

**JORDAN
NATIONAL
SITUATION
REPORT ON
HIGHLY
HAZARDOUS
PESTICIDES
(HHPS)**

**Land and Human to Advocate
Progress (LHAP)
August 2020**



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ACKNOWLEDGEMENTS

This work would not have been possible without the financial and technical support of IPEN. Land and Human to Advocate Progress (LHAP) is thankful to Mr. Ziyad Alalawneh, Sustainable Development Expert, who drafted the report with the support of Ms. Islam Hawamdeh. Special thanks to Ms. Hawamdeh for her logistical work.

LHAP is grateful to Jennifer Federico (Network Operations & Projects Coordinator, IPEN), Dr. Tadesse Amera (IPEN Co-Chair and Director of Pesticide Action Nexus-Ethiopia), Dr. Mohammad Khashashneh (Secretary General of the Ministry of Environment), Engineer Raed Bani Hani (representative of the Ministry of Environment in the Pesticides Registration Committee), and to Engineer (Ms) Nedal Gharyabeh (Ministry of Agriculture), who have shared their valuable knowledge and data about the designated fields, and without which the report would not be possible to produce.

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1. Introduction to Jordan

Jordan lies in the Middle East and the Arab world. The area of the country is 89,000 km², of which more than three-quarters is arid. There are three main geographic regions:

The Jordan-Valley Region (the Ghor) (2.25% of the total country area): This has the distinction of including the lowest region on the earth. The Dead Sea surface is ~400 m below sea-level. The climate is sub-tropical, hot and dry in summer and warm during winter, with monthly-average temperatures ranging between 16°C in winter and 35°C in summer. However, temperatures up to 50°C have been reached, in the shade, during summer. The Zarqa, Yarmouk and Wadi Shuib valleys and Jordan River are the major sources of water used for irrigation.

The Highland Region (the mountainous terrain) (19.94% of the total country area): The elevation of this region varies between 1000 and 1500 m above sea-level. The climate during summer is moderate and dry, whereas the winters are cold and rainy. The monthly-average temperatures are 10°C in winter and 30°C in summer. The region experiences the highest rainfall in the country; its annual average being approximately between 300 and 550 mm with occasional light snowfalls. Most (88 %) of the country's population lives in this region; the main cities and towns being located there.

The Badia Region (the desert) (77.37% of the total country area): This plateau extends eastwards from the highland region. Its elevation varies between 600 and 900 m above sea-level. It comprises most of the country and is linked with the Arabian Desert. The climate there is very hot, dry and dusty in summer and cold and dry in winter, with monthly-average temperatures of 5°C in winter and 37°C in summer. The maximum temperature during the summer months usually exceeds 40°C. The average annual rainfall is less than 50 mm, but the amount may vary significantly from year to year.

Jordan is divided into twelve administrative divisions, called governorates. On top of each governorate there is a governor. There are 15 main cities and about 600 villages. Jordan was primarily an agricultural country, but in recent decades the importance of the agricultural sector has declined both in terms of its contribution to the national income and as the main source of employment. The country has become more dependent on the manufacturing and service sectors, as well as upon tourism and transport activities.

The population (exceeding 10 million) of Jordan is highly urban. In 1952, only 39.6% of Jordan's population lived in urban areas. By 2002, the figure had reached 78.7%. This increase is largely a result of internal rural – to- urban migration, combined with the influx of refugees and migrants, mainly from Palestine, Iraq and Syria. The urban population within Amman, Irbid and Zarqa governorates now account for more than 8 million people.

1.1 General overview of Jordan and its agricultural activities

The real GDP growth of Jordan was 2.7% in 2012. In 2018, agriculture contributed around 5.63% to the GDP of Jordan (H. Plecher, Jan 8, 2020). The performance of the indicators related to the agricultural sector in 2012 showed that the value of agricultural exports increased by 7.8% compared to an increase of 17.4% in 2011.

In 2011, the percentage distribution of Jordanians employed at age 15+ shows that the agriculture, forestry and fishery sectors constitute 1.7% of the Jordanians employed in all economic activities in the country. In 2012, this percentage reached 2% (Department of Statistics- DoS). This sector is dominated by foreign workers, the majority of whom are Egyptians. The workers are mostly unskilled and mostly men. Women work mainly in harvesting and in grading carried out in packing houses.

The number of engineers registered in the Agriculture Engineers Association is 13,436 out, of which 45.7% are female.

Jordan has a land area of about 89,300 km², 90% of which receives rainfall of 200 mm or less. The arable land is estimated at 89000 km², which accounts for 10% of the total area of the country. Out of this area, only 36000 km² are utilized, which is around 40.5% of the arable land and 4% of the total area of the country.

The following table 1 shows the average annual rainfall in the different climate areas (MoA, Agriculture Development Program 2001-2010).

