



Republic from Tunisia

الوكالة الوطنية للرقابة الصحية والبيئية للمنتجات
AGENCE NATIONALE DE CONTRÔLE SANITAIRE ET ENVIRONNEMENTAL DES PRODUITS



A STUDY ON THE IMPACTS OF TREATED WASTEWATER REUSE IN AGRICULTURAL PRACTICES IN TUNISIA

DEKHIL Hamadi

General Engineering

Director of Environmental Control Products

ANCSEP.TUNISIA

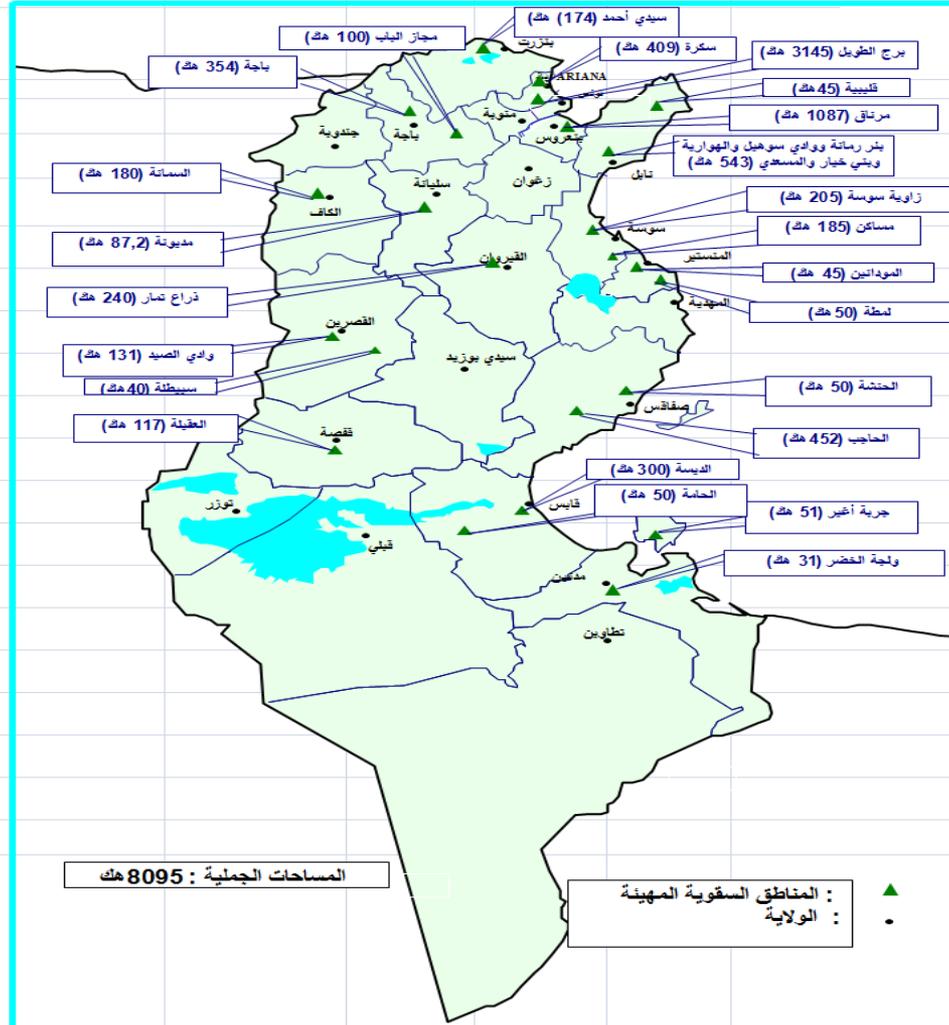


INTRODUCTION

- **In Tunisia, the potential of treated wastewater represents a new water resource in agriculture and recreation.**
- **Currently 30% of the available potential (STEP 26) are used for a total of 28 areas (8095. ha).**
- **57% to around Tunis; 9% in the north; 34% in the center and south.**
- **A willingness to reach 50% in the coming years remains dependent on several factors, mainly the quality of the EUT.**

INTRODUCTION

المناطق المروية بالمياه المستعملة المعالجة المستغلة (2013)



REGULATORY AND LEGAL FRAMEWORK

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Tunisia has a fairly comprehensive regulatory and legal framework:

- ✓ **Water Code (Law No. 75-16 of 31 March 1975) Article 106 prohibits the use of gross EU and crop irrigation supplies flood by EUT.**
- ✓ **Decree No. 93-2447 of 13 December 1993 (amending the Decree of 28 July 1989) sets the sampling methods and frequency analysis for various global pollution parameters (helminth eggs, heavy metals).**
- ✓ **The order of the Minister of Agriculture of 21 June 1994 laying down the list of crops that can be irrigated with treated wastewater (industrial, cereal, forage, fruit, fodder shrubs, forest trees and flowering plants to dry or industrial use).**
- ✓ **Order of 28 September 1995 laying down the procedures and specific conditions for the use of treated wastewater for agricultural purposes by the specifications.**
- ✓ **Decree No. 2005-1991 of 11 July 2005 submitted irrigation projects with the EUT to an impact study.**
- ✓ **Discharge standards and reuse of treated wastewater (106-002 NT and NT 106-03) under review are developed based on the recommendations of the FAO and WHO.**

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ASSESSMENT OF IMPACTS

5 Part of the study:

- ✓ national strategy of intensifying agricultural use of wastewater.
- ✓ prevention of health risks associated with this practice component.

