

Research Paper

Methods of Sustainable Agricultural Water Management in Hamedan Province

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ABSTRACT

The purpose of this study was to delineate methods of sustainable agricultural water management. The study is based on a mixed methodology, namely both quantitative and qualitative. The statistical population included 130 water experts in *Hamedan* province. In the qualitative phase, 35 participants were purposefully selected, but, in the quantitative phase, there were 100 experts selected randomly according to Krejcie and Morgan's sampling table. In order to identify the relationships between the independent variables (i.e. solutions to water management) and the dependent variable (i.e. sustainable agricultural water management), structural equation modeling was used through the PLS algorithm. The results showed that 55 % of the dependent variable variance was determined by 13 independent variables. Of these variables, the irrigation planning solution proved to be the main solution with the highest impact and a coefficient of 0.275. The next five factors with great effects on sustainable agricultural water management included applied and continuous training, water recycling, water transfer efficiency, information sharing, and reducing agricultural wastes with impact coefficients of 0.269, 0.247, 0.209, 0.197, and 0.172 respectively.

Key words:

Agricultural water,
Mixed method,
Sustainable management, Solution

Extended Abstract

1. Introduction

Freshwater scarcity is a threat to the sustainability of development. As a solution to this problem, sustainable water management was introduced to meet the ever-increasing demands for water while protecting the water resources. Water crisis is internation-

ally known as a managerial one; better management can substantially control the adversaries of water limitations. Iran has been hit the hardest in this regard by poor implementation of smart and sustainable water resource management strategies especially in agriculture. To face the problem and move toward the sustainable management of water resources, adaptive strategies should be employed. Every country needs to execute appropriate strategies based on its accessible water resources. The main purpose of the present study is to identify the most sustainable ag-

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ricultural water management strategies and to determine their impacts on the sustainability of agricultural water resources in *Hamedan*, Iran.

2. Methodology

A mixed method was employed to identify the sustainable agricultural water strategies in the province of *Hamedan*, Iran. In the qualitative stage of the study, a discourse analysis was done to identify the strategies first. Then, in the quantitative stage, a survey was carried out to examine the dynamics of those strategies according to the respondents' views already collated via a self-made questionnaire. Out of 130 water experts in the province, 35 participants were purposefully selected and interviewed in the first phase. Then, 97 experts were randomly selected using *Krejcie and Morgan's* sampling table (1970) to respond to the questionnaire. To ensure the findings validity, the confirmability, transferability, credibility, and dependability indices were put to practice according to *Lincoln & Guba* (1985). The research was based on three types of variables including the strategies as the independent variables, the sustainable agricultural water management (SAWM) as the dependent variable, and such demographic features as age, work experience, education level, course of study, and job position. To assess the strategies and the SAWM, 56 and 17 factors were evaluated respectively. After the validity of the instrument was established, its reliability was secured using Cronbach's Alpha at 0.92. Finally, through partial least squares path modeling (PLS-SEM) and by means of the WarpPLS software, the relationships between the measured and the latent variables were determined.

3. Results

The results of the research showed that the most important strategies and measures for sustainable water management in *Hamedan* province are a) modification of the cropping patterns at a macro level, b) balancing the aquifers, c) reduction of agricultural wastes, d) reduction of the planting time in the field, e) development of greenhouse crops, f) increase of the water transfer efficiency, g) improvement of irrigation systems, irrigation planning and water reversal in the production process, h) improvement of the physical structure of the soil, and i) continuous training. Planning for an irrigation strategy, with an estimate of 0.317, was found to have the highest determining impact on the SAWM. The estimates for the other strategies were in the following order: lifelong and practical education (0.281), water recycling (0.242), information sharing or improving water transfer effi-

ciency (0.211), and maintaining groundwater equilibrium (0.186). The estimates for the other measured parameters were not statistically significant.

4. Discussion

The results indicated that the way some farmers practiced modern irrigation was the most important strategy in the sustainable utilization of water resources. However, most farmers were found to have limited knowledge about how to apply modern irrigation systems, leading to inappropriate use of water resources. It decreases water efficiency and makes water management unsustainable. There might be a solution to this problem under the determining impact of lifelong and practical education. The participants mentioned that the current educational courses provided for farmers regarding sustainable management of water resources were not continuous although the farmers needed to receive extended recommendations during all the stages of agricultural production activities. The strategy of water recycling secured the third place in terms of its determining impact. This strategy was indicated to play an important part in SAWM.

5. Conclusion

It can be concluded that the water crisis we face today is the consequence of inappropriate decisions on the use of resources. Indeed, rather than making best efforts to tackle the causes of the problem, we have chosen to confront the effects. This has made the water crisis even worse. The unsustainability of water resources is due to years of mismanagement. Implementation of the best SAWM strategies can pave the way for a more sustainable future in the area. The lack of sustainable water management in the agricultural sector has had significant social, economic and environmental consequences, including unsustainable employment, reduction of farmers' income, increase of rural migration, disappearance of social dynamics and solidarity of villages, lack of drought control, and food insecurity.

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Conflict of Interest

The authors declared no conflicts of interest