PAN ASIA PACIFIC
For a just and pesticide-free future

FROM THE GROUND UP

Documenting Pesticide Use in Bangladesh, India, Laos, and Vietnam

FROM THE GROUND UP: DOCUMENTING PESTICIDE USE IN BANGLADESH, INDIA, LAOS & VIETNAM

Published by PAN Asia Pacific

PAN ASIA PACIFIC
For a just and pesticide-free future

This document has been produced with the financial assistance of the Swedish International Development Cooperation Agency (Sida), Sweden, Agroecology Fund (AEF) & Katholische Zentralstelle (KZE). The views herein shall not necessarily be taken to reflect the official position of SIDA or Sweden or AEF or KZE.

Research Author: Dinesh Rajendran

Editors: Sarojeni V. Rengam & Alia Diyana

Layout Design: Andrew Zarate

Contributors and researchers from:

1. Bangladesh Resource Center for Indigenous Knowledge (BARCIK) (Bangladesh)
2. Shikkha Shastha Unnayan Karzakram (SHISUK) (Bangladesh)
3. Pesticide Action Network India (PAN India) (India)
4. Thanal Trust (India),
5. Sustainable Agriculture & Environment Development Association (SAEDA) (Laos)
6. Research Centre for Gender, Family and Environment in Development (CGFED) (Vietnam)
7. Centre for Sustainable Rural Development (SRD) (Vietnam)

PANAP would like to acknowledge and extend sincere appreciation to the following individuals for their invaluable contributions in conducting field surveys with farmers at their respective study sites:

- **Manikganj, Bangladesh:** (BARCIK: Liza Akter, Shafiqul Islam, Md. Masudur Rahman, Ananna Akter, Sonjita Kirtoniya, & ABM Touhid Alam)
- **Cumilla, Bangladesh:** (SHISUK: Raisul Millat Safkat, Mojjamel Hossain, Nafisa Rahman, Abdur Rakib, & Zillur Rahman)
- **Yavatmal, India:** (PAN India: Avinash Harsing Pawar, Vilas Laxman Tambe, Varsha Vijay Sonule, Akash Suresh Masram, Prashant Suresh Masram, Seema Devanand Jambhe, Prashant Raghunath Jadhav, Athira P S, Sangeetha Pradeep & Dileepkumar A D) with Students of Savitri Jyotirao Social Work College ,Yavatmal under the advisory of Dr.Narasimha Reddy Donthi & Jayakumar C
- **Kerala, India:** Thanal staff and volunteers
- **Xiengkhouang, Lao PDR:** (SAEDA: Phetlamphay Manivong, Bounlap Pathilath, Xongnengkha, Ousana Sivixay & Visith Xayyasensouk) with (Provincial Natural Resource and Environment: Phiengphanet), (Provincial Agriculture and Forestry Office: Juha), (District Natural Resource and Environment: Ainisone) & (District Agriculture and Forestry Office: Daleexay & Sounin)
- **Hai Hau, Vietnam:** (CGFED: Nguyễn Kim Thúy, Thân Nguyễn Phương Hải, Nguyễn Thị Phương Thanh & Phạm Thị Lương) with local partners including The Hai Hau District Women's Union & the Pioneer Women Farmers Group of Hai Xuan Commune, Hai Hau District, Nam Dinh Province
- **Son La, Vietnam:** (SRD: Hoang Thi Sen& Bui Quoc Quan) with (Sub-Department of Crop Cultivation and Plant Protection of Son La province: Pham Van Tho, Pham Duc Vu, Nguyen Thi Phuong, Pham Thi Thuy Hang, Phan Thi Lien, Chu Manh Cuong, Tran Van Đong, & Nguyen Thi Thanh Huyen)

Their dedication and efforts in supporting field data collection and farmer engagement have been instrumental to the success of this study. PANAP expresses its deep gratitude for their commitment and valuable work on the ground.

Comments and inquiries may be forwarded to:

PAN Asia Pacific (PANAP)
48-1, Persiaran Mutiara 1, Pusat Komersial Bandar Mutiara,
14120 Simpang Ampat, Penang, Malaysia
Tel: +604–502 2337
Email: info@panap.net
Web: www.panap.net
Facebook: www.facebook.com/panasiapacific
Twitter: @PANAsiaPacific
Instagram: @justpesticidefreeasia

FROM THE GROUND UP

Documenting Pesticide Use in Bangladesh, India, Laos, and Vietnam

PAN ASIA PACIFIC
For a just and pesticide-free future

CONTENTS

FOREWORD

By Sarojeni Rengam, Executive Director, PANAP

Community-based Pesticide Action Monitoring (CPAM) is a participatory process and methodology developed by Pesticide Action Network Asia Pacific (PANAP). What began as a simple toolkit has since evolved into a robust process for monitoring and documenting the impact of pesticides on communities.

CPAM's roots go back to the early 1990s when Canadian volunteer Gregg Strong conceptualised the Community Pesticide Action Kit (CPAK). PANAP then brought together a committed group of activists, including Dr. Romy Quijano, the late Dr. Irene Fernandez, and Rossana Devi, to develop a kit of easy-to-understand materials, rich in visuals, that highlighted the impact of pesticides on human health, the environment, and plantation workers and on alternatives to pesticides.

This early work was soon followed by Tenaganita's landmark study on the health of plantation workers in Malaysia. Women workers, who sprayed pesticides on a daily basis, recorded their symptoms using a checklist. At the same time, PANAP engaged the National Poison Centre at Universiti Sains Malaysia (USM), which collaborated on a cholinesterase study among plantation workers. The findings, published in Poisoned and Silenced (2002), revealed the poisoning of workers by paraquat and organophosphates. That same year, the Malaysian Pesticide Board announced a ban on paraquat, only to rescind it under pressure from the oil palm plantation industry and pesticide corporations. It would take two more decades before paraquat was finally banned in Malaysia.

Building on this momentum, CPAM expanded in 2008, when 1,304 farmers and agricultural workers from 12 communities across 8 Asian countries were interviewed in their local languages. The findings were published in a report launched in 2010, with then PANAP staff Bella Whittle playing a key role.

In the years that followed, PANAP, led by Deeppa Ravindran, strengthened CPAM as a process. Together with grassroots partners across Asia, the team developed questionnaires, trained participants, and expanded monitoring across several countries. This resulted in the 2018 report, Of Rights and Poisons: Accountability of the Agrochemical Industry, involving over 2,000 respondents from 7 countries. In 2022, another CPAM report, Field Survey: Use and Impacts of Pesticide in four countries in Asia" was compiled by Alia Diyana, based on the responses of 350 participants.

Now, in 2025, we are proud to launch yet another milestone: this CPAM report, "From the Ground Up: Documenting Pesticide Use in Bangladesh, India, Laos and Vietnam", which covers more than 4,000 respondents across 4 countries, developed in close collaboration with 7 partner groups. The report was meticulously compiled and written by Dinesh Rajendran, whose tireless work in analysing the data and presenting the findings has been invaluable. We also extend our heartfelt thanks to the entire team and partners whose contributions have strengthened the depth, clarity, and comprehensiveness of this endeavour.

To ensure wider reach and impact, PANAP has also launched a public landing page where the survey results and data from 4,000 respondents across the four countries are now accessible. This resource is available to activists, CSOs, researchers, governments, and the general public, furthering our collective struggle to phase out hazardous pesticides.

From its beginnings as CPAK to its evolution into CPAM, each stage has contributed to growing global recognition of the urgent need to phase out highly hazardous pesticides. The evidence generated by CPAM has not only informed international policy debates but has also equipped grassroots groups with powerful tools for advocacy, strengthening campaigns to eliminate toxic pesticides and advance agroecology as the real alternative.

1. INTRODUCTION

Agriculture remains a critical sector across Asia, employing a significant portion of the population, especially in rural areas. It provides food security, livelihoods, and cultural identity for millions. However, the Green Revolution and the industrialisation of agriculture have brought with them an overwhelming reliance on chemical inputs, particularly pesticides. The expansion of monoculture farming, contract farming, and export-oriented agricultural production systems has driven farmers to use ever-increasing volumes and varieties of chemical pesticides, often without adequate safety training, personal protective equipment (PPE), or awareness of the long-term consequences. This widespread and unsafe pesticide use has disproportionately affected smallholder farmers, landless agricultural workers, and Indigenous communities, many of whom are women, children, and other vulnerable groups. Globally, around 138 million children are involved in child labour, with over 61% working in agriculture[1]. Many of these children are exposed to harmful pesticides while working in the fields during or soon after spraying. Understanding the realities on the ground, including what types of pesticides are in use, how they are applied, and the resulting health impacts, is critical to advancing safer, more sustainable farming systems.

The environmental toll of pesticides is equally devastating. These chemicals have caused significant biodiversity loss, particularly among pollinators such as bees and birds. Pesticides have been and continues to disrupt the environment and the ecological balance. Pesticides easily cross borders, contaminating soil, water, and air through runoff, spray drift, and volatilisation.[2] These pollutants can have both anticipated and unforeseen effects, further degrading terrestrial and aquatic ecosystems. In addition, the production and use of pesticides contribute to greenhouse gas (GHG) emissions, and the lack of agroecological alternatives undermines the role of agriculture in climate change mitigation.[3]

This Community-based Pesticide Action Monitoring (CPAM) report presents the findings of a quantitative, community-based study conducted across selected agricultural areas in Bangladesh, India, Laos, and Vietnam. The study utilised the CPAM methodology developed by Pesticide Action Network Asia Pacific (PANAP), a participatory action research approach that actively engages community members in identifying and understanding the risks of pesticide exposure. CPAM not only generates crucial data for advocacy and education but also empowers local people, especially women and youth, to take informed action within their communities. This report aims to serve as a critical resource for communities, civil society organisations, and policymakers by providing evidence-based insights into pesticide use practices and their health consequences, while advocating for agroecological alternatives that prioritise the well-being of farmers, especially women and children.

1.1. Objective

The primary objective of this study is to document the types of pesticides currently in use, examine the prevailing conditions under which they are applied, and assess the associated health impacts, particularly through a gendered lens, across various communities in Bangladesh, India, Laos, and Vietnam.

[1] International Labour Organization & United Nations Children's Fund. (2025). Child Labour: Global estimates 2024, trends and the road forward. ILO and UNICEF. New York.

[2] Zhou W., Li M., Achal V. (2025). A comprehensive review on environmental and human health impacts of chemical pesticide usage. Emerging Contaminants, Vol 1 (1) 100410.

[3] PANNA. (2023). Pesticides and Climate Change: A Vicious Cycle. https://www.panna.org/wp-content/uploads/2023/02/202301ClimateChangeEngFINAL.pdf

2. METHODOLOGY

2.1. Participating organisations

2.1.1. Bangladesh

Bangladesh Resource Center for Indigenous Knowledge (BARCIK)

With a strong emphasis on agroecology and food sovereignty, the Bangladesh Resource Center for Indigenous Knowledge (BARCIK) collaborates closely with local farming communities to promote sustainable agricultural practices that integrate ecological principles with traditional indigenous knowledge. This approach not only enhances biodiversity but also strengthens the resilience of farming systems to climate change. A key aspect of BARCIK's work involves empowering farmers through participatory action research, enabling them to efforts in conserving native seeds and adopting organic farming techniques. For instance, in the coastal regions of Satkhira district, BARCIK has documented the efforts of women farmers who have adopted agroecological methods, such as preparing organic fertilisers and pesticides, conserving seeds, and selecting climate-tolerant crop varieties, thereby improving their livelihoods and food security. In its efforts to address the challenges posed by pesticide use, BARCIK has partnered with PANAP to advocate for the reduction of highly hazardous pesticides and promote safer, sustainable alternatives. Recognising the significant health risks associated with pesticide exposure, especially among women and children, BARCIK emphasises the importance of peer learning among farmers to develop and adopt appropriate solutions and innovations. This collaborative approach has proven effective in creating accessible and readily adopted agroecological practices. Through initiatives like the establishment of Agroecology Learning Centres, BARCIK provides resources and training on seed conservation, organic farming, and modern agricultural tools, fostering a community-driven movement towards sustainable agriculture and improved public health.

Shikkha Shastha Unnayan Karzakram (SHISUK)

Shikkha Shastha Unnayan Karzakram (SHISUK), established in 1994, is a national non-governmental organisation in Bangladesh dedicated to sustainable community development through education, health, and enterprise. Recognised for pioneering the Daudkandi model of floodplain aquaculture in 1997, SHISUK has been instrumental in promoting agroecological practices that integrate fish farming and crop cultivation, enhancing food security and livelihoods in flood-prone regions. In collaboration with PANAP, SHISUK has actively participated in initiatives aimed at reducing the harmful impacts of highly hazardous pesticides. Through the Community Pesticide Action Monitoring (CPAM) programme, SHISUK has contributed to data collection and advocacy efforts, highlighting the risks associated with pesticide use and promoting safer alternatives. Moreover, SHISUK has engaged in educational campaigns and training programmes to raise awareness of sustainable agricultural practices. For instance, in partnership with PANAP and other organisations, SHISUK organised a training session on sustainable beekeeping, marketing, and quality control, emphasising the importance of pollinators in agroecological systems. Through these collaborative efforts, SHISUK continues to play a vital role in advancing agroecology and promoting environmentally friendly farming practices in Bangladesh.

2.1.2. India

Pesticide Action Network India (PAN India)

Pesticide Action Network India (PAN India) is a key organisation working to reduce pesticide use, promote agroecology, and advocate for the rights of farmers and agricultural workers. As part of the global Pesticide Action Network (PAN), PAN India collaborates closely with PANAP to address the harmful impacts of highly hazardous pesticides (HHPs) on human health and the environment. The organisation actively documents pesticide poisoning cases, such as large-scale poisoning incidents in Yavatmal, Maharashtra, where farmers and workers suffered severe health consequences due to pesticide exposure. Through its research and advocacy efforts, PAN India has brought attention to the dangers of HHPs, pushing for stricter regulations and bans on hazardous agrochemicals. Additionally, the organisation promotes agroecological farming practices as safer and more sustainable alternatives, working directly with farming communities to implement ecological pest management, organic farming, and traditional seed conservation. PAN India also engages in policy advocacy at national and regional levels, influencing regulatory decisions and working with stakeholders to transition towards pesticide-free food production. By partnering with PANAP, PAN India strengthens its regional and global impact, contributing to campaigns against corporate-driven agriculture and promoting people-centred food systems based on food sovereignty, environmental sustainability, and social justice.

Thanal Trust

Thanal Trust is a prominent environmental organisation based in Kerala, India, dedicated to promoting sustainable agriculture, biodiversity conservation, and environmental justice. With a strong focus on the adverse impacts of pesticides, Thanal has been actively working to raise awareness about the dangers of HHPs and to advocate for safer, agroecological alternatives. The organisation has been instrumental in supporting affected farming communities, particularly in Kerala, where pesticide-related health issues have been a significant concern. Thanal has conducted extensive research and led campaigns against the use of toxic agrochemicals, including playing a critical role in exposing the devastating effects of endosulfan, a persistent organic pollutant that caused severe health crises in Kasaragod, Kerala and successfully campaigned for its ban. As part of its commitment to agroecology, Thanal has initiated programmes to promote organic farming, seed conservation, and sustainable land management, helping farmers transition away from chemical-intensive agriculture. In collaboration with PANAP, Thanal has strengthened its advocacy efforts at national and international levels, contributing to policy discussions and grassroots campaigns aimed at phasing out HHPs. Through training workshops, research publications, and community-led initiatives, Thanal continues to work towards a pesticide-free and ecologically resilient agricultural system that prioritises farmers' health, food sovereignty, and environmental sustainability.

2.1.3. Laos

Sustainable Agriculture & Environment Development Association (SAEDA)

The Sustainable Agriculture & Environment Development Association (SAEDA) is a Lao-based non-governmental organisation dedicated to promoting sustainable agriculture, environmental conservation, and food security. SAEDA works closely with local farmers, communities, and stakeholders to advocate for agroecological farming practices that reduce reliance on synthetic inputs, including HHPs. The organisation plays a key role in raising awareness about the dangers of pesticide exposure and promoting alternatives that prioritise human and environmental health. In partnership with PANAP, SAEDA actively engages in research, policy advocacy, and capacity-building initiatives aimed at minimising the use of toxic agrochemicals and strengthening community resilience against industrial agricultural practices. Through training programmes, knowledge-sharing platforms, and on-the-ground interventions, SAEDA empowers farmers, especially smallholders and women, to adopt ecological farming techniques that enhance biodiversity, improve soil health, and ensure food sovereignty. By advocating for stricter pesticide regulations and supporting sustainable food production systems, SAEDA contributes to the broader regional movement towards pesticide-free, climate-resilient agriculture.

2.1.4. Vietnam

Research Centre for Gender, Family and Environment in Development (CGFED)

The Research Centre for Gender, Family and Environment in Development (CGFED) is a Vietnamese non-governmental organisation dedicated to promoting gender equality, environmental sustainability, and community development. As a long-time partner of PANAP, CGFED has played a crucial role in addressing the harmful impacts of pesticides on farmers, particularly women and children, while advocating for safer agricultural practices. Their research and advocacy efforts have highlighted the widespread use of HHPs in Vietnam, exposing their detrimental effects on human health and the environment. Through community-based initiatives, CGFED has worked closely with smallholder farmers to promote agroecology as a sustainable alternative, encouraging the adoption of organic farming practices and reducing dependence on toxic agrochemicals. Additionally, CGFED has actively contributed to PANAP's CPAM, documenting cases of pesticide poisoning, unsafe pesticide handling, and environmental contamination to push for stronger pesticide regulations. Their work also extends to awareness-raising campaigns and policy advocacy, urging the Vietnamese government to ban HHPs, regulate online pesticide sales, and uphold the rights of women farmers. By integrating gender perspectives into agroecological initiatives, CGFED ensures that women, who are disproportionately affected by pesticide exposure, are empowered to lead and influence sustainable farming practices in their communities.

Centre for Sustainable Rural Development (SRD)

The Centre for Sustainable Rural Development (SRD) is a Vietnamese non-governmental organisation dedicated to improving rural livelihoods, promoting sustainable agriculture, and advocating for environmental protection. SRD has been actively involved in addressing the harmful impacts of pesticide use in Vietnam, particularly among smallholder farmers who face significant health risks due to exposure to HHPs. Through its collaboration with PANAP, SRD promotes agroecological farming practices as safer and more sustainable alternatives to chemical-intensive agriculture. The organisation conducts capacity-building programmes, providing farmers, especially women and ethnic minorities, with training on integrated pest management (IPM), organic farming, and ecological pest control methods to reduce dependence on toxic pesticides. Additionally, SRD engages in policy advocacy to push for stricter pesticide regulations and the phase-out of HHPs, aligning with regional and global efforts to protect human health and the environment. By fostering community-driven solutions and strengthening local knowledge, SRD plays a crucial role in promoting sustainable food systems and advancing environmental justice, particularly in Vietnam's rural areas.

2.2. Selection of respondents

In this quantitative study, locations across the four countries were selected using purposive sampling, while participants within those areas were chosen through random sampling. Local villagers, communes, or local agricultural departments informed the partner organisations that the selected communities were actively engaged in agriculture and using pesticides.

2.3. Data gathering and analysis

Data collection for the study was carried out using the CPAM methodology developed by PANAP. CPAM is a participatory action research approach aimed at documenting and raising awareness about the hazards of pesticide use and its impacts on human health and the environment. It actively involves community members in the research process, fostering both awareness and local action.

To prepare for the survey, PANAP conducted both online and in-person orientation and training sessions with partner organisations in Bangladesh, India, Laos, and Vietnam. The partner organisations then trained local community leaders, key farmers, students and collaborated with the local government officials to support the data-gathering process. The CPAM questionnaire was translated into the respective local languages and hard copies were provided to the interviewees, while the research team used the CPAM database website to input and manage the collected data.

In Bangladesh, data was gathered from respondents in unions located in the Singair sub-district of Manikganj and the Daudkandi sub-district of Cumilla. In India, PAN India conducted its survey in Yavatmal, an eastern district in the Vidarbha region of Maharashtra, while Thanal collected data from various locations in Kerala. In Lao PDR, the study was conducted in Xieng Khouang province, with assistance from the Provincial Office of Natural Resources and Environment (PoNRE), the Provincial Agriculture and Forestry Office (PAFO), the District Office of Natural Resources and Environment (DoNRE), and the District Agriculture and Forestry Office (DAFO). In Vietnam, the survey was carried out in the Hai Hau district of the Nam Dinh province, and in the Son La province.

2.4 Limitation of the study

There was limited information available on the active ingredients of the pesticides used, condition of use and impacts in Cumilla, as many farmers were not aware of the names or contents of the products. According to the interviewers, this was most likely because many farmers are illiterate and simply follow what others are doing. They usually ask the pesticide sellers, who then indicate which product to use and in what quantity. As a result, while the farmers regularly use pesticides, they are often unable to identify the generic or brand names and the precautions that comes with it.

The farmers surveyed were primarily from Wayanad, where the main crops targeted generally require less pesticide use. In addition, the state government and several agencies, including Thanal, have been actively promoting organic farming in the area, which likely contributed to the higher number of organic farmers included in the survey. Many of the respondents were also referred by other farmers Thanal team met, so although there was still an element of random selection, the sample reflected lower pesticide use overall. Most of the farmers interviewed were small-scale farmers who rely on farming for their livelihoods. Larger contract farms, where pesticide use is more common, were not represented in the survey. In these cases, only farm workers were present during visits, and they were unwilling to participate in the survey. As a result, these farmers could not be included, which may have limited the data collected on pesticide use, conditions of use, and impacts.

The data was analysed based on the total number of survey respondents. This refers to the combined total for all countries in the overall analysis, and the individual country totals for country-specific analysis. This approach was taken because, in some instances, farmers who initially answered “no” to questions about pesticide use or left them unanswered still responded to follow-up questions related to details of pesticide use. This suggests that some respondents may actually be using pesticides, even if they initially said otherwise, or that their answers were based on assumptions rather than a clear confirmation.

2.5. Description of districts involved in study

2.5.1. Bangladesh

Bangladesh's agricultural sector has experienced significant intensification over recent decades to meet the demands of its growing population. This intensification has led to a substantial increase in pesticide use, particularly in vegetable production, which has surged by 37.63% in 2023 compared to previous decades.[4] Farmers commonly apply pesticides such as chlorpyrifos, dimethoate, diazinon, and malathion to protect crops from pests and diseases.[5] As a result, studies have revealed that over 29% of vegetable samples were contaminated with pesticide residues, with 73% of these exceeding the maximum residue limits (MRLs).[6] Crops like cucumber, tomato, and cauliflower were among the most affected.

The prevalent use of HHPs raises serious health concerns among Bangladeshi farmers. A study conducted across six agro-based districts found that 39% of farmers experienced acute symptoms during pesticide application, including sneezing, burning sensations on the face, conjunctivitis, dizziness, and headaches.[7] Alarmingly, this study also revealed that 85% of farmers who sprayed pesticides in the field often did so without adequate protective measures. Lack of awareness and proper safety protocols exacerbate the risk of chronic health issues stemming from prolonged exposure to pesticides.

[4] Khatun, P., Islam, A., Sachi, S., Islam, M. Z., & Islam, P. (2023). Pesticides in vegetable production in Bangladesh: A systemic review of contamination levels and associated health risks in the last decade. Toxicology Reports, 11, 199–211. https://doi.org/10.1016/j.toxrep.2023.09.003

[5] Ibid

[6] Ibid

[7] Kobir, M. A., Hasan, I., Rahman, M. A., Pervin, M., Farzana, F., & Karim, M. R. (2020). Ubiquitous use of agricultural pesticides in six agro-based districts of Bangladesh and its impact on public health and environment. Journal of Agriculture, Food and Environment, 3 (3), 47-52. http://doi.org/10.47440/JAFE.2020.1307

Manikganj

Singair is a sub-district located in the Manikganj district, approximately 30 kilometres from Dhaka, the capital of Bangladesh. It is a rural community where paddy, vegetables, and various other crops are cultivated. While both boys and girls typically attend primary school, a significant gap emerges at the secondary level, with more boys continuing their education than girls. This disparity is influenced by patriarchal norms and a prevailing family preference for prioritising boys' education.

Cumilla

Eliotgonj (South) Union is located within Daudkandi Upazila in the Cumilla district of Bangladesh. According to SHISUK, Daudkandi Upazila[8] spans an area of 349.91 square kilometres and comprises 83245 households. Eliotgonj (South) Union itself covers 14.70 square kilometres and, based on the 2011 national population census, has a population of 30288. The union consists of 17 villages, including Bashora, Kutubpur, Bakinagor, Malikhil, Daulatpur, Kolakopa, Khilalpar, Lakshimpur, Elliotgonj Bazar, Mobarokpur, Viktala, Noakandi, and Bitman.

2.5.2. India

India's agricultural sector has increasingly embraced intensive farming practices to meet the food demands of its growing population. This intensification has led to a significant rise in pesticide usage, with over a hundred HHPs currently in use across the country, posing substantial risks to human health and the environment.[9] Despite the known dangers associated with these chemicals, their application remains widespread, raising concerns about the sustainability and safety of current agricultural practices.

The health implications for farmers exposed to these pesticides are alarming. Common acute symptoms reported include excessive sweating (36.5%), burning or itching eyes (35.7%), dry or sore throat (25.5%), and excessive salivation (14.1%).[10] These health issues are exacerbated by factors such as inadequate use of protective gear, limited awareness about safe handling practices, and the high toxicity of the chemicals involved. The situation underscores the urgent need for comprehensive strategies to reduce reliance on HHPs, promote safer alternatives, and implement robust policies to safeguard the health of agricultural workers.

Yavatmal

Yavatmal, an eastern district in the Vidarbha region of Maharashtra, India, has a total population of 2772348, with males comprising 51.22% (1419965) and females 48.78% (1352383).[11] The region predominantly follows a cotton monocropping system, where both legal and illegal pesticides are routinely applied as part of a standard agricultural calendar. Since 2017, Yavatmal has gained national and local media attention due to a series of pesticide-related deaths and hospitalisations resulting from occupational exposure in cotton fields.[12] Official reports from that year recorded over 450 cases of pesticide poisoning and 23 fatalities in the district.[13] Farmers in the region cultivate various Bacillus thuringiensis (Bt) cotton hybrids, including Bollgard III, also known as Roundup Ready Flex, a herbicide-tolerant hybrid that remains unapproved and has entered the country illegally.[14] Many farmers attributed their poisoning to the unusual height of Bt cotton plants, which positioned pesticide spray at the level of their faces. Without PPE, farmers became drenched in pesticides, with their clothes soaked in the chemical mist.[15] Moreover, they had received no training on pesticide hazards, proper application and handling, precautionary measures, or the use of PPE.

[8] Upazilas are the second lowest tier of regional administration in Bangladesh, below Divisions and Districts
[9] Toxic Link. (2023). Highly hazardous pesticides usage in India: A survey report. https://toxicslink.org/wp-content/uploads/2024/01/HHP%20survey%20report%20Final.pdf
[10] Chitra, G. A., Muraleedharan, V. R., Swaminathan, T., & Veeraraghavan, D. (2006). Use of pesticides and its impact on health of farmers in South India. International Journal of Occupational and Environmental Health, 12(3), 228–233. https://doi.org/10.1179/oeh.2006.12.3.228
[11] Census of India. (2011). District Census Handbook, Yavatmal. https://censusindia.gov.in/2011census/dchb/DCHB_A/27/2714_PART_A_DCHB_YAVATMAL.pdf
[12] Public Eye. (2018). The Yavatmal Scandal. https://www.publiceye.ch/fileadmin/doc/Pestizide/2018_Public_Eye_Investigation_Pesticid_Yavatmal.pdf
[13] PAN India. (2017). Pesticide Poisonings in Yavatmal District in Maharashtra: Untold Realities. http://www.pan-india.org/wp-content/uploads/2017/10/Yavatmal-Report_PAN-India_Oct-2017_web.pdf
[14] The Times of India. (2017). BG-III cotton illegally grown in Yavatmal. https://timesofindia.indiatimes.com/city/nagpur/bg-iii-cotton-illegally-grown-in-yavatmal/articleshow/60986490.cms
[15] Public Eye. (2018). The Yavatmal Scandal. https://www.publiceye.ch/fileadmin/doc/Pestizide/2018_Public_Eye_Investigation_Pesticid_Yavatmal.pdf

PAN India documented the widespread pesticide poisoning cases in Yavatmal and published its findings, highlighting the severe impact of pesticides on farmers and agricultural workers. As a result of these efforts, the Maharashtra Association of Pesticide Poisoned Persons (MAPPPs) was established in 2018 as a grassroots community organisation. Its mission is to organise affected farmers and workers, seek justice for poisoning victims, and hold agrochemical companies accountable. Despite Maharashtra's status as a highly developed state, many villages in Yavatmal, such as Dattapur, Yerad, and Borgaon Pungi, remain rural, with poor infrastructure. Cotton and soybeans are the dominant crops, while Dattapur also cultivates pigeon peas (intercropped with cotton), black gram, chickpeas, wheat, turmeric, ginger, and vegetables. In Yerad, minor crops include sorghum and pigeon peas, alongside wheat, chickpeas, groundnuts, brinjal, onions, chillies, okra, and spinach. Similarly, Borgaon Pungi produces pigeon peas (mainly intercropped with cotton), chickpeas, groundnuts, wheat, turmeric, brinjal, spinach, bitter gourd, potatoes, and onions.

Kerala

Wayanad district, situated in the northern region of Kerala, is known for its rich biodiversity and significant tribal population, with indigenous communities comprising 33.47% of the district's inhabitants.[16] Kerala, a southern Indian state, is often recognised both nationally and internationally for its high Human Development Indices. Agriculture is the primary economic activity in Wayanad, with over half of the population relying on farming for their livelihood. The district produces a variety of crops, including coffee, tea, cocoa, pepper, plantain, vanilla, rice, coconut, cardamom, and ginger. Despite its strong agricultural presence, Wayanad is classified as an "industrially backward district" due to the absence of major industries, with only a few small-scale industries and farms operating in the region.[17] One of the district's key economic activities is cattle rearing, and it is home to the Wayanad Dairy of Milma, a cooperative under the Kerala Cooperative Milk Marketing Federation, located in Kalpetta. While 72 industrial cooperatives are registered in Wayanad, only 19 remain operational.

According to Thanal, a prominent environmental organisation, paddy cultivation once dominated the district's agricultural landscape, covering vast expanses of farmland. However, in recent years, paddy fields have drastically declined, and now cover only 204 hectares, with just a single crop harvested annually. Many of these former paddy fields have been converted into banana and ginger farms, reflecting a shift in agricultural practices in the district.

2.5.3. Laos

In Laos, the expansion of intensive agriculture has led to increased use of HHPs, raising significant health concerns among farming communities. A 2023 survey[18] by PANAP found that more than one-third of both women and men farmers reported symptoms of illness after pesticide exposure, including dizziness, headaches, excessive sweating, vomiting, blurred vision, and skin rashes. Further highlighting the issue, a 2017 study in Xieng Khouang province found that 96% of residents had pesticide or herbicide residues in their blood, with contamination primarily attributed to the consumption of locally produced food. The study also revealed that more than half of the tested fruits and vegetables in the province were contaminated with pesticides.[19]

Xieng Khouang province

The Lao People's Democratic Republic (Lao PDR or Laos) is a Southeast Asian country with a total land area of 236800 square kilometres and a population of approximately 6.7 million. Laos has a rice-based agricultural economy and achieved rice self-sufficiency in 2000.[20] Currently, 72% of the country's agricultural land is dedicated to rice cultivation. Additionally, agriculture plays a vital role, providing at least 60% of household income in rural areas.[21]

[16] Kerala Scheduled Tribes Development Department (KSTDD). (2013). Scheduled Tribes of Kerala: Report on the Socio-Economic Status. Government of Kerala.

[17] Directorate of Industries and Commerce, Government of Kerala. (2022). Industrial Profile. https://aspirational.vikaspedia.in/viewcontent/aspirational-districts/kerala/wayanad/know-your-district/overview-of-the-wayanad-district?lgn=en#:~:text=Economy%20Agriculture%20is%20the%20backbone%20of%20the,agriculture%20in%20order%20to%20earn%20their%20livelihood.

[18] Diyana, A., Rajendran, D., Watts, M., Rengam & S., Alviar, E. (2022). Field survey: Use and impacts of pesticides in four countries in Asia. https://files.panap.net/resources/Field-Survey-use-and-impacts-of-pesticides.pdf

[19] Radio Free Asia. (2018). Most residents of Laos' Xiangkhouang province contaminated by agricultural chemicals: Officials. https://www.rfa.org/english/news/laos/contamination-03052018171620.html

[20] Ministry of Agriculture and Forestry, Planning Department. (2004). National Report to CFS on The Implementation of The World Food Summit Plan of Action Until End 2003. https://www.fao.org/4/ae016e/ae016e.pdf

[21] FAO, European Union and CIRAD. (2022). Food Systems Profile – The Lao People's Democratic Republic. Catalysing the sustainable and inclusive transformation of food systems. Rome, Brussels and Montpellier, France. https://doi.org/10.4060/cc0302en

2.5.4. Vietnam

Vietnam's agricultural sector has experienced significant growth, establishing the country as a leading exporter of commodities such as rice, coffee, and seafood. This expansion has been accompanied by substantial pesticide use, with annual imports going up to 100000 tonnes.[22] The market comprises over 200 pesticide manufacturers operating nearly 100 processing facilities, alongside approximately 30000 pesticide agents. Notably, Vietnam's list of approved pesticides is among the most diverse globally, encompassing 1700 active ingredients and 4080 commercial products.[23] A 2022 survey[24] across farming communities in Vietnam, India, Bangladesh, and Laos revealed that 60% of the pesticides used in Vietnam were classified as HHPs or banned in one or more countries

The extensive use of such pesticides has raised significant health concerns among Vietnamese farmers. A 2020 cross-sectional study in the Mekong Delta reported that 96.2% of participating smallholder farmers had used at least one World Health Organization (WHO) Class II pesticide in the past year.[25] Despite this high usage, the adoption of PPE was limited, primarily due to unavailability (37%) and discomfort (83%). The impact of pesticide exposure extends beyond farmers to other vulnerable populations, such as schoolchildren. A 2020 study in Nam Dinh province found that 98.6% of students were exposed to pesticides in their homes and schools, which were located less than one kilometre from agricultural fields where pesticides were sprayed. This exposure resulted in symptoms like fatigue, dizziness, and headaches among the children[26].

Hai Hau district

Hai Hau is a coastal district in Nam Dinh province, located in the southern part of the Red River Delta, covering an area of 226 square kilometres. Agricultural land constitutes over 56% of the province's total land area. The district has a population of 294216, spread across 32 communes and three towns, with an average population density of 1301 people per square kilometre. Farmers primarily harvest rice manually using sickles or mechanised reaping machines. After threshing, fresh rice is sun-dried naturally, rather than using mechanical dryers, before being milled at privately owned facilities. While much of the produce meets local demand, a portion is also supplied to markets outside the district.

Livestock and poultry slaughtering is mainly carried out on a small scale to serve local consumption. Women play a vital role in agricultural and economic activities, often using capital to invest in crop production, livestock farming, and small businesses. Many women work as farmers, labourers in local factories, or small business owners, contributing significantly to the district's economy.

Son La province

The survey was conducted in Muoi Noi and Bon Phang communes in Thuan Chau district, Son La province, located 330 kilometres from the capital. This remote rural area is characterised by vast paddy fields, reflecting its strong agricultural foundation.

[22] The Saigon News. (2024). Vietnam imports 100,000 tons of pesticides annually. https://english.thesaigontimes.vn/vietnam-imports-100000-tons-of-pesticides-annually/

[23] VietnamCredit. (n.d.). Overview of Vietnam pesticides market. https://vietnamcredit.com.vn/news/overview-of-vietnams-pesticides-market_14646

[24] Diyana, A., Rajendran, D., Watts, M., Rengam & S., Alviar, E. (2022). Field survey: Use and impacts of pesticides in four countries in Asia. https://files.panap.net/resources/Field-Survey-use-and-impacts-of-pesticides.pdf

[25] Galli, A., Winkler, M. S., Doanthu, T., Fuhrimann, S., Huynh, T., Rahn, E., Stamm, C., Staudacher, P., Van Huynh, T., & Loss, G. (2022). Assessment of pesticide safety knowledge and practices in Vietnam: A cross-sectional study of smallholder farmers in the Mekong Delta. Journal of Occupational and Environmental Hygiene, 19(9), 509–523. https://doi.org/10.1080/15459624.2022.2100403

[26] Quan, B.C., Lan, V.C., Thuy, N.K., Ravindran, D., Diyana, A. & Quijano, I. (2020). Schoolchildren's exposure to pesticides in Vietnam: A Study in three districts. https://files.panap.net/resources/School-Childrens-Exposure-to-Pesticides-in-Vietnam.pdf

3. CONSOLIDATED ANALYSIS

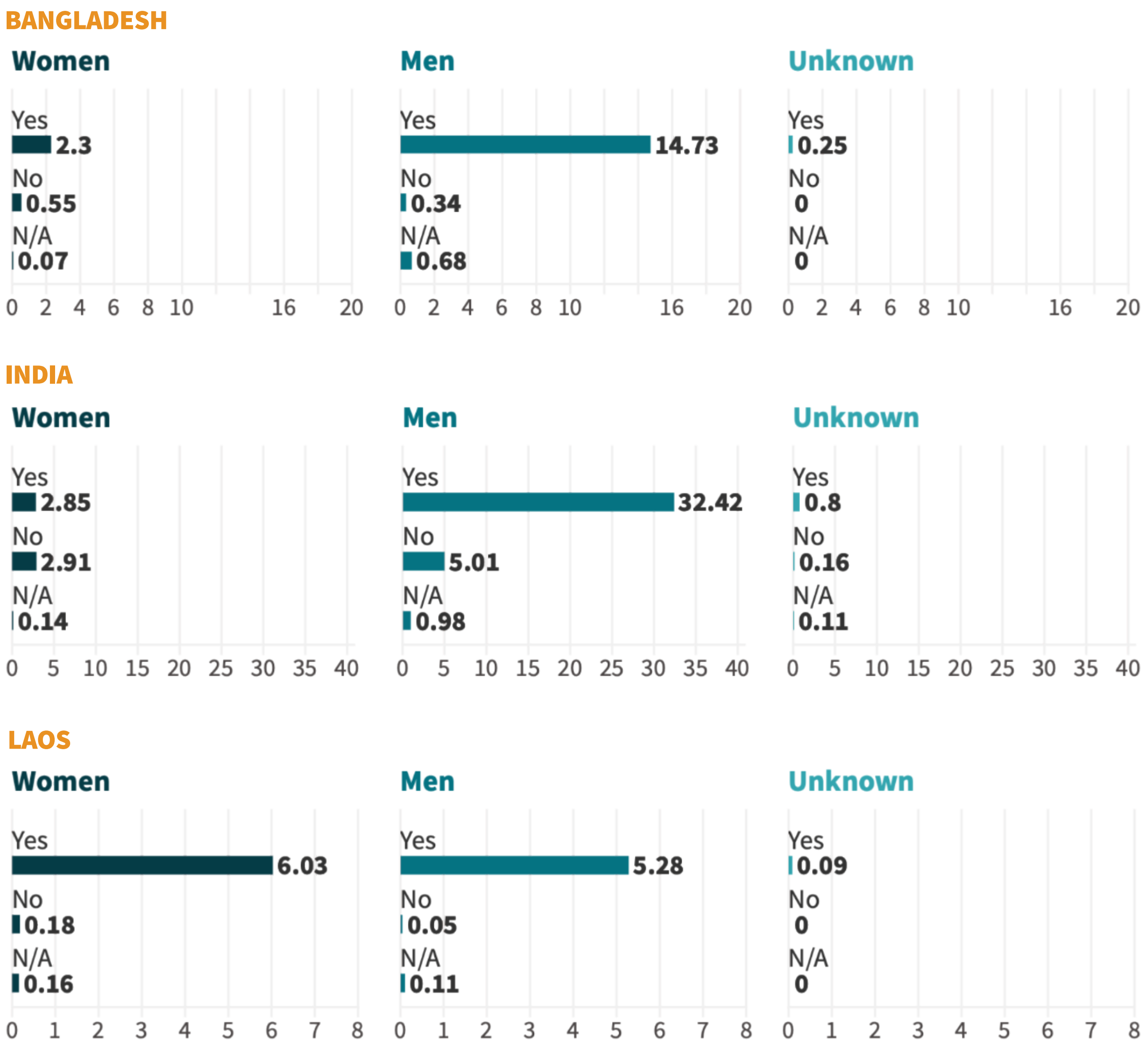
- A total of 4392 respondents participated in the survey, comprising 1183 women, 3141 men, and 68 farmers who did not specify their gender (Table 1).

Table 1. **Breakdown of respondents**

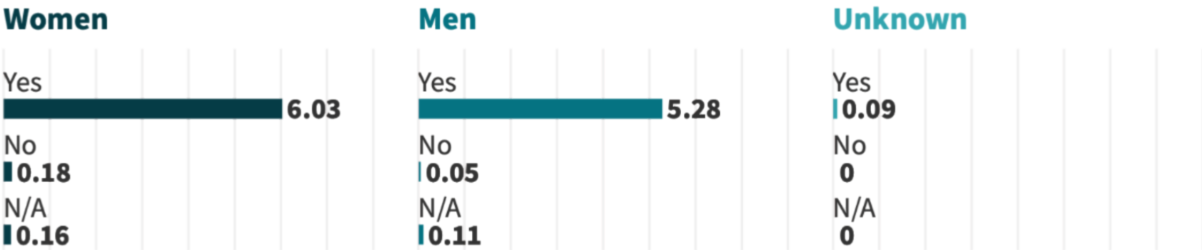
COUNTRY	TOTAL	WOMEN	MEN	UNKNOWN
BANGLADESH	**831** (18.92%)	**128** (2.91%)	**692** (15.76%)	**11** (0.25%)
INDIA	**1993** (45.38%)	**259** (5.90%)	**1687** (38.41%)	**47** (1.07%)
LAOS	**1045** (23.79%)	**516** (11.75%)	**523** (11.91%)	**6** (0.14%)
VIETNAM	**523** (11.91%)	**280** (6.38%)	**239** (5.44%)	**4** (0.09%)
TOTAL	**4392** (100%)	**1183** (26.94%)	**3141** (71.52%)	**68** (1.55%)

- Among these, 3825 respondents (87.09%) reported using pesticides, including 973 women (22.15%), 2797 men (63.68%), and 55 of unknown gender (1.25%; Figure 1).

Figure 1. **Response on Pesticide Use (%)**



VIET NAM



Pesticide use

- Most farmers (1498, 34.11%) have been using pesticides for 10 to 19 years (women: 412, 9.38%; men: 1071, 24.39%; unknown: 15, 0.34%).
- The majority of farmers (3369, 76.71%) are involved in applying and spraying pesticide in the field (women: 842, 19.17%; men: 2490, 56.69%; unknown: 37, 0.84%; Table 2).

Table 2. **Breakdown of pesticide-related activities by gender in each country**

BANGLADESH			
ACTIVITY	**WOMEN**	**MEN**	**UNKNOWN**
Apply/spray pesticides in the field	78	657	11
Apply pesticides in the household	2	6	1
Human therapeutic purposes	-	3	-
Mix, load, or decant pesticides	83	603	11
Purchase or transport pesticides	28	292	3
Vector control	3	7	-
Veterinary therapeutic purposes (e.g. for foot and mouth disease)	-	15	-
Wash clothes used during pesticide spraying or mixing	30	115	-
Wash equipment used during pesticide spraying or mixing	30	132	1
Work in fields where pesticides are being used or have been used	51	106	2
Not applicable (N/A)	16	17	-
INDIA			
ACTIVITY	**WOMEN**	**MEN**	**UNKNOWN**
Apply/spray pesticides in the field	84	1172	18
Apply pesticides in the household	4	66	2
Human therapeutic purposes	-	7	-
Mix, load, or decant pesticides	50	736	11
Purchase or transport pesticides	43	523	7
Vector control	-	58	2
Veterinary therapeutic purposes (e.g. for foot and mouth disease)	2	76	1
Wash clothes used during pesticide spraying or mixing	50	632	8
Wash equipment used during pesticide spraying or mixing	51	549	8
Work in fields where pesticides are being used or have been used	43	523	8
Not applicable (N/A)	162	438	29

LAOS			
ACTIVITY	WOMEN	MEN	UNKNOWN
Apply/spray pesticides in the field	417	428	4
Apply pesticides in the household	2	2	-
Human therapeutic purposes	3	6	-
Mix, load, or decant pesticides	247	230	4
Purchase or transport pesticides	47	41	-
Vector control	83	202	2
Veterinary therapeutic purposes (e.g. for foot and mouth disease)	75	61	-
Wash clothes used during pesticide spraying or mixing	265	185	4
Wash equipment used during pesticide spraying or mixing	251	181	5
Work in fields where pesticides are being used or have been used	243	222	-
Not applicable (N/A)	35	17	-

VIETNAM			
ACTIVITY	WOMEN	MEN	UNKNOWN
Apply/spray pesticides in the field	263	233	4
Apply pesticides in the household	108	98	-
Human therapeutic purposes	6	9	-
Mix, load, or decant pesticides	88	91	4
Purchase or transport pesticides	85	75	1
Vector control	14	63	-
Veterinary therapeutic purposes (e.g. for foot and mouth disease)	70	29	-
Wash clothes used during pesticide spraying or mixing	172	145	2
Wash equipment used during pesticide spraying or mixing	160	138	1
Work in fields where pesticides are being used or have been used	131	108	2
Not applicable (N/A)	12	4	-

- Farmers are often exposed to pesticides through ground spraying (2619, 59.63%; women: 137, 3.12%; men: 1801, 41.01%; unknown: 697, 15.87%; Table 3).

Table 3. **Respondents' pesticide exposure by gender in each country**

BANGLADESH			
ACTIVITY	**WOMEN**	**MEN**	**UNKNOWN**
Apply pesticides from the air (plane, helicopter)	2	75	2
Eat food after spraying pesticides without washing hands	2	27	-
Eat contaminated food	30	77	2
Ground spray (backpack, tractor)	74	603	11
Exposed to neighbours' use of pesticides	48	243	4
Exposed to water contamination	55	90	-
Exposed to pesticides through Governments spraying for public health purposes	-	-	-
N/A	20	54	-
INDIA			
ACTIVITY	**WOMEN**	**MEN**	**UNKNOWN**
Apply pesticides from the air (plane, helicopter)	4	56	1
Eat food after spraying pesticides without washing hands	1	32	-
Eat contaminated food	-	36	1
Ground spray (backpack, tractor)	40	536	19
Exposed to neighbours' use of pesticides	4	23	-
Exposed to water contamination	1	130	1
Exposed to pesticides through Governments spraying for public health purposes	2	27	-
N/A	208	995	27
LAOS			
ACTIVITY	**WOMEN**	**MEN**	**UNKNOWN**
Apply pesticides from the air (plane, helicopter)	66	60	3
Eat food after spraying pesticides without washing hands	2	16	-
Eat contaminated food	17	13	-
Ground spray (backpack, tractor)	400	436	4
Exposed to neighbours' use of pesticides	140	65	3
Exposed to water contamination	17	22	-
Exposed to pesticides through Governments spraying for public health purposes	-	-	-
N/A	96	74	2
VIETNAM			
ACTIVITY	**WOMEN**	**MEN**	**UNKNOWN**
Apply pesticides from the air (plane, helicopter)	1	-	-
Eat food after spraying pesticides without washing hands	7	7	-
Eat contaminated food	16	14	-
Ground spray (backpack, tractor)	262	231	3
Exposed to neighbours' use of pesticides	168	153	3
Exposed to water contamination	28	28	-
Exposed to pesticides through Governments spraying for public health purposes	-	-	-
N/A	12	2	-

- Farmers are constantly exposed to pesticides as they live less than 1 kilometre from where pesticides spraying takes place (1712, 38.98%; women: 362, 8.24%; men: 1319, 30.03%; unknown: 31, 0.71%).

- A total of 96 pesticides were found in this survey, of which, 53 (58.24%) were identified as HHPs (Table 4 & Table 5).

Table 4. **Number of pesticides used in each country**

	BANGLADESH	INDIA	LAOS	VIETNAM
TOTAL NUMBER OF PESTICIDES	32	41	20	50
NUMBER OF HHPS	20	29	10	30
NUMBER OF T20	5	10	5	7
% OF HHPS	62.50	70.73	50.00	60.00

Table 5.a. **List of pesticides used by farmers**

PESTICIDE	BANGLADESH	INDIA	LAOS	VIETNAM
2, 4 D	-	1	298	-
Abamectin	31	-	16	130
Acephate	1	200	-	-
Acetamiprid	17	27		41
Acetochlor	-	-	-	9
Alpha-cypermethrin	-	1	-	175
Alpha-naphthyl acetic acid	-	3	-	-
Atrazine	-	-	677	12
Azoxystrobin	21	5	-	1
Beta-cypermethrin	19	-	-	-
Bifenthrin	1	-	-	-
Bispyribac sodium	-	19	-	-
Bromadiolone	-	-	-	3
Buprofezin	-	3	-	19
Butachlor	-	-	10	2
Carbaryl	-	1	88	-
Carbendazim	11	84	-	-
Carbofuran	117	74	-	-
Carbosulfan	27	-	-	1
Chlorantraniliprole	74	19		11
Chlorfenapyr	-	-	-	42
Chlorfluazuron	-	-	-	11
Chlorimuron ethyl	-	7	-	-
Chlorothalonil	-	-	-	33
Chlorphenoxy acetic acid	13	-	-	-
Chlorpyrifos ethyl	77	149	-	18
Cyhalofop	-	-	10	-
Cymoxanil	-	-	-	8
Cypermethrin	76	5	43	48
Cyromazine	-	2	-	12

PESTICIDE	BANGLADESH	INDIA	LAOS	VIETNAM
Deltamethrin	-	-	-	95
Diazinon	20	-	-	-
Diafenthiuron	-	26	-	-
Difenoconazole	16	-	-	31
Dimethoate	-	11	-	8
Dinotefuran	-	1	-	-
Diphacinone	-	-	-	2
Diquat dibromide		-	111	4
Disodium octaborate tetrahydrate	-	2	-	-
Emamectin benzoate	17	34	6	192
Esfenvalerate	-	9	-	-
Ethion	-	2	-	-
Fenitrothion	1	-	-	-
Fenobucarb	-	-	39	12
Fenvalerate	-	1	-	-
Fipronil	51	66	-	12
Flonicamid	-	174	-	-
Flubendiamide	-	3	-	-
Glufosinate ammonium	-	-	-	34
Glyphosate	1	136	682	9
Hexaconazole	-	1	-	187
Imazethapyr	-	3	-	-
Imidacloprid	28	166	66	145
Indoxacarb	-	-	-	121
Isocycloseram	-	-	-	4
Isoprocarb	-	-	-	10
Isoprothiolane	-	-	-	54
Kasugamycin	-	-	-	65
Lambda cyhalothrin	17	19	-	26
Malathion	-	6	-	-
Mancozeb	21	83	-	42
Mepiquat chloride	-	1		-
Mesotrione	-	-	662	-
Metalaxyl	1	-	-	20
Metaldehyde	-	2		-
Methyl-parathion	-	-	22	-
Metsulfuron-methyl	-	7	63	-
Monocrotophos	-	569	-	-
Naphthalene	-	5	-	-
Nereistoxin	-	-	-	12
Niclosamide olamine	-	-	-	16
Nicosulfuron	-	-	390	
Nitenpyram	-	-		101

PESTICIDE	BANGLADESH	INDIA	LAOS	VIETNAM
Oxyfluorfen	-	21	-	-
Paraquat	3	3	-	-
Penoxsulam	9		10	
Permethrin	-	5	-	23
Pretilachlor	13	-	68	-
Profenofos	21	74	-	-
Propiconazole	-	-	-	28
Propineb	-	2	-	4
Pyrazosulfuron ethyl	-	-	66	6
Pyriproxyfen	4	11	-	-
Pyrithiobac sodium	-	27	-	-
Quinalphos	-	86	-	-
Quinclorac	-	-	-	6
Tebuconazole	1	2	-	-
Thiamethoxam	149	34	-	53
Thifensulfuron methyl	-	5	-	-
Thiosultap sodium	-	-	-	22
Tribenuron methyl	-	5	-	-
Tricyclazole	1	-	-	28
Trifloxystrobin	1	-	-	-
Trifluralin	-	2	-	-
Triphenyltin acetate	-	-	23	-

Table 5.b. **Classification of pesticides used by farmers**

PESTICIDE	WHO CLASS[27]	PAN HHP LIST[28]	NO. OF COUNTRIES BANNED[29]
2, 4 D	II Moderately hazardous	X (GHS+ C2 & R2)	10
Abamectin	Ib Highly hazardous	X (H330, highly toxic to bees)*	Not known to be banned
Acephate	II Moderately hazardous	X (GHS+ repro (1A ,1B), highly toxic bees)	43
Acetamiprid	II Moderately hazardous	-	Not known to be banned
Acetochlor	III Slightly hazardous	X (GHS+ carc (1A, 1B), GHS+ C2 & R2)	51

[27] World Health Organization. (2019). *The WHO recommended classification of pesticides by hazard and guidelines to classification.* https://www.who.int/publications/i/item/9789240005662

[28] Pesticide Action Network International. (2024). *PAN International list of highly hazardous pesticides.* https://pan-international.org/wp-content/uploads/PAN_HHP_List.pdf

[29] Pesticide Action Network International. (2024). *Consolidated list of banned pesticides.* https://pan-international.org/pan-international-consolidated-list-of-banned-pesticides/

PESTICIDE	WHO CLASS	PAN HHP LIST	NO. OF COUNTRIES BANNED
Alpha-cypermethrin	II Moderately hazardous	X (highly toxic to bees)	29
Alpha-naphthyl acetic acid	III Slightly hazardous	-	Not known to be banned
Atrazine	III Slightly hazardous	-	60
Azoxystrobin	U Unlikely to present acute hazard	-	Not known to be banned
Beta-cypermethrin	-	X (highly toxic to bees)	32
Bifenthrin	II Moderately hazardous	X (GHS+ C2 & R2, highly toxic bees)	30
Bispyribac sodium	III Slightly hazardous	-	Not known to be banned
Bromadiolone	Ia Extremely hazardous	X (H330, GHS+ repro (1A ,1B))	31
Buprofezin	III Slightly hazardous	X (EU ED)	Not known to be banned
Butachlor	III Slightly hazardous	X (EPA prob likel carc)	39
Carbaryl		X (EPA prob likel carc, GHS+ C2 & R2)	48
Carbendazim	U Unlikely to present acute hazard	X (GHS+ muta (1A, 1B), GHS+ repro (1A ,1B))	41
Carbofuran	Ib Highly hazardous	X (WHO Ib, H330, highly toxic bees)	106
Carbosulfan	II Moderately hazardous	X (H330, highly toxic to bees, PIC)	63
Chlorantraniliprole		X (very pers water, soil or sediment, very toxic to aq. organism)	Not known to be banned
Chlorfenapyr	II Moderately hazardous	X (highly toxic to bees)	38
Chlorfluazuron	U Unlikely to present acute hazard	X (very bio acc, very toxic to aq. organism)	29
Chlorimuron ethyl	U Unlikely to present acute hazard	-	Not known to be banned
Chlorothalonil	U Unlikely to present acute hazard	X (H330, EPA prob likel carc)	42
Chlorphenoxy acetic acid	-	-	29
Chlorpyrifos ethyl	II Moderately hazardous	X (GHS+ repro (1A ,1B), highly toxic to bees)	44
Cyhalofop	U Unlikely to present acute hazard	-	Not known to be banned
Cymoxanil	II Moderately hazardous	X (GHS+ repro (1A ,1B))	Not known to be banned
Cypermethrin	II Moderately hazardous	X (highly toxic to bees)	1

PESTICIDE	WHO CLASS	PAN HHP LIST	NO. OF COUNTRIES BANNED
Cyromazine	III Slightly hazardous	-	Not known to be banned
DDT	II Moderately hazardous	X (IARC prob carc, EPA prob likel carc, GHS+ C2 & R2, very pers water, soil or sediment, very toxic to aq. Organism, PIC, POP)	150
Deltamethrin	II Moderately hazardous	X (GHS+ C2 & R2, highly toxic to bees)	Not known to be banned
Diazinon	II Moderately hazardous	X (GHS+ carc (1A, 1B), GHS+ repro (1A ,1B), highly toxic bees)	48
Diafenthiuron	III Slightly hazardous	X (highly toxic bees)	32
Difenoconazole	II Moderately hazardous	-	Not known to be banned
Dimethoate	II Moderately hazardous	X (GHS+ repro (1A ,1B), highly toxic bees)	38
Dinotefuran	III Slightly hazardous	X (highly toxic bees)	20
Diphacinone	Ia Extremely hazardous	X (WHO Ia)	31
Diquat dibromide	II Moderately hazardous	X (H330)	30
Disodium octaborate tetrahydrate	-	X (GHS+ repro (1A ,1B))	Not known to be banned
Emamectin benzoate	II Moderately hazardous	X (very pers water, soil or sediment, very toxic to aq. organism, highly toxic to bees)	Not known to be banned
Esfenvalerate	II Moderately hazardous	X (H330, highly toxic bees)	Not known to be banned
Ethion	II Moderately hazardous	X (H330)	35
Fenitrothion	II Moderately hazardous	X (GHS+ C2 & R2, highly toxic bees)	34
Fenobucarb	II Moderately hazardous	-	37
Fenvalerate	II Moderately hazardous	X (highly toxic to bees)	38
Fipronil	II Moderately hazardous	X (highly toxic to bees)	49
Flonicamid	II Moderately hazardous	-	Not known to be banned
Flubendiamide	III Slightly hazardous	X (very pers water, soil or sediment, very toxic to aq. organism)	1

PESTICIDE	WHO CLASS	PAN HHP LIST	NO. OF COUNTRIES BANNED
Glufosinate ammonium	II Moderately hazardous	X (GHS+ repro (1A ,1B))	29
Glyphosate	III Slightly hazardous	X (EPA prob likel carc)	12
Hexaconazole	III Slightly hazardous	-	41
Imazethapyr	U Unlikely to present acute hazard	-	29
Imidacloprid	II Moderately hazardous	X (highly toxic to bees)	29
Indoxacarb	II Moderately hazardous	X (highly toxic to bees)	29
Isocycloseram	-	-	Not known to be banned
Isoprocarb	II Moderately hazardous	-	29
Isoprothiolane	II Moderately hazardous	-	Not known to be banned
Kasugamycin	U	-	Not known to be banned
Lambda cyhalothrin	II Moderately hazardous	-	Not known to be banned
Malathion	III Slightly hazardous	X (GHS+ carc (1A, 1B), IARC prob carc)	40
Mancozeb	U Unlikely to present acute hazard	X (EPA prob likel carc, GHS+ repro (1A ,1B), EU EDC)	37
Mepiquat chloride	II Moderately hazardous	-	1
Mesotrione	III Slightly hazardous	-	Not known to be banned
Metalaxyl	II Moderately hazardous	-	1
Metaldehyde	II Moderately hazardous	-	8
Methyl-parathion	Ia Extremely hazardous	X (H330)	80
Metsulfuron-methyl	U Unlikely to present acute hazard	-	1
Monocrotophos	Ib Highly hazardous	X (H330, highly toxic bees)	137
Naphthalene	II Moderately hazardous	-	36
Nereistoxin	-	-	Not known to be banned
Niclosamide olamine	U Unlikely to present acute hazard	-	31

PESTICIDE	WHO CLASS	PAN HHP LIST	NO. OF COUNTRIES BANNED
Nicosulfuron	U Unlikely to present acute hazard	-	Not known to be banned
Nitenpyram	II Moderately hazardous	X (highly toxic to bees)	28 †
Oxyfluorfen	U Unlikely to present acute hazard	X (EPA prob likel carc)	9
Paraquat	II Moderately hazardous	X (H330, PIC)	72
Penoxsulam	U Unlikely to present acute hazard	-	Not known to be banned
Permethrin	II Moderately hazardous	X (EPA prob likel carc , highly toxic to bees)	39
Pretilachlor	U Unlikely to present acute hazard	-	Not known to be banned
Profenofos	II Moderately hazardous	X (highly toxic to bees)	39
Propiconazole	II Moderately hazardous	X (GHS+ repro (1A ,1B))	30
Propineb	U Unlikely to present acute hazard	X (EPA prob likel carc)	31
Pyrazosulfuron ethyl	U Unlikely to present acute hazard	-	Not known to be banned
Pyriproxyfen	U Unlikely to present acute hazard	-	1
Pyrithiobac sodium	III Slightly hazardous	-	29
Quinalphos	II Moderately hazardous	X (GHS+ C2 & R2, highly toxic bees)	32
Quinclorac	III Slightly hazardous	-	Not known to be banned
Tebuconazole	II Moderately hazardous	-	Not known to be banned
Thiamethoxam	II Moderately hazardous	X (highly toxic to bees)	28
Thifensulfuron methyl	U Unlikely to present acute hazard	-	Not known to be banned
Thiosultap sodium	-	-	Not known to be banned
Tribenuron methyl	U Unlikely to present acute hazard	-	Not known to be banned
Tricyclazole	II Moderately hazardous	-	30
Trifloxystrobin	U Unlikely to present acute hazard	-	Not known to be banned
Trifluralin	U Unlikely to present acute hazard	X (GHS+ C2 & R2, very bio acc)	38
Triphenyltin acetate	II Moderately hazardous	X (H330, GHS+ C2 & R2)	33

† Not banned in any country but approval has been withdrawn in the European Union.
*Please refer to Annex A for explanatory notes on HHPs

TOP 10 PESTICIDES USED BY FARMERS

1.	GLYPHOSATE	18.85%
2.	ATRAZINE*	15.69%
3.	MESOTRIONE	15.07%
4.	MONOCROTOPHOS	12.96%
5.	IMIDACLOPRID	9.22%
6.	NICOSULFURON	8.88%
7.	2, 4 D	6.81%
8.	EMAMECTIN BENZOATE	5.67%
9.	CHLORPYRIFOS ETHYL	5.56%
10.	THIAMETHOXAM	5.44%

* The International Agency for Research on Cancer has recently found that **atrazine** is classified as probably carcinogenic to humans (Group 2A), with positive associations observed specifically for non-Hodgkin lymphoma with the t(14;18) chromosomal translocation

Glyphosate was identified as the most commonly used pesticide by farmers in all four countries (828, 18.85%) despite being banned in Vietnam in 2019[30]. Scientific evidence has linked glyphosate exposure to multiple adverse health effects. Studies indicate that glyphosate can damage liver, kidney, and skin cells; in skin, it has been associated with premature aging and potentially increased cancer risk.[31] Its absorption through the skin may increase up to fivefold when the skin is already damaged. Glyphosate has also been shown to disrupt estrogen, androgen, and other steroidogenic pathways, and has been associated with the proliferation of human breast cancer cells.[32] Furthermore, exposure to glyphosate-based herbicides, even at very low doses, has been linked to reproductive health problems, including miscarriages, pre-term deliveries, low birth weights, and birth defects.[33] Evidence also suggests that glyphosate formulations can interfere with the immune system, leading to adverse respiratory outcomes such as asthma, as well as contributing to conditions like rheumatoid arthritis and autoimmune effects on the skin and mucous membranes.[34]

Farmers were also found to be using Class Ia[35] pesticides such as bromadiolone (Vietnam), diphacinone (Vietnam), and methyl parathion (Laos). These pesticides are classified by the WHO as extremely hazardous due to their very extremely high acute oral and dermal toxicity.

Bromadiolone exposure can result in bleeding-related symptoms such as nosebleeds, bleeding gums, blood in the urine, black tarry stools, and easy bruising[36]. Less commonly, individuals may experience headaches, sore throat, muscle pain, shortness of breath, unusually heavy menstrual bleeding, or bloody mucus[37]. Direct skin contact may cause mild irritation, while eye exposure can lead to redness, swelling, and irritation[38].

Diphacinone interferes with normal blood clotting and can lead to bleeding in various parts of the body[39]. Common effects include nosebleeds, bruising, and bleeding of the skin and mucous membranes[40]. Internal bleeding may also occur, such as in the digestive tract (resulting in blood in the stool), kidneys (causing flank pain and blood in the urine), and other organs[41]. Exposure can sometimes cause skin rashes with peeling and prolonged or repeated exposure may damage the liver and kidneys, lower white blood cell counts, and in some cases affect brain function[42].

Methyl parathion is a pesticide that is listed in the Rotterdam Convention[43] and exposure to it can lead to serious neurological effects, including tremors, convulsions, and cardiac arrhythmia[44]. In mild to moderate cases, affected individuals may remain alert and oriented, while in severe cases they can present with confusion, ataxia, and slurred speech[45]. Common symptoms also include headache, dizziness, and impaired coordination[46]. Respiratory manifestations often involve chest tightness, wheezing, and a productive cough, while gastrointestinal effects typically include nausea, vomiting, diarrhea, and abdominal cramps[47].

Similarly, the use of Class Ib[48] pesticides was reported, including abamectin (Bangladesh, Laos, and Vietnam), carbofuran (Bangladesh and India), and monocrotophos (India). These are categorized as highly hazardous because of their high acute oral and dermal toxicity.