Table 1. Average annual rainfall in different climatic areas of Jordan

Climate Area	Average annual rainfall(mm)	Area (Km ²)	Area (percentage of the total area)
Semi-desert (Badiya)	Less than 200	80800	90.5
Dry area	200-300	4900	5.5
Semi-dry area	300-400	1700	1.9
Semi-humid area	More than 400	1900	2.1
Total	-----	89300	-----

Water is the most important resource for agriculture. Jordan is among the poorest countries in the world in terms of water resources. Water sources (total 1100 million m³) in Jordan consist of the following (in million cubic meter of water (m³)):

1. Surface water 300;
2. Renewable ground water 370;
3. Treated water 180;
4. "Peace Treaty" water 90;
5. Al Disi Basin (non-renewable ground water) 100; and
6. Desalination of ground water 60.

From the above sources, agriculture consumes 650 million cubic meters of water, which accounts for 60% of the total.

1.2 Main crops produced in Jordan

Agricultural products in Jordan consist of the following types:

- **Field crops:** wheat, barley, lentils, chickpeas, maize, clover trefoil, vetch-common vetch, and others.
- **Vegetables:** tomatoes, squash, eggplants, cucumber, potatoes, cabbage, cauliflower, hot pepper, sweet pepper, broad beans, string beans, peas, Jew's mallow, dry onion, and others.

- **Bearing trees:** citrus fruits, olives, grapes, fig, almonds, peach, apple, dates, palm, bananas, and others.
- **Livestock:** sheep, goats, cattle, and poultry.

1.3 National pesticide registration and control policy framework

The instructions no Z/18 for the year 2016 on registration, manufacturing, preparation, importing, handling and trade, issued in accordance with Article 21 of the Agriculture Law No. (13) of 2015 and its amendments, provide information on the Agricultural Pesticides Committee. The Committee is entrusted with the duty of selecting or specifying the kinds of agricultural pesticides that are permitted for circulation, and specifying their prices, specifications, and registration conditions, as well as conditions of their trade. The technical committee composed of representatives according to article (16): A. Pursuant to paragraph (E) in article (21) of the Agricultural law no. (13) of 2015 and its amendments, includes the director or deputy director and the following members:

1. A representative of the Ministry of Health
2. A representative of the Royal Scientific Society (RSS)
3. Two representatives of public Jordanian universities/ Faculty of Agriculture
4. A representative of the Ministry of Environment
5. Two members of the Union of the Traders and Producers of Agricultural Material
6. A representative of the National Agricultural Research Centre (NARC)
7. A representative of the Agricultural Engineers Association
8. The director of the directorate of the Plant Wealth Labs / the Ministry of Agriculture

The head of Pesticide Registration section must be a member and reporter of the committee. This committee is entrusted and formed as per the instruction for the purposes of:

1. Participating in the preparation of the instructions that monitor the process of production, import, export, and handling of agricultural pesticides, and following its implementation.
2. Securing the information, decisions and procedures of registering and handling the agricultural chemicals.
3. Registering the agricultural and public health pesticides.
4. Issuing import certificates of pesticides for the agricultural companies and following their renewal in cooperation with the agricultural directorates across Jordan.
5. Participating in and preparing the specific registration of biological pesticides.
6. Auditing, monitoring and filing registration certificates of pesticides and agricultural chemicals.
7. Executing the committee decisions:
 - a. Addressing companies with formal letters.
 - b. Issuing letters of pesticides samples analysis for registration purposes.
 - c. Studying the pesticides labels.
 - d. Receiving the fees and issuing the certificates.
 - e. Documenting the information electronically.

8. Registering of the pesticides entering Jordan, studying their potential risks and recommending prohibition of their entry if it was proven that they are harmful to human health and/or environment.

The Ministry of Agriculture started performing its role in controlling the import of pesticides at the beginning of 1966, when it adopted a classification based on the chemical group. The Persistent Organic Pollutant (POP) pesticides represented the largest quantity consumed (83,000 kg in 1966) (NIP update 2015). It should be noted that the majority of the POP pesticides were imported, not manufactured locally, except those designated as veterinary drugs. Local preparation of these started when the first pesticide factory was established to produce veterinary drugs in 1976.

Pursuant to the Pesticide Registration Committee's resolution in its meeting No. 68 dated 29/10/1980, a decision prohibiting POP pesticides was taken based upon studies carried out by the United States Agency for Environment Protection. The Ministry of Health acted strictly and promptly and stopped using DDT in 1993, and a decision prohibiting it completely was issued in 1995.

The Ministry of Agriculture plays an important role in the field of controlling pesticides. The first laboratory for pesticide residue analysis in agricultural products was established in 1982. This lab participates in implementing regional projects for the responsible use of pesticides, and contributes to studies conducted on residue analysis of imported pesticides, as well as locally-produced products. In addition, the pesticide analysis laboratory was established in 1986 and carries out quality control tests on pesticides on the basis of the FAO international standards.

