

Report on Pollution

2018-2019

Prepared by:

Dr. Michel Antoine Afram

- **PDG of the Lebanese Agricultural Research
Institute (LARI)**
- **Elected Chairman of the Board of trustees of
ICARDA**

Tal Amara 15/08/2019

Introduction:

Lari publishes every year a report on Pollution which is an indication of the Pollution situation in Lebanon.

The Pollution results may change during the year 2019, or the year after.

The results are not general, but are an alert about what is happening.

This report will be criticized by many people or politicians, “saying that it will affect tourism in Lebanon”.

For that reason, it is published at the end of August, the end of the tourism season.

But on the other side, I am obliged to publish these results, as I did for many years, because it is my duty as a scientist is to tell the Lebanese people the truth; and God help me!

PDG of LARI

Michel Afram

I want to highlight many problems to be taken into consideration:

1. The tanks water must be tested.
2. The schools water must be tested.
3. The hospitals water must be tested.
4. The nurseries water must be tested.
5. The hotels and restaurants water must be tested.
6. The water filters must be tested.
7. The city water must be tested.
8. Litani River and all the other rivers must be cleaned; they are all polluted.
9. Wells must be controlled.
10. Wells used for sewage must be completely shut.
11. Sewage must be treated.
12. Garbage must be treated. The sludge and organic matters must be tested.
13. Rain harvesting and water management (city, industry, agriculture), must be priorities to the government.
14. Water scarcity is a major problem.
15. Lari has all the laboratories needed, so it is unacceptable to say that Lebanon doesn't have laboratories.
16. Necessity of using Lari's laboratories.
17. Lari will be ready to clarify any comment.

Impact of heavy rainfall during 2018-2019.

1) Rainfall between 80% to 150% of the annual average.

2) This amount of rain didn't decrease the pollution because of:

- The cause of pollution (sewage ...) is still the same, it even increased.
- The rain took all pollution through the soil to the underground water.
- The rain pushes the rivers and pollution from them to the sea.
- Some pollution materials need water to solve them, so rain did it.
- This amount of water was mostly lost and went to the sea; 80% to 90%.

Lebanese Republic

Ministry of Agriculture

Lebanese Agricultural Research Institute (LARI)

Sustainability and rural development



2018-2019

1 - LARI is a governmental organization under the Supervision of the Ministry of Agriculture.

The Institute conducts applied and basic scientific researches for the development and advancement of the agricultural sector in Lebanon. In addition, the Institute keeps close ties with the farmers, and tries to develop research activities aiming at solving their problems.

2 – Research centers: Twelve centers located at different sites through out Lebanon.

Tel Amara: Headquarters.

Fanar- Tyre –Lebaa – Aabdeh – Kfarshakhna – Terbol – Kfardan- Hasbaia – Baaklin – Hermel – Kleiaat(Kesrwan).

3 - Personnel

500 employes, among which are 25 researchers (Ph Ds)

4 – Research: six research titles with 20 Research Divisions:

a- Plant Science:

Crop Production

Crop Protection

Plant Breeding

Seed Technology

Tissue Culture

Biotechnology

Pomology and Viticulture

Pasture and Forage Production

Medicinal Plants

b- Soil Science

Soil Fertility

Soil Biology and Biochemistry

c- Animal Science

Animal Health

Poultry Science

Ruminant Production

d- Environmental Sciences

Agrobiodiversity

Fate of Pesticides

Irrigation and Agrometeorology

Water Management

Climate Change

e- Food Science

Food Technology

Food Quality

f- Economics

Agricultural Socio-Economies

Food marketing and Agri-Business.

5 - Laboratories:

120 Departments and Laboratories.

6 - Services

Extended services for farmers: management of soil fertility, water consumptive use, plant pest and disease control, crop rotation, animal diseases treatment and prevention...

Analytical services of soil, plant, water, feed, fertilizers and pesticides.

Analytical quality control of food.

Production and distribution of foundation and certified basic seeds.

Production and distribution of improved and selected ruminants.

Field days involving participation of farmers.

Spread of agrometeorological data.

7 - Capacity Building for Graduate and Undergraduate Students

Scientific supervision of research projects

Technical trainings for 200 students per year.

8 -Magon

Edited by LARI, this journal welcomes original research papers concerning all aspects of agricultural Sciences.