30 PANAP. (2019). PANAP welcomes immediate ban on glyphosate imports in Vietnam, paraquat total ban in Malaysia in 2020. https://panap.net/2019/03/panap-welcomes-immediate-ban-on-glyphosate-imports-in-vietnam-paraquat-total-ban-in-malaysia-in-2020/
31 PAN International. (2016). Glyphosate monograph. https://panap.net/resource/glyphosate-monograph/?ind=1603270594025&filename=Glyphosate-monograph.pdf&wpdmdl=3364&refresh=68c1285e7dd681757489246
32 Ibid
33 Ibid
34 Ibid
35 World Health Organization. (2019). The WHO recommended classification of pesticides by hazard and guidelines to classification. https://www.who.int/publications/i/item/9789240005662
36 National Pesticide Information Center. (2013). Bromadiolone Fact Sheet. https://npic.orst.edu/factsheets/bromadgen.html
37 Ibid
38 Ibid
39 New Jersey Department of Health. (1999). Hazardous Substance Fact Sheet – Diphacinone. https://nj.gov/health/eoh/rtkweb/documents/fs/0794.pdf
40 Ibid
41 Ibid
42 Ibid
43 Rotterdam Convention. (2017). Annex III Chemicals. https://www.pic.int/theconvention/chemicals/annexiiichemicals
44 Agency for Toxic Substances and Disease Registry (US). (2001). Toxicological Profile for Methyl Parathion. Atlanta (GA), RELEVANCE TO PUBLIC HEALTH. https://www.ncbi.nlm.nih.gov/books/NBK600341/
45 Ibid
46 Ibid
47 ibid
48 World Health Organization. (2019). The WHO recommended classification of pesticides by hazard and guidelines to classification. https://www.who.int/publications/i/item/9789240005662

Abamectin is associated with a wide range of acute and chronic health effects. Acute symptoms include mydriasis (pupil dilation), vomiting, tremors, seizures, partial ptosis (drooping eyelid), confusion, and coma[49]. Mild intoxication often presents with nausea, vomiting, diarrhoea, and weakness and in severe poisoning, hypotension, coma, and respiratory failure can occur[50]. Chronic exposure to abamectin has been linked to fertility failure in men, with documented impacts on semen quality and reproductive health[51].

Carbofuran is a pesticide that is listed in the Rotterdam known to be highly hazardous[52]. It may cause reproductive and developmental issues, disrupt the endocrine system, and even lead to testicular degeneration[53].

Monocrotophos is also a pesticide listed in the Rotterdam Convention[54] that can cause acute exposure that leads to eye irritation, pupil constriction (miosis), blurred vision, dizziness, convulsions, breathing difficulties (dyspnoea), excessive salivation, abdominal cramps, nausea, diarrhea, and vomiting[55]. Prolonged or repeated exposure has been associated with neurobehavioral problems, delayed neuropathy, endocrine disruption, as well as reproductive, developmental, and metabolic disorders[56].

Apart from this, PANAP recognises that some of the pesticides used by farmers are highly alarming. For instance, in Laos, 298 farmers reported using 2,4D. This pesticide is considered potentially carcinogenic, with evidence linking it to reproductive harm, as well as liver and kidney damage[57]. It has also been associated with Parkinson's disease, raising serious concerns about the widespread use of this chemical among farmers in Laos[58].

It is important to note that cypermethrin is one of the toxic pesticides used by farmers across all four countries. This chemical is acutely toxic, particularly to children, and has been linked to a wide range of adverse health effects, including respiratory distress, neurotoxicity, endocrine disruption, and immunotoxicity. Long-term exposure is associated with severe consequences such as an increased risk of breast cancer and male reproductive disorders. Evidence also links cypermethrin exposure to Parkinson's disease, underscoring the grave and lasting dangers it poses to human health[59]. Farmers in Bangladesh, India and Vietnam are continuing to use the children brain harming pesticide, chlorpyrifos[60].

Chlorpyrifos can cause a wide range of acute symptoms, including nausea, dizziness, confusion, slurred speech, tremors, ataxia, convulsions, depression of the respiratory and circulatory centres, respiratory paralysis, and even death[61]. The most severe chronic health impacts of chlorpyrifos are seen in children, particularly during brain development in the foetal stage[62]. Even very low-level exposure during pregnancy can result in structural brain changes and long-term cognitive deficits, such as reduced IQ and impaired working memory[63]. Other chronic health effects include metabolic disruptions that may increase the risk of obesity, diabetes, and cardiovascular disease later in life, as well as immune toxicity, liver damage, kidney failure, and cancer, particularly of the lung and rectum[64].

---

49 Aminiahidashti, H., Jamali, S. R., & Heidari Gorji, A. M. (2014). Conservative care in successful treatment of abamectin poisoning. Toxicology international, 21(3), 322–324. https://doi.org/10.4103/0971-6580.155386

50 Ibid

51 Ibid

52 Rotterdam Convention. (2017). Annex III Chemicals. https://www.pic.int/theconvention/chemicals/annexiiichemicals

53 University of Hertfordshire. (2025). Pesticide Properties Database – Carbofuran. https://sitem.herts.ac.uk/aeru/ppdb/en/Reports/118.htm

54 Rotterdam Convention. (2017). Annex III Chemicals. https://www.pic.int/theconvention/chemicals/annexiiichemicals

55 National Institute for Occupational Safety and Health. (2019). Monocrotophos. https://www.cdc.gov/niosh/npg/npgd0435.html

56 Ibid

57 New Jersey Department of Health. (2017). Hazardous Substance Fact Sheet – 2,4D. https://nj.gov/health/eoh/rtkweb/documents/fs/0593.pdf

58 Agency for Toxic Substances and Disease Registry (US) (2020). Toxicological Profile for 2,4-Dichlorophenoxyacetic Acid (2,4-D). CHAPTER 2, HEALTH EFFECTS. Atlanta (GA). https://www.ncbi.nlm.nih.gov/books/NBK590138/

59 PANAP. (2025). Cypermethrin Fact Sheet. https://panap.net/resource/20-pesticides-toxic-to-children-factsheet-cypermethrin/?ind=1594051470093&filename=pesticides-factsheet-hhps-cypermethrin.pdf&wpdmdl=2164&refresh=68d2466ee02101758611054

60 PANAP. (2022). Urgent Need to Ban the Brain-Harming Chlorpyrifos. https://panap.net/resource/urgent-need-to-ban-the-brain-harming-chlorpyrifos/?ind=1658812902276&filename=Chlorpyrifos-PANAP-Policy-Brief.pdf&wpdmdl=4760&refresh=68d66ba7ef87c1758882727

61 Ibid

62 Ibid

63 Ibid

64 Ibid

It is deeply concerning that farmers in Yavatmal, India are still using diafenthiuron, a pesticide that has already been linked to numerous poisoning cases in that region. Interviews with 51 affected families revealed that exposure to diafenthiuron caused severe health impacts, with many farmers experiencing temporary blindness and unconsciousness lasting several days. Other reported symptoms included nausea, breathing difficulties, as well as neurological and muscular disorders, highlighting the serious risks associated with this pesticide[65].

DDT is another pesticide listed in the Rotterdam convention[66] and in the Stockholm convention (Restricted)[67] that can cause acute symptoms such as tremors, headaches, nausea, and seizures[68]. DDT exposure has been associated with an increased risk of developing Type II diabetes in certain populations[69]. The International Agency for Research on Cancer (IARC) has classified DDT as a possible human carcinogen[70].

Fipronil, a Class II (moderately hazardous) pesticide, is also being used by farmers in Bangladesh, India, and Vietnam. It is classified as a possible human carcinogen[71]. Beyond its health risks, fipronil has devastating environmental impacts, by product seeping in soil harming other organisms[72]. Although Vietnam banned fipronil in 2019[73] due to its environmental and health hazards evidence suggests that it can still be found in use, raising serious concerns about enforcement and continued exposure in farming communities.

Exposure to pesticides containing imidacloprid, a pesticide used in all four countries, has been linked to symptoms such as skin and eye irritation, dizziness, breathlessness, confusion, and vomiting[74]. Beyond human health risks, imidacloprid is highly toxic to honeybees and other beneficial insects, posing serious threats to biodiversity and pollination[75].

Exposure to lambda-cyhalothrin, a pesticide used by farmers in Bangladesh, India and Vietnam can cause irritation to the skin, throat, nose, and other body parts[76]. A characteristic symptom is skin tingling, burning, or prickling sensations, particularly around the face, which are usually temporary. Other commonly reported effects include dizziness, headache, nausea, loss of appetite, and fatigue and in severe cases of poisoning, seizures and coma may occur. Beyond human health risks, lambda-cyhalothrin is also highly toxic to fish, raising serious environmental concerns.

Farmers in Bangladesh, India, and Vietnam are reported to be using malathion, a pesticide that poses significant risks to human health. Even at low levels of exposure, malathion has been associated with cancer, reproductive toxicity, and neurodevelopmental disorders, raising grave concerns about its continued use[77]. It was noted that paraquat is still being used in Bangladesh and India as long-term health consequences paraquat poisoning include chronic lung damage and scarring, kidney and heart failure, esophageal scarring, and difficulty swallowing[78].

Another notable pesticide, profenofos, used by farmers in Bangladesh and India can cause cholinesterase inhibition in humans[79]. This overstimulation of the nervous system can result in nausea, dizziness, and confusion[80]. At very high levels of exposure, such as in accidents or major spills, it can lead to respiratory paralysis and even death[81].

---

65 PANAP. (2020). Yavatmal poisonings: Syngenta's pesticide far more heavily involved. https://panap.net/2020/09/yavatmal-poisonings-syngentas-pesticide-far-more-heavily-involved/
66 Rotterdam Convention. (2017). Annex III Chemicals. https://www.pic.int/theconvention/chemicals/annexiiichemicals
67 Stockholm Convention. (n.d.). All POPs listed in the Stockholm Convention (Annex B). https://www.pops.int/TheConvention/ThePOPs/AllPOPs/tabid/2509/Default.aspx
68 Agency for Toxic Substances and Disease Registry. (2022). ToxFAQs™ for DDT, DDE, and DDD. https://wwwn.cdc.gov/TSP/ToxFAQs/ToxFAQsDetails.aspx?faqid=80&toxid=20
69 Ibid
70 Ibid
71 California Department of Pesticide Regulation. (2023). Fipronil Risk Characterization Document. https://www.cdpr.ca.gov/wp-content/uploads/2024/10/fipronil_rcd.pdf
72 Ibid
73 PANAP (2019). PAN Vietnam welcomes the ban of chlorpyrifos and fipronil. https://panap.net/2019/02/pan-vietnam-welcomes-the-ban-of-chlorpyrifos-and-fipronil/
74 National Pesticide Information Center. (2010). Imidacloprid (General Fact Sheet). https://npic.orst.edu/factsheets/imidagen.html
75 Ibid
76 National Pesticide Information Center. (2001). Lambda cyhalothrin (General Fact Sheet). https://npic.orst.edu/factsheets/l_cyhalogen.pdf
77 Earth Justice. (2021). Malathion. https://earthjustice.org/feature/organophosphate-pesticides-united-states/malathion
78 Centers for Disease Control and Prevention. (2024). Paraquat – Chemical Fact Sheet. https://www.cdc.gov/chemical-emergencies/chemical-fact-sheets/paraquat.html
79 United States Environmental Protection Agency. (2000). Profenofos Facts. https://www3.epa.gov/pesticides/chem_search/reg_actions/reregistration/fs_PC-111401_1-Jul-00.pdf
80 Ibid
81 Ibid

Pesticide exposure and spillage

- Most farmers re-enter their farm only one day after spraying takes place, risking exposure to pesticides (111, 25.30%; women: 170, 3.87%; men: 919, 20.92%; unknown: 22, 0.50%; Table 6).

Table 6. **Re-entry into field after pesticide spraying**

BANGLADESH			
INTERVAL	**WOMEN**	**MEN**	**UNKNOWN**
Same day	59	67	-
After one day	12	438	7
After two days	17	102	3
After three days	18	42	-
After five days	-	-	-
After one week	2	13	1
Depending on pesticide/authority	-	-	-
N/A	20	30	-
Total	**128**	**692**	**11**
INDIA			
INTERVAL	**WOMEN**	**MEN**	**UNKNOWN**
Same day	46	700	9
After one day	47	413	11
After two days	40	267	7
After three days	8	61	9
After five days	-	-	-
After one week	-	-	-
Depending on pesticide/authority	-	-	-
N/A	115	246	11
Total	**259**	**1687**	**47**
LAOS			
INTERVAL	**WOMEN**	**MEN**	**UNKNOWN**
Same day	32	7	-
After one day	74	30	4
After two days	13	9	-
After three days	51	68	1
After five days	1	7	-
After one week	305	377	1
Depending on pesticide/authority	-	-	-
N/A	40	25	-
Total	**516**	**523**	**6**
VIETNAM			
INTERVAL	**WOMEN**	**MEN**	**UNKNOWN**
Same day	22	19	-
After one day	37	38	-
After two days	55	54	-
After three days	73	67	4
After five days	8	6	-
After one week	70	41	-
Depending on pesticide/authority	-	3	-
N/A	15	11	-
Total	**280**	**239**	**4**

INTERVAL	TOTAL
Same day	**964**
After one day	**1111**
After two days	**567**
After three days	**402**
After five days	**22**
After one week	**810**
Depending on pesticide/authority	**3**
N/A	**513**
Total	**4392**

FARMERS' RE-ENTRY INTO THE FIELD AFTER PESTICIDE SPRAYING

SAME DAY
21.95%

AFTER ONE DAY
25.30%

AFTER TWO DAYS
12.91%

AFTER THREE DAYS
9.15%

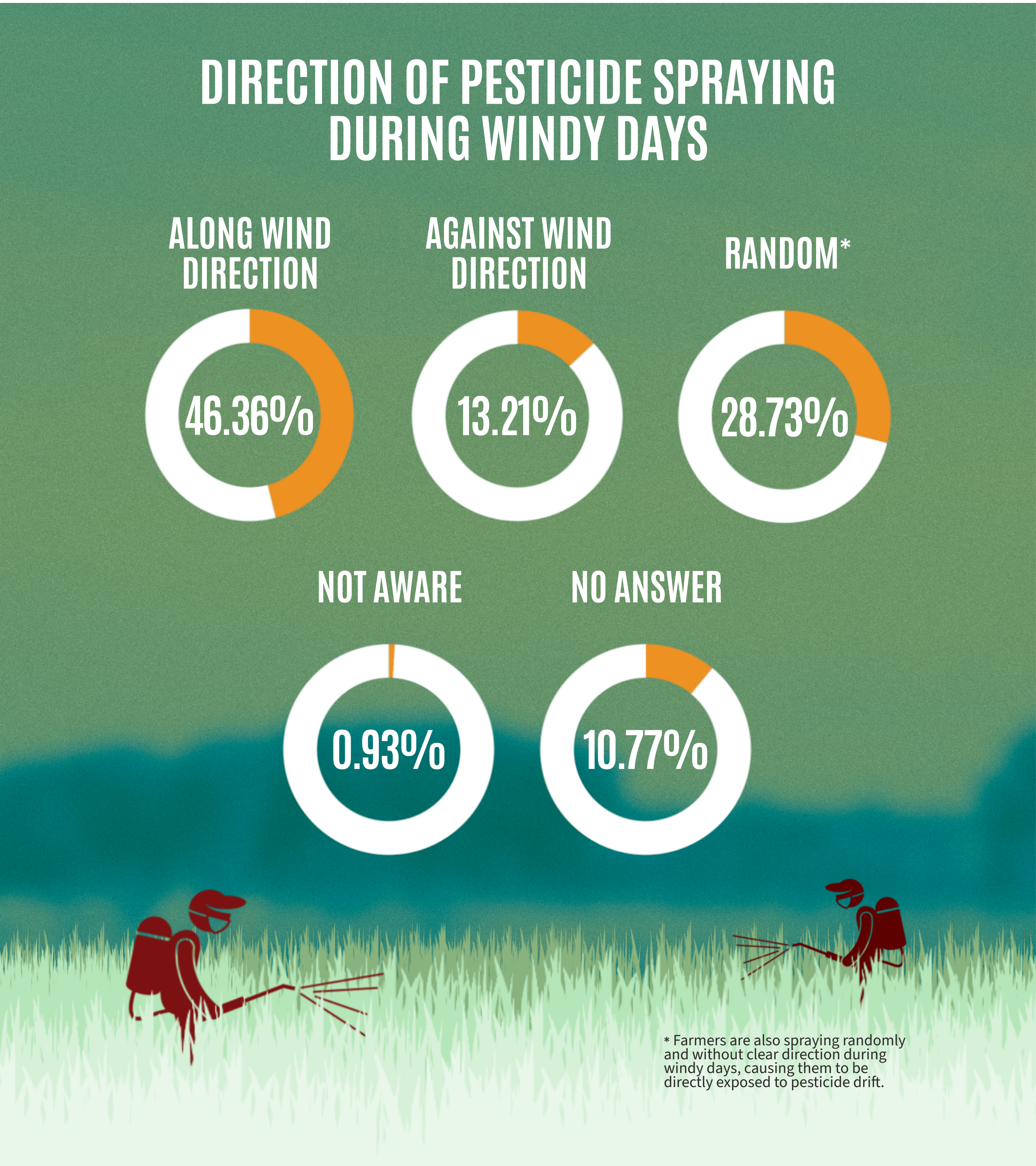
AFTER FIVE DAYS
0.50%

AFTER ONE WEEK
18.44%

DEPENDING ON PESTICIDE/AUTHORITY
0.07%

NO ANSWER
11.68%

- Although the majority of farmers in the four countries spray in the direction of the wind or on windy days (2036, 46.36%; women: 758, 17.26%; men: 1258, 28.64%; unknown: 20, 0.46%), nearly one-third sprayed without specific guidelines, increasing their risk of pesticide exposure (1262, 28.73%; women: 168, 3.83%; men: 1079, 24.57%; unknown: 15, 0.34%). Farmers are also spraying randomly and without clear direction during windy days, causing them to be directly exposed to pesticide drift.



- While the majority of farmers did not report experiencing pesticide spillage (2949, 67.14%; women: 780, 17.76%; men: 2134, 48.59%; unknown: 35, 0.80%), a notable proportion did experience spillage (974, 22.18%; women: 279, 6.35%; men: 674, 15.35%; unknown: 21, 0.48%), with many incidents involving spills on their hands (724, 16.48%; women: 200, 4.55%; men: 512, 11.66%; unknown: 12, 0.27%; Table 7).

Table 7. **Body areas exposed to spillage**

BANGLADESH			
AREAS	**WOMEN**	**MEN**	**UNKNOWN**
Face	2	39	-
Eyes	1	4	-
Mouth	1	21	1
Hands	27	216	5
Feet	11	189	4
Upper body	1	35	-
Lower body	1	14	-
Front of body	1	71	3
Back of body	-	46	-
Genital area	-	-	-
N/A	100	428	6
INDIA			
AREAS	**WOMEN**	**MEN**	**UNKNOWN**
Face	1	25	-
Eyes	1	21	-
Mouth	-	16	-
Hands	10	83	3
Feet	7	62	1
Upper body	2	47	1
Lower body	2	49	11
Front of body	-	48	1
Back of body	-	37	-
Genital area	-	7	-
N/A	98	1445	28
LAOS			
AREAS	**WOMEN**	**MEN**	**UNKNOWN**
Face	63	116	-
Eyes	36	99	-
Mouth	30	84	-
Hands	121	176	4
Feet	73	102	-
Upper body	15	66	-
Lower body	10	51	-
Front of body	2	37	-
Back of body	-	9	-
Genital area	-		-
N/A	384	337	2
VIETNAM			
AREAS	**WOMEN**	**MEN**	**UNKNOWN**
Face	7	7	-
Eyes	0	1	-
Mouth	0	1	-
Hands	42	37	-
Feet	31	38	-
Upper body	11	10	-
Lower body	2	10	-
Front of body	11	6	-
Back of body	69	68	-
Genital area	-	-	-
N/A	180	144	3

- These pesticide spillages mostly occur due to faulty spraying equipment (684, 15.57%; women: 192, 4.37%; men: 481, 10.95%; unknown: 11, 0.25%).

- When they experienced pesticide spillage, farmers usually wash their hands or the affected area (744, 16.94%; women: 221, 5.03%; men: 507, 11.54%; unknown: 16, 0.36%) or take a bath (593, 13.50%; women: 135, 3.07%; men: 445, 10.13%; unknown: 13, 0.30%).

Personal Protective Equipment (PPE) use

- Approximately 40% of farmers (1627, 37.04%; women: 345, 7.86%; men: 1260, 28.69%; unknown: 22, 0.50%) reported not using PPE, with the highest proportion observed in India (1009, 22.97%; women: 141, 3.21%; men: 851, 19.38%; unknown: 17, 0.39%).

- Farmers who use PPE reported wearing face masks (1988, 45.26%; women: 639, 14.55%; men: 1277, 29.08%; unknown: 72, 1.64%; Table 8), long-sleeved shirts (1822, 41.48%; women: 580, 13.21%; men: 1156, 26.32%; unknown: 86, 1.96%), long pants (1727, 39.32%; women: 574, 13.05%; men: 1077, 24.52%; unknown: 76, 1.73%), gloves (1638, 37.30%; women: 568, 12.93%; men: 1059, 24.11%; unknown: 11, 0.25%) and boots or shoes (1615, 36.77%; women: 562, 12.80%; men: 1041, 23.70%; unknown: 11, 0.25%).

Table 8. **Types of PPE used by farmers in four countries**

BANGLADESH			
PPE	**WOMEN**	**MEN**	**UNKNOWN**
Boots/shoes	1	14	2
Eyeglasses	1	3	1
Face mask	20	208	62
Gloves	4	24	6
Long pants	20	98	65
Long-sleeved shirt	18	170	75
Overalls	-	-	-
Respirators	-	6	-
Lungi (Men's skirt)	11	11	-
N/A	82	449	156
INDIA			
PPE	**WOMEN**	**MEN**	**UNKNOWN**
Boots/shoes	35	560	6
Eyeglasses	23	438	5
Face mask	35	559	6
Gloves	37	562	1
Long pants	28	498	6
Long-sleeved shirt	31	512	6
Overalls	3	71	1
Respirators	-	5	-
Lungi (Men's skirt)	-		-
N/A	213	1035	22
LAOS			
PPE	**WOMEN**	**MEN**	**UNKNOWN**
Boots/shoes	345	329	1
Eyeglasses	168	147	2
Face mask	389	366	2
Gloves	346	346	2
Long pants	349	345	2
Long-sleeved shirt	381	369	2
Overalls	44	-	-
Respirators	1	4	-
Lungi (Men's skirt)	-	-	-
N/A	119	139	4
VIETNAM			
PPE	**WOMEN**	**MEN**	**UNKNOWN**
Boots/shoes	181	138	2
Eyeglasses	124	52	-
Face mask	195	144	2
Gloves	181	127	2
Long pants	177	136	3
Long-sleeved shirt	150	105	3
Overalls	10	9	-
Respirators	5	4	-
Lungi (Men's skirt)	-	-	-
N/A	79	90	1

FARMERS' USE OF PPE

USING PPE	NOT USING PPE	NO ANSWER
49.43%	37.04%	13.52%

TYPES OF PPE USED BY FARMERS

EYEGLASSES 21.95%	FACEMASK 45.26%	RESPIRATORS 0.57%
GLOVES 37.30%	LONG-SLEEVED SHIRT 41.48%	LONG PANTS 39.32%
LUNGI (MEN'S SKIRT) 0.50%	OVERALLS 3.14%	BOOTS/SHOES 36.75%

Note: Total is not equal to 100% due to multiple responses

- However, some of the PPE items used do not comply with the International Code of Conduct on Pesticide Management's Guidelines for Personal Protection when Handling and Applying Pesticides,[82] as surgical masks, which are commonly used but are not recommended for pesticide spraying.

- Many farmers reported acquiring PPE themselves (2230, 50.77%; women: 636, 14.48%; men: 1564, 35.61%; unknown: 30, 0.68%).

- Additionally, farmers indicated that PPE is often unavailable in their area (687, 15.64%; women: 90, 2.05%; men: 580, 13.21%; unknown: 17, 0.39%).

Washing facilities

- The most commonly used washing facilities by farmers in the four countries are watercourses and irrigation drains (1309, 29.80%; women: 495, 11.27%; men: 803, 18.28%; unknown: 11, 0.25%; Table 9).

Table 9. **Washing facilities in four countries**

BANGLADESH			
WASHING FACILITIES	**WOMEN**	**MEN**	**UNKNOWN**
Watercourse/irrigation drains	10	168	1
Water containers	32	68	-
Taps	-	23	-
River	-	126	1
Wells	2	5	1
Ponds	43	270	2
Others	4	17	-
N/A	59	347	9
INDIA			
WASHING FACILITIES	**WOMEN**	**MEN**	**UNKNOWN**
Watercourse/irrigation drains	20	195	5
Water containers	12	270	5
Taps	67	203	7
River	29	346	7
Wells	78	908	15
Ponds	12	99	-
Others	-	-	-
N/A	109	362	18
LAOS			
WASHING FACILITIES	**WOMEN**	**MEN**	**UNKNOWN**
Watercourse/irrigation drains	302	292	4
Water containers	74	114	-
Taps	91	93	2
River	65	56	1
Wells	2	12	-
Ponds	10	21	-
Others	-	-	-
N/A	53	33	-
VIETNAM			
WASHING FACILITIES	**WOMEN**	**MEN**	**UNKNOWN**
Watercourse/irrigation drains	163	148	1
Water containers	8	11	-
Taps	37	44	-
River	83	92	1
Wells	17	28	-
Ponds	6	11	-
Others	29	13	-
N/A	41	26	3

[82] FAO and WHO. (2020). Guidelines for personal protection when handling and applying pesticide – International Code of Conduct on Pesticide Management. Rome.

Training on pesticide handling, storage and disposal

- A majority of the farmers (2424, 55.19%; women: 557, 12.68%; men: 1831, 41.69%; unknown: 36, 0.82%) reported not receiving any training on pesticide handling.
- While most farmers store pesticides in sheds (1343, 30.58%; women: 324, 7.38%; men: 1000, 22.77%; unknown: 19, 0.43%), a comparable proportion store them inside their homes (1338, 30.46%; women: 283, 6.44%; men: 1036, 23.59%; unknown: 19, 0.43%), increasing the risk of pesticide exposure.
- Furthermore, many farmers are exposed during pesticide disposal practices, particularly through burning (1478, 33.65%; women: 328, 7.47%; men: 1128, 25.68%; unknown: 22, 0.50%; Table 10).

Table 10. **Pesticide disposal**

BANGLADESH			
DISPOSAL METHOD	WOMEN	MEN	UNKNOWN
Returned to company/distributor	3	90	2
Thrown in an open field	45	368	6
Thrown in a river	3	5	-
Buried	28	199	2
Burned	24	221	4
Thrown in rubbish/trash	35	191	3
Storage tank	-	-	-
Sold to scrap collectors	-	-	-
N/A	41	93	1
INDIA			
DISPOSAL METHOD	WOMEN	MEN	UNKNOWN
Returned to company/distributor	7	51	-
Thrown in an open field	8	116	6
Thrown in a river	-	-	-
Buried	29	397	6
Burned	36	662	14
Thrown in rubbish/trash	10	147	3
Storage tank	-	-	-
Sold to scrap collectors	13	39	3
N/A	171	652	24
LAOS			
DISPOSAL METHOD	WOMEN	MEN	UNKNOWN
Returned to company/distributor	1	-	-
Thrown in an open field	100	98	-
Thrown in a river	-	-	-
Buried	130	162	1
Burned	260	239	4
Thrown in rubbish/trash	28	35	-
Storage tank	-	-	-
Sold to scrap collectors	-	-	-
N/A	109	99	1
VIETNAM			
DISPOSAL METHOD	WOMEN	MEN	UNKNOWN
Returned to company/distributor	-	-	-
Thrown in an open field	52	42	-
Thrown in a river	-	-	-
Buried	1	3	-
Burned	8	6	-
Thrown in rubbish/trash	157	111	1
Storage tank	98	81	3
Sold to scrap collectors	-	-	-
N/A	20	23	-

Illness after pesticide exposure

- Headaches (868, 19.76%; women: 364, 8.29%; men: 496, 11.29%; unknown: 8, 0.18%; Table 11) and dizziness (837, 19.06; women: 326, 7.42%; men: 500, 11.38%; unknown: 11, 0.25%) were the most commonly reported symptoms among farmers following pesticide exposure.

Table 11. **Illness and symptoms due to pesticide exposure**

BANGLADESH			
ILLNESS/SYMPTOM	**WOMEN**	**MEN**	**UNKNOWN**
Blurred vision	-	4	-
Convulsions	-	1	-
Diarrhoea	-	26	-
Difficulty of breathing	-	13	-
Dizziness	7	112	6
Excessive salivation	-	19	-
Excessive sweating	2	15	5
Hand tremors	1	1	1
Headaches	3	45	2
Irregular heartbeat	-	1	1
Constricted pupils/miosis	-	9	-
Nausea	-	64	1
Skin rashes	-	5	-
Sleeplessness/Insomnia	-	14	-
Staggering	-	19	-
Vomiting	3	12	1
No symptoms reported	-	-	-
N/A	117	441	221

INDIA			
ILLNESS/SYMPTOM	**WOMEN**	**MEN**	**UNKNOWN**
Blurred vision	5	21	-
Convulsions	-	-	-
Diarrhoea	2	35	-
Difficulty of breathing	3	17	-
Dizziness	10	66	-
Excessive salivation	1	47	1
Excessive sweating	3	22	-
Hand tremors	2	36	-
Headaches	17	139	2
Irregular heartbeat	2	24	-
Constricted pupils/miosis	-	1	-
Nausea	6	181	2
Skin rashes	7	107	7
Sleeplessness/Insomnia	-	28	-
Staggering	2	4	-
Vomiting	8	233	2
No symptoms reported	4	-	-
N/A	322	1234	24

LAOS			
ILLNESS/SYMPTOM	**WOMEN**	**MEN**	**UNKNOWN**
Blurred vision	46	94	-
Convulsions	-	-	-
Diarrhoea	53	41	-
Difficulty of breathing	73	63	-
Dizziness	174	195	4
Excessive salivation	53	64	4
Excessive sweating	66	106	4
Hand tremors	35	25	-
Headaches	190	169	4
Irregular heartbeat	42	25	-
Constricted pupils/miosis	25	53	-
Nausea	99	89	-
Skin rashes	39	17	-
Sleeplessness/Insomnia	65	53	4
Staggering	21	2	-
Vomiting	70	55	-
No symptoms reported	4	-	-
N/A	242	283	-

VIETNAM			
ILLNESS/SYMPTOM	**WOMEN**	**MEN**	**UNKNOWN**
Blurred vision	37	44	1
Convulsions	1	1	-
Diarrhoea	28	19	-
Difficulty of breathing	39	32	-
Dizziness	135	127	1
Excessive salivation	9	5	1
Excessive sweating	67	89	-
Hand tremors	54	47	-
Headaches	154	143	-
Irregular heartbeat	5	7	-
Constricted pupils/miosis		3	-
Nausea	34	31	-
Skin rashes	45	48	-
Sleeplessness/Insomnia	22	20	-
Staggering	29	27	-
Vomiting	32	26	-
No symptoms reported	13	12	-
N/A	27	34	1

- In suspected cases of poisoning, farmers frequently sought help from family members (1815, 41.33%; women: 551, 12.55%; men: 1205, 27.44%; unknown: 59, 1.34%).

Highlights of the Consolidated Analysis

58.33% of pesticides are HHPs according to PAN International list of HHPs.

29.17% of pesticides are highly toxic to bees.

37.04% of farmers do not wear PPE.

21.70% of farmers did not have proper access to washing facilities after pesticides application.

38.98% farmers live less than 1km from pesticide spraying location.

30.46% farmers store pesticides in their homes.

4. COUNTRY REPORTS

4.1. Bangladesh

4.1.1. Manikganj District

Demographic profile

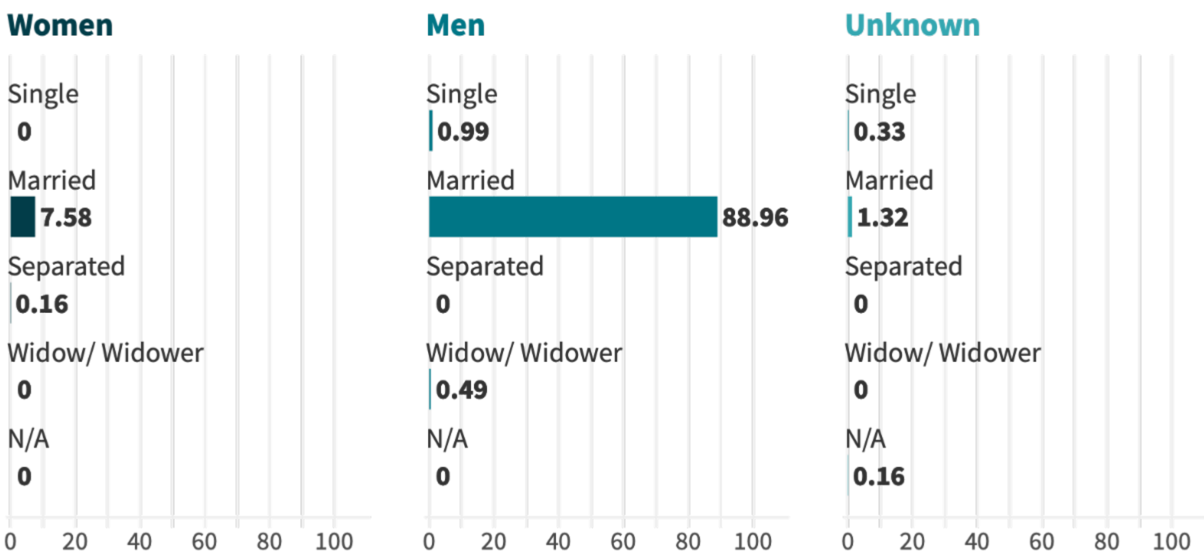
- A total of 607 respondents were surveyed in Manikganj, comprising 47 women (7.74%), 549 men (90.44%), and 11 individuals (1.81%) whose gender was not specified.

- The largest proportion of farmers (222, 36.57%) fell within the 50 to 59 age group (women: 2, 0.33%; men: 215, 35.42%; unknown: 5, 0.82%; Table 12).

Table 12. **Age range of farmers in Manikganj**

AGE	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
18 - 19	-	-	1	0.16	-	-	**1**	**0.16**
20 – 29	4	0.66	14	2.31	2	0.33	**20**	**3.29**
30 – 39	30	4.94	73	12.03	2	0.33	**105**	**17.30**
40 – 49	11	1.81	180	29.65	1	0.16	**192**	**31.63**
50 – 59	2	0.33	215	35.42	5	0.82	**222**	**36.57**
60 – 69	-	-	52	8.57	-	-	**52**	**8.57**
70 – 79	-	-	13	2.14	-	-	**13**	**2.14**
80 – 89	-	-	1	0.16	-	-	**1**	**0.16**
N/A	-	-	-	-	1	0.16	**1**	**0.16**
TOTAL	**47**	**7.74**	**549**	**90.44**	**11**	**1.81**	**607**	**100.00**

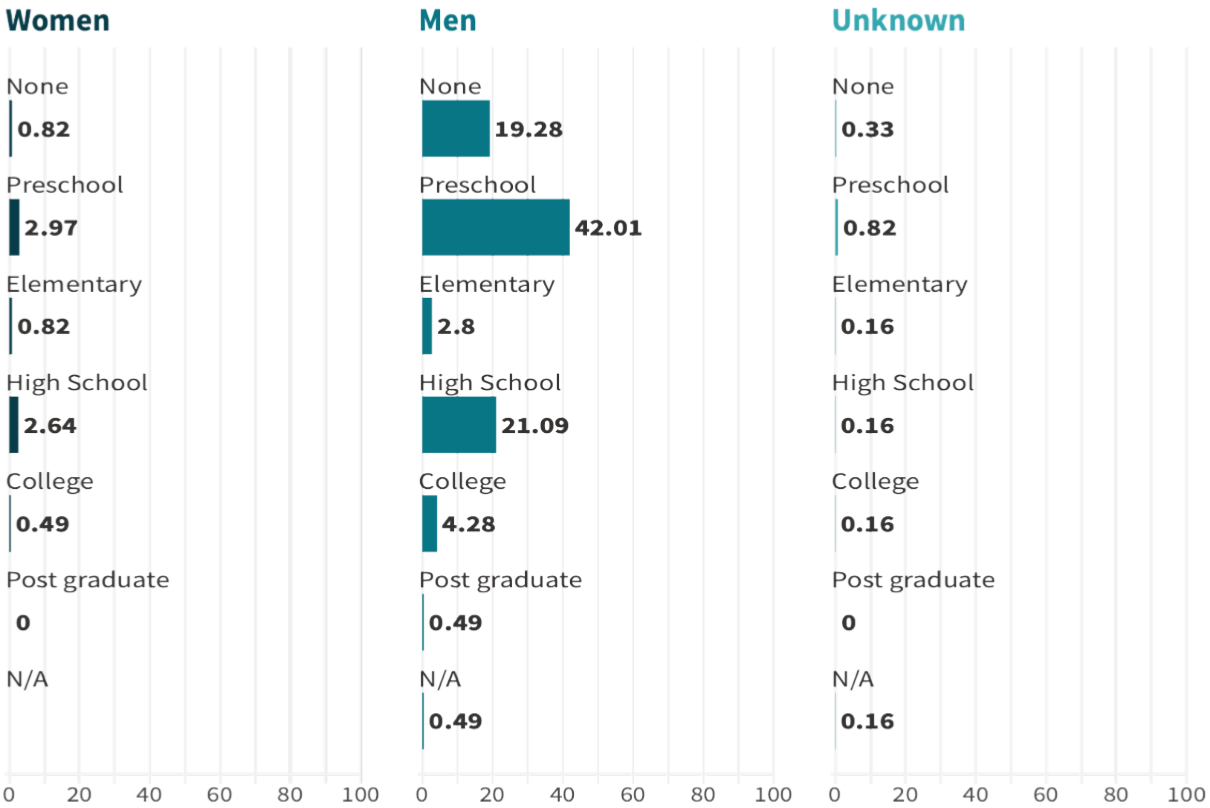
- The vast majority of respondents (594, 97.86%) were married (women: 46, 7.58%; men: 540, 88.96%; unknown: 8, 1.32%; Figure 2).



- None of the women surveyed were pregnant or breastfeeding. However, three (6.38%) respondents did not provide a response.

- Regarding education levels, 278 farmers (45.80%) reported having attended only up to preschool (women: 18, 2.97%; men: 255, 42.01%; unknown: 5, 0.82%; Figure 3).

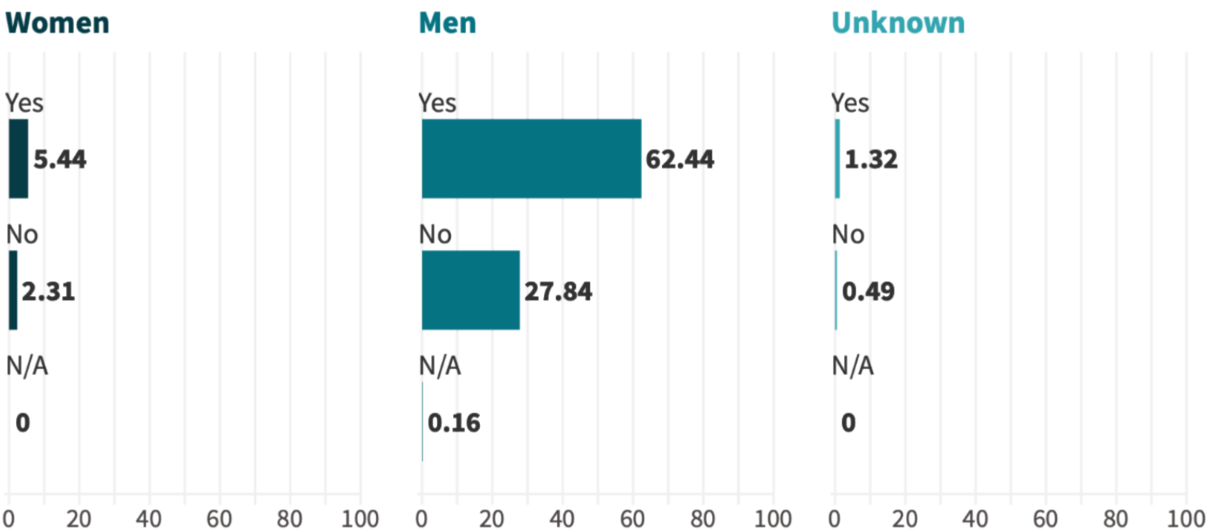
Figure 3. **Education levels of farmers in Manikganj (%)**



- A total of 524 respondents (86.33%) reported being self-employed (women: 43, 7.08%; men: 473, 77.92%; unknown: 8, 1.32%). Only seven farmers (1.15%) indicated that they were employed (women: 1, 0.16%; men: 6, 0.99%), while 77 respondents (12.69%) did not provide an answer (women: 3, 0.49%; men: 71, 11.70%; unknown: 3, 0.49%).

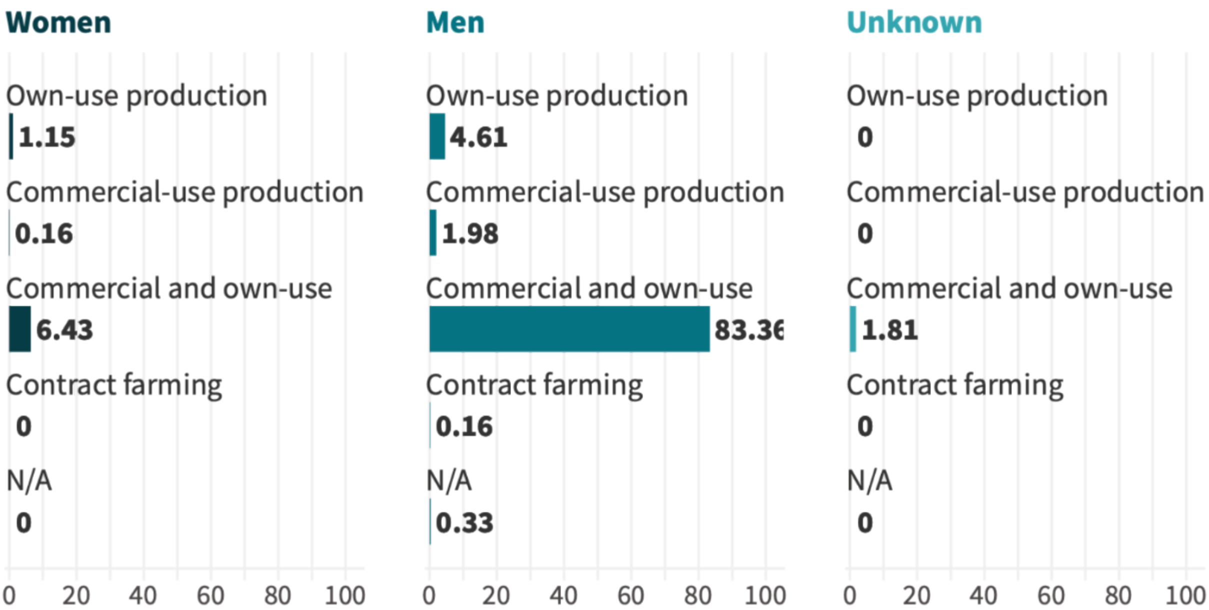
- The majority of farmers (420, 69.19%) own the land they work on (women: 33, 5.44%; men: 379, 62.44%; unknown: 8, 1.31%; Figure 4).

Figure 4. **Land ownership of farmers in Manikganj (%)**



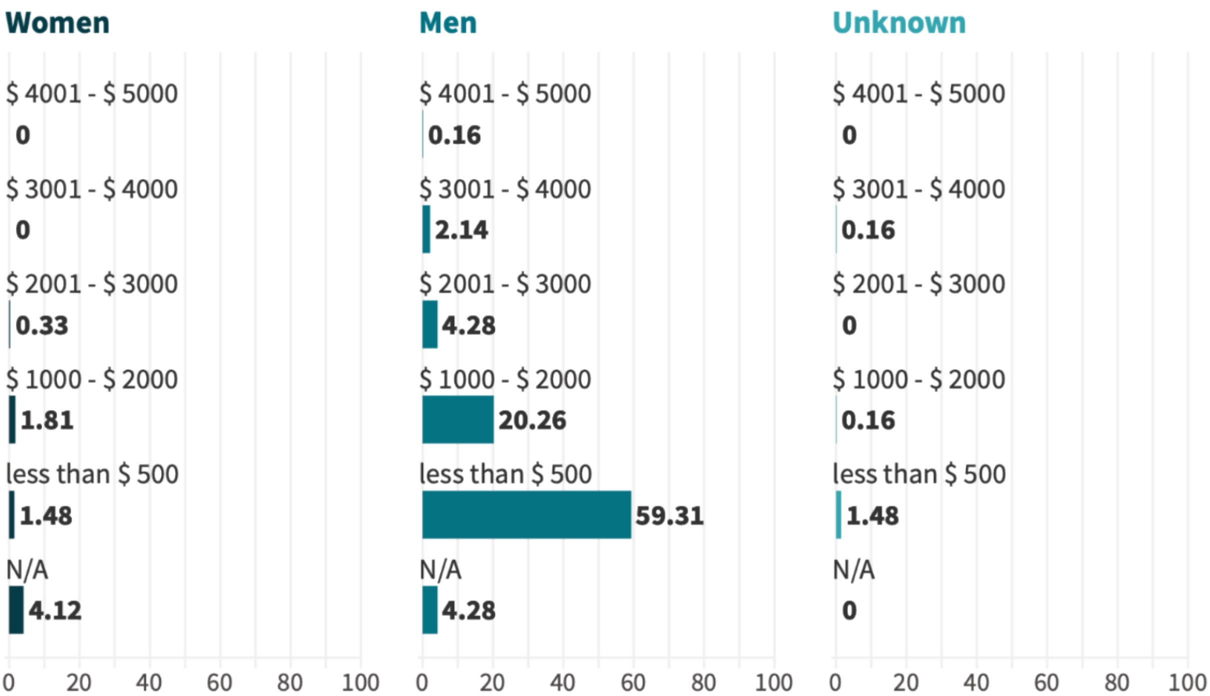
- Most respondents (556, 91.60%) reported that their farming activities are for both personal and commercial use (women: 39, 6.43%; men: 506, 83.36%; unknown: 11, 1.81%; Figure 5).

Figure 5. **Farming activities on land in Manikganj (%)**



- Among those who answered, a significant portion of farmers in Manikganj (378, 62.27%) reported an average annual household income of less than USD500 (women: 9, 1.48%; men: 360, 59.31%; unknown: 9, 1.48%; Figure 6).

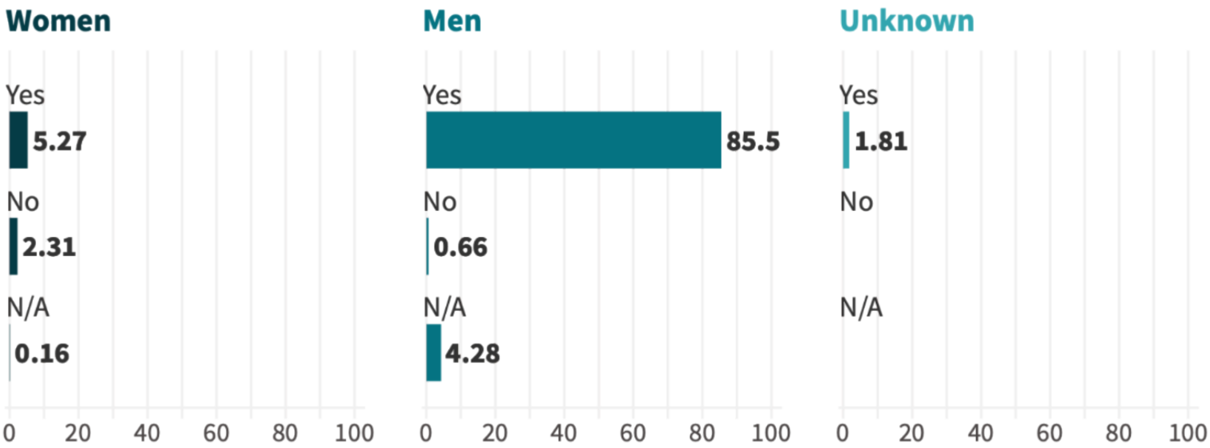
Figure 6. **Annual household income of farmers in Manikganj (%)**



Pesticide use

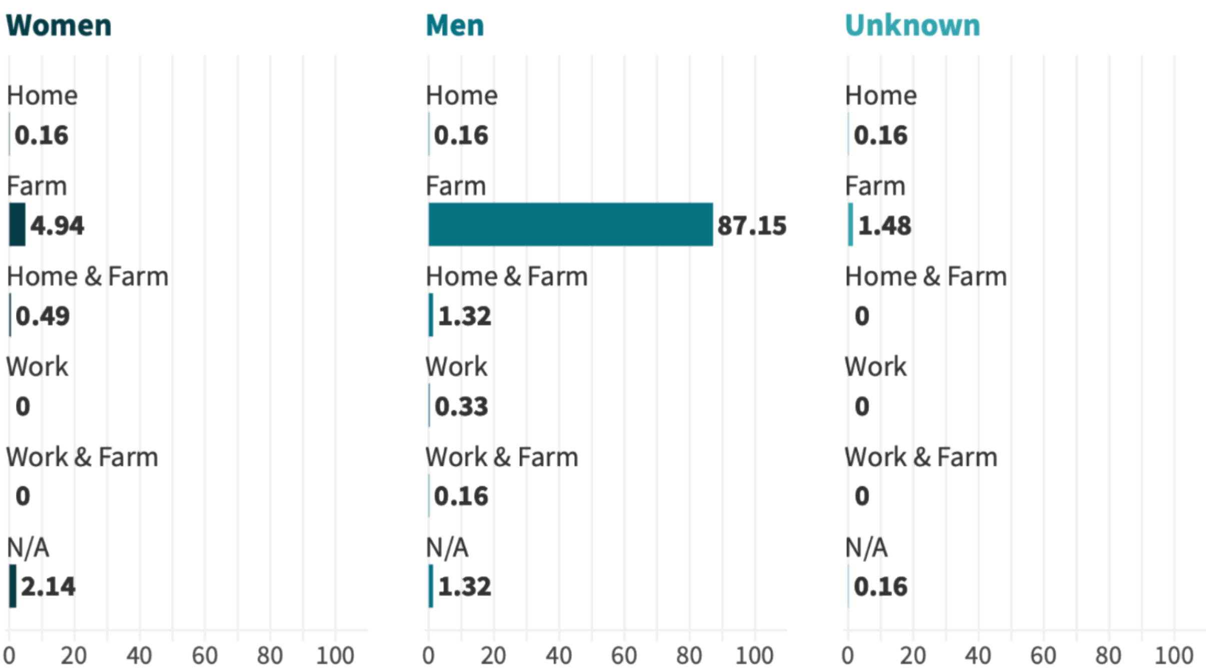
- A total of 562 farmers (92.59%) in Manikganj reported using pesticides (women: 32, 5.27%; men: 519, 85.50%; unknown: 11, 1.81%; Figure 7).

Figure7. **Farmers' use of pesticides in Manikganj (%)**



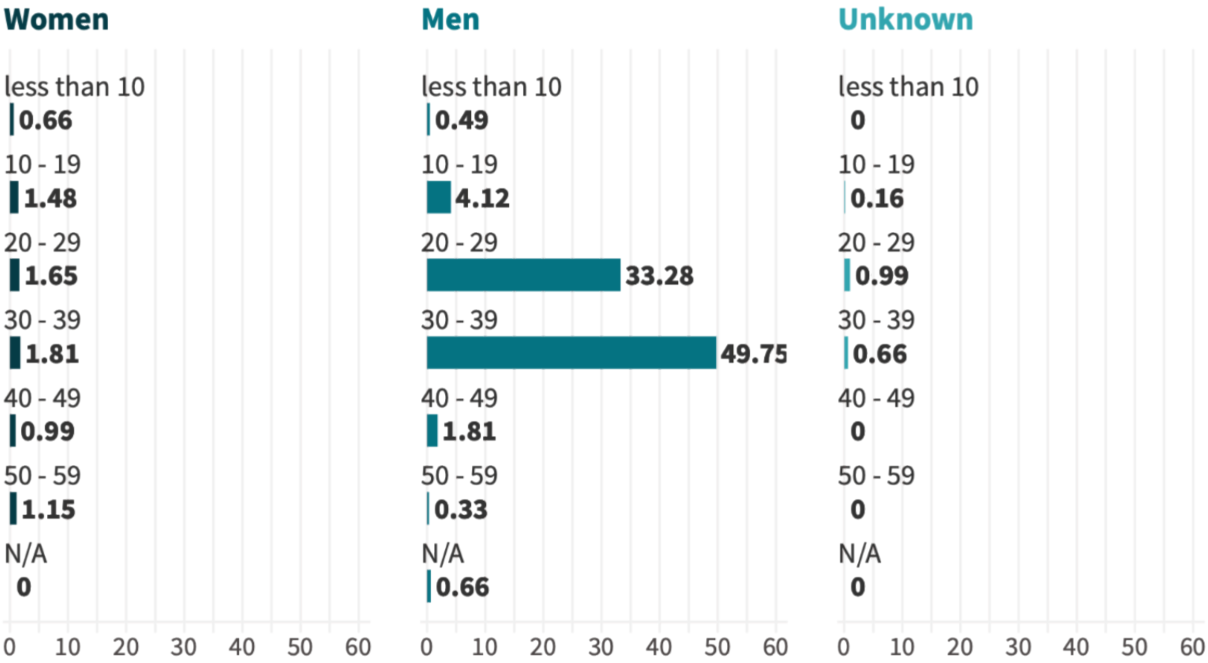
- Pesticides are primarily applied on farms, with 568 farmers (93.57%) indicating this usage (women: 30, 4.94%; men: 529, 87.15%; unknown: 9, 1.48%; Figure 8).

Figure 8. **Locations of pesticide use in Manikganj (%)**



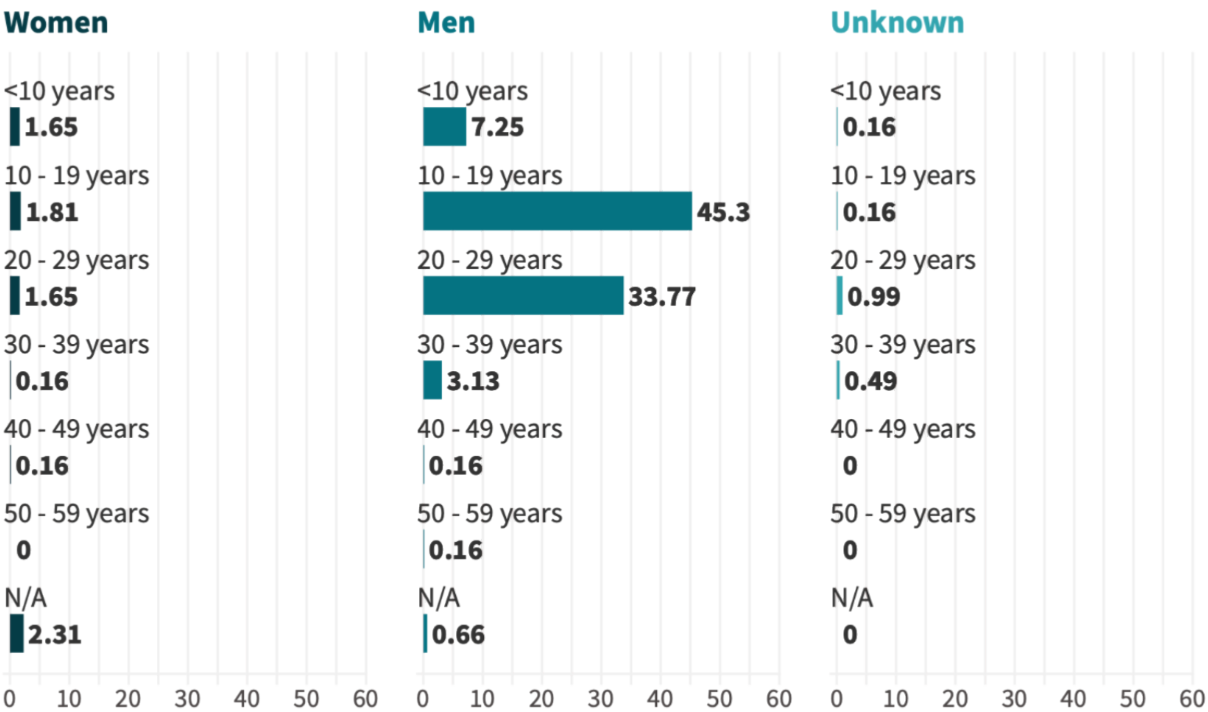
- Nearly half of the respondents (287, 47.28%) have been using pesticides for 10 to 19 years (women: 11, 1.81%; men: 275, 45.30%; unknown: 1, 0.16%; Figure 9).

Figure 9. **Years of pesticide use by farmers' family members in Manikganj (%)**



- Additionally, the majority of farmers reported that their family members have been using pesticides for approximately 30 to 39 years (317, 52.22%; women: 11, 1.81%; men: 302, 49.75%; unknown: 4, 0.66%; Figure 10).

Figure 10. **Years of pesticide use in Manikganj (%)**



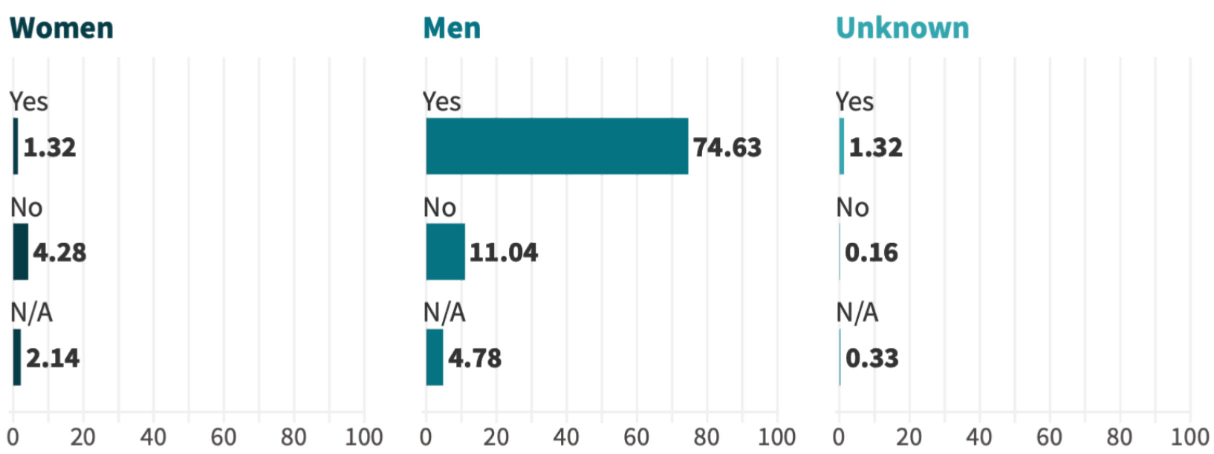
- The primary activity involving pesticide use is spraying or applying pesticides in the field, reported by 556 farmers (91.60%; women: 6, 0.99%; men: 539, 88.80%; unknown: 11, 1.81%; Table 13), followed closely by mixing, loading, or decanting pesticides, with 555 farmers (91.43%) involved (women: 32, 5.27%; men: 512, 84.35%; unknown: 11, 1.81%).

Table 13. **Farmers' pesticide-related activities in Manikganj**

ACTIVITY	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Apply/spray pesticides in the field	6	0.99	539	88.80	11	1.81	**556**	**91.60**
Apply pesticides in the household	1	0.16	4	0.66	1	0.16	**6**	**0.99**
Human therapeutic purposes	-	-	2	0.33	-	-	**2**	**0.33**
Mix, load, or decant pesticides	32	5.27	512	84.35	11	1.81	**555**	**91.43**
Purchase or transport pesticides	6	0.99	218	35.91	3	0.49	**227**	**37.40**
Vector control	-	-	11	1.81	-	-	**11**	**1.81**
Veterinary therapeutic purposes (e.g. for foot and mouth disease)	-	-	3	0.49	-	-	**3**	**0.49**
Wash clothes used during pesticide spraying or mixing	25	4.12	75	12.36	-	-	**100**	**16.47**
Wash equipment used during pesticide spraying or mixing	22	3.70	81	13.34	1	0.16	**104**	**17.21**
Work in fields where pesticides are being used or have been used	24	4.04	82	13.51	2	0.33	**108**	**17.88**
Not applicable (N/A)	13	2.19	4	0.66	-	-	**17**	**2.85**

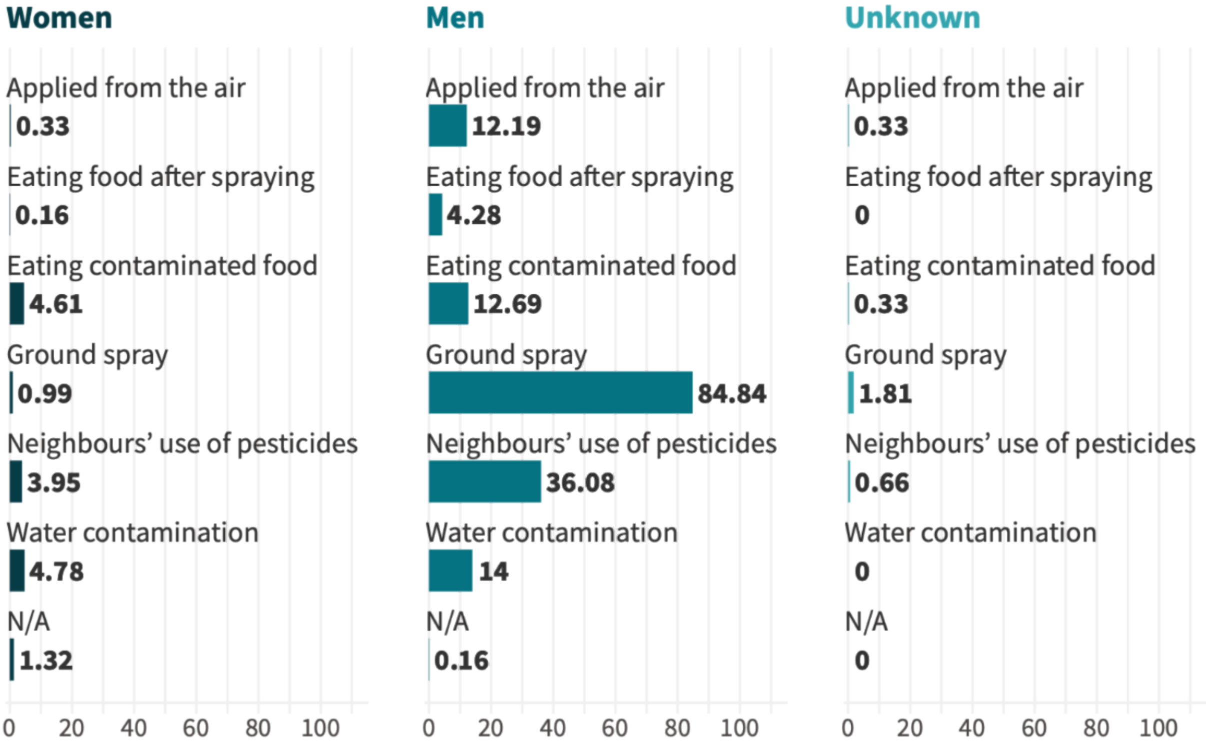
- A majority of the farmers (469, 77.27%) decant pesticides (women: 8, 1.32%; men: 453, 74.63%; unknown: 8, 1.32%; Figure 11).

Figure 11. **Pesticide decanting by farmers in Manikganj (%)**



- Farmers are constantly (532, 87.64%) exposed to pesticides through ground spraying (women: 6, 0.99%; men: 515, 84.84%; unknown: 11, 1.82%; Figure 12).

