Toxic Blooms: Impacts of Pesticides on Children in the Floriculture Industry in Tamil Nadu, India

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Toxic Blooms: Impacts of Pesticides on Children in the Floriculture Industry in Tamil Nadu, India

Introduction

India, with an estimated market size of around USD 4.9 billion in 2017, is the fourth largest global producer of pesticides after United States, Japan and China. India's share in the global pesticide market is around 10%[1]. There has been a vast expansion of pesticide use throughout India, especially among commercialised production in irrigated or bore well dependent systems. Data from the Department of Agriculture, Cooperation, and Farmers Welfare show that pesticide usage in India jumped from 47,020 tonnes in 2002 to 60,280 tonnes in 2014. Paddy accounts for the largest share of pesticide use (around 26 to 28%) followed by cotton (18 to 20%) (Gadhe, 2017). Meanwhile, pesticide use in floriculture is expected to rise as the industry continues to expand because of its potential to provide quick returns to farmers. However, it uses vast amounts of toxic pesticides in all stages of production. The floriculture industry uses children in its employ, with their small hands ideal for picking flowers. These child labourers thus become exposed to highly hazardous pesticides (HHPs) as a result.

PANAP's report on the results of Community-based Pesticide Action Monitoring (CPAM) in Tamil Nadu, India surfaced disturbing facts of children's rights violations in the floriculture industry that need to be addressed and brought to the attention of the National Human Rights Commission and the relevant agencies of the Government of India.

1 CARE Ratings, 2017 taken from PANAP. (2018). Of rights and poisons: Accountability of the agrochemical industry. Retrieved from https://panap.net/2018/10/of-rights-and-poisons-accountability-of-the-agrochemical-industry/

Children in floriculture industry were reported to pluck flowers in pesticide-sprayed fields, and also live in areas exposed to spray drifts. They were observed to pluck flowers with no protective gear, enter or work in the fields immediately after the spraying, and mix pesticides and a chemical powder (preservative) with bare hands. Children between ages 9 to 13 were among the workers at the time of the CPAM.

Children are particularly vulnerable because they utilise more air, food, and water per unit of body weight, which means they are more exposed to the environment contaminated by pesticides as compared to adults (PANAP, 2014). Exposure to pesticides can damage children's rapidly changing bodies. Even low levels of exposure in the womb up to early childhood can disrupt important biological processes, harming children's physical and mental development, and can lead to lifelong consequences (Marquez et al., 2016). Labouring in the flower fields and consequently being exposed to pesticides violates children's right to life, health, and clean environment. These rights are enshrined in India's Constitution, as well as in different conventions that India signed.

The Constitution of India guarantees the right to life and liberty; prohibits the practice of debt bondage and other forms of slavery; prohibits the employment of children below 14 years old in factories, mines, and other hazardous occupations that include the handling of pesticides; and requires the state to "direct its policy toward securing" the rights of children vis-à-vis their health and their opportunity to develop themselves. There are enacted laws that reinforce these rights. Party to several conventions, including the UN Convention on the Rights of the Child (UNCRC), India is also obligated to address forced labour, debt bondage and child servitude; protect children and young persons from economic and social exploitation; and ensure to the maximum extent possible the survival and development of the child.

However, India's reservations on child labour (explained in Section B), weak monitoring and implementation of laws, and lack of accountability on the part corporate manufacturers and pesticide retailers contribute to the continuing violations of children's rights through child labour and exposure to pesticides. To date, Union Carbide, the company responsible for the Bhopal disaster, has not yet been held accountable while residents and children still continue getting exposed to the pesticides in the abandoned factory. On the other hand, the lack of effective monitoring on the pesticide retailing practices contributes to children's increased risk of exposure. In a previous study done by PAN India, some retailers decant hazardous pesticides into polythene bags without any label or instructions, do not facilitate the safe disposal of empty containers, and even give improper advice to farmers on mixing pesticides and using them for non-approved purposes.

This report builds on the information in the publication *Of Rights and Poisons*, and further looks into the victims' conditions and fills in the information gaps with regards to children's exposure to pesticides.

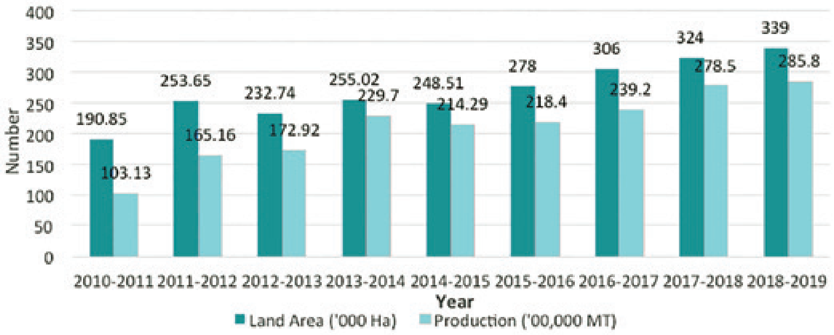
B. Background

Floriculture Industry in India

India has a long tradition of floriculture. Evidence of systematic growing of flowers to be used for various cultural practices, including religious, can be found in ancient Sanskrit texts (Dadlani, 1998). When India adopted economic liberalisation policies in the 1990s, floriculture production was identified as a priority sector and granted a 100% export oriented unit (EOU) status. EOUs engaged in floriculture export and import enjoy tax benefits in the form of exemptions, tax holidays, etc. (Pachpande, 2012). This ushered in the continuous increase of land devoted to floriculture as well as in the volume of production (see Figure 1).

The National Horticultural Board's data for 2017 to 2018 show that India has around 324,000 hectares of land cultivated for flowers (National Horticultural Board [NHB], 2019). The Board's estimates for 2018 to 2019 indicate that this land area increased to 339,000 hectares. The same database also shows that the production of flowers increased from 2.392 million metric tons (MMT) in 2016 to 2017, to 2.785 MMT in 2017 to 2018. Estimates for 2018 to 2019 indicate that production further increased to 2.858 MMT.

Figure 1. Floriculture Land Area and Production in India



Source: National Horticultural Board

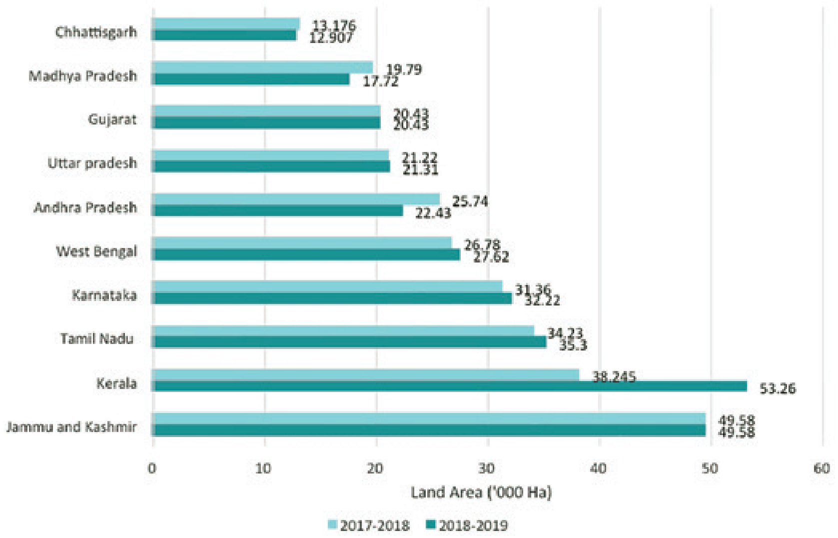
In 2018 to 2019, India exported 19,726.57 MT of floriculture products to the world for the worth of Rs. 571.38 Crores (81.94 Million USD) (Agricultural and Processed Food Products Export Development Authority [APEDA], 2019). The major export destinations are United States of America (USA), Netherlands, United Kingdom, Germany, and United Arab Emirates.

Some of the cultivated floriculture crops are rose, carnation, chrysanthemum, gerbera, gladiolus, gypsophila, liatris, nerine, orchids, archilea, anthurium, tulip, lilies gerberas, gaillardia, marigold, tuberose, jasmine, and aster.

The increasing domestic and international demand for floriculture products has attracted not only small holder farmers into switching to flower farming, but also big Indian corporations such as RPG Group, Harrison Malayalam, Oriental Floriculture, and Tata which have set up joint production and marketing tie-ups with Dutch companies (Pachpande, 2012). In 2015, the governments of Israel and India set up 29 centres of excellence to assist India's agricultural production, including floriculture under the bilateral agreement Indo-Israel Agricultural Project (IIAP) (Embassy of Israel-Delhi, 2015). In 2017, Israel and India inaugurated a centre for excellence in floriculture Thally in Krishnagiri district of Tamil Nadu (Consulate General of Israel in Bengaluru, 2018).

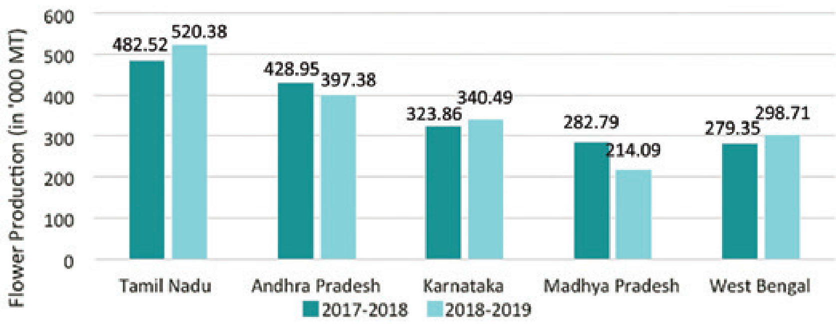
In 2017 and 2018, Jammu and Kashmir, Kerala, Tamil Nadu, Karnataka, and West Bengal were the top five Indian states with the largest land areas devoted for floriculture (see Figure 2). For both years, Tamil Nadu produced the highest volume of flower products (See Figure 3).

Figure 2. Top 10 States with Largest Land Areas for Floriculture



Source: National Horticultural Board

Figure 3. Top Five Largest Flower Producers (in ‘000 MT)



Source: National Horticultural Board

Child Labour and the Floriculture Industry

While there are no exact numbers of how many children are involved in the floriculture industry of India in general and in Tamil Nadu in particular, it is noteworthy that India has a high number of working children—around 10.1 million according to the 2011 census by the government (3.9% of 259.6 million in 2011) (International Labor Organization [ILO], 2017). Most of these child labourers are working in the agricultural sector either as main workers or as marginal workers who usually help their families work in the fields. Cases of slavery/bonded labour in flower farms have also been reported. In 2014, the International Justice Mission (IJM) and local authorities rescued four boys between the ages 9-15 from slavery in a rose farm located in the outskirts of Bangalore, India (IJM, 2015).

India’s laws and international commitments related to child rights have altogether failed to prevent the occurrence of child labour in the growing floriculture industry. India has signed and ratified ILO core conventions on labour, including those on child labour. These include the Forced Labour Convention (No. 29), Abolition of Forced Labour Convention (No.105), Equal Remuneration Convention (No.100), Discrimination

(Employment Occupation) Convention (No.111), Freedom of Association and Protection of Right to Organise Convention (No.87), Right to Organise and Collective Bargaining Convention (No.98), Minimum Age Convention (No.138), and Worst forms of Child Labour Convention (No.182) (Vikaspedia, n. d.).

Additionally, India has also ratified the United Nations Convention on the Rights of the Child (UNCRC) in December 1992. Article 7 of the CRC states that States Parties "recognize that every child has the inherent right to life" and that they "shall ensure to the maximum extent possible the survival and development of the child. Article 24 expresses the signatory countries' recognition of children's right to enjoy the highest standard of health, and to facilities for the treatment of illness and rehabilitation of health. Article 32, emphasizes "the right of the child to be protected from economic exploitation and from performing any work that is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral or social development." However, India made a declaration regarding Article 32, wherein it said that:

"While fully subscribing to the objectives and purposes of the Convention, realising that certain of the rights of Child, namely those pertaining to the economic, social and cultural rights can only be progressively implemented in the developing countries, subject to the extent of available resources and within the framework of international co-operation; recognising that the child has to be protected from exploitation of all forms including economic exploitation; noting that for several reasons children of different ages do work in India; having prescribed minimum ages for employment in hazardous occupations and in certain other areas; having made regulatory provisions regarding hours and conditions of employment; and being aware that it is not practical immediately to prescribe minimum ages for admission to each and every area of employment in India - the Government of India undertakes to take measures to progressively implement the provisions

of Article 32, particularly paragraph 2(a), in accordance with its national legislation and relevant international instruments to which it is a State Party." (International Commission of Jurists, 1994).

HAQ Centre for Child Rights (HAQ CRC, 2015) criticised India's continued reservation to the Article 32 of the UNCRC, describing it as a lack of political will and commitment to the realisation of children's rights. This continued reservation is reflected in India's Child Labour Prohibition and Regulation Act which was amended in 2015 by the Cabinet. The approved amendments to the law make it allowable for minors under 14 years old to work in family businesses under the conditions that the nature of the work is not hazardous and is not done during school hours. This was met by criticisms from child rights activists who feared that this would slow down efforts to curb child labour in India and increase girls' drop-out rate from schools which is higher than boys (Singh, 2015). According to HAQ CRC (2019, pp. 6-7), "in absence of strong monitoring process, this provision gets diluted and a number of children are engaged in household (family-based) enterprises even during their school hours," and "the list of hazardous occupations too has been diluted and restricted to factories, mines and explosives. This is a regression from the past, when 85 occupations and processes had been declared as hazardous under the previous legislation by the Government of India."