1.4 Authorities responsible for the registration of pesticides, role of different Ministries in Jordan

The following table 2 shows the pesticides registration committee and their anticipated roles.

Table 2. The role of different authorities in pesticide registration and control in Jordan

Authority	Role
Ministry of Agriculture	Looks after agricultural chemicals and pesticides and public health pesticides
Ministry of Health	Looks after insecticides to use for public health in the country
Ministry of Environment	National focal point of the Basel, Stockholm, Rotterdam and Minamata Conventions, in addition to SAICM, to make sure registered pesticides are complying with the Conventions
University of Jordan	Academic institute that uses the outcomes of research and knowledge in the decision-making process.
National Research and Extension Centre	Educates farmers about the use of pesticides in addition to carrying out field studies.
Livestock Laboratories	Examines pesticides residues left on the livestock, and analyzes pesticides in terms of the active substance, physical and chemical properties (according to FAO and WHO specifications).
Agricultural Engineers Association	Educates their engineers and defends their rights.

1.5 International chemical conventions related with pesticides (Stockholm, Montreal Protocol, and Rotterdam) Jordan ratified and the name of the Designated National Authority (DNA) for each convention, and a focal person for SAICM

The following table 3 shows the authoritative focal point for the international conventions and the year of ratification, and includes SAICM and its focal point.

Table 3. Chemical conventions ratified by Jordan

International Chemical Convention	Focal point / Designated National Authority – Focal Person	Year of ratification
Stockholm	Ministry of Environment / Dr. Mohammad Khashashneh	08/11/2004
Montreal Protocol	Ministry of Environment / Dr. Mohammad Khashashneh	31/05/1989
Rotterdam	Ministry of Environment/ Dr. Mohammad Khashashneh	22/07/2002
SAICM	Ministry of Environment / Dr. Mohammad Khashashneh	2006

2. Status of pesticide use in Jordan

The following table 4 contains the quantities of agricultural pesticides classified (by kind) that were imported to Jordan in metric tons from 2002-2017.

Table 4. Quantities of agricultural pesticides imported in Jordan from 2002-2017

2.1. The list of nationally registered pesticides

Today Jordan has 1902 registered pesticide for all uses, out of which 190 are used for public health (MoA). **Annex 1 (Pesticides of all uses registered in Jordan)** covers the following points about registered pesticides:

- Registration number
- Pesticide group
- Common name
- Pesticide type
- Concentration
- Trade name
- Local company code
- Producing company
- Date of registration
- Date of expiration

The two tables below (5 & 6) show the number of registered pesticides and their imported quantities in metric tons per kind for the years 2016 and 2017 (DoS).

Table 5. Number of registered pesticides and their imported quantities in metric tons per kind for the year 2016

Kind of Pesticide	Quantity imported (Metric Ton)	Number of registered pesticides
Insecticides	370,7	55
Fungicides	411	38
Acaricides	65,3	35
Herbicides	128,1	12
Soil, store & seed fumigant	42,9	0
Public health	290,1	13
Oil	42,9	0
Rodenticides & molluscicides	17,5	0
Total	1368,5	153

Table 6. Number of registered pesticides and their imported quantities in metric tons per kind for the year 2017

Kind of Pesticide	Quantity imported (Metric Ton)	Number of registered pesticides
Insecticides	340,7	57
Fungicides	422,9	56
Acaricides	48,8	19
Herbicides	95,7	10
Soil, store & seed fumigant	94,6	0
Public health	138,3	11
Oil	16,8	0
Rodenticides& molluscicides	32,7	2
Total	1190,5	155

2.2 The list of HHPs amongst list of nationally registered pesticides

In Jordan, the pesticides national registration committee criteria for banning pesticides from the market are based on United States Environmental Protection Agency (US EPA), European Union (EU) and international conventions (Stockholm and Rotterdam) guidelines / text. No list in Jordan exists that is called “HHPs”; however, it could be that any of the pesticides that the registration committee decides not to register or to delete from the list of used pesticides in Jordan after some time of use is an HHP.

Most of the pesticides that are persistent organic pollutants listed in the Stockholm Convention were banned in Jordan before being used. Even those hazardous pesticides that are persistent organic pollutants but not listed in the Stockholm Convention were also banned in Jordan.

The Pesticides Section of the Plant Protection Department of the Ministry of Agriculture is the implementing authority of the Pesticides Ordinance, Pesticides Rules and the Pesticides Technical Committees decisions.