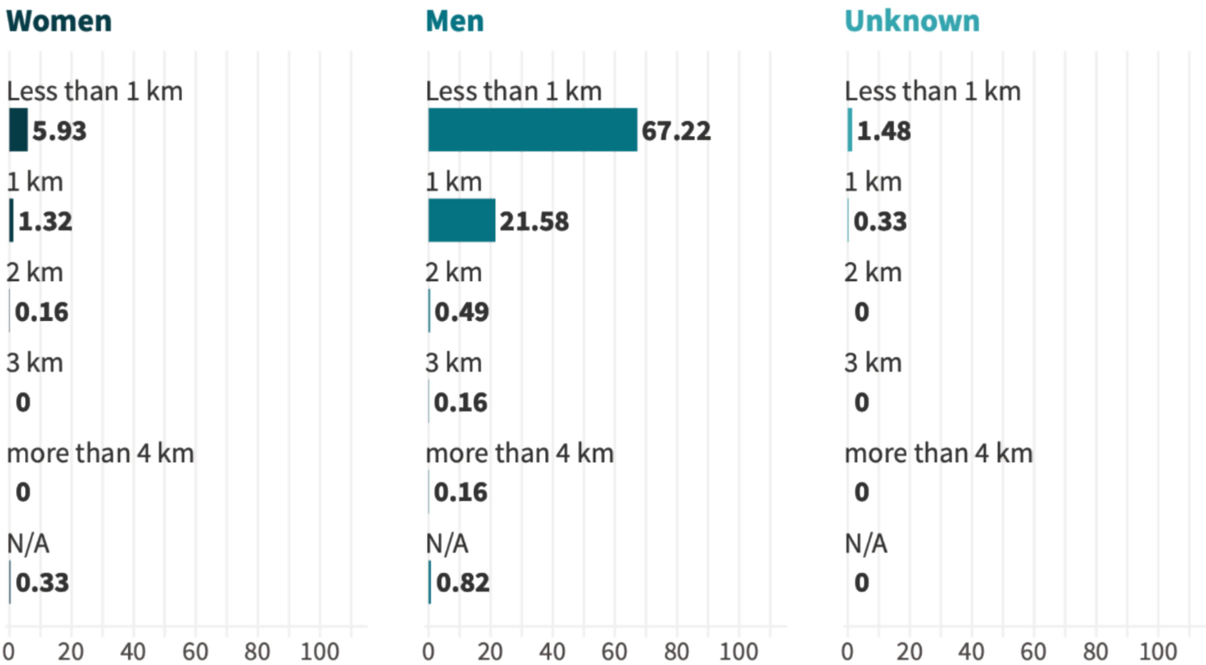
Figure 12. **Pesticide decanting by farmers in Manikganj (%)**



Note: Total is not equal to 100% due to multiple responses

- Most of the farmers in Manikganj live less than 1 kilometre from the sprayed fields (453, 74.63%; women: 36, 5.93%; men: 408, 67.22%; unknown: 9, 1.48%; Figure 13).

Figure 13. **Distance between farmers' homes and pesticide spraying locations (%)**



- Among the 26 pesticides being used (Image 1), the most commonly reported were thiamethoxam (148, 24.38%), followed by carbofuran (117, 19.28%), primarily for maize and paddy cultivation (Table 14).

Photo: **Examples of pesticides commonly used by farmers in Manikganj: Mancozeb, Chlorpyrifos + Cypermethrin, and Abamectin + Beta-cypermethrin)**

Table 14.a. **List of pesticides used by farmers in Manikganj, Bangladesh**

PESTICIDE	CROPS TREATED	NO. OF FARMERS	%
Abamectin	MAIZE, VEGETABLES	31	5.11
Acephate	-	1	0.16
Acetamiprid	PADDY, VEGETABLES	16	2.64
Azoxystrobin	PADDY	21	3.46
Beta-cypermethrin	MAIZE, PADDY, VEGETABLES	19	3.13
Carbendazim	MAIZE	11	1.81
Carbofuran	MAIZE, PADDY, VEGETABLES	117	19.28
Carbosulfan	PADDY	27	4.45
Chlorantraniliprole	MAIZE, PADDY	72	11.86
Chlorphenoxy acetic acid	MAIZE, PADDY, VEGETABLES	13	2.14
Chlorpyrifos	PADDY, VEGETABLES	74	12.19
Cypermethrin	VEGETABLES	76	12.52
Difenoconazole	PADDY	16	2.64

PESTICIDE	CROPS TREATED	NO. OF FARMERS	%
Emamectin benzoate	MAIZE, PADDY, VEGETABLES	17	2.80
Fipronil	PADDY	51	8.40
Glyphosate	PADDY	1	0.16
Imidacloprid	PADDY	28	4.61
Lambda cyhalothrin	PADDY, VEGETABLES	17	2.80
Mancozeb	VEGETABLES	18	2.97
Paraquat	PADDY, VEGETABLES	3	0.49
Penoxsulam	PADDY	9	1.48
Pretilachlor	PADDY	13	2.14
Profenofos	VEGETABLES	21	3.46
Pyriproxyfen	MAIZE, PADDY, VEGETABLES	4	0.66
Thiamethoxam	MAIZE, PADDY	148	24.38
Tricyclazole	-	1	0.16

Table 14.b. **Classification of pesticides used by farmers in Manikganj, Bangladesh**

PESTICIDE	WHO CLASS[83]	PAN HHP LIST[84]*	NO. OF COUNTRIES BANNED[85]
Abamectin		X (H330, HIGHLY TOXIC TO BEES)*	NOT KNOWN TO BE BANNED
Acephate	II MODERATELY HAZARDOUS	X (GHS+ REPRO (1A ,1B), HIGHLY TOXIC TO BEES)	43
Acetamiprid	II MODERATELY HAZARDOUS	-	NOT KNOWN TO BE BANNED
Azoxystrobin	U UNLIKELY TO PRESENT ACUTE HAZARD	-	NOT KNOWN TO BE BANNED
Beta-cypermethrin	-	X (HIGHLY TOXIC TO BEES)	32
CARBENDAZIM	U UNLIKELY TO PRESENT ACUTE HAZARD	X (GHS+ MUTA (1A, 1B), GHS+ REPRO (1A ,1B))	41
CARBOFURAN	IB HIGHLY HAZARDOUS	X (WHO IB, H330, HIGHLY TOXIC TO BEES)	106

[83] World Health Organization. (2019). The WHO recommended classification of pesticides by hazard and guidelines to classification. https://www.who.int/publications/i/item/9789240005662
[84] Pesticide Action Network International. (2024). PAN International list of highly hazardous pesticides. https://pan-international.org/wp-content/uploads/PAN_HHP_List.pdf
[85] Pesticide Action Network International. (2024). Consolidated list of banned pesticides. https://pan-international.org/pan-international-consolidated-list-of-banned-pesticides/

PESTICIDE	WHO CLASS	PAN HHP LIST	NO. OF COUNTRIES BANNED
Carbosulfan	II MODERATELY HAZARDOUS	X (H330, HIGHLY TOXIC TO BEES, PIC)	63
Chlorantraniliprole	U UNLIKELY TO PRESENT ACUTE HAZARD	X (VERY PERS WATER, SOIL OR SEDIMENT, VERY TOXIC TO AQ. ORGANISM)	NOT KNOWN TO BE BANNED
Chlorphenoxy acetic acid	-	-	29
Chlorpyrifos	II MODERATELY HAZARDOUS	X (GHS+ REPRO (1A ,1B), HIGHLY TOXIC TO BEES)	44
Cypermethrin	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	1
Difenoconazole	II MODERATELY HAZARDOUS	-	NOT KNOWN TO BE BANNED
EMAMECTIN BENZOATE		X (VERY PERS WATER, SOIL OR SEDIMENT, VERY TOXIC TO AQ. ORGANISM, HIGHLY TOXIC TO BEES)	NOT KNOWN TO BE BANNED
FIPRONIL	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	49
GLYPHOSATE	III SLIGHTLY HAZARDOUS	X (EPA PROB LIKEL CARC)	12
IMIDACLOPRID	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	29
LAMBDA CYHALOTHRIN	II MODERATELY HAZARDOUS	-	NOT KNOWN TO BE BANNED
MANCOZEB	U UNLIKELY TO PRESENT ACUTE HAZARD	X (EPA PROB LIKELY CARC, GHS+ REPRO (1A ,1B), EU EDC)	37
PARAQUAT	II MODERATELY HAZARDOUS	X (H330, PIC)	72
PENOXSULAM	U UNLIKELY TO PRESENT ACUTE HAZARD	-	NOT KNOWN TO BE BANNED
PRETILACHLOR	U UNLIKELY TO PRESENT ACUTE HAZARD	-	NOT KNOWN TO BE BANNED
PROFENOFOS	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	39
PYRIPROXYFEN	U UNLIKELY TO PRESENT ACUTE HAZARD	-	1
THIAMETHOXAM	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	28
TRICYCLAZOLE	II MODERATELY HAZARDOUS	-	30

TOP 10 PESTICIDES USED BY FARMERS IN MANIKGANJ

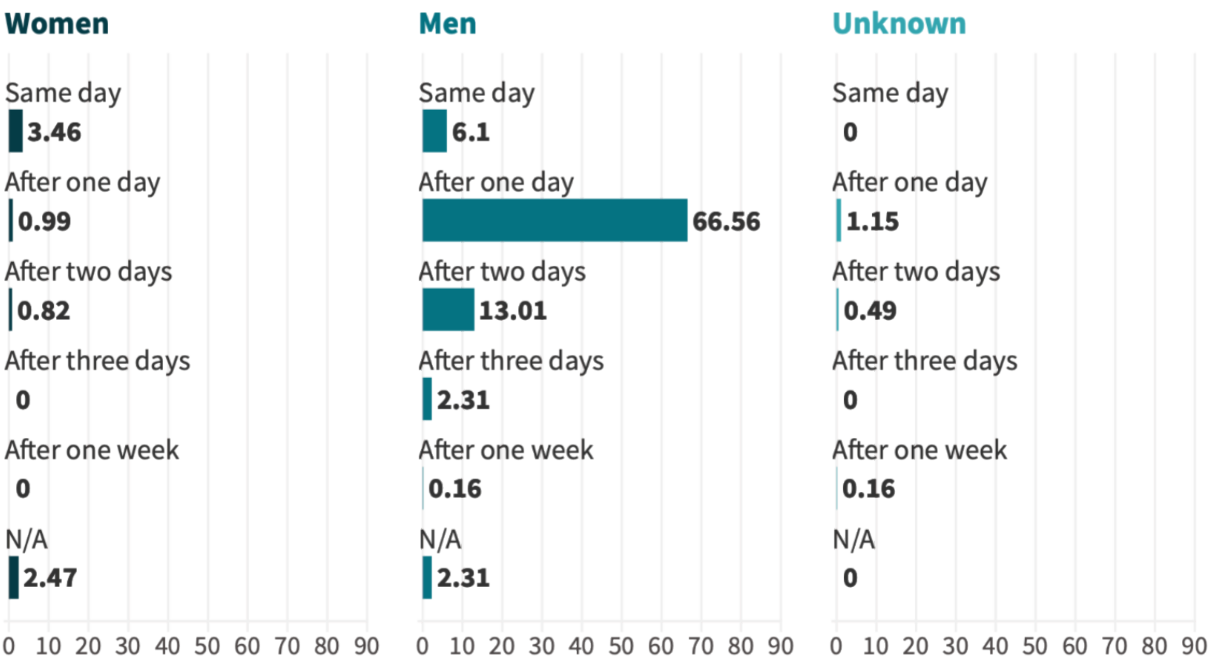
1. THIAMETHOXAM	24.38%
2. CARBOFURAN	19.28%
3. CYPERMETHRIN	12.52%
4. CHLORPYRIFOS	12.19%
5. CHLORANTRANILIPROLE	11.86%
6. FIPRONIL	8.40%
7. ABAMECTIN	5.11%
8. IMIDACLOPRID	4.61%
9. CARBOSULFAN	4.45%
10. AZOXYSTROBIN & PROFENOFOS	3.46%

Thiamethoxam is classified as a Class II pesticide (moderately hazardous). Exposure has been associated with acute kidney injury[86] as well as a range of neurological effects. Reported neurological symptoms include both typical effects, such as recent memory loss, finger tremors, headaches, general fatigue, palpitations or chest pain, abdominal pain, muscle weakness, spasms, and cough and atypical manifestations, which appear to be linked to higher levels of thiamethoxam detection.[87] Carbofuran, on the other hand, classified as a Class Ib pesticide (highly hazardous) is recognized not only for its acute toxicity but also for its endocrine-disrupting properties. Studies have shown that exposure can alter hormone levels, including increases in progesterone, cortisol, and estradiol[88], thereby raising concerns about its potential impact on reproductive health and long-term hormonal balance.

Pesticide exposure and spillage

- The majority of farmers in Manikganj return to their fields one day after pesticide spraying (417, 68.69%; women: 6, 0.99%; men: 404, 66.56%; unknown: 7, 1.15%; Figure 14), which still poses potential risks of exposure.

Figure 14. **Farmers' re-entry into the field after pesticide spraying in Manikganj (%)**

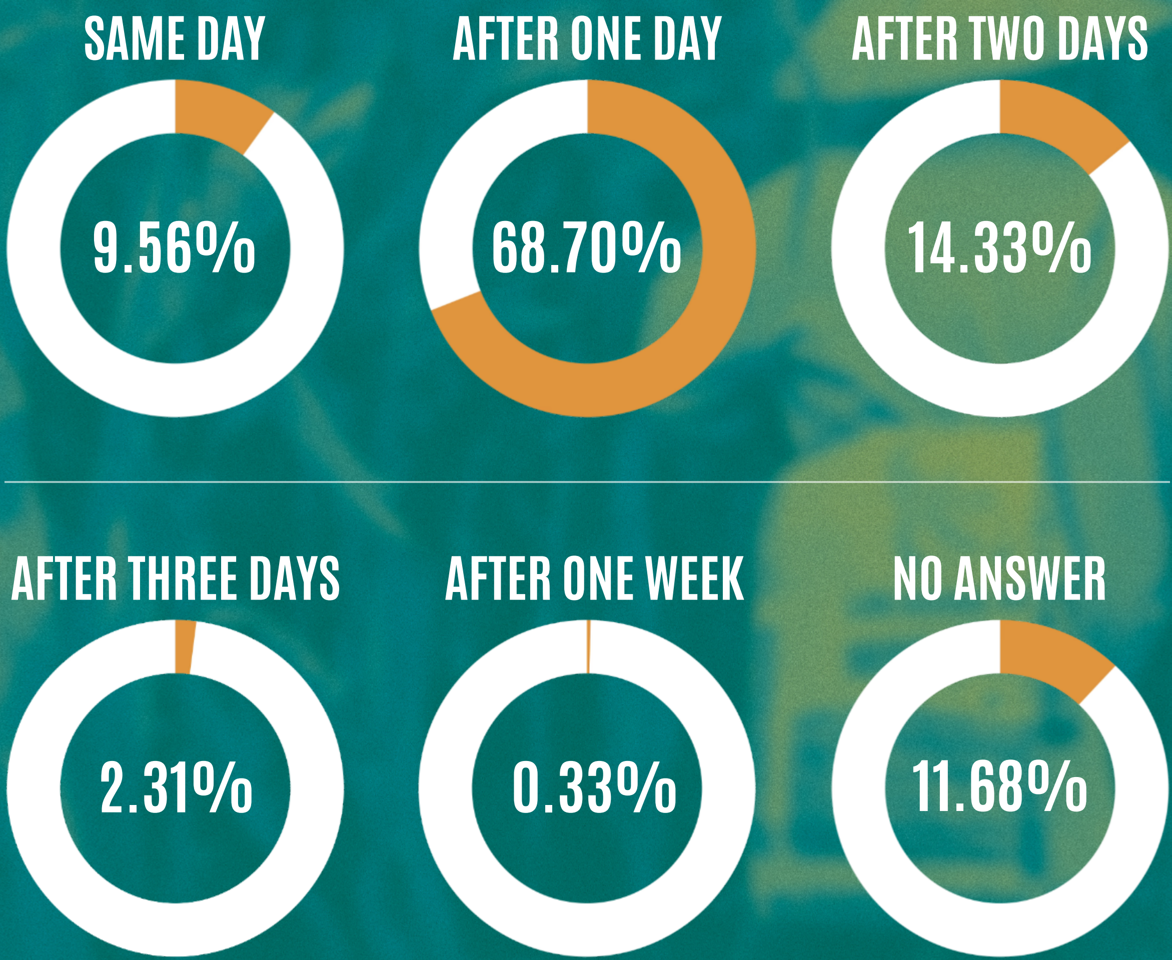


[86] Ramanathan, S., Kumar M, S., Sanjeevi, G., Narayanan, B., & Kurien, A. A. (2020). Thiamethoxam, a Neonicotinoid Poisoning Causing Acute Kidney Injury via a Novel Mechanism. Kidney international reports, 5(7), 1111–1113. https://doi.org/10.1016/j.ekir.2020.04.009

[87] Yi, L., Zhang, S., Chen, X., Wang, T., Yi, X., Yeerkenbieke, G., Shi, S., & Lu, X. (2023). Evaluation of the risk of human exposure to thiamethoxam by extrapolation from a toxicokinetic experiment in rats and literature data. Environment International, Vol 173, 107823. https://doi.org/10.1016/j.envint.2023.107823

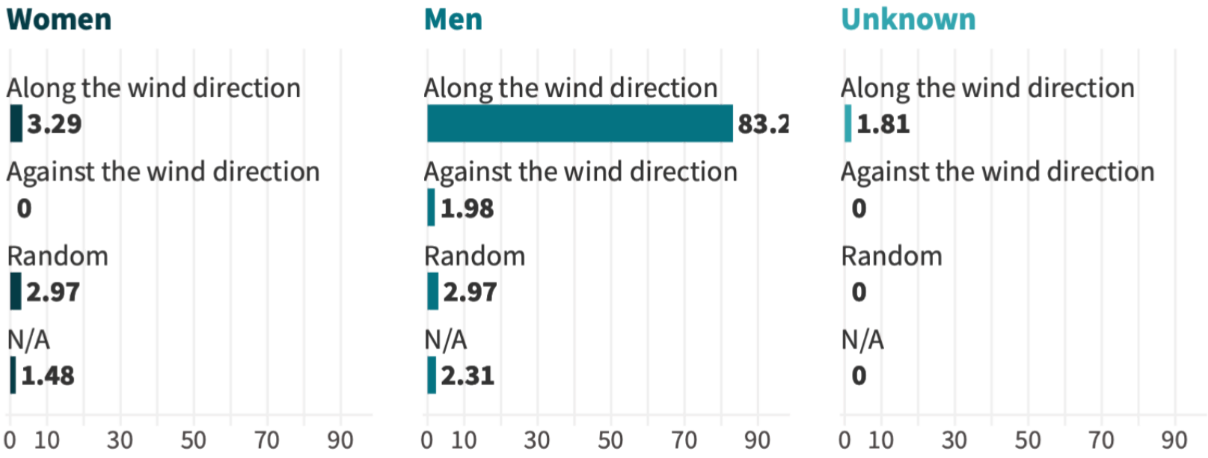
[88] IUPAC – International Union of Pure and Applied Chemistry. IUPAC. https://sitem.herts.ac.uk/aeru/iupac/Reports/118.htm

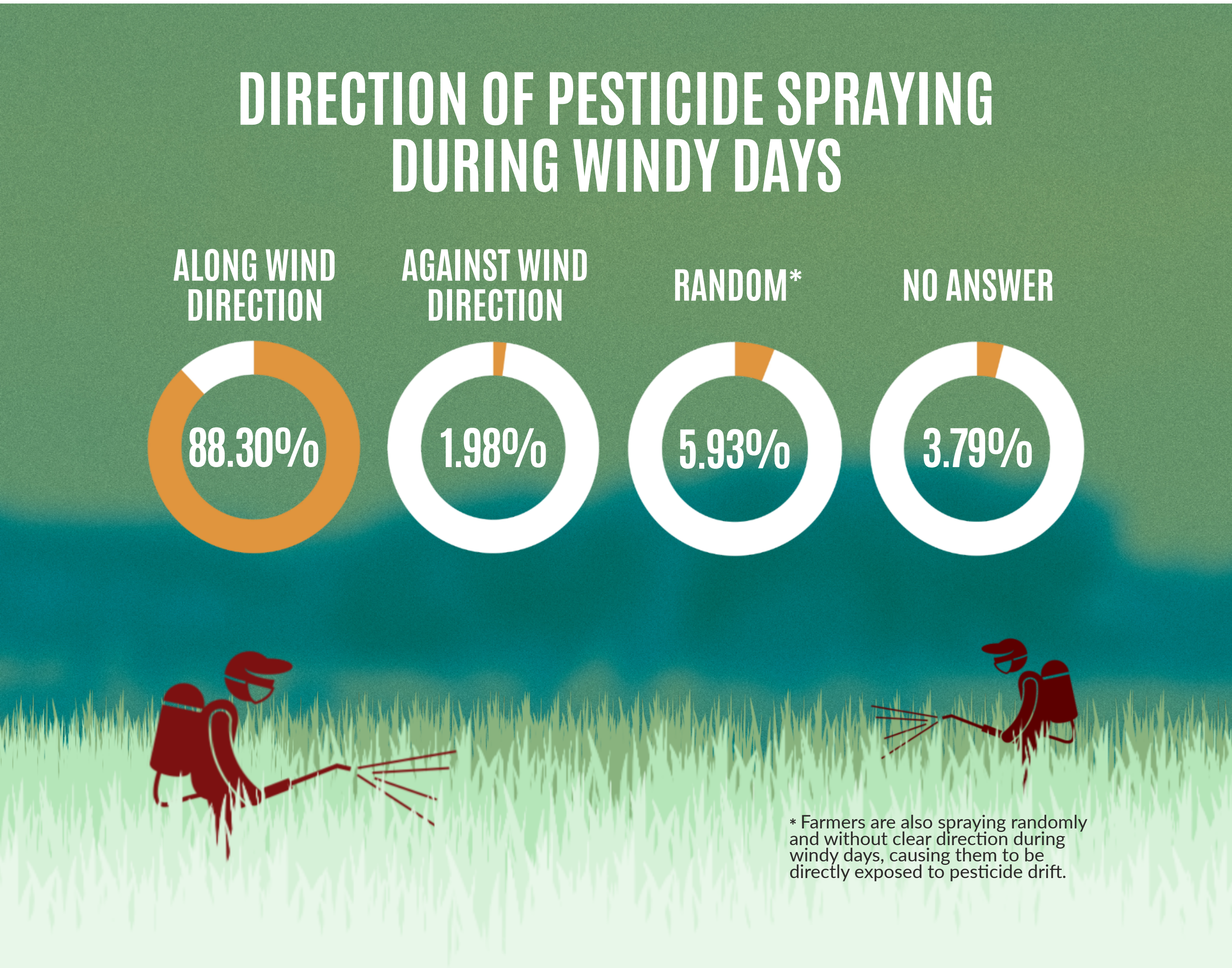
FARMERS' RE-ENTRY INTO THE FIELD AFTER PESTICIDE SPRAYING



- Most farmers (536, 88.30%) reported spraying pesticides along the direction of the wind (women: 20, 3.29%; men: 505, 83.20%; unknown: 11, 1.81%; Figure 15), however some sprayed against the wind, which also increases their risk of exposure.

Figure 15. **Direction of pesticide spraying during windy days (%)**



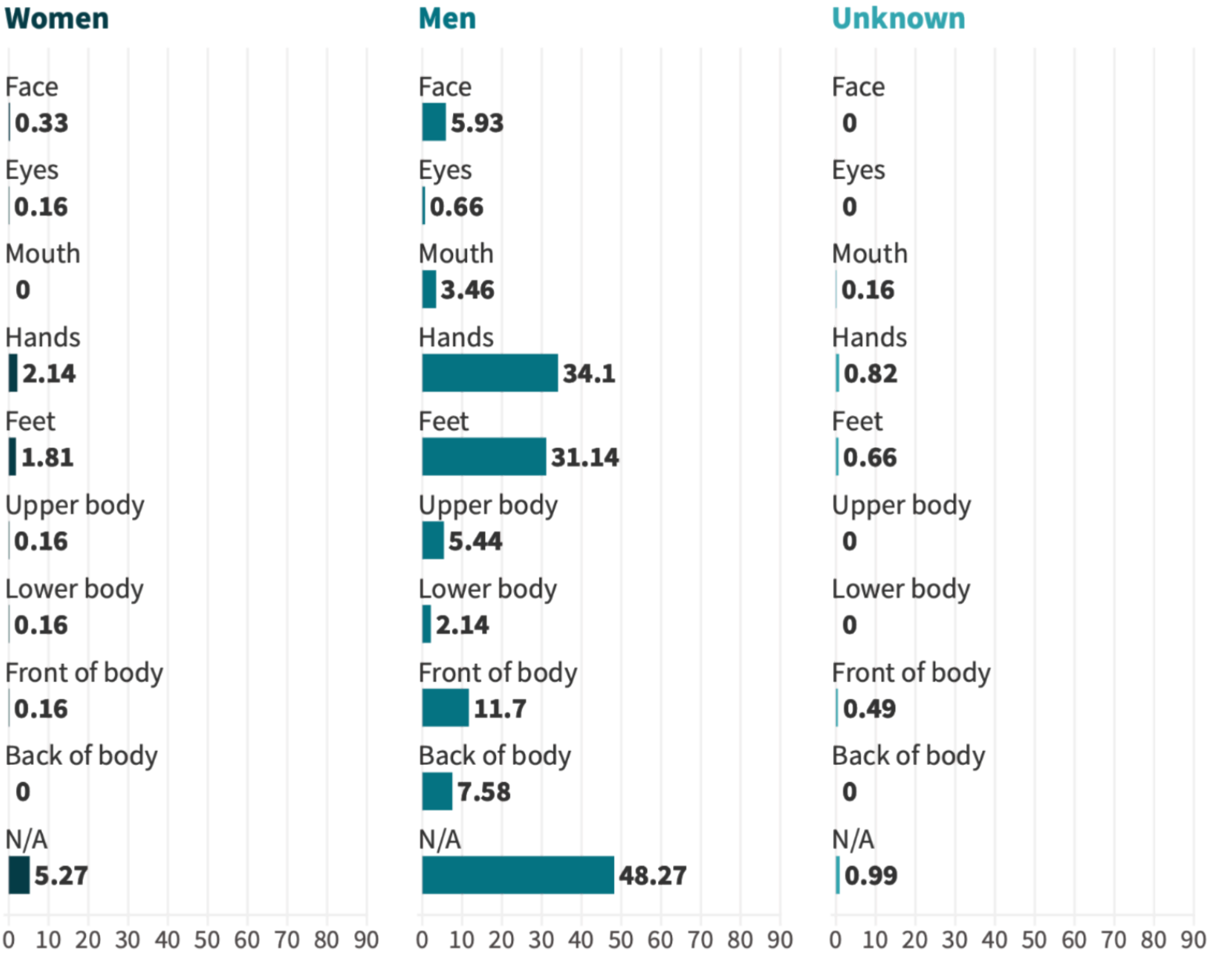


- A total of 275 farmers (45.30%; women: 16, 2.64%; men: 254, 41.85%; unknown: 5, 0.82%) reported experiencing pesticide spillage, while 315 farmers (51.89%; women: 29, 4.78%; men: 280, 46.13%; unknown: 6, 0.99%) stated they had not experienced such incidents.

- The majority of spillages (214, 35.25%; women: 2, 0.33%; men: 210, 34.60%; unknown: 2, 0.33%) occurred while spraying pesticides.

- The most commonly affected area during spillage was the hands, as reported by 225 farmers (37.07%; women: 13, 2.14%; men: 207, 34.10%; unknown: 5, 0.82%; Figure 16).

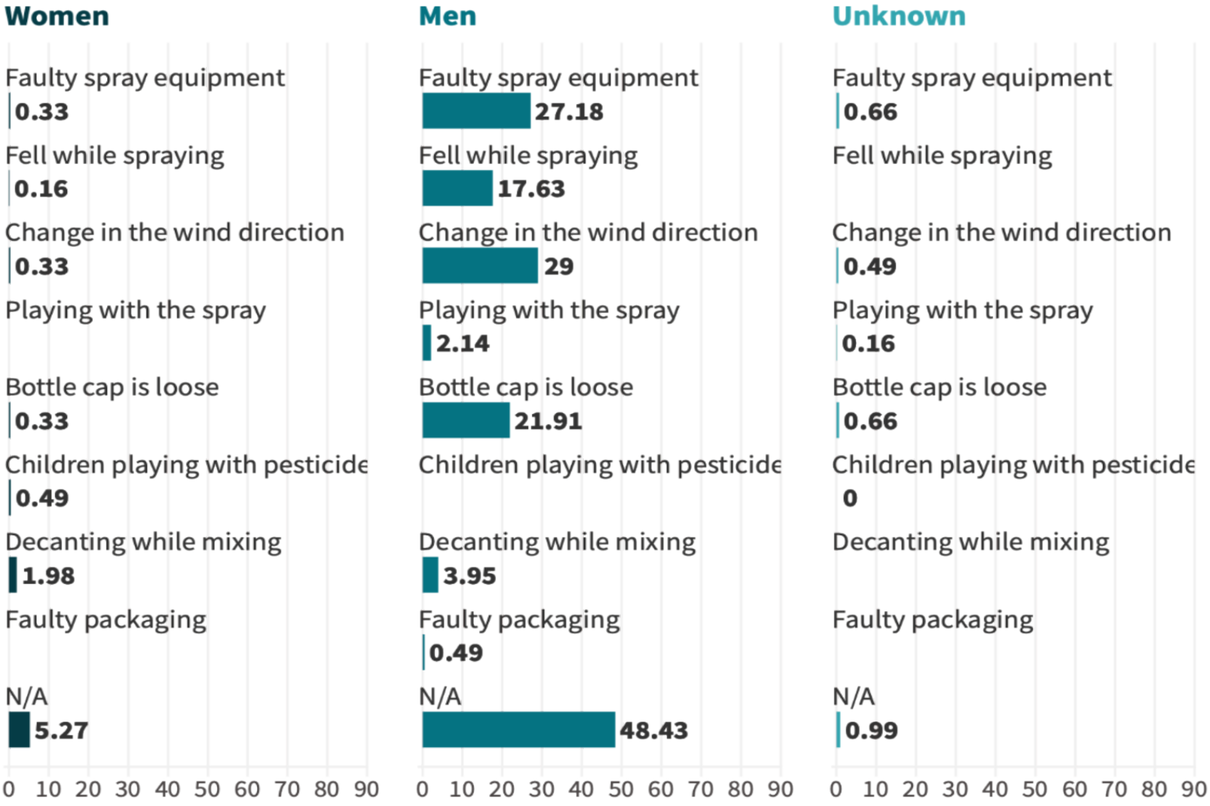
Figure 16. **Body areas exposed to spillage (%)**



Note: Total is not equal to 100% due to multiple responses

- A shift in wind direction was the primary reason cited for spillage by 181 farmers (29.82%; women: 2, 0.33%; men: 176, 29.00%; unknown: 3, 0.49%; Figure 17).

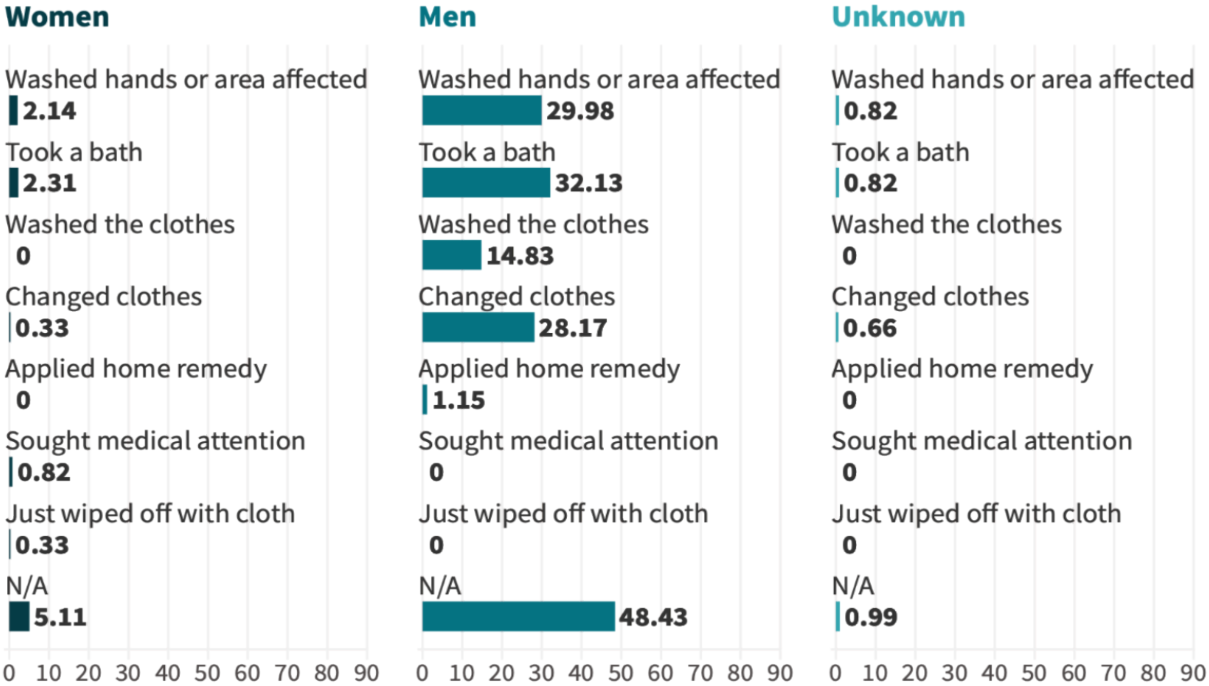
Figure 17. **Causes of pesticide spillage (%)**



Note: Total is not equal to 100% due to multiple responses

- Following pesticide spillage, most farmers (214, 35.26%; women: 14, 2.31%; men: 195, 32.13%; unknown: 5, 0.82%; Figure 18) reported bathing as a means of decontamination.

Figure 18. **Actions taken by farmers in response to pesticide spillage (%)**

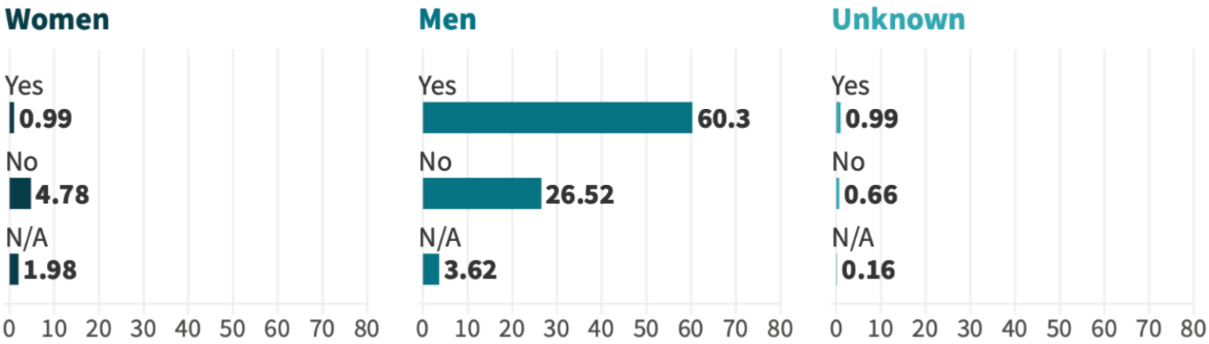


Note: Total is not equal to 100% due to multiple responses

PPE use

- The majority of farmers in Manikganj (378, 62.27%) reported wearing PPE while applying pesticides (women: 6, 0.99%; men: 366, 60.30%; unknown: 6, 0.99%; Figure 19).

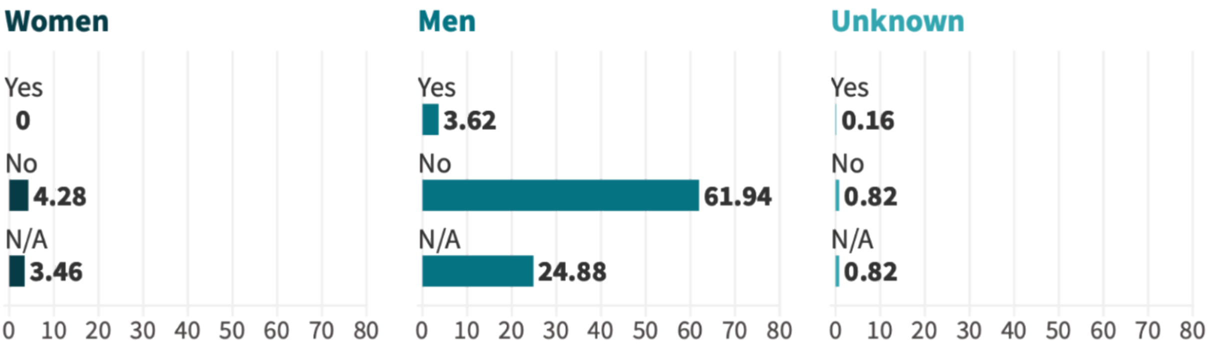
Figure 19. **Use of PPE by farmers in Manikganj (%)**



- Of those who used PPE, most (386, 63.59%) reported acquiring it themselves (women: 7, 1.15%; men: 373, 61.45%; unknown: 6, 0.99%).

- However, a significant number of farmers (407, 67.05%) indicated that they had not received any instructions on how to properly use PPE (women: 26, 4.28%; men: 376, 61.94%; unknown: 5, 0.82%; Figure 20).

Figure 20. **Availability of PPE instructions (%)**



- Face masks were the most commonly used type of PPE (women: 10, 1.65%; men: 157, 25.86%; unknown: 1, 0.16%; Table 15).

Table 15. **Types of PPE used by farmers in Manikganj**

PPE	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Boots/shoes	-	-	14	2.31	1	0.16	**15**	**2.47**
Eyeglasses	-	-	3	0.49	-	-	**3**	**0.49**
Face mask	10	1.65	157	25.86	1	0.16	**168**	**27.68**
Gloves	1	0.16	21	3.46	-	-	**22**	**3.62**
Long pants	8	1.32	45	7.41	-	-	**53**	**8.73**
Long-sleeved shirt	1	0.16	114	18.78	2	0.33	**117**	**19.28**
Respirators	-	-	6	0.99	-	-	**6**	**0.99**
Lungi (Men's skirt)	11	1.81	11	1.81	-	-	**22**	**3.62**
N/A	21	3.46	363	59.80	9	1.48	**393**	**64.74**

Note: Total is not equal to 100% due to multiple responses

FARMERS' USE OF PPE IN MANIKGANJ

USING PPE
62.27%

NOT USING PPE
31.96%

NO ANSWER
5.77%

TYPES OF PPE USED BY FARMERS

EYEGLASSES
0.49%

FACEMASK
27.68%

RESPIRATORS
0.99%

GLOVES
3.62%

LONG-SLEEVED SHIRT
19.28%

LONG PANTS
8.73%

LUNGI (MEN'S SKIRT)
3.62%

OVERALLS
0.00

BOOTS/SHOES
2.47%

Note: Total is not equal to 100% due to multiple responses

- Among those who did not use PPE, the most commonly reported reason was the unavailability of protective gear in their area (141, 23.23%; women: 5, 0.81%; men: 132, 21.75%; unknown: 4, 0.66%; Table 16).

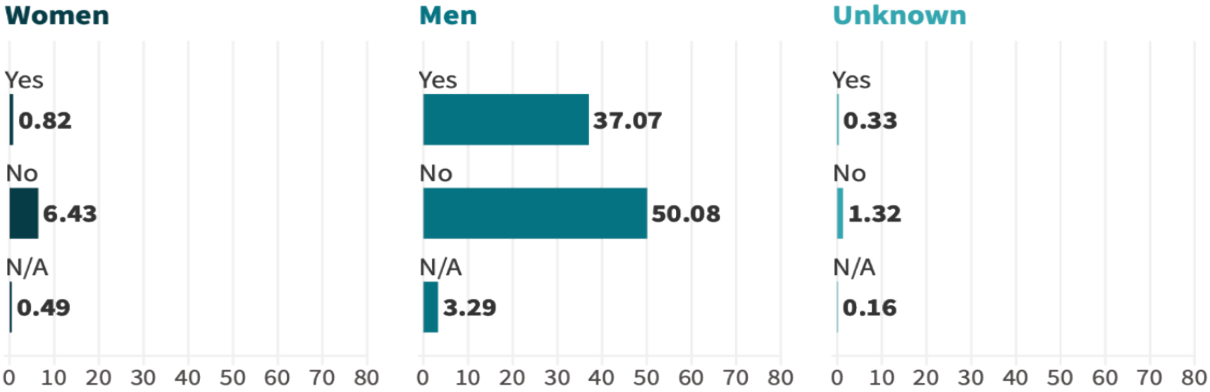
Table 16. **Reasons for not using PPE among farmers in Manikganj**

REASON	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
NOT AVAILABLE	5	0.82	132	21.75	4	0.66	**141**	**23.23**
TOO EXPENSIVE	-	-	29	4.78	1	0.16	**30**	**4.94**
UNCOMFORTABLE	-	-	6	0.99	-	-	**6**	**0.99**
N/A	42	6.92	401	66.06	7	1.15	**450**	**74.14**

Washing facilities

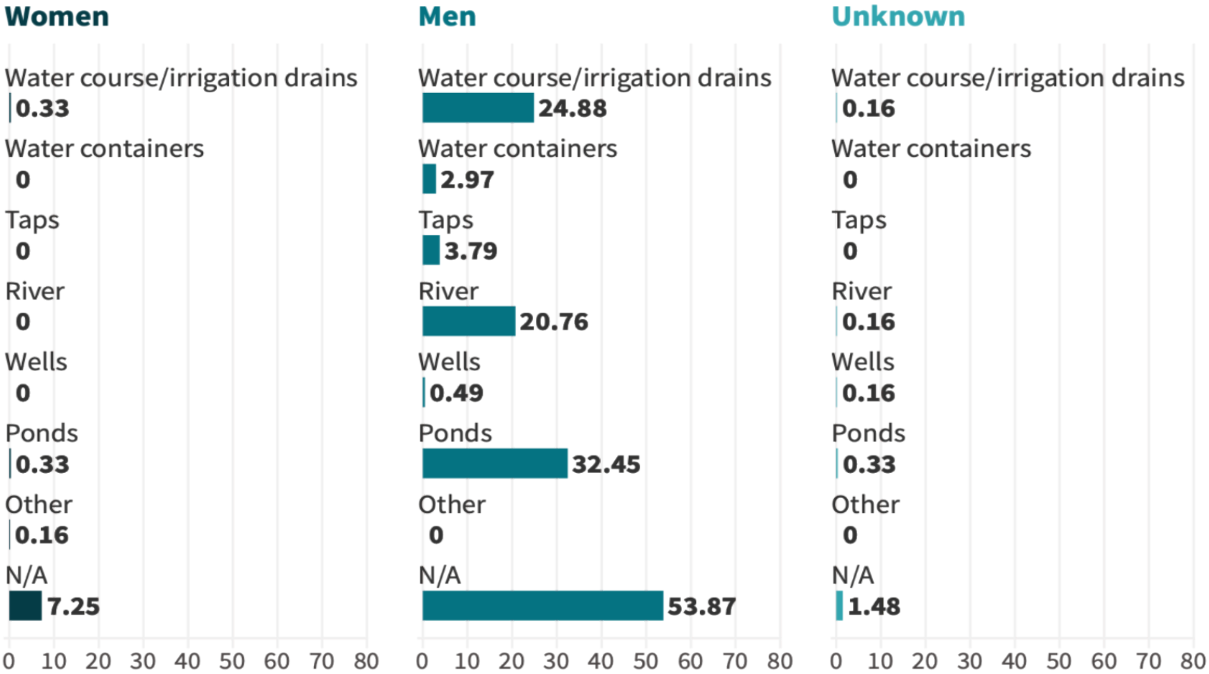
- A total of 351 farmers (57.83%) reported not having access to proper washing facilities after pesticide application (women: 39, 6.43%; men: 304, 50.08%; unknown: 8, 1.32%; Figure 21).

Figure 21. **Availability of washing facilities in Manikganj (%)**



- Among those who did have access, ponds were the most commonly used facility (201, 33.11%; women: 2, 0.33%; men: 197, 32.45%; unknown: 2, 0.33%; Figure 22).

Figure 22. **Types of washing facilities for farmers (%)**

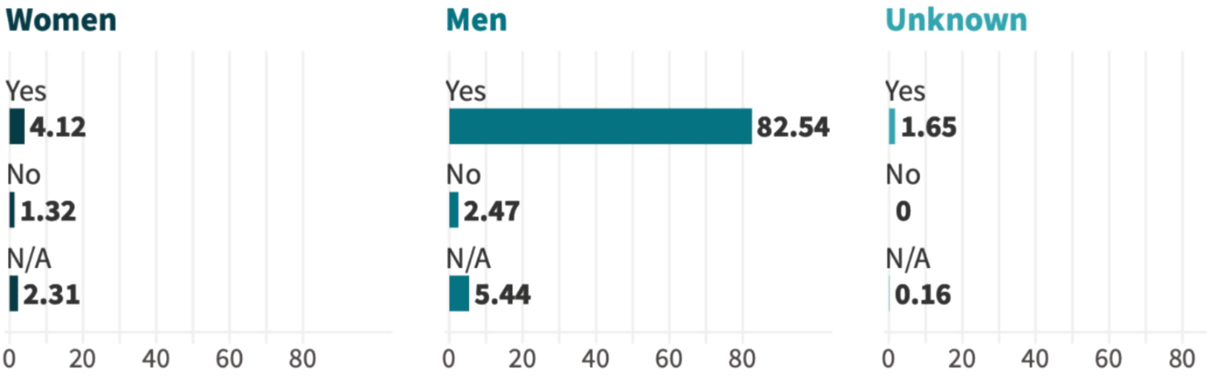


Note: Total is not equal to 100% due to multiple responses

Labels

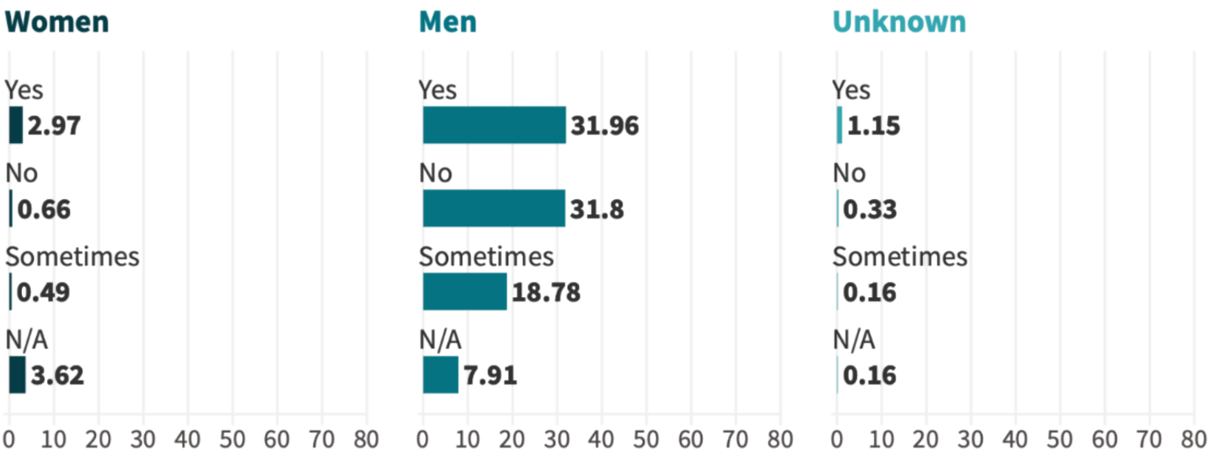
- A total of 536 farmers (88.30%) reported having access to labels on the pesticides they use (women: 25, 4.12%; men: 501, 82.54%; unknown: 10, 1.65%; Figure 23).

Figure 23. **Farmers' access to labels on pesticides they use (%)**



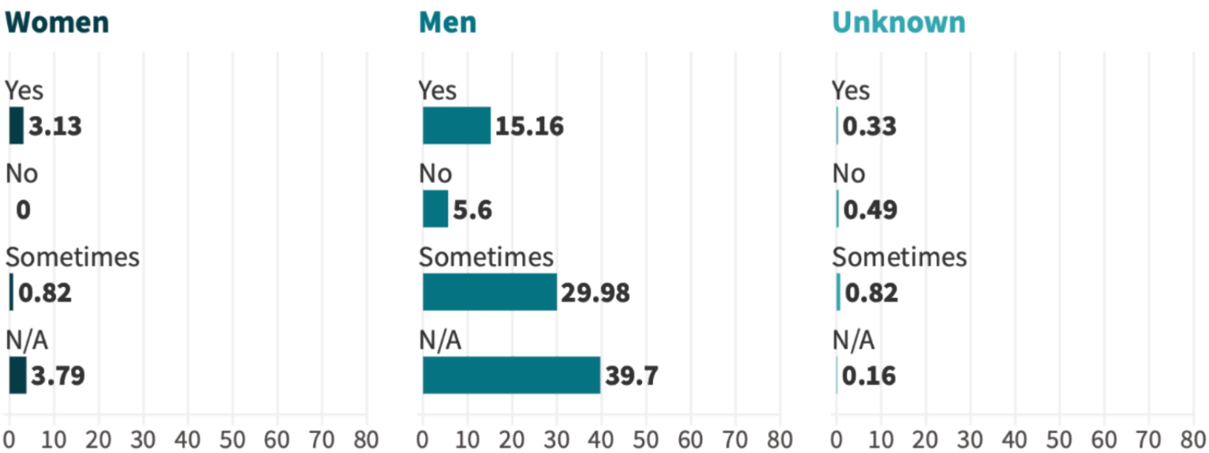
- However, only 219 farmers (36.08%) actually read the labels (women: 18, 2.97%; men: 194, 31.96%; unknown: 7, 1.15%; Figure 24).

Figure 24. **Pesticide label reading practices among farmers (%)**



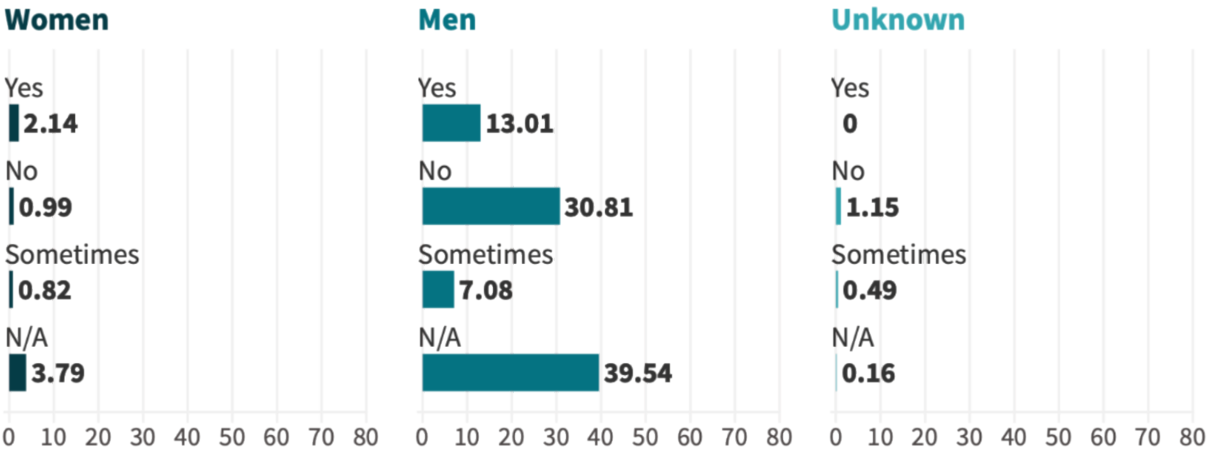
- Many farmers noted that labels are only sometimes written in local languages (192, 31.63%; women: 5, 0.82%; men: 182, 29.98%; unknown: 5, 0.82%; Figure 25).

Figure 25. **Availability of pesticide labels in local language (%)**



- A significant number (200, 32.95%) reported that the information on these labels is not legible (women: 6, 0.99%; men: 187, 30.81%; unknown: 7, 1.15%; Figure 26), limiting their ability to follow safety instructions effectively.

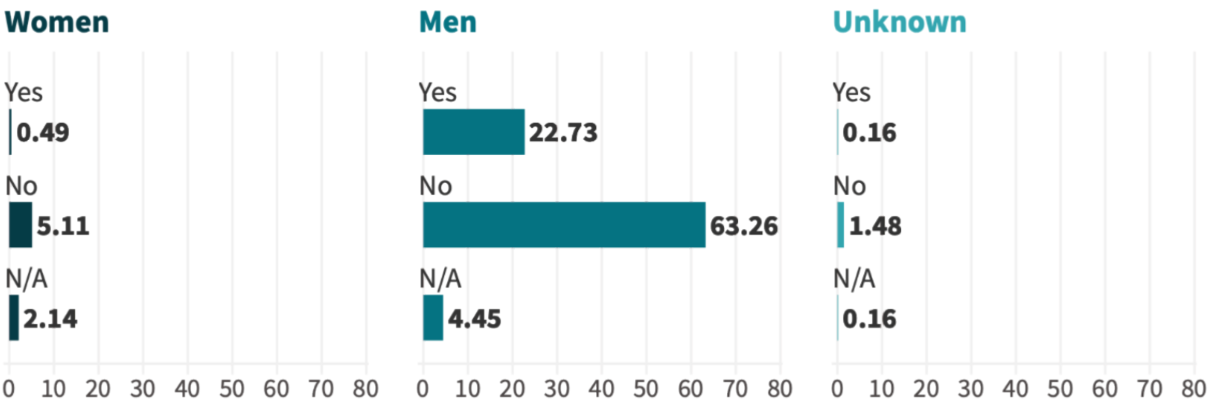
Figure 26. **Legibility of pesticide information labels (%)**



Training on pesticide use, purchase, storage and disposal

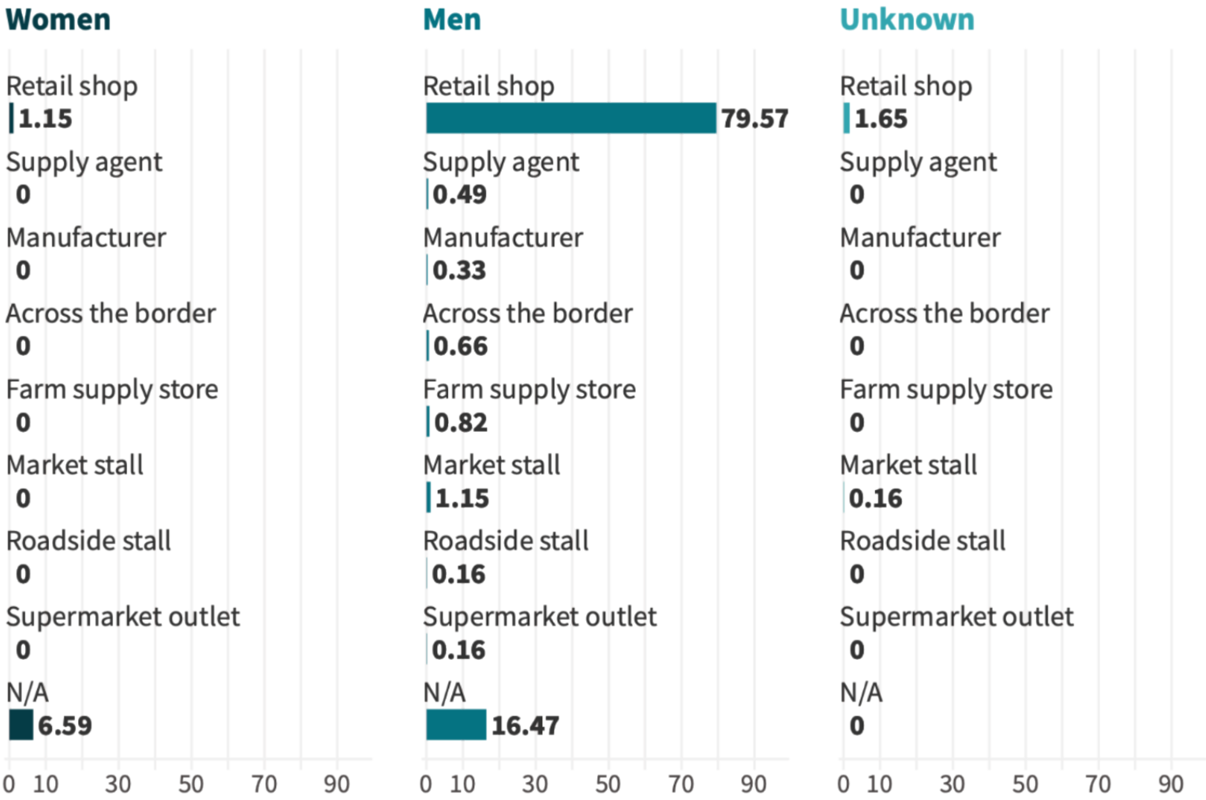
- Most farmers (424, 69.85%) were not trained on the pesticide that they use (women: 31, 5.11%; men: 384, 63.26%; unknown: 9, 1.48%; Figure 27).

Figure 27. **Farmers' training on handling and using pesticides (%)**



- Most farmers (500, 82.37%) purchase their pesticides from retail shops (women: 7, 1.15%; men: 483, 79.57%; unknown: 10, 1.65%; Figure 28).

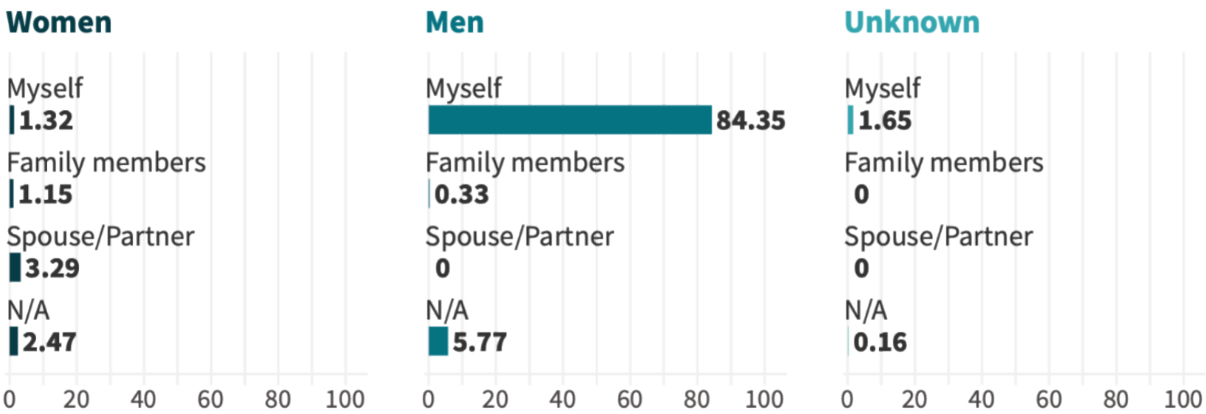
Figure 28. **Farmers' pesticide purchase location (%)**



Note: Total is not equal to 100% due to multiple responses

- The majority (530, 87.31%) make these purchases themselves (women: 8, 1.32%; men: 512, 84.35%; unknown: 10, 1.65%; Figure 29).

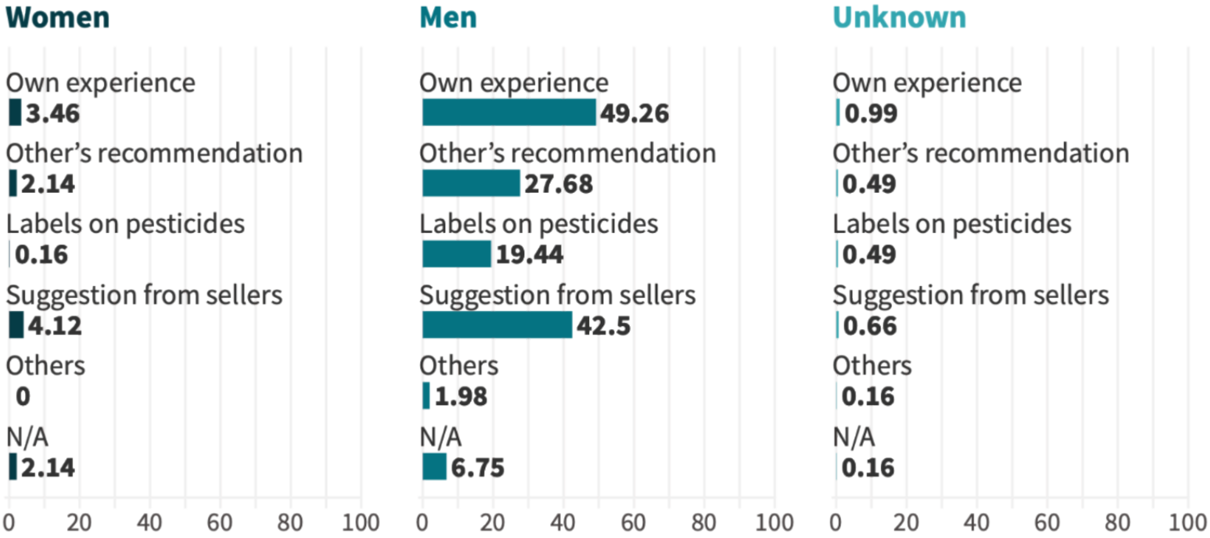
Figure 29. **Person in charge of purchasing pesticides in each household in Manikganj (%)**



Note: Total is not equal to 100% due to multiple responses

- Over half (326, 53.71%) base their pesticide choices on personal experience (women: 21, 3.46%; men: 299, 49.26%; unknown: 6, 0.99%; Figure 30).

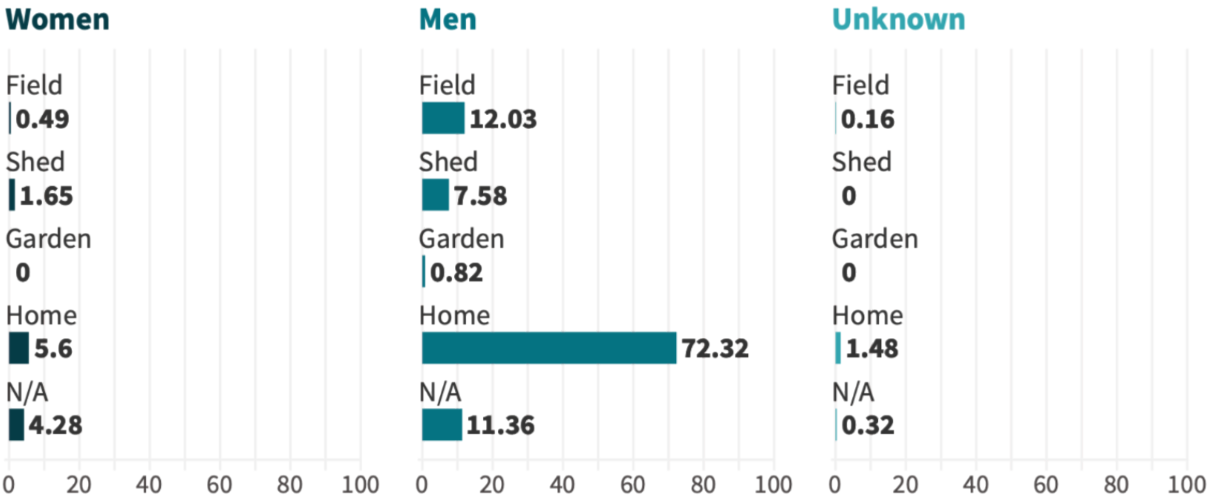
Figure 30. **Factors influencing farmers' pesticide choices in Manikganj (%)**



Note: Total is not equal to 100% due to multiple responses

- A significant number of farmers (482, 79.41%) store pesticides in their homes, increasing the risk of exposure (women: 34, 5.60%; men: 439, 72.62%; unknown: 9, 1.48%; Figure 31).

Figure 31. **Pesticide storage locations used by farmers in Manikganj (%)**



PESTICIDE STORAGE LOCATION BY FARMERS IN MANIKGANJ

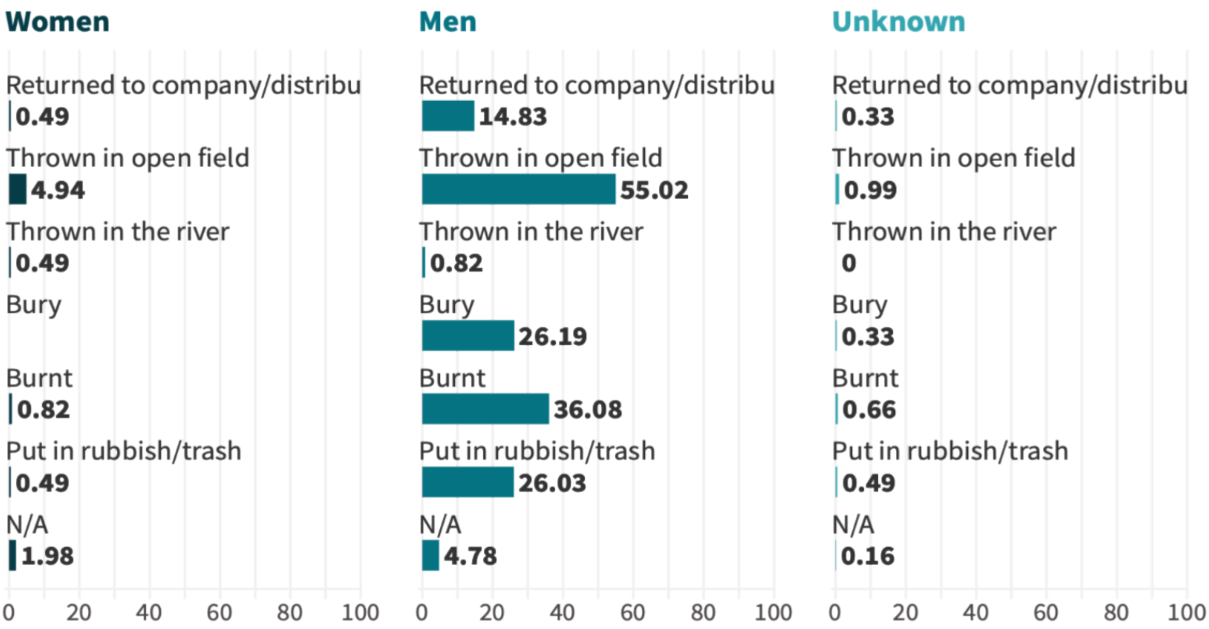
	WOMEN	MEN	UNKNOWN
HOME	5.60%	72.32%	1.48%
FIELD	0.49%	12.03%	0.16%
SHED	1.65%	7.58%	0.00
GARDEN	0.00	0.82%	0.00

- Although most do not reuse pesticide containers, four women and 23 men reported using them for household purposes, including food storage, which can lead to pesticide poisoning.

