The Impact of Government Policies on the Use of Clean Technology for Sustainable Soil Management (Case Study: Agricultural Research and Education Center of Ahvaz)

Extended Abstract

Introduction: In recent decades, the degradation of natural resources has become one of the most significant environmental challenges worldwide. Among these resources, soil holds a crucial position as the fundamental element for human survival and ecosystem development. This vital resource plays a key role in ensuring food security, preserving biodiversity, and storing carbon. However, the increasing industrial activities, unsustainable agricultural practices, land-use changes, and urban expansion have exerted severe pressures on soil, leading to pollution, erosion, and a decline in its quality. This situation has far-reaching consequences not only for ecosystems but also for economic development and human well-being. One of the most effective approaches to addressing this challenge is the adoption of clean technologies. These technologies encompass processes, equipment, and methods that minimize negative environmental impacts while maximizing resource efficiency. In soil management, clean technologies can prevent contamination, enhance land productivity, and even restore polluted soils. For instance, bioremediation technologies used for the decontamination of heavy metal-polluted soils or methods for reducing industrial pollutants in soil can significantly contribute to the sustainable management of this valuable resource. However, the implementation of clean technologies in soil management faces several challenges. One of the most critical barriers is the high initial cost of these technologies and the need for advanced technical expertise. In this regard, government policies can play a pivotal role. As regulatory instruments guiding individual and organizational behaviors, government policies can effectively promote the adoption of clean technologies through legislation, financial incentives, investment in research and education, and the establishment of regulatory frameworks.

Materials and methods: This study is an applied research project conducted using a descriptive-field methodology. The primary objective is to examine the impact of government policies on the adoption of clean technologies in soil management at the Ahvaz Agricultural Research and Training Center. The statistical population consists of managers, environmental experts, and technical officials, totaling 8,856 individuals. A stratified random sampling method was employed to ensure that the perspectives of various groups within the population were accurately represented. The sample size was determined to be 369 using Cochran's formula with a 95% confidence level, as calculated by the following formula. The collected data were analyzed using a questionnaire-based approach with SPSS 2022 software. Initially, univariate descriptive and analytical statistics were performed, utilizing central tendency indices such as mode, median, mean, and standard deviation. A multi-point Likert scale was used for scoring the criteria. For bivariate analysis, Spearman's correlation test and multiple regression analysis were applied. Additionally, for multivariate analysis, regression analysis using the ENTER method was conducted. To generalize the results to the statistical population, a significance level of less than 0.05 was considered.

Results: The results of Spearman's correlation analysis indicated a direct and significant relationship between government incentives, regulations, financial and tax support, government monitoring of soil environmental performance, and the adoption of clean technologies. Additionally, the results of multiple regression analysis demonstrated that the strongest significant correlation was between financial and tax support for sustainable soil conservation and management and the adoption of clean technologies (0.940). Government regulations (0.780), government incentives (0.719), and government monitoring and supervision of soil environmental performance (0.813) also showed a significant impact on the adoption of clean technologies.

Discussion and Conclusion: The preservation of soil environmental performance is one of the critical challenges in today's world, increasingly threatened by human and industrial activities. Soil pollution caused by industrial, agricultural, and urban waste necessitates innovative solutions that can mitigate the environmental impacts of this issue. Soil pollution is among the most significant environmental

problems globally, exacerbated by extensive human and industrial activities. Moreover, the pressures resulting from unsustainable agricultural practices, rapid urbanization, and uncontrolled industrial development have led to severe soil degradation and contamination in many regions worldwide. Sustainable soil management, as a fundamental solution to this challenge, requires a comprehensive and multidimensional approach that not only reduces pollution but also ensures long-term soil productivity and health. As the primary foundation for production and a key supporter of biodiversity, soil plays an unparalleled role in ensuring environmental sustainability and human well-being. However, increasing unsustainable exploitation and the infiltration of various pollutants have severely threatened soil health and functionality. This situation not only jeopardizes food production but also disrupts the natural functioning of ecosystems and ecological balance. Under such circumstances, transitioning toward sustainable soil management is no longer a choice but an unavoidable necessity for preserving natural resources and ensuring the continuity of life on Earth. Sustainable soil management goes beyond protective measures; it entails rethinking resource utilization strategies and enhancing human-environment interactions. From employing innovative technologies for the remediation of contaminated soils to improving agricultural practices and implementing intelligent governmental policies, all efforts must focus on reducing pressure on this invaluable resource. Financial support, strengthening scientific research, and raising public awareness about the significance of this approach play a crucial role in its success. The sustainable future of the world depends on the actions we take today to protect soil. This vital resource is the backbone of food security and environmental stability, and any negligence in its management will lead to irreversible consequences. Therefore, coordination among all stakeholders—including governments, industries, farmers, and local communities—is essential to mitigate the adverse effects of human activities and ensure soil health. Only through global collaboration and shared determination can we safeguard soil as a precious legacy for future generations.