2.2.1 Active ingredients banned in Jordan (extracted from PAN's HHPs list of March 2019)

Jordan has banned a total of **19 pesticides**, which are listed in table 7 below and based on Pesticide Action Network's (PAN's) consolidated list of bans, in accordance with Annex III of the Rotterdam Convention. The table also shows, per each banned pesticide, the number of countries that have taken similar decisions, as follows:

Table 7. List of active ingredients of pesticides banned in Jordan

CAS No	Name of Active Pesticide	Total number of countries that have banned the pesticide per active ingredient
2425-06-1	Captafol	124
63-25-2	Carbaryl	35
1563-66-2	Carbofuran	63
57-74-9	Chlordane	141
50-29-3	DDT	135
141-66-2	Dicrotophos	34
115-29-7	Endosulfan	115
106-06-2	Ethylene dibromide / EDB / 1,2-dibromoethane	124
107-06-2	Ethylene dichloride / 1,2-dichloroethane	112
75-21-8	Ethylene oxide	102
640-19-7	Fluoroacetamide	122
319-8-6;319-85-7	Hexachlorobenzene / benzene hexachloride (HCB/BHC)	128
118-74-1	Hexachlorocyclohexane (HCH)	132
58-89-9	Lindane	120
7439-97-6	Mercury compounds: ethyl mercury chloride ethyl mercury (dihydrogen phosphate) / Ganosan M mercuric chloride / calomel / mercurous chloride mercuric dichloride mercuric oxide methoxyethyl mercury chloride (MEMC) phenylmercury acetate	129
7786-34-7	Mevinphos	36
6923-22-4	Monocrotophos	112
87-86-5	Pentachlorophenol (PCP) and salts	113
50471-44-8	Vinclozolin	31
Total bans in Jordan	19	

Jordan has also **banned 66 pesticides** (from the previous registered list) that are proven to have health and environmental impacts. This list is shown in table 10 presented in items 2.7 below.

2.2.2. Crops using HHPs

According to communication with Dr. Mohammad Khashashneh and the Ozone Unit in the Ministry of Environment, Jordan is still using methyl bromide to fumigate soil for the purpose of sterilization (to prepare the soil where farming will take place to ensure no pests are present in the soil and thus it is clean for planting). However, according to the same communication, Jordan is phasing down the use of methyl bromide. This year the amount allowed to use is equal to 9 tons, compared to the previous year (12 tons). By 2022, Jordan will phase out the use of methyl bromide completely.

The majority of 1902 pesticides (Herbicides, Fungicides, Bactericide, Miticide, Insecticide, Fumigant, Adjuvant, Bio-insecticide, Rodenticide, Termicide, Desert Locust, Snake Repellent, Ovicide, Nematicide, and Molluscicides) are used in the field of agriculture. Specifically, **1712 pesticides are used in the field of agriculture and the rest (190 insecticides) are used for public health**. Comparing the Jordanian list of pesticides to the PAN International List of HHPs March 2019, many are hazardous and are still in use. This is due to the fact that the Jordanian government thus far does not recognize the PAN International List of HHPs as a document upon which to base its decision-making about pesticide use.

2.3 General data on the volume of use of HHPs for agriculture

As noted above, the amount of methyl bromide allocated for use for this year is 9 tons. The quantity for use has been decreasing each year so that it is phased out by the year 2022. It was not possible to obtain the volume of use for the banned 66 pesticides listed in the below table in item 2.7. The following table is the list of HHPs (according to the PAN International List of Highly Hazardous Pesticides) that are still used in Jordan:

Table 8. List of pesticides of all uses that are still in use in Jordan that are considered HHPs as per PAN International's List of HHPs – March 2019

CAS Number (in accordance with PAN list)	Pesticides
94-82-6	2,4-D
71751-41-2	Abamectin
20859-73-8	Aluminum phosphide
35575-96-3	Azamethiphos
68359-37-5	Beta-cyfluthrin; Cyfluthrin
82657-04-3	Bifenthrin
10043-35-3	Boric Acid
56073-10-0	Brodifacoum
28772-56-7	Bromadiolone
1689-84-5	Bromoxynil
55285-14-8	Carbosulfan
50000-45-7	Chlorantraniliprole
122453-73-0	Chlorfenapyr
2921-88-2	Chlorpyrifos
5589-13-0	Chlorpyrifos-methyl
210880-92-5	Clothianidin