- Furthermore, most farmers (370, 60.96%) dispose of pesticide containers by discarding them in the fields, further contributing to environmental contamination and exposure risks (women: 30, 4.94%; men: 334, 55.02%; unknown: 6, 0.99%; Figure 32).

- Farmers also disposed of pesticides by burning them (228, 37.65; women: 5, 0.82%, men: 219, 36.08%; unknown: 4, 0.66%). Burning pesticide containers can release toxic compounds, due to both the plastic materials of the containers and the chemical structure of the pesticide residues left inside.

Figure 31. **Pesticide disposal methods used by farmers in Manikganj (%)**



Note: Total is not equal to 100% due to multiple responses

Illness after pesticide exposure

- Farmers most commonly reported experiencing dizziness (115, 18.95%; women: 5, 0.85%; men: 109, 17.96%; unknown: 1, 0.16%; Table 17) as a symptom of pesticide exposure. Notably, dizziness was reported by some women respondents (5, 0.82%) despite none being pregnant, which could possibly be related to pesticide exposure, though other factors cannot be ruled out.

Table 17. **Pesticide exposure symptoms reported by farmers in Manikganj**

ILLNESS/SYMPTOMS	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Blurred vision	-	-	4	0.66	-	-	**4**	**0.66**
Convulsions	-	-	1	0.16	-	-	**1**	**0.16**
Diarrhoea	-	-	26	4.28	-	-	**26**	**4.28**
Difficulty of breathing	-	-	13	2.14	-	-	**13**	**2.14**
Dizziness	5	0.82	109	17.96	1	0.16	**115**	**18.95**
Excessive salivation	-	-	19	3.13	-	-	**19**	**3.13**
Excessive sweating	-	-	12	1.98	-	-	**12**	**1.98**
Hand tremors	1	0.16			-	-	**1**	**0.16**

ILLNESS/SYMPTOMS	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Headaches	1	0.16	45	7.41	-	-	46	7.58
Irregular heartbeat	-	-	1	0.16	1	0.16	2	0.33
Constricted pupils/miosis	-	-	9	1.48	-	-	9	1.48
Nausea	-	-	64	10.54	1	0.16	65	10.71
Skin rashes	-	-	5	0.82	-	-	5	0.82
Sleeplessness/Insomnia	-	-	14	2.31	-	-	14	2.31
Staggering	-	-	19	3.13	-	-	19	3.13
Vomiting	3	0.49	11	1.81	-	-	14	2.31
N/A	41	6.75	304	50.08	8	1.32	353	58.15

Note: Total is not equal to 100% due to multiple responses

- When pesticide poisoning is suspected, most farmers (428, 70.51%) reported contacting local doctors for assistance (women: 33, 5.44%; men: 388, 63.92%; unknown: 7, 1.15%; Table 18).

Table 18. **Farmers' contacts for suspected pesticide poisoning**

CONTACTS	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Local doctor	33	5.44	388	63.92	7	1.15	428	70.51
Company	-	-	6	0.99	-	-	6	0.99
Friend	-	-	7	1.15	-	-	7	1.15
Local remedies	28	4.61	169	27.84	-	-	197	32.45
Family member	9	1.48	293	48.27	5	0.82	307	50.58
Hospital	6	0.99	273	44.98	4	0.66	283	46.62
Poison centre	-	-	11	1.81	-	-	11	1.81
N/A	6	0.99	30	4.94	1	0.16	37	6.10

Note: Total is not equal to 100% due to multiple responses

Highlights of the report from Manikganj

63.58% of pesticides are HHPs according to PAN International list of HHPs.

46.15% of pesticides are highly toxic to bees.

31.96% of farmers do not wear PPE.

57.83% of farmers did not have proper access to washing facilities after pesticides application.

74.63% of farmers live less than 1km from pesticide spraying location.

79.41% of farmers store pesticides in their homes.

Summary

Among 607 farmers surveyed in **Manikganj, Bangladesh**, pesticide use was found to be widespread, with 594 farmers (97.86%) reporting regular application, predominantly men (90.28%). Pesticides are primarily used in maize and paddy cultivation, with thiamethoxam (24.38%) and carbofuran (19.28%) being the most common among 26 identified chemicals. Most farmers (93.57%) apply pesticides on their farms, with nearly half (47.28%) having done so for 10 to 19 years. Alarmingly, pesticide use spans generations, as 52.22% of farmers reported that their families have been using pesticides for 30 to 39 years. Unsafe practices are prevalent: 77.27% of farmers decant pesticides, and 79.41% store them inside their homes, increasing the risk of household exposure. Furthermore, 60.96% dispose of pesticides by discarding them in open fields. 18.95% of farmers reported dizziness. These findings highlight an urgent need for safer pesticide handling practices, greater awareness, and the promotion of alternative approaches including agroecology to mitigate long-term environmental and health risks. In addition, it is important to provide both financial support and practical training to help farmers transition away from pesticide dependence and adopt agroecological practices that are safer, more sustainable, and community-centered.

4.1.2. Cumilla District

Demographic profile

- A total of 224 respondents were surveyed in Cumilla, consisting of 81 women (36.61%) and 143 men (63.84%).

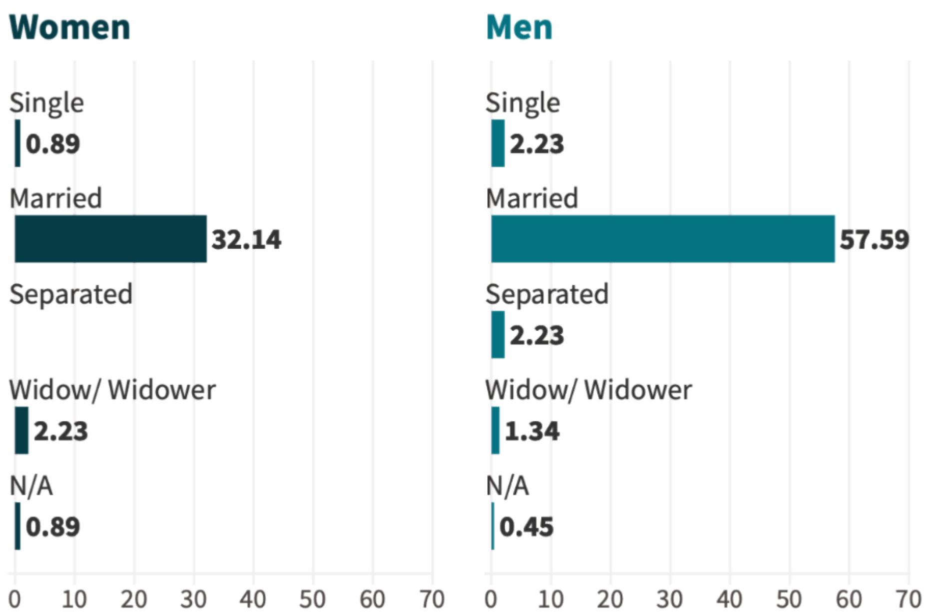
- The majority of farmers (66, 29.46%) were between the ages of 30 and 39 years (women: 39, 17.41%; men: 27, 12.05%; Table 19).

Table 19. **Age range of farmers in Cumilla**

AGE	WOMEN	%	MEN	%	TOTAL	%
18 - 19	1	0.45	-	-	1	0.45
20 – 29	17	7.59	14	6.25	31	13.84
30 – 39	39	17.41	27	12.05	66	29.46
40 – 49	16	7.14	31	13.84	47	20.98
50 – 59	4	1.79	31	13.84	35	15.63
60 – 69	1	0.45	30	13.39	31	13.84
70 – 79	2	0.89	8	3.57	10	4.46
80 – 89	-	-	2	0.89	2	0.89
N/A	1	0.45	-	-	1	0.45
TOTAL	81	36.16	143	63.84	224	100.00

- Most farmers (201, 89.73%) reported being married (women: 72, 32.14%; men: 129, 57.59%; Figure 33).

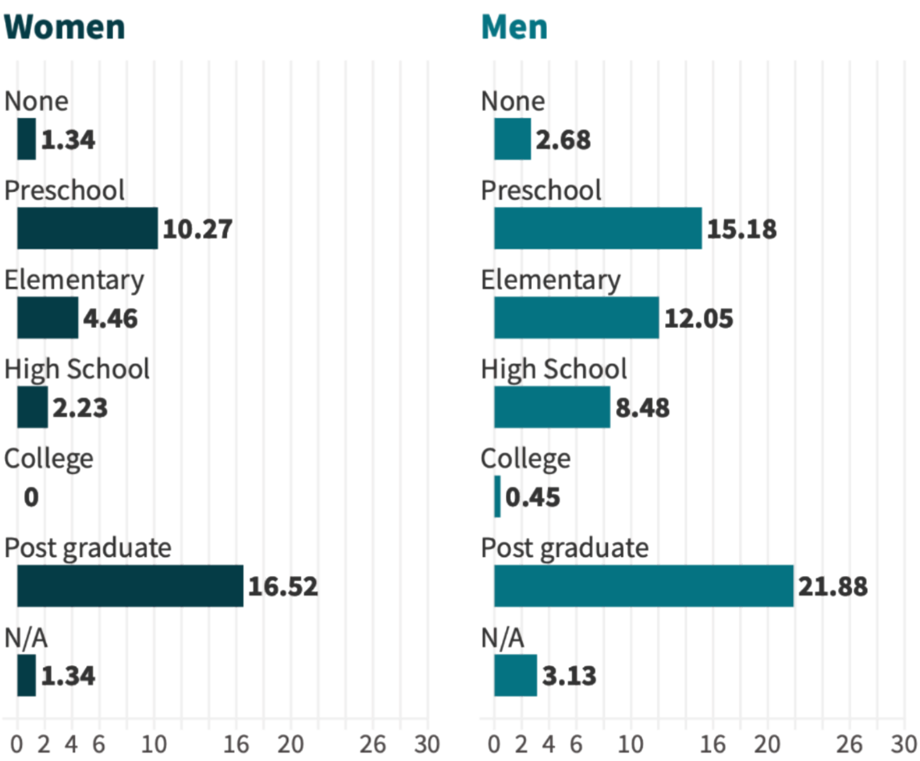
Figure 33. **Marital status of farmers in Cumilla (%)**



- None of the women surveyed were pregnant at the time, although three (3.70%) reported breastfeeding.

- Regarding education, 86 farmers (38.39%) had not received any formal education (women: 37, 16.52%; men: 49, 21.88%; Figure 34).

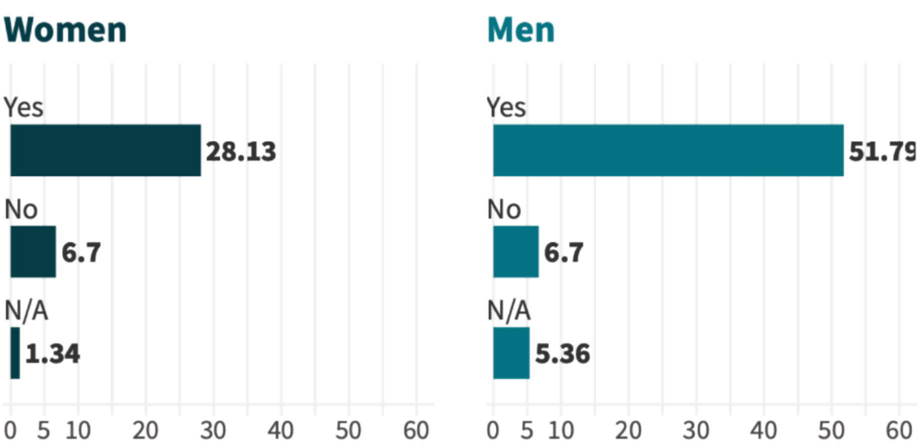
Figure 34. **Education levels of farmers in Cumilla (%)**



- A total of 211 farmers (94.20%) in Cumilla reported being self-employed (women: 75, 33.48%; men: 136, 60.71%). Nine farmers (4.02%) were employed (women: 5, 2.23%; men: 4, 1.79%), while four farmers (1.79%) did not provide their employment status (women: 1, 0.45%; men: 3, 1.34%).

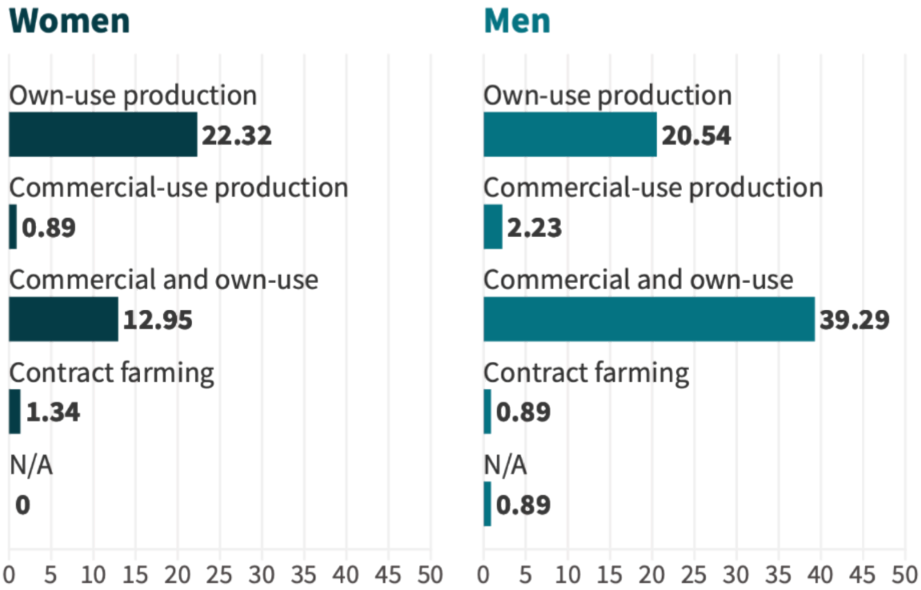
- The majority of farmers (179, 79.91%) owned the land they cultivated (women: 63, 28.13%; men: 116, 51.79%; Figure 35).

Figure 35. **Land ownership of farmers in Cumilla (%)**



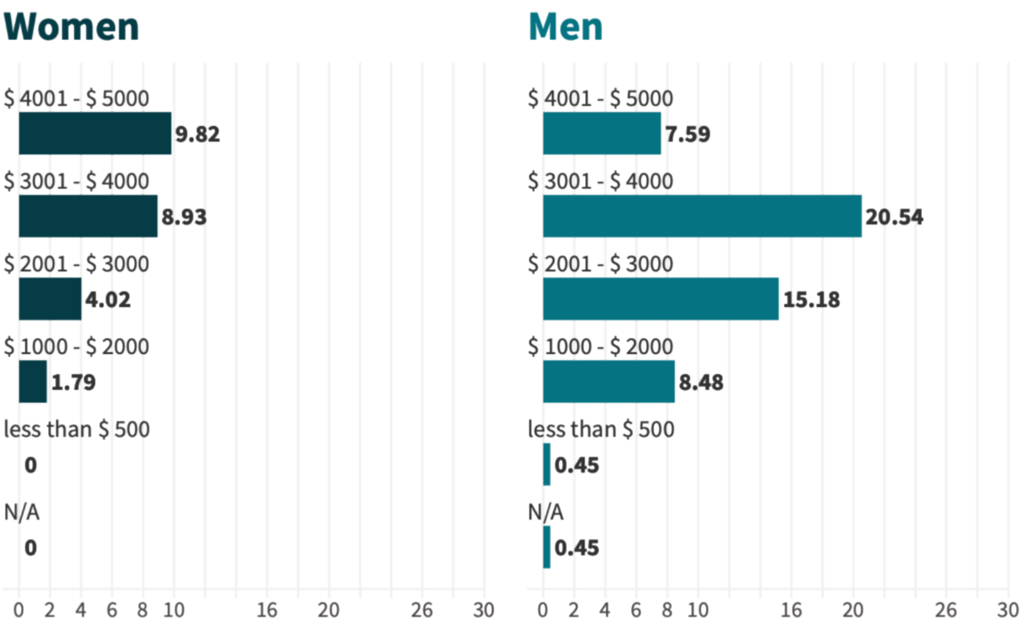
- Most (117, 52.23%) worked on their farms for both personal and commercial purposes (women: 29, 12.95%; men: 88, 39.29%; Figure 36).

Figure 36. **Farming activities on land in Cumilla (%)**



- Among respondents who disclosed their income, the majority in Cumilla (66, 29.46%) reported an average annual household income between USD 1000 and USD 2000 (women: 20, 8.93%; men: 46, 20.54%; Figure 37).

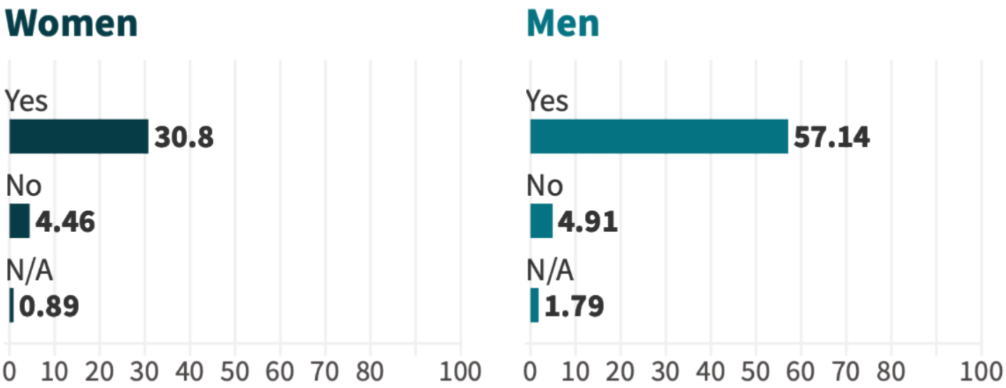
Figure 37. **Annual household income of farmers in Cumilla (%)**



Pesticide use

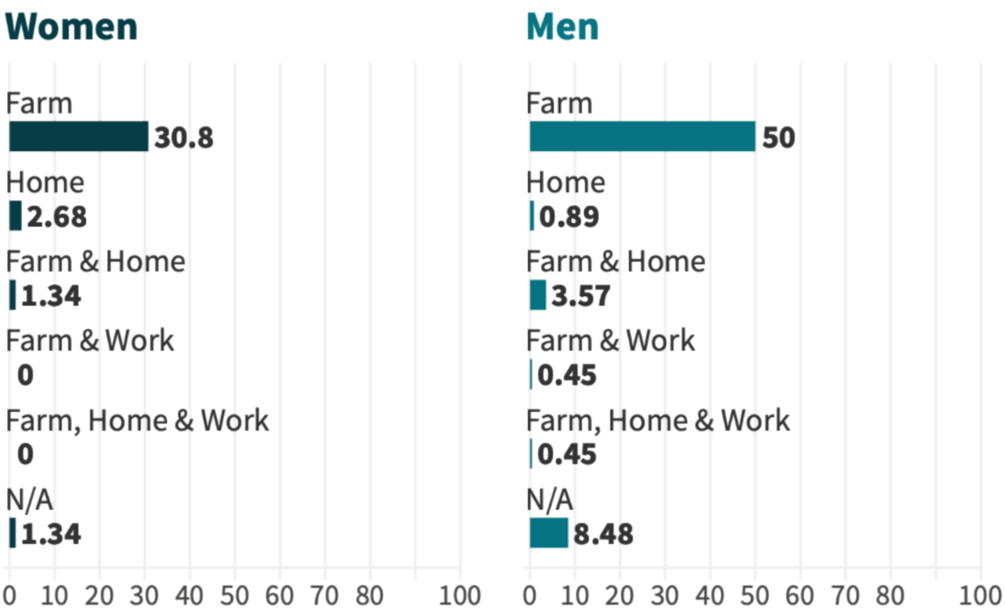
- A total of 197 farmers (87.95%) in Cumilla reported using pesticides (women: 69, 30.80%; men: 128, 57.14%; Figure 38).

Figure 38. **Farmers' use of pesticides in Cumilla (%)**



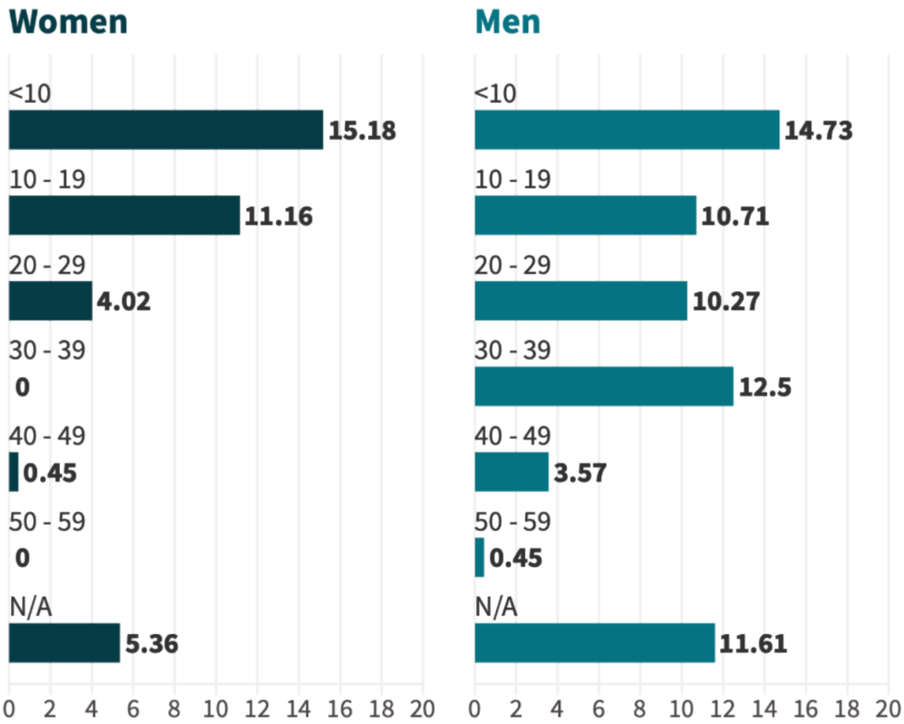
- Most of these farmers (181, 80.80%) apply pesticides on their own farms (women: 69, 30.80%; men: 112, 50.00%; Figure 39).

Figure 39. **Locations of pesticide use in Cumilla (%)**



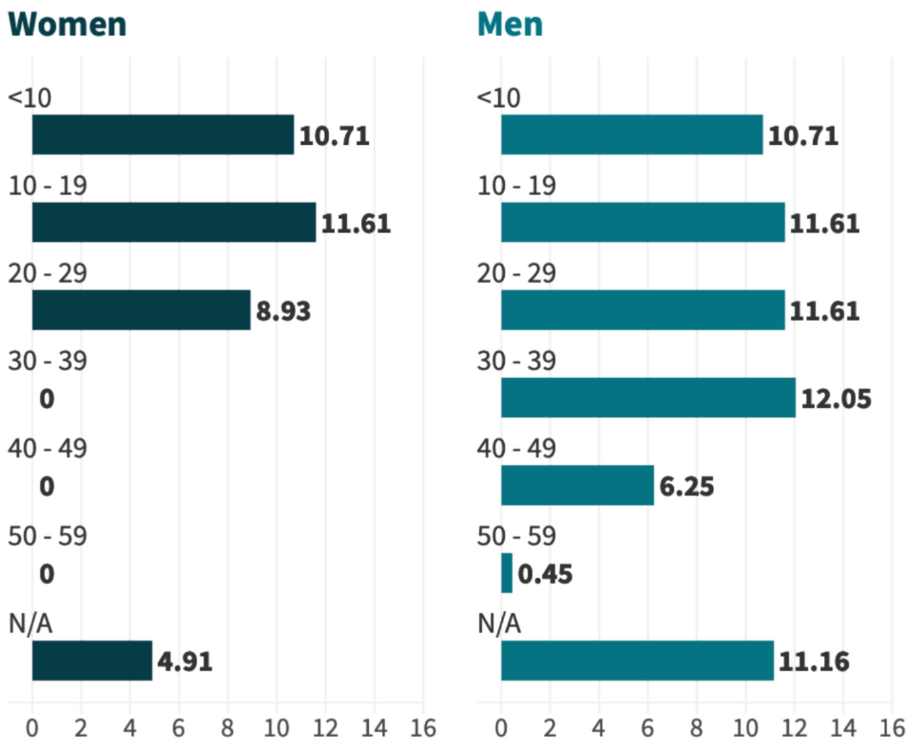
- The majority of farmers (67, 29.91%) have been using pesticides for less than 10 years (women: 34, 15.18%; men: 33, 14.73%; Figure 40).

Figure 40. **Years of pesticide use in Cumilla (%)**



- Their family members have mostly been using pesticides for 10 to 19 years (52, 23.21%; women: 26, 11.61%; men: 26, 11.61%; Figure 41).

Figure 41. **Years of family's pesticide use in Cumilla (%)**



- A key pesticide-related activity among Cumilla farmers is applying or spraying pesticides in the field (190, 84.82%; women: 72, 32.14%; men: 118, 52.68%; Table 20), followed by mixing, loading, or decanting pesticides (142, 63.39%; women: 51, 22.77%; men: 91, 40.63%).

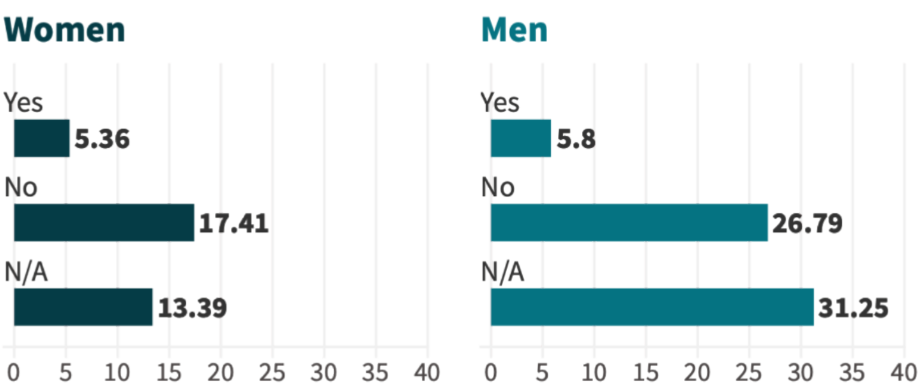
Table 20. **Farmers' pesticide-related activities in Cumilla**

ACTIVITY	WOMEN	%	MEN	%	TOTAL	%
Apply/spray pesticides in the field	72	32.14	118	52.68	**190**	**84.82**
Apply pesticides in the household	1	0.45	2	0.89	**3**	**1.34**
Human therapeutic purposes	-	-	1	0.45	**1**	**0.45**
Mix, load, or decant pesticides	51	22.77	91	40.63	**142**	**63.39**
Purchase or transport pesticides	22	9.82	74	33.04	**96**	**42.86**
Vector control			4	1.79	**4**	**1.79**
Veterinary therapeutic purposes (e.g. for foot and mouth disease)	3	1.34	4	1.79	**7**	**3.13**
Wash clothes used during pesticide spraying or mixing	5	2.23	40	17.86	**45**	**20.09**
Wash equipment used during pesticide spraying or mixing	8	3.57	51	22.77	**59**	**26.34**
Work in fields where pesticides are being used or have been used	27	12.05	24	10.71	**51**	**22.77**
Not applicable (N/A)	3	1.34	13	5.80	**16**	**7.14**

Note: Total is not equal to 100% due to multiple responses

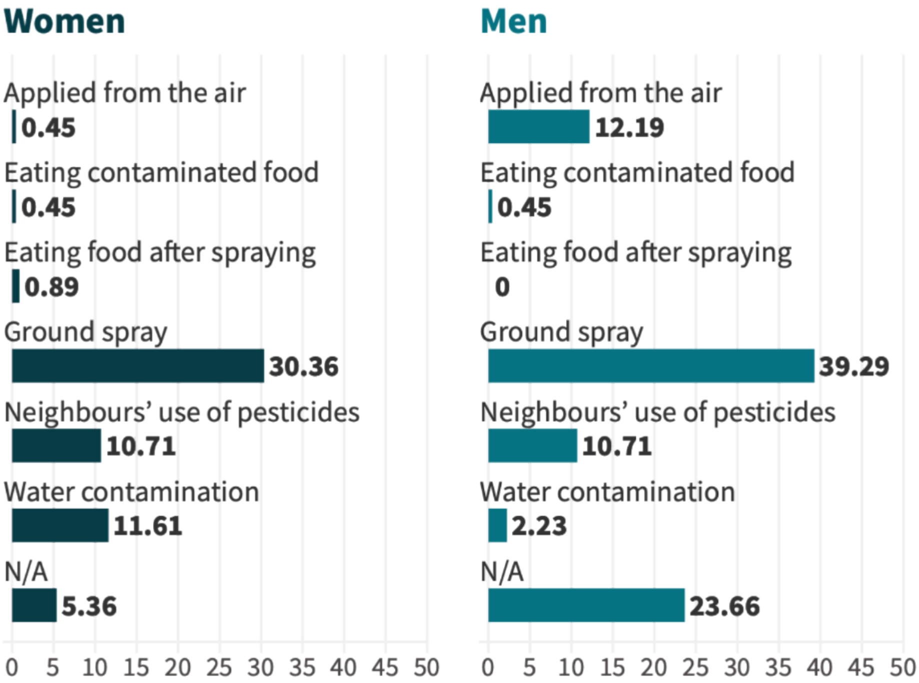
- The majority of farmers (99, 44.20%) decant pesticides (women: 39, 17.41%; men: 60, 26.79%; Figure 42).

Figure 42. **Pesticide decanting by farmers in Cumilla (%)**



- Farmers are constantly exposed to pesticides (156, 69.64%) through ground spraying (women: 68, 30.36%; men: 88, 39.29%: Figure 43).

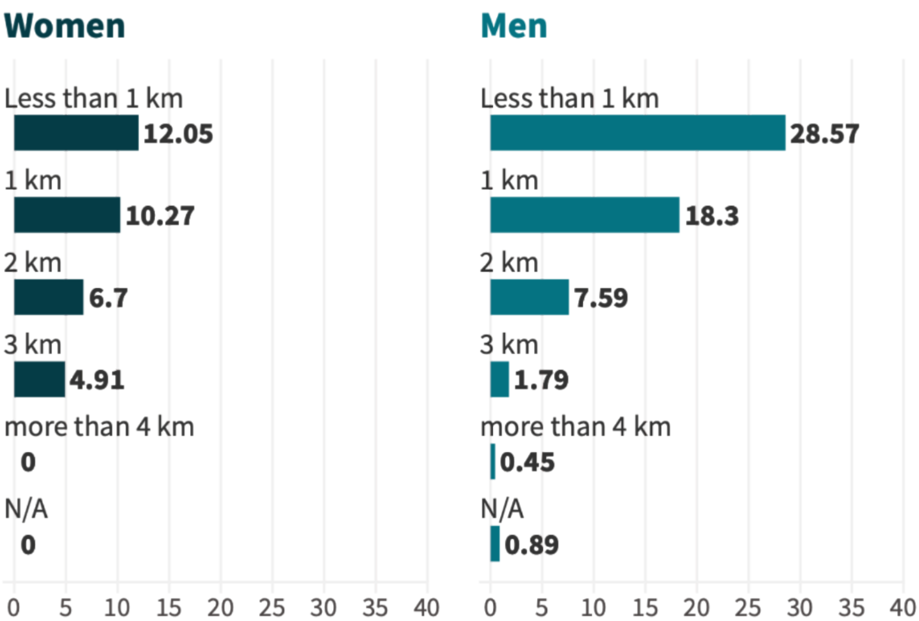
Figure 43. **Farmers' exposure to pesticides in Cumilla (%)**



Note: Total is not equal to 100% due to multiple responses

- Farmers are constantly exposed to pesticides (156, 69.64%) through ground spraying (women: 68, 30.36%; men: 88, 39.29%: Figure 43).

Figure 44. **Distance between farmers' homes and pesticide spraying locations (%)**



- Among those identified, diazinon was the most commonly reported pesticide (20, 8.93%) and is primarily used for paddy cultivation (Table 21).

Table 21.a. **List of pesticides used by farmers in Cumilla**

PESTICIDE	CROPS TREATED	NO. OF FARMERS	%
Acetamiprid	-	1	0.45
Bifenthrin	-	1	0.45
Chlorantraniliprole	PADDY, MAIZE	2	0.89
Chlorpyrifos	PADDY, VEGETABLES	3	1.34
Diazinon	PADDY	20	8.93
Fenitrothion	-	1	0.45
Mancozeb	-	3	1.34
Metalaxyl	-	1	0.45
Tebuconazole	-	1	0.45
Thiamethoxam	-	1	0.45
Trifloxystrobin	-	1	0.45

Note: Total is not equal to 100% due to multiple responses

Table 21.b. **Classification of pesticides used by farmers in Cumilla**

PESTICIDE	WHO CLASS[89]	PAN HHP LIST[90]	NO. OF COUNTRIES BANNED[91]
Acetamiprid	II MODERATELY HAZARDOUS	-	NOT KNOWN TO BE BANNED
Bifenthrin	II MODERATELY HAZARDOUS	X (GHS+ C2 & R2, HIGHLY TOXIC TO BEES)	30
Chlorantraniliprole	U UNLIKELY TO PRESENT ACUTE HAZARD	-	NOT KNOWN TO BE BANNED
Chlorpyrifos	II MODERATELY HAZARDOUS	X (GHS+ REPRO (1A ,1B), HIGHLY TOXIC TO BEES)	44
Diazinon	II MODERATELY HAZARDOUS	X (GHS+ CARC (1A, 1B), GHS+ REPRO (1A ,1B), HIGHLY TOXIC TO BEES)	48
Fenitrothion	II MODERATELY HAZARDOUS	X (GHS+ C2 & R2, HIGHLY TOXIC TO BEES)	34
Mancozeb	U UNLIKELY TO PRESENT ACUTE HAZARD	X (EPA PROB LIKEL CARC, GHS+ REPRO (1A ,1B), EU EDC)	37
Metalaxyl	II MODERATELY HAZARDOUS	-	1
Tebuconazole	II MODERATELY HAZARDOUS	-	NOT KNOWN TO BE BANNED
Thiamethoxam	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	28
Trifloxystrobin	U UNLIKELY TO PRESENT ACUTE HAZARD	-	NOT KNOWN TO BE BANNED

[89] World Health Organization. (2019). The WHO recommended classification of pesticides by hazard and guidelines to classification. https://www.who.int/publications/i/item/9789240005662
[90] Pesticide Action Network International. (2024). PAN International list of highly hazardous pesticides. https://pan-international.org/wp-content/uploads/PAN_HHP_List.pdf
[91] Pesticide Action Network International. (2024). Consolidated list of banned pesticides. https://pan-international.org/pan-international-consolidated-list-of-banned-pesticides/

PESTICIDES USED BY FARMERS IN CUMILLA*

1. DIAZINON 8.93%
2. CHLORPYRIFOS 1.34%
3. MANCOZEB 1.34%
4. CHLORANTRANILIPROLE 0.89%
5. ACETAMIPRID 0.45%
6. BIFENTHRIN 0.45%
7. FENITROTHION 0.45%
8. METALAXYL 0.45%
9. TEBUCONAZOLE 0.45%
10. THIAMETHOXAM 0.45%
11. TRIFLOXYSTROBIN 0.45%

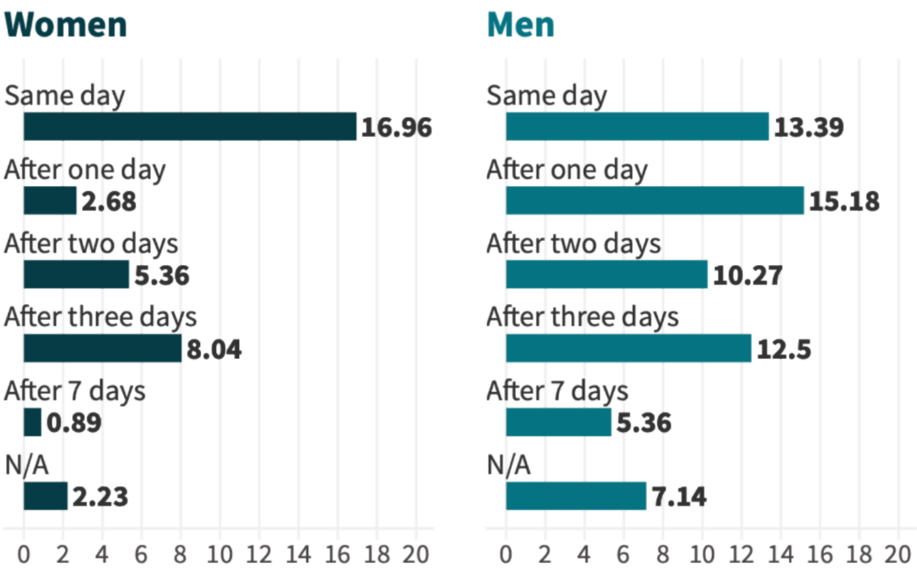
*Due to low literacy levels and reliance on pesticide sellers for advice, farmers often follow others and cannot recall product names. Many simply refer to all chemicals as "bish" (poison). As a result, only a limited number of active ingredients could be identified.

Diazinon is classified as a Class II pesticide (moderately hazardous). Symptoms of acute diazinon poisoning typically appear within minutes to hours after exposure, depending on the route and level of contact. Early signs include nausea, dizziness, excessive salivation, headache, sweating, tearing of the eyes (lacrimation), and runny nose (rhinorrhoea).[92] As exposure progresses, symptoms may worsen to include vomiting, abdominal cramps, diarrhoea, muscle twitching, weakness, tremors, and loss of coordination.[93] More severe effects such as blurred or darkened vision, heightened anxiety, restlessness, and psychiatric manifestations, including depression, memory impairment, and confusion have also been reported in cases of significant exposure[94].

Pesticide exposure and spillage

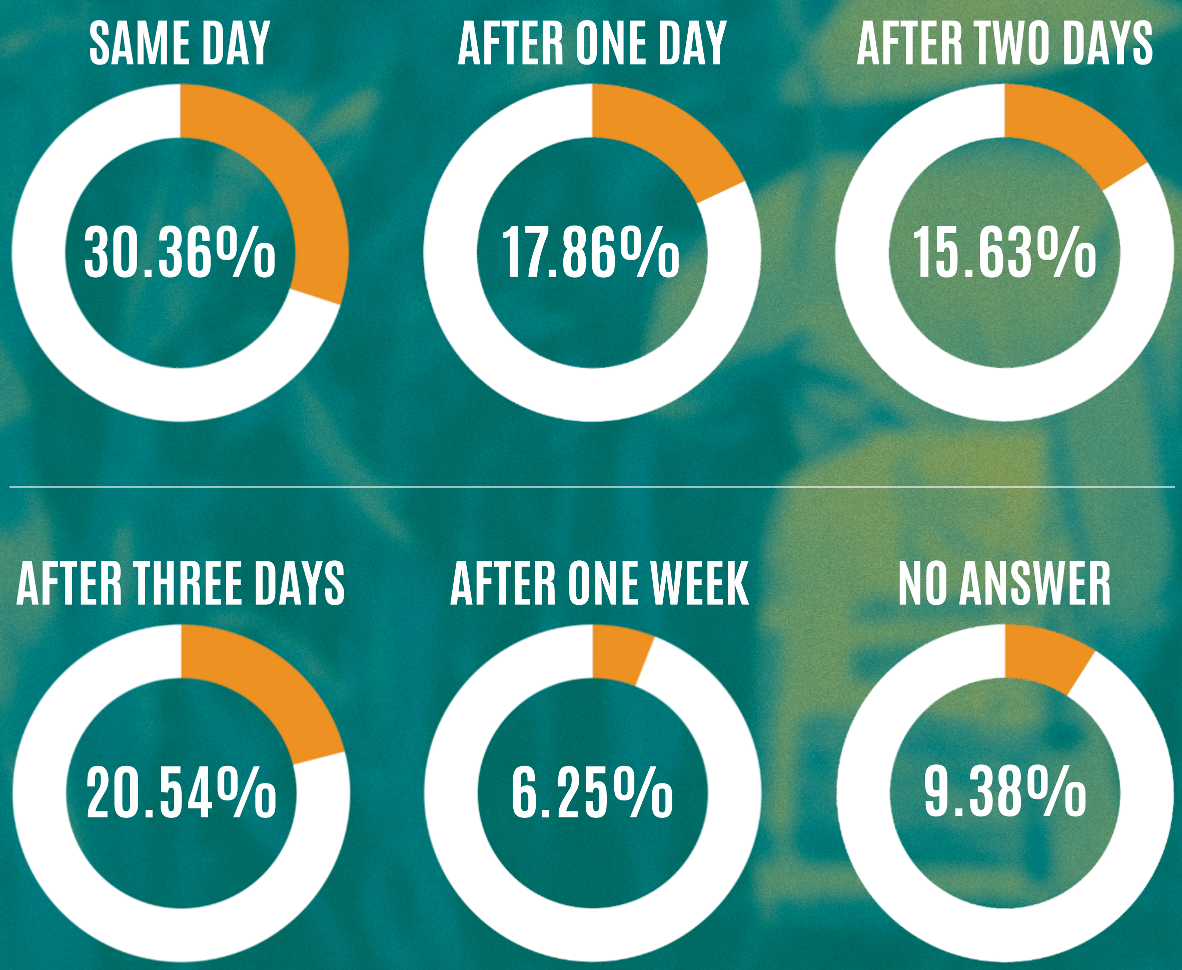
- Most farmers in Cumilla re-enter their fields on the same day that pesticides are sprayed (68, 30.36%; women: 30, 16.96%; men: 30, 13.39%; Figure 45), increasing their risk of pesticide exposure.

Figure 45. **Farmers' re-entry into the field after pesticide spraying in Cumilla (%)**



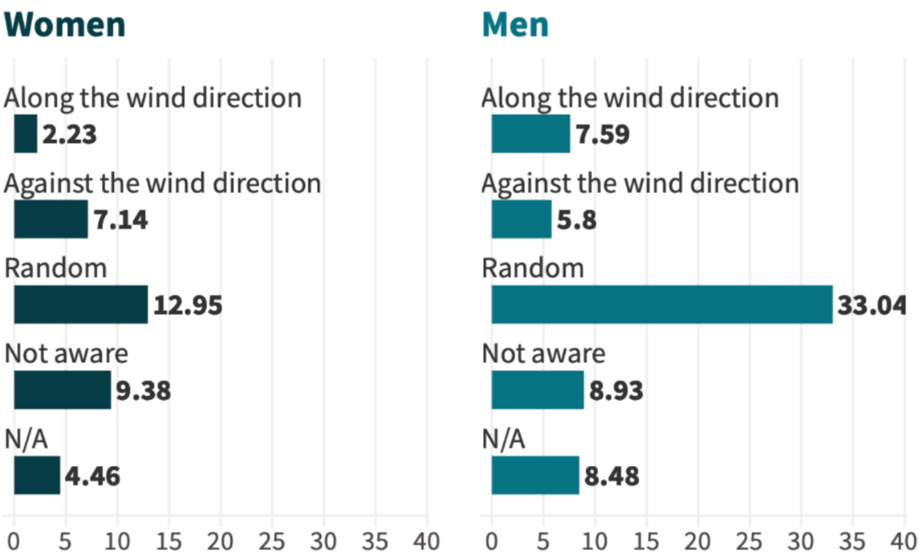
[92] National Pesticide Information Center (2009). Diazinon – Technical Fact Sheet. https://npic.orst.edu/factsheets/archive/diazinontech.html
[93] Ibid
[94] Ibid

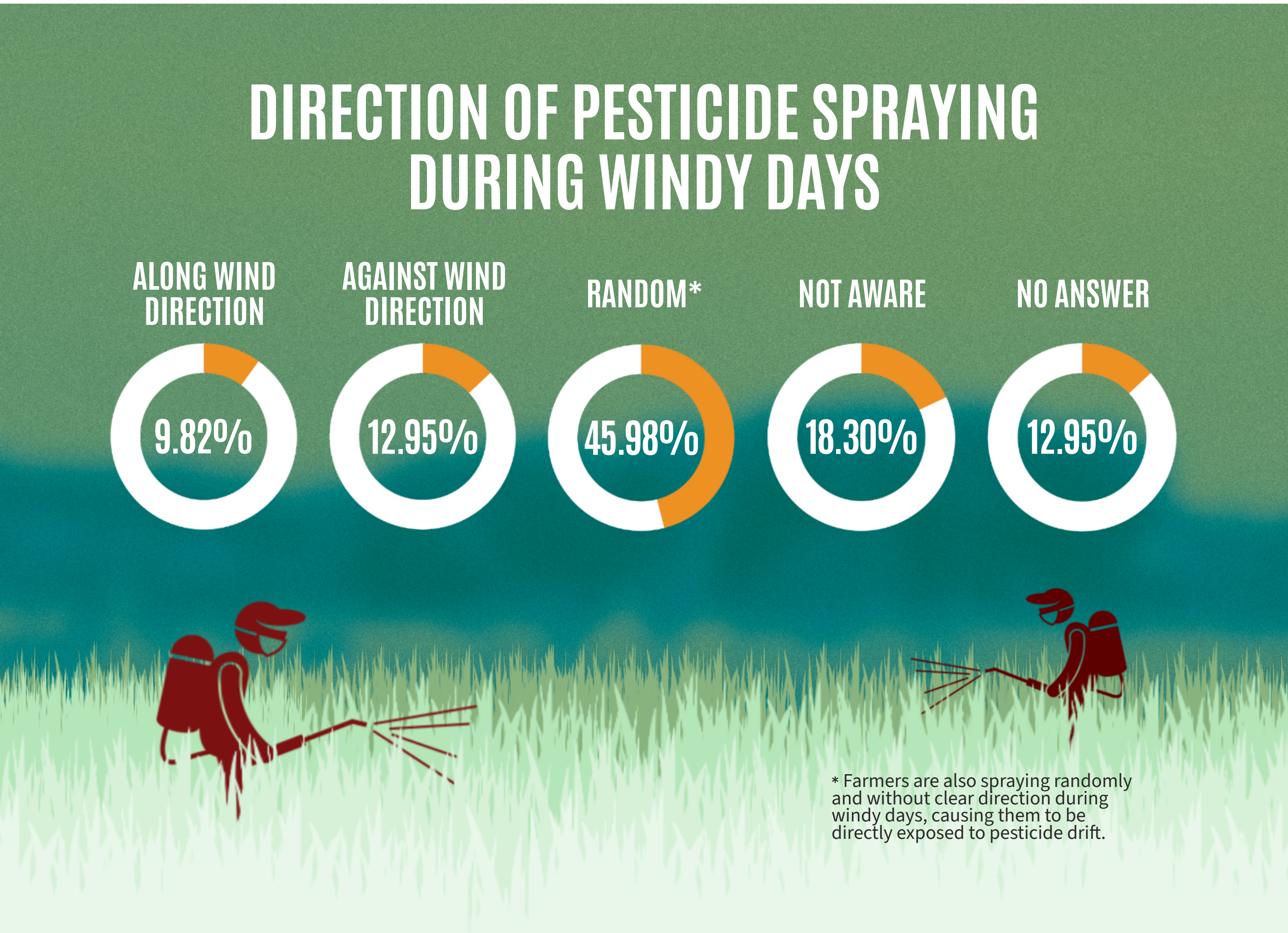
FARMERS' RE-ENTRY INTO THE FIELD AFTER PESTICIDE SPRAYING



- Additionally, the majority of farmers (103, 45.98%) applied pesticides without specific guidelines, without considering factors like wind direction (women: 29, 12.95%; men: 74, 33.04%; Figure 46), further raising concerns about safety and exposure.

Figure 46. **Direction of pesticide spraying during windy days (%)**



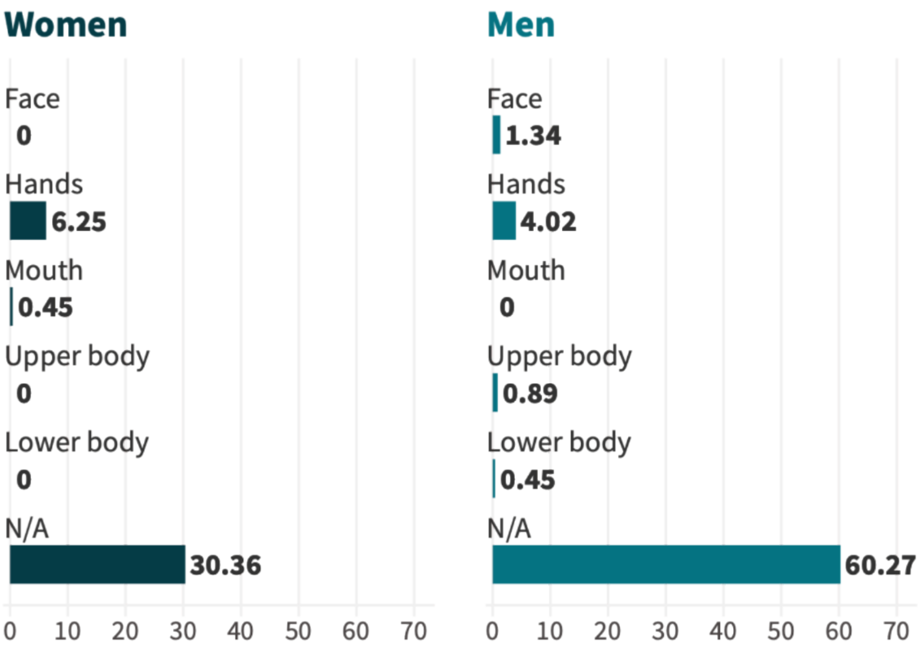


- A total of 171 farmers (76.34%; women: 61, 27.23%; men: 110, 49.11%) reported not experiencing pesticide spillage, while 29 farmers (12.95%; women: 16, 7.14%; men: 13, 5.80%) did experience spillage, and 24 farmers (10.71%; women: 4, 1.79%; men: 20, 8.93%) did not respond to the question.

- Twelve farmers (5.36%) reported experiencing spillage while spraying pesticides (women: 7, 3.13%; men: 5, 2.23%).

- The most commonly affected area during spillage was the hands (23, 10.27%; women: 14, 6.25%; men: 9, 4.02%; Figure 47).

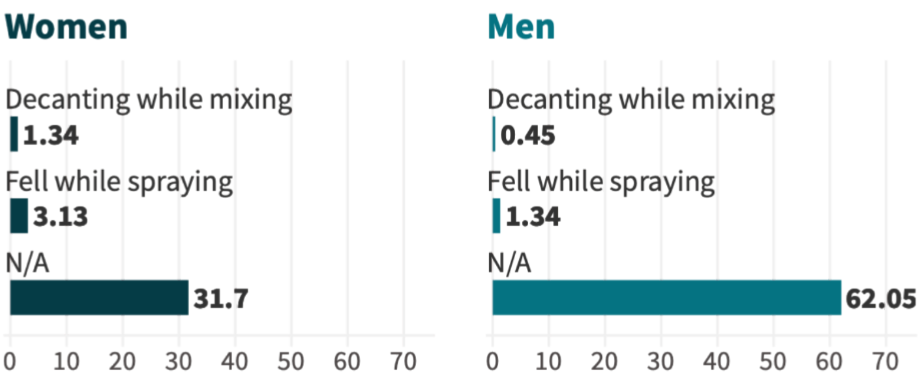
Figure 47. **Body areas exposed to spillage (%)**



Note: Total is not equal to 100% due to multiple responses

- Most farmers (10, 4.46%) experienced pesticide spillage when they fell while spraying (women: 7, 3.13%; men: 3, 1.34%; Figure 48).

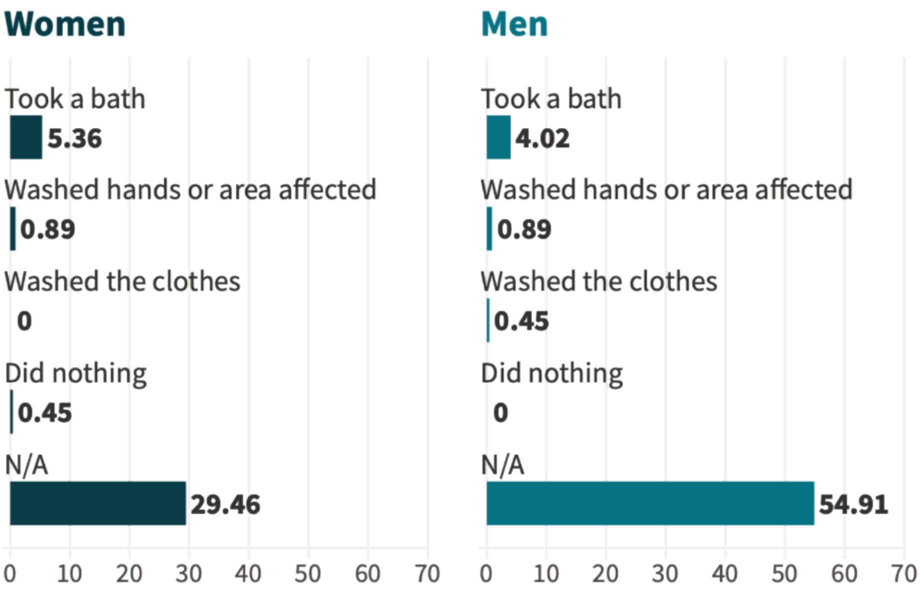
Figure 48. **Causes of pesticide spillage (%)**



Note: Total is not equal to 100% due to multiple responses

- When spillage occurred, a majority of farmers (21, 9.38%) reported bathing as a means of decontamination (women: 12, 5.36%; men: 9, 4.02%; Figure 49).

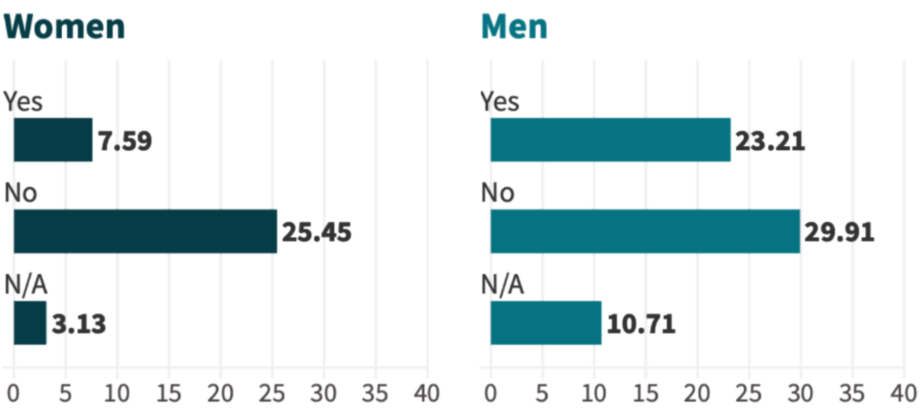
Figure 49. **Actions taken by farmers in response to pesticide spillage (%)**



PPE use

- Alarmingly, most farmers in Cumilla (124, 55.36%) do not use PPE when applying pesticides (women: 57, 25.45%; men: 67, 29.91%; Figure 50).

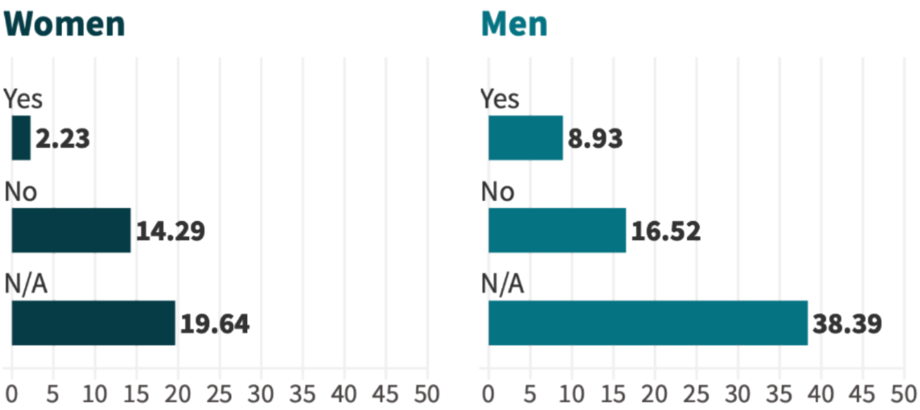
Figure 50. **Use of PPE by farmers in Cumilla (%)**



- Among those who do use PPE, the majority (41, 18.30%) acquired it themselves (women: 8, 3.57%; men: 33, 14.73%).

- Sixty-nine farmers (30.80%) did not receive any instructions on how to properly use PPE (women: 32, 14.29%; men: 37, 16.52%; Figure 51).

Figure 51. **Availability of PPE instructions (%)**



- The most commonly used form of protection was long-sleeved shirts (73, 32.59%; women: 17, 7.59%; men: 56, 25.00%; Table 22).

Table 22. **Types of PPE used by farmers in Cumilla**

PPE	WOMEN	%	MEN	%	TOTAL	%
Boots/shoes	1	0.45	-	-	**1**	**0.45**
Eyeglasses	1	0.45	-	-	**1**	**0.45**
Face mask	10	4.46	51	22.77	**61**	**27.23**
Gloves	3	1.34	3	1.34	**6**	**2.68**
Long pants	12	5.36	53	23.66	**65**	**29.02**
Long-sleeved shirt	17	7.59	56	25.00	**73**	**32.59**
N/A	61	27.23	86	38.39	**147**	**65.63**

- A notable portion of farmers (43, 19.20%) considered PPE unnecessary, which they cited as the main reason for not using it (women: 22, 9.82%; men: 21, 9.38%; Table 23).

Table 23. **Reasons for not using PPE among farmers in Cumilla**

REASON	WOMEN	%	MEN	%	TOTAL	%
Not available	2	0.89	2	0.89	**4**	**1.79**
Unaware	-	-	2	0.89	**2**	**0.89**
Uncomfortable	4	1.79	1	0.45	**5**	**2.23**
Unnecessary	22	9.82	21	9.38	**43**	**19.20**
N/A	54	24.11	117	52.23	**171**	**76.34**

FARMERS’ USE OF PPE IN CUMILLA

USING PPE	NOT USING PPE	NO ANSWER
30.80%	55.36%	13.84%

TYPES OF PPE USED BY FARMERS

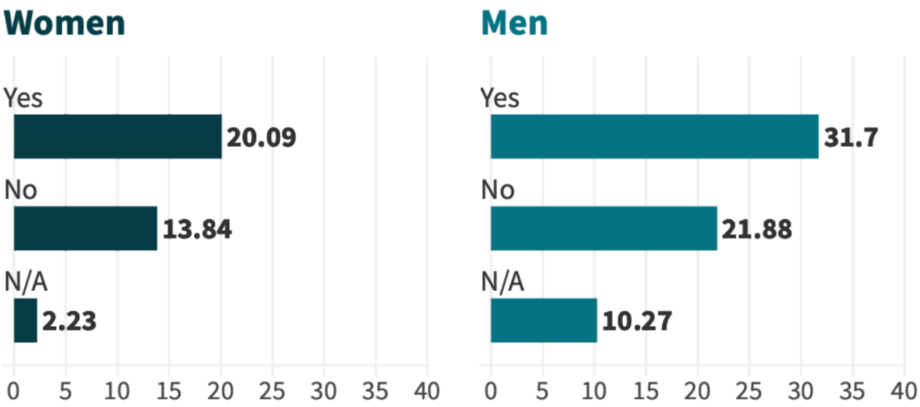
PPE	%
EYEGLASSES	0.45%
FACEMASK	27.23%
RESPIRATORS	0.00
GLOVES	2.68%
LONG-SLEEVED SHIRT	32.59%
LONG PANTS	29.02%
LUNGI (MEN'S SKIRT)	0.00
OVERALLS	0.00
BOOTS/SHOES	0.45%

Note: Total is not equal to 100% due to multiple responses

Washing facilities

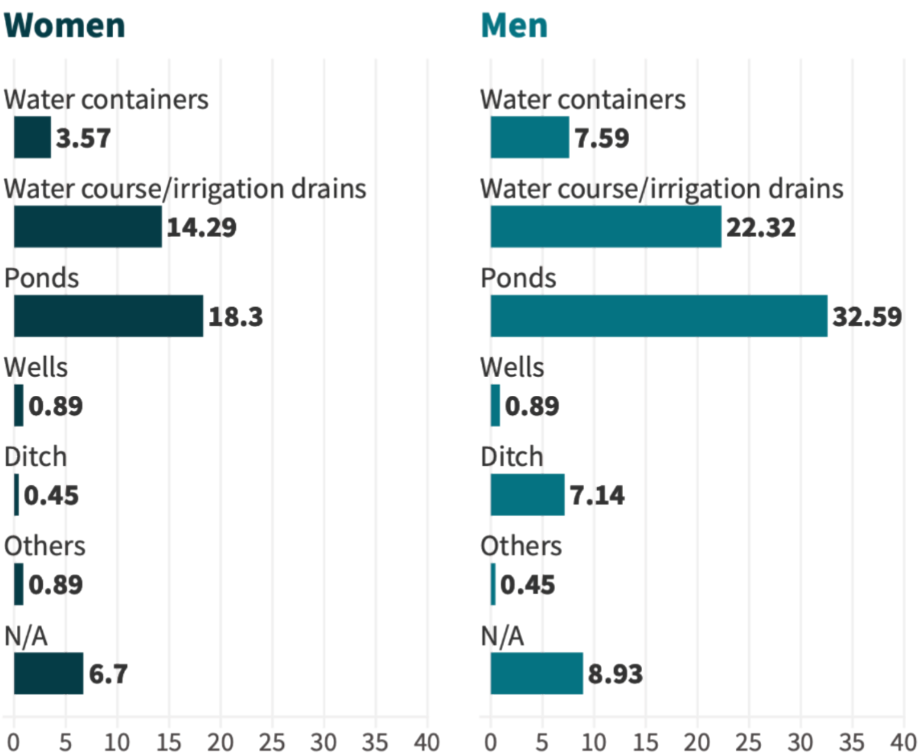
- One hundred and sixteen (51.79%) farmers have washing facilities available after applying pesticides (women: 45, 20.09%; men: 71, 31.70%; Figure 52).

Figure 52. **Availability of washing facilities in in Cumilla (%)**



- Ponds are the most commonly used washing facilities by farmers (114, 50.89%; women: 41, 18.30%; men: 73, 32.59%; Figure 53).

Figure 53. **Types of washing facilities for farmers (%)**

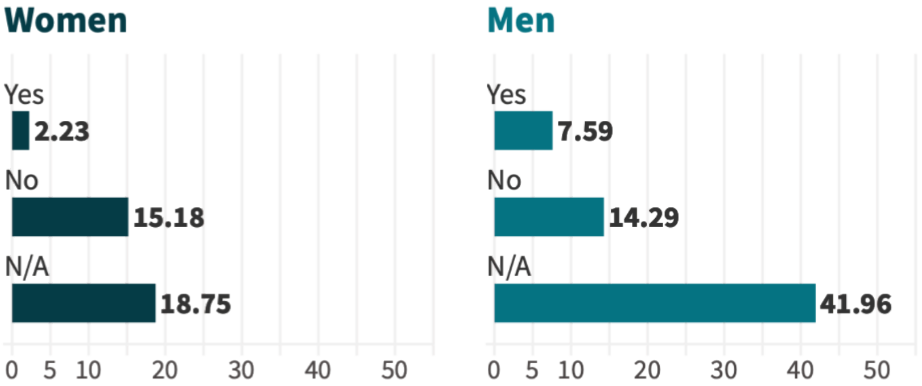


Note: Total is not equal to 100% due to multiple responses

Labels

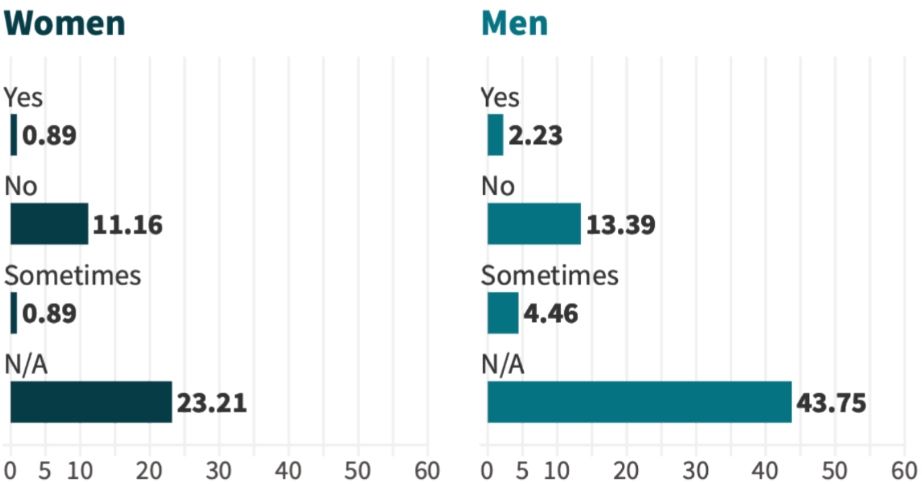
- Sixty-six farmers (29.46%) do not have access to the labels of the pesticides they use (women: 34, 15.18%; men: 32, 14.29%; Figure 54).

