



Contents lists available at ScienceDirect

Annals of Agrarian Science

journal homepage: <http://www.journals.elsevier.com/annals-of-agrarian-science>

## Radioactive contamination of the soils of Georgia

Tengiz F. Urushadze <sup>a,\*</sup>, Dimitriy V. Manakhov <sup>b</sup><sup>a</sup> Agricultural University of Georgia, Michell Sakashvili Institute of Soil Science, Agrochemistry and Melioration, Kakha Bendukidze University Campus, 240, David Aghmashenebeli Alley, Tbilisi, 0159, Georgia<sup>b</sup> Faculty of Soil Science of Moscow State University of M.V. Lomonosov, L. Leninskii Gory, Moscow, 119992, Russia

### ARTICLE INFO

#### Article history:

Received 29 March 2017

Accepted 30 May 2017

Available online 4 August 2017

#### Keywords:

Radioactive contamination

Radionuclide

Deposition

Cesium-137

Strontium-90

Yellow podzolic soil

### ABSTRACT

After 29–30 years from Chernobyl atomic plant accident the main soil types of Georgia have been examined on contamination presence of <sup>137</sup>Cs and <sup>90</sup>Sr.

Level of radioactive contamination of soils (<sup>137</sup>Cs deposition) we can separate three levels: I - 0–10 kBq/m<sup>2</sup> - Black, Cinnamonic, Raw carbonate, Mountain meadow, Chernozems, Black forest brown, Primitive and Yellow soils; II - 10–37 kBq/m<sup>2</sup> - Red, Bog and Yellow forest brown soils; III - > 37 kBq/m<sup>2</sup> - Yellow podzolic soils.

In a big majority of soils <sup>137</sup>Cs deposition of layer 0–20 cm does not exceed 37 kBq/m<sup>2</sup> (1 Ci/km<sup>2</sup>), that allows us to attribute this examined sample points to non-contaminated territories.

In five points of sampling with maximum <sup>137</sup>Cs deposition in a layer of 0–20 cm have been measured specific activities of <sup>137</sup>Cs in a layer of 20–40 cm and have been evaluated <sup>137</sup>Cs deposition in a layer of 0–40 cm. Results for most of the soils also does not exceed 37 kBq/m<sup>2</sup> (1 Ci/km<sup>2</sup>).

Exclusion in Yellow podzolic soil near to v.Jvari (West Georgia), where <sup>137</sup>Cs deposition was 38.0 and 70.4 kBq/m<sup>2</sup> accordingly in layers of 0–20 cm and 0–40 cm. We can attribute this zone to radiological contamination, particularly to living zone of privileged socio-economic status. In Yellow podzolic soils we can observe high mobility of <sup>137</sup>Cs primary in kaolinite composition of clay fraction and in connection to this lowering of intensity of non-exchangeable absorption by soil of this radionuclide.

In all soils <sup>90</sup>Sr deposition in a layer of 0–20 cm does not exceed 11.1 kBq/m<sup>2</sup> (0.3 Ci/km<sup>2</sup>) that allows us to attribute examined territories to "relatively satisfying situation".

© 2017 Agricultural University of Georgia. Production and hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

### Introduction

From the main types of radioactivity of soils the biggest treat comes from artificial radioactivity. Sources of radioactive contamination of soils are different. This includes global deposition of radionuclides resulting from testing of nuclear weapon, radiation breakdowns/accidents and "peace" nuclear explosions. Radioactive elements are easily accumulating in agricultural products. Radioactive contamination of soils is an independent type of contamination, lowering quality of agricultural production [1].

Exceptionally dangerous in biological relations are anthropogenic radionuclides and in first place <sup>90</sup>Sr ( $T_{1/2} = 28.79$  years) and <sup>137</sup>Cs ( $T_{1/2} = 30.17$  years) [2]. Both radionuclides are actively involved in biological circuit of substances as Cs is a chemical analog of K and Sr of Ca. We must mention that direct proportional

dependency between their content in soil and in plants that grow on it is observed often.

In Georgia after examination of contamination of plants by global deposition of strontium-90 scientist found out, that maximum level of contamination by this radionuclide is in western part of country, on the Black Sea coastal area. In high mountain regions contamination level was not so high.

Like Georgia, also Austria was contaminated after Chernobyl accident [3]. Whereby radionuclides showed very small speed of migration in a few millimetres per year and accumulate in upper parts of soils, transforming them into important source of radioactive elements for plants.