20427-59-2	Copper II Hydroxide
5836-29-3	Coumatetralyl
52315-07-8	Cypermethrin
94361-06-5	Cyproconazole
52918-63-5	Deltamethrin
333-41-5	Diazinon
62-73-7	Dichlorvos;DDVP
51338-27-3	Diclofop-methyl
60-51-5	Dimethoate
165252-70-0	Dinotefuran
155569-91-8	Emamectin Benzoate
133855-98-8	Epoconazole
66230-04-4	Esfenvalerate
80844-07-1	Etofenprox; Ethofenprox
22224-92-6	Fenamiphos
60168-88-9	Fenarimol
120928-09-8	Fenazaquin
122-14-5	Fenitrothion
39515-41-8	Fenpropathrin
134098-61-6	Fenpyroximate
51630-58-1	Fenvalerate
120068-37-3	Fipronil
90035-08-8	Flocoumafen
69806-50-4	Fluazifop-butyl
272451-65-8	Flufenoxuron
951659-40-8	Flupyradifurone
85509-19-9	Flusilazole
77182-82-2	Glufosinate-ammonium
	Glyphosate
78587-05-0	Hexythiazox
35554-44-0	Imazalil
138261-41-3	Imidacloprid
72963-72-5	Imiprothrin
173584-44-6	Indoxacarb
91465-08-6	Lambda-cyhalothrin
12057-74-8	Magnesium phosphide
121-75-5	Malathion
8018-01-7	Mancozeb
139968-49-3	Metaflumizone
137-41-7	Metam-potassium
950-37-8	Methidathion
2032-65-7	Methiocarb
16752-77-5	Methomyl
21087-64-9	Metribuzin
51596-10-2	Milbemectin
19666-30-9	Oxadiazon
23135-22-0	Oxamyl
42874-03-3	Oxyfluorfen
64741-88-4	Paraffin oils; mineral oils
1910-42-5	Paraquat Dichlorid
40487-42-1	Pendimethalin
52645-53-1	Permethrin
2597-03-7	Phenthoate
23031-36-9	Prallethrin
41198-08-7	Profenofos

31218-83-4	Propetamphos
60207-90-1	Propiconazole
96489-71-3	Pyridaben
13593-03-8	Quinalphos
124495-18-7	Quinoxifen
119738-06-6	Quizalofop-p-tefuryl
187166-15-0	Spinetoram
168316-95-8	Spinosad
148477-71-8	Spirodiclofen
3383-96-8	Temephos
7696-12-0	Tetramethrin
111988-49-9	Thiacloprid
153719-23-4	Thiamethoxam
23564-05-8	Thiophanate-methyl
129558-76-5	Tolfenpyrad
55219-65-3	Triadimenol
52-68-6	Trichlofon

There are **88 HHPs** among the list of registered pesticides still in use in Jordan.

2.4 General data on the volume of use of HHPs for non-agriculture (household and public health) purposes

The list of insecticides used for public health (Annex 2) provided by the Ministry of Agriculture was compared with the PAN International List of HHPs March 2019. The following table shows the results:

Table 9. List of insecticides used for public health that are still in use in Jordan and are considered HHPs as per PAN International's List of HHPs – March 2019

CAS Number (PAN)	Pesticides
35575-96-3	Azamethiphos
68359-37-5	Beta-cyfluthrin; Cyfluthrin
10043-35-3	Boric Acid
2921-88-2	Chlorpyrifos
52315-07-8	Cypermethrin
52918-63-5	Deltamethrin
333-41-5	Diazinon
155569-91-8	Emamectin Benzoate
122-14-5	Fenitrothion
51630-58-1	Fenvalerate
120068-37-3	Fipronil
138261-41-3	Imidacloprid
173584-44-6	Indoxacarb
91465-08-6	Lambda-cyhalothrin
121-75-5	Malathion
16752-77-5	Methomyl
52645-53-1	Permethrin
31218-83-4	Propetamphos
3383-96-8	Temephos
153719-23-4	Thiamethoxam
52-68-6	Trichlofon

21 HHPs are still in use among the list of registered pesticides for public health.

2.5 List of HHPs banned in other countries but in use in the country

PAN HHP's March 2019 list contains 310 highly hazardous pesticides. Tables 8 and 9 show the HHPs that are on that list but still in use in Jordan. As mentioned earlier, Jordan does not consider the PAN list as equal to the research that is generated from the US EPA and EU, and therefore, Jordan needs to recognize the PAN list in order to remove these pesticides from the market. This is something LHAP will work on to help the Ministry of Agriculture adopt PAN International's regularly published List of HHPs.

That said, more than 66 pesticides (shown in section 2.7) were banned in Jordan during the course of implementation after research from the US EPA and EU showed detrimental health and environmental impacts.

2.6 Human health, environmental impacts or human rights issues related with HHPs in the nation (NIP update 2015)

There are no real field studies about contamination of **air** by pesticides in Jordan. With regards to water polluted by pesticides, Jordan, like many other countries, has understood the magnitude of the problem and conducted several studies. All conducted studies showed that there was no contamination of drinking water with residues of chlorinated hydrocarbon pesticides. Research (*Pesticides residues in agricultural crops in southern governorates of Jordan in 2016*, Tawfiq M Al-Antary, Mahmoud A Alawi, Asmaa M Shadermah, Nezar A Haddad) has also been carried out related to pesticide residues (particularly chlorinated hydrocarbon compounds) in **soil and sediments**. All studies showed the availability of chlorinated hydrocarbon pesticide residues in soils of open fields and under green houses and in sediments of agricultural regions. Soil in some regions, particularly in Jordan Valley, has lost most of its fertility due to the intensive use of pesticides or the previous use of chlorinated hydrocarbon pesticides.