Figure 54. **Farmers' access to labels on pesticides they use (%)**



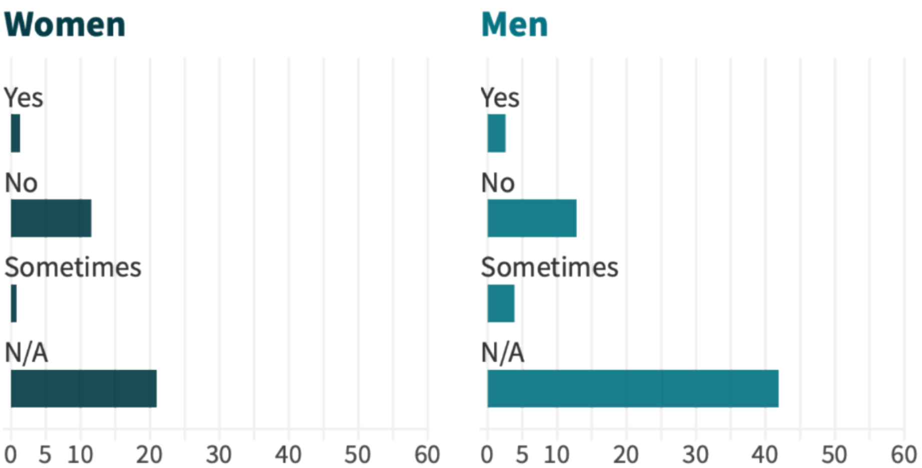
- A majority of farmers (55, 24.55%) do not read the labels (women: 25, 11.16%; men: 30, 13.39%; Figure 55).

Figure 55. **Pesticide label reading practices among farmers (%)**



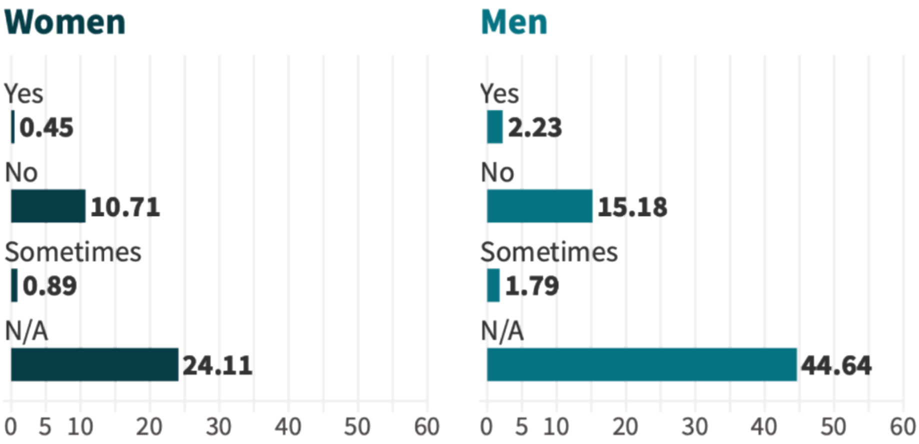
- Many farmers (57, 25.45%) reported that the labels are not always available in local languages (women: 27, 12.05%; men: 30, 13.39%; Figure 56).

Figure 56. **Availability of pesticide labels in in local language (%)**



- Additionally, 58 farmers (25.89%) stated that the information on pesticide labels is not legible (women: 24, 10.71%; men: 34, 15.18%; Figure 57).

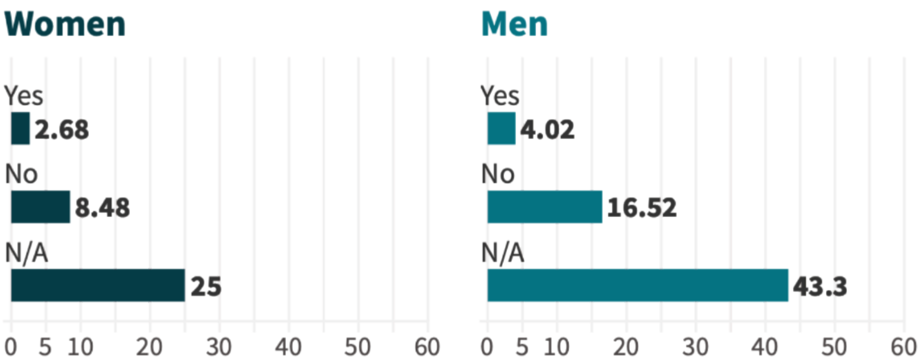
Figure 57. **Legibility of pesticide information labels (%)**



Training on pesticide use, purchase, storage and disposal

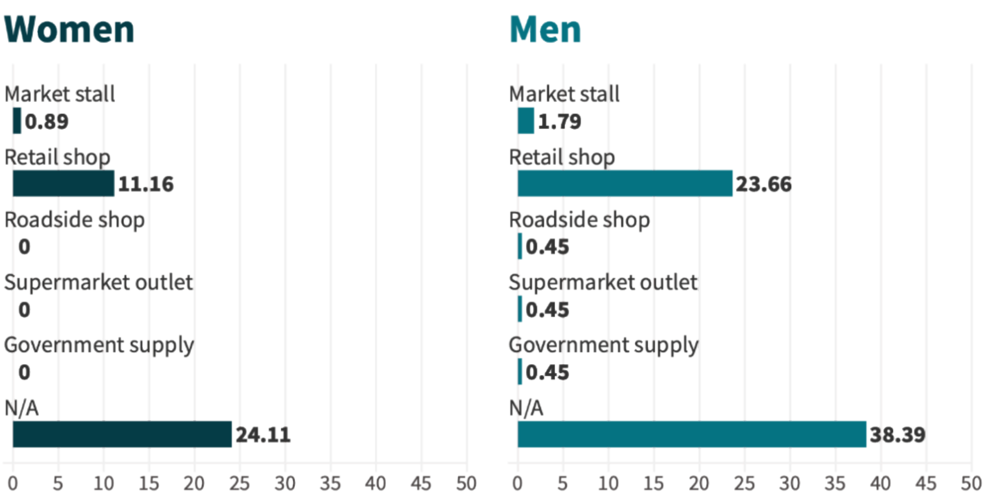
- Most farmers (56, 25.00%) are not trained on the pesticides that they use (women: 19, 8.48%; men: 37, 16.52%; Figure 58).

Figure 58. **Farmers' training on handling and using pesticides (%)**



- Most farmers in Cumilla (78, 34.82%) purchase their pesticides from retail shops (women: 25, 11.16%; men: 53, 23.66%; Figure 59).

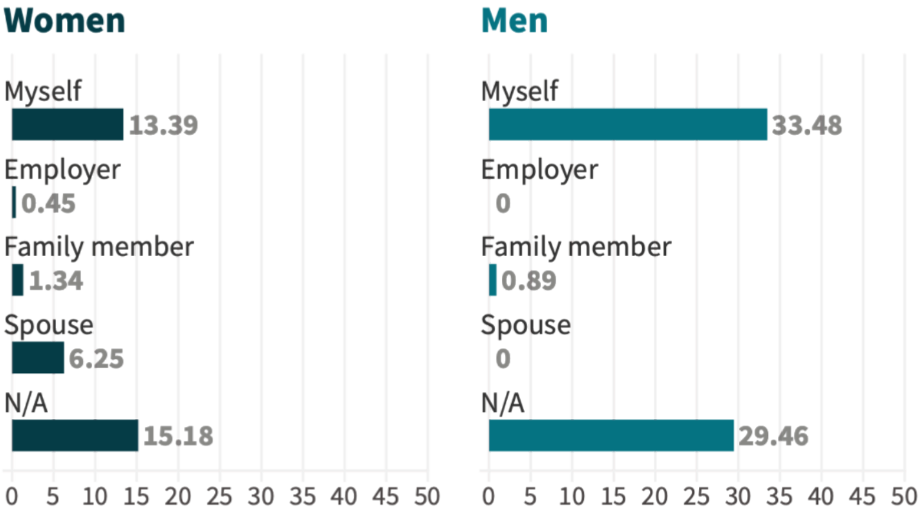
Figure 59. **Farmers' pesticide purchase location (%)**



Note: Total is not equal to 100% due to multiple responses

- Majority (105, 46.88%) purchase the pesticides themselves (women: 30, 13.39%; men: 75, 33.48%; Figure 60).

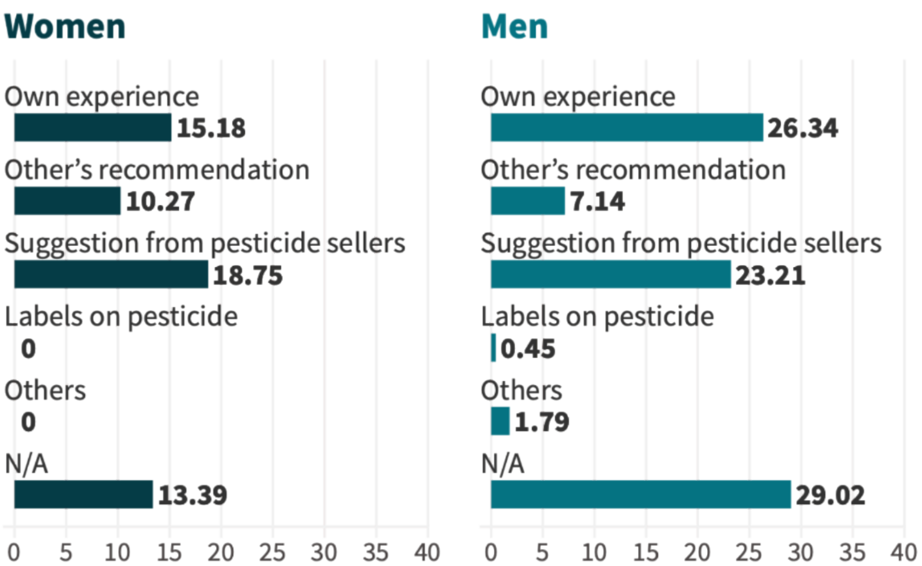
Figure 60. **Person in charge of purchasing pesticides in each household in Cumilla (%)**



Note: Total is not equal to 100% due to multiple responses

- Purchasing decisions are mostly influenced by suggestions from pesticide sellers (94, 41.96%; women: 42, 18.75%; men: 52, 23.21%; Figure 61).

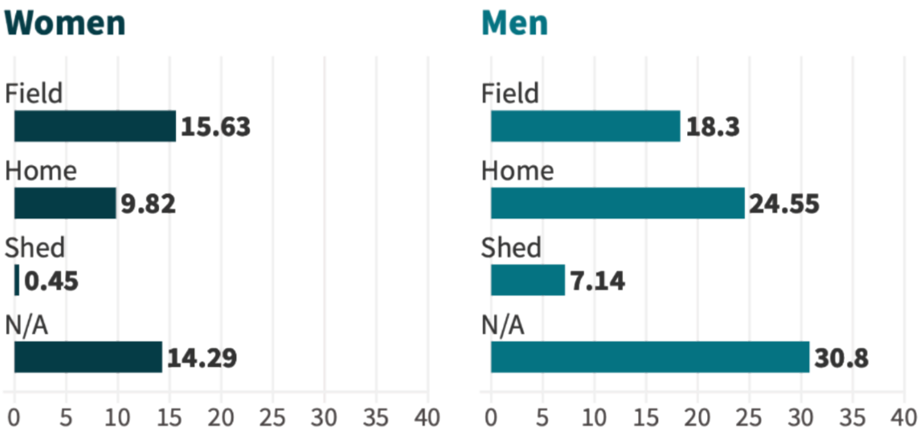
Figure 61. **Factors influencing farmers' pesticide choices in Cumilla (%)**



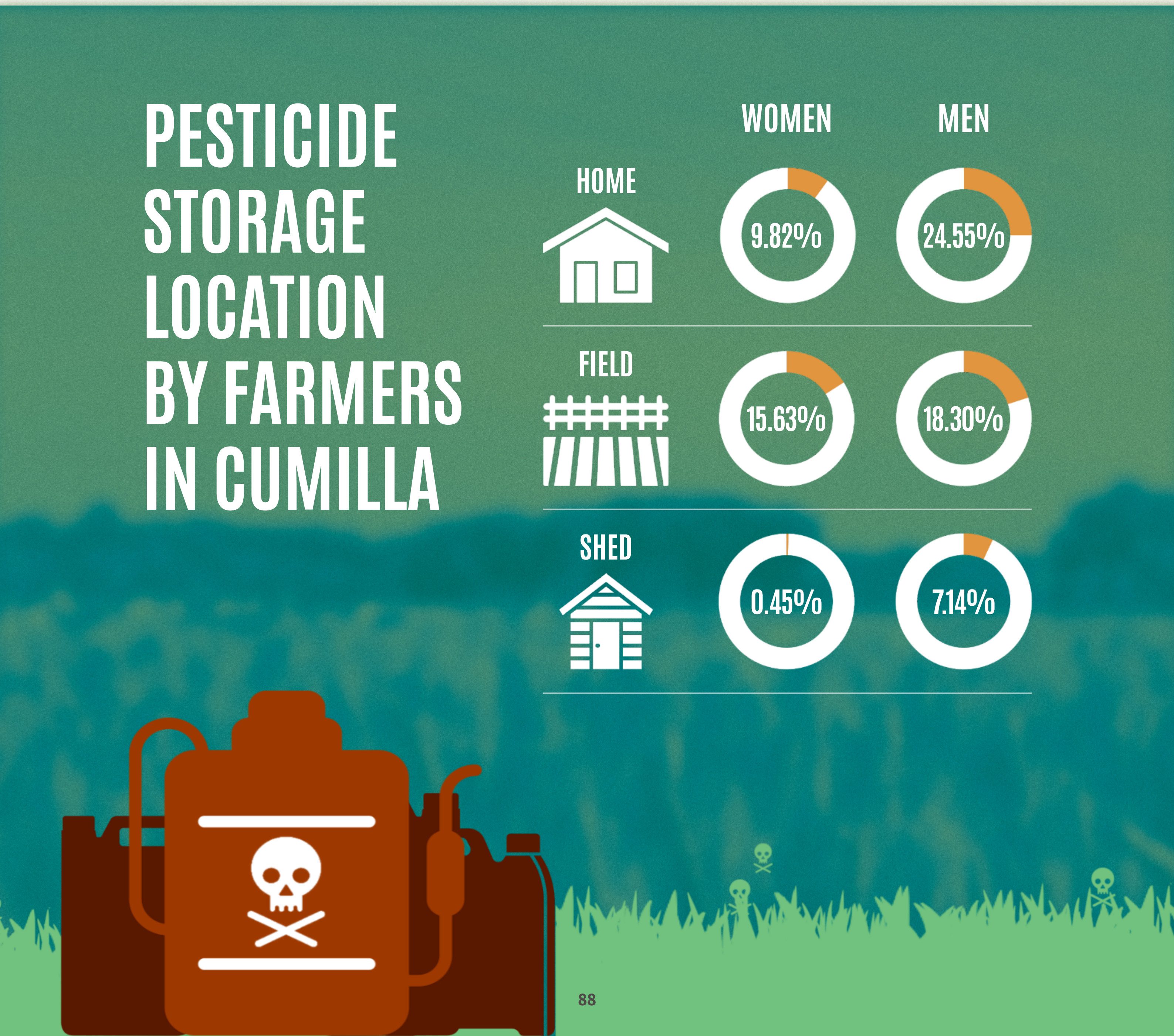
Note: Total is not equal to 100% due to multiple responses

- When it comes to storage, 77 farmers (34.38%) store pesticides in their home (women: 22, 9.82%; men: 55, 24.55%; Figure 62), raising concerns regarding exposure risks.

Figure 62. **Pesticide storage locations used by farmers in Cumilla (%)**

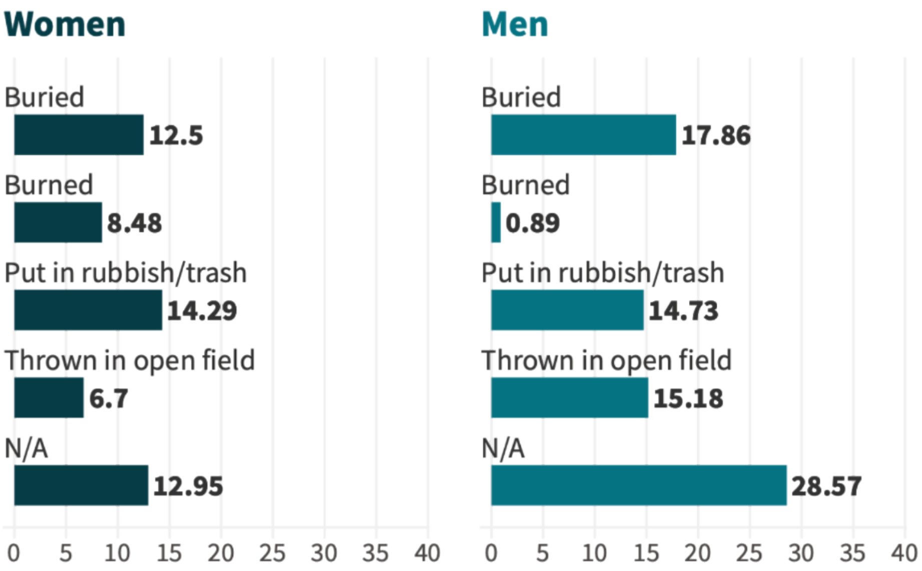


Note: Total is not equal to 100% due to multiple responses



- No farmers reported reusing pesticide containers for other purposes, which is a positive safety behaviour.
- For disposal, most farmers (65, 29.02%) discard pesticide containers in the rubbish (women: 32, 14.29%; men: 33, 14.73%; Figure 63).

Figure 63. **Pesticide disposal methods used by farmers in Cumilla (%)**



Note: Total is not equal to 100% due to multiple responses

Illness after pesticide exposure

- Despite limited responses, most farmers (5, 2.23%) experienced dizziness (women: 2, 0.89%; men: 3, 1.34%; Table 24) and excessive sweating (women: 2, 0.89%; men: 3, 1.34%).

Table 24. **Pesticide exposure symptoms reported by farmers in Cumilla**

SYMPTOMS	WOMEN	%	MEN	%	TOTAL	%
Dizziness	2	0.89	3	1.34	**5**	**2.23**
Excessive sweating	2	0.89	3	1.34	**5**	**2.23**
Hand tremors	-	-	1	0.45	**1**	**0.45**
Headaches	2	0.89	-	-	**2**	**0.89**
Vomiting	-	-	1	0.45	**1**	**0.45**
N/A	76	33.93	137	61.16	**213**	**95.09**

- Most farmers (79, 35.27%) also contact the local doctors when they suspect pesticide poisoning (women: 24, 10.71%; men: 55, 24.55%; Table 25).

Table 25. **Farmers' contacts for suspected pesticide poisoning**

CONTACTS	WOMEN	%	MEN	%	TOTAL	%
Local doctor	24	10.71	55	24.55	**79**	**35.27**
Friend	1	0.45	1	0.45	**2**	**0.89**
Local remedies	1	0.45	3	1.34	**4**	**1.79**
Family member	24	10.71	23	10.27	**47**	**20.98**
Hospital	27	12.05	34	15.18	**61**	**27.23**
N/A	30	13.39	61	27.23	**91**	**40.63**

Highlights of the report from Cumilla

54.55% of pesticides are HHPs according to PAN International list of HHPs.

45.45% of pesticides are highly toxic to bees.

55.36% of farmers do not wear PPE.

35.71% of farmers did not have proper access to washing facilities after pesticides application.

40.63% of farmers live less than 1km from pesticide spraying location.

34.38% of farmers store pesticides in their homes.

Summary

In **Cumilla**, pesticide use among farmers is widespread, with 87.95% of respondents reporting its application, including both women (30.80%) and men (57.14%). Most pesticides are applied directly on farms (80.80%), and a significant portion of users (29.91%) have been using them for less than a decade. However, pesticide exposure spans generations with 23.21% of respondents indicating that family members have been using pesticides for 10 to 19 years. Knowledge about the pesticides used is notably limited, as many farmers are unable to identify the active ingredients in the products they apply. There was limited information available on the active ingredients of the pesticides used, as many farmers were not aware of the names or contents of the products. According to the interviewers, this was most likely because many farmers are illiterate and simply follow what others are doing. They usually ask the pesticide sellers, who then indicate which product to use and in what quantity. As a result, while the farmers regularly use pesticides, they are often unable to identify the generic or brand names. Instead, they commonly refer to all such products as bish (meaning pesticide, weedicide, or poison). This lack of specific knowledge stems from their limited literacy and the fact that they do not prioritise remembering the exact product names. Diazinon, a hazardous pesticide, is the most frequently reported chemical, particularly for paddy cultivation (8.93%). Unsafe practices among farmers are widespread. Over 30 percent (30.36%) re-enter their fields on the same day pesticides are applied, which increases their risk of exposure. Nearly 46 percent (45.98%) apply pesticides without following any clear guidelines. Additionally, more than half (55.36%) of farmers do not use PPE while handling pesticides. Among these, many farmers, especially women (19.20%), consider PPE unnecessary. Proximity to pesticide-treated fields poses an additional risk, with 40.63% of farmers living less than one kilometre away. Although often underreported, health effects such as dizziness and excessive sweating, early signs of pesticide poisoning, have been noted. In addition, it is important to provide both financial support and practical training to help farmers transition away from pesticide dependence and adopt agroecological practices that are safer, more sustainable, and community-centered.

4.2. India

4.2.1. Yavatmal

Demographic profile

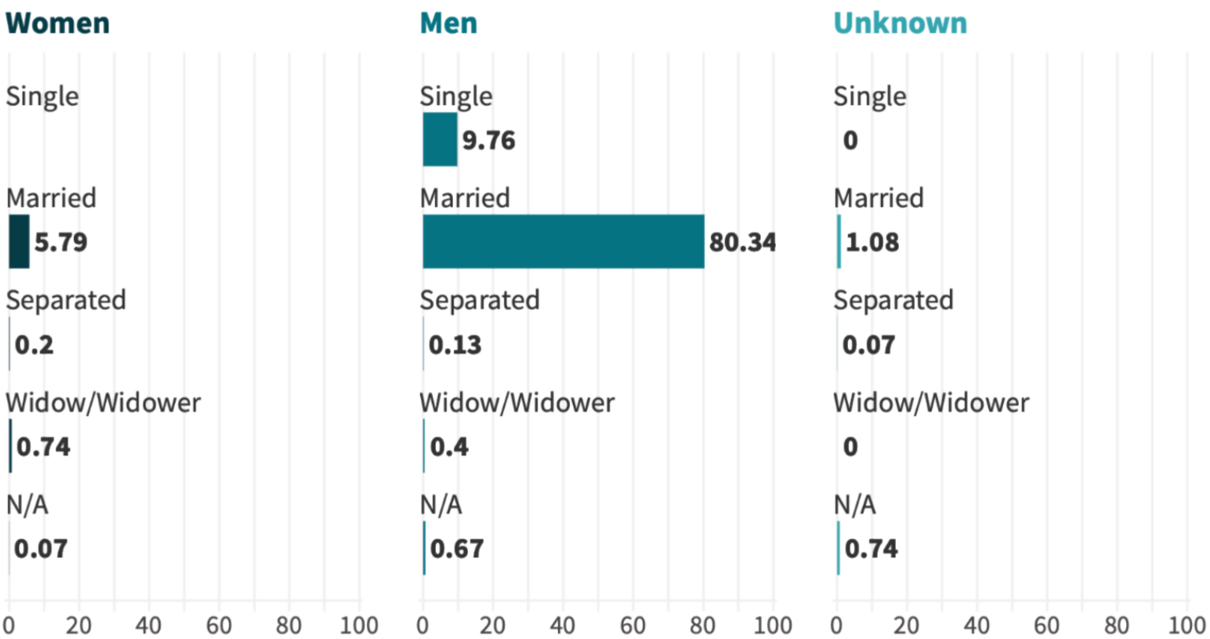
- A total of 1485 respondents were surveyed in Yavatmal, of whom 101 (6.80%) were women, 1356 (91.31%) were men, and 28 (1.89%) were of unknown gender.
- The limited representation of women farmers in this survey reflects the prevailing gender dynamics of the region, where agricultural responsibilities are predominantly undertaken by men.
- The majority of farmers (442, 29.76%) were within the age range of 30 to 39 years (women: 26, 1.75%; men: 413, 27.81%; unknown: 3, 0.20%; Table 26).

Table 26. **Age range of farmers in Yavatmal**

AGE	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
18 – 19	-	-	6	0.40	-	-	**6**	**0.40**
20 – 29	2	0.13	180	12.12	-	-	**182**	**12.26**
30 – 39	26	1.75	413	27.81	3	0.20	**442**	**29.76**
40 – 49	23	1.55	364	24.51	4	0.27	**391**	**26.33**
50 – 59	29	1.95	253	17.04	6	0.40	**288**	**19.39**
60 – 69	12	0.81	108	7.27	4	0.27	**124**	**8.35**
70 – 79	7	0.47	20	1.35	-	-	**27**	**1.82**
80 – 89	-	-	2	0.13	-	-	**2**	**0.13**
N/A	2	0.13	10	0.67	11	0.74	**23**	**1.55**
TOTAL	**101**	**6.80**	**1356**	**91.31**	**28**	**1.89**	**1485**	**100.00**

- Most farmers (1295, 87.21%) were married (women: 86, 5.79%; men: 1193, 80.34%; unknown: 16, 1.08%; Figure 64).

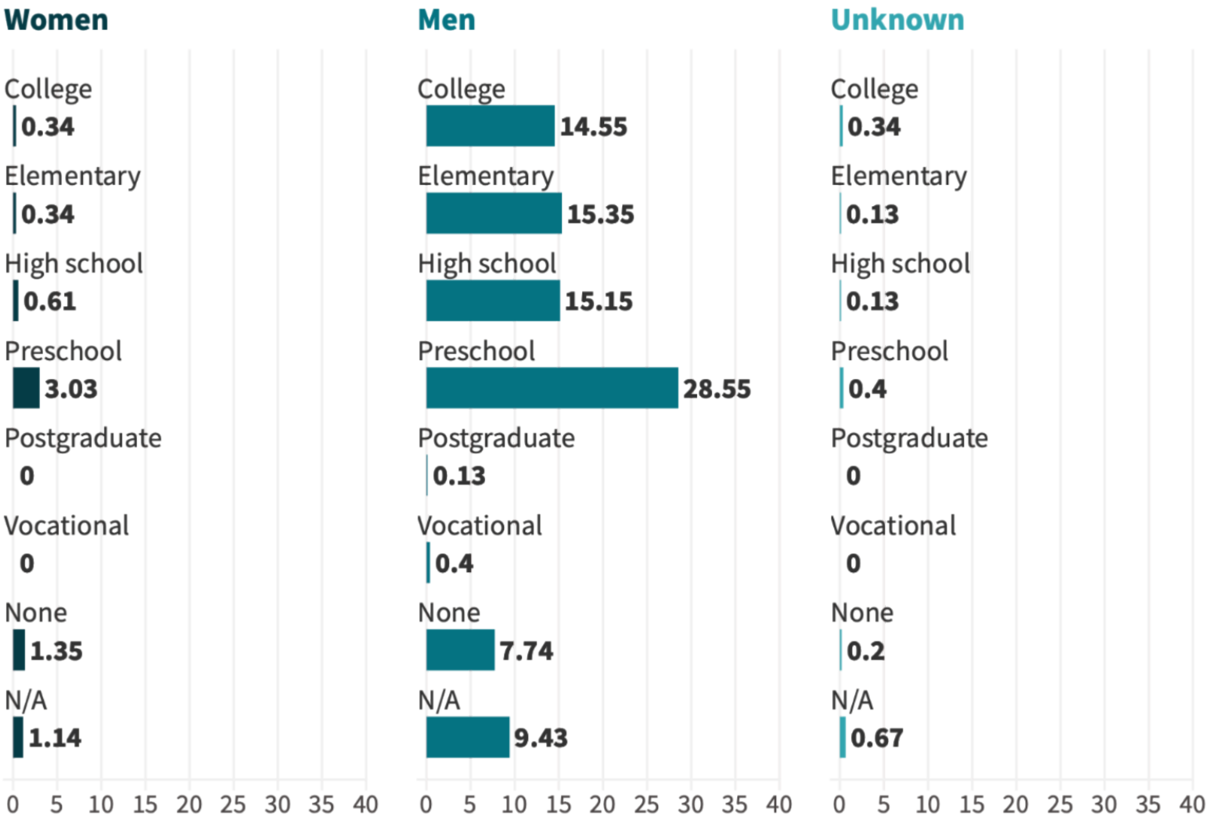
Figure 64. **Marital status of farmers in Yavatmal (%)**



- Twenty-five women farmers (24.75%) reported not being pregnant or breastfeeding, while 76 women farmers (75.25%) did not respond.

- Four hundred and seventy-five farmers (31.99%) had attained education up to preschool level (women: 45, 3.03%; men: 424, 28.55%; unknown: 6, 0.40%; Figure 65).

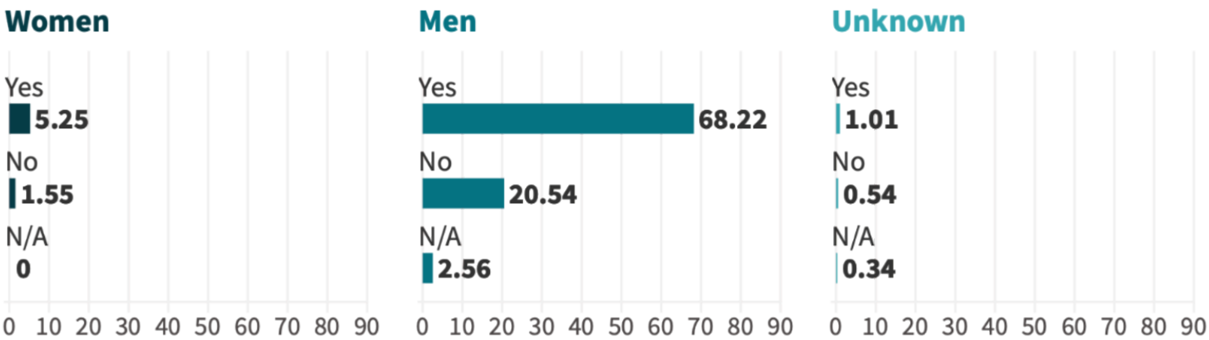
Figure 65. **Education levels of farmers in Yavatmal (%)**



- A total of 1294 farmers (87.14%) reported being self-employed (women: 96, 6.46%; men: 1178, 79.33%; unknown: 20, 1.35%), while 127 farmers (8.55%) were employed (women: 4, 0.27%; men: 120, 8.08%; unknown: 3, 0.20%), and 64 farmers (4.31%) did not answer (women: 1, 0.07%; men: 58, 3.91%; unknown: 5, 0.34%).

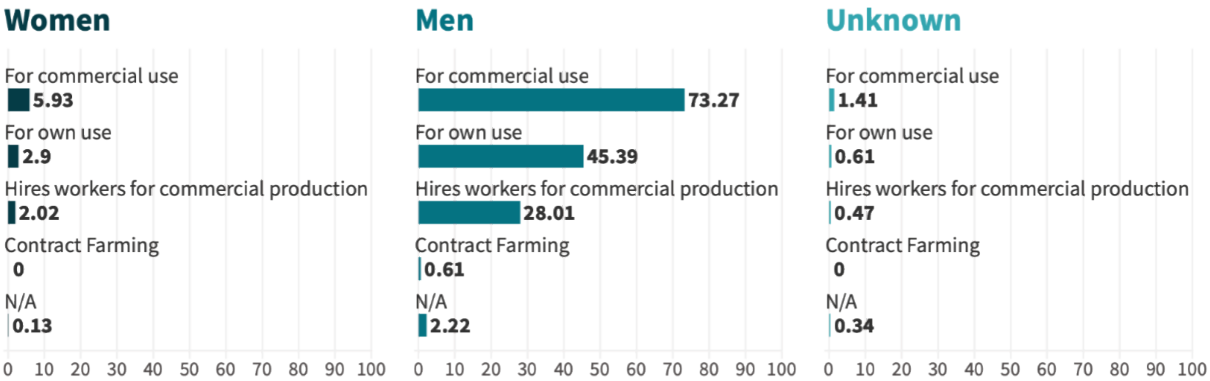
- Most farmers (1106, 74.48%) own the land they work on (women: 78, 5.25%; men: 1013, 68.22%; unknown: 15, 1.01%; Figure 66).

Figure 66. **Land ownership of farmers in Yavatmal (%)**



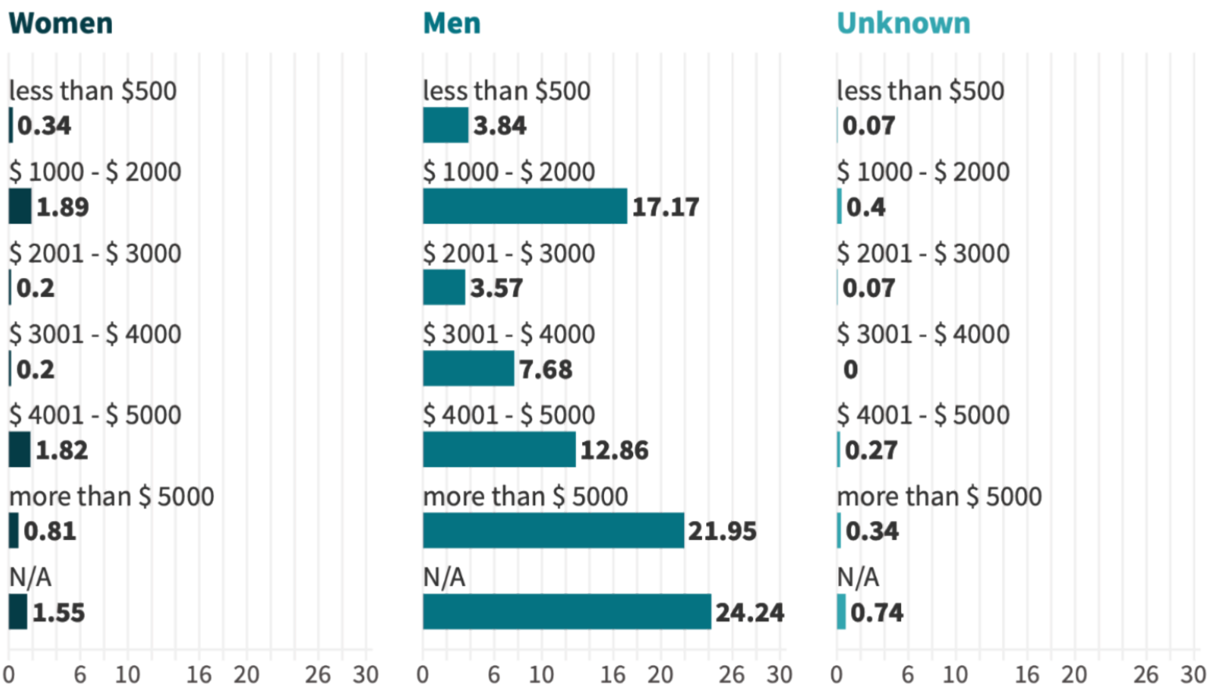
- The majority of farmers (1197, 80.61%) work on their farms for commercial production (women: 88, 5.93%; men: 1088, 73.27%; unknown: 21, 1.41%; Figure 67).

Figure 67. **Farming activities on land in Yavatmal (%)**



- Among those who answered, farmers in Yavatmal mostly (343, 23.10%) reported having an average annual household income of more than USD 5000 (women: 12, 0.81%; men: 326, 21.95%; unknown: 5, 0.34%; Figure 68).

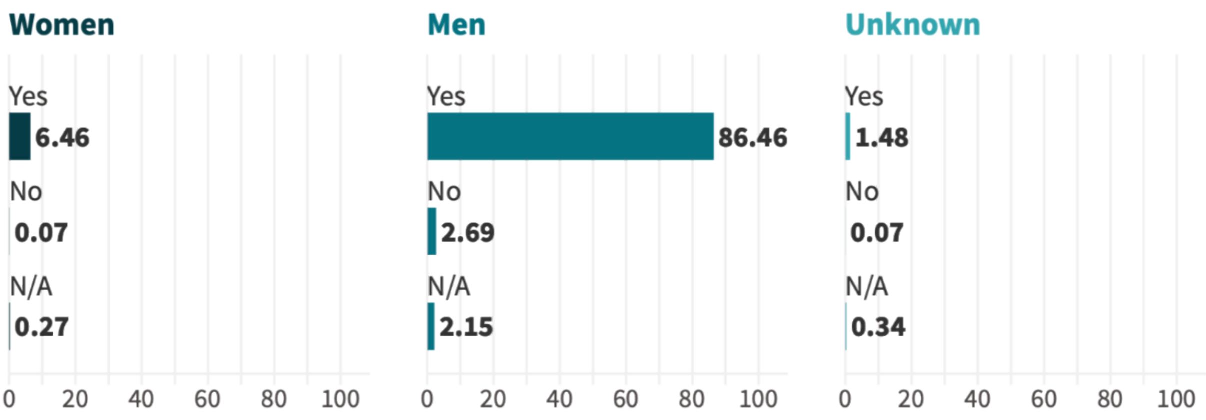
Figure 68. **Annual household income of farmers in Yavatmal (%)**



Pesticide use

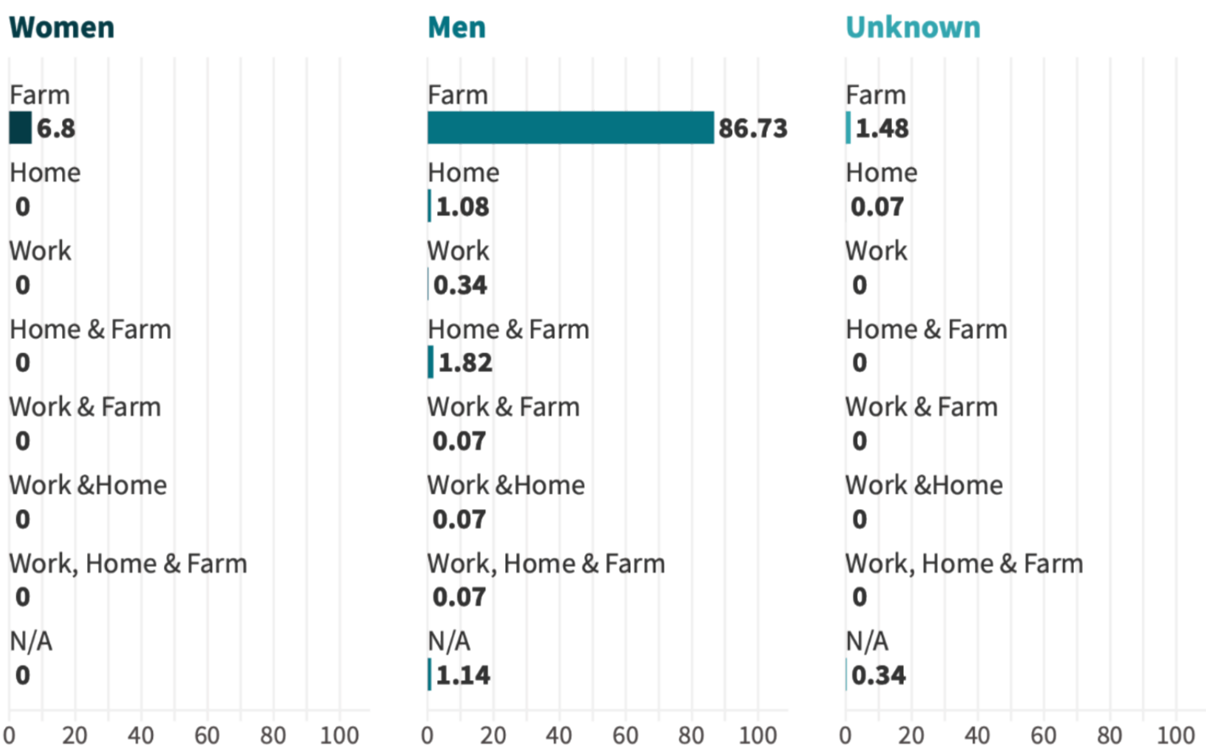
- Almost all the farmers (1402, 94.41%) are using pesticides (women: 96, 6.46%; men: 1284, 86.46%; unknown: 22, 1.48%; Figure 69).

Figure 69. **Farmers' use of pesticides in Yavatmal (%)**



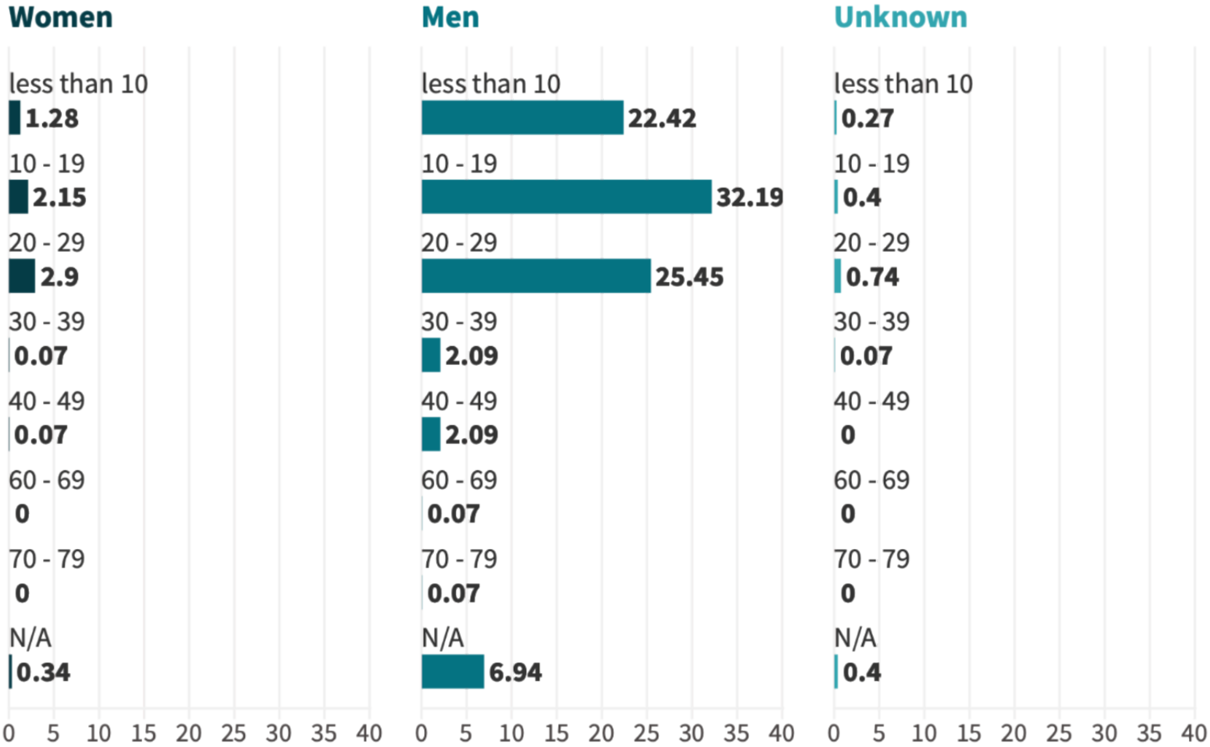
- Most farmers use pesticides on their farms (1411, 95.02%; women: 101, 6.80%; men: 1288, 86.73%; unknown: 22, 1.48%; Figure 70).

Figure 70. **Locations of pesticide use in Yavatmal (%)**



- The majority of farmers (516, 34.75%) have been using pesticides for 10 to 19 years (women: 32, 2.15%; men: 478, 32.19%; unknown: 6, 0.40%; Figure 71).

Figure 71. **Years of pesticide use in Yavatmal (%)**



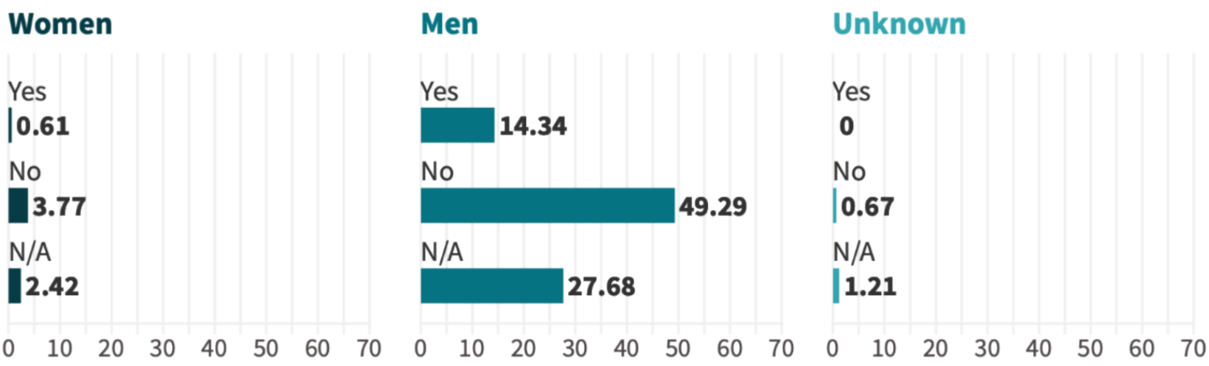
- One of the main activities that farmers in Yavatmal engage in involving pesticides is applying or spraying them in the field (1116, 75.15%; women: 59, 3.97%; men: 1041, 70.10%; unknown: 16, 1.08%; Table 27).

Table 27. **Farmers' pesticide-related activities in Yavatmal**

ACTIVITY	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Apply/spray pesticides in the field	59	3.97	1041	70.10	16	1.08	1116	75.15
Apply pesticides in the household	1	0.07	57	3.84	2	0.13	60	4.04
Human therapeutic purposes	-		5	0.34	-	-	5	0.34
Mix, load, or decant pesticides	35	2.36	648	43.64	9	0.61	692	46.60
Purchase or transport pesticides	37	2.49	456	30.71	6	0.40	535	36.03
Vector control	-	-	37	2.49	1	0.07	58	3.91
Veterinary therapeutic purposes (e.g. for foot and mouth disease)	-	-	57	3.84	1	0.07	38	2.56
Wash clothes used during pesticide spraying or mixing	42	2.83	562	37.85	6	0.40	579	38.99
Wash equipment used during pesticide spraying or mixing	42	2.83	479	32.26	6	0.40	496	33.40
Work in fields where pesticides are being used or have been used	38	2.56	463	31.18	6	0.40	507	34.14
Not applicable (N/A)	30	2.02	239	16.09	12	0.81	281	18.92

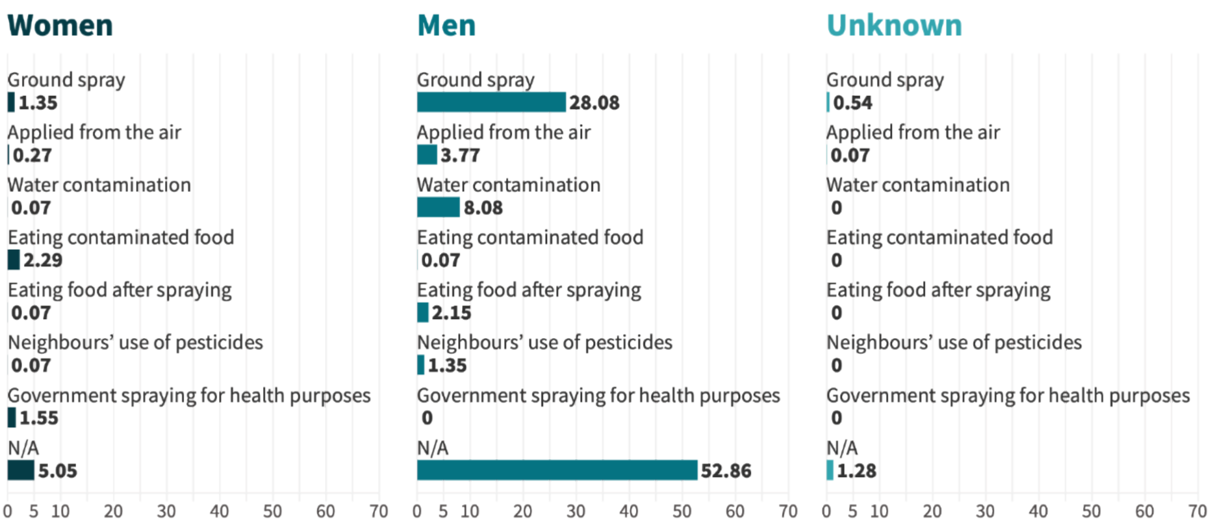
- Majority of the farmers (798, 53.74%) do not decant pesticides (women: 56, 3.77%; men: 732, 49.29%; unknown: 10, 0.67%; Figure 73).

Figure 73. **Pesticide decanting by farmers in Yavatmal (%)**



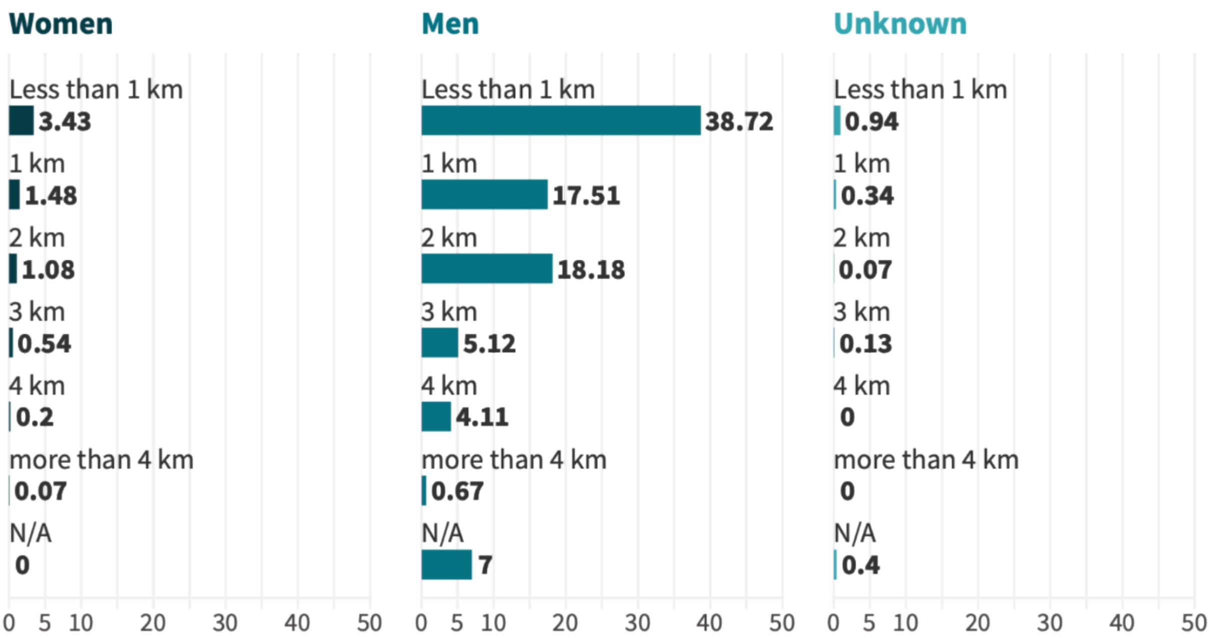
- Farmers are frequently exposed to pesticides through ground spraying (445, 29.97%; women: 20, 1.35%; men: 417, 28.08%; unknown: 8, 0.54%; Figure 74).

Figure 74. **Farmers' exposure to pesticides in Yavatmal (%)**



- Most farmers in the Yavatmal live less than 1 kilometre (640, 43.10%; women: 51, 3.43%; men: 575, 38.72%; unknown: 14, 0.94%; Figure 75) from where pesticide spraying takes place.

Figure 75. **Distance between farmers' homes and pesticide spraying locations (%)**



- The most common pesticides (Image 2) that are being used by farmers in Yavatmal are monocrotophos (569, 38.32%), followed by acephate (200, 13.47%) and flonicamid (174, 11.72%; Table 28), and most of these pesticides are used in cotton cultivation.

Image 2. **Karate (Lambda-cyhalothrin) being used by farmers in Yavatmal**

Table 28.a. **List of pesticides used by farmers in Yavatmal**

PESTICIDE	CROPS TREATED	NO. OF FARMERS	%
Acephate	SOYBEAN, COTTON, JOWAR, TUR	200	13.47
Acetamiprid	COTTON	25	1.68
Alpha cypermethrin	-	1	0.07
Alpha-naphthyl acetic acid	COTTON, SOYBEAN	1	0.07
Bispyribac sodium	RICE	1	0.07
Buprofezin	-	3	0.20
Carbendazim	-	1	0.07
Carbofuran	-	2	0.13
Chlorantraniliprole	COTTON, SOYBEAN.	15	1.01
Chlorpyrifos	COTTON	1	0.07
Diafenthiuron	COTTON, TOOR, SOYBEAN	26	0.40
Dimethoate	COTTON, SOYBEAN	4	0.27
Dinotefuran	COTTON	1	0.07
Emamectin benzoate	COTTON, SOYBEAN, TUR	34	2.29
Fipronil	COTTON, SOYBEAN	65	4.38
Flonicamid	COTTON, SOYBEAN, TUR, JOWAR.	174	11.72
Glyphosate	TOOR, COTTON, JOWAR, CHANA.	35	2.36
Hexaconazole	-	1	0.07
Imazethapyr	-	3	0.20
Imidacloprid	COTTON	159	10.71
Lambda cyhalothrin	PLANTAIN, RICE, TAPIOCA, COTTON	13	0.87
Malathion	PLANTAIN, PADDY, WEEDS	1	0.07
Mepiquat chloride	COTTON	1	0.07
Monocrotophos	COTTON, SOYBEAN, TUR, JOWAR	569	38.32
Oxyfluorfen	COTTON, TUR, SOYBEAN	21	1.41
Paraquat dichloride	COTTON, SOYBEAN	3	0.20
Profenofos	COTTON, SOYBEAN	74	4.98
Pyriproxifen	-	11	0.74
Pyrithiobac sodium	COTTON	27	1.82
Quinalphos	COTTON, SOYBEAN, TUR, JOWAR, CHANA	1	0.07
Thiamethoxam	COTTON, SOYBEAN,	28	1.89

The percentage does not add up to 100% due to multiple responses given by respondents.

Table 28.b. **Classification of pesticides used by farmers in Yavatmal**

PESTICIDE	WHO CLASS[95]	PAN HHP LIST[96]	NO. OF COUNTRIES BANNED[97]
Acephate	II MODERATELY HAZARDOUS	X (GHS+ REPRO (1A ,1B), HIGHLY TOXIC TO BEES)	43
Acetamiprid	II MODERATELY HAZARDOUS	-	NOT KNOWN TO BE BANNED
Alpha cypermethrin	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	29
Alpha-naphthyl acetic acid	III SLIGHTLY HAZARDOUS	-	NOT KNOWN TO BE BANNED
Bispyribac sodium	III SLIGHTLY HAZARDOUS	-	NOT KNOWN TO BE BANNED
Buprofezin	III SLIGHTLY HAZARDOUS	X (EU ED)	NOT KNOWN TO BE BANNED
Carbendazim	U UNLIKELY TO PRESENT ACUTE HAZARD	X (GHS+ MUTA (1A, 1B), GHS+ REPRO (1A ,1B))	41
Carbofuran	IB HIGHLY HAZARDOUS	X (WHO IB, H330, HIGHLY TOXIC TO BEES)	106
Chlorantraniliprole	U UNLIKELY TO PRESENT ACUTE HAZARD	X (VERY PERS WATER, SOIL OR SEDIMENT, VERY TOXIC TO AQ. ORGANISM)	NOT KNOWN TO BE BANNED
Chlorpyrifos	II MODERATELY HAZARDOUS	X (GHS+ REPRO (1A ,1B), HIGHLY TOXIC TO BEES)	44
Diafenthiuron	III SLIGHTLY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	32
Dimethoate	II MODERATELY HAZARDOUS	X (GHS+ REPRO (1A ,1B), HIGHLY TOXIC TO BEES)	38
Dinotefuran	III SLIGHTLY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	20
Emamectin benzoate	II MODERATELY HAZARDOUS	X (VERY PERS WATER, SOIL OR SEDIMENT, VERY TOXIC TO AQ. ORGANISM, HIGHLY TOXIC TO BEES)	NOT KNOWN TO BE BANNED
Fipronil	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	49

[95] World Health Organization. (2019). The WHO recommended classification of pesticides by hazard and guidelines to classification. https://www.who.int/publications/i/item/9789240005662
[96] Pesticide Action Network International. (2024). PAN International list of highly hazardous pesticides. https://pan-international.org/wp-content/uploads/PAN_HHP_List.pdf
[97] Pesticide Action Network International. (2024). Consolidated list of banned pesticides. https://pan-international.org/pan-international-consolidated-list-of-banned-pesticides/

PESTICIDE	WHO CLASSH	PAN HHP LIST	NO. OF COUNTRIES BANNED
Flonicamid	II MODERATELY HAZARDOUS	-	NOT KNOWN TO BE BANNED
Glyphosate	III SLIGHTLY HAZARDOUS	X (EPA PROB LIKEL CARC)	12
Hexaconazole	III SLIGHTLY HAZARDOUS	-	41
Imazethapyr	U UNLIKELY TO PRESENT ACUTE HAZARD	-	29
Imidacloprid	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	29
Lambda cyhalothrin	II MODERATELY HAZARDOUS	X (H330, HIGHLY TOXIC TO BEES)	NOT KNOWN TO BE BANNED
Malathion	III SLIGHTLY HAZARDOUS	X (GHS+ CARC (1A, 1B), IARC PROB CARC)	40
Mepiquat chloride	II MODERATELY HAZARDOUS	-	1
Monocrotophos	IB HIGHLY HAZARDOUS	X (H330, HIGHLY TOXIC TO BEES)	137
Oxyfluorfen	U UNLIKELY TO PRESENT ACUTE HAZARD	X (EPA PROB LIKEL CARC)	9
Paraquat dichloride	II MODERATELY HAZARDOUS	X (H330, PIC)	72
Profenofos	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	39
Pyriproxifen	U UNLIKELY TO PRESENT ACUTE HAZARD	-	1
Pyrithiobac sodium	III SLIGHTLY HAZARDOUS	-	29
Quinalphos	II MODERATELY HAZARDOUS	X (GHS+ C2 & R2, HIGHLY TOXIC TO BEES)	32
Thiamethoxam	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	28

TOP 10 PESTICIDES USED BY FARMERS IN YAVATMAL

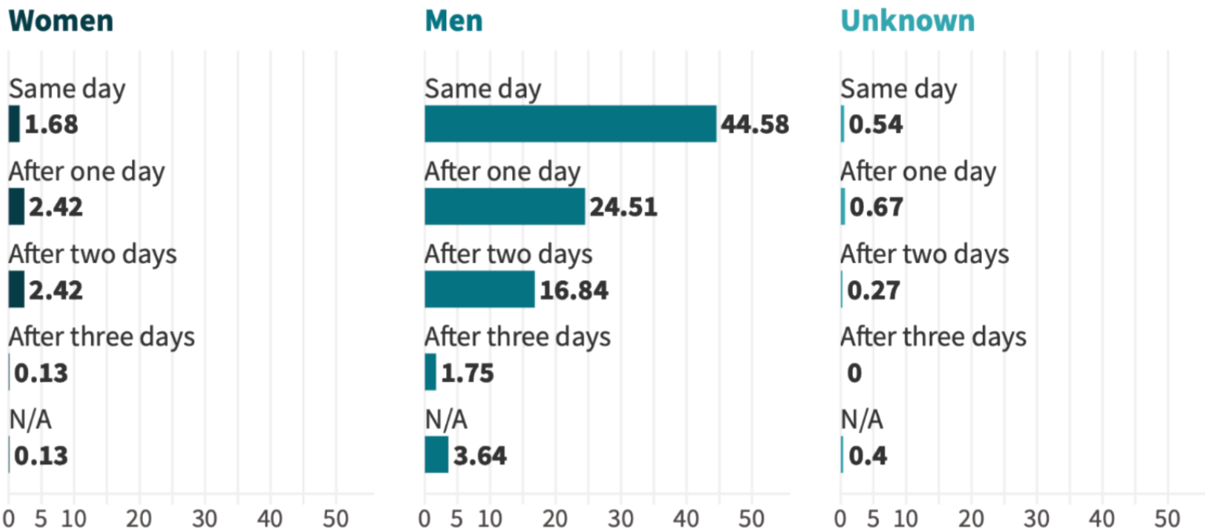
1.	MONOCROTOPHOS	38.32%
2.	ACEPHATE	13.47%
3.	FLONICAMID	11.72%
4.	IMIDACLOPRID	10.71%
5.	PROFENOFOS	4.98%
6.	FIPRONIL	4.38%
7.	GLYPHOSATE	2.36%
8.	EMAMECTIN BENZOATE	2.29%
9.	PYRITHIOBAC SODIUM	1.89%
10.	DIAFENTHIURON	1.82%

Monocrotophos is a Class Ib pesticide (highly hazardous) known to cause a wide range of acute and chronic health effects. Acute symptoms include eye irritation, miosis (pupil constriction), blurred vision, dizziness, convulsions, breathing difficulties (dyspnoea), excessive salivation, abdominal cramps, nausea, diarrhea, and vomiting.[98] Long-term exposure has been linked to neurobehavioral problems, delayed neuropathy, endocrine disruption, reproductive and developmental disorders, and metabolic dysfunctions.[99] Acephate is classified as a Class II pesticide (moderately hazardous). Exposure to acephate is associated with significant metabolic disturbances, including hyperglycemia, oxidative stress, lipid metabolism dysfunction, and DNA damage, which may increase cancer risk.[100] Research suggests acephate can also exert cytotoxic and genotoxic effects on male sperm, resulting in reduced sperm volume, poor motility, and cell membrane damage[101]. Chronic exposure has been documented to cause severe outcomes such as respiratory depression, paralysis (including quadriplegia), and even death[102].

Pesticide exposure and spillage

- Most farmers in Yavatmal re-enter their field on the same day (695, 46.80%; women: 25, 1.68%; men: 662, 44.58%; unknown: 8, 0.54%; Figure 76) from when pesticide spraying takes place, increasing their risk of to pesticides.

