Chlorpyrifos, Country Situation Report, Nepal

Executive Summary

The Federal Democratic Republic of Nepal is a landlocked sovereign state located in Asia. Nepal has a surface area of 147,181.48 km^2 and is located in south Asia. This Himalayan country borders China in the north and India in the south, east, and west. Nepal is among the least developed countries and is one of 47 landlocked countries in the world. Nepal's population as of 1st July 2022 is 30,225,582 people, with a net increase of one person every minute.[1] Agriculture is the leading sector of the Nepalese economy, providing employment opportunities to around 65% of the total population and contributing about 27% to the GDP.

Chlorpyrifos, among the top 10 most used insecticides in Nepal, is a widely used organophosphate insecticide applied to control many different kinds of pests, including termites, mosquitoes, and roundworms. It is a developmental neurotoxin pesticide, which kills insects (insecticide) by blocking an enzyme in their nervous system that is also present in the nerve cells of humans and other animals. Chlorpyrifos is strongly linked to brain damage in children. This means the neurotoxicity of chlorpyrifos is not limited to insects. Farmers and their families are the first groups experiencing the negative health impacts of its use.

As per the records of the Government of Nepal, Ministry of Agriculture and Livestock, Plant Quarantine and Pesticide Management Center (PQPMC), a total of 2506.0 kg (DP, GR) of active ingredients (a.i) of chlorpyrifos in solid form, 8054.25 liters (EC) of liquid chlorpyrifos and 72289.29 liters of a mixture of chlorpyrifos and cypermethrin of different composition (EC) of a.i. were imported in the last physical years 2077/78 (Mid July 2020 to Mid July 2021). **Chlorpyrifos comprises almost 50% of the total amount of insecticides imported into Nepal.**

Chlorpyrifos is a widely used organophosphate group of insecticides in Nepal registered for the first time in 2000. It is widely used in Nepal for different crops such as barley, wheat, paddy, grams, yellow lentil (Mung), peanuts, sugarcane, cotton, mustard, brinjal, cabbage, cauliflower, onions, potatos, oranges, etc. with different active ingredients.

With the increased use of chlorpyrifos, there is also increased evidence of the impact of chlorpyrifos on human health and the environment.

One study revealed a very high concentration and associated hazardous share is with chlorpyrifos in Nepal. Out of the 23 tested analytes, 14 residues (approximately 61% of the tested analytes) were detected. About 97% of the tested vegetable samples contained at least one analyte. The observed concentration of **chlorpyrifos** in eggplants, tomatos, and chilli pepper samples ranged from 1.19 to 45.3 µg/kg (41% of the samples), 1.07–1772 µg/kg (94% of the samples), and 1.29–491 µg/kg (81% of the samples) respectively. The residues of triazophos, omethoate, **chlorpyrifos,** and carbendazim exceeded the EU MRLs. Chlorpyrifos was present in 44% of the tomato samples (10.6–1772 µg/kg) and 19% of the chilli samples (10.5–491 µg/kg), which exceeded the EU MRL. **Likewise, chlorpyrifos was present in 25% of the tomato samples and**

[1] Nepal Population 2022 (Demographics, Maps, Graphs) (worldpopulationreview.com)

4% of the chilli samples exceeded the Nepalese foodstuff MRL (50 µg/kg). Furthermore, adolescent and adult dietary exposure using hazard quotient (HQ) and hazard index (HI) were also evaluated for different pesticides, including chlorpyrifos. **HQ> 1 was observed for chlorpyrifos in all vegetables consumed such as eggplants, tomatoes**, and **chillies** included in the study**.** Out of all HQs, the highest acute HQ (HQ) was for triazophos (tomatoes) in adolescents (aHQ=657) and adults (aHQ=677), showing the highest risks of foodstuff exposure. The cumulative foodstuff exposure showed a higher HI for organophosphates (HI>83) and a lower HI for organochlorines, acaricides, and biological insecticides (HI<1)[2].

A study related to chlorpyrifos researched the health effects of pesticides by asking farmers about the eighteen signs and symptoms of pesticide poisoning. **Out of 628 participants, 317 participants (50.5%) complained about discomfort immediately after spraying pesticides. About 43.7% of the participants complained of headache, followed by blurred vision 25.4%, back pain 24.3%, and dizziness and nausea 19.7%.** More than one-tenth of the interviewees complained of dry mouth, skin irritation, and muscular illness and less than one-tenth of participants suffered from extreme tiredness, loss of appetite, respiratory difficulties, and speech difficulty (Aryal KK, et.al, NHRC, 2016) [3].