9 - Meteo-Stations

LARI has 60 meteo stations covering all Lebanon. These stations are linked by GSM and Internet. They allow LARI to do:

- *Weather forecasts*
- *Early system warning for pests and diseases*
- *Fire forest warning (fire index)*

10 - National Conventions

Links with CNRS, Faculty of Agriculture at the Lebanese University; American University of Beirut; Saint-Esprit of Kaslik University; Saint-Joseph University-Taanail; Cooperation with NGO's.

11 - International Conventions and Networks

INRA (France)

CIHEAM (Italy)

Royal Botanic Gardens

French Universities

Italian Universities

Spanish Universities

WANA Seed Network

12 - International Cooperating Organisations

FAO, UNDP/GEF, IPGRI, ICARDA, ACSAD, UNEP, KEW GARDEN, ...

13- Address:

LARI - Tal Amara – Bekaa:

P.O.Box 287 Zahleh, Lebanon, Tel: 961 8 90 15 75 (76).

Fax: 961 8 90 00 77.

E-mail: lari@lari.gov.lb

Website : www.LARI.gov.lb

LARI - Fanar – Beirut- Lebanon:

Tel: 961 1 682473 / 6

Fax: 961 1 682474

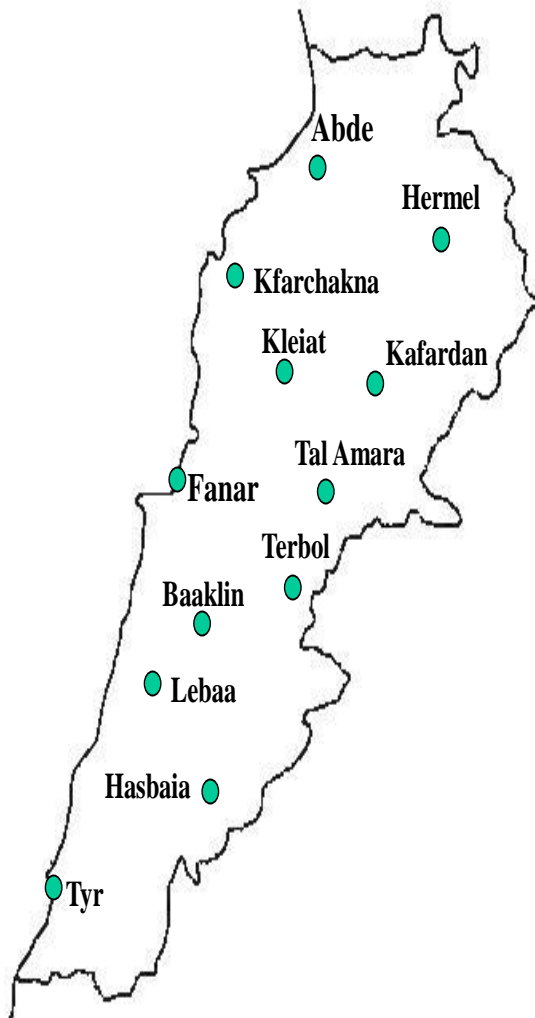
P.O.Box: 90 -1965 Jdeidet El Maten

<p style="text-align: center;"><u>Tyre:</u></p> <ul style="list-style-type: none"> ❖ Citrus. ❖ Exotic agriculture. ❖ Olive trees nursery ❖ Water Lab ❖ Soil Lab ❖ Oil Lab ❖ Honey Lab ❖ Food Lab ❖ Early warning system 	<p style="text-align: center;"><u>Abdeh:</u></p> <ul style="list-style-type: none"> ❖ Olive trees and olive oil ❖ Citrus. ❖ Plant Pathology. ❖ Plant Nutrition. ❖ Greenhouses. ❖ Water Lab ❖ Soil Lab ❖ Food Lab ❖ Honey Lab ❖ Early warning system. 	