areas between 500m-1,000m in elevation of the Funuishan, the Xunershan, the Xiaoshan, the Songshan, the Waifanfshan in west and the Nantongshan, the Dabieshan in south Henan, where the mountain feature is gentle but the surface soil is loose and the rainfall is concentrated so the erosion is medium.

The tactics for the zone is that the forestry, agriculture and animal husbandry should be paid same attention. The counter-measure, for low mountain area in north western Henan is to focus on both slope and gully with the combined method of agriculture, forest and grass, for the Funuishan, the Tongbaishan and the Dabieshan where is rich in precipitation is also to focus on both slope and gully but using the method of close mountain and then to restore vegetation naturally and to pay attention to flood too. When using vegetation method we must take care of the match of the vegetation species in different part of the mountain, Generally on the top or high slope mixed arbor should good choose, on middle slope the forest of erosion control should be predominated, on the root of the mountain where usually is more gentle the land could build terrace to make sure the food self-sufficiency.

2.3 The medium or heavy one in hilly area

This zone includes the Taihangshan in north, the Qingling Mountains in west, the areas from 200m to 500m in elevation in south of Henan, where is lack of vegetation but concentrated the large population and for this reason the nature is disturbed frequently, therefore the erosion is medium.

The tactics of the zone is that the agriculture should be the main profession then to develop the forest and animal husbandry where it is suitable. In addition, because of rich in mine resources in the zone the mine industry should be developed deeply and extensively. The counter measure, for farm land below 25 ° it should be changed into terrace, for the slope over than 25 ° it should be panted with tree or grass, for hilly area in north and west the gully should be construction dam and in south flood control is important. The economy and fuel vegetation should be increased in the zone to meet the tremendous needs of fuel. The newly created soil erosion by human being's activities should be monitored strictly and restored as soon as possible.

2.4 The medium or heavy one in hilly area of loess plateau

This zone is the east extension of the loess plateau which is the area from west provincial border to Zhengzhou in east city and from Jiyuan city in north to northern slope of the Waifanfshan, the Xunershan and the Songshan in south, where the land surface is tattered , the density of gully in the range of 1.5km/km^2—5 km／km^2, the gravity erosion such as landslip occurs often. The erosion is medium.

The tactics of the zone is to develop agriculture and others where it is suitable. The counter measure is to use the small erosion control construction to stop the developing of the gully and for the same

purpose to plant tree or bush or grass on the banks, at the head of gully to protect the bank and head of gully.

2.5 The light erosion zone in hilly area

This type of erosion distributed in south-eastern slope of the Taihangshan in north, the east part of mountains in west, north slope of the Dabieshan and the Tongbaishan in south of Henan, where the elevation is between 20m—200m and the land is relatively flat but the density of population is high and the vegetation fuel is shortage.

The tactics of the zone is also to develop agriculture and others where it is suitable. The main measure is to improve slope farmland into terrace and to build small reservoir to protect the drought mean while to raise fish. To enlarge the vegetation cover, especially the economy and fuel forest, to protect erosion and to supply fuel.

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