



# OPEN Ecological risk assessment of trace elements (TEs) pollution and human health risk exposure in agricultural soils used for saffron cultivation

Mahmoud Taghavi<sup>1</sup>, Mostafa Darvishiyan<sup>2</sup>, Maryam Momeni<sup>2</sup>, Hadi Eslami<sup>3</sup>, Reza Ali Fallahzadeh<sup>4</sup> & Ahmad Zarei<sup>1,5,6</sup>

Contamination of farmland soils by trace elements (TEs) has become an international issue concerning food safety and human health risks. In the present research, the concentrations of TEs including cadmium (Cd), cobalt (Co), chromium (Cr), copper (Cu), manganese (Mn), nickel (Ni), lead (Pb), zinc (Zn) and iron (Fe) in soils of 16 farmlands were determined in Gonabad, Iran. In addition, the human health risks due to exposure to the TEs from the soils were assessed. Moreover, the soil contamination likelihood was evaluated based on various contamination indices including contamination factor (CF), enrichment factor (EF), geo-accumulation index (I<sub>geo</sub>), and pollution load index (PLI) calculations. The soil mean concentrations for Cd, Co, Cr, Cu, Mn, Ni, Pb, Zn and Fe ranges as 0.102, 6.968, 22.550, 29.263, 475.281, 34.234, 13.617, 54.482 and 19,683.6 mg/kg in farmland soils. The mean concentrations of the TEs decreased in the order of Fe > Mn > Zn > Ni > Cu > Cr > Pb > Co > As > Cd. Levels of all metals in this study were within the FAO/WHO and Iranian soil standards. The HQ values from investigated elements for adults and children in the studied farms were less than the limit of 1, indicating no health risks for the studied subpopulations. The results of the present research indicated no significant carcinogenic health hazards for both adults and children through ingestion, skin contact and inhalation exposure routes. CF values of Ni and Zn in 100% and 6.25% of farmlands were above 1, showing moderate contamination conditions. EF values of metals in farmlands were recorded as “no enrichment”, “minimal enrichment” and “moderate enrichment” classes. Furthermore, it can be concluded that the all farms were uncontaminated except Ni (moderately contaminated) based on I<sub>geo</sub>. This is an indication that the selected TEs in the agricultural soils have no appreciable threat to human health.

Issues arise from the rapid process of urbanization, industrialization and land use has attracted worldwide public attention from both environmental and health perspectives<sup>1,2</sup>. Soil is the skin of our globe and is necessary for living organisms as it provides elements and nutrients for plants growth and serves as habitat for microflora and fauna<sup>3</sup>. The growing population in world significantly increase pressure on the farmlands. In order to improve the yield and profit of agricultural products, the excessive cultivation has inevitably resulted in the contamination of the soils by TEs. Farming is considered to be one of the main sources of As, Cu, Zn, Fe and Pb in the soils<sup>4–7</sup>. Among toxic and persistent pollutants found in agricultural soils, a special attention is paid on heavy metals. Heavy metals (including both metals and metalloids) are the most widely distributed elements of concern in

<sup>1</sup>Department of Environment Health Engineering, School of Health, Social Determinates of Health Research Center, Gonabad University of Medical Sciences, Gonabad, Iran. <sup>2</sup>Student Research Committee, Gonabad University of Medical Sciences, Gonabad, Iran. <sup>3</sup>Department of Environmental Health Engineering, School of Health, Occupational Safety and Health Research Center, NIKCO, World Safety Organization and Rafsanjan University of Medical Sciences, Rafsanjan, Iran. <sup>4</sup>Genetic and Environmental Adventures Research Center, School of Abarkouh Paramedicine, Shahid Sadoughi University of Medical Sciences, Yazd, Iran. <sup>5</sup>Department of Environment Health Engineering, School of Health, Infectious Diseases Research Center, Gonabad University of Medical Sciences, Gonabad, Iran. <sup>6</sup>email: a.zarei.burns@gmail.com

# Ecological Risk Evaluation Of Polluted Soils

**RC Schank**

A decorative graphic element consisting of a light blue horizontal bar with a rounded right end, and a red circular shape partially visible behind it.

## **Ecological Risk Evaluation Of Polluted Soils:**

## Reviewing **Ecological Risk Evaluation Of Polluted Soils**: Unlocking the Spellbinding Force of Linguistics

In a fast-paced world fueled by information and interconnectivity, the spellbinding force of linguistics has acquired newfound prominence. Its capacity to evoke emotions, stimulate contemplation, and stimulate metamorphosis is actually astonishing. Within the pages of "**Ecological Risk Evaluation Of Polluted Soils**," an enthralling opus penned by a highly acclaimed wordsmith, readers attempt an immersive expedition to unravel the intricate significance of language and its indelible imprint on our lives. Throughout this assessment, we shall delve to the book is central motifs, appraise its distinctive narrative style, and gauge its overarching influence on the minds of its readers.

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### **Table of Contents Ecological Risk Evaluation Of Polluted Soils**

1. Understanding the eBook Ecological Risk Evaluation Of Polluted Soils
  - The Rise of Digital Reading Ecological Risk Evaluation Of Polluted Soils
  - Advantages of eBooks Over Traditional Books
2. Identifying Ecological Risk Evaluation Of Polluted Soils
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Ecological Risk Evaluation Of Polluted Soils
  - User-Friendly Interface
4. Exploring eBook Recommendations from Ecological Risk Evaluation Of Polluted Soils
  - Personalized Recommendations
  - Ecological Risk Evaluation Of Polluted Soils User Reviews and Ratings
  - Ecological Risk Evaluation Of Polluted Soils and Bestseller Lists

5. Accessing Ecological Risk Evaluation Of Polluted Soils Free and Paid eBooks
  - Ecological Risk Evaluation Of Polluted Soils Public Domain eBooks
  - Ecological Risk Evaluation Of Polluted Soils eBook Subscription Services
  - Ecological Risk Evaluation Of Polluted Soils Budget-Friendly Options
6. Navigating Ecological Risk Evaluation Of Polluted Soils eBook Formats
  - ePub, PDF, MOBI, and More
  - Ecological Risk Evaluation Of Polluted Soils Compatibility with Devices
  - Ecological Risk Evaluation Of Polluted Soils Enhanced eBook Features
7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Ecological Risk Evaluation Of Polluted Soils
  - Highlighting and Note-Taking Ecological Risk Evaluation Of Polluted Soils
  - Interactive Elements Ecological Risk Evaluation Of Polluted Soils
8. Staying Engaged with Ecological Risk Evaluation Of Polluted Soils
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Ecological Risk Evaluation Of Polluted Soils
9. Balancing eBooks and Physical Books Ecological Risk Evaluation Of Polluted Soils
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Ecological Risk Evaluation Of Polluted Soils
10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
11. Cultivating a Reading Routine Ecological Risk Evaluation Of Polluted Soils
  - Setting Reading Goals Ecological Risk Evaluation Of Polluted Soils
  - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Ecological Risk Evaluation Of Polluted Soils
  - Fact-Checking eBook Content of Ecological Risk Evaluation Of Polluted Soils
  - Distinguishing Credible Sources
13. Promoting Lifelong Learning

- 
- Utilizing eBooks for Skill Development
  - Exploring Educational eBooks

#### 14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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