Figure 76. **Farmers' re-entry into the field after pesticide spraying in Yavatmal (%)**



[98] National Institute for Occupational Safety and Health. (2019). Monocrotophos. https://www.cdc.gov/niosh/npg/npgd0435.html

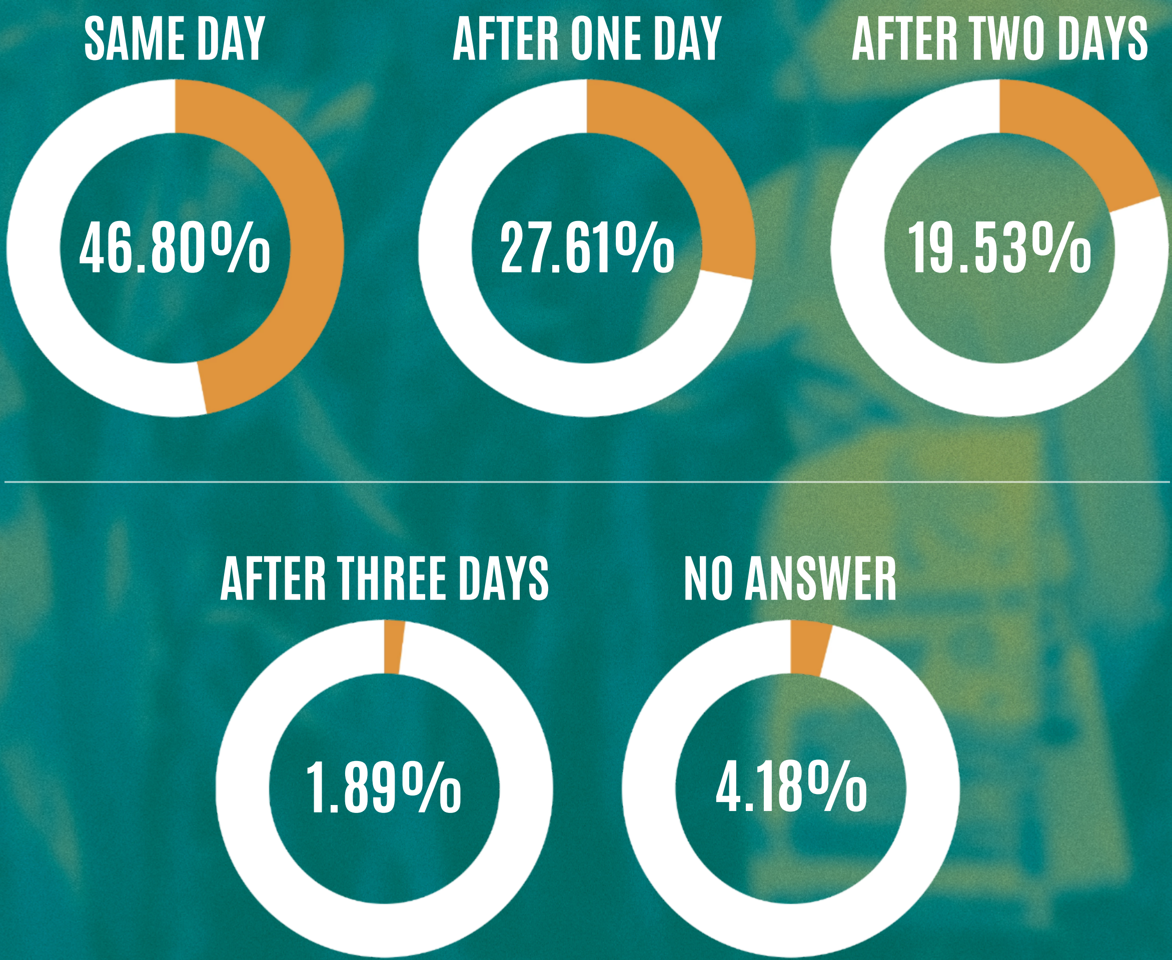
[99] Watts, M. (2011). Monocrotophos Fact sheet. https://panap.net/resource/20-pesticides-toxic-to-children-factsheet-monocrotophos/?ind=1636520212164&filename=pesticides-factsheet-hhps-monocrotophos.pdf&wpdmdl=2186&refresh=68c1409526b011757495445

[100] Mota, T.F.M., Oliveira, W.L., Gonçalves, S., Vasconcelos, M.W., Miglioranza, K.S.B. & Ghisi, N.C. (2023). Are the issues involving acephate already resolved? A scientometric review. Environmnetal Research. Vol 237(2). 117034. https://doi.org/10.1016/j.envres.2023.117034

[101] Ibid

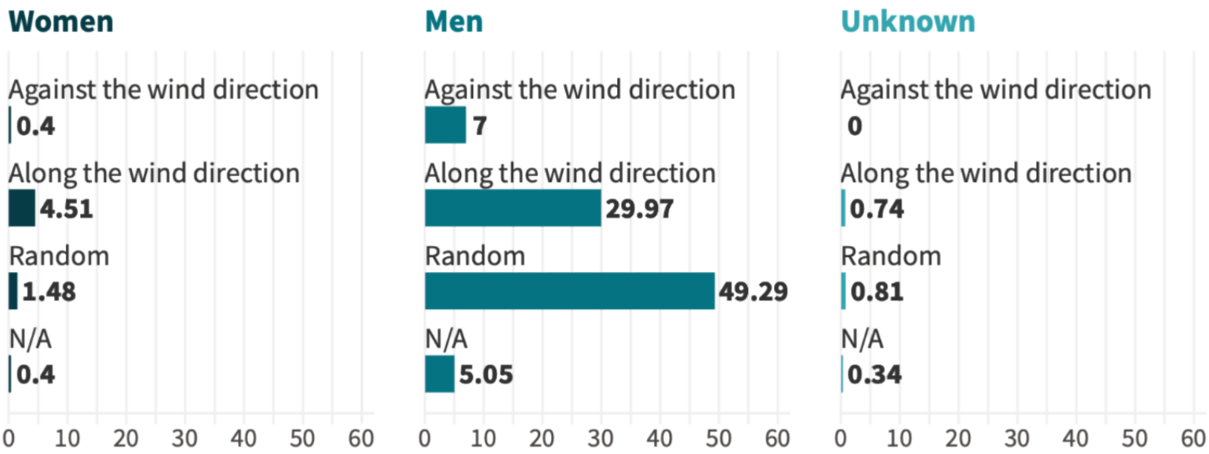
[102] Ibid

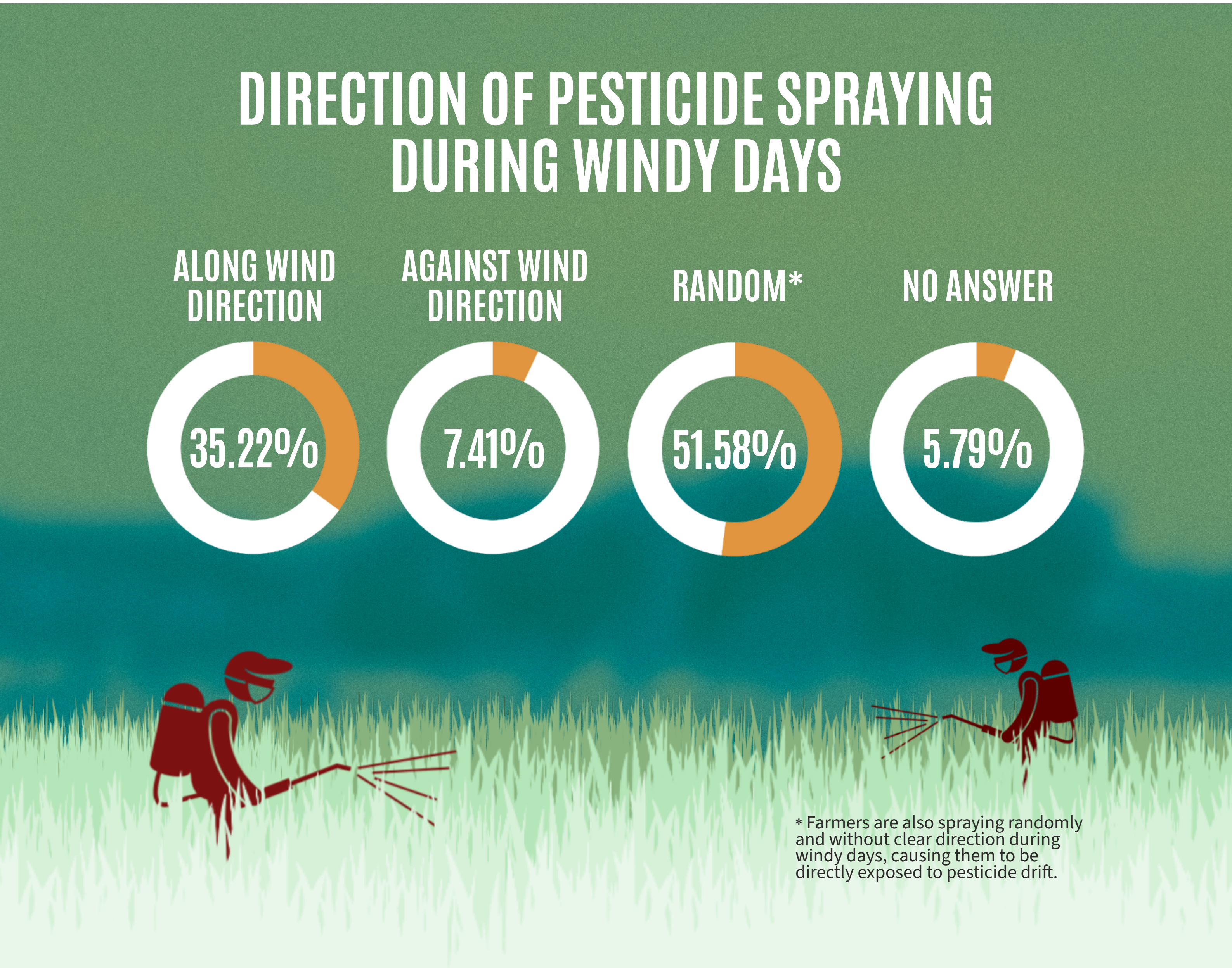
FARMERS’ RE-ENTRY INTO THE FIELD AFTER PESTICIDE SPRAYING



- Most farmers (766, 51.58%) sprayed pesticides without specific guidelines (women: 22, 1.48%; men: 732, 49.29%; unknown: 12, 0.81%; Figure 77).

Figure 77. **Direction of pesticide spraying during windy days (%)**



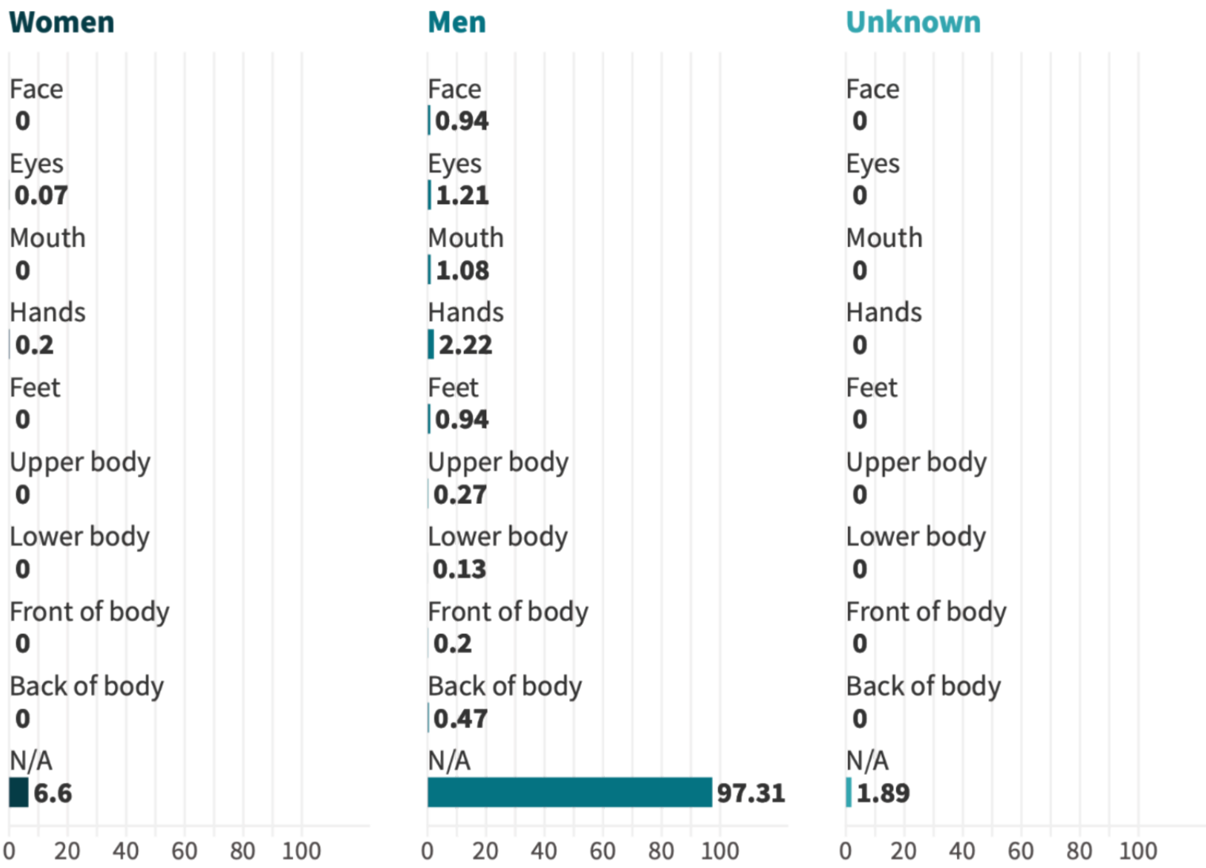


- Fifty farmers (3.37%) reported experiencing pesticide spillage (women: 3, 0.20%; men: 47, 3.16%). The majority, 1288 farmers (86.73%), reported no such incidents (women: 95, 6.40%; men: 1172, 78.92%; unknown: 21, 1.41%). A total of 130 farmers (8.75%) did not respond to the question (women: 3, 0.20%; men: 120, 8.08%; unknown: 7, 0.47%).

- The majority of farmers (33, 2.22%) experienced spillage while spraying pesticides (women: 2, 0.13%; men: 31, 2.09%).

- Majority of farmers experienced spillages on their hands (36, 2.42%; women: 3, 0.20%; men: 33, 1.21%; Figure 78).

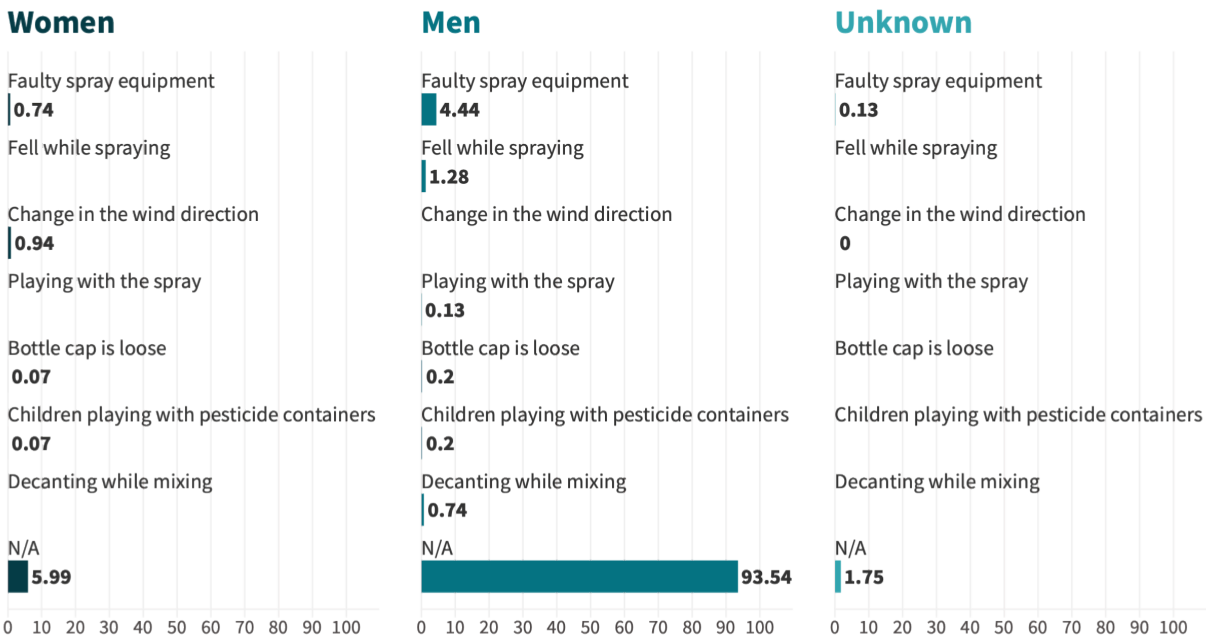
Figure 78. **Body areas exposed to spillage (%)**



Note: Total is not equal to 100% due to multiple responses

- Most farmers (79, 5.32%) experienced pesticide spillage due to faulty spray equipment (women: 11, 0.74%; men: 66, 4.44%; unknown: 2, 0.13%; Figure 79).

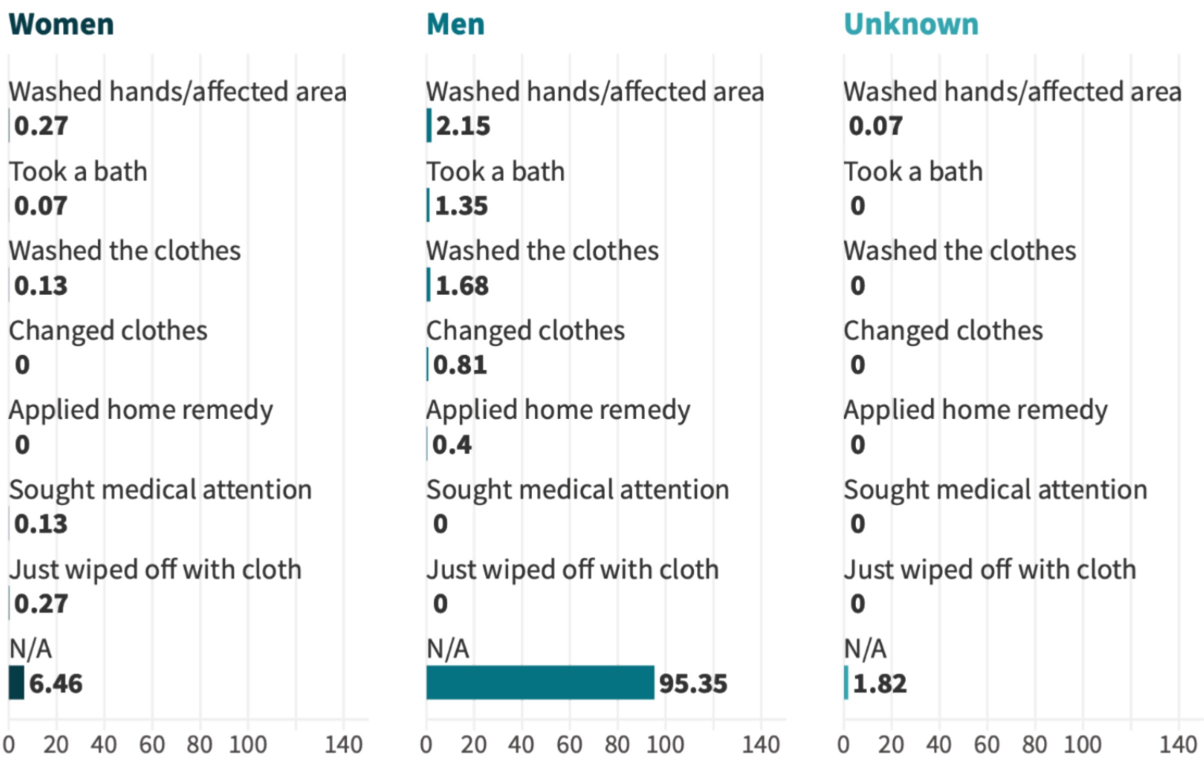
Figure 79. **Causes of pesticide spillage (%)**



Note: Total is not equal to 100% due to multiple responses

- The majority of farmers washed their hands or the area affected when they experience pesticide spillage (38, 2.56%; women: 4, 0.27%; men: 33, 2.15%; unknown: 1, 0.07%; Figure 80).

Figure 80. **Actions taken by farmers in response to pesticide spillage (%)**

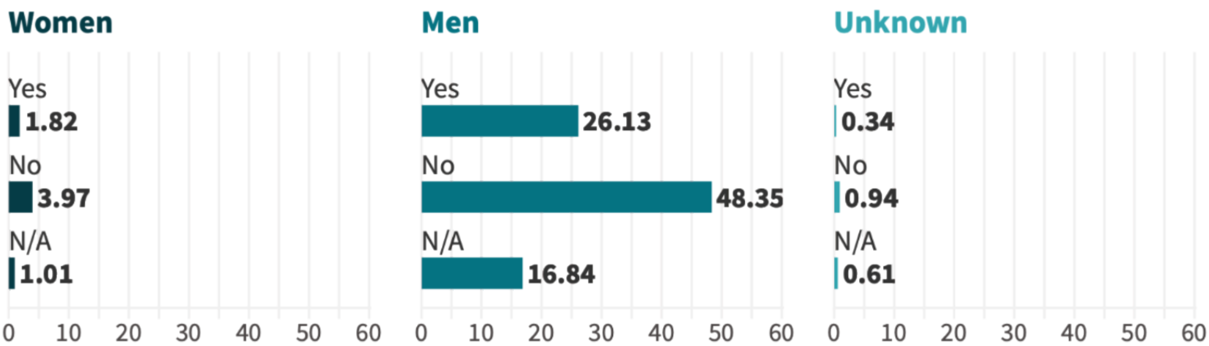


Note: Total is not equal to 100% due to multiple responses

PPE use

- Most farmers (791, 53.27%) do not wear PPE when applying pesticides (women: 59, 3.97%; men: 718, 48.35%; unknown: 14, 0.94%; Figure 81), while 420 farmers (28.28%) do wear PPE (women: 27, 1.82%; men: 388, 26.13%; unknown: 5, 0.34%).

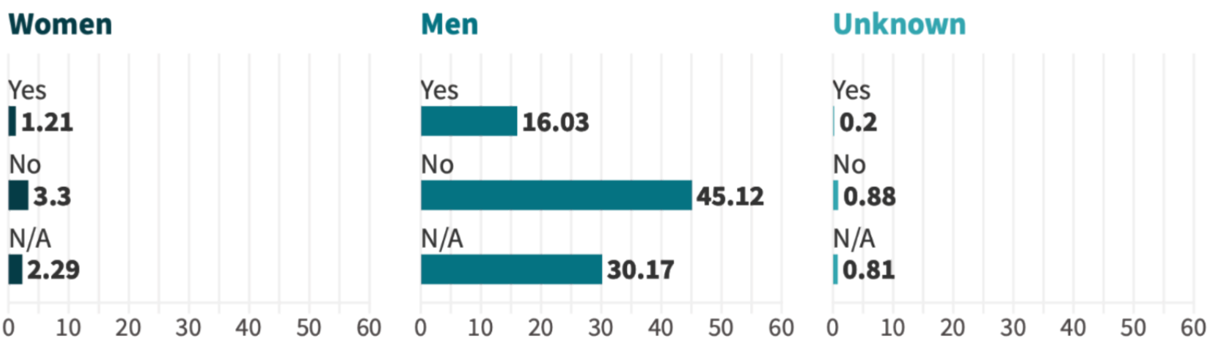
Figure 81. **Use of PPE by farmers in Yavatmal (%)**



- Among those who use PPE, most farmers (583, 39.26%) acquired the PPE themselves (women: 27, 1.82%; men: 551, 37.10%; unknown: 5, 0.34%).

- Only 259 farmers (17.44%) received instructions on how to use PPE (women: 18, 1.21%; men: 238, 16.03%; unknown: 3, 0.20%; Figure 82).

Figure 82. **Availability of PPE instructions (%)**

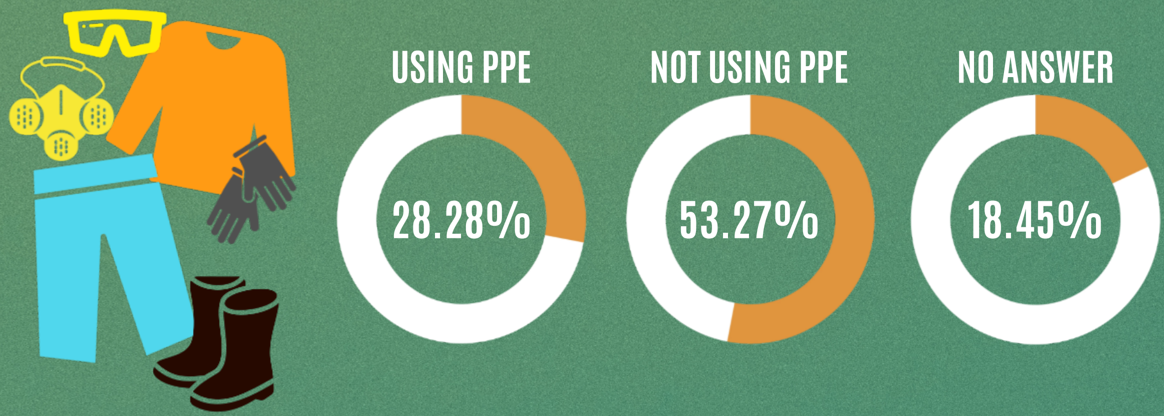


- In Yavatmal, farmers mostly used boots or shoes (526, 35.42%; women: 24, 1.62%; men: 497, 33.47%; unknown: 5, 0.34%; Table 29).

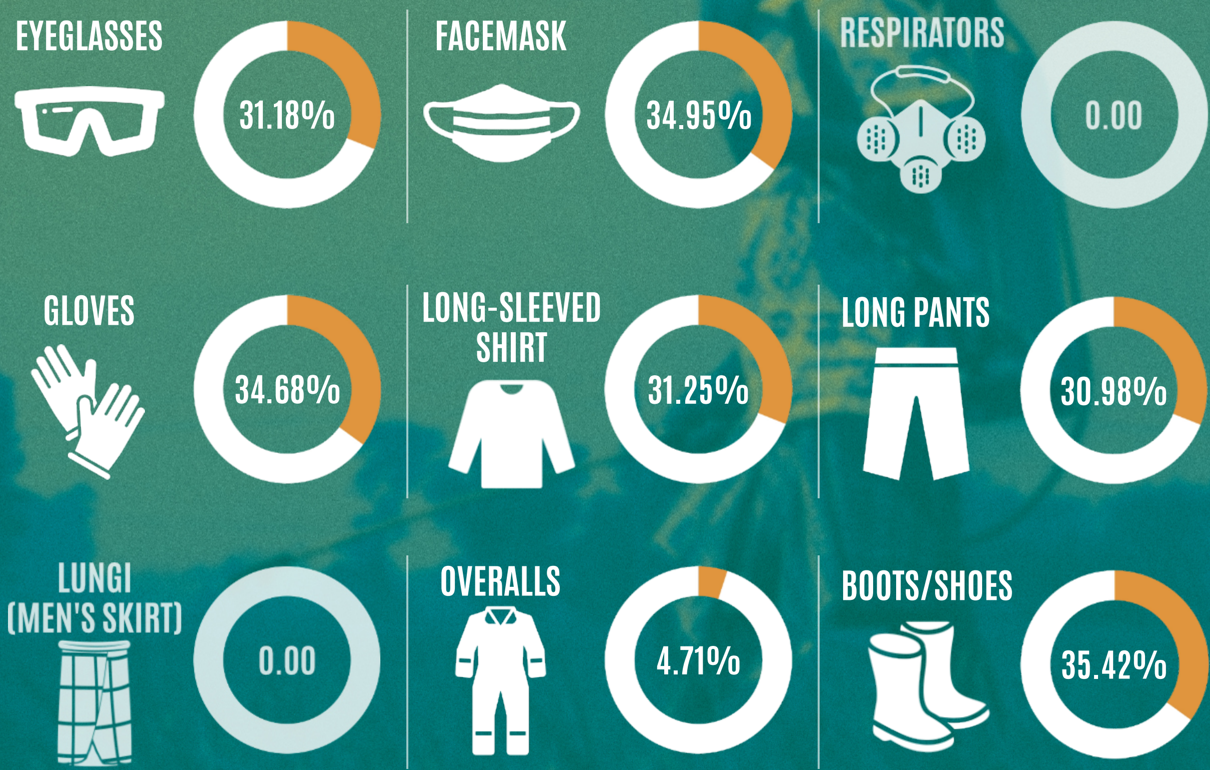
Table 29. **Types of PPE used by farmers in Yavatmal**

PPE	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Boots/shoes	24	1.62	497	33.47	5	0.34	**526**	**35.42**
Eyeglasses	22	1.48	436	29.36	5	0.34	**463**	**31.18**
Face mask	24	1.62	490	33.00	5	0.34	**519**	**34.95**
Gloves	23	1.55	492	33.13	-	-	**515**	**34.68**
Long pants	21	1.41	434	29.23	5	0.34	**460**	**30.98**
Long-sleeved shirt	18	1.21	441	29.70	5	0.34	**464**	**31.25**
Overalls	2	0.13	67	4.51	1	0.07	**70**	**4.71**
Respirators	-	-	5	0.34	-	-	**5**	**0.34**
N/A	71	4.78	780	52.53	22	1.48	**873**	**58.79**

FARMERS' USE OF PPE IN YAVATMAL



TYPES OF PPE USED BY FARMERS



Note: Total is not equal to 100% due to multiple responses

- A majority of farmers reported that PPE is not available in their area (471, 31.72%; women: 42, 2.83%; men: 417, 28.08%; unknown: 12, 0.81%; Table 30).

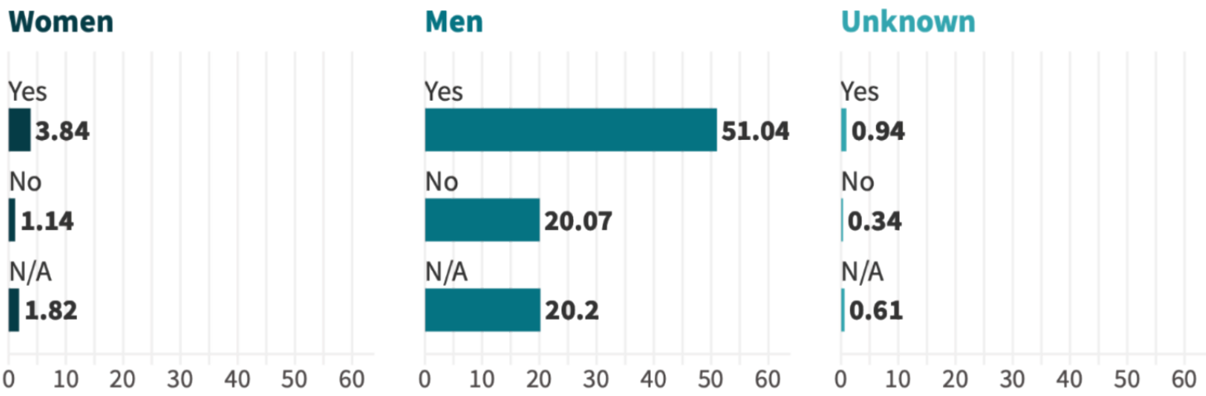
Table 30. **Reasons for not using PPE among farmers in Yavatmal**

REASON	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Not available	42	2.83	417	28.08	12	0.81	**471**	**31.72**
Too expensive	2	0.13	23	1.55	-	-	**25**	**1.68**
Uncomfortable	2	0.13	16	1.08	-	-	**18**	**1.21**
N/A	54	3.64	905	60.94	16	1.08	**975**	**65.66**

Washing facilities

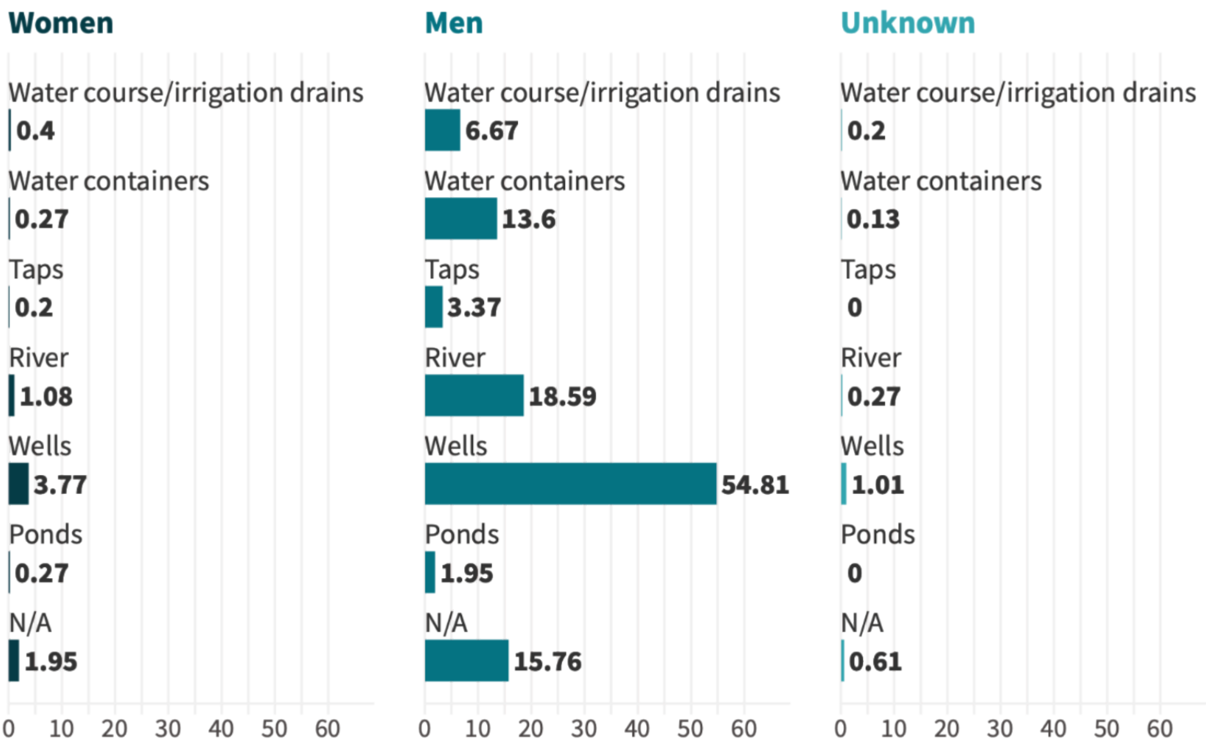
- Eight hundred twenty-nine (55.82%) farmers reported having access to washing facilities after applying pesticides (women: 57, 3.84%; men: 758, 51.04%; unknown: 14, 0.94%; Figure 83).

Figure 83. **Availability of washing facilities in in Yavatmal (%)**



- Wells are the most commonly used washing facility (885, 59.60%; women: 56, 3.77%; men: 814, 54.81%; unknown: 15, 1.01%; Figure 84).

Figure 84. **Types of washing facilities for farmers (%)**

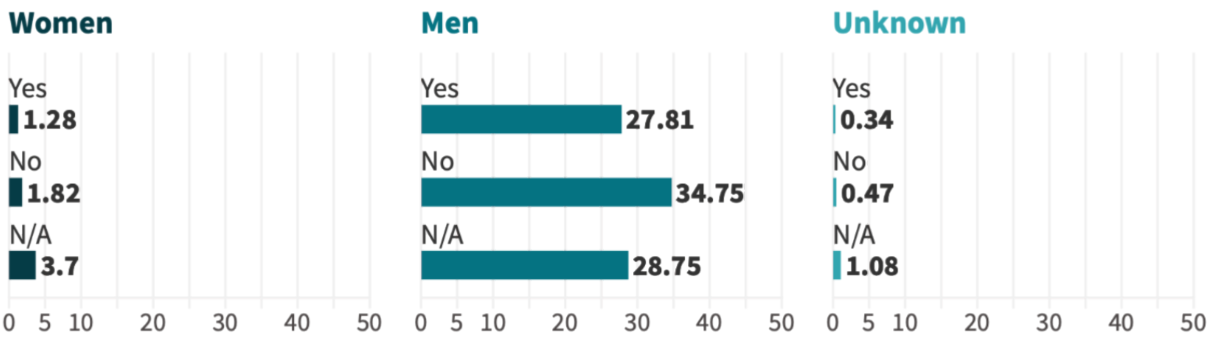


Note: Total is not equal to 100% due to multiple responses

Labels

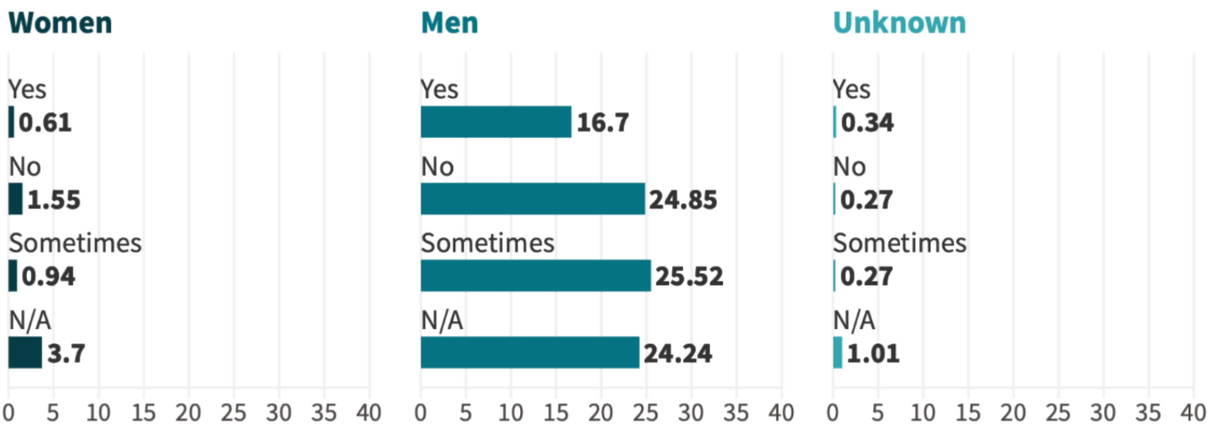
- Four hundred and thirty-seven farmers (29.43%) have access to the labels of the pesticides they use (women: 19, 1.28%; men: 413, 27.81%; unknown: 5, 0.34%; Figure 85).

Figure 85. **Farmers' access to labels on pesticides they use (%)**



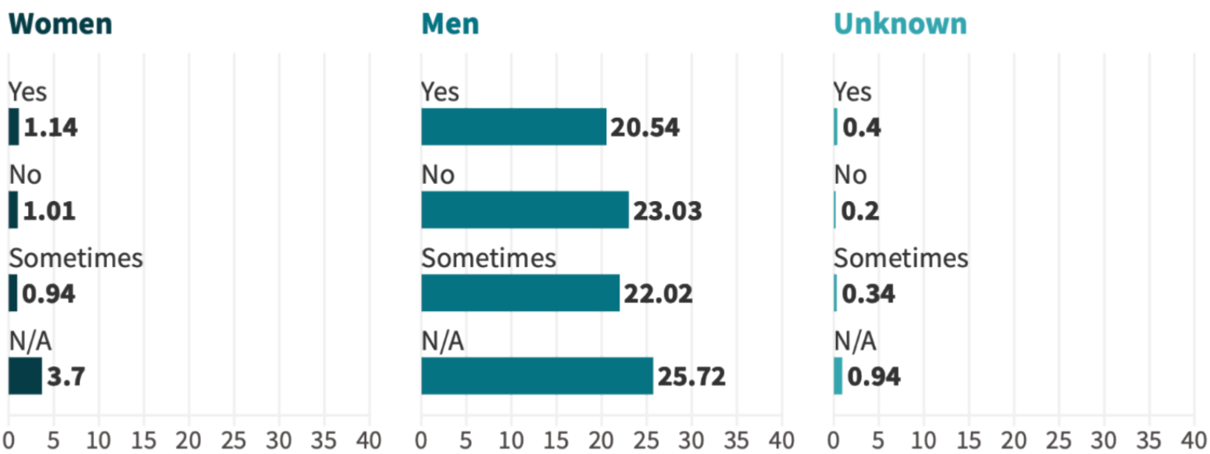
- Most farmers (397, 26.73%) stated that they read the labels only sometimes (women: 14, 0.94%; men: 379, 25.52%; unknown: 4, 0.27%; Figure 86).

Figure 86. **Pesticide label reading practices among farmers (%)**



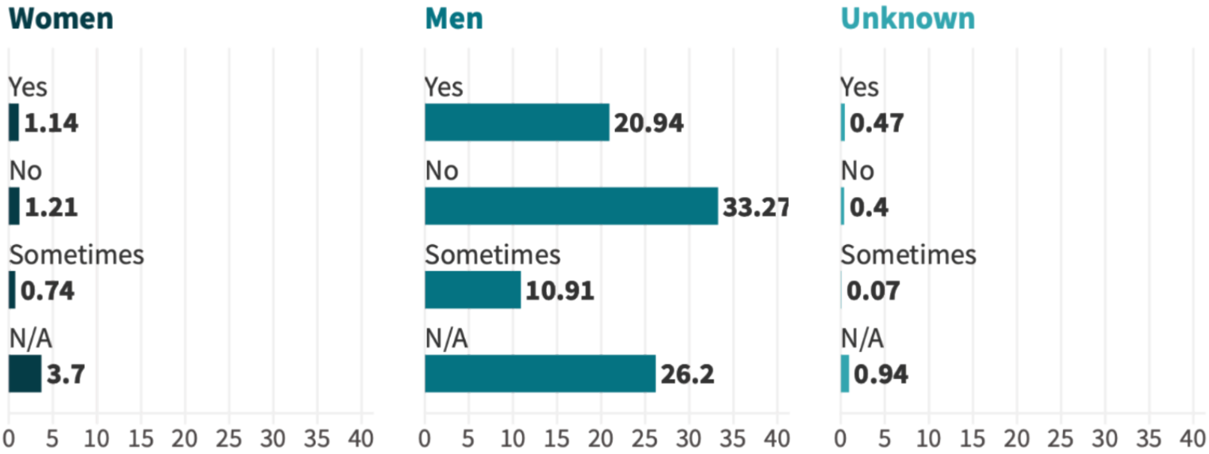
- A majority of farmers (360, 24.24%) indicated that the labels are not in local languages (women: 15, 1.01%; men: 342, 23.03%; unknown: 3, 0.20%; Figure 87).

Figure 87. **Availability of pesticide labels in in local language (%)**



- Additionally, most farmers (518, 34.88%) find that the information on the pesticide labels is not large enough to be read easily (women: 18, 1.21%; men: 494, 33.27%; unknown: 6, 0.40%; Figure 88).

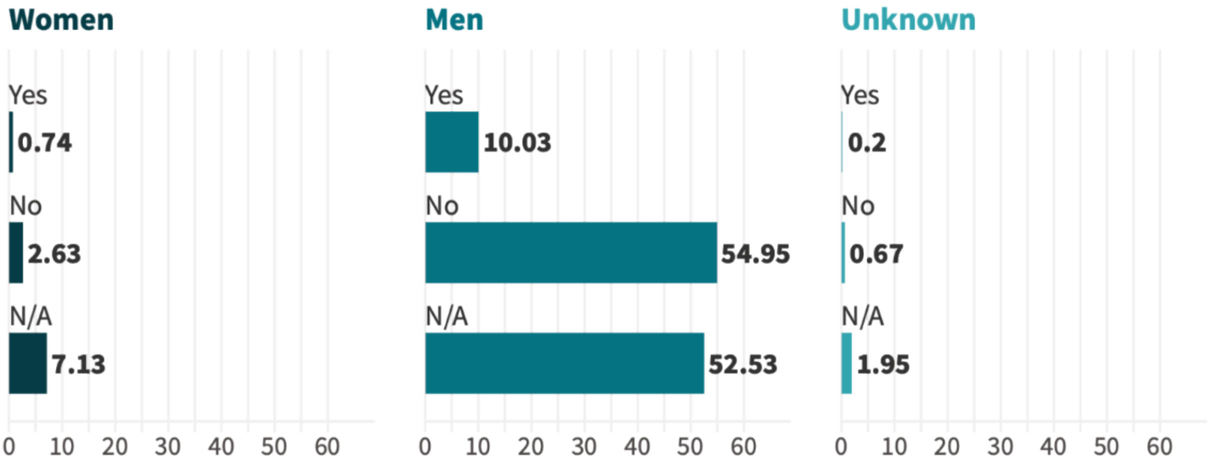
Figure 88. **Legibility of pesticide information labels (%)**



Training on pesticide use, purchase, storage and disposal

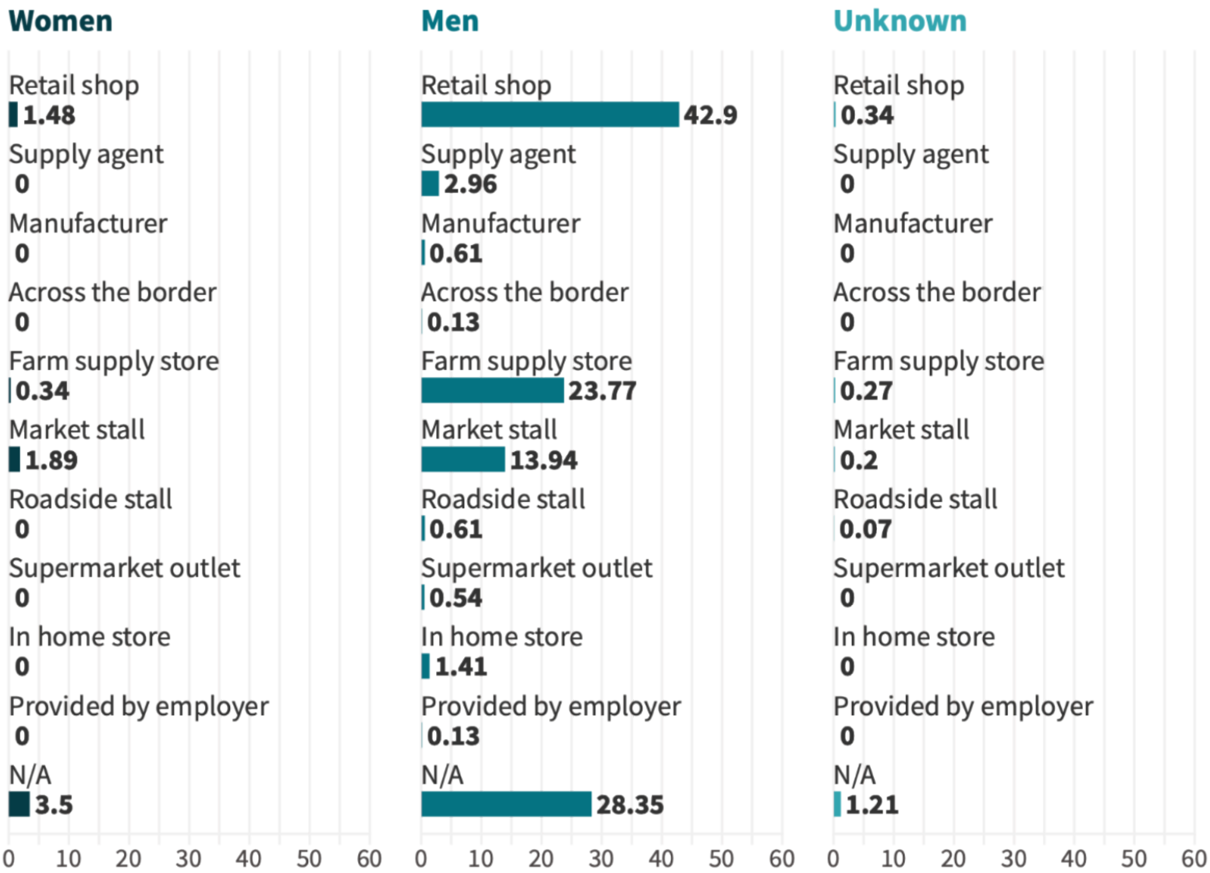
- Most farmers (865, 58.25%) are not trained on the pesticides they use (women: 39, 2.63%; men: 816, 54.95%; unknown: 10, 0.67%; Figure 89).

Figure 89. **Legibility of pesticide information labels (%)**



- Most farmers (664, 44.71%) purchase their pesticides from retail shops (women: 22, 1.48%; men: 637, 42.90%; unknown: 5, 0.34%; Figure 90).

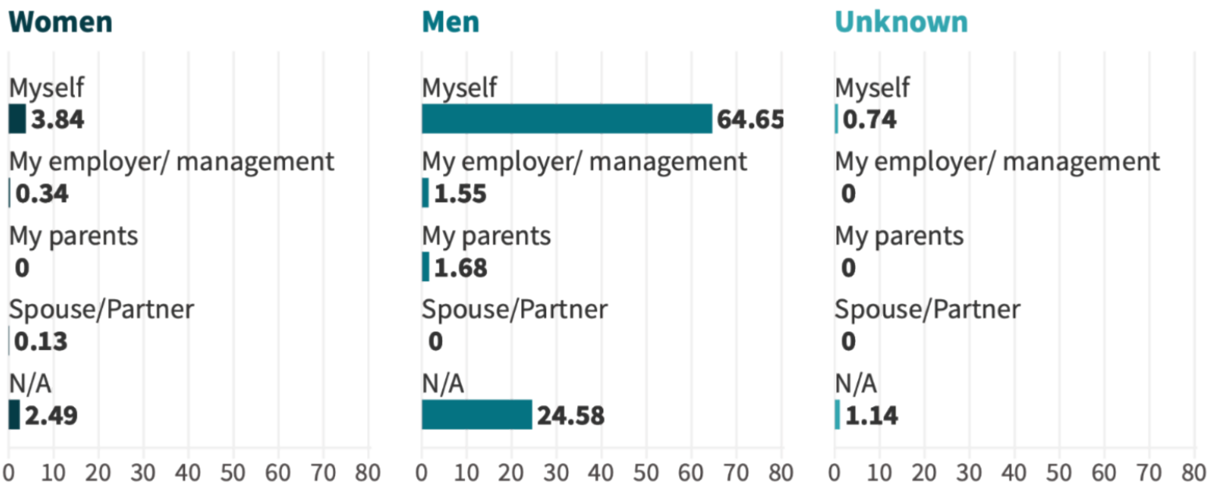
Figure 90. **Farmers' pesticide purchase location (%)**



Note: Total is not equal to 100% due to multiple responses

- Majority (1028, 69.23%) purchased the pesticides themselves (women: 57, 3.84%; men: 960, 64.65%; unknown: 11, 0.74%; Figure 91).

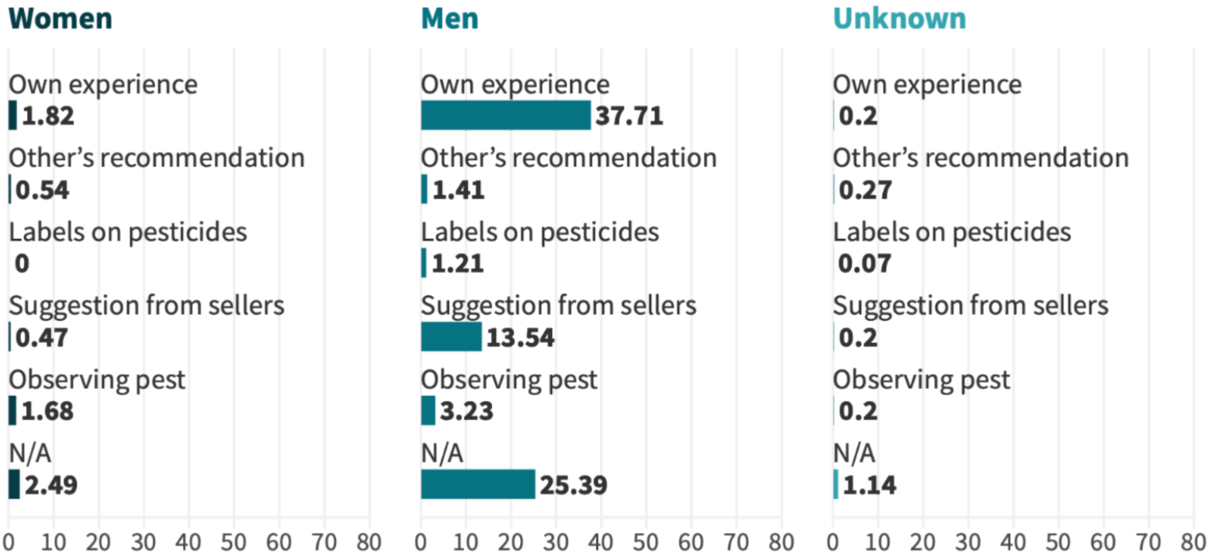
Figure 91. **Person in charge of purchasing pesticides in each household (%)**



Note: Total is not equal to 100% due to multiple responses

- These pesticides are primarily purchased based on personal experience (590, 39.73%; women: 27, 1.82%; men: 560, 37.71%; unknown: 3, 0.20%; Figure 92).

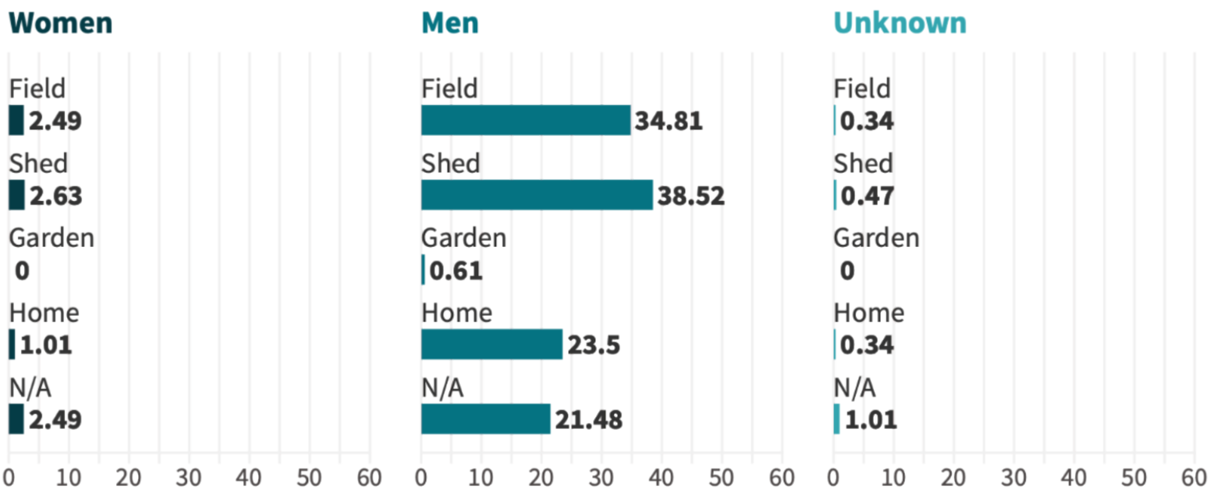
Figure 92. **Factors influencing farmers' pesticide choices in Yavatmal (%)**



Note: Total is not equal to 100% due to multiple responses

- Farmers often store pesticides in a shed (618, 41.62%; women: 39, 2.63%; men: 572, 38.52%; unknown: 7, 0.47%; Figure 93).

Figure 93. **Pesticide storage locations used by farmers in Yavatmal (%)**

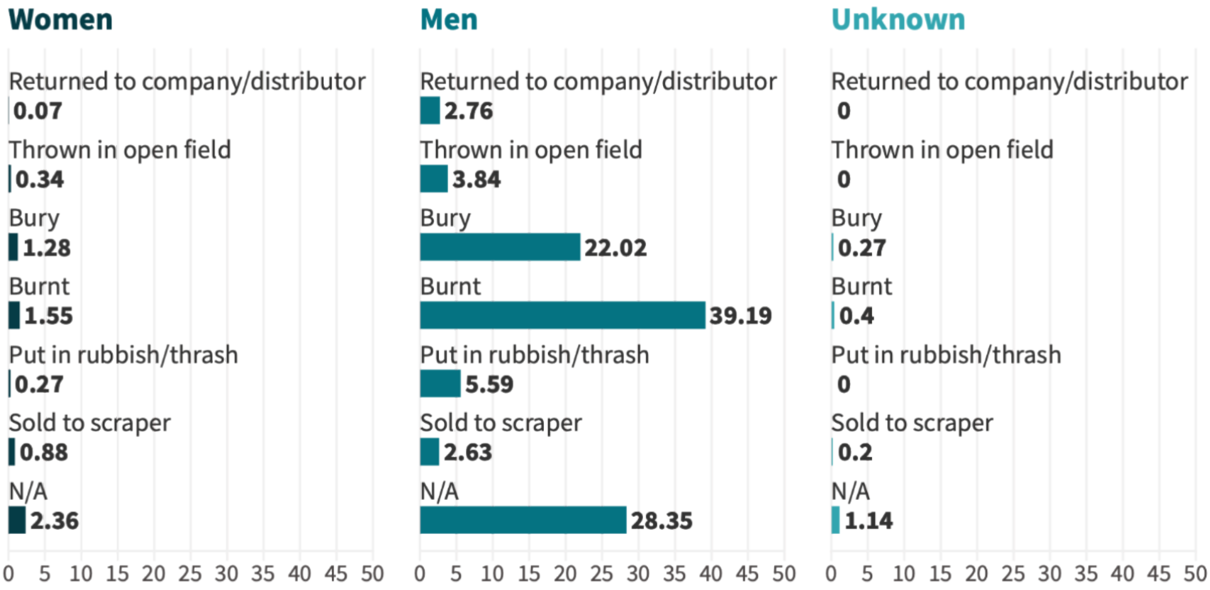


PESTICIDE STORAGE LOCATION BY FARMERS IN YAVATMAL

	WOMEN	MEN	UNKNOWN
SHED	2.63%	38.52%	0.47%
FIELD	2.49%	34.81%	0.34%
HOME	1.01%	23.50%	0.34
GARDEN	0.00	0.61%	0.00

- Most farmers (611, 41.14%) dispose of pesticides by burning them, which increases the risk of exposure (women: 23, 1.55%; men: 582, 39.19%; unknown: 6, 0.40%; Figure 94). Burning pesticide containers can release toxic compounds, due to both the plastic materials of the containers and the chemical structure of the pesticide residues left inside.

Figure 94. **Pesticide disposal methods used by farmers in Yavatmal (%)**



Note: Total is not equal to 100% due to multiple responses

Illness after pesticide exposure

- Farmers mostly experienced vomiting (231, 15.56%; women: 8, 0.54%; men: 221, 14.88%; unknown: 2, 0.13%; Table 31), followed by nausea (180, 12.12%; women: 6, 0.40%; men: 172, 11.58%; 2, 0.13%) when they were exposed to pesticides although the majority of farmers did not respond to the question (1054, 70.98%; women: 80, 5.39%; men: 951, 64.04%; unknown: 24, 1.62%).

Table 24. **Pesticide exposure symptoms reported by farmers in Yavatmal**

SYMPTOMS	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Blurred vision	5	0.34	16	1.08	-	-	**21**	**1.41**
Convulsions	-	-	10	0.67	-	-	**10**	**0.67**
Diarrhoea	2	0.13	31	2.09	-	-	**33**	**2.22**
Difficulty of breathing	2	0.13	15	1.01	-	-	**17**	**1.14**
Dizziness	8	0.54	50	3.37	-	-	**58**	**3.91**
Excessive salivation	-	-	33	2.22	-	-	**33**	**2.22**
Excessive sweating	3	0.20	16	1.08	-	-	**19**	**1.28**
Hand tremors	2	0.13	35	2.36	-	-	**37**	**2.49**
Headaches	12	0.81	74	4.98	-	-	**86**	**5.79**
Irregular heartbeat	-	-	12	0.81	-	-	**12**	**0.81**
Constricted pupils/miosis	-	-	1	0.07	-	-	**1**	**0.07**
Nausea	6	0.40	172	11.58	2	0.13	**180**	**12.12**
Skin rashes	4	0.27	78	5.25	-	-	**82**	**5.52**
Sleeplessness/Insomnia	-	-	27	1.82	-	-	**27**	**1.82**
Staggering	2	0.13	1	0.07	-	-	**3**	**0.20**
Vomiting	8	0.54	221	14.88	2	0.13	**231**	**15.56**
N/A	80	5.39	951	64.04	24	1.62	**1055**	**71.04**

Note: Total is not equal to 100% due to multiple responses

- Even though they were not pregnant, a small number of women farmers reported nausea (6 cases, 0.40%) and vomiting (8 cases, 0.54%), which could possibly be related to pesticide exposure, though other factors cannot be ruled out.

- Most farmers (542, 36.50%) also contacted their local doctors when they suspected someone was poisoned by pesticides (women: 44, 2.96%; men: 493, 33.20%; unknown: 5, 0.34%; Table 32).

Table 24. **Pesticide exposure symptoms reported by farmers in Yavatmal**

SYMPTOMS	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Company	-	-	8	0.54	-	-	**8**	**0.54**
Family member	22	1.48	369	24.85	2	0.13	**393**	**26.46**
Friend	12	0.81	327	22.02	2	0.13	**341**	**22.96**
Hospital	34	2.29	326	21.95	5	0.34	**365**	**24.58**
Local doctor	44	2.96	493	33.20	5	0.34	**542**	**36.50**
Local remedies	2	0.13	25	1.68	-	-	**27**	**1.82**
Poison centre	-	-	3	0.20	-	-	**3**	**0.20**
N/A	45	3.03	609	41.01	21	1.41	**675**	**45.45**

Note: Total is not equal to 100% due to multiple responses

Highlights of the report from Yavatmal

70.97% of pesticides are HHPs according to PAN International list of HHPs.

48.39% of pesticides are highly toxic to bees.

53.27% of farmers do not wear PPE.

21.55% of farmers did not have proper access to washing facilities after pesticides application.

43.10% of farmers live less than 1km from pesticide spraying location.

24.85% of farmers store pesticides in their homes.

Summary

Farmers in **Yavatmal, India**, have an alarmingly high pesticide usage rate, with 98.86% (1468) reporting pesticide application, including 101 women (6.88%) and 1344 men (91.55%). The majority (34.75%) have been using pesticides for 10 to 19 years, with family members also exposed for similar durations (28.62%). Most farmers (43.10%) live within 1 kilometre of pesticide-sprayed fields, increasing their risk of exposure. Monocrotophos, a highly hazardous organophosphate pesticide linked to acute poisoning, neurological disorders, and fatal toxicity, is the most commonly used (38.32%), followed by flonicamid (11.72%) and imidacloprid (10.71%), primarily for cotton cultivation.

A significant number of farmers (46.80%) re-enter fields on the same day pesticides are sprayed, further heightening their exposure risk. Consequently, farmers frequently experience acute poisoning symptoms such as vomiting (15.56%) and nausea (12.12%), although a large proportion (70.98%) did not respond to questions on health effects. These findings highlight the urgent need for improved pesticide regulations, PPE accessibility, and farmer education on the health risks associated with pesticide exposure. In addition, it is important to provide both financial support and practical training to help farmers transition away from pesticide dependence and adopt agroecological practices that are safer, more sustainable, and community-centered.

4.2.2. Kerala

Demographic profile

- A total of 508 respondents were surveyed in Kerala, of whom 158 (31.10%) were women, 331 (65.16%) were men, and 19 (3.74%) were unknown in terms of gender.

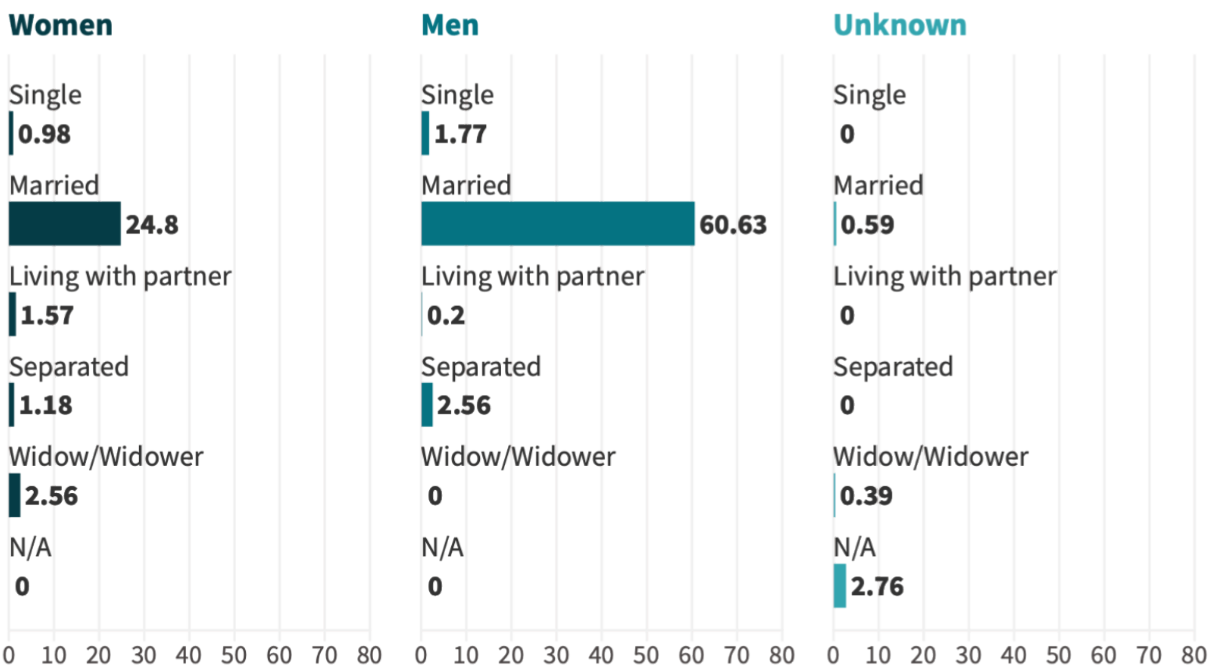
- The majority (152, 29.92%) of the farmers fell within the age range of 50 to 59 years old (women: 48, 9.45%; men: 103, 20.28%; unknown: 1, 0.20%; Table 33).

