Digital System of Soil and Water Conservation
——A Case Study of the Three-Gorge Reservoir of Chongqing

Liu Yijun[1,2] and *Zhu Jinzhao*[2]

[1]College of Resource and Environment, Southwest Agriculture University, Chongqing, 400716, China
E-mail: liuswau@sohu.com
[2]Beijing Forestry University, Beijing, 100083, China

Abstract: The system of soil and water conservation is the most important supporting system of eco-environment. It is also a base of a regional sustainable economic development. The requirement of soil and water conservation is far, wide and continuous. So studying on digital system of soil and water conservation is very heavy demand. There are many kinds of soil and water conservation in the Three-gorge reservoir of Chongqing. Monitoring stations and observation system are established in this region. Using this new information system, the collecting data are digitized one with both data observed in sites and remote sensing, crossing a range of scales (temporal and spatial), including various kinds of soil and water conservation data products, and serving the entire society and relative scientific researches. Digital system of soil and water conservation can help us search, transfer, share the information very easily. People can use it together, in different fields, to deal with the soil erosion and runoff, to combat desertification, and to rebuild eco-environment. It will accelerate steps of treatments and construction, and promote the development of science of soil and water conservation, and other relative science and technology.

Keywords: digital system of soil and water conservation, data sharing, eco-environmental building, chongqing, the three-gorge reservoir

1   Introduction

Today, the eco-environmental problem is a very serious problem of all over the world. The most subject of people is sustainable utilization of global soil and water resources and conservation of soil and water. The system of soil and water conservation is the most important support system of eco-environment. The demand of research in this field is very strong. More and more people want to know and work on it. They built many kinds of control works, pilot plants, and monitor sites. How to share these useful data is the key problem. To everyone that engaged in these scientific research fields, useful experimental search is essential and indispensable. It is well know to get those data is a hard work, and it requires much time, many tests in fields or labs. People often suffer from lack of data for experimental conditions, even have no useful data.

With the rapid development of computer, communication, high compact storage technology, and digital earth, digital technology is applied to conservation of soil and water research. Some models, management systems for soil and water conservation have set up, such as WEPP, Region GIS, etc. we had also established some special database on soil and water conservation in the Three-Gorges Reservoir of Chongqing. These systems can provide service to scientific workers, college and graduate students, and officers. If based on digital earth, we can get and share more information. As we know, digital technology can help us to build digital system. Making use of digital information, people in different place and another research fields, share the information, investigate soil and water conservation together. Using new digital information system, the collecting data are digitized one with both data observed in sites and remote sensing, crossing a range of scales (temporal and spatial), including various kinds of soil and water conservation data products, and serving the entire society and relative scientific researches. So, building digital system of soil and water conservation is very important to us.

2 Research object

The major subject of the system is to provide service of digital information in the field of soil and water conservation, to model laws and process of soil erosion and runoff, the buffer of soil erosion and computation.

The system can update the resource database, input, and query information of soil and water conservation. It also can model and processes digital data production. It is intended for two groups of users: people, who work or study on it, or who may not be aware of ways and means of erosion control but wish to learn more about these topics or related on it. In either case it will provide structured interviews for both overall and specific condition assessments.

The first group consists of scientists, teachers, students, researcher who study or relate on it. They hope to explain, dope out, model, and evaluate soil erosion and runoff. Using it, it can be displayed, printed. Administering the system, you can modify the database structure, replace exist data and transmit to other format documents to share the information with others.

The second group is concerned about soil and water conservation condition but either not yet aware of the variety of influences on soil erosion. This system will show them the condition of what they want to know, and tailor to their interests, needs and backgrounds.

3 Experiment materials and methodology

Software and Hardware requirements

The system is being designed for operation on windows 9x, NT, 2000 based PC machines having 200MHz CPU (or higher) and a minimum of 64M RAM. Due to the large storage requirements anticipated for the information base module, distribution of the system will most likely be on CD-ROM disks. These hardware requirements are reasonable with respect to current users, software, computing environments and the growing technological trends.

ARC/INFO 3.4 (or higher) for PC or 7.1 (or higher) for workstation, one of the famous GIS software, was selected to provide a convenient programming environment.

Collect, Process, Standardize and Digitize the Information

First, using ARC module to digitize relief map of the Three-Gorges Reservoir of Chongqing with 1:100000.Then apply the block of TIN to process irregular deltoid net, and use GRID to produce a DEM (Digital Elevation Model).

Applying GPS technology to find and identify the location of research region input their data with INFO. The database is the foundation of computer retrieval system, it is also a database management and digital productions process system.

4 Key conclusions

Digital system is challenge and opportunities

Building digital system of soil and water conservation is a new research way for this field. It reforms the traditional science and technology of soil and water conservation, and makes use of the digital information technology. The new system should be a digitized one with both data observed in sites and remote sensing, covering the whole space (catchments, watershed or region), crossing a range of scales (temporal and spatial). It is easy to deal with fields test data and serve for more people. The minimum software and hardware requirements of your computer system to run it successfully are described.

Digital system provides more functions

It can provide soil erosion type, area, distribution and the whole condition of Chongqing city form 1995 to 2001. If you want to know more about them, just press the right mouse button. It can be displayed, printed. If you administer the system, you can modify the database structure, replace exist data and transmit to other format documents to share the information with others.

Modeling and simulating soil erosion and runoff processing and influencing

Transmitting some data or field research into this system, a few minutes late, the process and influence of them will be showed from now on. The result can be displayed and printed. It can be modeled and simulated less than 50 years.

Various kinds of data products

This system is a special database management system, and basically provides the static database serving of the entire society and relative scientific researches. It also gives us the dynamic modeling and processing information as you share research results with it, and other products such as pictures, imaging services, etc.

Planned and future development

Assessment of soil erosion and runoff condition presents a variety of eco-environment problems. The erosion condition of catchments (watershed, region) deepens on many characteristics including the type of climate, soil and its eroding velocity, rainfall, vegetable, presence and amount of dieback, management activities, etc. So planned developments include the addition of whole China and expand to automated suggested design of sustainable utilization of soil and water. Future development could also include popular operation and reducing cost in collecting data, processing and digitizing information. More testing and evaluation of the system will also be done in the future.

References

Dooge J C. 1999.The Emergence of Scientific Hydrology in the Twentieth Century. Advances in Water Science, vol. **10**(3):p.202-214.

Liu Xinren. 2000. Digital Hydrology. Hydrology, vol. **20** (4):p.5-8.

Luo Xiaomei. 1998.Primany Study on Rainstorm Debris Flow Prediction Using GIS Technology. Mountain Research, vol. **16**(1):p.73-76.

Martz W, Garbrecht J.1992. Numerical Definition of Drainage Network and Subcatchment Areas from Digital Elevation models. Computer & Geosciences. vol. **18**(6):p.747-761.

Ren Liliang. 2001. Digital Basin and River Network in the Sanxia Region of the Yangtze River. Resources and Environment in the Yangtze Basin, vol. **10**(1):p.43-50.

Ren Liliang, Liu Xinren.2000. Hydrological Processes Modeling Based on Digital Elevation Model. Geographical Research, vol. **19**(4):p.369-376.