It is also interesting to use <sup>137</sup>Cs for evaluation of modern agrogenic transformation of soil layers in Chernobyl contamination region [4]. In addition to the above, ability of using spatial distribution stocks of radioactive isotope <sup>137</sup>Cs for assessment of agrogenic transformation of soil layer on territories with high level of Chernobyl contamination. The main basic requirements for the methodology have been examined for particular region. The best

\* Corresponding author.

E-mail address: [t.urushadze@phdbee.com](mailto:t.urushadze@phdbee.com) (T.F. Urushadze).

Peer review under responsibility of Journal Annals of Agrarian Science.

# Radioactive Contamination Of Soils Pla

**United States. Environmental  
Protection Agency. Library Systems  
Branch**

## **Radioactive Contamination Of Soils Pla:**

**The Effects of Radiation and Radioisotopes on the Life Processes** Charles M. Pierce, U.S. Atomic Energy Commission, 1963    *The Effects of Radiation and Radioisotopes on the Life Processes: Index*, 1963    *The Nature of Radioactive Fallout and Its Effects on Man: May 27-29, June 3, 1957. 1008 p* United States. Congress. Joint Committee on Atomic Energy. Special Subcommittee on Radiation, 1957    *The Nature of Radioactive Fallout and Its Effects on Man* United States. Congress. Joint Committee on Atomic Energy. Special Subcommittee on Radiation, 1957    **The Nature of Radioactive Fallout and Its Effects on Man** United States. Congress. Joint Committee on Atomic Energy, 1957

**Combined Subject and Author Indexes to Radiobiology Bibliographies** U.S. Atomic Energy Commission. Division of Technical Information, 1967    **Public Health Service Publication**, 1967    **Environmental Protection Research Catalog: Indexes** Smithsonian Science Information Exchange, 1972    *Soviet Soil Science*, 1968    *U.S. Environmental Protection Agency Library System Book Catalog* United States. Environmental Protection Agency. Library Systems Branch, 1975    *KWIC Index to the Journal of the Health Physics Society*, 1958    **Scientific Basis for Soil Protection in the European Community** H. Barth, P. L'Hermite, 2012-12-06 PH BOURDEAU Directorate General Science Research and Development Commission of the European Communities Brussels Belgium We are living on a unique planet the only one in the solar system where life exists The very existence of life has modified the physical and chemical environment of the earth its atmosphere and oceans in a way that makes life sustainable This system with its complex cybernetic mechanisms has been named GAIA by Lovelock Man has always interfered with it on a more or less limited scale This interference is now reaching global proportions such as climate modifications resulting from CO and trace gas 2 accumulation in the atmosphere or the destruction of stratospheric ozone not to speak of global radioactive contamination GAIA will probably prevail as a living system but it probably does not give much importance to man s survival as such and it is man that has to take care of his own survival In the ecosystem of Planet Earth soils are the thin interface between lithosphere and atmosphere which constitutes the essential substrate for the terrestrial biosphere the productivity of which far exceeds that of the oceans even though the latter cover a much larger area than the continents Soils themselves are complex systems They develop through weathering of minerals are colonised by living organisms which in turn modify their substrate making it suitable for other organisms This induces a primary ecological succession which eventually reaches a climax in equilibrium between climate soil and the biological communities    *Bibliography of Agriculture*, 1976    *Hearings and Reports on Atomic Energy* United States. Congress. Joint Committee on Atomic Energy, 1957    **Radioecology and the Restoration of Radioactive-Contaminated Sites** F.F. Luykx, Martin J. Frissel, 2012-12-06 Most of the nuclear facilities built since the Second World War have ceased active operation and have been decommissioned Some of the sites are heavily contaminated with radioactive substances Correct and efficient action to mitigate the radiological consequences of such contamination will only be possible when the