<p style="text-align: center;"><u>Fanar:</u></p> <ul style="list-style-type: none"> ❖ Animal Health. ❖ Vaccine production ❖ Microbiology. ❖ Food industry ❖ Plant protection: bacterial, virological. ❖ Water quality Lab ❖ Fertilizers Lab. ❖ Lab of nematodes. ❖ Agrobiodiversity ❖ Biotechnology ❖ Agricultural economics. ❖ Chemicals – food Lab. ❖ Water Lab ❖ Heavy metals Lab ❖ Chemical residues Lab ❖ Hormone and antibiotics Lab ❖ Mycotoxine Lab ❖ Early warning system ❖ Honey Lab 	<p style="text-align: center;"><u>Tal Amara:</u></p> <ul style="list-style-type: none"> ❖ General Administration. ❖ Central Laboratory: water-soil-fertilizers. ❖ Mycotoxine Lab ❖ Olive oil Lab ❖ Fruit trees. ❖ Plant Breeding and Improvement. ❖ Plant protection ❖ Poultry sciences ❖ Crop production ❖ Plant biotechnology ❖ Natural enemies ❖ Forage Lab ❖ Seed production ❖ Seed Bank ❖ Animal health ❖ Irrigation, water managements and agrometeorology.
<p style="text-align: center;"><u>Kfardan:</u></p> <ul style="list-style-type: none"> ❖ Wheat barley ❖ Legume production ❖ Forage production ❖ Fruit Trees ❖ Icarda Center ❖ Acsad Center ❖ Water Lab ❖ Soil Lab ❖ Oil Lab ❖ Honey Lab ❖ Early warning system. 	<p style="text-align: center;"><u>Hasbaia- Kleiaat- Baaklin:</u></p> <ul style="list-style-type: none"> ❖ Soil Lab ❖ Water Lab ❖ Oil Lab ❖ Honey Lab ❖ Fruit trees. ❖ Medicinal plants 		
<p style="text-align: center;"><u>Terbol:</u></p> <ul style="list-style-type: none"> ❖ Animal breeding. ❖ Animal production ❖ Icarda Center ❖ Acsad Center ❖ Milk Lab ❖ Early warning system 	<p style="text-align: center;"><u>Kfarshakhna:</u></p> <ul style="list-style-type: none"> ❖ Olive trees ❖ Irrigation technology ❖ Greenhouses ❖ Exotic Agriculture ❖ Water Lab ❖ Soil Lab ❖ Honey Lab ❖ Oil Lab ❖ Early warning system 		<p style="text-align: center;"><u>Hermel:</u></p> <ul style="list-style-type: none"> ❖ Icarda Center ❖ Acsad Center ❖ Water Lab ❖ Soil Lab ❖ Oil Lab ❖ Honey Lab ❖ Forages.