Meanwhile, India's constitution has provisions related to protecting children from child labour. These include the Right to Education (Article 21 A), and the prohibition of employment of children in factories and hazardous employment (Article 24). Under Article 39, the State takes on the mandate to ensure that the health and strength of workers, men and women, and the tender age of children are not abused and that citizens are not forced by economic necessity to enter avocations unsuited to their age or strength.

As part of India's National Child Labour Policy, the Government is implementing the National Child Labour Project Scheme (NCLP) to rehabilitate child labourers and help them get back to school (Ministry of Labour and Employment, n. d.). However, weak monitoring, underreporting, and low conviction rates for cases of child labour continue to contribute to the problem of implementation of relevant laws on child labour.

C. Methodology

On 5-13, August 2019, staff from Pesticide Action Network Asia Pacific and local partner Society for Rural Education and Development (SRED) visited Tamil Nadu to conduct data gathering and validation on children's exposure to pesticides through using the Community-based Pesticide Action Monitoring (CPAM).

CPAM is a participatory action research approach to document and create awareness of pesticide impacts on human health and the environment. It involves community members who undertake the research, and encourages organising and action. CPAM involves recording of the impacts of pesticide use on health and raising awareness of the hazards of pesticide use. (See Appendix 1 for a short description of CPAM)

The field work was done in Thiruvallur District which is one of the top jasmine-producing areas in Tamil Nadu. Floriculture as an export industry started to develop during the 1990s as the government pushed to expand the industry to respond to globalisation. Flowers grown in the district are sold by the farmers to shops in the city which supply exporters. Currently, there are more small holder family-owned flower farms than the ones owned by land lords.

This research is exploratory in nature since the effects of pesticide use in Thiruvallur district is not well studied, including the impacts of pesticide use on the children who work alongside their parents on the flower farms. The research aims to describe the emerging effects of pesticides on children and the farmers as the floriculture industry grows in the district. It also aims to give a snapshot on the practices of farmers and retailers in handling pesticides, as well as to the kind of pesticides are children and farmers exposed to.

Before conducting the field work, SRED identified children, farmers, and retailers of pesticide products who can be interviewed for the CPAM through purposive sampling. SRED identified the children interviewees from those who participated in their organisation's programmes for women and children. The parents of the 24 children who participated in the study gave their consent. The farmers were selected from a list of recommendations by the local farmers' movement that SRED works with. The retailers, on the other hand, were selected through their willingness to be interviewed.

SRED trained community members on how to use the CPAM application to assist the research team in data gathering. The organisation also ensured the presence of a human rights lawyer who can be consulted by the research team in facilitating the signing of the consent forms by the parents; and a medical doctor who will check the conditions of the children and verify their illnesses if needed, or identify health clinics or other ways wherein the team can get information on the health condition of children.

Hard copies of the CPAM questionnaire were translated into the local language were provided for the interviewees, while the research team used the CPAM App to record the data. Consent forms translated into the local language, including for the children involved in the research, were also provided. The team discussed the nature and purpose of the research, and ensured that these consent forms were properly understood by the participants before being filled up.

D. Results & Discussion

D.1. CHILDREN

Demographics

The 24 children (n=24) who were interviewed worked in the flowers fields of Thiruvallur District. They were between ages 9 to 13 (see Figure 4) and studied in middle school located in the district. Majority of the children interviewed were girls (see Figure 5).

Figure 4. Age

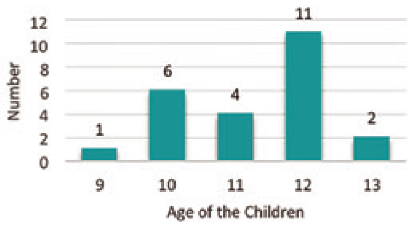


Figure 5. Gender

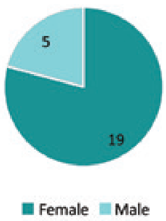


Photo 1. Children as young as nine inhale toxic pesticide fumes as they work on flower farms to augment their families' meager income

Exposure to Pesticides

Knowledge of When Pesticides were Sprayed

Majority of the children are aware when pesticides are being sprayed and have attempted to stay away. All of the children knew when pesticide is being sprayed through seeing the actual spraying being done (n=21), by mixing or spraying the pesticides themselves (n=19), and through the scent (n=7) of the pesticides being sprayed (see Figure 6).

Almost half of the respondents were able to either smell or feel the substance on their skin and eyes when pesticides were sprayed (n=11) (see Figure 7).

More than half of the children tried to keep away from the pesticide spray by staying indoors (n=9) and avoiding the fields sprayed with pesticides (n=5). A third of the children (n=9) did not do anything special after being aware that pesticide was being sprayed (see Figure 8).

Figure 6. Awareness When Pesticides are Sprayed

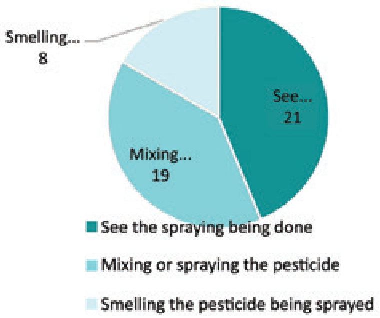


Figure 7. Smelt/Felt the Pesticides on Skin or Eyes

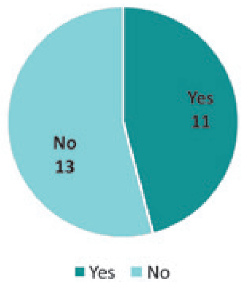
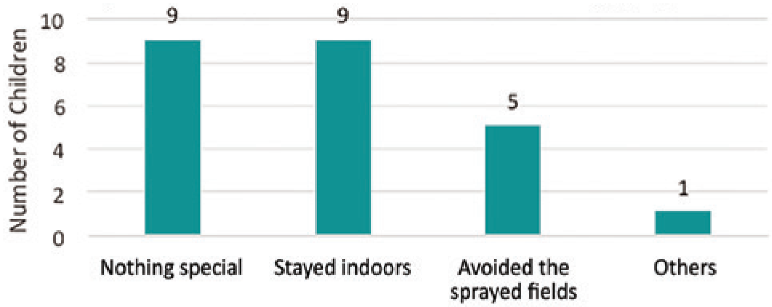


Figure 8. Actions Done While Pesticide was being Sprayed



Direct Contact with Pesticides

Although only three children confirmed that they spray pesticides, almost all of the children came into direct contact with pesticides through working in the fields (n=23) (see Figure 9). These children pluck flowers in fields sprayed with pesticides to supplement their meager family income.

Their small hands are quick and suited for plucking flowers, and so they are preferred by local landlords. Meanwhile, small farmer families often need the extra pair of hands and mobilise their own children to save on costs.

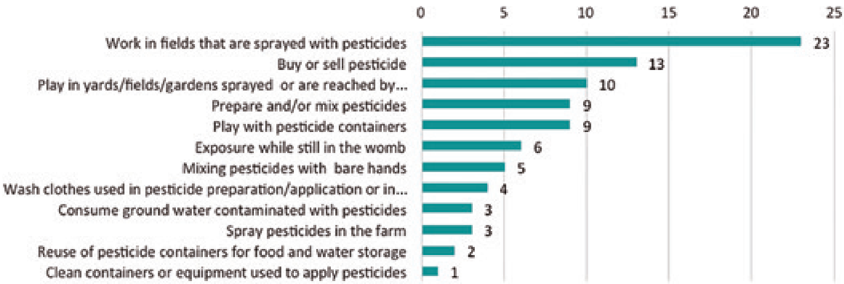
Buying/selling pesticides is also done by more than half of the children (n=13). Meanwhile, almost half of the children spend their leisure time by playing in areas that have been sprayed or are reached by pesticide drift (n=10), and playing with pesticide containers (n=9). Children are also exposed through preparing and/or mixing pesticides (either doing it on their own or helping in the process (n=9)).

Other means by which the children came into contact with pesticides were mixing the pesticides with bare hands (n=5); washing clothes that

Photo 2. Children smell toxic fumes while playing outside their homes, situated beside flower fields where pesticides are sprayed

were used during pesticide preparation/application or in pesticide sprayed farms (n=4); reusing of pesticide containers for food and water storage (n=2); and cleaning containers or equipment used to apply pesticides (n=1). The children also said that they had exposure while still in the womb (n=6) and this was confirmed by the parent. Similarly, they also mentioned consuming ground water that has been contaminated with pesticides (n=3).

Figure 9. Means of Contact with Pesticides

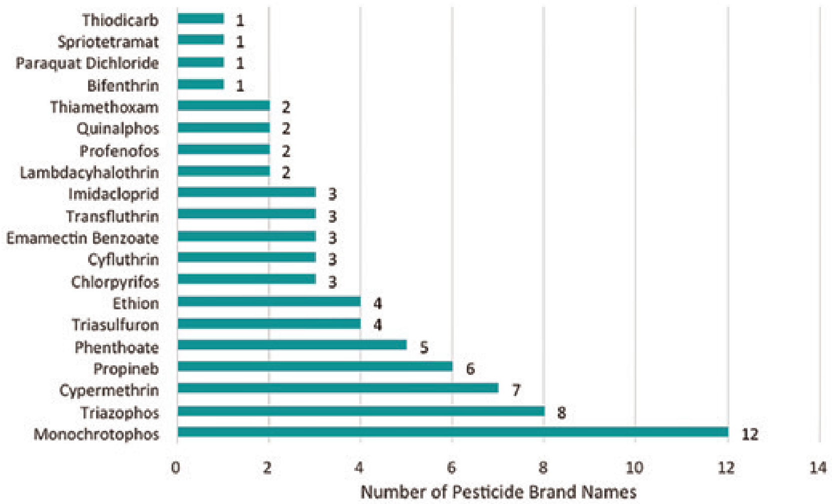


Knowledge of which Pesticides are Being Used

The children were asked to identify those pesticides are commonly used in the farms. Among the 26 pesticide brand names that they identified, the most common were Nuvacron (n=7), Tarzan Rite (n=7), Antracol (n=6), and Dhanusan 50 (n=5) (see Annex 1 for full list). All of the pesticides were commonly applied through a backpack sprayer/ manual sprayer. Cans or buckets were used for mixing.

In terms of the pesticides' active ingredients, majority (23) of the 26 brand names contained HHPs, the most common of which are monochrotophos which is found in 12 brand names, triazhophos in 8, cypermethrin in 7, propineb in 6, and phenthoate in 5 (see Figure 10).

Figure 10. Active Ingredients in the Pesticide Brand Names Identified by Children



All of the active ingredients listed above, except for ethion, spriotetramat, transfluthrin, triasulfuron were listed in the 2019 Pesticide Action Network's list of Highly Hazardous Pesticides (HHPs)[2]. Monocrotophos, cypermethrin, lambdacyhalothrin, paraquat, and chlorpyrifos are included in PANAP's list of 20 Terrible Pesticides that are Toxic to Children[3]. Meanwhile triazophos, is an organophosphorus pesticide which disrupts endocrine functions. It is also known to be toxic to birds and bees.

Photo 3. Majority of the brand names identified during the survey have active ingredients that are listed as HHPs, the most common of which are monocrotophos can be found in Monodhan (left), triazhophos in Tarzan Rite (center), and cypermethrin in Superkiller-25 (right).

The use of some pesticides are also restricted to certain crops. According to the Central Insecticide Board and Registration Committee (CIBRC), paraquat and chlorpyrifos are restricted only to a number of crops. Jasmine and jathimalli, which are planted in the fields where the children work, are not included in the approved list of crops.

2 https://files.panap.net/resources/PAN_HHP_List.pdf

3 https://files.panap.net/resources/20-Terrible-Pesticides-poster.pdf

Table 1 summarises the known effects of the HHPs and the number of countries where they are banned, as provided by PAN's list of HHPs.

The children were also asked how frequent each of the pesticides were used. Most of the pesticides were used once a month (n=27), while other where used once a week (n=9), once every two months (n=9), twice a month (n=7), and once every three months (n=4). Only a few were used three times a month (n=1), four to six times a year (n=1), and depending on the number of insects (n=1).

Table 1. Effects of HHPs Found in Pesticides Identified by Children

ACTIVE INGREDIENT	EFFECTS	BAN IN # OF COUNTRIES
Monocrotophos	Highly hazardous I Fatal if inhaled I Highly toxic to bees	112
Triazophos	Highly hazardous	40
Propineb	Likely carcinogenic	28
Phenthoate	Highly toxic to bees	32
Chlorpyrifos	Highly toxic to bees	4
Emamectin Benzoate	Highly toxic to bees I Very toxic to aquatic organisms I Very persistent in water, soil, sediment	--
Cyfluthrin	Highly hazardous I Fatal if inhaled I Highly toxic to bees	29
Imidacloprid	Highly toxic to bees	--
Lambdacyhalothrin	Fatal if inhaled I Endocrine disruptor I Highly toxic to bees	28
Profenofos	Highly toxic to bees	29
Quinalphos	Endocrine disruptor I Highly toxic to bees	30
Thiamethoxam	Highly toxic to bees	--
Bifenthrin	Endocrine disruptor I Highly toxic to bees	2
Cypermethrin	Highly toxic to bees	28
Paraquat Dichloride	Fatal if inhaled	46
Thiodicarb	Likely carcinogenic I Highly toxic to bees	29

The children also identified when these pesticides were last used. Most of the pesticides were used in the previous month (n=35), while the others were used in the previous week (n=7), two months ago (n=4), two weeks ago (n=4), and six months ago (n=1) (see Figures 11 and 12). (See Annexes 2 and 3 for tables on frequency of use per identified pesticide).