behaviour of radionuclides in the terrestrial environment is sufficiently well known Yet radioecologists often find it difficult to study the transfer of radioactivity in agricultural land and semi natural ecosystems because of the complexity and diversity of such environments The present book presents an analysis of all the factors that affect the behaviour of radionuclides as they move from their point of release through the environment and then enter the tissues of biota living in the ecosystems in particular plants and animals consumed by humans The course on which the book is based was held in a region that is heavily contaminated by radioactive discharges into the environment during nuclear weapons fabrication in the 1950s and 60s and due to a severe accidental release following the explosion of a rad waste tank in 1957 This allowed in situ training of the students The book s main emphasis is on specific radioecological problems in severely contaminated areas in the former Soviet Union the Southern Urals Trail the rivers Techa Isert Tobol Irtysh Ob and the 30 km zone around Chernobyl Systems examined include soils arable and pasture land forests lakes and rivers Special attention is paid to the effects of radiation on natural ecosystems trees soil dwelling organisms and aquatic organisms Synergistic effects are also considered Short medium and long term countermeasures are discussed Toxicology Research Projects Directory ,1980-04 Bibliography of Agriculture with Subject Index ,1985 Bibliography of Agriculture ,1977 Vols for 1975 have data provided by National Agricultural Library U S Department of Agriculture **Green Chemistry in Practice** Thomas McKeag,2023-04-01 Green Chemistry in Practice Greener Material and Chemical Innovation Through Collaboration collects a unique set of case studies based on researchers experiences in developing practical green chemistry driven solutions to industry problems as part of the Greener Solutions Program at the Berkeley Center for Green Chemistry Beginning with an introduction to green chemistry the book goes on to provide an overview of the interdisciplinary approach taken by the Center which aims to bring about a generational transformation toward the design and use of inherently safer chemicals and materials through research teaching and outreach This is followed by four detailed case studies revealing each step of the process involved in assessing and designing greener solutions to real world problems in the fields of preservatives textiles additive manufacturing and green energy Drawing together the hands on practical experience of an interdisciplinary team from across academia and industry Practice in Green Chemistry provides a unique insight into the practicalities of applying green chemistry principles in support of a global push toward a more sustainable world Green Chemistry in Practice Greener Material and Chemical Innovation Through Collaboration is also a valuable resource for both academia and industry students and researchers Reviews the foundational principles of green chemistry in the context of real world scenarios Highlights successes pitfalls and practical steps to take when working with a multifaceted interdisciplinary group Supports those involved in designing and implementing green solutions across a whole range of fields Nuclear Science Abstracts ,1976

If you ally compulsion such a referred **Radioactive Contamination Of Soils Pla** book that will offer you worth, acquire the very best seller from us currently from several preferred authors. If you want to funny books, lots of novels, tale, jokes, and more fictions collections are moreover launched, from best seller to one of the most current released.

You may not be perplexed to enjoy all book collections Radioactive Contamination Of Soils Pla that we will very offer. It is not almost the costs. Its just about what you craving currently. This Radioactive Contamination Of Soils Pla, as one of the most full of life sellers here will unconditionally be in the course of the best options to review.

[https://pinsupreme.com/About/scholarship/Download\\_PDFS/russian%20eyewitness%20travel%20phrase.pdf](https://pinsupreme.com/About/scholarship/Download_PDFS/russian%20eyewitness%20travel%20phrase.pdf)

## **Table of Contents Radioactive Contamination Of Soils Pla**

1. Understanding the eBook Radioactive Contamination Of Soils Pla
  - The Rise of Digital Reading Radioactive Contamination Of Soils Pla
  - Advantages of eBooks Over Traditional Books
2. Identifying Radioactive Contamination Of Soils Pla
  - 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 Radioactive Contamination Of Soils Pla
  - User-Friendly Interface
4. Exploring eBook Recommendations from Radioactive Contamination Of Soils Pla
  - Personalized Recommendations
  - Radioactive Contamination Of Soils Pla User Reviews and Ratings
  - Radioactive Contamination Of Soils Pla and Bestseller Lists
5. Accessing Radioactive Contamination Of Soils Pla Free and Paid eBooks