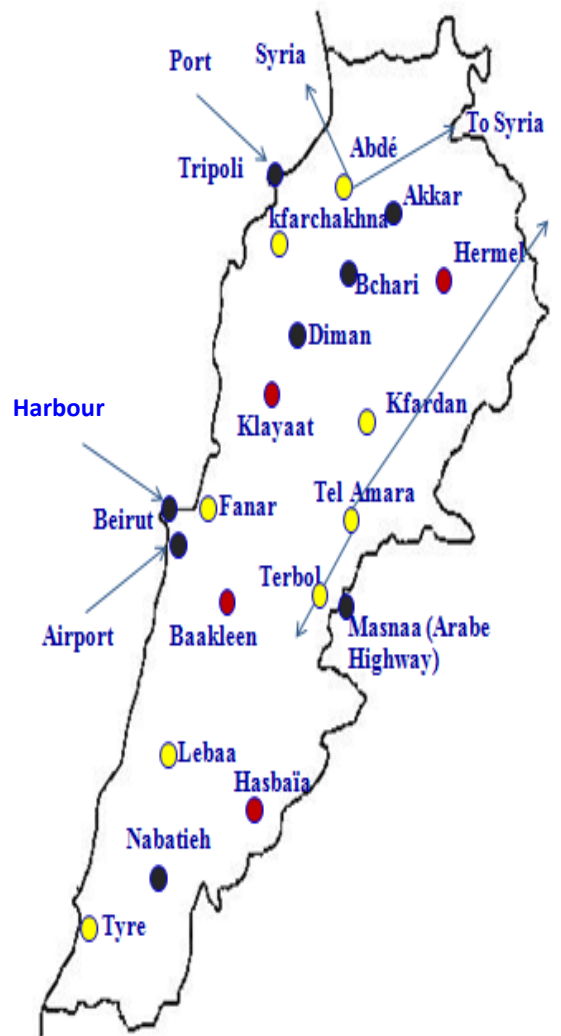


LARI Stations

2019



2020



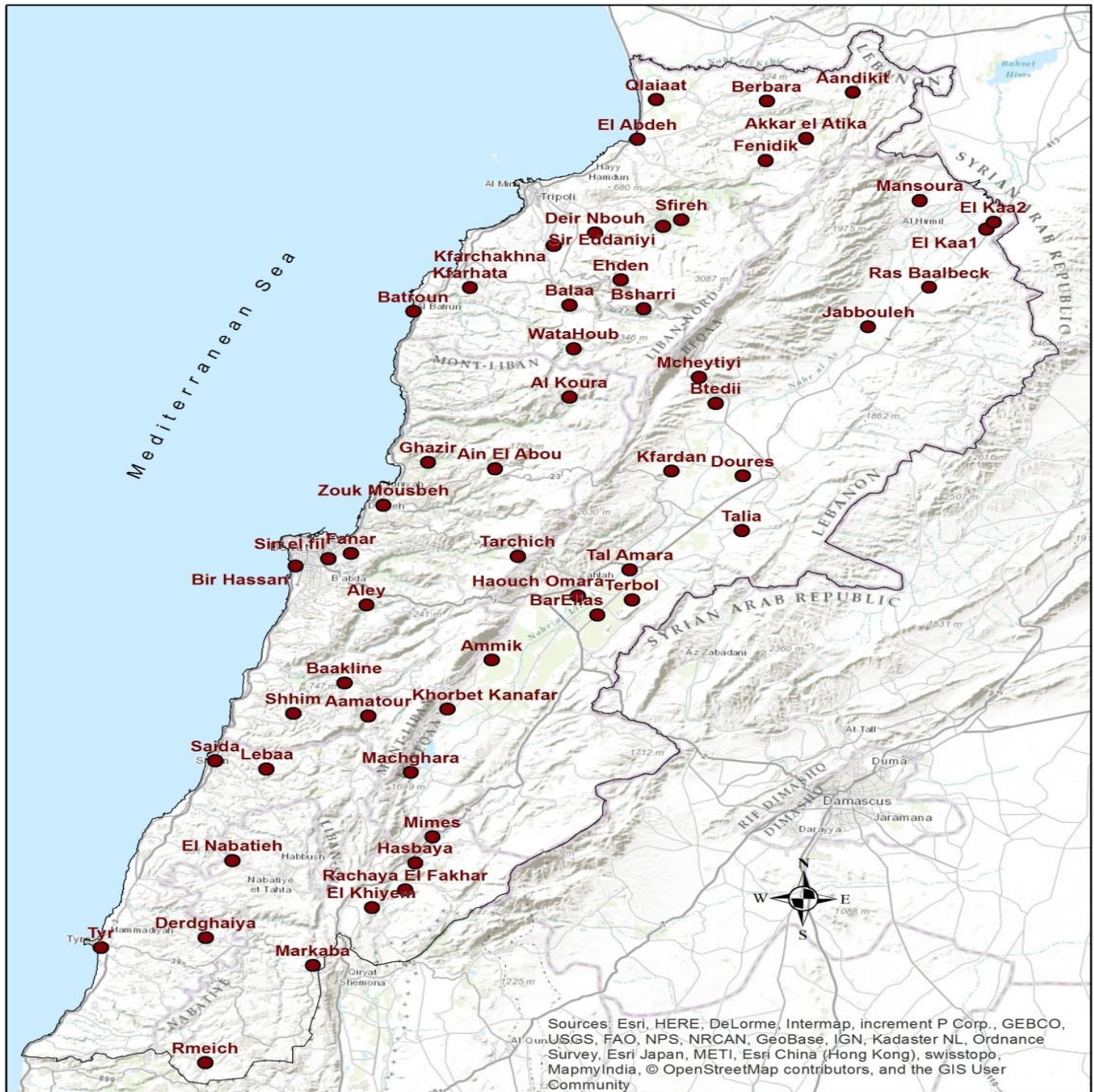
Lari has a network of 80 meteo stations covering all Lebanon,

To study:

- Water scarcity
- Water harvest
- Water management
- Water pollution
- Climate change