Figure 11.Frequency of Pesticide Use

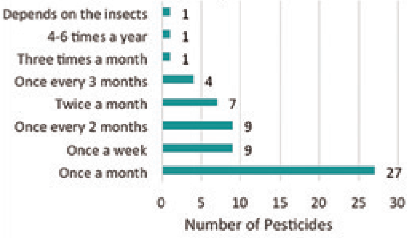
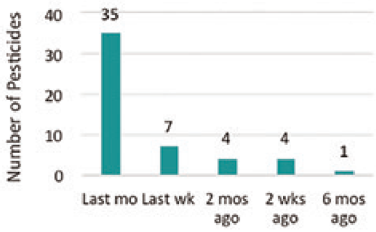


Figure 12. When Pesticides were Last Used



The children were asked if they felt ill after pesticides were sprayed in the fields. A big majority (n=21) said yes, while only three of them said no (see Figure 13). Almost a third (n=7) felt ill weekly, six felt ill monthly, five cannot recall how often, while some of the children fell ill daily (n=1), twice a week (n=1), or only when pesticides are sprayed (n=1) (see Figure 14).

Figure 13. Felt Ill After Pesticide Spraying

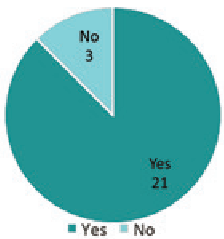


Figure 14.How Often the Children Felt Ill After Spraying

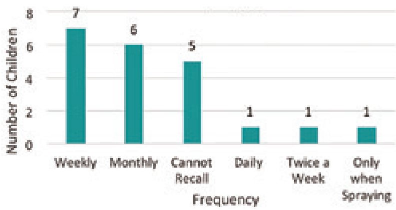
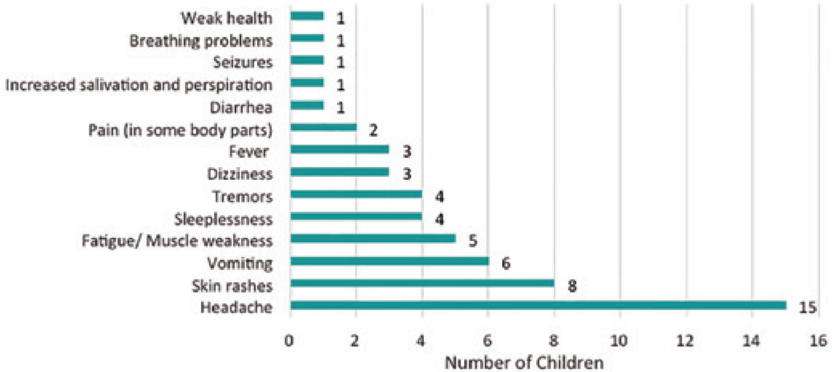


Photo 4. Skin rashes and allergies are common among children labourers in flower farms in Tamil Nadu

After the fields have been sprayed with pesticides, more than half of the children reported having headaches (n=15), while a third (n=8) had skin rashes (see Figure 15). Vomiting (n=6), fatigue (n=5), sleeplessness (n=4), tremors (n=4), dizziness (n=3), fever (n=3), and pain (in some

Figure 15. Type of Illnesses Felt by the Children After Spraying



body parts) (n=2) were also reported by the children. Some of them also experienced diarrhea (n=1), increased salivation and perspiration (n=1), seizures (n=1), breathing problems (n=1), and weakened health condition (n=1).

Out of the 21 children who reported feeling ill, only 13 received medical treatment (see Figure 16). All of the 13 children reported that no receipts, prescriptions, written medical opinions, or medical records were kept after their treatment (see Figure 17).

Figure 16.Taken for Medical Treatment After Feeling Ill

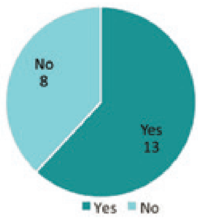


Figure 17. Saved Records

Meanwhile, 17 children reported health problems that may be related to pesticide exposure (see Figure 18). These were allergies/ hypersensitivity (n=13), memory loss (n=2), asthma (n=1), and reduced speed of response to stimuli (n=1) (see Figure 19).

One of the children reported having boils, pain in the hands, and itching. All of the children who reported health problems that may be related to pesticide exposure said there was no documentation of the treatment they received.

Figure 18. Reported any Health Problems that may be Attributed to Pesticide Exposure

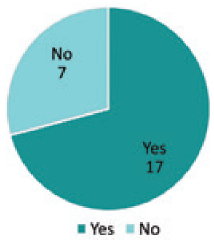
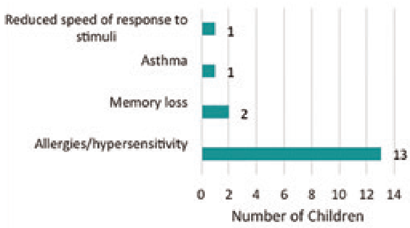


Figure 19. Health Problems that May be Related to Pesticide Exposure



D. 2. FARMERS

(See Appendix 2 for full report.)

The team was also able to interview five farmers (4 male, 1 female) who were all married and between the ages 30 to 59. All of the farmer respondents identified themselves as Dalits. Four of them have completed secondary schooling, while one—the eldest—was only able to complete kindergarten. The average household size is five. Four of the farmers have at least one child below 18 years old living in their household.

All of the farmers that were interviewed are self-employed and their families own the land that they are working on. They plant jasmine and jathimalli (pink jasmine) for commercial purposes. According to the respondents, they chose this type of work because there are no other jobs available. No household earned more than USD 2,000 annually. Three farmers disclosed that their household earned below USD 1,000, while two said their household earned between USD 1,000 – 2000. All of them lived within less than a kilometer away from their flower farms.

Among the 15 pesticide brand names used by farmers, the most commonly used were Markar and Monocil. Meanwhile the most commonly found HHPs in the 15 brand names used were monochrotophos, acephate, and bifenthrin. All of these three HHPs are highly toxic to bees. At the same time, monochrotophos is highly hazardous and fatal if inhaled, while bifenthrin is a known endocrine disruptor.

The health and safety of farmers is compromised by the lack of translations of the pesticide labels into the local language and the lack of training on the proper handling and use of pesticides. The farmers also do not wear any form of PPE when buying pesticides, while only one of them wore PPE when applying pesticides in their farms.

This is particularly worrisome as almost all of them experienced pesticides being spilled on their backs; hands; on the upper, lower, and front parts of their bodies; and on their feet. Three of the farmers said they washed the body parts that were spilled by pesticides. Other forms of removing pesticide spillages were applying home remedies, wiped with a wash cloth, changed clothes, took a bath, or applied coconut oil.

Only three out of the five farmers reported that there are washing facilities for the hands and body in the fields where they apply pesticides. Equipment used for spraying pesticides are also washed in the fields using water containers. Run-off from washing equipment can potentially contaminate water sources.

Almost all farmers are knowledgeable about the proper storage of pesticides. Four of the farmers store pesticides in the field, while one of them store pesticides at home. All of the farmers lock the pesticides away from children and make sure that they are separated from other items. Although majority of the farmers decant pesticides into other containers, all said that they do not use pesticide containers for other purposes. However, proper disposal of left-over pesticides and empty containers is not observed. Left-over pesticides are thrown in the river and in the field. Empty containers are also thrown in the field, buried, stored in a big container in the field, or sold to scrap dealers if the containers are made of aluminum.

Photo 5. Farmer mixing pesticides with his bare hands in Tamil Nadu, India

All of the farmers reported experiencing illnesses such as skin rashes, headache, nausea, burning sensations, excessive salivation, and vomiting, and difficulty breathing after being exposed to pesticides. Four of them, experienced a combination of two or more symptoms. Asked who they would call if they thought they were experiencing pesticide poisoning, two answered they would call a doctor and one would call a hospital. Others would call either the salesman or retail shop owner where they purchased the pesticides.

D. 3. RETAILERS

Three pesticide retailers were also surveyed in Vellore about the types of pesticides they sell and how these are sold to customers. Two of these shops sell both pesticides and fertilisers.

How Pesticides are Being Sold

The survey team found that all of the three shops are operating near places where food is handled and processed: one is close to a flourmill, while the other two are close to eateries (small restaurants).

All of the respondents said yes when asked if the pesticides they sold have signs that indicate that these products are hazardous, and if these are available in different sizes for small-scare users (see Table 2). All of them are also selling PPE in their shops.

However, the types of PPE available at their shops are rather limited. Only gloves (n=3), overalls (n=2), eyeglasses (n=1), and facemasks (n=3) are sold (see Figure 20). The list of pesticides that are available in their stores revealed that all of the shops are selling pesticides that are restricted and are classified as HHPs by both PANAP and the World Health Organization (WHO) (see Annex 4).

Figure 20. Types of PPE Sold by Retailers

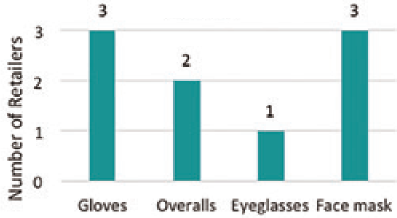


Table 2. How Pesticides are Sold		
	YES	NO
Is there any sign that they are hazardous?	3	
Are pesticides provided in different sizes including small sizes appropriate for small-scale users?	3	
Is there protective clothing sold in the store?	3	
Are there any banned or restricted products available for sale?	3	
Are there any WHO Class Ia or Ib pesticides (or other notable HHPs) for sale in the shop?	3	

Pesticides Sold at the Retailers' Shops

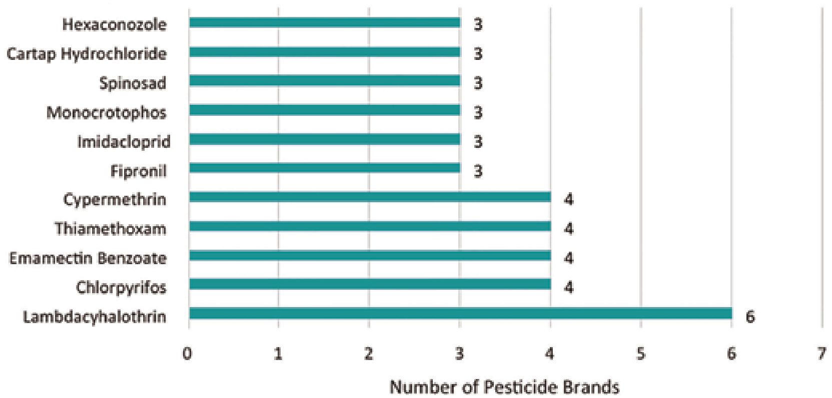
A total of 93 products were surveyed from the three establishments. Among these products, 84 different brands of pesticides were identified in the survey. Meanwhile, the total of active ingredients found in the pesticide products was 59. Out of the 59 active ingredients, 41 are HHPs.

Photo 6. Some of the Highly Hazardous Pesticides being sold in retail shops surrounding the survey area in Tamil Nadu. (Photo: PAN India)

Overall, majority of the brands that were being sold at the shops contained active ingredients that were classified as either HHP by PAN or 1B by the WHO. Of the 84 brands, more than half (n=67) contained active ingredients that are classified as HHPs. Only less than a quarter (n=17) of the brands did not contain HHPs in their active ingredients.

The active ingredients were formulated in various concentrations. The most common main active ingredients are lambdacyhalothrin (n=6), chlorpyrifos (n=4), emamectin benzoate (n=4), cypermethrin (n=4), thiamethoxam (n=4), fipronil (n=3), imidacloprid (n=3), monocrotophos (n=3), spinosad (n=3), cartap hydrochloride (n=3), and hexaconozole (n=3) (Figure 21). All are classified as HHPs excluding cartap hydrochloride and hexaconozole.

Figure 21. Most Common Active Ingredients in the Pesticides Sold by Retailers



Product Suppliers and Training on Handling Pesticides

Table 3 indicates whether the retailers have a contract with their suppliers, if they have training on handling the pesticides they sell, and if their government issues licenses to sell pesticides. All of the retailers sourced their products from the manufacturers themselves with whom they have contracts to sell their products.

The retailers also responded positively when asked if they had received training on the pesticides they sell (n=3), and if their government issues licenses for selling pesticide (n=3).

Table 3. Supplier and Training

	YES	NO
Do they have a contract with their supplier?	3	
Have you received training on the pesticides you sell?	3	
Does your government license to sell pesticides?	3	

Product Packaging

Product Labels

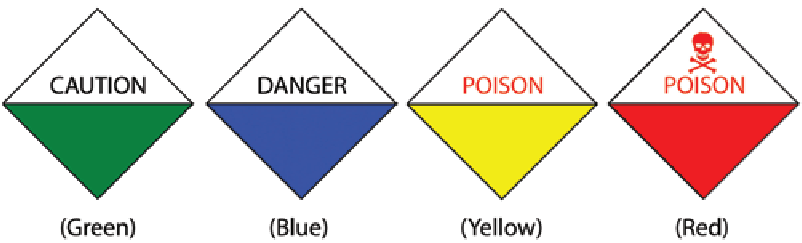
All of the 93 pesticide products had labels on their packaging. However, not all the labels were easy to read (see Table 4). The font sizes in the labels of 27 pesticide products were too small to read.

The labels of all 93 products indicated the name/trade name of the product, its active ingredients, the manufacturer, and the hazard classification of the product. Majority (n=88) of the labels had warning symbols, and have a precautionary statement (n=91).

Table 4. Labels		
	YES	NO
Does the package have a label	93	0
Is the label easy to read?	66	27
Does the label indicate the name of product or trade name?	93	0
Does the label indicate the active ingredient/s?	93	0
Does the label indicate the manufacturer?	93	0
Are there warning symbols in the label?	88	5
Is there a precautionary statement in the label?	91	2
Does the label indicate the hazard classification of the product?	93	0
Does the label instructions on how to use the product	9	84
Does the label have instructions on how to dispose of the product?	0	93
Does the label have instructions on how to decontaminate containers	0	93
Are the instructions in local language?	5	88

Almost half (n=44) of the hazard classifications on the labels indicated "poison" in yellow triangle (Figure 22). Meanwhile, less than half indicated "danger" in blue triangle (n=33), "caution" in green triangle (n=12), "poison" in red triangle with a skull and crossbone above it (n=4) (see Table 5).