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

### Radioactive Contamination Of Soils Pla Introduction

Radioactive Contamination Of Soils Pla Offers over 60,000 free eBooks, including many classics that are in the public domain. Open Library: Provides access to over 1 million free eBooks, including classic literature and contemporary works. Radioactive Contamination Of Soils Pla Offers a vast collection of books, some of which are available for free as PDF downloads, particularly older books in the public domain. Radioactive Contamination Of Soils Pla : This website hosts a vast collection of scientific articles, books, and textbooks. While it operates in a legal gray area due to copyright issues, its a popular resource for finding various publications. Internet Archive for Radioactive Contamination Of Soils Pla : Has an extensive collection of digital content, including books, articles, videos, and more. It has a massive library of free downloadable books. Free-eBooks Radioactive Contamination Of Soils Pla Offers a diverse range of free eBooks across various genres. Radioactive Contamination Of Soils Pla Focuses mainly on educational books, textbooks, and business books. It offers free PDF downloads for educational purposes. Radioactive Contamination Of Soils Pla Provides a large selection of free eBooks in different genres, which are available for download in various formats, including PDF. Finding specific Radioactive Contamination Of Soils Pla, especially related to Radioactive Contamination Of Soils Pla, might be challenging as theyre often artistic creations rather than practical blueprints. However, you can explore the following steps to search for or create your own Online Searches: Look for websites, forums, or blogs dedicated to Radioactive Contamination Of Soils Pla, Sometimes enthusiasts share their designs or concepts in PDF format. Books and Magazines Some Radioactive Contamination Of Soils Pla books or magazines might include. Look for these in online stores or libraries. Remember that while Radioactive Contamination Of Soils Pla, sharing copyrighted material without permission is not legal. Always ensure youre either creating your own or obtaining them from legitimate sources that allow sharing and downloading. Library Check if your local library offers eBook lending services. Many libraries have digital catalogs where you can borrow Radioactive Contamination Of Soils Pla eBooks for free, including popular titles. Online Retailers: Websites like Amazon, Google Books, or Apple Books often sell eBooks. Sometimes, authors or publishers offer promotions or free periods for certain books. Authors Website Occasionally, authors provide excerpts or short stories for free on their websites. While this might not be the Radioactive Contamination Of Soils Pla full book , it can give you a taste of the authors writing style. Subscription Services Platforms like Kindle Unlimited or Scribd offer subscription-based access to a wide range of Radioactive Contamination Of

Soils Pla eBooks, including some popular titles.

### **FAQs About Radioactive Contamination Of Soils Pla Books**

How do I know which eBook platform is the best for me? Finding the best eBook platform depends on your reading preferences and device compatibility. Research different platforms, read user reviews, and explore their features before making a choice. Are free eBooks of good quality? Yes, many reputable platforms offer high-quality free eBooks, including classics and public domain works. However, make sure to verify the source to ensure the eBook credibility. Can I read eBooks without an eReader? Absolutely! Most eBook platforms offer web-based readers or mobile apps that allow you to read eBooks on your computer, tablet, or smartphone. How do I avoid digital eye strain while reading eBooks? To prevent digital eye strain, take regular breaks, adjust the font size and background color, and ensure proper lighting while reading eBooks. What the advantage of interactive eBooks? Interactive eBooks incorporate multimedia elements, quizzes, and activities, enhancing the reader engagement and providing a more immersive learning experience. Radioactive Contamination Of Soils Pla is one of the best book in our library for free trial. We provide copy of Radioactive Contamination Of Soils Pla in digital format, so the resources that you find are reliable. There are also many Ebooks of related with Radioactive Contamination Of Soils Pla. Where to download Radioactive Contamination Of Soils Pla online for free? Are you looking for Radioactive Contamination Of Soils Pla PDF? This is definitely going to save you time and cash in something you should think about.

