

Consideration on Design for Park of Soil and Water Conservation and Eco-sci-technology —Case in Baifoshi Watershed, Suining, Sichuan

*Li Changzhi*¹, *Dai Yongbo*², *Liu Xingnian*¹, *Cao Shuyou*¹ and *Lei Xiaozhang*¹

¹State Key Hydraulics Lab. of High Speed, Chengdu, Sichuan, 610065 P.R.China

²Sichuan Planning Committee, Chengdu, Sichuan, 610016 P.R.China

E-mail: li_changzhi@263.net

Abstract: Baifoshi watershed, locates in the hinterland of Sichuan Basin. Based on social economical condition and the status quo land-use, this design for park of soil and water conservation and eco-sci-technology has been completed. From the very beginning, both reconstructing the eco-environment, developing the area industrial chain, and the application of new technology of soil and water conservation, are the two aims. And the practice of this design will set example for soil and water conservation, eco-environment construction, and study the method for sustainable development in small watershed in the upper reaches of the Yangtze River.

1 General settings

The studied watershed, Baifoshi Watershed, locates in the hinterland of Sichuan Basin and ranges from 105° 04' 22" E in the east to 105° 45' 58" E in the west, and from 30° 10' 50" N in the south to 30° 39' 25" in the north, covering total area of 3,025 square kilometers. This watershed, crossed from north to south by a weir, lies near the Fujiang River, one first class branches of the Jialing River.

The landform in the watershed fluctuates from east - north to south - west. And soil is mainly purple soil, whose PH values ranging from 4.77 to 6.26, and content of organic matter and N, P Concentration are quite low. In the past, it is a watershed with many forests, and now, the vegetable cover rate is only 7.6%, however.

In addition to this, the annual average temperature varies only from 16.7°C to 18.0°C, and annual rainfall from 993.3mm to 1,443.3mm. From March to July, the rainfall increases step by step, but decreases from August to next February. Therefore, the rainfall in summer semi-year is 804.5mm, 81% of the total, and winter semi-year 188.8 mm, 19% of the total.

Moreover, the statistic data in 2000 present that there are 19,041 residents in this watershed, among which, 18,846 are farmers.

2 Aims of design on eco-sci-tec park

From various data analysis, one can see that, some factors in the land-use and agriculture industrial structure are unreasonable. First of all, the land-use is not satisfactory. Agriculture is the corbelling in the watershed, and land area for agriculture covers 64.38% of the total. Now, the plowland with slope over 6 degree is 944.47hm², and over 25 degree 65hm²; and land for forest and grass is only 784.6 hm², 25.94% of the total area, but for forest just 83.33 hm². Most of the woods are low-effect-forest (long time for growth and low economic value), with poor quality and dismal market prospect. Secondly, the agricultural industrial structure is unreasonable. In fact, crop is the main product in this watershed, such as grain, wheat, corn, potato, which has low yield and append value, only 5,025kg/hm². The income of farmers, therefore, is considerably unsatisfactory. Moreover, the industrial structure is quite single. Almost paddy field and ponds are not developed to fish except a Yuzhong Station (providing some ordinary fishes for market). And there's few other industry. Finally, the irrigation system on slope is obstructed frequently. Factually, land with certain slope is eroded when wettest but drought when rainless, which results in serious soil loss. And the soil erosion modulus reaches 5,182 t/(km² • a). Therefore,

Bofoshi watershed is a developing region with considerable serious soil loss, burden of population and backward industries. In this design, therefore, the aims are reconstructing eco-environment, serving the residents and keeping sustainable development.