Figure 22. Pesticides Toxicity Labels



Only a small number (n=9) had labels that contain instructions on how to use the product. None of the labels included instructions on how to dispose the product and on how to decontaminate containers. Only five out of the nine products with instructions on their labels were written in the local language (EM-1 by Dhanuka Agritech, Index by NACL Industries, Permasect by Coromandel International, Stinger by Nikita Bio, and Suckgan by ADAMA).

Table 5. Hazard Classification in the Product Labels

HAZARD CLASSIFICATION	NUMBER
Poison (yellow)	44
Danger (blue)	33
Caution (green)	12
Poison (red and skull crossbone)	4
TOTAL	**93**

Product Containers

All of the containers of the 93 products were found intact. None of them had been transferred or repacked to another container or packet. Almost all of the containers (n=92) were considered by the retailers as child-proof (see Table 6).

Out of the 93 products, 76 were sold in jars with screw-on caps. This feature makes almost all of these jars (n=73) attractive for reuse as storage. The 17 other product containers were made of plastic sachets (see Table 7).

Only three of the products were ready to use, while the other 91 still need to be diluted or mixed. This is quite concerning since only nine had instructions on how to use the product, and only five of these were written in the local language (see Table 6).

Table 6. Product Containers		
	YES	NO
Has the pesticide been transferred?	0	93
Is the container attractive for reuse?	73	20
Is the container child-proof (unable to be easily opened by a child)	92	1
Is it ready to use (i.e. already diluted or mixed)?	3	90
Does the label indicate the manufacturer?	93	0
Are there warning symbols in the label?	88	5
Is there a precautionary statement in the label?	91	2
Does the label indicate the hazard classification of the product?	93	0
Does the label instructions on how to use the product	9	84
Does the label have instructions on how to dispose of the product?	0	93
Does the label have instructions on how to decontaminate containers	0	93
Are the instructions in local language?	5	88

Table 7. Description of Product Containers	
CONTAINER	NUMBER
Jar with a screw-on cap	76
Plastic sachet	17
TOTAL	**93**

E. Summary of Identified Pesticides, their Manufacturers, and Effects

A total of 109 pesticide brand names were identified by the children, farmers, and the retailers (see Annex 5).

Manufacturers

A total of 28 manufacturers produced the pesticides identified by the interviewees. The top manufacturers are Dhanuka Agritech (n=15), Bayer Crop Science (n=12), Syngenta (n=12), Adama (n=6), Dow AgroSciences (n=6), Rallis India (n=6), Crystal Crop Protection (n=5), DuPont India (n=5), and Nagarjuna Agrichem (n=5) (see Figure 23). Out of top pesticides manufacturers, almost half are multinational corporations (n=4) are foreign corporations.

The companies that manufactured the most products that had HHPs as active ingredients are Dhanuka Agritech (n=13), Syngenta (n=10), Bayer Crop Science (n=9), Dow AgroSciences (n=6), and Rallis India (n=5) (see Figure 24).

Figure 23. Top Pesticide Manufacturers

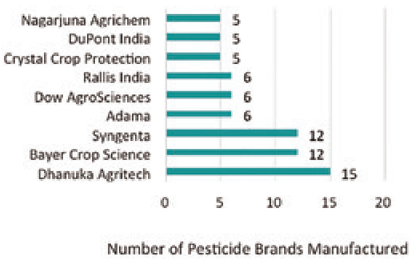
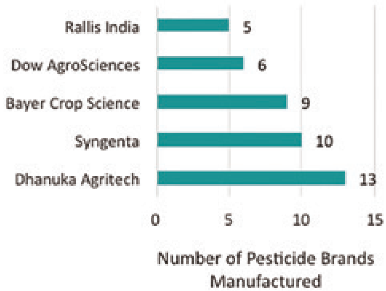


Figure 24. Top HHP Manufacturers



Meanwhile, triazophos and dichlorvos, two HHPs that are scheduled for phase out on December 31, 2020 are being marketed by some manufacturers. Triazophos is still being sold by Krishi Rasayan (Tarzan Rite), Willowood Chemicals (Teknox), and Dhanuka Agritech (Ghatak). Dichlorvos is being marketed by UPL Limited in its product Doom.

Effects of Pesticides

Out of the total 109 pesticides brands identified by the children, farmers, and retailers, only 20 or less than a quarter do not have HHPs in their active ingredients. The rest, 89 or 82% contain HHPs (see Figure 25). There were a total of 44 HHPs in the pesticide brands that were identified. The most common were cypermethrin (n=8), imidacloprid (n=7), lambdacyhalothrin (n=7), thiamethoxam (n=6), chlorpyrifos (n=5), and monocrotophos (n=5). (See Annex 6 for brand names grouped according to HHP).

More than half (n=30) of these HHPs are highly toxic to bees, 9 are fatal if inhaled, 9 are likely carcinogenic, 8 are reproductive toxicants, 8 are endocrine disruptors, 6 are highly hazardous, 5 are very toxic to aquatic organisms, 3 are very persistent to water, soil, and sediments, 1 is mutagenic, and 1 is very bioaccumulative (see Figure 26).

Figure 25. Pesticide Active Ingredients

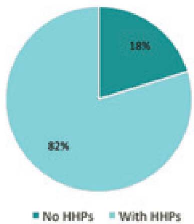
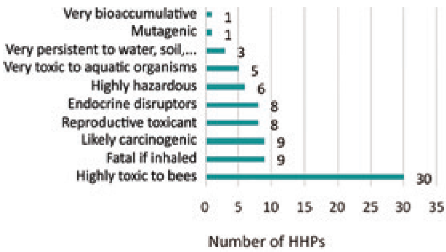
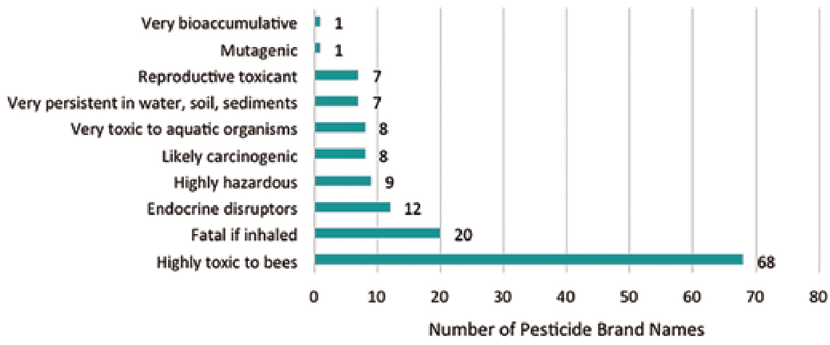


Figure 26. Toxicity of Pesticides



By grouping the pesticide brand names according to the toxic effects of the active ingredients that they contain, more than half of them (n=68) are highly toxic to bees. This is quite ironic since these products are used on flowers, which need bees to propagate. The rest are fatal if inhaled (n=20), endocrine disruptors (n=12), highly hazardous (n=19), likely carcinogenic (n=8), very toxic to aquatic organisms (n=8), very persistent in water, soil, and sediments (n=7), reproductive toxicants (n=7), mutagenic (n=1), and very bioaccumulative (n=1) (see Figure 27).

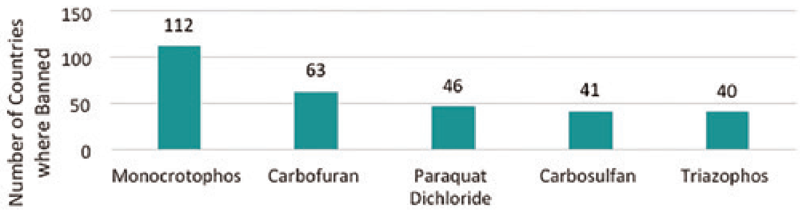
Figure 27. Pesticide Brand Names Grouped Accdg. to Effects of their Active Ingredients



Out of the 44 HHPs in the products, only 32 are banned by one or more countries. The top five most banned HHPs are monocrotophos (n=112), carbofuran (n=63), paraquat dichloride (n=46), carbosulfan (n=41), and triazophos (n=40) (see Figure 28).

However, India has only two HHPs that are scheduled for phase out by December 31, 2020: triazophos, and dichlorvos.

Figure 28. Top 5 Most Banned HHPs

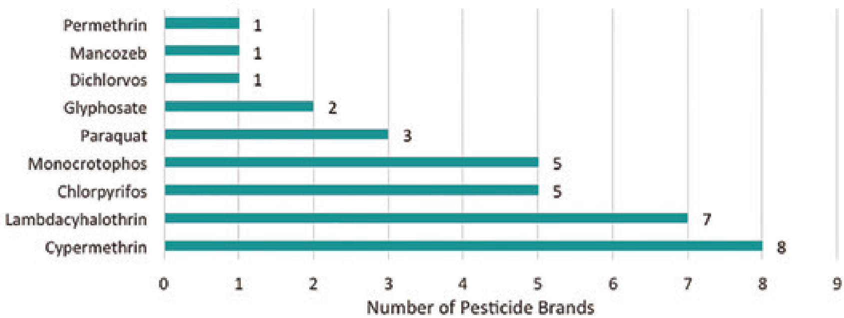


Pesticides Most Harmful to Children

Although all 44 HHPs are harmful to children, nine are included in PANAP's 20 Most Terrible Pesticides to Children (see Figure 29).

Cypermethrin is a synthetic pyrethroid insecticide that is known to be highly toxic to bees, an endocrine disruptor, and is a possible human carcinogen according to the US EPA. It can cause potential developmental effects, later in life cancer, male reproductive problems, and has adverse effects on the immune system. Number of countries where it is banned: 28.

Figure 29. HHPs Included in PANAP's Terrible 20 List



Lambdacyhalothrin is an insecticide widely used in farming, public health, and in households. It is highly toxic to bees, an endocrine disruptor, and it is fatal if inhaled. Because of its toxicity, it can cause acute poisoning and damage to kidneys, liver, lungs, heart, and spleen in animals. It is known to suppress the immune system and cause impaired learning and brain changes similar to Parkinson's disease, increases the risk of breast cancer and male reproductive problems later in life. Number of countries where it is banned: 28.

Chlorpyrifos is an acutely toxic organophosphate insecticide that can result in death. At low levels of exposure, it can cause brain damage, reduced IQ, and ADHD. As an endocrine disruptor, it affects the thyroid and sex hormones. It can impair the immune system, can cause birth defects, and may cause predisposition to diabetes and obesity. Number of countries where it is banned: 4.

Monocrotophos is acutely toxic by all routes of exposure. It can cause neurobehavioral problems, delayed neuropathy, and growth of human breast cancer. Tests in animals also show evidence that it can cause decreased fertility, depressed lactation, birth defects, and lesser effectiveness of the immune system. Number of countries where it is banned: 112

Paraquat can cause acute poisoning, disrupts hormones, and negatively affects the immune system. It is implicated in diabetes, linked to Parkinson's disease, and can adversely affect the brain's development and functioning. Number of countries where it is banned: 46.

Glyphosate is classified as probable human carcinogen by the International Agency on Research (IARC) on Cancer. It can cause birth defects, skin conditions, allergy responses, and kidney damage. It can disrupt hormones particularly progesterone and testosterone, alter the progression of puberty, can cause breast cancer. Like paraquat, it is also linked to Parkinson's disease. Based on IARC's identification, a number of countries are considering restrictions and bans.

Dichlorvos is an organophosphate insecticide that is highly hazardous, immunotoxic, an endocrine disruptor, and a reproductive toxicant. It can cause acute poisoning, brain cancer, leukemia, and impaired immune function. It increases the risk of contracting Parkinson's disease, cancers, and diabetes later in life. Number of countries where it is banned: 33

Mancozeb is likely carcinogenic and can alter the immune system. It is also a reproductive toxicant. It can cause acute poisoning, allergic sensitization, and birth defects. It can also alter the developing brain and affect behavior. It may cause Parkinson's disease, cancers, and female reproductive problems later in life. Number of countries where it is banned: 1

Permethrin is associated with neurobehavioral effects, delayed mental development, and leukemia. It can aggravate skin irritations, asthma, and allergies. It can also cause breast cancer later in life. Number of countries where it is banned: 29.

Out of these nine HHPs, only dichlorvos is scheduled for phase out in India by December 21, 2020.

F. Violation of Rights and Agreements

Violation of National Regulations

India's Insecticides Act 1968 facilitated the creation of the Insecticides Rules of 1971, which lays down some of the regulations on the use, manufacture, and distribution of pesticides in the country. Provisions of the Insecticides Rules 19, 42, and 44 were found to have been violated.

Rule 19-7, which states that "The label and leaflets to be affixed or attached to the package containing insecticides shall be printed in Hindi, English and in one or two regional languages in use in the areas where the said packages are likely to be stocked, sold or distributed" was violated by almost all of the manufacturers of the pesticides. Although companies of Dhanuka, NACL Industries, Coromandel Industries, Nikita Bio, and ADAMA did attach instructions in the local language, but not for all of their products.

Rule 44 sub rule 1, that states "it shall be the duty of manufacturers, formulators of insecticides and operators to dispose packages or surplus materials and washing in a safe manner so as to prevent environmental or water pollution" was infringed, as no proper disposal mechanisms or washing facilities were present in the fields.

Majority of the farmers have been using pesticides without proper training, and this violates Rule 42 which states that "manufacturers and distributors of insecticides and operators should arrange suitable training in observing safety precautions and handling safety equipment provided to them."

Violations of the International Code of Conduct on Pesticide Management

The conditions of use of HHPs in India are problematic and as such violate the Code.