With regards to **wildlife**: No survey or study on the effects of pesticides, particularly chlorinated hydrocarbons, on wildlife such as birds, wild animals and honey bees have been carried out.

Regarding **agricultural commodities**: Some studies (Jordan's Draft National Implementation Plan update) showed the presence of chlorinated hydrocarbon residues in samples of local and imported vegetables, fruit trees and field crops.

2.6.1 Threat of pesticides on public health

Acute toxicity: The numbers related to pesticides poisoning (53 cases between 1997 and 2002) could not represent the actual status due to the lack of documentation for poisoning cases in hospitals and health centres. However, according to Jordan's Draft National Implementation Plan update, 27-69 % of poisoning cases indoors were due to pesticides handling and storing. Therefore, projects for improvement of poisoning documentation are needed.

Chronic toxicity: Jordan's Draft National Implementation Plan update also shows that banned chlorinated hydrocarbon pesticide residues were found in some samples of local or imported agricultural and food commodities. In addition, some chlorinated hydrocarbon pesticides were found (Alawi et al. 1992, Nasir et al. 1998) in imported and local animal products and mothers' milk. This data was interpreted as providing the possibility for the compounds to cause carcinogenic effects, mutagenicity, teratogenicity, feto-toxicity and reproduction effects. A total of 3362 cases of cancer were recorded (*Jordan's Draft National Implementation Plan* update) among Jordanians in 2000 and the number increased to 4187 in 2002.) There is as of yet no documented link between exposure to pesticides and cancer cases in Jordan; research studies and monitoring of pesticide residues, particularly chlorinated hydrocarbons in food studies, are needed to minimize the potential health risks.

Threats of pesticides on the environment: Pesticides, particularly chlorinated hydrocarbon compounds, have a number of adverse effects on the different environmental systems in Jordan and everywhere in the world. These effects lead to negative changes in the food chain. According to Jordan's Draft National Implementation Plan update, 0.1 % of the sprayed pesticide is able to reach the target. The remaining amount of pesticides goes to soil, water, air, wildlife and food chains. Chlorinated hydrocarbon residues in Jordan were found in soil, sediments and, in a few cases, in water. Eggs of several wild birds were not able to hatch due to the effect of DDT on its calcium. Residues of some chlorinated hydrocarbon pesticides were detected in fish in Jordan Valley. The actual threats of pesticides, particularly chlorinated hydrocarbon, on the environment needs to be further studied to decrease its threat in Jordan.

Socio-economic implications of pesticides on workers and local communities: Field surveys done by the Ministry of Environment in 2004 showed that still a small percentage of farmers use banned chlorinated hydrocarbon pesticides, particularly Aldrin, Dieldrin, Toxaphene and DDT. A study by the University of Jordan concluded that most of the people living in the Jordan Valley surroundings are highly aware of the disadvantages of pesticides on health and environment, but are not able to avoid the hazardous effects due to their existence in the vicinity of agricultural regions. The survey covered 96 farmers in the Jordan Valley, the pesticide usage by farmers aimed to increase profit gained from crop yield by decreasing financial cost and increasing incomes, ignoring the side effects on public health and environment. Most farmers take the needed information about pesticides from agricultural engineers of the Ministry of Agriculture (31.3%), their own experience (20%), extension bulletins (13.3 %) and from national media (9.5%). This means that the agricultural engineers always need to be highly educated with the necessary knowledge about pesticides. 23% of the farmers harvest their crops without considering the waiting period for pesticides. This leads one to conclude that economic aim for farmers is more important than public health of the community and environment, to improve their economic status by increasing the profits. Some farmers believe that the more they use pesticides, the more crop yield they will have. According to the study, about 65.5% of the farmers believe that the customers know of pesticide residues in crops and, in spite of that, they continue buying them. Farmers will continue using pesticides, despite the fact that some of the consumers might not buy their crops that are treated with pesticides. Farmers believe also in continuing the use of pesticides, despite the increase in pesticide price. The possibility of improved economic

status appeared to be a very important factor in use of pesticides by farmers. Additionally, the use of pesticides might decrease the need for laborers, particularly for getting rid of weeds, fungi and insects. Literate farmers use pesticides more than others, but they do not know enough about the disadvantages and proper use of pesticides.

2.7 The precautionary principle and provisions to phase out HHPs, ban pesticides and deregister the already-registered pesticides

Jordan's policy to ban pesticides is based on chemicals conventions' requirements, and, as previously mentioned, US EPA and EU bans. Therefore, according to the Ministry of Agriculture, the Pesticides Registration reviews pesticides banned in the EU and the US and then takes a similar action. The list in table 10 below (source: Ministry of Agriculture) contains pesticides that are banned by the Ministry of Agriculture of Jordan, as well as the date of banning and the reason for banning as follows.