Location of LARI Weather Stations



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

العنوان: تل عمارة - رياق - زحلة - البقاع ص.ب. 287 - لبنان

هاتف: 961 8 901575 - 961 8 901576

التطبيق الذكي LARI - LEB

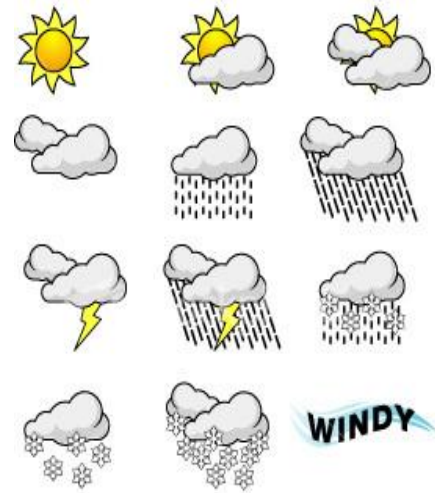
الموقع الإلكتروني: www.lari.gov.lb

البريد الإلكتروني: lari@lari.gov.lb فاكس: 961 8 900077

Smart Application Early Warning System

- Weather Forecast
- Pest and diseases
- Forest fire
- Drought
- Irrigation management
- Natural disasters
- Climate change

Lari-leb: Two times "Best Application" in the Arab world



Sea Water- 2019

Microbiological Results

	Escherichia Coli	Heavy metals
Jal el Dib	9000 not conform	Hg Pb
Karantina	20000 not conform	Hg Pb
Costa Brava	8000 not conform	Hg Pb
Ramle Baida	30000 not conform	-
Raouche	30000 not conform	Hg Pb
Bourj Hammoud	70000 not conform	Hg Pb
Chekka	30 conform	-
Dbayeh	7000 not conform	-
Daoura	7000 not conform	Hg Pb
Byblos	2000 not conform	-
Jounieh	40000 not conform	Pb

نتائج التحليل الجرثومي لمياه النهر:

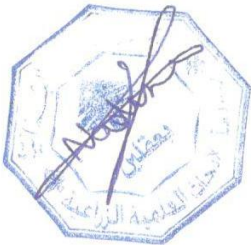
Results	Aerobic Germs	Aerobic Germs	Total Coliforms	Fecal Coliforms	Escherichia coli	Streptococcus group D	Pseudomonas aeruginosa
	(CFU/1 ml at 22°C in 72H)	(CFU/1ml at 37°C in 24H)	(CFU/100ml 37°C)	(CFU/250ml 44°C)	(CFU/250ml 44°C)	(CFU/250ml 37°C)	(CFU/250ml 37°C)
Method of testing	ISO 6222:1999	ISO 6222:1999	ISO 9308-1:2000	ISO 9308-1:2000	ISO 9308-1:2000	ISO 7899-2:1984	ISO 16266:2006
Limits recommended by SEQ-Eaux francais	-	-	1000	100	-	-	-
Water for irrigation	>200	>200	14,000	27,500	9,500	1,300	0

نتائج تحاليل المعادن الثقيلة لمياه النهر:

نوع التحليل	As زرنيخ	Pb رصاص	Cu نحاس	Hg زئبق	Fe حديد	Zn زنك	Mn منغنيز	Cd كادميوم	Cr كروم
الحد الأقصى المسموح به	0.1 mg/L	5 mg/L	0.2 mg/L	...	5 mg/L	2 mg/L	0.2 mg/L	0.01mg/L	0.1mg/L
Results mg/L	0.003	0	0.002	0.0053	0.007	0	0	0	0

N.B.:Limits by FAO recommended maximum concentration of trace element in irrigation water

النتائج عام: 2016 ، 2017 ، 2018 ، 2019 و 2019



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Norms

1- Heavy metals (Libnor 161: 1999)

Hg	0,001	mg/kg
Pb	0,01	mg/kg
	0,05	mg/kg
Cd	0,005	mg/kg
Zn	1	mg/kg
Cu	0, 5	mg/kg

2- Microbiology (ISO 6222: 1999)

germes aérobies	(22°C)	100
germes aérobies	(27°C)	20
Coliformes totaux	0	
Coliformes fécaux	0	
EC	0	
Entérocoques fécaux	0	
Staphylocoques	0	
Pseudomonas	0	
Salmonella	0	
Listeria	0	

3- Mercury (Hg) Very dangerous

- Problems in Brain
- Problems in new born
- Decrease in fertility
- Toxic to nervous system
- Genetical problems
- Heart disease
- Cancer

4- Lead (Pb)