Per Article 1.7.3, the Indian government has the responsibility to "promote practices which reduce risks throughout the life cycle of pesticides, with the aim of minimising adverse effects on humans, animals and the environment and preventing accidental poisoning resulting from handling, storage, transport, use or disposal, as well as from the presence of pesticide residues in food and feed."

With the widespread pesticide use, the Indian government and pesticide companies have a responsibility to minimise its adverse impacts on people and the environment. Therefore, the government should exercise strict regulation over the use and sale of highly hazardous pesticides, and conduct programmes to ensure that farmers are wellinformed on the proper handling, use, and disposal of pesticides. However, programmes on the ground for implementing this are absent/ very limited in Thiruvallur district.

The limited availability of PPE also poses adverse risks and violates Article 3.6 of the Code which states "Pesticides whose handling and application require the use of personal protective equipment that is uncomfortable, expensive or not readily available should be avoided, especially in the case of small-scale users and farm workers in hot climates." The complete set of good quality PPE needs to be available to farming communities that apply pesticides. If this is not ensured, the government should ban such pesticides that require its use, as put forth in Article 3.6

Such methods and equipment to minimise pesticide exposure are non-existent on the ground, and put communities — especially the children and farmers — at risk of pesticide poisoning due to prolonged exposure. This is aggravated by the lack of availability and provision of PPE by pesticide retailers/manufacturers. The lack of PPE also violates the right to a safe and healthy working environment of pesticide applicators in the farms. This is in violation of Article 5.2.5, which calls on the industry to "halt sale and recall products as soon as possible when handling or pose an unacceptable risk under any use directions or restrictions and notify the government."

Article 3.5.6 states that the pesticide industry must "retain an active interest in following their products through their entire life cycle, keeping track of major uses, and the occurrence if any problems arising from the use of their products, as a basis for determining the need for changes in labelling, directions for use, packaging, formulation or product availability." This rarely happens and the Indian government should ensure that these pesticide corporations continue to monitor their products from production to use and final disposal.

Manufacturers of HHPs, including the Big Four agrochemical TNCs, are directly responsible for labels that are written in language incomprehensible to its users, and in font size that are too small. This violates several articles of the code on the use of appropriate language/s in the labels of pesticide products (3.5.4, 10.2.2 and 10.2.4). Article 10.2.4, which states "include in appropriate language or languages, a warning against the reuse of containers and instructions for decontamination and the safe disposal of used containers" is also violated by all the manufacturers since none of the pesticide products had information on the safe disposal and decontamination procedures on their labels.

The lack of programmes and systems for proper disposal of pesticide containers poses big risks to the community. This violates the Articles 5.2.4.4, using returnable and refillable containers where effective container collection systems are in place; and 5.2.4.5, using containers that are not attractive for subsequent reuse and promoting programmes to discourage their reuse, where effective container collection systems are not in place.

Violation of Children's and Human Rights

The rights of the children employed in the floriculture industry of the Tamil Nadu are violated in a number of ways.

Child labour violates Article 32 of the CRC which says it is the "right of the child to be protected from economic exploitation and from performing any work that is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral or social development." Children's exposure to hazardous pesticides without their knowledge because they work in the flower fields and/or because their schools, houses, and places of leisure are located within short distances from pesticide-laden fields also violates Article 32 of the CRC.

Photo 7. Most children in this primary school in Thiruvallur District, Tamil Nadu, India are exposed to Highly Hazardous Pesticides while working in flower fields that surround their school and community

The CRC's Article 6.1 which recognises children's right to life, and Article 24 which recognises children's right to health, nutritious food, and clean environment, are likewise violated because exposure to hazardous pesticides endangers the lives of children. Moreover, their quality of life is also affected not only because of the immediate illnesses caused by exposure to pesticides. Since their bodies are still developing, children face possible lifetime chronic impacts from pesticides that damage physical and mental development. Organophosphates such as chlorpyrifos, triazophos, and monocrotophos, are associated with negative effects on neurodevelopment such as lower intelligence and poorer motor development. Chlorpyrifos in particular is associated with reduced IQ, attention deficit/hyperactivity disorder (ADHD), smaller head circumference, and altered brain structure, long-term consequences for social adjustment and academic achievement (PANAP, 2014). Monocrotophos on the other hand, has been known to have caused DNA damage, chromosomal damage in human lymphocytes, and the growth of human breast cancer cells (PANAP, 2011).

Girls' rights to life, education, and health are also violated. More than half of the children who were interviewed were girls of school age. As mentioned earlier, girls who work are more likely to drop-out from school than boys. Exposure of girls before childbearing age affects their reproductive health, and may affect future generations.

Photo 8. Young girls exposed to pesticides while working in a flower farm in Tamil Nadu, India

Meanwhile, the rights to life and a safe, healthy environment of farmers are likewise violated by being exposed to hazardous pesticides. Farmers are not aware of the hazardous substances they are using, they are not trained and these pesticides are sold to them as crop protection medicines and not as poisons. In addition, labels are not written in the local language, some of the labels were also difficult to read because the font is too small. There are also no instructions for the proper disposal of these products, and how to decontaminate containers. These factors, along with the violation of Rules 44 and 42, may have reinforced improper handling and disposal practices among farmers.

G. Conclusion and Recommendations

The study revealed the circumstances of pesticide use and impacts on children and farmers in the flower-growing district of Thiruvallur. As discussed in the previous sections, several national laws and international conventions regarding child labour and pesticide use were violated.

Child labour in the floriculture industry in Thiruvallur district based on our survey, persists because of the inadequate implementation of the CRC, as well India's reservation on the CRC's article on child labour, which is supported by a loophole in India's child labour laws that allows children to work alongside their families. However, even the condition in that loophole that the nature of the work is not hazardous to children is also not met since working in pesticide-laden fields exposes them to immediate and long term health risks. Moreover, if effective programmes tackling poverty and child labour are absent on the ground, loopholes like this will only further encourage child labour even in hazardous conditions.

In our opinion, both the Indian government and pesticide manufacturing corporations are accountable for exposing the children and farmers to pesticides by failing to ensure that regulations on pesticide use, disposal, and labelling are followed. Moreover, based on the facts, the government and the corporations should also be held accountable for allowing the production and sales of pesticides despite their known deleterious impacts, and despite being banned in other countries.

Below are some of the recommendations by SRED and PANAP with regards to the child labour and pesticide use in Thiruvallur District. Some of these include the recommendations by Hilal Elver, the UN's Special Rapporteur on the right to food in her on report the implications for human rights of the environmentally sound management and disposal of hazardous substances and wastes in 2017.

On child labour

1. Implement programmes on the ground that tackle child labour and poverty, coupled with awareness raising on the negative effects of child labour and children's exposure to pesticides, especially with families that grow flowers.

2. Ensure that flower farms owned by landlords do not employ child labour.

3. Rescind the amendment on India's child labour laws that allows children to work in family enterprises. Likewise, withdraw India's reservation on the CRC's prohibition on child labour.

4. Fully implement the CRC and other related conventions and laws that prohibit child labour and ensure the safety and health of children.

On regulation of pesticides

1. Ensure the proper implementation of the International Code of Conduct on Pesticide Management

2. Ban the manufacturing, sale, and use of all highly hazardous pesticides.

3. The international community must work on a comprehensive, binding treaty to regulate hazardous pesticides throughout their life cycle, taking into account human rights principles.

4. Develop comprehensive national action plans that include incentives to support alternatives to hazardous pesticides, as well as initiate binding and measurable reduction targets with time limit.

5. Enact safety measures to ensure adequate protections for pregnant women, children and other groups who are particularly susceptible to pesticide exposure.

6. Create buffer zones around plantations and farms until pesticides are phased out, to reduce pesticide exposure risk.

7. Organise training programmes for farmers to raise awareness of the harmful effects of hazardous pesticides and of alternative methods.

8. Regulate corporations to respect human rights and avoid environmental damage during the entire life cycle of pesticides

9. Impose penalties on companies that fabricate evidence and disseminate misinformation on the health and environmental risks of their products.

10. Monitor corporations to ensure that labelling, safety precautions and training standards are respected.

On the promotion of agroecology

1. Encourage farmers to adopt agroecological practices to enhance biodiversity and naturally suppress pests, and to adopt measures such as crop rotation, soil fertility management and crop selection appropriate for local conditions.

2. Provide incentives for organically produced horticultural products through subsidies and financial and technical assistance, as well as by using public procurement.

Sign PANAP petitions on children and pesticides

Civil society and advocates are encouraged to sign the following petitions to help in promoting children's health, safety, and rights against pesticides and call for corporate accountability of agro-chemical corporations.

- Urge the state governments to institute pesticide-free buffer zones around schools- https://www.change.org/p/urge-the-state-governments-to-institute-pesticide-free-buffer-zones-around-schools

- END CORPORATE GREED! RIGHTS NOW! A Sign-On Statement To Stop The Poisoning Of The People And The Planet- https://panap.net/2017/12/end-corporate-greed-sign-on/

Annex

Annex 1. List of Pesticide Brand Names Identified by the Children Grouped According to Active Ingredients

Table A1. Pesticides Being Used in the Farms as Identified by the Children

Active Ingredient	Effects	Ban in # of Countries	Product Name	Manufacturer
Monocrotophos 36% SL (n=12)	- Highly hazardous - Fatal if inhaled - Highly toxic to bees	112	Monocil (n=3) Nuvacron (n=7) Monodhan (n=2)	Insecticides India Ltd Bayer Crop Science Dhanuka Agritech Ltd
Triazophos 40% (n=8)	Highly hazardous	40	Ghatak Tarzan Rite (n=7)	Dhanuka Agritech Ltd Krishi Rasayan
Propineb (n=6)	Likely carcinogenic	28	Antracol (n=6)	Bayer Crop Science
Phenthoate 50% (n=5)	Highly toxic to bees	32	Dhanusan (n=5)	Dhanuka Agritech Ltd
Triasulfuron (n=4)			Nugran	Nufarm (Syngenta)
Chlorpyrifos 50% + Cypermethrin 5% (n=3)	- Highly toxic to bees	-4 -28	Super D	Dhanuka Agritech Ltd
Ethion 50% EC (n=3	- Highly toxic to bees	30	Fosmite	PI Industries
Emamectin Benzoate 5% SG (n=3)	- Highly toxic to bees - Very toxic to aquatic organisms - Very persistent in water, soil, sediment		EM-1	Dhanuka Agritech Ltd
Transfluthrin + Cyfluthrin (n=3)	- Highly hazardous - Fatal if inhaled - Highly toxic to bees	-29	All Out	Johnson

Imidacloprid 30.5% M/M (n=2)	Highly toxic to bees		Media Super M-Con Super	Dhanuka Agritech Ltd Sumitomo Chemical India Pvt Ltd
Lambdacyhalothrin (n=2)	- Fatal if inhaled - Endocrine disruptor - Highly toxic to bees	28	Singham	Moti Insecticide Pvt Ltd
Profenofos 40% + Cypermethrin 4% EC (n=2)	- Highly toxic to bees - Highly toxic to bees	-29 -28	Hitcel	Excel Crop Care Ltd
Quinalphos 25% w/w (n=2)	- Endocrine disruptor - Highly toxic to bees	30	Ekalux	Syngenta
Thiamethoxam 30% (n=2)	- Highly toxic to bees		Creita Bheema	Sunil Chemical Industries Pvt Ltd Insecticides India Ltd
Bifenthrin 10% EC	- Endocrine disruptor - Highly toxic to bees	2	Markar	Dhanuka Agritech Ltd
Cypermethrin 25%	Highly toxic to bees	28	Superkiller 25	Dhanuka Agritech Ltd
Ethion 40% + Cypermethrin 5%	- Highly toxic to bees	-30 -28	Ananda	Anu Products Ltd
Paraquat Dichloride 24% SL	Fatal if inhaled	46	Ozone	Dhanuka Agritech Ltd
Spriotetramat 11.01 % U/W + Imidacloprid 11.01% W/W SL	- Highly toxic to bees		Movento	Bayer Crop Science
Thiodicarb	- Likely carcinogenic - Highly toxic to bees	29	Larvin	Bayer Crop Science
			Flower Booster (n=2)	

Annex 2. Pesticide Brand Names Grouped According to Frequency of Use

Table A2. Frequency of Pesticide Use (Children)		
Once a month (n=27)	Tarzan Rite (n=6) Dhanusan 50 (n=4) Antracol (n=3) Nugran (n=3) Super D (n=2) Ananda (n=1) Ekalux (n=1)	Hitcel (n=1) Markar (n=1) Media Super (n=1) Monocil (n=1) Movento (n=1) Nuvacron (n=1) Superkiller 25 (n=1)
Once a week (n=9)	Fosmite (n=3) Monocil (n=2) Monodhan (n=1)	Nuvacron (n=1) Starthene (n=1) Tarzan Rite (n=1)
Once every 2 months (n=9)	Nuvacron (n=2) Singham (n=2) Dhanusan 50 (n=1) EM-1 (n=1)	Hitcel (n=1) Monodhan (n=1) NUGRAN (n=1)
Twice a month (n=7)	Antracol (n=2) Nuvacron (n=2) Dhanusan 50 (n=1)	Ekalux (n=1) EM-1 (n=1)
Once every 3 months (n=4)	ALL OUT (n=3)	Nuvacron (n=1)
Three times a month (n=1)	Ghatak (n=1)	
4-6 times in a year (n=1)	Antracol (n=1)	
Depends on the insects / Once every 2 months (n=1)	EM-1 (n=1)	