Table 10. Pesticides banned in Jordan

Name Of Banned Pesticide	Date of Banning	Reason for Banning
2,4,5-T	-----	Based on PIC list
Alachlor	-----	No approval by the pesticides registration committee due to its negative effect on soil and water
Aldicarb	-----	Due to pesticide toxicity and to its long-term accumulative effects and its high risk of use on vegetables
Aldrin	-----	Based on PIC list
Azinphos Ethyl	-----	Due to high pesticide toxicity
Binapacryl	-----	Based on PIC list
Captafol	-----	Based on PIC list
Carbaryl	-----	Due to pesticide genetic mutation and being suspected of being carcinogenic and impact on the genital organ performance
Carbofuran	-----	Based on PIC list
Chlordane	-----	Based on PIC list
Chlorobenzilate	-----	Based on PIC list
Chlorodimeform	-----	Based on PIC list
DDT	-----	Based on PIC list
Dicrotophos	-----	Due to high pesticide toxicity and to its long-term residues impact with high risk to apply on vegetables
Dieldrin	-----	Based on PIC list
Dimefox	-----	Due to high pesticide toxicity and to its long-term residues impact with high risk to apply on vegetables
Dinoseb & Dinoseb Salt	-----	Based on PIC list
EDB (1,2-Dibromoethane)	-----	Based on PIC list
Endosulfan	-----	Pesticide contains chlorinate hydrocarbons, suspicious of being carcinogenic and detected in underground water
Endrin	-----	Due to pesticide high toxicity, long accumulation of residues effect and the high risk of use on vegetables
Ethylene Dichloride	-----	Based on PIC list
Ethylene Oxide	-----	Based on PIC list
Fluoroacetamide	-----	Based on PIC list
Fonofos	-----	No approval by the pesticides registration committee due to its

		high toxicity
Heptachlor	-----	Based on PIC list
Hexachlorobenzene	-----	Based on PIC list
Lindane (Gamma Hch), Mixed Isomers	-----	Based on PIC list
Methamidophos	-----	Based on PIC list
Methyl Isothiocyanate	-----	Due to its high toxicity on Environment (surface water) and because it one of the chlorinate hydrocarbons
Methyle Parathion	-----	Based on PIC list
Methylene Chloride (Solvent)	-----	Due to high toxicity of the solvent on human health
Mevinphos	-----	Due to high pesticide toxicity
Monocrotophos	-----	Based on PIC list
Parathion	-----	Based on PIC list
Pentachlorophenol	-----	Based on PIC list
Phosphamidon	-----	based on PIC list
Dicofol	-----	Because of being the pesticide from the chlorinated hydrocarbons and has an impact on human health and the environment
Nonylphenyl Exthoxylate	-----	Due to being one of the substance of having negative impact on health and the environment
Methomyl 90%	2011/3/29	Due to being one of the substance of having negative impact on health and the environment
Propargite 57%	2011/1/13	Due to being one of the substance of having negative impact on health and the environment
Dichloropropene 94%	2010/11/23	Due to being one of the substance of having negative impact on health and the environment
Paraquat	2013/3/24	High toxicity
Propoxur	2012/9/30	Carcinogen according to USEPA
Procymidon	2013/12/8	Carcinogenic according to USEPA and has long term accumulative residue on vegetables
Fipronil	2014/4/3	Prohibited for agriculture use due to its long accumulative residue effect, allowed for public health use on white ants only.
Triazophos	2015/4/29	Long accumulative residue effect and not registered in the EU
Ethion	2016/2/22	Cancelled by US EPA and EU
Flusilazole	2016/3/30	Cancelled by US EPA and EU
Carbosulfan	2016/7/24	Cancelled by US EPA and EU
Bendiocarb	2016/7/28	Cancelled by US EPA and EU
Carbendazim	2016/8/14	Cancelled by US EPA and EU and carcinogenic according to US EPA
Azocyclotin	2016/8/14	Cancelled by US EPA and EU, has negative impacts on human health and contain tin compounds
Fenbutatin Oxide	2016/8/14	Cancelled by US EPA and EU, has negative impacts on human health and contain tin compounds
Iprodione	2016/8/14	Has negative impacts on health and environment and carcinogenic according to US EPA
Ethoprophos	2016/8/14	Carcinogenic according to US EPA
Chlorfenapyer	2017/5/16	Misuse
Atrazine	218/7/26	Negative impacts on human health and the environment
Acephate	2018/3/28	Cancelled by US EPA and EU

Benomyl	218/8/30	Cancelled by US EPA and EU
Zineb	07/02/2019	Cancelled by US EPA and EU and has negative impacts on human health
Maneb	07/02/2019	Cancelled by US EPA and EU and has negative impacts on human health
Propineb	07/02/2019	Cancelled by US EPA and EU and has negative impacts on human health

2.8 Companies/associations representing the pesticide industry in Jordan

Jordan, according to the Ministry of Agriculture, has 18 manufacturing pesticide companies, which are shown in Annex 3. The majority of their production is for export. 225 companies are importing pesticides.

