An ecological based sustainability assessing system for cropping system

Jingcheng Zhang\textsuperscript{a,b}, Jihua Wang\textsuperscript{a,∗}, Xiaohe Gu\textsuperscript{a}, Juhua Luo\textsuperscript{a}, Wenjiang Huang\textsuperscript{a}, Kun Wang\textsuperscript{a,c}

\textsuperscript{a} National Engineering Research Center for Information Technology in Agriculture, Beijing 100097, China
\textsuperscript{b} Institute of Agriculture Remote Sensing and Information System Application, Zhejiang University, Hangzhou 310029, China
\textsuperscript{c} School of Mathematics, Physics and Software Engineering, Lanzhou JiaoTong University, Lanzhou 730070, China

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\textbf{ABSTRACT}

The assessment of sustainability in cropping system is an important issue for natural resources management and environmental protection. Incorporating the geographical information system (GIS) and remote sensing (RS) technologies, an initial idea of the crop sustainability assessing system was thus proposed, based on ecosystem services value (ESV) assessing criterions. The system is basically constituted by two major parts, which were net primary production (NPP) based ESV evaluating system and universal soil loss equation (USLE) based conserving soil and water (CSW) evaluating system. The input datasets includes temporal moderate resolution satellite images (HJ-CCD), Meteorological data, DEM data and soil data. To test the efficiency of the proposed system, an assessment was thus conducted along the Huai river watershed. The results showed that the value of sustainability for the study area was $40.89 \times 10^4$ yuan/m\textsuperscript{2} in average. Besides, a descending trend of sustainable value was found along the watershed from the outer region to center. Moreover, it was pointed out that the agroecosystem provided more value or services in feeding people than in maintaining the sustainability of the environment, comparing with the other ecosystem, such as forests and wetlands. Thereby, it is recommended to maintain or increase the ecosystem diversity in a place, which would be able to enhance the sustainability of it.

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1. Introduction

Recently, the environmental problems have occurred frequently which has caught people’s attention. How to effectively assess the sustainability of a certain area is an urgent question that presented in front of the governments for most regions and countries. To address this problem, a great number of studies were conducted [1–5], which yielded various types of assessing schemes or systems. Various types of ecosystems such as agricultural lands, forests, wetlands, urban regions, etc. were included [6–9]. However, it is worth noting that most of those assessing systems were based on some statistical data and designed for large scale applications, which lead to a lack of spatially understanding of sustainability.

Fortunately, the appearance of remote sensing techniques enable the spatially continuous observations which largely promoted the applications in the aspects of environmental monitoring and assessing. There were several studies attempted to incorporate remote sensing data in the assessing framework of ecosystem services value (ESV). Yu assessed the ESV in Huzhou city in Zhejiang province [10]. Liu attempted to assess the ESV in Songnen Plain in Heilongjiang Province. Jin conducted an assessment on ecosystem capital in Zhejiang Province in China and developed a new quantitative model of ecological compensation [11].

∗ Corresponding author.
\textit{E-mail addresses:} zjc_19840222@hotmail.com (J. Zhang), w-jihua@263.net (J. Wang).

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