Annex 3. Pesticide Brand Names Grouped According to When Last Used

Table A3. When the Pesticide was Last Used (Children)		
	Nuvacron (n=6)	Hitcel (n=2)
Last month (n=35)	Tarzan Rite (n=5)	Singham (n=2)
	Antracol (n=3)	Super D (n=2)
	Dhanusan 50 (n=3)	Ananda (n=1)
	Fosmite (n=3)	Ekalux (n=1)
	NUGRAN (n=3)	Ghatak (n=1)
	EM-1 (n=2)	Monocil (n=1)
	Monocil (n=2)	Monodhan (n=1)
Last week (n=7)	Antracol (n=1)	NUGRAN (n=1)
	Dhanusan 50 (n=1)	Starthene (n=1)
2 months ago (n=4)	ALL OUT (n=3)	Nuvacron (n=1)
2 weeks ago (n=4)	Antracol (n=1)	Monodhan (n=1)
	Dhanusan 50 (n=1)	Super killer 25 (n=1)
6 months ago (n=1)	Ekalux (n=1)	

Annex 4. Effects of Active Ingredients Found in Pesticide Brands Sold by Retailers

Table A4. Pesticides Sold at the Retailers' Establishments

Active Ingredient	Effects	Ban in # of Countries	Specific Formulation	Brand Name	PAN	WHO
Chlorpyrifos (n=4)	Highly toxic to bees	4	Chlorpyrifos (20%)	Dursban	HHP	–
				Kemtrek	HHP	–
			Chlorpyrifos (50%)	Predator	HHP	–
			Chlorpyrifos (50%); Cypermethrin (5%)	Stinger	HHP	–
Lambdacyhalothrin (n=4)	- Fatal if inhaled	28	Lambdacyhalothrin (2.5%)	Reeva - 2.5	HHP	–
	- Endocrine disruptor		Lambdacyhalothrin (4.6%)	Ampligo	HHP	–
	- Highly toxic to bees		Lambdacyhalothrin (5%)	Deva Shakti	HHP	–
				Reeva	HHP	–
Cartap Hydrochloride (n=3)			Cartap Hydrochloride (50%)	Nidan	–	–
				Dollar	–	–

			Cartap Hydrochloride (75%)	Mortar	–	–
Emamectin Benzoate (n=3)	- Highly toxic to bees		Emamectin Benzoate (3%)	EM-1	HHP	–
	- Very toxic to aquatic organisms		Emamectin Benzoate (3%); Thiamethoxam (12%)	Nikhar	HHP	–
	- Very persistent in water, soil, sediment		Emamectin Benzoate (5%)	Proclaim	HHP	–
Fipronil (n=3)	Highly toxic to bees	37	Fipronil (5%)	Regent	HHP	–
				Mortel	HHP	–
			Fipronil (80%)	Jump	HHP	–
Imidacloprid (n=3)	- Highly toxic to bees		Imidacloprid (17.8%)	Confidor	HHP	–
			Imidacloprid (6%); Lambda Cyhalothrin (4%)	Inovexia	HHP	–
			Imidacloprid (19.81%);	Solomon	HHP	
Betacyfluthrin	- Fatal if inhaled	-1	Betacyfluthrin (8.49%)			1B
	- Highly hazardous					
	- Highly toxic to bees					
Monocrotophos (n=3)	- Highly hazardous	112	Monocrotophos (36%)	Luphos 36	HHP	1B
	- Fatal if inhaled			Monodhan	HHP	1B
	- Highly toxic to bees			Phoskill	HHP	1B
Spinosad (n=3)	Highly toxic to bees		Spinosad (2.5%)	Success	HHP	–
			Spinosad (45%)	One up	HHP	–
				Conserve	HHP	–
Thiamethoxam (n=3)	Highly toxic to bees		Thiamethoxam (25%)	Suckgan	HHP	–
				Actara	HHP	–
			Thiamethoxam (12.6%); Lambdacyhalothrin (9.5%)	Alika	HHP	–
Acetamiprid (n=2)			Acetamiprid (20%)	Dupont Rekord	–	–
			Acetamiprid (20%)	Ennova	–	–
Chlorantraniliprole (n=2)	- Very toxic to aquatic organisms		Chlorantraniliprole (0.4%)	Ferterra	HHP	–
	- Very persistent in water, soil, sediment		Chlorantraniliprole (18.5%)	Coragen	HHP	–

Diafenthiuron (n=2)	Highly toxic to bees	29	Diafenthiuron (50%)	Agas	HHP	–
			Diafenthiuron (50%)	Pegasus	HHP	–
Dimethoate (n=2)	Highly toxic to bees	4	Dimethoate (30%)	Tafgor	HHP	–
Ethion (n=2)		30	Ethion (40%); Cypermethrin (5%)	Nagata	HHP	–
			Ethion (50%)	Fosmite	–	–
Glyphosate (n=2)	Probably carcinogenic		Glyphosate (41%)	Clinton	HHP	–
			Glyphosate (41%)	Cleanup	HHP	–
Hexaconozole (n=2)		-29	Hexaconazole (5%); Validamycin (2.5%)	Walxtra	– HHP	
			Hexaconozole (5%)	Contaf Plus	–	
Validamycin	- Highly toxic to bees	-28				
Paraquat Dichloride (n=2)	Fatal if inhaled	46	Paraquat Dichloride (24%)	Avast	HHP	–
			Paraquat dichloride (24%)	Gramoxone	HHP	–
Phentoate (n=2)	Highly toxic to bees	32	Phenthoate (50%)	Dhanusan	HHP	–
			Phenthoate (50%)	Phendal	HHP	–
Pretilachlor (n=2)			Pretilachlor (37%)	Rifit plus	–	–
			Pretilachlor (50%)	Rifit	–	–
Profenophos (n=2)	Highly toxic to bees	29	Profenophos (40%); Cypermethrin (4%)	Profex super	HHP	–
			Profenophos (40%);	Etna	HHP	–
Fenpyroximate	Fatal if inhaled		Fenpyroximate (2.5%)		HHP	–
Propiconazole (n=2)	Reproductive toxicant	28	Propiconazole (25%)	Bumper	HHP	–
				Nagarjuna Result	HHP	–
Amine salt			2,4 D amine salt (58%)	2,4-D Main	–	–
Acephate	Highly toxic to bees	32	Acephate (75%)	Asataf	HHP	–
Azoxystrobin			Azoxystrobin (18.2%); Difenconazole 11.4 %	Amistar Top	–	–
Bifenthrin	- Endocrine disruptor - Highly toxic to bees	2	Bifenthrin (10%)	Highlight	HHP	–
Bispyribac sodium			Bispyribac sodium (10%)	Narkis	–	–
Butachlor	Likely carcinogenic	31	Butachlor (38.8%); Penoxsulam (0.97%)	Coreon	HHP	–
Carbendazim	- Mutagenic - Reproductive toxicant	29	Carbendazim (50%)	Bavistin	HHP	–

Carbofuran	- Highly hazardous - Fatal if inhaled - Highly toxic to bees	63	Carbofuran (3%)	Furadan	HHP	1B
Carbosulfan	- Fatal if inhaled - Highly toxic to bees	41	Carbosulfan (25%)	Aaatank	HHP	1B
Chlorfenapyr	Highly toxic to bees	28	Chlorfenapyr (10%)	Intrepid	HHP	–
Chlorfluazuron	- Very bioaccumulative - Very toxic to aquatic organisms	28	Chlorfluazuron (5.4%)	Atabron	HHP	–
Chlormepiquat chloride			Chlormepiquat chloride (50%)	Lihocin	–	–
Cyhalofop-Butyl + Penoxsulam			Cyhalofop-Butyl (5%); Penoxsulam (1.02%)	Vivaya	–	–
Cypermethrin	Highly toxic to bees	28	Cypermethrin (36%)	Cymbush	HHP	–
Dichlorvos	- Highly hazardous - Fatal if inhaled - Highly toxic to bees	33	Dichlorvos (76%)	Doom	HHP	–
Dinotefuran	Highly toxic to bees	28	Dinotefuran (20%)	Osheen	HHP	–
Ethoxysulfuron			Ethoxysulfuron (15%)	Sunrice	–	–
Fenazaquin	Highly toxic to bees		Fenazaquin (10%)	Magister	HHP	–
Flubendiamide	- Very toxic to aquatic organisms - Very persistent in water, soil, sediment		Flubendiamide (39.35%)	Fame	HHP	–
Glufosinate ammonium	Reproductive toxicant	28	Glufosinate ammonium (13.5%)	Sweep Power	HHP	–
Mancozeb + Trycylazole	- Probably carcinogenic - Reproductive toxicant	1	Mancozeb (62%) Trycylazole (18%)	Merger	HHP	–
Myclobutanil			Myclobutanil (10%)	Index	–	–
Novaluron			Novaluron (5.25%+); Emamectin benzoate (0.9%)	Barazide	– HHP	–

Permethrin	- Likely carcinogenic - Highly toxic to bees	29	Permethrin (25%)	Permasect	HHP	–
Quizalofop ethyl	Endocrine disruptor		Quizalofop ethyl (5%)	Targa super	HHP	–
Spinetoram	Highly toxic to bees		Spinetoram (11.7%)	Nagarjuna Syndicate	HHP	–
Spiromesifen			Spiromesifen (22.9%)	Oberon	–	–
Sulfoxaflor	Highly toxic to bees		Sulfoxaflor (21.8%)	Transform	HHP	–
Tebuconazole			Tebuconazole (25.9%)	Folicur	–	–
Thiacloprid	- Likely carcinogenic - Reproductive toxicant		Thiacloprid (21.7%)	Alanto	HHP	–
Triazophos	Highly hazardous	40	Triazophos (20%)	Teknox	HHP	–
Zineb	Endocrine disruptor	32	Zineb (68%); Hexaconozole (4%)	Avtar	HHP	–
Hexaconozole						

Annex 5. Summary Of Pesticides Grouped According To Manufacturers

Brands in green boxes do not contain known HHPs.

Table A5. Summary of Pesticide Manufacturers

Manufacturers	Brand Name		
Dhanuka Agritech Limited (n=15)	Aaatank	Markar	Super D
	Deva Shakti	Media Super	Superkiller 25
	Dhanusan	Monodhan	Targa super
	EM-1	One up	Caldan
	Ghatak	Ozone	Mortar
Bayer Crop Science (n=12)	Alanto	Larvin	Solomon
	Antracol	Movento	Folicur
	Fame	Nuvacron	Oberon
	Jump	Regent	Sunrice
Syngenta (n=12)	Actara	Ekalux	Rifit
	Alika	Gramoxone	Rifit plus
	Ampligo	Pegasus	Amistar Top
	Cymbush	Proclaim	Nugran

Adama India Private Limited (n=6)	Suckgan Agas	Barazide Bumper	Narkis 2,4-D Main
Dow AgroSciences India Pvt. Ltd. (n=6)	Conserve Coreon	Dursban Predator	Success Transform
Rallis India Limited (n=6)	Asataf Nagata	Reeva Reeva - 2.5	Tafgor Contaf Plus
Crystal Crop Protection (n=5)	Bavistin Clinton	Luphos 36 Furadan	Nidan
DuPont India (n=5)	Coragen Ferterra	Magister Vivaya	Dupont Rekord
NACL Industries Limited, Nagarjuna Agrichem Ltd. (n=5)	Nagarjuna Result Profex super	Nagarjuna Syndicate Ennova	Index
Indofil Industries Limited (n=4)	Avtar Cleanup	Merger Nikhar	
Sumitomo Chemical India (n=4)	Avast Creita	Kemtrek M-Con Super	
UPL Limited (n=4)	Atabron Doom	Phoskill Sweep Power	
Willowood Chemicals (n=3)	Inovexia	Teknox	Walxtra
Insecticides India Limited (n=2)	Bheema	Monocil	
PI Industries (n=2)	Osheen	Fosmite	
Swal Corporation Ltd (n=2)	Starthene Power	Starthene	
Anu Products Limited (n=1)	Ananda		
Isagro Asia Agrochemicals Private Limited (n=1)	Highlight		
SC Johnson (n=1)	All Out		
Krishi Rasayan (n=1)	Tarzan Rite		
Moti Insecticide Pvt Ltd (n=1)	Singham		
Nikita Bio Agro Pvt. Ltd. (n=1)	Stinger		
Parijat Industries (n=1)	Mortel		
Saraswati Agrochemicals India (n=1)	Confidor		
	Flower Booster		

Annex 6. Summary of Pesticide Brand Names Grouped According To HHPs they Contain

Table A6. Summary of HHPs in Pesticide Products				
HHPs as Active Ingredient	**Effects**	**Ban in # of Countries**	**Brand Name**	
Cypermethrin (n=8)	Highly toxic to bees I Endocrine disruptor I Likely carcinogenic	28	Nagata Profex super Stinger Super D	Superkiller 25 Ananda Cymbush Hitcel
Imidacloprid (n=7)	Highly toxic to bees		Confidor Inovexia M-Con Super Media Super	Movento Solomon Starthene Power
Lambdacyhalothrin (n=7)	Fatal if inhaled I Endocrine disruptor I Highly toxic to bees I Reproductive toxicant	28	Alika Ampligo Deva Shakti Inovexia	Reeva Reeva 2.5 Singham
Thiamethoxam (n=6)	Highly toxic to bees		Nikhar Suckgan Actara	Alika Bheema Creita
Chlorpyrifos (n=5)	Highly toxic to bees I Endocrine disruptor	4	Dursban Kemtrek Predator	Stinger Super D
Monocrotophos (n=5)	Highly hazardous I Fatal if inhaled I Highly toxic to bees	112	Luphos 36 Monocil Monodhan	Nuvacron Phoskill
Emamectin Benzoate (n=4)	Highly toxic to bees I Very toxic to aquatic organisms I Very persistent in water, soil, sediment		Barazide EM-1	Nikhar Proclaim
Fipronil (n=3)	Highly toxic to bees	37	Jump Mortel	Regent
Paraquat Dichloride (n=3)	Fatal if inhaled	46	Avast Gramoxone	Ozone
Profenofos (n=3)	Highly toxic to bees	29	Etna Hitcel	Profex super
Spinosad (n=3)	Highly toxic to bees		Success Conserve	One up
Triazophos (n=3)	Highly hazardous	40	Tarzan Rite Teknox	Ghatak
Acephate (n=2)	Highly toxic to bees	32	Starthene	Asataf