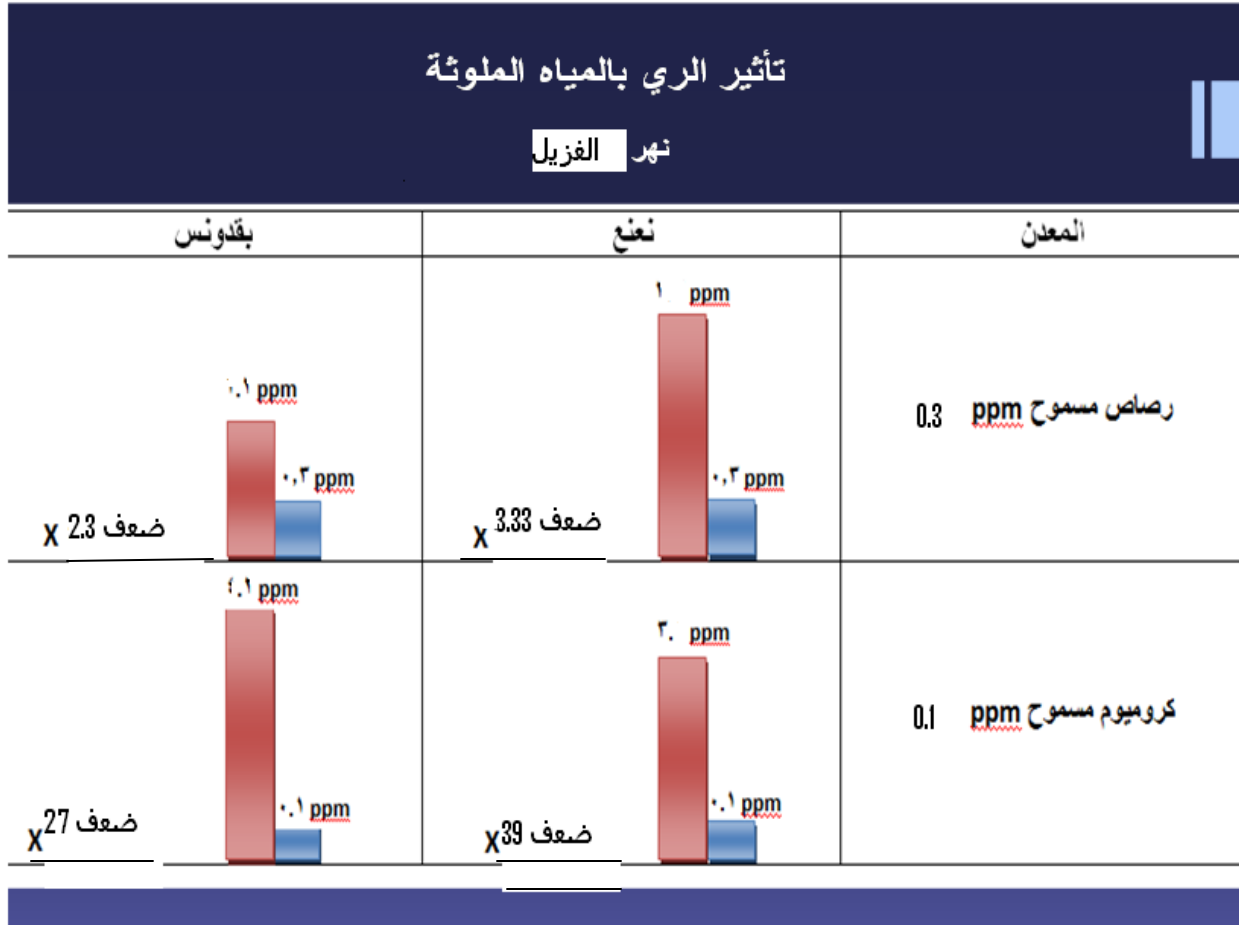
- Muscles problems
- Toxic to nervous system
- Cancer

- **Wells**

This is a big and dangerous problem:

1. No control of digging wells
2. No control of the depth of wells
3. No statistics about the number and places of wells
4. No information about the use of wells
5. A large number of wells through out Lebanon are used to get rid of sewage, so the underground water is completely polluted

In 2018, parsley and mint vegetables irrigated from Litani River contained 42 times more Chromium (Cr) and 12 times more Lead.