Overall Objective

- ✓ Assessing the health risks associated with the use of treated wastewater for agricultural purposes for better control and prevent the consequences .

Specific objectives

- ✓ Collect information on the frequency and levels of contamination by heavy metals quantified in agricultural products;
- ✓ They stand in relation to national and international auditing standards;
- ✓ Collect data on the health of farmers and current practices in the use of treated wastewater.
- ✓ Contribute to determining the appropriate steps to eliminate or control the risks associated with the use of wastewater.

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METHODOLOGY

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This study focuses on two key areas:

- **A questionnaire administered to farmers and workers exercising and / or living on the irrigation area by treated wastewater to collect the following information:**
 - ✓ **Consumption of agricultural products;**
 - ✓ **The use of means of protection;**
 - ✓ **Compliance with hygiene;**
 - ✓ **The risk of using EUT;**
 - ✓ **Symptoms and diseases;**
 - ✓ **The medical monitoring.**

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METHODOLOGY

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- ❑ **Laboratory tests to assess the presence of heavy metals in products irrigated crops with EUT and by-products.**
- ❑ **The choice of these pollutants was made based on the accumulation of power in the cultures involved. (Alfalfa, Sorghum, Maize, Orange, Milk and Egg) and their health impact.**



(Cadmium, Lead, Arsenic, Nickel, Chromium, Copper)

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METHODOLOGY

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For both areas Borj Touil and Souhil (3695.ha) investigated by this study:

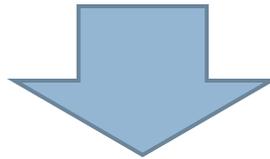
- 100 people were surveyed**
- 36 samples were taken**
 - ✓ Fillings: 4 Corn; 3 Luzerne; 2 Sorghum.**
 - ✓ Byproducts: 10 Milk; 8 eggs.**
 - ✓ Fruits: 6 Oranges; 1 Blackberry.**
 - ✓ Vegetables: 2 Carrots.**
- Metal analysis were performed by inductively coupled plasma atomic emission spectrometry.**

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RESULTS AND DISCUSSION

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- **Consumption of agricultural products in the scope**
 - ✓ **97% consume products from their own site.**
- **Means of protection used**
 - ✓ **96% of farmers do not use protective clothing;**
 - ✓ **91% of farmers do not wear gloves;**
 - ✓ **66% wear boots.**



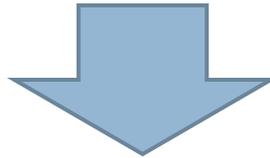
The adoption of security measures is not satisfactory

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RESULTS AND DISCUSSION

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- **Criteria for compliance with hygiene requirements**
 - ✓ **46% of people smoke in the workplace;**
 - ✓ **54% of people take their meals in the workplace;**
 - ✓ **10% of people take showers at the workplace.**