Bifenthrin (n=2)	Endocrine disruptor I Highly toxic to bees	2	Highlight	Markar
Chlorantraniliprole (n=2)	Very toxic to aquatic organisms I Very persistent in water, soil, sediment		Coragen	Ferterra
Diafenthiuron (n=2)	Highly toxic to bees	29	Agas	Pegasus
Glyphosate (n=2)	Likely carcinogenic		Clinton	Clean up
Phenthoate (n=2)	Highly toxic to bees	32	Dhanusan	Phendal
Propiconazole (n=2)	Reproductive toxicant	28	Bumper	Nagarjuna Result
Betacyfluthrin (n=1)	Fatal if inhaled I Highly hazardous I Highly toxic to bees	1	Solomon	
Butachlor (n=1)	Likely carcinogenic	31	Coreon	
Carbendazim (n=1)	Mutagenic I Reproductive toxicant	29	Bavistin	
Carbofuran (n=1)	Highly hazardous I Fatal if inhaled I Highly toxic to bees	63	Furadan	
Carbosulfan (n=1)	Fatal if inhaled I Highly toxic to bees	41	Aaatank	
Chlorfenapyr (n=1)	Highly toxic to bees	28	Intrepid	
Chlorfluazuron (n=1)	Very bioaccumulative I Very toxic to aquatic organisms	28	Atabron	
Cyfluthrin (n=1)	Highly hazardous I Fatal if inhaled I Highly toxic to bees	29	All Out	
Dichlorvos (n=1)	Highly hazardous I Fatal if inhaled I Highly toxic to bees I Endocrine disruptor I Reproductive toxicant	33	Doom	
Dimethoate (n=1)	Highly toxic to bees	4	Tafgor	
Dinotefuran (n=1)	Highly toxic to bees	28	Oshee	
Fenazaquin (n=1)	Highly toxic to bees		Magister	
Flubendiamide (n=1)	Very toxic to aquatic organisms I Very persistent in water, soil, sediment		Fame	
Glufosinate ammonium (n=1)	Reproductive toxicant	28	Sweep Power	
Mancozeb (n=1)	Likely carcinogenic I Reproductive toxicant	1	Merger	
Permethrin (n=1)	Likely carcinogenic I Highly toxic to bees	29	Permasect	
Propineb (n=1)	Likely carcinogenic	28	Antracol	
Quinalphos (n=1)	Endocrine disruptor I Highly toxic to bees	30	Ekalux	
Quizalofop ethyl (n=1)	Endocrine disruptor		Targa Super	
Spinetoram (n=1)	Highly toxic to bees		Nagarjuna Syndicate	

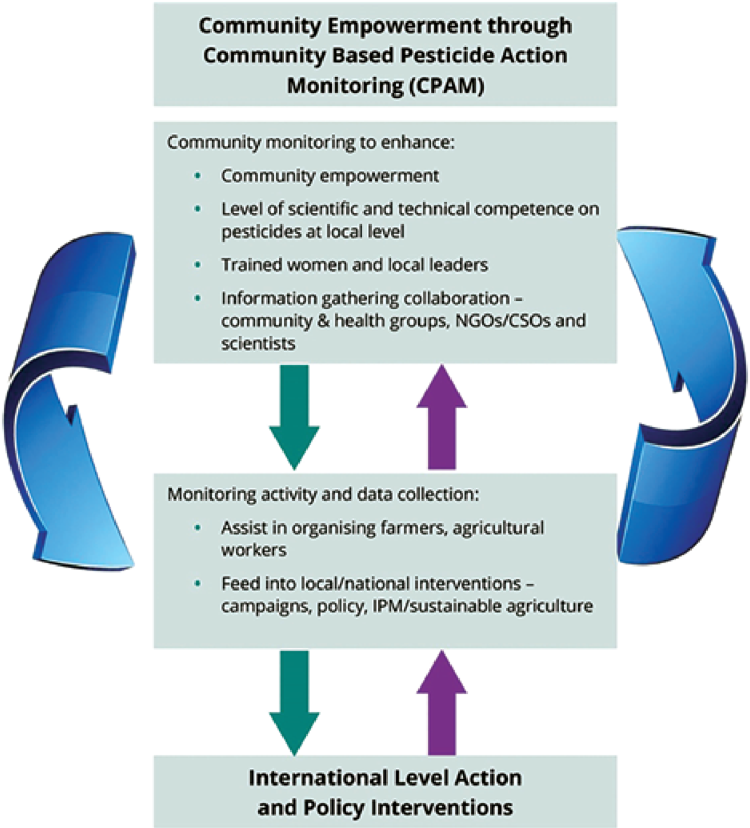
Sulfoxaflor (n=1)	Highly toxic to bees		Transform
Thiacloprid (n=1)	Likely carcinogenic | Reproductive toxicant		Alanto
Thiodicarb (n=1)	Likely carcinogenic | Highly toxic to bees	29	Larvin
Validamycin (n=1)	Highly toxic to bees	28	Walxtra
Zineb (n=1)	Endocrine disruptor	32	Avtar

Appendix 1. Community-based Pesticide Action Monitoring (CPAM)

CPAM is a Participatory Action Research approach to document and create awareness of pesticide impacts on human health and the environment. It involves community members who undertake the research, and encourages organising and action. CPAM involves recording of the impacts of pesticide use on health and raising awareness of the hazards of pesticide use. Through CPAM, the community learns to record the impacts of pesticide use and becomes aware of the pesticides' harmful effects. CPAM aims to empower communities to address their situation themselves and get actively involved in solving their problems. This approach drives the changes required to reduce the use of pesticides, adopt more ecological and sustainable agricultural practices, and pressure governments for the implementation of better pesticide regulations and international conventions on pesticides.

The interrelationship between CPAM, organising, action and advocacy is illustrated in the diagram below.

As an integral process of CPAM, it makes use of questionnaires as a method of data collection and analysis. CPAM Questionnaire is composed of six (6) main parts, namely: (1) Pesticide Use and Effects, (2) Incident Report Form, (3) Retail Questionnaire, (4) Documenting Advertisements, (5) Corporate Profile, and (6) Children's Exposure to

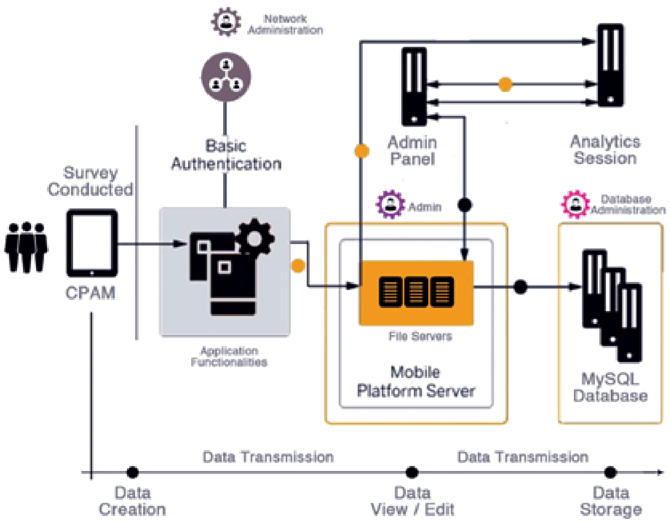


Pesticides. These questionnaires are carried out as field surveys via interviews in local languages.

To provide a more focused approach towards data gathering for the various questionnaires, PANAP has designed and developed the CPAM mobile application. The mobile application has been built on an Android platform and has three (3) main modules which makes it a feasible data collection, data storing and data analytical application. The mobile application has three (3) main components: (1). Application Program Interface (API) which are made of sets of routines, protocols, and tools on, how the components should interact with the graphical user interface (GUI) components; (2) Middle Layer which comprises of management system on PHP environment which collects, stores and hosts all the files such as Database, Content Management, Messaging and Resources; and (3) Android Mobile Application which can be used to conduct the survey, to collect media such as photos, audio and video as part of its survey.

With user registration and sign-up process, intended users are given access codes to download and install the mobile app on their Android phones. The user information and data, which is being collected and transmitted between mobile device and server are of sensitive nature. A robust security plan is implemented to protect the integrity of the CPAM mobile application backbone which holds and manages the data. All data generated by the mobile app users are encrypted as secured data while being transmitted to the Database as mentioned in the Middle Layer. Only Administrators and those with access will be able to view the data.

The complex process of systematic collection and creation of data for CPAM mobile application through its various questionnaire is depicted in the diagram below.



PANAP conducts trainings on CPAM to its staff, network partners and their community leaders. CPAM training usually takes three days to complete. SRED, a long-time partner of PANAP, with some of its women staff and community leaders were trained by PANAP on CPAM. The training also includes the use of the CPAM mobile application. CPAM trainings have been proven as an effective tool to help facilitate skills training to research, monitor and document the extent of pesticide trade and use, and its impact on human health and environment in communities. SRED has certainly benefitted from these trainings.

Appendix 2. Full Report of Farmers' CPAM

Demographics

The team was also able to interview five farmers (4 male, 1 female) who were all married and between the ages 30 to 59. All of the farmer respondents identified themselves as Dalits. Four of them were able to finish secondary schooling, while one—the eldest—was only able to finish kindergarten. The average household size is five. Four of the farmers have at least one child below 18 living in their household.

All are self-employed and their families own the land that they are working on. They plant jasmine and jathimalli for commercial purposes. According to the respondents, they chose this type of work because there are no other jobs available. No household earned more than USD 2,000 annually. Three farmers disclosed that their household earned below USD 1,000, while two said their household earned between USD 1,000 – 2000.

Exposure to Pesticides

Pesticides Used by Farmers

The farmers identified 15 pesticide brand names that they regularly use (see Appendix 3). The most commonly used pesticides are Markar (n=5) and Monocil (n=5) which contain bifenthrin and monocrotophos, respectively.

Majority (11) of the 15 brand names contained HHPs in their active ingredients. Out of the 15 active ingredients present in the products, 11 were HHPs. The most commonly found HHPs in the products in the products were monochrotophos (n=9), acephate (n=6), and bifenthrin (n=5) (see Figure Ap1).

Table Ap1 summarises the effects of the HHPs found in the active ingredients of the brand names and the number of countries where they are banned.

Figure Ap1. Active Ingredients in the Pesticide Brand Names Identified by Farmers

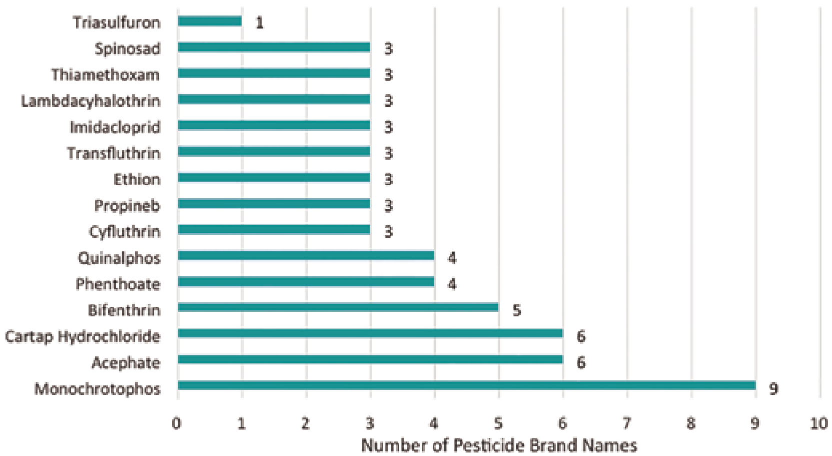


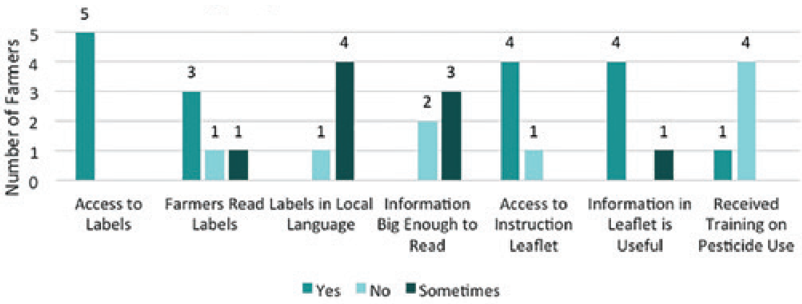
Table Ap1. Effects of HHPs Found in Pesticides Identified by Children		
Active Ingredient	**Effects**	**Ban in # of Countries**
Monocrotophos	Highly hazardous I Fatal if inhaled I Highly toxic to bees	112
Acephate	Highly toxic to bees	32
Bifenthrin	Endocrine disruptor I Highly toxic to bees	2
Phenthoate	Highly toxic to bees	32
Quinalphos	Endocrine disruptor I Highly toxic to bees	30
Cyfluthrin	Highly hazardous I Fatal if inhaled I Highly toxic to bees	29
Propineb	Likely carcinogenic	28
Imidacloprid	Highly toxic to bees	
Lambdacyhalothrin	Fatal if inhaled I Endocrine disruptor I Highly toxic to bees	28
Thiamethoxam	Highly toxic to bees	
Spinosad	Highly toxic to bees	

Access to Labels and Instruction Leaflets of Pesticide Products

All of the farmers have access to the labels of the pesticide (n=5) (see Figure). However, only three of the farmers read the labels (see Figure Ap2). However, even if labels are available, they are not always written in local language (n=4) and are only sometimes big enough (n=3), or not at all/too small to be read (n=2).