Table 26. **Age range of farmers in Kerala**

AGE	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
20 – 29	7	1.38	1	0.20	-	-	8	1.57
30 – 39	27	5.31	49	9.65	1	0.20	77	15.16
40 – 49	42	8.27	63	12.40	1	0.20	106	20.87
50 – 59	48	9.45	103	20.28	1	0.20	152	29.92
60 – 69	23	4.53	76	14.96	-	-	99	19.49
70 – 79	11	2.17	34	6.69	2	0.39	47	9.25
80 – 89	-	-	2	0.39	1	0.20	3	0.59
N/A	-	-	3	0.59	13	2.56	16	3.15
TOTAL	158	31.10	331	65.16	19	3.740	508	100.00

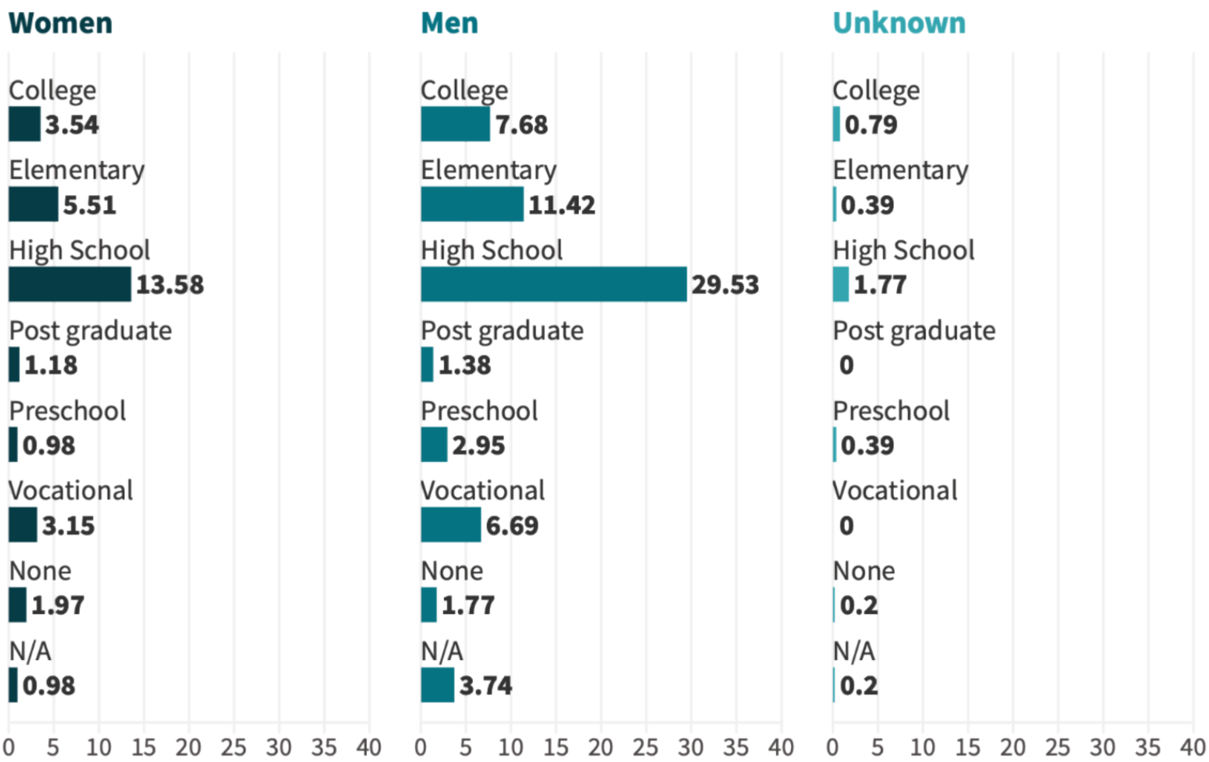
- Most farmers (437, 86.02%) were married (women: 126, 24.80%; men: 308, 60.63%; unknown: 3, 0.59%; Figure 95).

Figure 95. **Marital status of farmers in Kerala (%)**



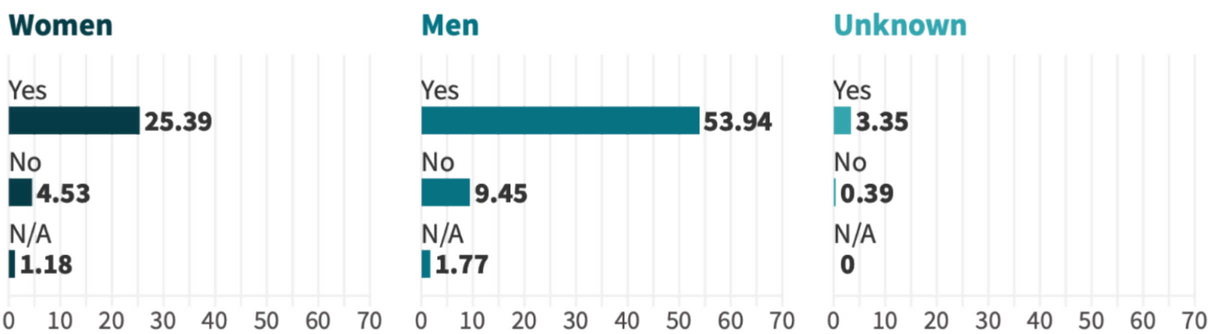
- Three women (1.90%) were pregnant, while 137 (86.71%) women were not pregnant during the survey, and 18 (11.39%) women did not respond.
- Similarly, three women (1.90%) were reported to be breastfeeding, 131 (82.91%) were not breastfeeding, and 24 (15.19%) women did not respond.
- Two hundred and twenty-eight (44.88%) farmers attained education up to high school (women: 69, 13.58%; men: 150, 29.53%; unknown: 9, 1.77%; Figure 96).

Figure 96. **Education levels of farmers in Kerala (%)**



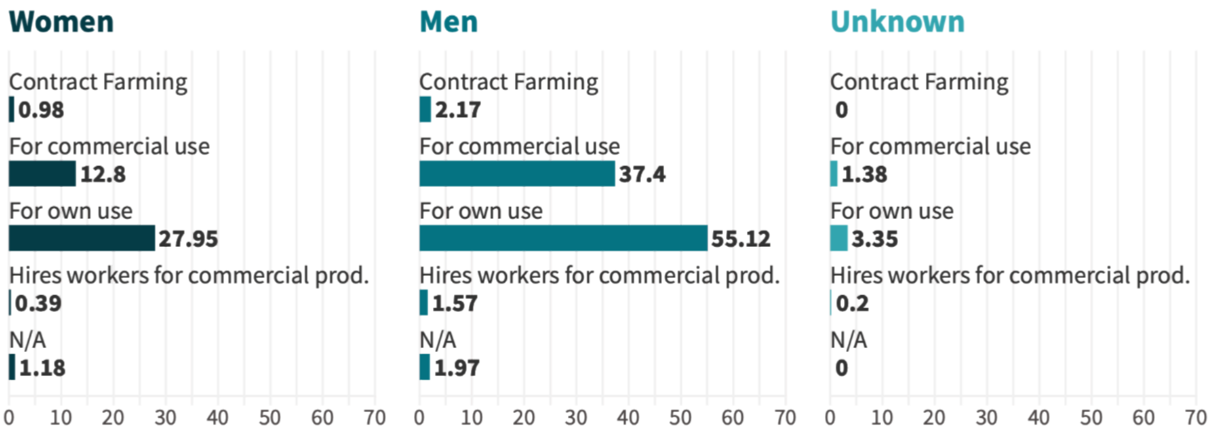
- Four hundred thirty-five (85.63%) reported being self-employed (women: 127, 25.00%; men: 290, 57.09%; unknown: 18, 3.54%), 58 farmers (11.42%) were employed (women: 25, 4.92%; men: 32, 6.30%; unknown: 1, 0.20%) and 15 farmers (2.95%) did not answer (women: 6, 1.18%; men: 9, 1.77%).
- Most farmers (420, 82.68%) owned the land that they were working on (women: 129, 25.39%; men: 274, 53.94%; unknown: 17, 3.35%: Figure 97).

Figure 97. **Land ownership of farmers in Kerala (%)**



- Farmers mostly (439, 86.42%) worked on the farm to produce for own use (women: 142, 27.95%; men: 280, 55.12%; unknown: 17, 3.35%; Figure 98).

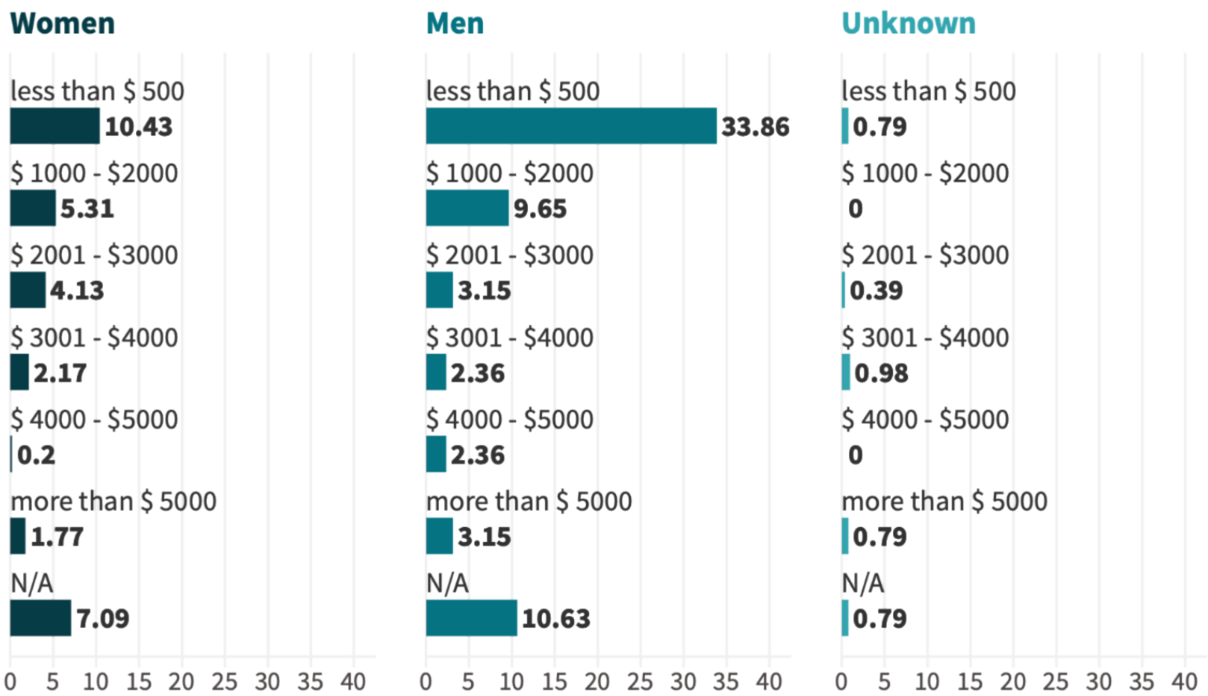
Figure 98. **Farming activities on land in Kerala (%)**



Note: Total is not equal to 100% due to multiple responses

- Among those who answered, farmers in Kerala mostly (229, 45.08%) averaged less than USD 500 for their average annual household income (women: 53, 10.43%; men: 172, 33.86%; unknown: 4, 0. 79; Figure 99).

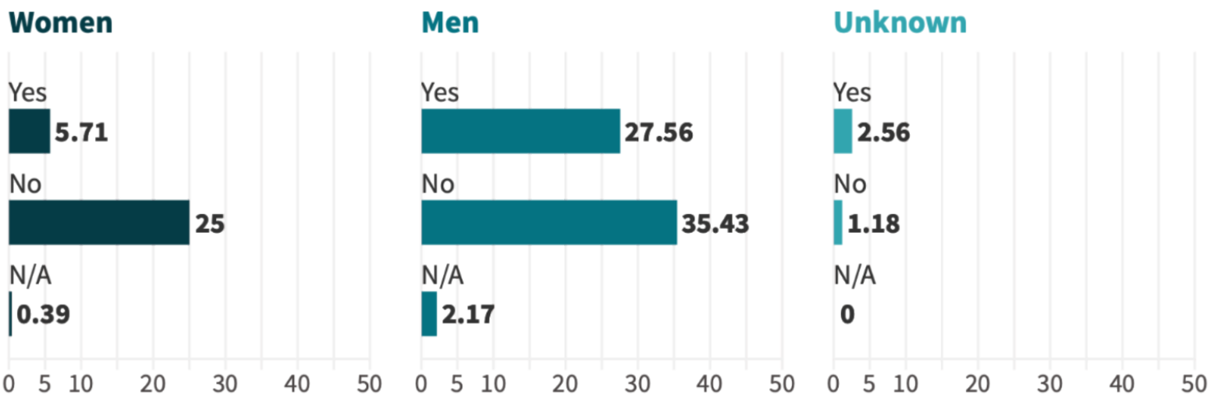
Figure 99. **Annual household income of farmers in Kerala (%)**



Pesticide use

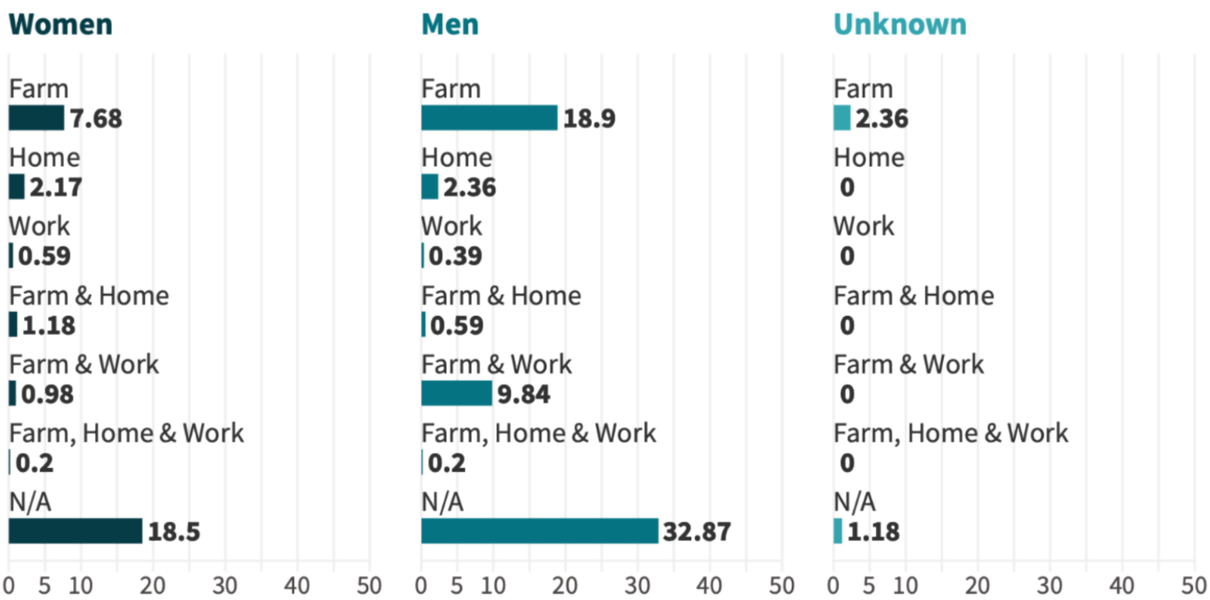
- Only 182 farmers (35.83%) reported using pesticides (women: 29, 5.71%; men: 140, 27.56%; unknown: 13, 2.56%; Figure 100) and majority of the farmers are organic farmers (286, 56.30; women: 127, 25.00%; men: 154, 30.31%; unknown: 5, 0.98%).

Figure 100. **Farmers' use of pesticides in Kerala (%)**



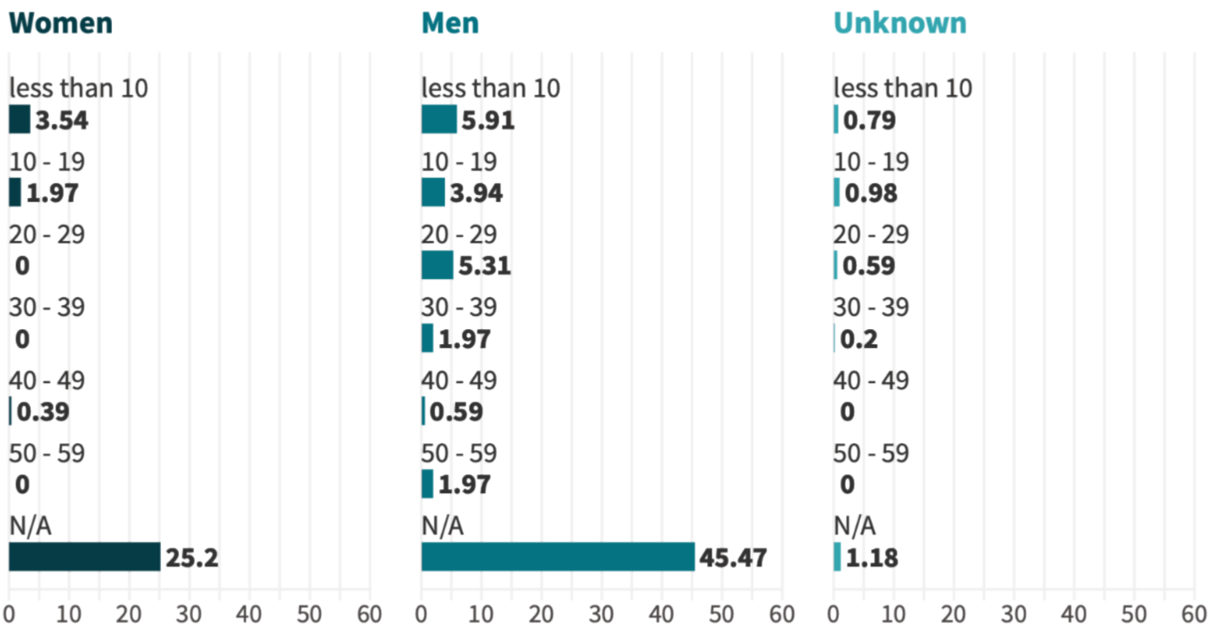
- Most farmers used pesticides on their farms (147, 28.94%; women: 39, 7.68%; men: 96, 18.90%; unknown: 12, 2.36%; Figure 101).

Figure 101. **Locations of pesticide use in Kerala (%)**



- The majority of farmers (52, 10.24%) had been using pesticides for less than 10 years (women: 18, 3.54%; men: 30, 5.91%; unknown: 4, 0.79%; Figure 102).

Figure 102. **Years of pesticide use in Kerala (%)**



- One of the major activities involving pesticides that farmers in Kerala engage in is applying or spraying them in the field (158, 31.10%; women: 25, 4.92%; men: 131, 25.79%; unknown: 2, 0.39%; Table 34).

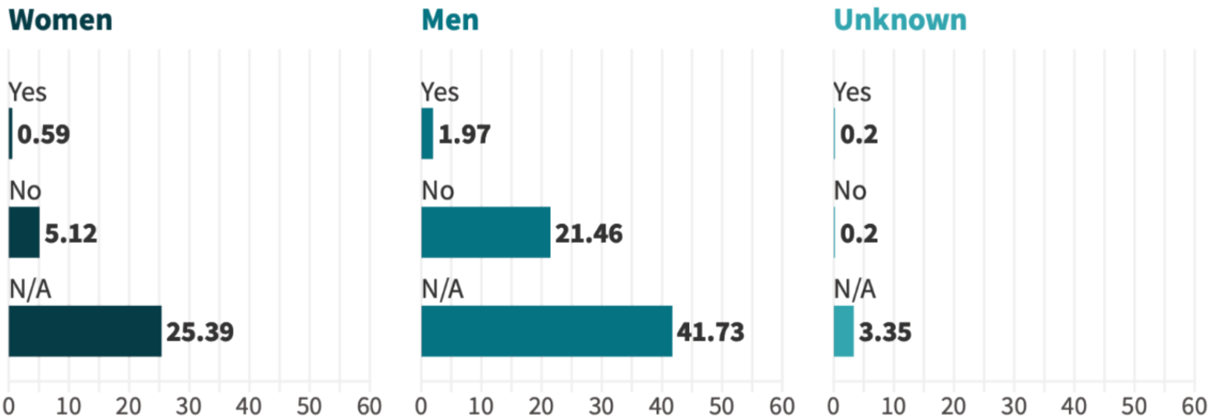
Table 34. **Farmers' pesticide-related activities in Kerala**

ACTIVITY	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Apply/spray pesticides in the field	25	4.92	131	25.79	2	0.39	**158**	**31.10**
Apply pesticides in the household	3	0.59	9	1.77	-	-	**12**	**2.36**
Human therapeutic purposes	-	-	2	0.39	-	-	**2**	**0.39**
Mix/load/decant pesticides	15	2.95	88	17.32	2	0.39	**105**	**20.67**
Purchase or transport pesticides	5	0.98	67	13.19	1	0.20	**73**	**14.37**
Vector control	2	0.39	18	3.54	-	-	**20**	**3.94**
Veterinary therapeutic purposes (e.g. use for foot and mouth disease)	-	-	1	0.20	1	0.20	**2**	**0.39**
Wash clothes used during pesticide spraying or mixing	8	1.57	70	13.78	2	0.39	**75**	**14.76**
Wash equipment used during pesticide spraying or mixing	9	1.77	70	13.78	2	0.39	**76**	**14.96**
Work in fields where pesticides are being used or have been used	5	0.98	60	11.81	2	0.39	**67**	**13.19**
N/A	132	25.98	199	39.17	17	3.35	**348**	**68.50**

Note: Total is not equal to 100% due to multiple responses

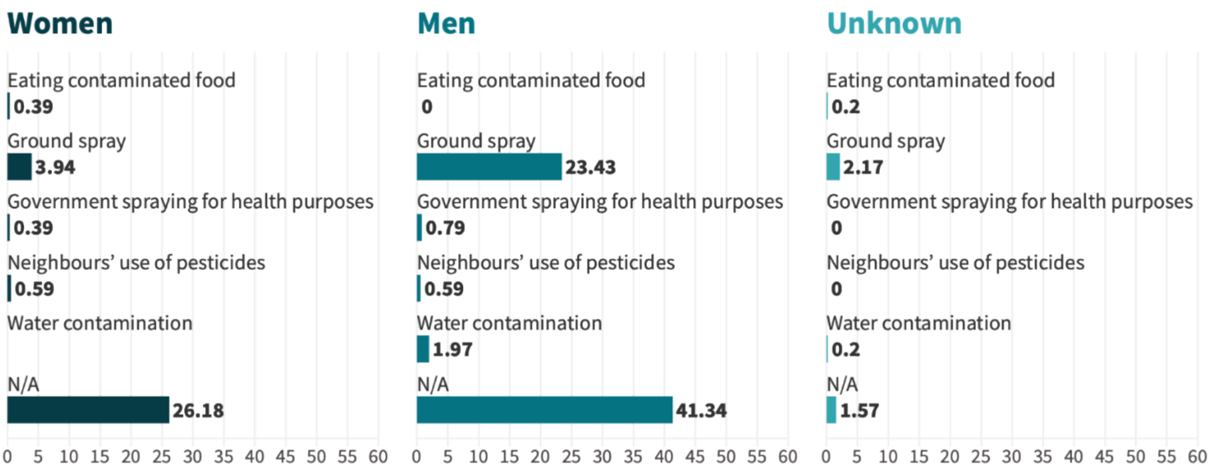
- The majority of farmers (136, 26.77%) did not decant pesticides (women: 26, 5.12%; men: 109, 21.46%; unknown: 1, 0.20%; Figure 104).

Figure 104. **Pesticide decanting by farmers in Kerala (%)**



- Farmers were constantly (150, 29.53%) exposed to pesticides through ground spraying (women: 20, 3.94%; men: 119, 23.43%; unknown: 11, 2.17%; Figure 105).

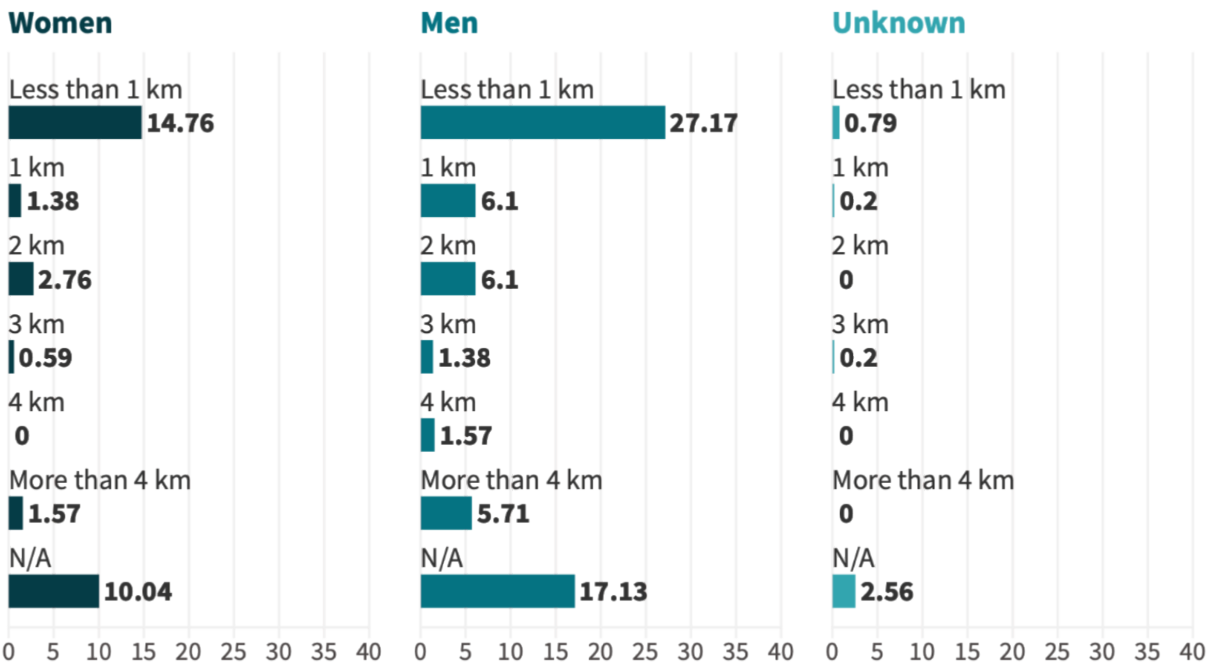
Figure 105. **Farmers' exposure to pesticides in Kerala (%)**



Note: Total is not equal to 100% due to multiple responses

- Most farmers in Kerala lived less than 1 kilometre (217, 42.72%; women: 75, 14.76%; men: 138, 27.17%; unknown: 4, 0.79%; Figure 106) from where pesticide spraying takes place.

Figure 106. **Distance between farmers' homes and pesticide spraying locations (%)**



- The most common pesticides used by farmers in Kerala are chlorpyrifos (148, 29.13%; Table 35; Image 3), followed by glyphosate (101, 19.88%) and most of these pesticides are used in banana, coffee and vegetable cultivation.

Image 3. **Some of the pesticides commonly used by farmers in Kerala (Hilban-Chlorpyrifos, Glytaf-Glyphosate, and Ekalux-Quinalphos)**

Table 35.a. **List of pesticides used by farmers in Kerala**

PESTICIDE	CROPS TREATED	NO. OF FARMERS	%
2, 4 D	RICE	1	0.20
Acetamiprid	BANANA	2	0.39
Alpha-naphthyl acetic acid	BANANA, VEGETABLES	2	0.39
Azoxystrobin	-	5	0.98
Bispyribac sodium	RICE	18	3.54
Carbaryl	COCONUT	1	0.20
Carbendazim	BANANA, COFFEE, VEGETABLES	83	16.34
Carbofuran	VEGETABLES	72	14.17
Chlorantraniliprole	BANANA, VEGETABLES, RICE	4	0.79
Chlorimuron ethyl	PADDY, VEGETABLES	7	1.38
Chlorpyrifos	BANANA, COFFEE, VEGETABLES	148	29.13
Cypermethrin	COFFEE, BANANA, PADDY	5	0.98
Cyromazine	BANANA	2	0.39
DDT	BANANA	8	1.57
Dimethoate	RICE, VEGETABLES	7	1.38
Disodium octaborate tetrahydrate	-	2	0.39
Esfenvalerate	VEGETABLES	9	1.77
Ethion	BANANA	2	0.39
Fenvalerate	VEGETABLES	1	0.20
Fipronil	BANANA	1	0.20
Flubendiamide	BANANA, VEGETABLES	3	0.59
Glyphosate	BANANA, COFFEE, VEGETABLES	101	19.88
Imidacloprid	BANANA	7	1.38
Lambda cyhalothrin	VEGETABLES	11	2.17
Malathion	-	5	0.98
Mancozeb	BANANA, COFFEE	83	16.34
Metaldehyde	BANANA	2	0.39
Metsulfuron-methyl	RICE	7	1.38
Naphthalene	BANANA	5	0.98
Permethrin	-	5	0.98
Propineb	VEGETABLES	2	0.39

PESTICIDE	CROPS TREATED	NO. OF FARMERS	%
Quinalphos	BANANA, COFFEE, VEGETABLES	85	16.73
Tebuconazole	-	5	0.98
Thiamethoxam	VEGETABLES	6	1.18
Thifensulfuron methyl	-	5	0.98
Tribenuron methyl	-	5	0.98
Trifluralin	-	2	0.39

Note: Total is not equal to 100% due to multiple responses

Table 35.b. **Classification of pesticides used by farmers in Kerala**

PESTICIDE	WHO CLASS[103]	PAN HHP LIST[104]	NO. OF COUNTRIES BANNED[105]
2, 4 D	II MODERATELY HAZARDOUS	X (GHS+ C2 & R2)	10
Acetamiprid	II MODERATELY HAZARDOUS	-	NOT KNOWN TO BE BANNED
Alpha-naphthyl acetic acid	III SLIGHTLY HAZARDOUS	-	NOT KNOWN TO BE BANNED
Azoxystrobin	U UNLIKELY TO PRESENT ACUTE HAZARD	-	NOT KNOWN TO BE BANNED
Bispyribac sodium	III SLIGHTLY HAZARDOUS	-	NOT KNOWN TO BE BANNED
Carbaryl	II MODERATELY HAZARDOUS	X (EPA PROB LIKEL CARC, GHS+ C2 & R2)	48
Carbendazim	U UNLIKELY TO PRESENT ACUTE HAZARD	X (GHS+ MUTA (1A, 1B), GHS+ REPRO (1A ,1B))	41
Carbofuran	IB HIGHLY HAZARDOUS	X (WHO IB, H330, HIGHLY TOXIC TO BEES)	106
Chlorantraniliprole	U UNLIKELY TO PRESENT ACUTE HAZARD	X (VERY PERS WATER, SOIL OR SEDIMENT, VERY TOXIC TO AQ. ORGANISM)	NOT KNOWN TO BE BANNED
Chlorimuron ethyl	U UNLIKELY TO PRESENT ACUTE HAZARD	-	NOT KNOWN TO BE BANNED
Chlorpyrifos	II MODERATELY HAZARDOUS	X (GHS+ REPRO (1A ,1B), HIGHLY TOXIC TO BEES)	44
Cypermethrin	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	42
Cyromazine	II MODERATELY HAZARDOUS	-	NOT KNOWN TO BE BANNED

[103] World Health Organization. (2019). The WHO recommended classification of pesticides by hazard and guidelines to classification. https://www.who.int/publications/i/item/9789240005662

[104] Pesticide Action Network International. (2024). PAN International list of highly hazardous pesticides. https://pan-international.org/wp-content/uploads/PAN_HHP_List.pdf

[105] Pesticide Action Network International. (2024). Consolidated list of banned pesticides. https://pan-international.org/pan-international-consolidated-list-of-banned-pesticides/

PESTICIDE	WHO CLASS	PAN HHP LIST	NO. OF COUNTRIES BANNED
DDT	II MODERATELY HAZARDOUS	X (IARC PROB CARC, EPA PROB LIKEL CARC, GHS+ C2 & R2, VERY PERS WATER, SOIL OR SEDIMENT, VERY TOXIC TO AQ. ORGANISM, PIC, POP)	150
Dimethoate	II MODERATELY HAZARDOUS	X (GHS+ REPRO (1A ,1B), HIGHLY TOXIC TO BEES)	38
Disodium octaborate tetrahydrate	-	X (GHS+ REPRO (1A ,1B))	NOT KNOWN TO BE BANNED
Esfenvalerate	II MODERATELY HAZARDOUS	X (H330, HIGHLY TOXIC TO BEES)	NOT KNOWN TO BE BANNED
Ethion	II MODERATELY HAZARDOUS	X (H330)	35
Fenvalerate	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	38
Fipronil	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	49
Flubendiamide	III SLIGHTLY HAZARDOUS	X (VERY PERS WATER, SOIL OR SEDIMENT, VERY TOXIC TO AQ. ORGANISM)	1
Glyphosate	III SLIGHTLY HAZARDOUS	X (EPA PROB LIKEL CARC)	12
Imidacloprid	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	29
Lambda cyhalothrin	II MODERATELY HAZARDOUS	X (H330, HIGHLY TOXIC TO BEES)	NOT KNOWN TO BE BANNED
Malathion	III SLIGHTLY HAZARDOUS	X (GHS+ CARC (1A, 1B), IARC PROB CARC, HIGHLY TOXIC TO BEES)	40
Mancozeb	U UNLIKELY TO PRESENT ACUTE HAZARD	X (EPA PROB LIKEL CARC, GHS+ REPRO (1A ,1B), EU EDC)	37
Metaldehyde	II MODERATELY HAZARDOUS	-	8
Metsulfuron-methyl	U UNLIKELY TO PRESENT ACUTE HAZARD	-	1
Naphthalene	II MODERATELY HAZARDOUS	-	36
Permethrin	II MODERATELY HAZARDOUS	-	39

PESTICIDE	WHO CLASSH	PAN HHP LIST	NO. OF COUNTRIES BANNED
Propineb	U UNLIKELY TO PRESENT ACUTE HAZARD	X (EPA PROB LIKEL CARC)	31
Quinalphos	II MODERATELY HAZARDOUS	X (GHS+ C2 & R2, HIGHLY TOXIC TO BEES)	32
Tebuconazole	II MODERATELY HAZARDOUS	X (H330, GHS+ C2 & R2)	2
Thiamethoxam	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	28
Thifensulfuron methyl	U UNLIKELY TO PRESENT ACUTE HAZARD	-	NOT KNOWN TO BE BANNED
Tribenuron methyl	U UNLIKELY TO PRESENT ACUTE HAZARD	-	NOT KNOWN TO BE BANNED
Trifluralin	U UNLIKELY TO PRESENT ACUTE HAZARD	X (GHS+ C2 & R2, VERY BIO ACC)	38

† Not banned in any country but approval has been withdrawn in the European Union.
*Please refer to Annex A for explanatory notes on HHPs

TOP 10 PESTICIDES USED BY FARMERS IN KERALA

1. CHLORPYRIFOS	29.13%
2. GLYPHOSATE	19.88%
3. QUINALPHOS	16.73%
4. CARBENDAZIM	16.34%
5. MANCOZEB	16.34%
6. CARBOFURAN	14.17%
7. BISPYRIBAC SODIUM	3.54%
8. LAMBDA CYHALOTHRIN	2.17%
9. ESFENVALERATE	1.77%
10. DDT	1.57%

Chlorpyrifos is a Class II pesticide (moderately hazardous) associated with a range of acute and chronic health effects. It is known to cause reproductive toxicity, neurotoxicity, and genotoxicity[106]. The compound acts by blocking the enzyme cholinesterase, which leads to the overstimulation of the nervous system. Acute symptoms of exposure include nausea, dizziness, confusion, slurred speech, tremors, ataxia, convulsions, depression of respiratory and circulatory centers, respiratory paralysis, and even death[107]. The most serious long-term health impacts of chlorpyrifos are observed in children, particularly during brain development. Even very low-level exposure during the foetal stage has been shown to cause structural changes in the developing brain, leading to significant and often irreversible losses in cognitive function, such as reduced IQ and impaired working memory[108].

As mentioned in Section 3, scientific evidence has linked the class III (slightly hazardous) glyphosate exposure to multiple adverse health effects. Studies indicate that glyphosate can damage liver, kidney, and skin cells; in skin, it has been associated with premature aging and potentially increased cancer risk.[109] Its absorption through the skin may increase up to fivefold when the skin is already damaged. Glyphosate has also been shown to disrupt estrogen, androgen, and other steroidogenic pathways, and has been associated with the proliferation of human breast cancer cells.[110] Furthermore, exposure to glyphosate-based herbicides, even at very low doses, has been linked to reproductive health problems, including miscarriages, pre-term deliveries, low birth weights, and birth defects.[111] Evidence also suggests that glyphosate formulations can interfere with the immune system, leading to adverse respiratory outcomes such as asthma, as well as contributing to conditions like rheumatoid arthritis and autoimmune effects on the skin and mucous membranes.[112]

[106] Wołejko, E., Łozowicka, B., Jabłońska-Trypuć, A., Pietruszyńska, M., & Wydro, U. (2022). Chlorpyrifos Occurrence and Toxicological Risk Assessment: A Review. International journal of environmental research and public health, 19(19), 12209. https://doi.org/10.3390/ijerph191912209

[107] Watts, M. (2022). Urgent Need to Ban the Brain-Harming Chlorpyrifos – Policy brief. https://panap.net/resource/urgent-need-to-ban-the-brain-harming-chlorpyrifos/?ind=1658812902276&filename=Chlorpyrifos-PANAP-Policy-Brief.pdf&wpdmdl=4760&refresh=68c14945e8cc01757497669

[108] Ibid

[109] PAN International. (2016). Glyphosate monograph. https://panap.net/resource/glyphosate-monograph/?ind=1603270594025&filename=Glyphosate-monograph.pdf&wpdmdl=3364&refresh=68c1285e7dd681757489246

[110] Ibid

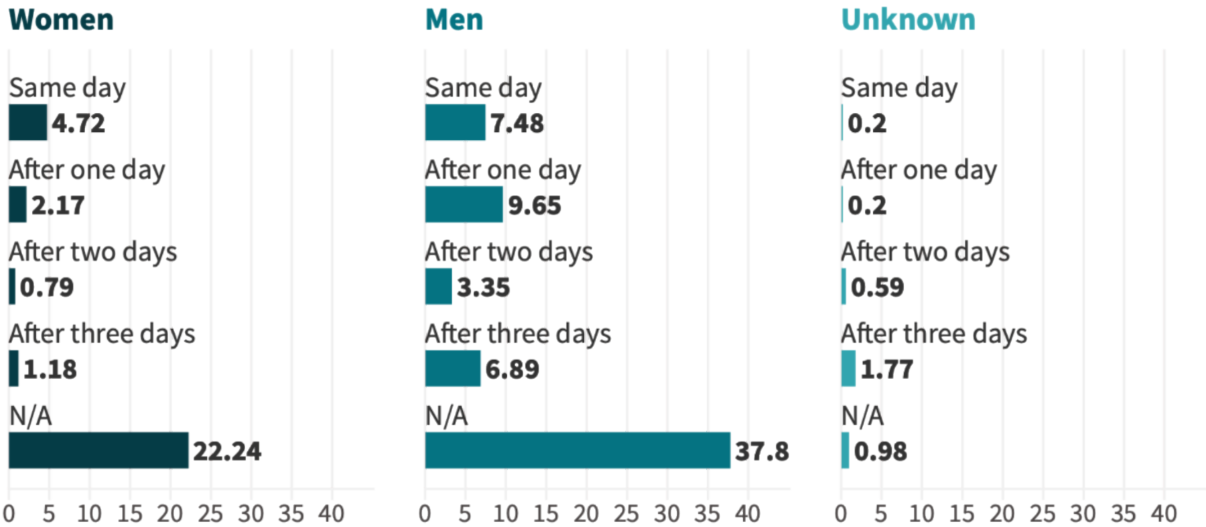
[111] Ibid

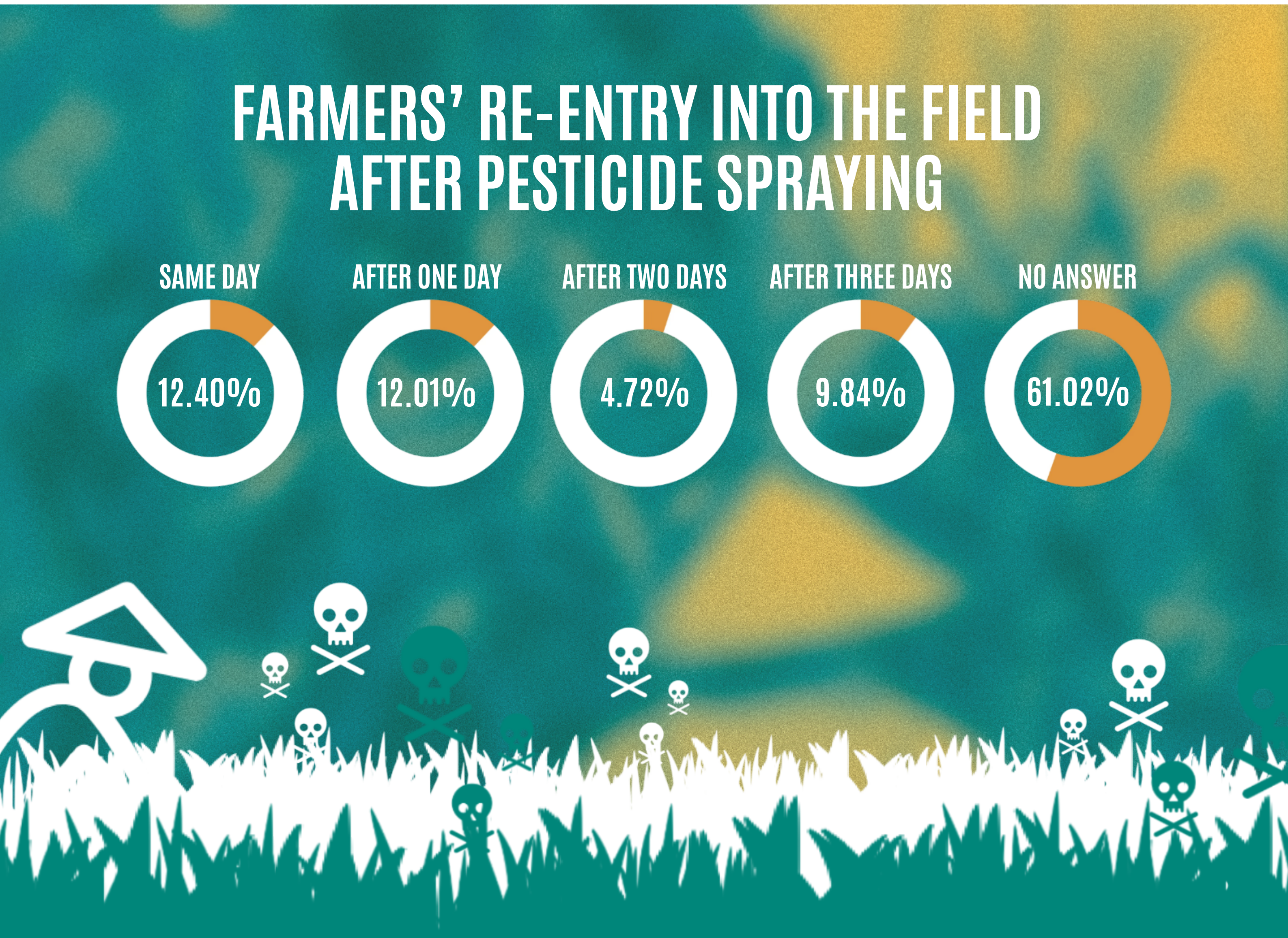
[112] Ibid

Pesticide exposure and spillage

- Most farmers in Kerala re-entered their field on the same day (63, 12.40%) after pesticide spraying takes place (women: 24, 4.72%; men: 38, 7.48%; unknown: 1, 0.20%; Figure 107).

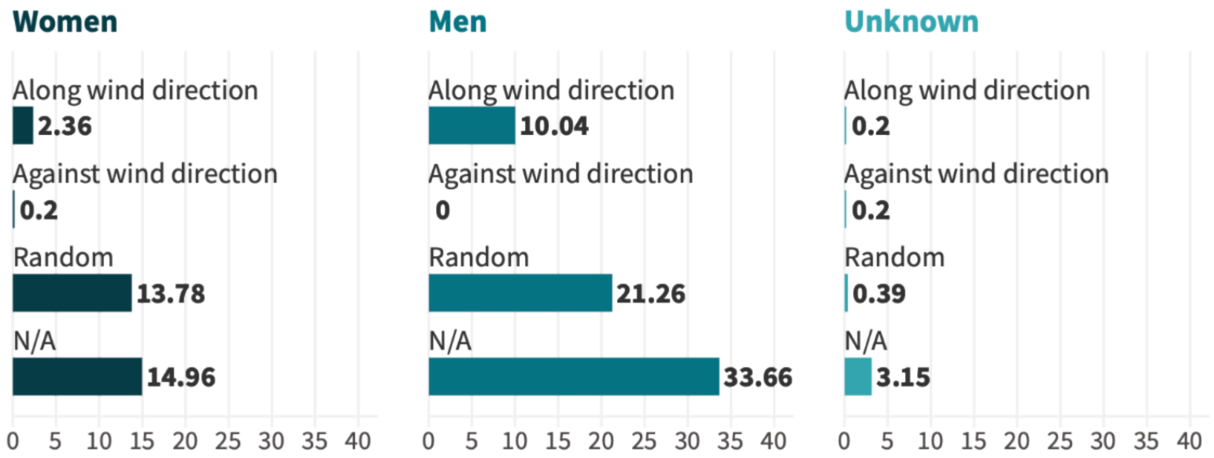
Figure 107. **Re-entry after pesticides have been sprayed (%)**

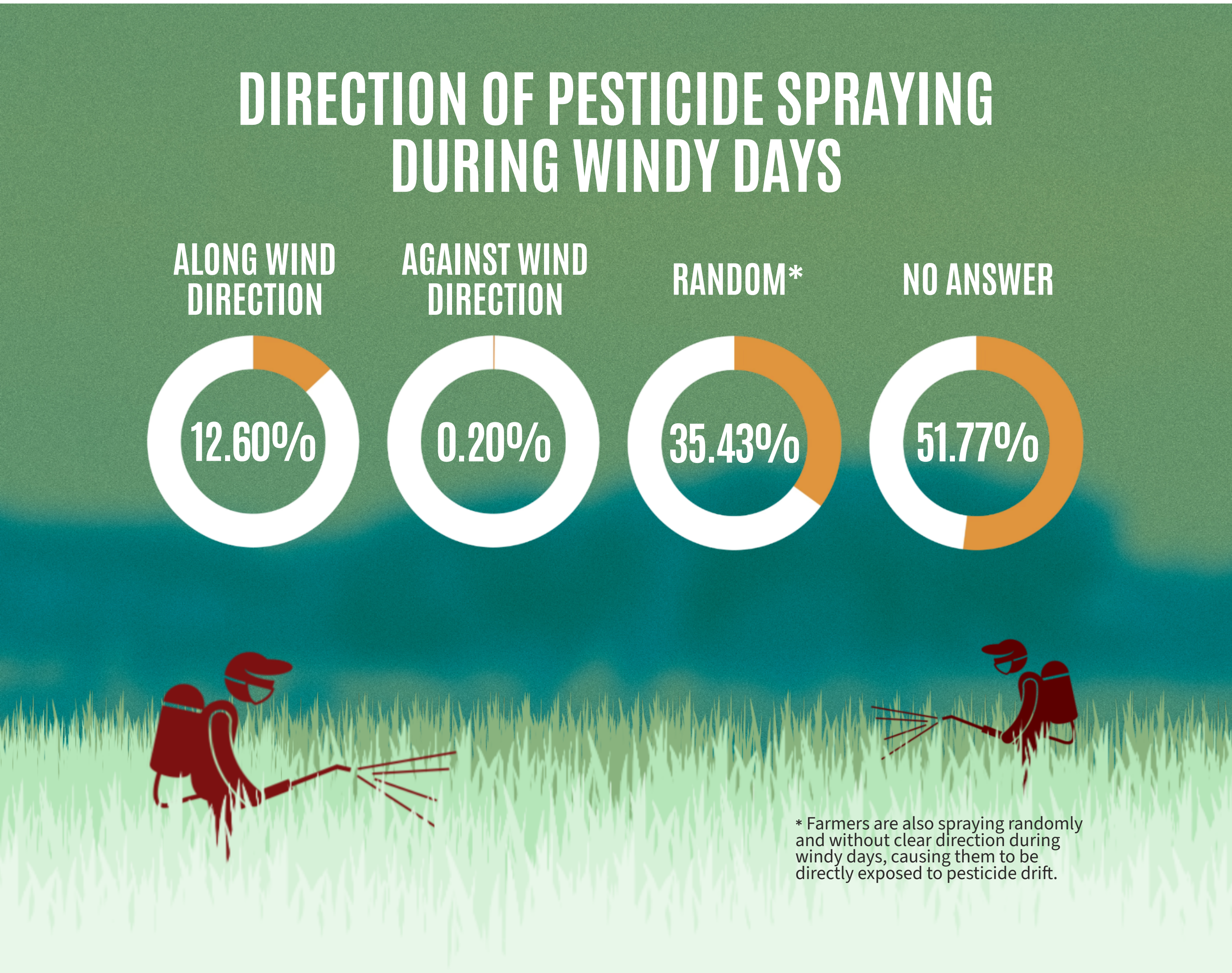




- The majority of farmers (180, 35.43%) sprayed pesticides without specific guidelines (women: 70, 13.78%; men: 108, 21.26%; unknown: 2, 0.39%; Figure 108).

Figure 108. **Direction of pesticide spraying during windy days (%)**



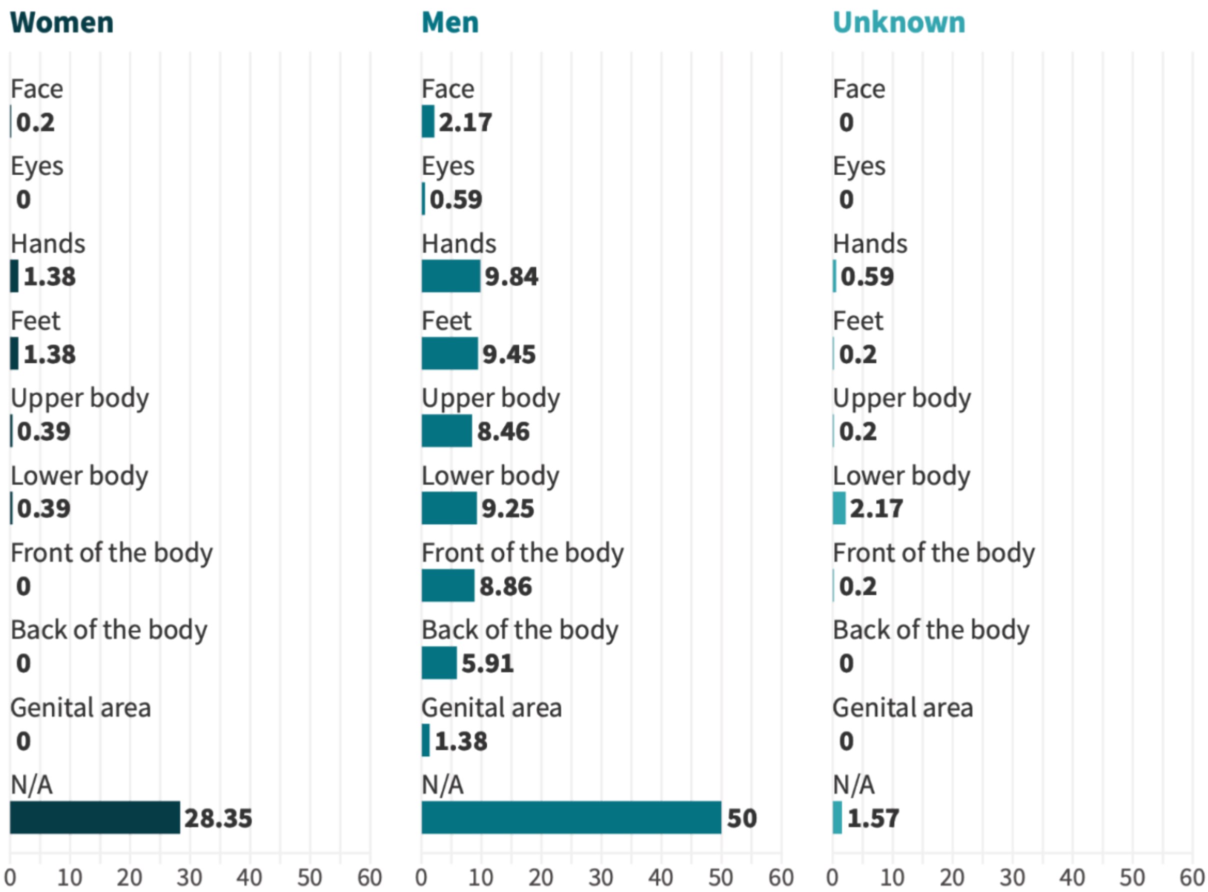


- Ninety-nine farmers (19.49%) experienced pesticide spillage (women: 10, 1.97%; men: 77, 15.16%; unknown: 12, 2.36%), while 222 farmers (43.70%) did not experience pesticide spillage (women: 92, 18.11%; men: 128, 25.20%; unknown: 2, 0.39%). One hundred and eighty-seven farmers did not answer this question (36.81%; women: 56, 11.02%; men: 126, 24.80%; unknown: 5, 0.98%).

- The majority of farmers (88, 17.32%) experienced spillage while spraying pesticides (women: 6, 1.18%; men: 72, 14.17%; unknown: 10, 1.97%).

- A significant number of farmers (60, 11.81%) experienced spillage on their hands (women: 7, 1.38%; men: 50, 9.84%; unknown: 3, 0.59%) and their lower bodies (women: 2, 0.39%; men: 47, 9.25%; unknown: 11, 2.17%; Figure 109).

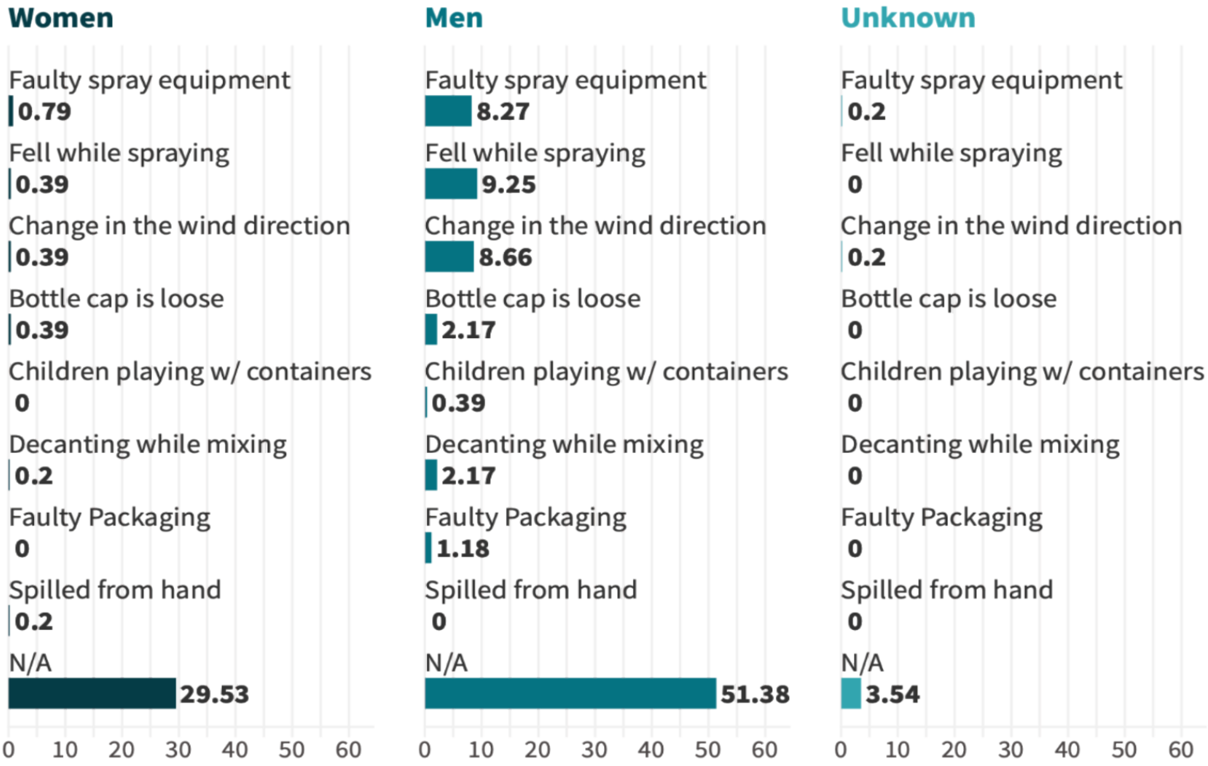
Figure 109. **Body areas exposed to spillage (%)**



Note: Total is not equal to 100% due to multiple responses

- Most farmers (49, 9.65%) experienced pesticide spillage when they fell while spraying (women: 2, 0.39%; men: 47, 9.25%; Figure 110).

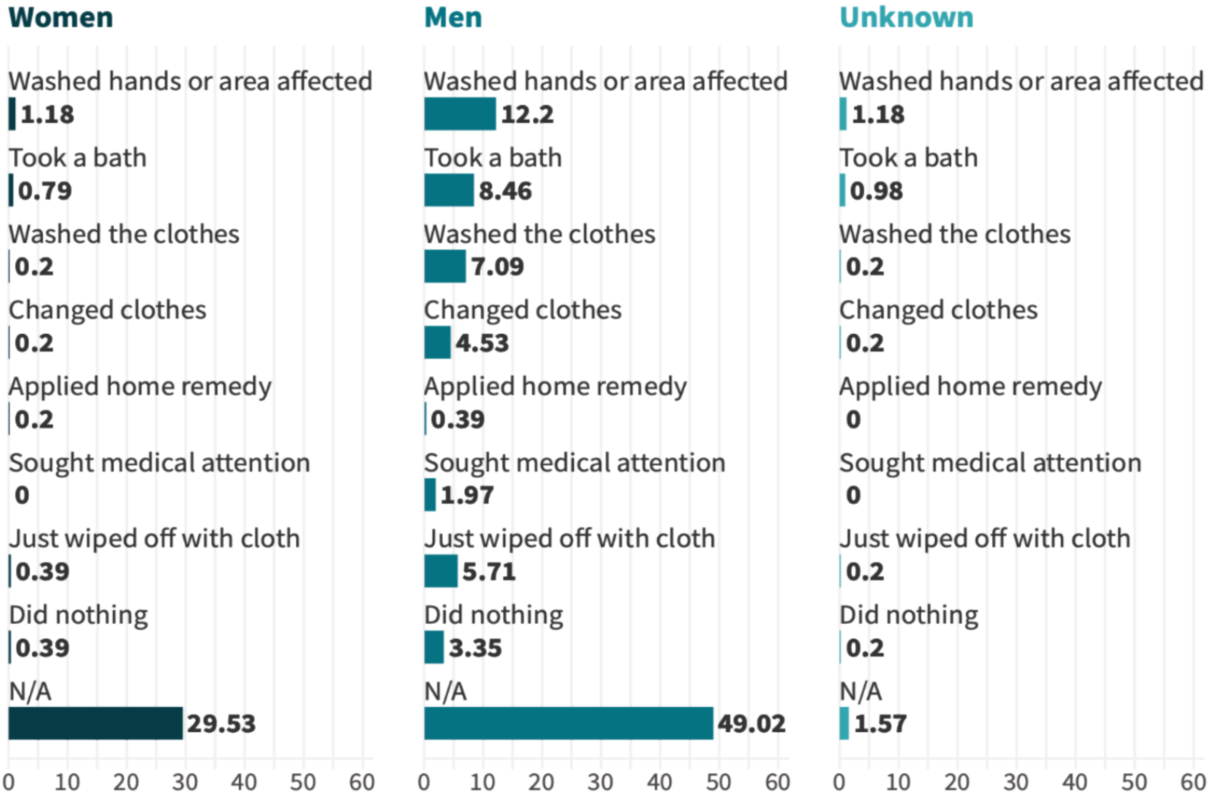
Figure 110. **Causes of pesticide spillage (%)**



Note: Total is not equal to 100% due to multiple responses

- The majority of farmers (74, 14.57%) washed their hands or the affected area when they experienced pesticide spillage (women: 6, 1.18%; men: 62, 12.20%; unknown: 6, 1.18%; Figure 111).

Figure 111. **Actions taken by farmers in response to pesticide spillage (%)**

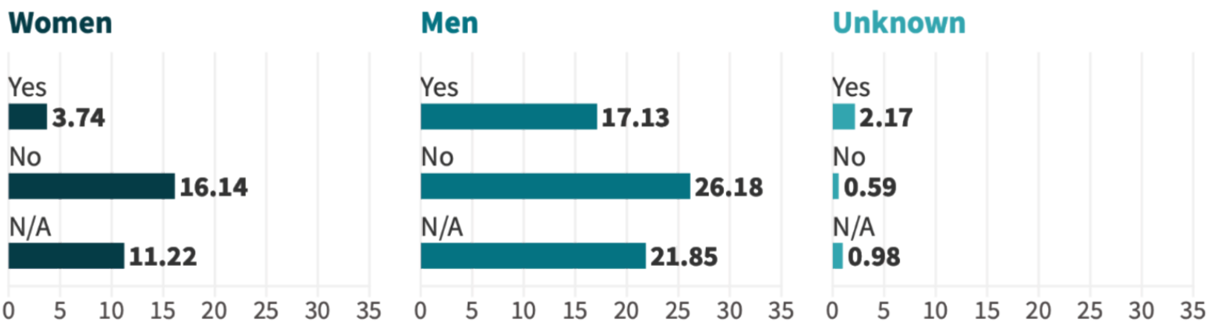


Note: Total is not equal to 100% due to multiple responses

PPE use

- Most farmers (218, 42.91%) did not use PPE when applying pesticides (women: 82, 16.14%; men: 133, 26.13%; unknown: 3, 0.59%; Figure 112).

Figure 112. **Use of PPE by farmers in Kerala (%)**

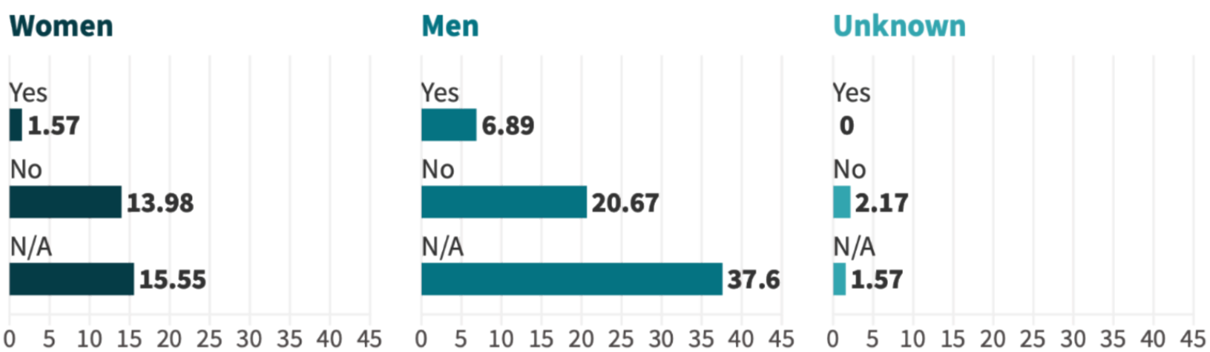


- Among those who used PPE, most farmers (98, 19.29%) acquired it themselves (women: 17, 3.35%; men: 70, 13.78%; unknown: 11, 2.17%; Figure 113).

Figure 113. **PPE provider for farmers in Kerala (%)**

- One hundred and eighty-seven farmers (36.81%) did not receive instructions on how to use PPE (women: 71, 13.98%; men: 105, 20.67%; unknown: 11, 2.17%; Figure 114).

Figure 114. **Availability of PPE instructions (%)**



- Farmers in Kerala mostly used gloves (85, 16.73%; women: 14, 2.76%; men: 70, 13.78%; unknown: 1, 0.20%; Table 36), followed by face masks (81, 15.94%; women: 11, 2.17%; men: 69, 13.58%; unknown: 1, 0.20%).

Table 36. **Types of PPE used by farmers in Kerala**

PPE	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Boots/shoes	11	1.77	63	12.40	1	0.20	**75**	**14.76**
Eyeglasses	1	0.20	2	0.39	-	-	**3**	**0.59**
Face mask	11	2.17	69	13.58	1	0.20	**81**	**15.94**
Gloves	14	2.76	70	13.78	1	0.20	**85**	**16.73**
Long pants	7	1.38	64	12.60	1	0.20	**72**	**14.17**
Long-sleeved shirt	13	1.97	71	13.19	1	0.20	**85**	**16.73**
Overalls	1	0.20	4	0.79	-	-	**6**	**1.18**
N/A	142	27.95	255	50.20	-	-	**397**	**78.15**

Note: Total is not equal to 100% due to multiple responses

FARMERS' USE OF PPE IN KERALA

- USING PPE: 30.80%
- NOT USING PPE: 55.36%
- NO ANSWER: 13.84%

TYPES OF PPE USED BY FARMERS

- EYEGLASSES: 0.45%
- FACEMASK: 27.23%
- RESPIRATORS: 0.00
- GLOVES: 2.68%
- LONG-SLEEVED SHIRT: 32.59%
- LONG PANTS: 29.02%
- LUNGI (MEN'S SKIRT): 0.00
- OVERALLS: 0.00
- BOOTS/SHOES: 0.45%

Note: Total is not equal to 100% due to multiple responses

- Some farmers reported that PPE is uncomfortable (27, 5.31%; women: 7, 1.38%; men: 20, 3.94%; Table 37).