تأثير الري بالمياه الملوثة

نهر الليطاني

	بقدونس	نوع	المعدن
أضعاف 4 X	<p>1.2 ppm 0.3 ppm</p>	<p>2.7 ppm 0.3 ppm</p> <p>ضعف 12.3 X</p>	رصاص مسموح ppm 0.3
ضعف 42 X	<p>4.2 ppm 0.1 ppm</p>	<p>2.4 ppm 0.1 ppm</p> <p>ضعف 34 X</p>	كروميوم مسموح ppm 0.3

- **Results of water survey in Hasbaya and Marjeeyoun:**

13 samples were tested:

- 100% microbiological contaminated by sewage.
- 100% chemically contaminated by industrial sewage.
- 100% contains mercury (Hg).

- **Results of water survey in Baaklin (2018):**

10 samples were tested:

- 100% microbiological contaminated by sewage.
- 60% chemically contaminated by industrial sewage.
- 100% contains mercury (Hg).

- **Results of water survey in Baaklin (2019):**

15 samples were tested:

- 87% microbiological contaminated by sewage.
- 100% contains mercury (Hg).

From 2016 to 2019, the pollution has increased.

- **Results of water survey in Tyr:**

15 samples were tested from the city water and River's water:

City water:

- 73% microbiological contaminated by sewage.
- 82% chemically contaminated.
- 100% contains mercury (Hg).

River water:

- 100% microbiological contaminated by sewage.
- 50% chemically contaminated.
- 100% contains mercury (Hg).

- **Results of water survey in Keserwan and Byblos:**

13 samples were tested:

- 54% microbiological contaminated by sewage.
- 23% chemically contaminated.

- **Results of water survey in the city of Zahle:**

24 samples were tested:

- 40% microbiological contaminated by sewage.

- **Lari did a survey of the water quality in Hermel and the Assi River. We took 18 samples from Assi and different wells and springs.**

100% are contaminated with sewage Ec...

- **Results of water survey in Zgharta:**

24 samples were tested:

- 90% contain Mercury.
- 13% microbiologically contaminated

- **Results of water survey in official schools in Zgharta:**

We took water samples from 8 schools:

All of them do not conform to norms: microbiologically and mercury.

- **Results of water survey of different regions in Lebanon**

(springs, wells, ...):

All the 30 samples do not conform to norms; some contain mercury.

Sample from High Mountain like Laban Spring, Assal Spring, Yammouni,
Beyrouth...

- **Results of water survey of bottled water:**

We tested many bottled water coming from different regions of Lebanon:

All of them do not conform to the norms.

- **Results of water survey of restaurants and hotels water:**

Some samples do not conform to the norms.

- **Results of the nurseries and hospitals water:**

19 samples:

- 74% microbiologically contaminated
- 23% chemically contaminated.

Hospitals: surgery room, Intensive units, Kidney treatment.

- **Results of water survey from bakeries and flour mills:**

All samples do not conform to norms.

- **Results of water survey from Litani River and Qaraoun Lake:**

All samples do not conform to norms.

- **Results of water survey from some Rivers in Lebanon:**

River-City	Microbiological Contamination
Antelias	200.000
El Kaleb	800.000
Beyrouth	40.000.000
Ghzayel- Bekaa	100.000
Berdawni- Zahle	140.000
Jdita	34.000.000
Ibrahim	200.000
Awali	0,0038 + mercury (norm= 0,001)

- **Survey of irrigation water in organic farming**

Some samples contain mercury and salmonella.

- **Survey of water coming from different places:**

- Private companies : 34% do not conform
- Ministries: 47% do not conform
- Municipalities: 50% do not conform
- Private schools: 72 % do not conform
- Official school 26% do not conform
- Nurseries: 87% do not conform

Lari tested vegetables irrigated by Litani River water, they contained:

- 67% mercury
- 100% Arsenic
- 100% cadmium
- 17% Chrome
- 100% Lead

Water harvesting and Sewage treatment plant

In Tal Amara Station



Rain Harvesting



Sewage Treatment

- **Survey of compost and Sludge:**

Some samples contain Heavy metals like Manganese, Aluminum and Molybdenum.

- **Survey of Pool's water:**

July 2018 91% did not conform (Ec, Chlore)

August 2019 74% did not conform (Ec, Chlore)

- **Survey of Nargile and Tobacco:**

Water contains sewage.

Water contains 5 times Hg and 9 times Cd more than normal.

Tobacco: 50% does not conform: mycotoxine.

Tobacco: cigars, cigarettes: contain germs.

Tobacco: contains colorant.