



“Gheorghe Asachi” Technical University of Iasi, Romania



DEVELOPMENT OF AN AGRICULTURAL WATER RESOURCE PROGRAMMING MODEL FOR THE SHUYANG TOWN WATERSHED UNDER UNCERTAINTY

Yalei Pan¹, Lei Jin^{1*}, Huibin Guo¹, Qiuchen Wang¹, Yang Cheng¹, Guohe Huang²

¹College of Environmental Science and Engineering, Xiamen University of Technology, Xiamen, Fujian 361024, China

²Environmental Systems Engineering Program, University of Regina, Sask S4S 0A2, Canada

Abstract

The agricultural water resource distribution is usually associated with many uncertainties related to incomplete historical records, seasonal and demand fluctuations, and complex relationships between water resources and environmental and economic factors. These uncertainties aggravate the complexity of agricultural water resource allocation and of achieving economic objectives. Therefore, an uncertain fuzzy set programming (UFSP) model for agricultural water-system planning in Shuyang town was developed. The uncertain factors affecting the allocation of agricultural water resources, including agricultural income and developmental and sewage treatment costs, are represented by fuzzy sets. The results show that the total local agricultural economic income of Shuyang town can be increased from (23.77, 25.57) to (33.12, 39.67) billion yuan in three stages corresponding to the increase in land for planting, animal husbandry, and forestry and the development of agricultural ecotourism. Furthermore, the study compared the results from the three methods, as well as from the UFSP, UFSP- β , and UFSP-U models. The comparison shows that the UFSP model has more advantages in predicting the total agricultural economic income than the other models, which reflects the uncertainty of the local agricultural water resource system and, consequently, leads to greater economic benefits.

Key words: programming model, Shuyang town, uncertainty, water resources

Received: December, 2020; *Revised final:* March, 2021; *Accepted:* October, 2021; *Published in final edited form:* December, 2021

* Author to whom all correspondence should be addressed: e-mail: jinlei777@outlook.com; Phone: +86-592-6291138; Fax: +86-592-6291138