The government of Nepal has implemented an Integrated Pest Management (IPM) Program to minimize the use of pesticides in the country. However, farmers misuse and overuse pesticides in the agriculture sector. Organophosphate insecticides are commonly used pesticides in Nepal that inhibit the neurotransmitter acetylcholinesterase and affect the central and peripheral nervous systems. Organophosphate and organochlorine affect the endocrine system, which can lead to diabetes mellitus[3].

Nepal has different legal provisions related to the use of pesticides. Pesticide Act and Rule 1991 and 1994 and Pesticide Act 2019 regulate the import, manufacture, sale, distribution, and use of pesticides within the country and aims to prevent risks to human and animal health, and matters connected herewith. Nepal ratified the Stockholm Convention, Basel Convention, and Rotterdam Convention to minimize environmental pollution and manage agrochemicals, including pesticides. At present, the Government of Nepal (GoN) has banned 24 chemicals (Chlordane, D.D.T, Dieldrin, Endrin, Aldrin, Heptachlor, Mirex, Toxaphene, B.H.C., Lindane, Phosphamidon, Organomercury fungicide, Methyl parathion, Monocrotophos, **Endosulfan,** Phorate, Carbofuran, Dichlorvus, Triazophos, Dicofol, Carbaryl, Benomyl, **Aluminum Phosphate and Carbosulfan**) due to their toxicity, persistence, tendencies of accumulation and biomagnifications and long-term serious threats to human and environmental health.

The Government of Nepal, Ministry of Agriculture and Livestock Development (MoALD) has also adopted an Integrated Pest Management (IPM) approach since 1997 to support the reduction of poverty and ensure food security and environmental protection in a sustainable way (6). IPM field schools were organized in 63 out of 75 districts aiming at minimizing the use of pesticides and protecting human health and the environment. The Department of Food Technology and

2 Bhandari, G. et.al., Pesticide residues in Nepalese vegetables and potential health risks, Environmental Research, Volume 172, May 2019, Pages 511-521, https://doi.org/10.1016/j.envres.2019.03.002

[3] Aryal KK, Neupane S, Lohani GR, Jors E, Neupane D, Khanal PR,Jha BK, Dhimal M, Shrestha BM, Bista B, Poudyal A, Karki KB. Health Effects of Pesticide among Vegetable Farmers and the Adaptation Level of Integrated Pest Management Program in Nepal, 2014. Kathmandu, Nepal: Nepal Health Research Council, 2016.

Quality Control regularly monitors pesticide residues in food products. The GoN has launched several initiatives to reduce health hazards and environmental impacts caused by the use of pesticides. However, various studies have revealed that farmers do not have proper knowledge on how to apply pesticides and are not properly following procedures during application. Many of them handle pesticides without using personal protective equipment (PPE), because there are no appropriate ones for existing weather conditions, and dispose of waste materials in an improper way, because there is no mechanism to collect waste generated by pesticide trade (Aryal KK et.al. NHRC, 2016).

The country adopted IPM, which helps reduce the use of chemical fertilizers and pesticides. Furthermore, Nepal is a party to all important Multinational Environmental Agreements (MEAs) related to chemicals and waste such as Basel, Rotterdam, and Stockholm Conventions for more than a decade, and will hopefully move along with the BRS COPs on the banning of chlorpyrifos.[4]

We had a meeting with the Focal Point of the Plant Quarantine and Management Centre, Dr. Shahadev Pd Humagain, and Mr. Manoj Pokhrel, Senior Plant Quarantine Officer, to obtain information about the import and export of chlorpyrifos in Nepal.

Different studies have revealed the impact of chlorpyrifos on human health, aquatic ecosystems, edaphic (soil) ecosystems, etc. Varied levels of residues of this insecticide are found in crops such as vegetables-eggplants, chilli, tomatoes, and even farm soil.

Farm soil pesticides are still registered in the country, no initiatives are controlling their import, sale, distribution, and use as such. However, the Government of Nepal has now planned to study the alternatives to these pesticides. It has planned to ban the chlorpyrifos pesticide in the near future. Hence, first of all, they need to study the prices and effectiveness of alternatives and their socioeconomic impact on farmers. Additionally, with the increase of IPM, agriculture extension, farmer schools, and promotion of biological pesticides, the country is dedicated and determined to reduce the overall use of pesticides in agricultural sectors.

[4] Ram Charitra Sah, Review of Status of MEAs to which Nepal is Party.