Almost all of the farmers (n=4) have access to the instruction leaflets of the pesticide products which they found useful (n=4). However, only one of the farmers received training on the use of pesticides, which he received in the form of a 10-minute sales information given to him at the shop where he bought the pesticides.

Figure Ap2.Labels and Instructions for Pesticides



Buying Pesticides

All of the farmers are in charge of buying pesticides, which they purchase from retail shops (n=5), supply agents (n=1), and manufacturers (n=1) (see Figures Ap3).

Farmers choose which pesticides to buy according to their own experience (n=4), from suggestions from the seller (n=2), and from suggestions from the agricultural officer (n=1) (see Figure Ap4).

While buying pesticides, none of the farmers wear any form of Personal Protective Equipment (PPE) (n=5).

Figure Ap3. Where Pesticides are Bought

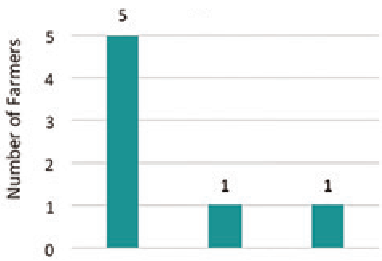
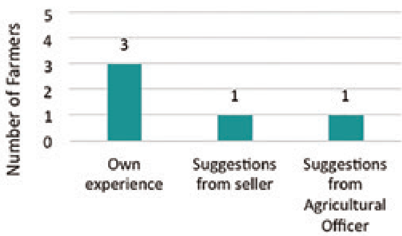


Figure Ap4.How Farmers Choose which Pesticide to Buy



All of the farmers interviewed used pesticides on their flower farms and live less than a kilometer away from these farms. Two of them have been using pesticides for 15 years, while the other two have been using pesticides between 16-30 years. One of them, have been using pesticides for more than 31 years (see Figure Ap5). The farmers spray most of the pesticides the use on a weekly basis (see Figure Ap6).

Figure Ap5. Number of Years Using Pesticides

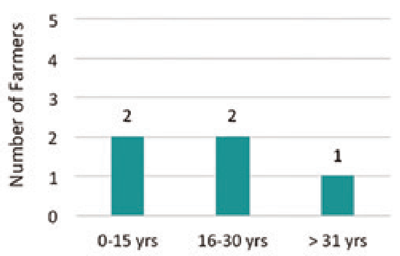
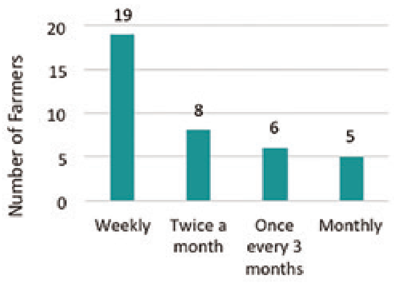


Figure Ap6.Frequency of Pesticide Use

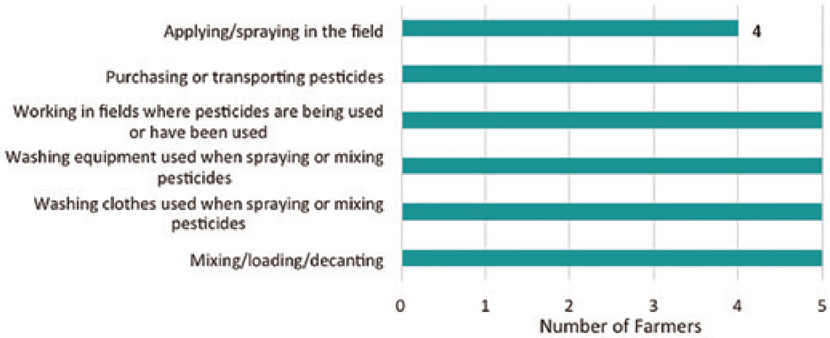


The most common activities done by farmers involving pesticides are mixing/loading/decanting (n=5), washing clothes used when spraying or mixing pesticides (n=5), washing equipment used when spraying or mixing pesticides (n=5), working in fields where pesticides are being used or have been used (n=5), purchasing or transporting pesticides (n=5), and applying/spraying pesticides in the fields (n=4) (see Figure Ap7).

Due to the nature of their work, almost all of the farmers interviewed are exposed to pesticides weekly. Farmers get additional exposure to pesticides through ground spray (n=4), water contamination (n=1), and through their neighbors' use of pesticides (n=1).

All of four farmers who sprayed pesticides in their fields do so along the direction of the wind. However, all of them enter their farms within the day after pesticides were sprayed.

Figure Ap7. Activities Done Involving Pesticides



Incidences of Pesticide Spillage

Almost all of the respondents (n=4) had experienced pesticides spilled on them. Most spills occurred during spraying (n=4).

They had pesticides spilled on their backs (n=4), hands (n=4), upper body (n=2), feet (n=1), lower body (n=1), and front body (n=1) (see Figure Ap8) due to faulty spraying equipment (n=3), loose bottle caps (n=2), they fell while spraying (n=2), and change in wind direction while spraying (n=2) (see Figure Ap9). In some instances, the spills occurred while playing with the sprayer (n=1), while decanting the pesticide for mixing (n=1), and because of faulty packaging (n=1).

Figure Ap8.Part of the Body Where Pesticide was Spilled on

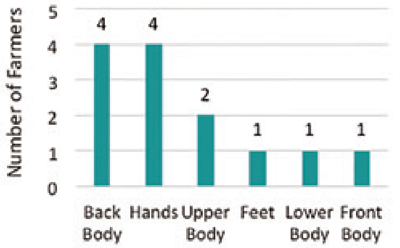
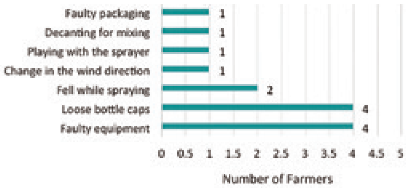
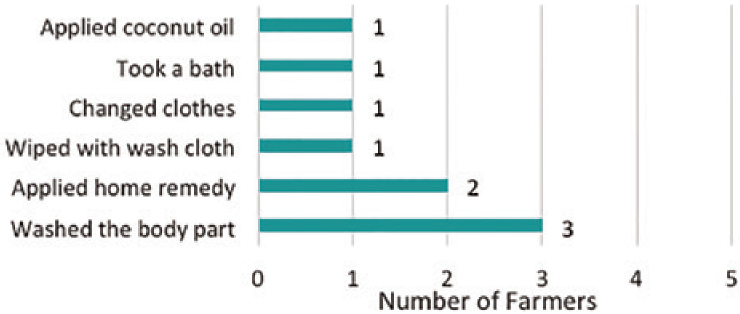


Figure Ap9.Part of the Body Where Pesticide was Spilled on



After they get spilled with pesticides, most of the farmers reported that they washed the body part (n=3), and applied home remedy (n=2) (see Figure Ap10). Wiping the spill with a wash cloth (n=1), changing clothes (n=1), taking a bath (n=1) and applying coconut oil (n=1) were also some of the methods that the farmers used to remove pesticide spills from their bodies.

Figure Ap10. Actions Done after Spillage



Use of Personal Protective Equipment

Although almost all of the farmers had experienced accidental spillage of pesticides on them, only one of the farmers interviewed used personal protective equipment (PPE) which he bought for himself (n=1). The others did not use PPE because it was too expensive (n=4) and uncomfortable (n=1).

The PPE used by the lone farmer, gloves and a mouth mask, are however not enough to protect him from accidental spillage and general exposure to pesticides. According to him, instructions were given by an agricultural officer on how to use the PPE.

Availability of Washing Facilities

Only three out of the five farmers reported that there are washing facilities for the hands and body in the fields where they apply pesticides. Equipment used for spraying pesticides are also washed in the fields using water containers. Run-off from washing equipment can potentially contaminate water sources.

Pesticide Storage and Disposal

Almost all farmers are knowledgeable about the proper storage of pesticides. Four of the farmers store pesticides in the field (n=5), while one of them store pesticides at home. All of the farmers lock the pesticides away from children and make sure that they are separated from other items. Although majority of the farmers decant pesticides into other containers (n=3), all said that they do not use pesticide containers for other purposes.

All of the farmers use the pesticides until they are finished (n=5). However, proper disposal of left-over pesticides and empty containers is not observed. Some of them throw left-overs in the river (n=1) and in the field (n=1) (see Figure Ap11). Empty containers are thrown in the field (n=4), buried (n=2), stored in a big container in the field (n=1), and sold to scrap dealers if the containers are made of aluminum (see Figure Ap12).

Figure Ap11. What are Done to Left Over Pesticides

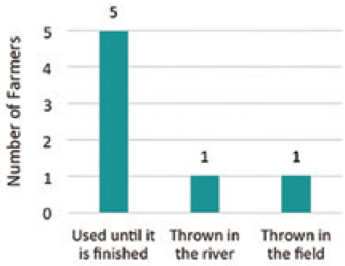
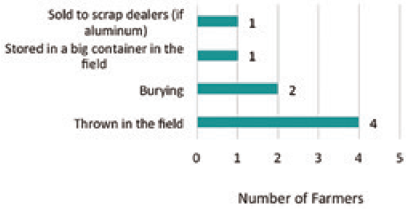


Figure Ap12. What are Done to Left Over Pesticides



Effects of Pesticide Exposure

The farmers experienced various illnesses after being exposed to pesticides. They reported having skin rashes (n=4), headaches (n=4), nausea (n=2), burning sensation (n=2), excessive salivation (n=1), vomiting (n=1), and difficulty breathing (n=1) (see Figure Ap13). Table Ap2 shows that four out of the five farmers felt more than one effects after being exposed to pesticides.

If the farmers think someone is poisoned, they would call the local doctor (n=2) or the hospital (n=1). Some would also call the retail shop owner where they bought the pesticides (n=1) or the salesman (n=1) (see Figure Ap14).

Figure Ap13. Effects of Pesticide Exposure

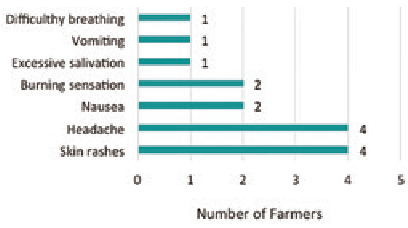


Figure Ap14. Who Farmers Would Call if Someone was Poisoned

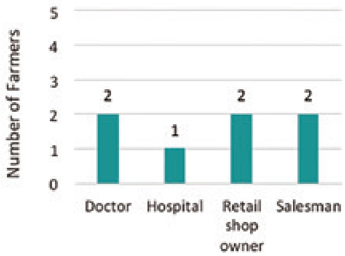


Table Ap2. Combinations of Symptoms Experienced by Farmers

	Symptoms
Farmer 1	Burning sensation, headache, skin rashes, nausea
Farmer 2	Skin rashes
Farmer 3	Headache, skin rashes
Farmer 4	Excessive salivation, vomiting, difficulty of breathing, skin rashes, headache
Farmer 5	Burning sensation, headache, nausea

Appendix 3. List of Pesticides Used by Farmers

Table Ap3. Pesticides Used by Farmers				
Active Ingredient	**Effects**	**Ban in # of Countries**	**Brand Name**	**Manufacturer**
Monocrotophos (n= 9)	- Highly hazardous - Fatal if inhaled - Highly toxic to bees	112	Monocil (n=5) Nuvacron (n=4)	Insecticides (India) Limited Bayer Crop Science
Bifenthrin 10% EC (n=5)	- Endocrine disruptor - Highly toxic to bees	2	Markar (n=5)	Dhanuka Agritech Ltd Dhanuka Agritech Ltd
Phenthoate 50% (n=4)	- Highly toxic to bees	32	Dhanusan (n=4)	
Quinalphos 25% w/w (n=4)	- Endocrine disruptor - Highly toxic to bees	30	Ekalux (n=4)	Syngenta
Acephate 50% + Imidacloprid 1.8% SP (n=3)	- Highly toxic to bees - Highly toxic to bees	-32	Starthene Power (n=3)	Swal Corporation Ltd
Acephate 75% w/w (n=3)	- Highly toxic to bees	-32	Starthene (n=3)	Swal Corporation Ltd
Cartap Hydrochloride 50% SP (n=3)			Caldan 50 (n=3)	Dhanuka Agritech Ltd
Cartap Hydrochloride 75% SG (n=3)			Mortar (n=3)	Dhanuka Agritech Ltd
Ethion 50% EC (n=3)		30	Fosmite (n=3)	PI Industries
Propineb (n=3)	- Likely carcinogenic	28	Antracol (n=3)	Bayer Crop Science
Spinosad (n=3)	- Highly toxic to bees		Success (n=3)	Dow
Thiamethoxam (12.6%) + Lambdacyhalothrin (9.5%) (n=3)	- Highly toxic to bees - Fatal if inhaled - Endocrine disruptor - Highly toxic to bees	-28	Alika (n=3)	Syngenta
Transfluthrin + Cyfluthrin (n=3)	- Highly hazardous - Fatal if inhaled - Highly toxic to bees	-29	All Out (n=3)	SC Johnson
Triasulfuron (n=1)			Nugran (n=1)	Nufarm (Syngenta)

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PAN Asia Pacific (PANAP) is one of the five regional centres of Pesticide Action Network (PAN). PANAP works for the elimination of harm caused by pesticides on human health and the environment. PANAP also promotes agroecology, helps strengthen people's movements in their assertion of rights to land and livelihood, and advances food sovereignty and gender justice.

As a network, PANAP is currently comprised of more than 100 partner organisations from the Asia-Pacific region and has links with about 400 other regional and global civil society and grassroots organisations.

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