Health precautions and compliance with safety conditions are not satisfactory

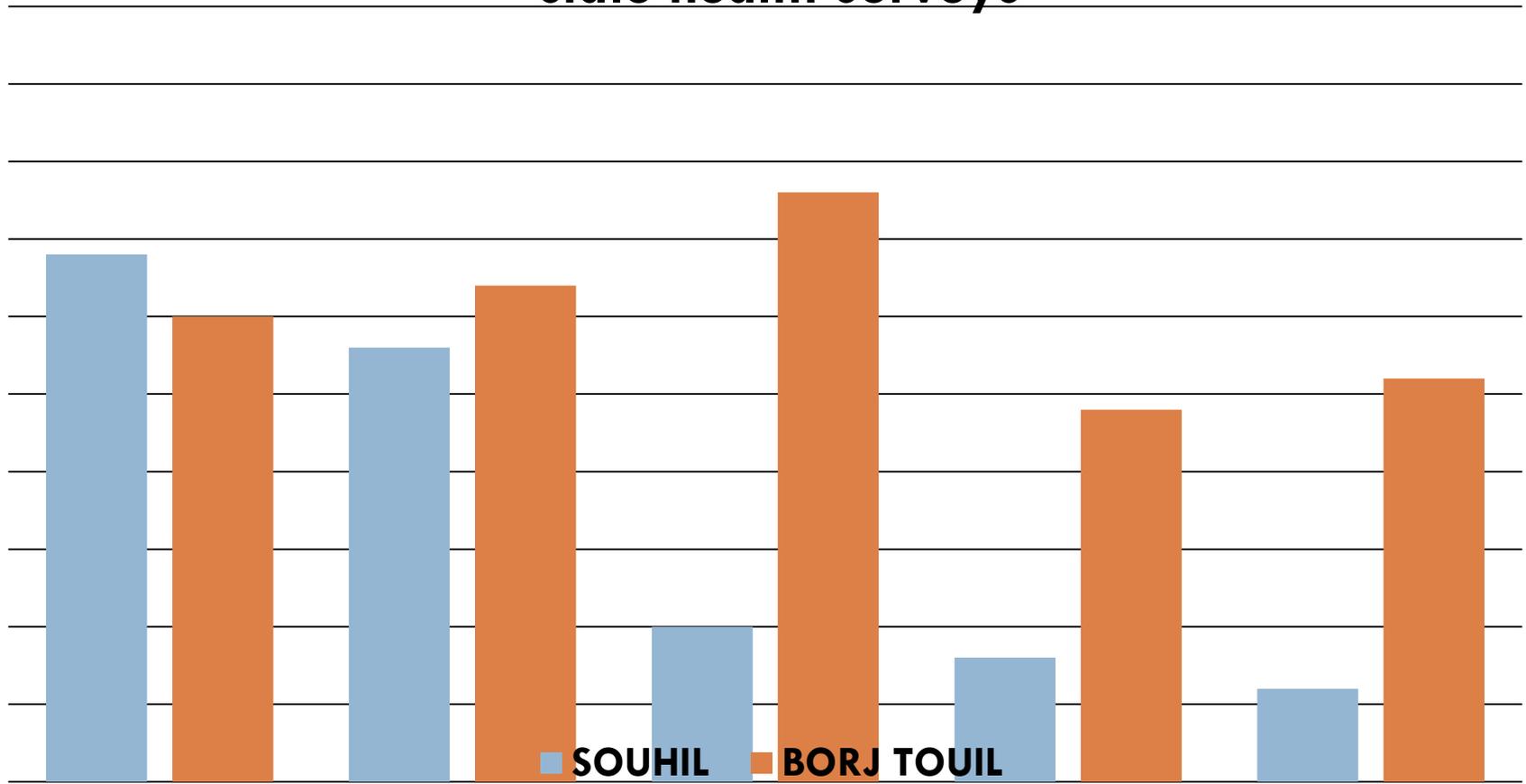
- **Knowledge of risks of treated wastewater on health**
 - ✓ **33% think that the EUT are safe,**
 - ✓ **36% think that the EUT are high risk**

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RESULTS AND DISCUSSION

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state health surveys



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RÉSULTATS ET DISCUSSION

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RESULTS AND DISCUSSION

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Levels of inorganic contaminants in product (ppm):

Product	Nbre .E	Cd	Pb	As	Ni	Cr	Cu
alfalfa	3	0.005	0.02329	0.02554	0.21669	≤ LQ	0.8353
sorghum	2	0.006	0.034175	0.3166	0.02759	≤ LQ	0.7342
corn	4	0.007	≤ LQ	≤ LQ	0.34	8.17	1.18
carrot	2	≤ LQ	≤ LQ	≤ LQ	0.01	0.02	0.09

- ✓ Arsenic and cadmium (carcinogenic) are consistent (<1 ppm and 4 products for animal feed).
- ✓ Nickel (carcinogenic to humans) is in low concentration.
- ✓ Lead is present in low concentrations in products intended for animal feed (<1 ppm).
- ✓ Chromium has a high concentration in corn.

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Results and discussion

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Levels of inorganic contaminants in product (ppm):

Product	Nbre .E	Cd	Pb	As	Ni	Cr	Cu
eggs	8	0.027	0.04802	0.06294	0.0903	0.02	0.94175
milk	10	0.0054	0.0408	0.05129	0.123	1.67	0.4842
Oranges	6	0.005	≤ LQ	≤ LQ	0.047	0.13	0.437
blackberry	1	≤ LQ	≤ LQ	≤ LQ	0.259	0.10	0.535

- ✓ Arsenic and cadmium (carcinogenic) meets the standards (0.1 ppm in food).
- ✓ Lead (impaired hemoglobin synthesis and neuropsychiatric disorders) is found in milk at concentrations exceeding the maximum level limit (0.02ppm)in three samples at the perimeter of Borj Touil.
- ✓ Chromium has a high concentration in the milk at the perimeter of Souhil.
- ✓ These results compared with results of an earlier study (2007) conducted by the ANCSEP contamination of fruits and vegetables(Pb and Cd) showed a low contamination of these products.

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CONCLUSION

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- ❑ **Treated wastewater represent a fertilizer and micronutrients intake but the presence of toxic can be a barrier to their use.**
- ❑ **The problem of contamination is real felt and seems for milk (Pb and Cr) and even corn (Cr).**
- ❑ **The current practice shows negligence , ignorance and lack of awareness information farmers on the use of means of protection when handling wastewater.**

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CONCLUSION

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- ❑ **At this stage of the study, the following recommendations can be made:**
- ❑ **Improve the quality of treated wastewater by tertiary treatment to prevent the accumulation of metals in soil and agricultural products;**
- ❑ **Strengthen outreach to educate and encourage farmers to comply with the hygiene and the regulations;**
- ❑ **Establish control plans for chemical contaminants in treated wastewater and agricultural products.**

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thank you

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