### **Find Radioactive Contamination Of Soils Pla :**

#### **russian eyewitness travel phrase**

~~russia without stalin~~

*saddles east horseback over the old oreg*

#### **sadie rose and the champion sharpshooter**

#### **sacred and secular religion and politics worldwide**

~~ruskii arkiv 15-4-3~~

~~sacred and magical plants~~

~~rutgers manual on strategies for teaching german through the short story~~

#### **sacred buffalo the lakota way for a new beginning**

~~sacred symbology~~

rusian; a complete elementary course

saddles up rideem high

ryans bride

**rustler of owlhorns**

*sacre raoul*

### **Radioactive Contamination Of Soils Pla :**

Spanish 2 Cuaderno de Vocabulario y Gramática - 1st ... Our resource for Expresate!: Spanish 2 Cuaderno de Vocabulario y Gramática includes answers to chapter exercises, as well as detailed information to walk you ... Chapter 3 Pueblos y Ciudades Vocabulary 2 Flashcards Perdón. Pardon me or Excuse me. perderse. to get lost. UXWizz Sp.2ROJO:Capitulo 3 Pueblos y Ciudades Writing activity in textbook. Read Cultura—Comparaciones on pages 96 and 97 of the text. Then complete the comprehension questions on page 97 (Para comprender & ... Holt spanish 2 answer key: Fill out & sign online Adhere to the instructions below to complete Holt spanish 2 answer key pdf online easily and quickly: Sign in to your account. Sign up with your credentials or ... Pueblo o ciudad que modelo conocí la ciudad de santo Pueblo o ciudad que MODELO Conocí la ciudad de Santo Domingo conocí Qué tuve from SPANISH spanish2 at Lake Mary High School. 1556896815.pdf deberíamos ofrecernos de volunta- rios y servir de guías... —Mira, no es mala idea... ¿Vamos a la próxima sala? -¡Adelante! ANSWERS: 1. B; 2. A; 3. C; 4. D ... Spanish 3 CVG Answers SPANISH 3 CVG Answers. All right here. Free. In Progress... Chapter 1. Chapter 2. Chapter 3 1. Los inmigrantes van ahora a pueblos y ciudades del ... Sep 20, 2019 — 2. The state provides help to immigrants in the support network ... New questions in Spanish. Read each sentence carefully and select the ... Kawasaki Mule 3010 Trans 4x4 Utility Vehicle Wiring ... Kawasaki Mule 3010 Trans 4x4 Utility Vehicle Wiring Diagram Pdf Manual ... INTRODUCTION Kawasaki Mule 3010 Trans 4x4 Utility Vehicle Wiring Diagram Pdf Manual Pdf ... Mule 3010 4X4 PARTS DIAGRAM Mule 3010 4X4 PARTS DIAGRAM. Chassis Electrical Equipment. © 2023 Kawasaki Motors ... WIRE-LEAD,BATTERY(+) (Ref # 26011). 26011-1780. 1. WIRE-LEAD,BATTERY(-) (Ref ... Kawasaki MULE 3010 TRANS 4x4 Service Manual MULE 3010 TRANS 4 × 4 Utility Vehicle Service Manual Quick Reference Guide This quick reference guide will assist you in locating a desired topic or ... Mule manual 1 This Owner's. Manual contains those maintenance recommendations for your vehicle. Those items identified by the Periodic Maintenance. Chart are necessary to ... 2005-2008 KAWASAKI MULE 3010 TRANS 4x4 Repair ... The KAWASAKI MULE 3010 TRANS 4×4 Service Manual also includes a Wiring Diagram Schematic. The Repair Manual includes Troubleshooting Guides. This contains ... [DIAGRAM] 2005 Kawasaki Mule 3010 Wiring Diagram Wiring Diagram For Kawasaki Mule 3010 MULE Utility Vehicle pdf manual download. May 10, 2021 - I am having a wiring problem on my KAF620-A2 Mule 2510 4X4. Get Shipping Quotes Opens in a new tab ... Wiring

Diagram For Kawasaki Mule 3010 Document about Kawasaki Mule Trans 4x4 Utility Vehicle Wiring Diagram Manual is available on print and digital edition. They are reliable ... I have a mule 3010, and when turn the ignition ... - Pinterest Jan 13, 2010 — Chevrolet Camaro 1982-1992 Wiring Diagrams Repair Guide. Find out how to access AutoZone's Wiring Diagrams Repair Guide for Chevrolet Camaro ... Ma1210 College Mathematics Quiz 3 Answers Pdf Page 1. Ma1210 College Mathematics Quiz 3 Answers Pdf. INTRODUCTION Ma1210 College Mathematics Quiz 3. Answers Pdf [PDF] MA 1210 : College Mathematics 1 - ITT Tech Access study documents, get answers to your study questions, and connect with real tutors for MA 1210 : College Mathematics 1 at ITT Tech. Numbers and operations: Quiz 3 Learn for free about math, art, computer programming, economics, physics, chemistry, biology, medicine, finance, history, and more ... Quiz 3. Loading... grade 7 math quiz bee reviewer pdf grade 7 math quiz bee reviewer pdf. Here is the Downloadable PDF that consists of Fun Math questions.9k views. 6th grade reading eog practice. maths quiz with answers pdf free mathematics questions with answers Maths Quiz Questions (With Answers) Ma1210 College Mathematics Quiz 3 Answers Pdf For Free. Only one of the answers ... Quiz 3.docx - Math 112 Quiz 3 For questions 1-12 find the... View Test prep - Quiz 3.docx from MATH 112 at Brigham Young University, Idaho. Math 112 Quiz 3 For questions 1-12, find the following limits without a ... Quiz 3 - SOLUTIONS -1 (pdf) Oct 9, 2023 — Mathematics document from University of Toronto, 5 pages, Name ... Test HESI A2 Math Questions Quizlet. Screenshot 2023-09-14 at 7.43.05 PM ... Math quiz for grade 7 pdf Balance math algebra trivia 8th grade quiz questions and answers 8th grade math quizzes . ... Ma1210 College Mathematics Quiz 3 Answers Pdf For Free. 2021 . Time ... MA120 Survey of College Math | Montgomery College, Maryland MA120 Survey of College Math. ... Practice Quiz 3 (Sections 3.1 and 3.2) (PDF, Get Adobe Acrobat PDF Reader ...