3 Reconstructing of eco-environment and keeping sustainable development

In this design, the watershed are divided into two types, one is the eco-agricultural tour area at the linking area of Suining City and its countryside, the other is the eco-environment area of soil and water conservation, covering 2,313 hm². The main tasks on the latter are recovering eco-environment, developing area industrial chain and controlling soil loss. Some countermeasures and engineering are adopted in this design to promote the eco-environment. First, the integrative development system is planned for the entire watershed, trying to extend the area of forest and grass reaching 80% of woods-suitable area, capitalize 80% of water resources, and comprehensively controlled of soil loss over 80%. Second, practice the integrating control of hill, water, paddy, forest and road, and trying to rationalize the types, and content of forest, develop space agriculture. Third, plant forest 1,486hm² and improve the forest- covering rate to 38%. Hence, promote obviously the eco-effects, and decrease the soil loss modulus from 5,182 t/(km² • a) at present to less 1,544 t/(km² • a). In other words, the serious soil loss at present will come into slight or middle soil loss. Forth, rationalize the land-use structure and develop watershed economy. Some agriculture industrial structure must be adjusted. In detail, green industry should be improved, which is market perspective and going to raise the farmer's income. Fifth, some small-scale water facilities, such as water storage, ditches, ponds, will be built to improve the water system on slope. Finally, the research, management and prapaganda of soil and water conservation will be done at the same time.

4 Serving the residents

As far as the eco-agricultural tour area is concerned, the chief measures are developing economy, planting scenic forest of soil and water conservancy, so tourists can enjoy flowers in spring, taste fruits in summer, and appreciate leaves in autumn. Obviously, the aim is to serve the residents, and enrich their lives.

The measures to realize this aim are to plant scene trees for both appreciation and soil and water conservation. And the details lie in the following aspects:

First, many trees for enjoying will be built at the ridge and hillside of Fenghuang Hill, Baifo Temple and Changlingpo Hill. These trees will come into a long and beautiful corridor along the tour line. Along the ridges, some shrubs and arbor (evergreen trees mainly) will be planted and develop into mixed forest. Meanwhile, on the hillside, some trees for scene and fuel will be planted. And most of these trees are tall and quick growth, some evergreen, and some deciduous. Hence, a gradation of scene will come into being in the coming future.

Second, at the Yuzhong Station and its neighbor area, a large number of evergreen trees will be planted. Meanwhile, some trample-able grasses will cover the region under these trees. In addition to this, several broad and smooth roads will stretch all over these regions. And some fruits trees will stand in the hillside near roads welcoming tourists from all over the world.

Thirdly, some facilities for tourism are arranged at the watersheds. For example, there are several parking lots at Yuzhong station, Baifo Temple, Changlingpo and Longfeng Town. Some pavilions distribute at various stops along the evergreen tree corridor.

5 Application of computer technology

Two computer technologies, Geographic Information System (GIS) and Computer Aided Design (CAD) are applied in this design. In this design, Arc/Info GIS, Arc/View GIS software of ESRI and AutoCAD 2000 are used. According to reconnaissance on the spot, investigation, and data from some departments, the electrical maps of basic data of Baofoshi Watershed are obtained. Depending on these data, some analysis on the watershed was done, such as buffer analysis, spatial analysis and network

analysis. Then, the conference data and maps for design are provided accurately and efficiently. Further more, the design for structure regulation of land-use and agricultural industry, the arrangement and deposition of various measures for integral soil and water conservation are finished very soon. In addition to this, many small civil works, such as ponds, ditches, paddy field design, etc, and arrangement of forests for soil and water conservation, are all done by AutoCAD. And the most important is that computer technology has provided an electrical information system for Baifoshi Watershed, which is remarkably advantage to the development of this watershed.

6 Conclusions

From the design, the following points are easily to be cognizant.

(1) Protecting environment is quite important in the economic development. Baifoshi watershed is a developing watershed, only a well environment can support the sustainable development. Fruit trees and crops will exuberate in the watershed, and tourism will be strengthened. All of these will serve the economic development. Hence, All measures designed are for both residents and economic development.

(2) The advanced technologies should be used as possible as we can. A small watershed is a complicated system, containing abundant information. In this design, GIS and CAD technology are used to manage and analyze the information. Many facilities have been arranged in their locations quickly. Hence, a reasonable design has been made out in a short time.

References

- State Key Hydraulics Lab. Of High Speed, Sichuan University, and Bureau of Soil and Water Conservation, Sichuan Province. Preliminary design Report for Eco-Sci-Tec Park of Baofoshi Watershed, Suining, Sichuan Province. May, 2001. (In Chinese).
- ESRI, System Design Stragies- A Methodology for Designing Arc/Info and Arc/View Enterprise Environments [z], 5. ESRI, Redland, 1996, CA, USA.
- ESRI, Using Arc/View[z]. Redland, 1996.CA, USA.