3. National endeavours to phase out HHPs

3.1 Projects/programs and campaigns to phase out HHPs

Official authorities of the government of Jordan, led by the Ministry of Agriculture, are not dealing with HHPs as such, but all types of pesticides that prove to be harmful to human health and the environment are banned, in addition to the pesticides banned by the international conventions. There are awareness-raising activities in the Ministry of Agriculture targeting farmers to make them generally aware of the toxicity of pesticides, as all are toxic. The Ministry of Health does the same by educating users of public health pesticides about the risks associated with the use of pesticides. The Ministry of Environment does not have any awareness-raising campaigns to tackle pesticides in general. As mentioned above, the University of Jordan conducted pesticides sampling of soil and crops and revealed a drop in concentration since there were banned a long time ago.

Scientific knowledge about identification of impacted populations or environments, estimated scale and magnitude of threats to public health and environmental quality, and social implications for workers and local communities are significantly insufficient. In general, these issues are lacking research and studies in Jordan.

3.1.1 Alternatives to HHPs used in Jordan

The majority of farmers use pesticides to control pests; however, there are sporadic initiatives by farmers using integrated pest management (mainly the ones who export their yield outside the country). In addition, there are individual farmer initiatives considering organic farming.

3.2 Main challenges in the process of campaigning the phasing out of HHPs

One of the major challenges is the large number of pesticides registered (1902 pesticides) and in use in the market. Moreover, the process of deleting and adding new pesticides is hard for the educators and farmers to follow up.

The government is the only entity that can ban HHPs; moreover, its duty is to carry out general educational programs about toxic pesticides. Jordan therefore needs to develop and frequently update a list of HHPs for ban and phase-out and carry out comprehensive awareness-raising activities.

3.3 Recommendations and project ideas that support the national HHPs phase out

The following is recommended:

- Jordan, represented by the different governmental authorities, needs to create a list of HHPs by comparing the registered pesticides to the PAN HHPs list updated every 6 months. This may require the Ministry of Agriculture / Pesticides Registration Committee to adopt the PAN HHPs list as a reference document and follow every new, updated version. This means that the Pesticides Registration Committee needs to add an additional reference for banning pesticides listed in PAN's List of HHPs.
- The governmental authorities- MoA, MoH and MoEnv -need to launch a general awareness and education program addressing farmers about workers handling pesticides, with a focus on HHPs in Jordan (all pesticides should be included, but with a special focus on those that are banned). The awareness campaign should cover the following items:
 - Pesticides' chemical, physical, analytical, toxicological, physiological characteristics and economic implications. Hazardous properties and effects of pesticides before farmers use them, their mechanisms of action, toxicity to humans, toxicity to pests, side effects on non-targets, pathways of transportation, metabolism, degradation and contamination of food, soil, water, air, wildlife and natural enemies to pests, and long-term effects on human and environment.
 - The transportation and storage of pesticides must be subject to laws. A complete inventory of all pesticides in a storage area is essential. All pesticide stocks must be examined periodically for leaks, spills, or any sign of deterioration.
 - The proper handling and disposal of empty pesticide containers is the responsibility of the person, company or other organization that used and emptied the full containers. Improperly managed empty containers may become a serious safety hazard to people, livestock, pets, wildlife, fish and birds. Empty containers may contaminate water, soil, air and food.
 - Pesticide residues in food commodities, in addition to soil, air and water, should also be taken into consideration for their significant importance.
 - Existing regulations for controlling the smuggling of banned pesticides.
- It is worthwhile for the Ministry of Agriculture, which is leading the national efforts about pesticides through its national pesticides committee, to review the current regulations for reform and update.
- In view of the fact that Jordan has endorsed its Agricultural Organic Law for the year 2016, the MoA needs to enforce this law to encourage growers and farmers to decrease their dependence on the use of pesticides. This could be applied by promoting Integrated Pest Management and Organic Agriculture practices, and non-chemical alternatives, including agro-ecological methods.

- Jordan, through the governmental authorities, need a continuous enabling program for farmers, agriculture workers and workplace managers to ensure safe use procedures.
- Support needs to be provided to help NGOs do parallel or joint work to the governmental authorities to educate, train, monitor and raise awareness about pesticides with farmers, agriculture engineers and public health officers, in close cooperation and collaboration with these authorities.
- More studies are needed to examine the impact of pesticides on the air, water, soil and vegetables. Scientific knowledge about identification of impacted populations or environments, estimated scale and magnitude of threats to public health and environmental quality, and social implications for workers and local communities should be obtained.