Table 37. **Reasons for not using PPE among farmers in Kerala**

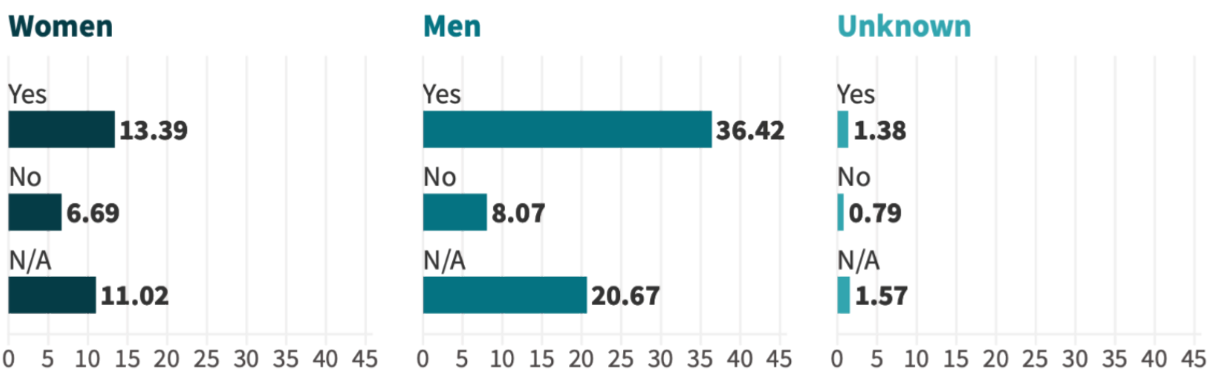
REASON	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Not available	9	1.77	23	2.56	1	0.20	33	6.50
Too expensive	5	0.98	18	3.54	-	-	23	4.53
Uncomfortable	7	1.38	20	3.94	-	-	27	5.31
Unaware/Not concerned	-	-	3	0.59	-	-	3	0.59
N/A	148	29.13	283	55.71	18	3.54	449	88.39

Note: Total is not equal to 100% due to multiple responses

Washing facilities

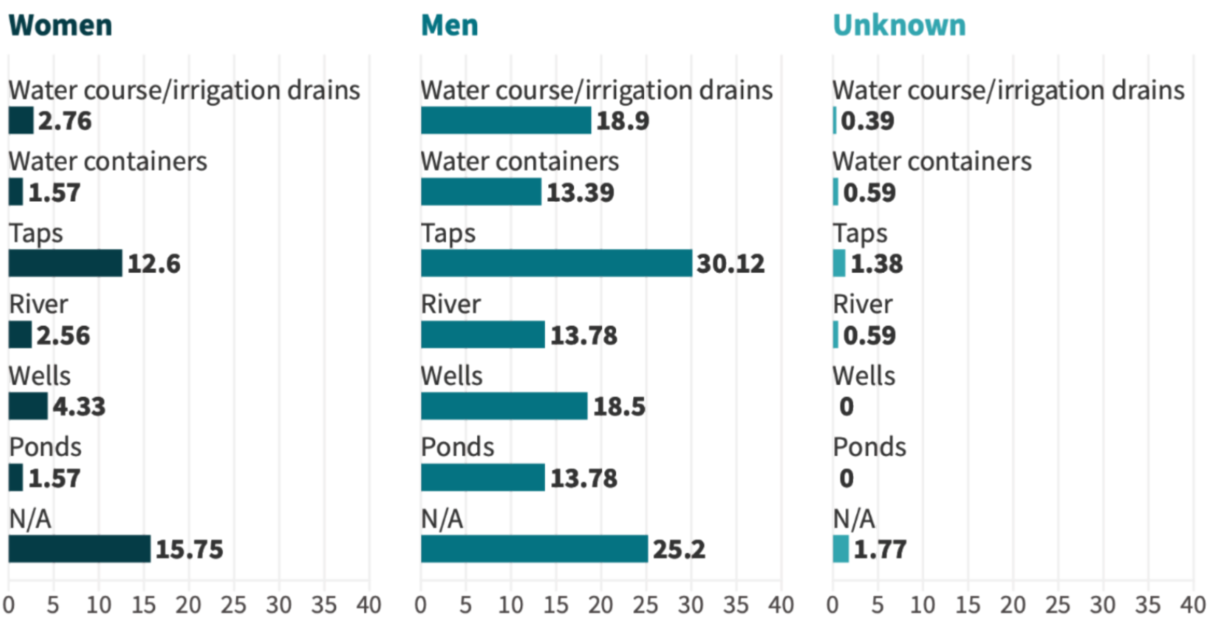
- Two hundred and sixty (51.18%) farmers had washing facilities available after applying pesticides (women: 68, 13.39%; men: 185, 36.42%; unknown: 7, 1.38%; Figure 115).

Figure 115. **Availability of washing facilities in in Kerala (%)**



- Taps were the most commonly used washing facility by farmers (224, 44.09%; women: 64, 12.60%; men: 153, 30.12%; unknown: 7, 1.38%; Figure 116).

Figure 116. **Types of washing facilities for farmers (%)**

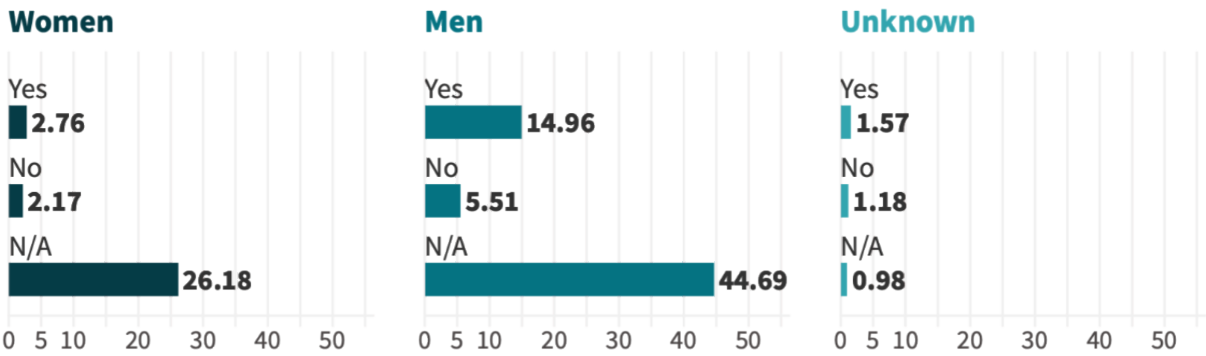


Note: Total is not equal to 100% due to multiple responses

Labels

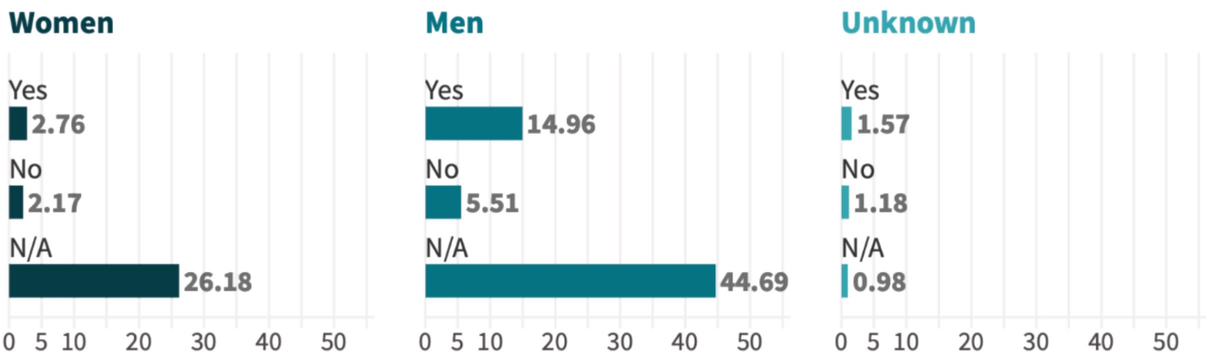
- Ninety-eight farmers (19.29%) had access to the labels of the pesticides they used (women: 14, 2.76%; men: 76, 14.96%; unknown: 8, 1.57%; Figure 117).

Figure 117. **Farmers' access to labels on pesticides they use (%)**



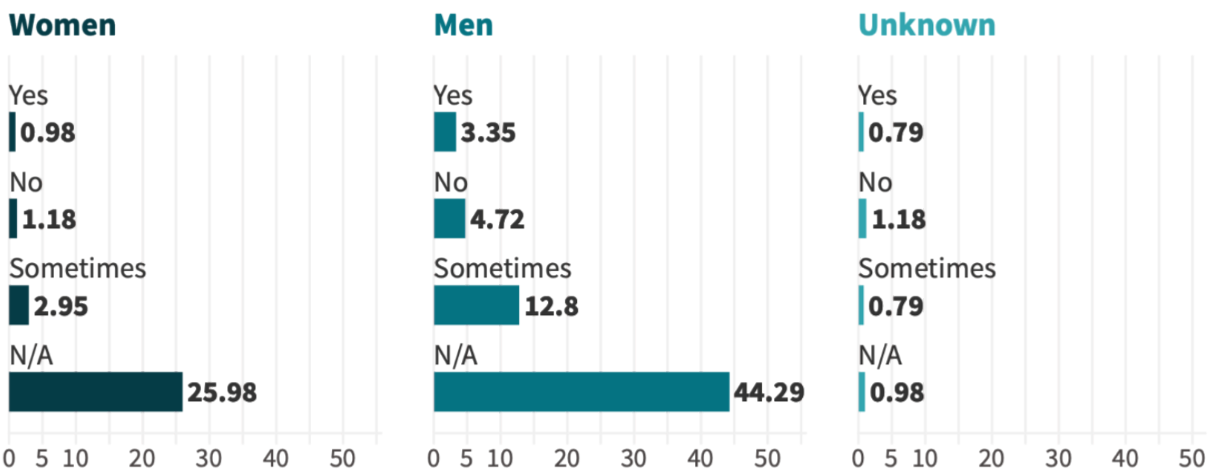
- Most farmers (84, 16.54%) only read the labels sometimes (women: 15, 2.95%; men: 65, 12.80%; unknown: 4, 0.79%; Figure 118).

Figure 118. **Pesticide label reading practices among farmers (%)**



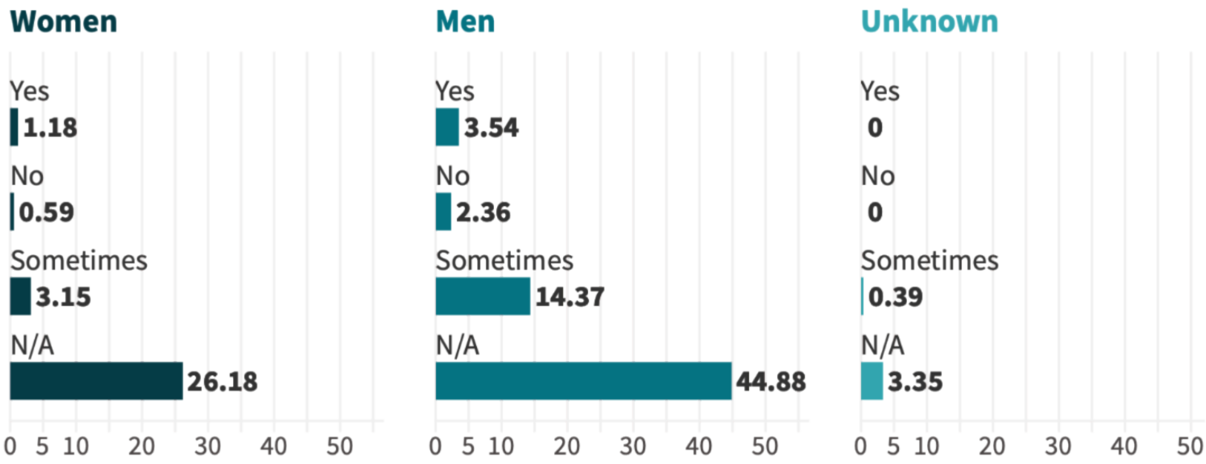
- Additionally, farmers found that most labels (84, 16.54%) were not usually available in local languages (women: 14, 2.76%; men: 65, 12.80%; unknown: 5, 0.98%; Figure 119).

Figure 119. **Availability of pesticide labels in in local language (%)**



- Farmers (91, 17.91%) also find that the information on the pesticide labels was only sometimes readable (women: 16, 3.15%; men: 73, 14.37%; unknown: 2, 0.39%; Figure 120).

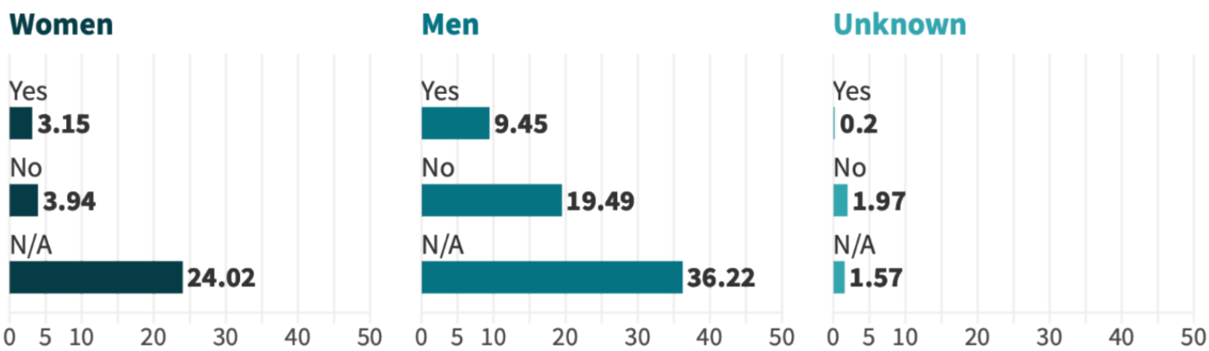
Figure 120. **Legibility of pesticide information labels (%)**



Training on pesticide use, purchase, storage and disposal

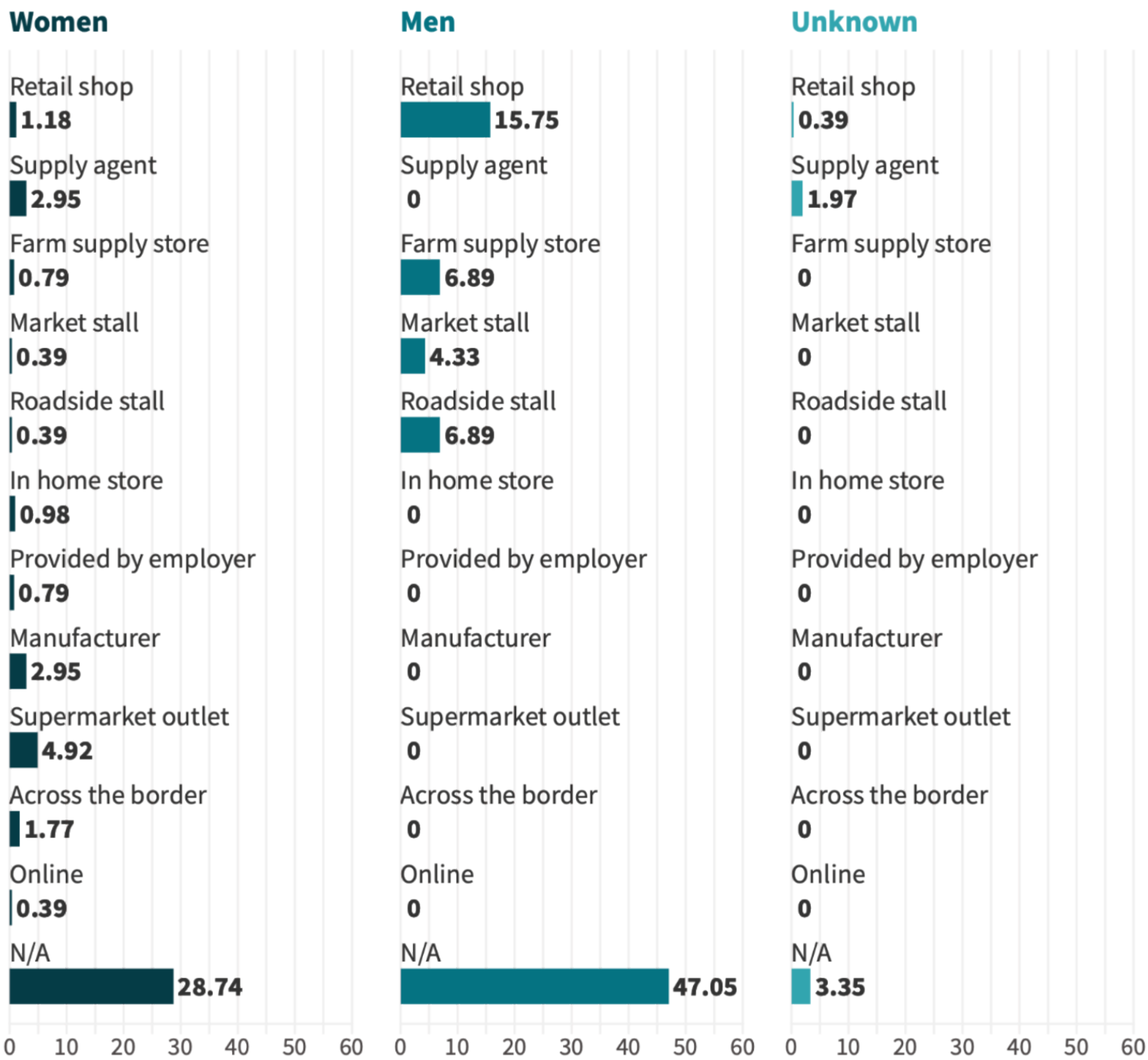
- Farmers (129, 25.39%) were not trained on the pesticide that they used (women: 20, 3.94%; men: 99, 19.495; unknown: 10, 1.97%; Figure 121).

Figure 121. **Farmers' training on handling and using pesticides (%)**



- Most farmers (88, 17.32%) purchased their pesticides from retail shops (women: 6, 1.18%; men: 80, 15.75%; unknown: 2, 0.39%; Figure 122).

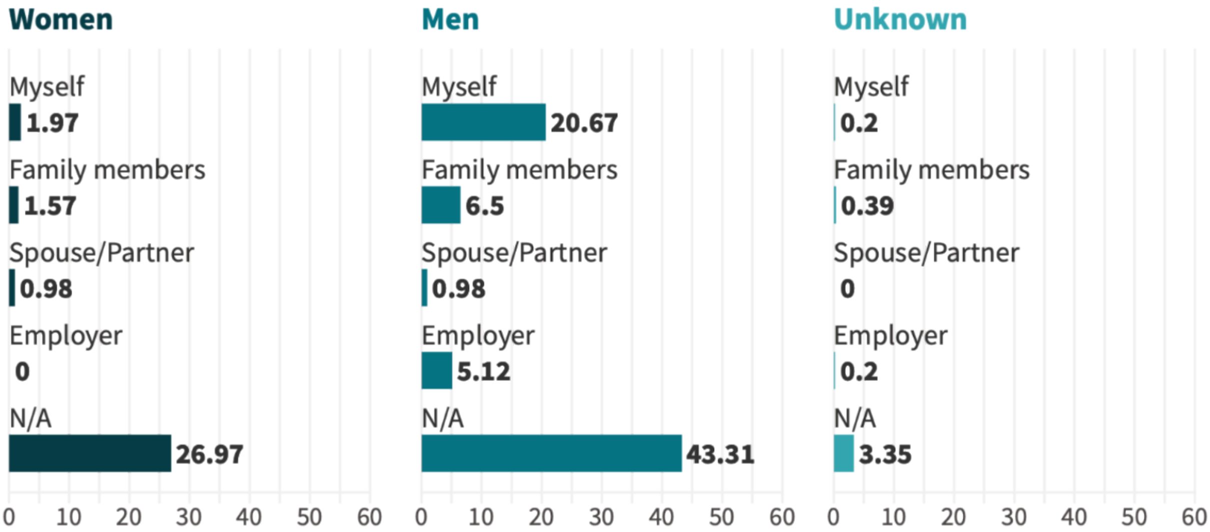
Figure 122. **Farmers' pesticide purchase location (%)**



Note: Total is not equal to 100% due to multiple responses

- Farmers mostly (116, 22.83%) purchased the pesticides by themselves (women: 10, 1.97%; men: 105, 20.67%; unknown: 1, 0.20%; Figure 123).

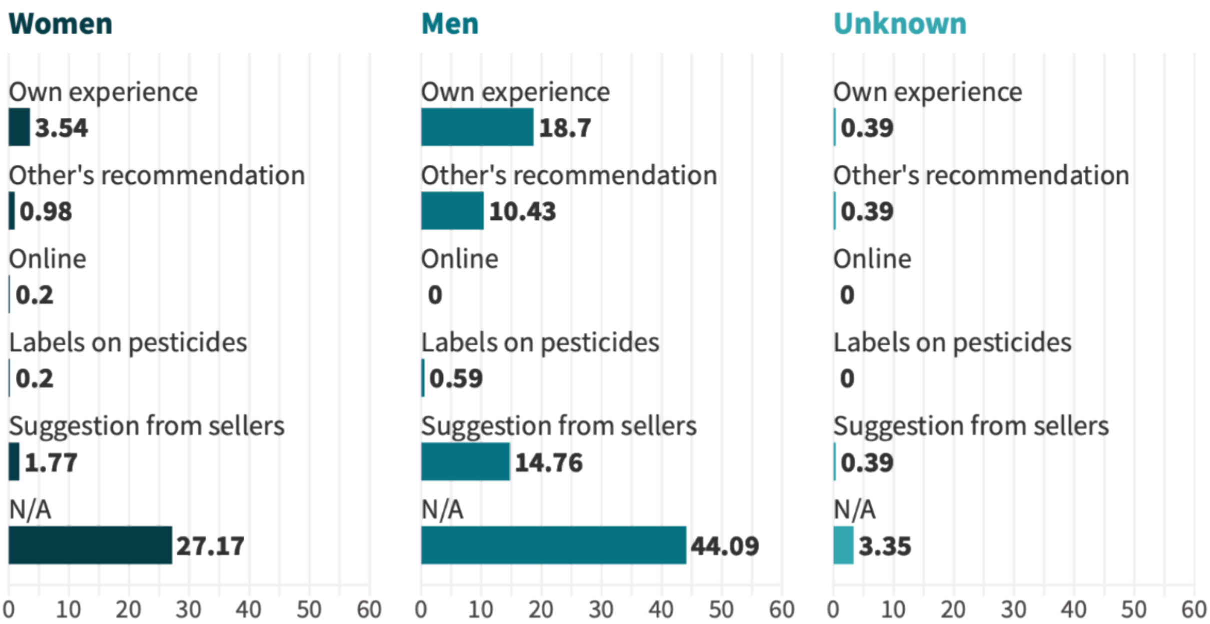
Figure 123. **Person in charge of purchasing pesticides in each household in Kerala (%)**



Note: Total is not equal to 100% due to multiple responses

- These pesticides are primarily purchased based on their own experience (115, 22.64%) (women: 18, 3.54%; men: 95, 18.70%; unknown: 2, 0.39%; Figure 124).

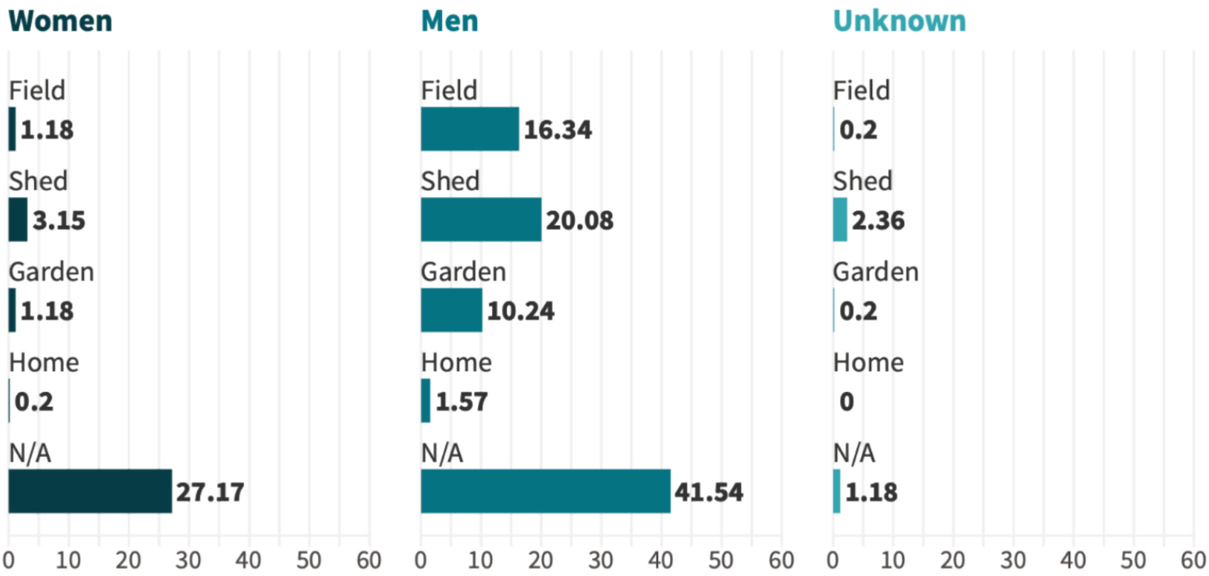
Figure 124. **Factors influencing farmers' pesticide choices in Kerala (%)**



Note: Total is not equal to 100% due to multiple responses

- Farmers often (130, 25.59%) stored pesticides in a shed (women: 16, 3.15%; men: 102, 20.08%; unknown: 12, 2.36%; Figure 125).

Figure 125. **Pesticide storage locations used by farmers in Kerala (%)**



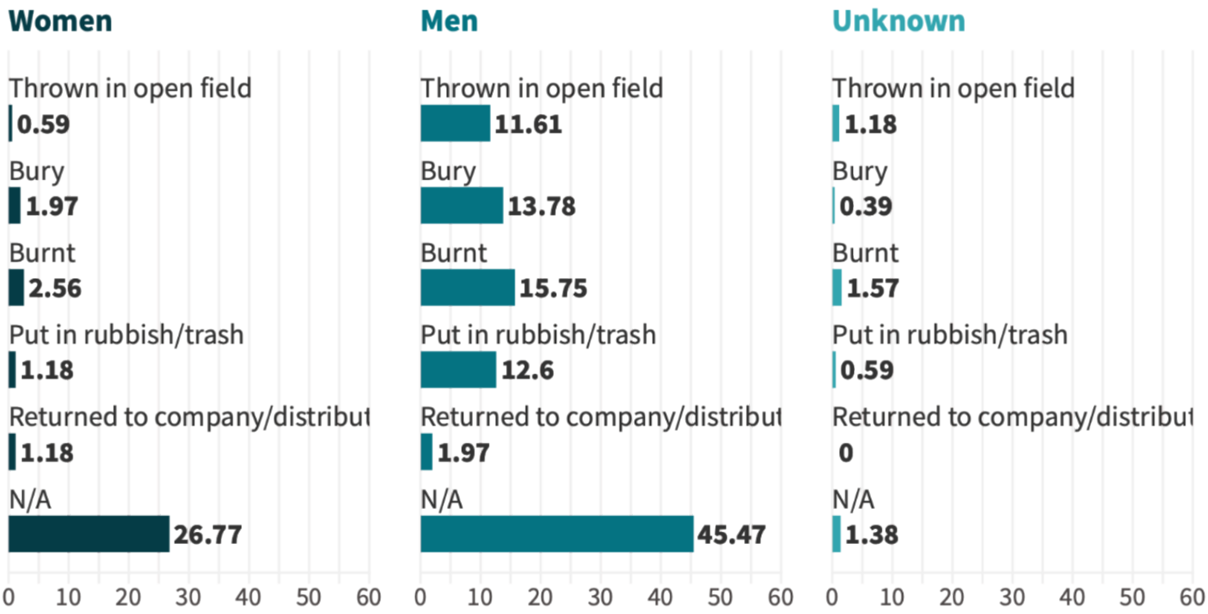
Note: Total is not equal to 100% due to multiple responses

PESTICIDE STORAGE LOCATION BY FARMERS IN KERALA

	WOMEN	MEN	UNKNOWN
HOME	0.20%	1.57%	0.00
FIELD	1.18%	16.34%	0.20%
SHED	3.15%	20.08%	2.36%
GARDEN	1.18%	10.24%	0.20%

- Most farmers (101, 19.88%) disposed of pesticides by burning them, risking exposure to the chemicals (women: 13, 2.56%; men: 80, 15.75%; unknown: 8, 1.57%; Figure 126). Burning pesticide containers can release toxic compounds, due to both the plastic materials of the containers and the chemical structure of the pesticide residues left inside.

Figure 126. **Pesticide disposal methods used by farmers in Kerala (%)**



Note: Total is not equal to 100% due to multiple responses

Illness after pesticide exposure

- Farmers most commonly experienced headaches (71, 13.98%; women: 4, 0.79%; men: 29, 5.71%; unknown: 7, 1.38%; Table 38) when exposed to pesticides.

Table 38. **Pesticide exposure symptoms reported by farmers in Kerala**

SYMPTOMS	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Blurred vision	-	-	5	0.98	-	-	**5**	**0.98**
Diarrhoea	-	-	4	0.79	-	-	**4**	**0.79**
Difficulty of breathing	1	0.20	2	0.39	-	-	**3**	**0.59**
Dizziness	2	0.39	16	3.15	-	-	**18**	**3.54**
Excessive salivation	1	0.20	14	2.76	1	0.20	**16**	**3.15**
Excessive sweating	-	-	6	1.18	-	-	**6**	**1.18**
Hand tremors	1	0.20	1	0.20	-	-	**1**	**0.20**
Headaches	4	0.79	65	12.80	2	0.39	**71**	**13.98**
Irregular heartbeat	1	0.20	12	2.36	-	-	**13**	**2.56**
Nausea	-	-	9	1.77	-	-	**9**	**1.77**
Skin rashes	3	0.59	29	5.71	7	1.38	**39**	**7.68**
Sleeplessness/ Insomnia	-	0.00	1	0.20	-	-	**1**	**0.20**
Staggering	-	-	3	0.59	-	-	**3**	**0.59**
Vomiting	-	-	12	2.36	-	-	**12**	**2.36**
N/A	149	29.33	243	47.83	-	-	**392**	**77.17**

Note: Total is not equal to 100% due to multiple responses

- Despite not being pregnant, some women farmers experienced dizziness (2, 0.39%), which could possibly be related to pesticide exposure, though other factors cannot be ruled out.

- Additionally, most farmers (223, 43.90%) sought medical help by contacting the hospital when they suspected someone had been poisoned by pesticides (women: 50, 9.84%; men: 159, 31.30%; unknown: 14, 2.76%; Table 39).

Table 39. **Farmers' contacts for suspected pesticide poisoning**

CONTACT	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Company	-	-	4	0.79	1	0.20	**5**	**0.98**
Family member	12	2.36	55	10.83	1	0.20	**68**	**13.39**
Friend	4	0.79	24	4.72	1	0.20	**29**	**5.71**
Hospital	50	9.84	159	31.30	14	2.76	**223**	**43.90**
Local doctor	9	1.77	45	8.86	3	0.59	**57**	**11.22**
Local remedies	5	0.98	32	6.30	1	0.20	**38**	**7.48**
Poison centre	5	0.98	23	4.53	-	-	**28**	**5.51**
N/A	104	20.47	143	28.15	2	0.39	**249**	**49.02**

Note: Total is not equal to 100% due to multiple responses

Highlights of the report from Kerala

67.57% of pesticides are HHPs according to PAN International list of HHPs.

32.43% of pesticides are highly toxic to bees.

42.91% of farmers do not wear PPE.

15.55% of farmers did not have proper access to washing facilities after pesticides application.

42.72% of farmers live less than 1km from pesticide spraying location.

1.77% of farmers store pesticides in their homes.

Summary

In **Kerala**, a significant portion of farmers (35.83%) use pesticides, with men comprising the majority (27.56%) and women accounting for a smaller proportion (5.71%), though majority of the farmers are organic farmers (286, 56.30; women: 127, 25.00%; men: 154, 30.31%; unknown: 5, 0.98%) while the remainder are categorised as unknown. The most commonly used pesticides include chlorpyrifos and glyphosate, primarily applied in banana, coffee, and vegetable cultivation. Experience with pesticide use varies, with the largest group of farmers (10.24%) having used pesticides for less than 10 years, while family members show longer histories of use (6.10% for 10-19 years). Farmers are primarily involved in pesticide spraying, with 31.10% identifying it as a major task. However, many farmers re-enter their fields on the same day pesticides are applied, posing serious health risks. A significant concern is that 42.91% of farmers do not use PPE during pesticide application, further increasing their exposure to hazardous chemicals. Health impacts are already evident, with 13.78% of farmers reporting headaches. Additionally, random pesticide spraying is common, potentially leading to ineffective pest control and heightened health risks. This practice, combined with the absence of protective measures, underscores the urgent need for better pesticide management and stricter safety protocols to mitigate environmental and long-term health impacts. Without proper precautions, pesticide exposure threatens not only the farmers but also their families and the broader environment. In addition, it is important to provide both financial support and practical training to help farmers transition away from pesticide dependence and adopt agroecological practices that are safer, more sustainable, and community-centered.

4.3. Laos

4.3.1. Xieng Khouang Province

Demographic profile

- One thousand and forty-five respondents were surveyed in Xieng Khouang province of whom 516 (49.38%) were women, 523 (50.05%) were men and six (0.57%) had unknown gender.

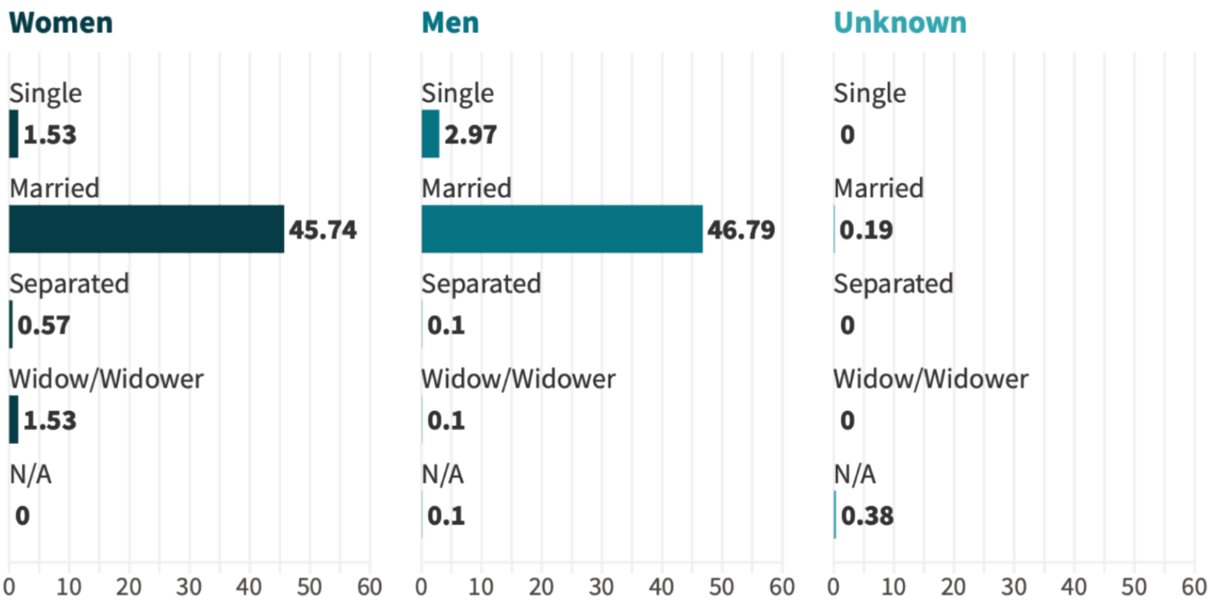
- The majority (358, 34.26%) of farmers were aged between 30 and 39 (women: 205, 19.62%; men: 153, 14.64%; Table 40).

Table 40. **Age range of farmers in Xieng Khouang province**

AGE	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
18 – 19	12	1.15	10	0.96	-	-	**22**	**2.11**
20 – 29	113	10.81	95	9.09	-	-	**208**	**19.90**
30 – 39	205	19.62	153	14.64	-	-	**358**	**34.26**
40 – 49	86	8.23	125	11.96	1	0.10	**212**	**20.29**
50 – 59	61	5.84	72	6.89	1	0.10	**134**	**12.82**
60 – 69	31	2.97	47	4.50	-	-	**78**	**7.46**
70 – 79	7	0.67	19	1.82	-	-	**26**	**2.49**
80 – 89	1	0.10	-	-	-	-	**1**	**0.10**
N/A	-	-	2	0.19	4	0.38	**6**	**0.57**
TOTAL	**516**	**49.38**	**523**	**50.05**	**6**	**0.57**	**1045**	**100.00**

- Most farmers (969, 92.73%) were married (women: 478, 45.74%; men: 489, 46.79%; unknown: 2, 0.19%; Figure 127).

Figure 127. **Marital status of farmers in Xieng Khouang province (%)**

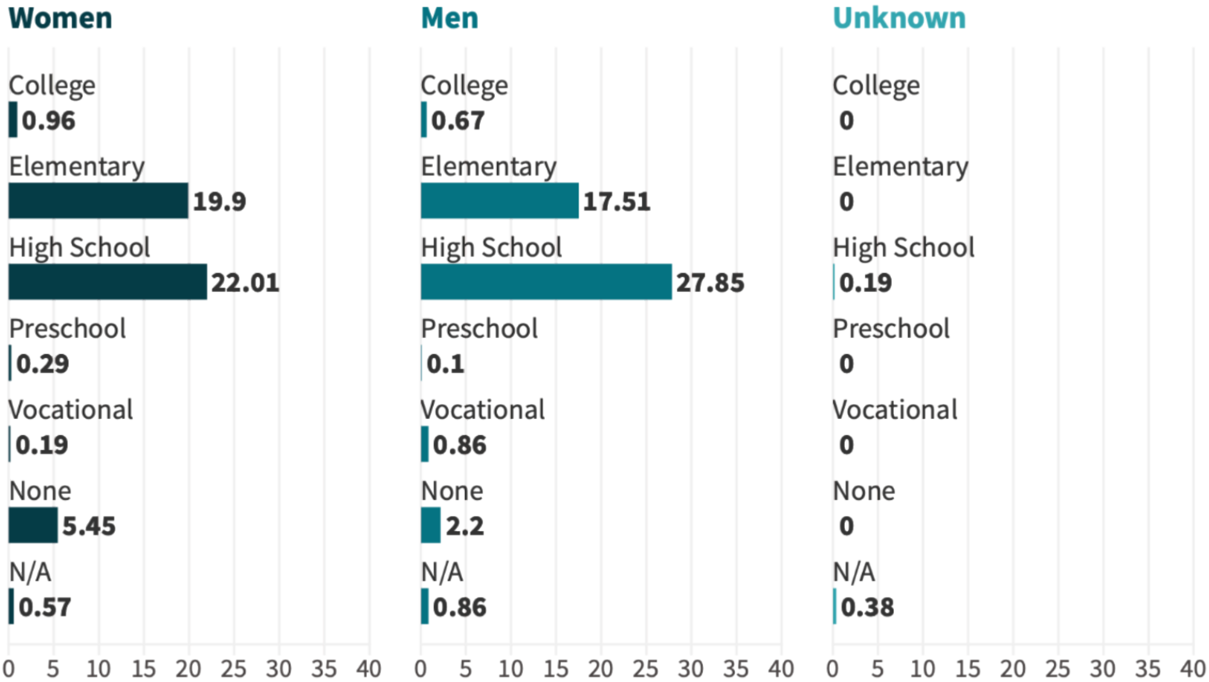


- Twenty-eight women farmers (5.43%) were reported to be pregnant and 57 (11.05%) women farmers did not answer the pregnancy question, while the remaining women farmers (431, 83.53%) reported not being pregnant during the time of survey.

- Meanwhile, almost all the women farmers (419, 81.20%) reported not breastfeeding during the survey period, except for 40 women who were breastfeeding (7.75%), and 57 women farmers (11.05%) who did not respond.

- Five hundred twenty-three (50.05%) farmers attained education up to high school (women: 230, 22.01%; men: 291, 27.85%; unknown: 2, 0.19%; Figure 128).

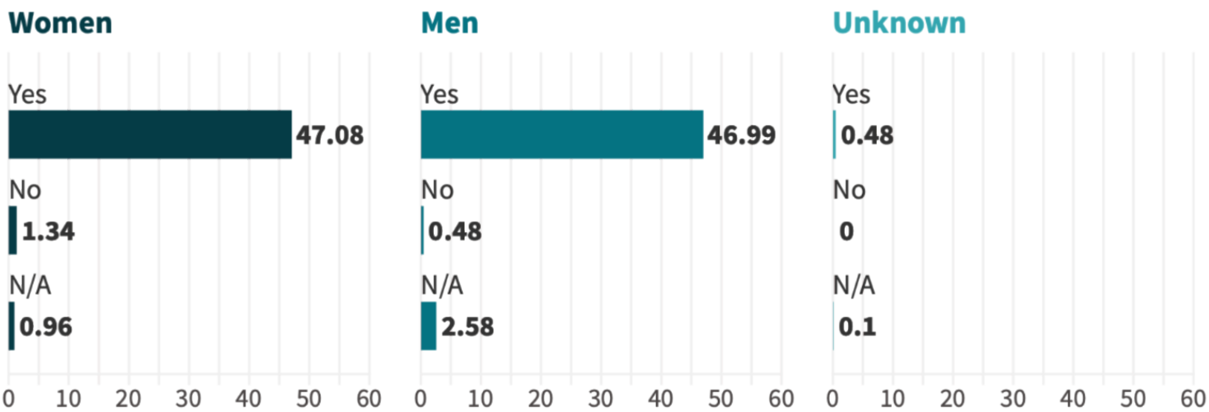
Figure 128. **Education levels of farmers in Xieng Khouang province (%)**



- One thousand and twenty-one farmers (97.70%) reported being self-employed (women: 508, 48.61%; men: 507, 48.52%; unknown: 6, 0.57%) while 13 farmers (1.24%) were employed (women: 3, 0.29%; men: 10, 0.95%) and 11 farmers (1.05%) did not answer (women: 5, 0.48%; men: 6, 0.57%).

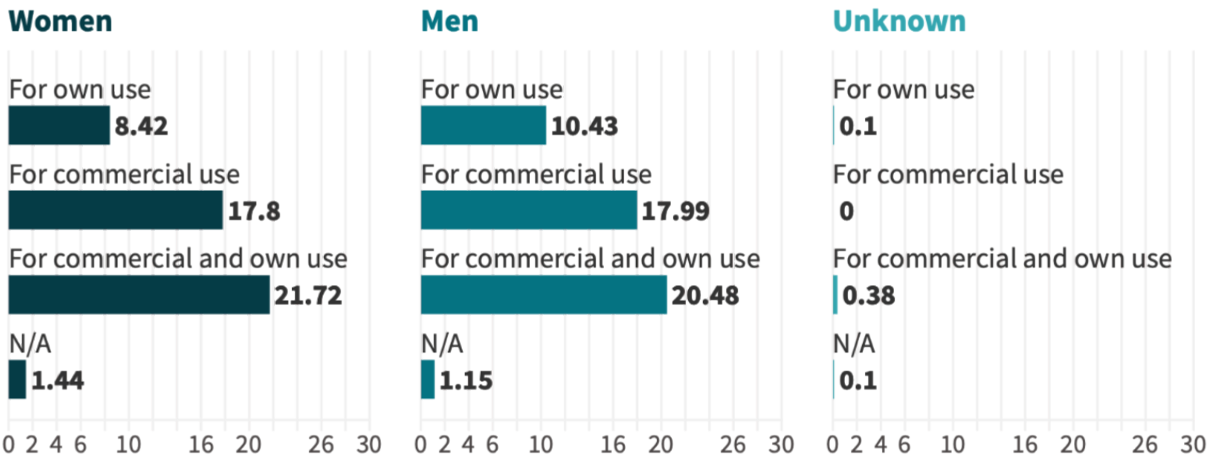
- Most farmers (988, 94.55%) owned the land they were working on (women: 492, 47.08%; men: 491, 46.99%; unknown: 5, 0.48%; Figure 129).

Figure 129. **Land ownership of farmers in Xieng Khouang province (%)**



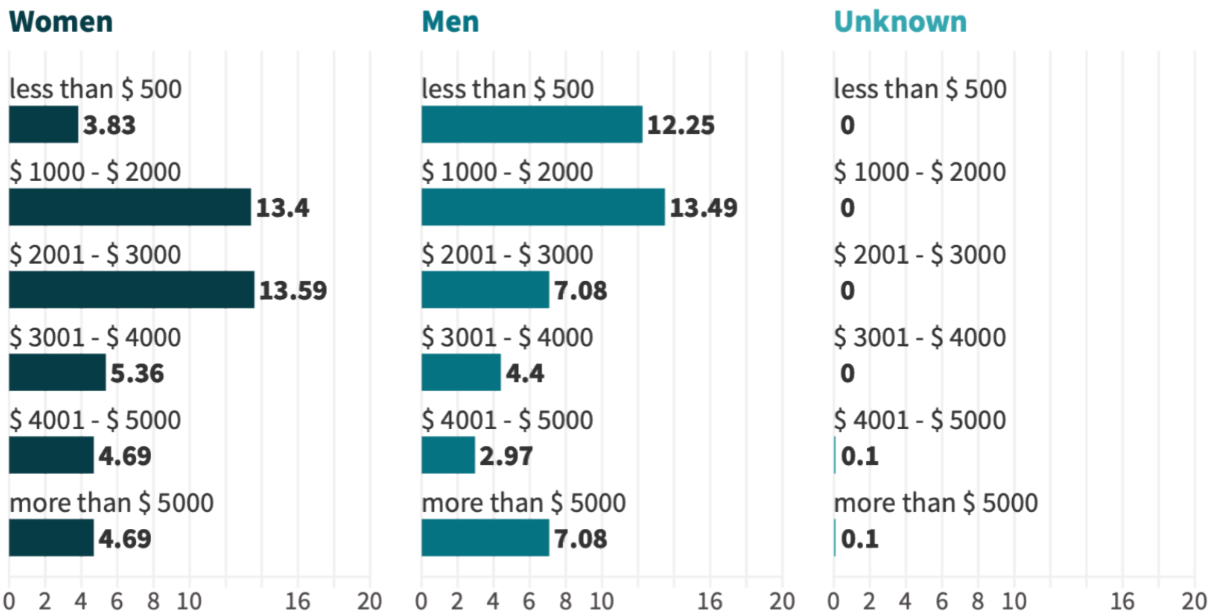
- Most farmers (445, 42.58%) worked on farms producing for both commercial and personal use (women: 227, 21.72%; men: 214: 20.48%; unknown: 4, 0.38%; Figure 130).

Figure 130. **Farming activities on land in Xieng Khouang province (%)**



- Most farmers in Xieng Khouang (281, 26.89%) reported an average annual household income between USD 1000 and USD 2000 (women: 140, 13.40%; men: 141, 13.49%; Figure 131).

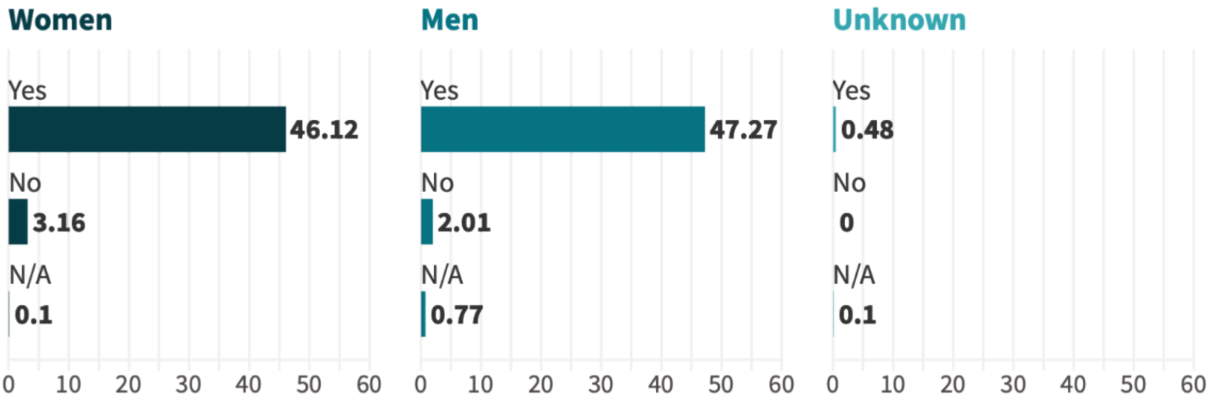
Figure 131. **Annual household income of farmers in Xieng Khouang province (%)**



Pesticide use

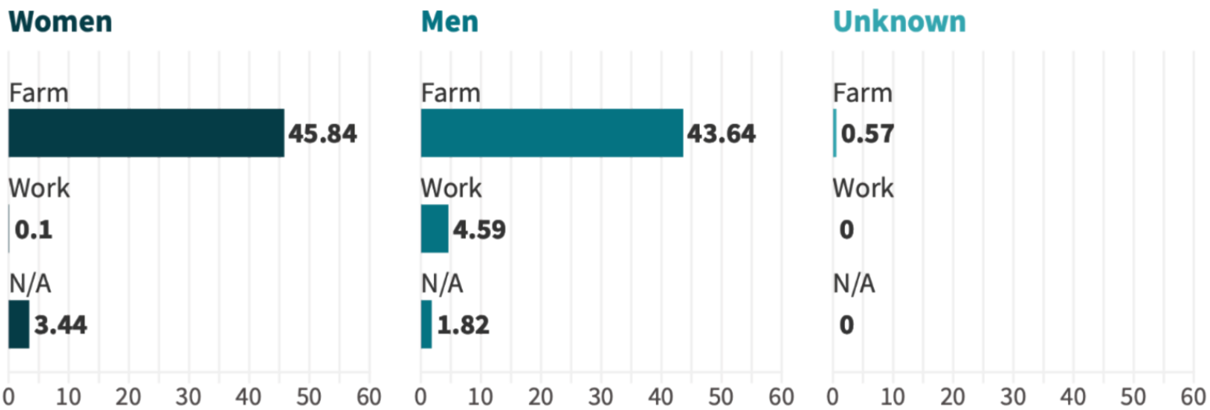
- Almost all the farmers (981, 93.88%) used pesticides (women: 482, 46.12%; men: 494, 47.27%; unknown: 5, 0.48%; Figure 132).

Figure 132. **Farmers' use of pesticides in Xieng Khouang province (%)**



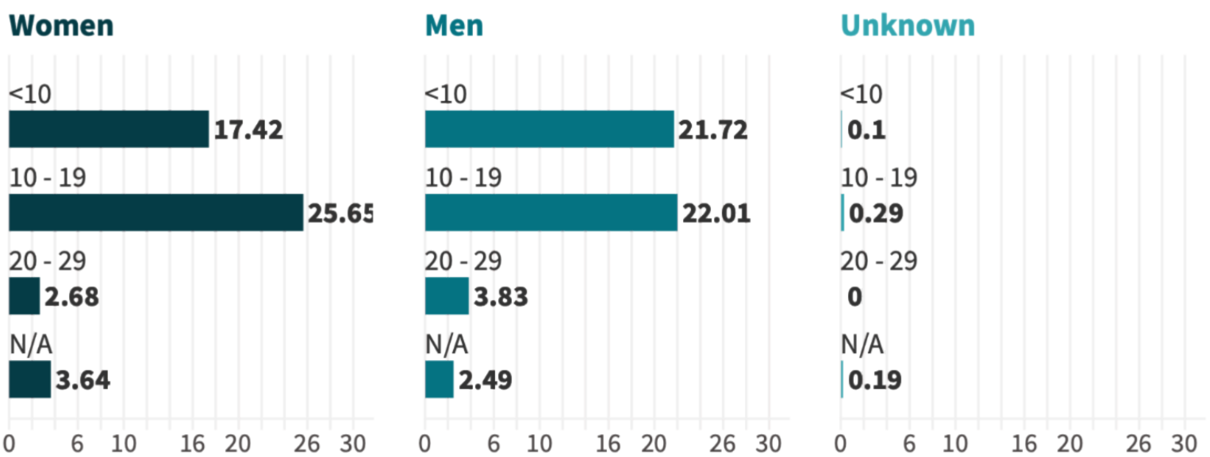
- Most farmers used pesticides on their farms (941, 90.05%; women: 479, 45.84%; men: 456, 43.64%; unknown: 6, 0.57%; Figure 133).

Figure 133. **Locations of pesticide use in Xieng Khouang province (%)**



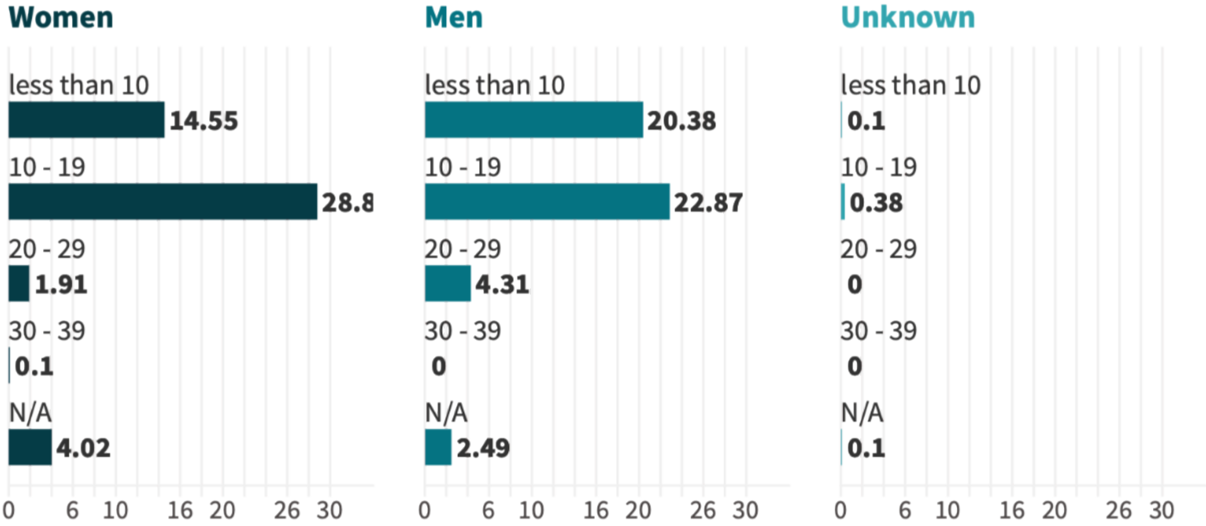
- Most farmers (501, 47.94%) had used pesticides for 10 to 19 years (women: 268, 25.65%; men: 230, 22.01%; unknown: 3, 0.29%; Figure 134).

Figure 134. **Years of pesticide use in Xieng Khouang province (%)**



- Most farmers' family members (544, 52.06%) had also used pesticides for around 10 to 19 years (women: 301, 28.80%; men: 239, 22.87%; unknown: 4, 0.38%; Figure 135).

Figure 135. **Years of family's pesticide use in Xieng Khouang province (%)**



- One of the major pesticide-related activities for farmers in Son La province was field application or spraying (849, 81.24%; women: 417, 39.90%; men: 428, 40.96%; unknown: 4, 0.38%; Table 42).

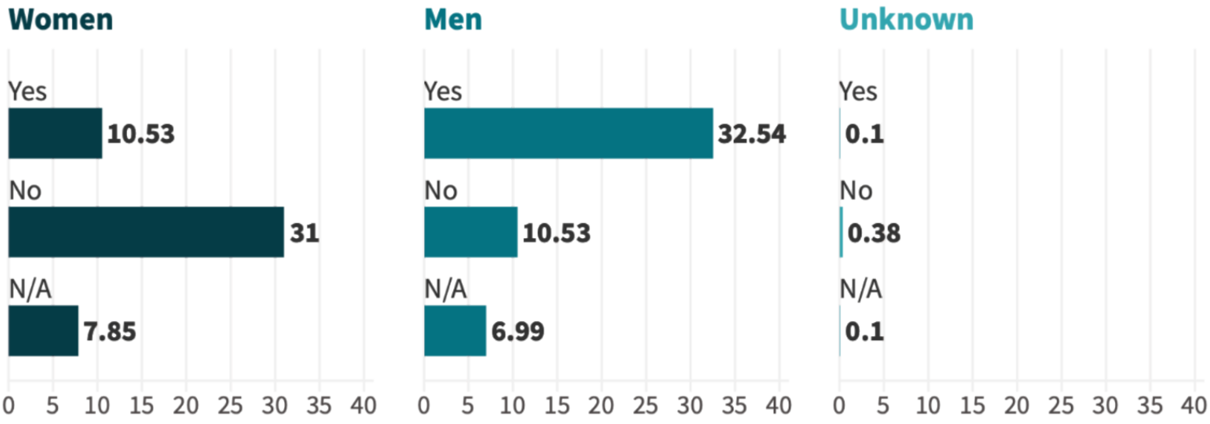
Table 42. **Farmers' pesticide-related activities in Xieng Khouang province**

ACTIVITY	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Apply/spray pesticides in the field	417	39.90	428	40.96	4	0.38	849	81.24
Apply pesticides in the household	2	0.19	2	0.19	-	-	4	0.38
Human therapeutic purposes	3	0.29	6	0.57	-	-	9	0.86
Mix/load/decant pesticides	247	23.64	230	22.01	4	0.38	481	46.03
Purchase or transport pesticides	47	4.50	41	3.92	-	-	88	8.42
Vector control	75	7.18	61	5.84	-	-	136	13.01
Veterinary therapeutic purposes (e.g. use for foot and mouth disease)	83	7.94	202	19.33	2	0.19	287	27.46
Wash clothes used during pesticide spraying or mixing	265	25.36	185	17.70	4	0.38	454	43.44
Wash equipment used during pesticide spraying or mixing	251	24.02	181	17.32	5	0.48	437	41.82
Work in fields where pesticides are being used or have been used	243	23.25	222	21.24	-	-	465	44.50
N/A	35	3.35	17	1.63	-	-	52	4.98

Note: Total is not equal to 100% due to multiple responses

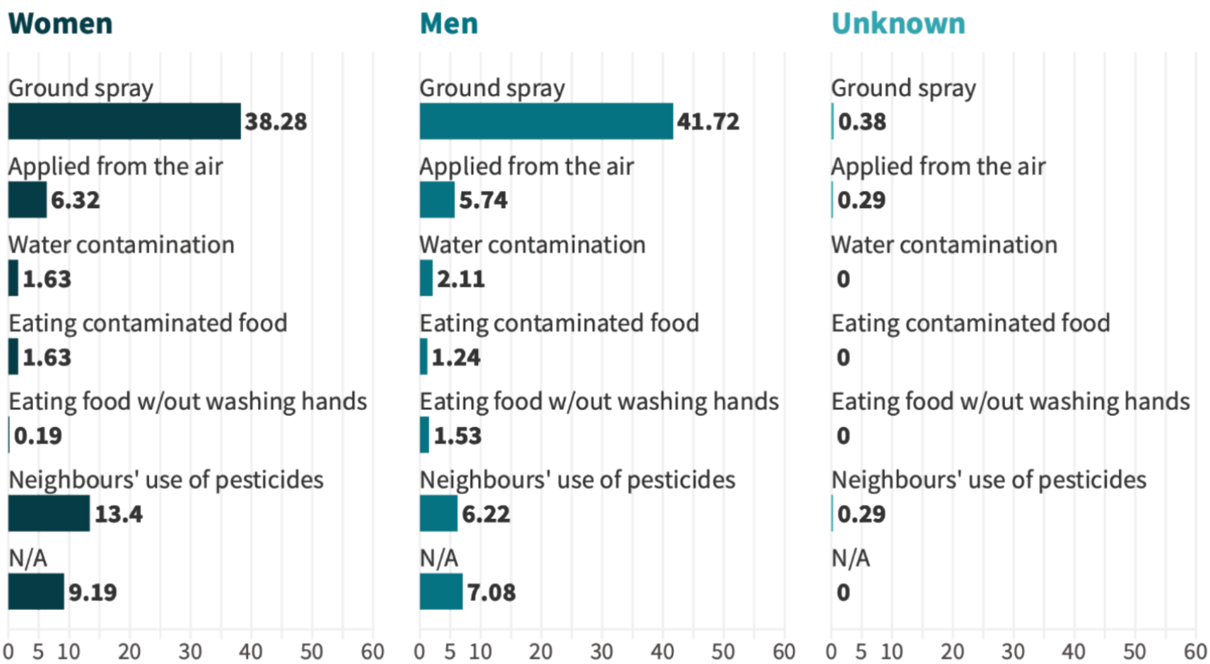
- Most farmers (451, 43.16%) decanted pesticides (women: 110, 11.02%; men: 340, 34.07%; unknown: 1, 0.10%; Figure 136).

Figure 136. **Pesticide decanting by farmers in Xieng Khouang (%)**



- Farmers are constantly (840, 80.38%) exposed to pesticides through ground spraying (women: 400, 38.28%; men: 436, 41.72%; unknown: 4, 0.38%; Figure 137).

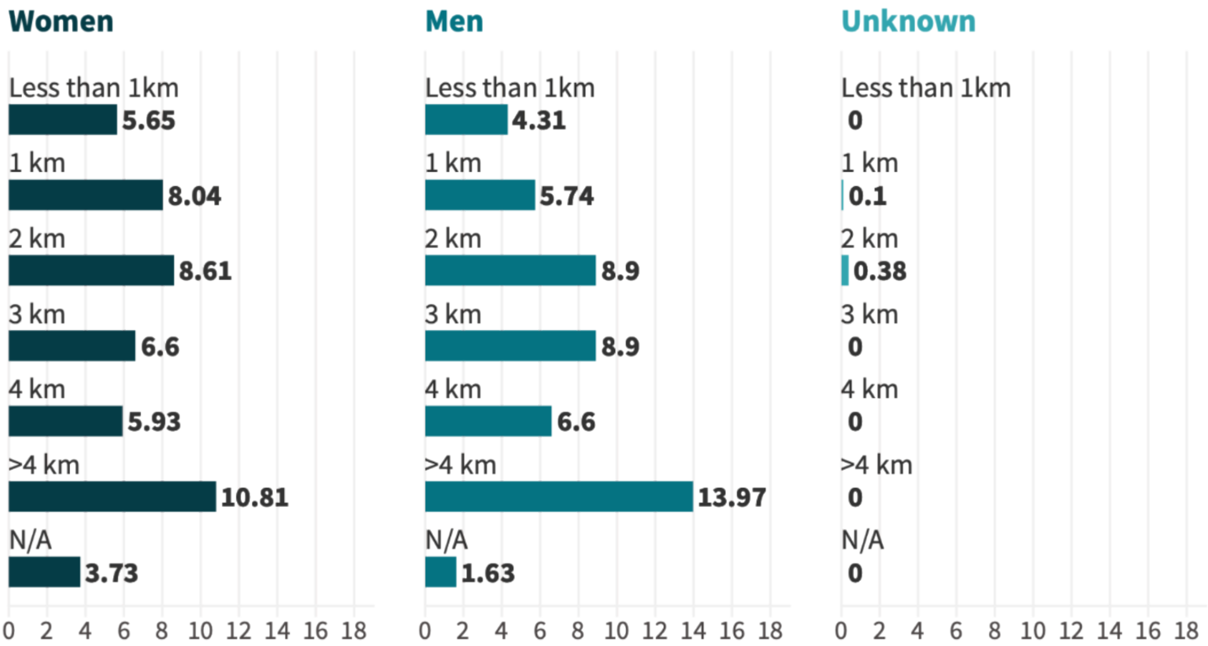
Figure 137. **Farmers' exposure to pesticides in Xieng Khouang province (%)**



Note: Total is not equal to 100% due to multiple responses

- Most farmers in the Xieng Khouang province live more than 4 kilometres (259, 24.78%; women: 113, 10.81%; men: 146, 13.97%; Figure 138) from where pesticide spraying takes place.

Figure 138. **Distance between farmers' homes and pesticide spraying locations (%)**



- The most common pesticides that are being used by farmers in Xieng Khouang are glyphosate (682, 65.26%), followed by atrazine (677, 64.78%) and mesotrione (662, 63.35%; Table 43; Image 4) and most of these pesticides were used in maize cultivation.

Image 4. **Some of the pesticides commonly used by farmers in Xieng Khouang (Glyphosate, Atrazine, and Mesotrione).**

Table 43.a. **List of pesticides used by farmers in Xieng Khouang, Laos**

PESTICIDE	CROPS TREATED	NO. OF FARMERS	%
2,4-D	MAIZE	298	28.52
Abamectin	RICE	16	1.53
Atrazine	MAIZE	677	64.78
Butachlor	-	10	0.96
Carbaryl	RICE	88	8.42
Cyhalofop	-	10	0.96
Cypermethrin	RICE, MAIZE	43	4.11
Diquat dibromide	MAIZE	111	10.62
Emamectin benzoate	MAIZE, VEGETABLES	6	0.57
Fenobucarb	MAIZE	39	3.73
Glyphosate	MAIZE	682	65.26
Imidacloprid	MAIZE	66	6.32
Mesotrione	MAIZE	662	63.35
Methyl-parathion	-	22	2.11
Metsulfuron-methyl	RICE, MAIZE	63	6.03
Nicosulfuron	MAIZE	390	37.32
Penoxsulam	-	10	0.96
Pretilachlor	RICE, MAIZE	68	6.51
Pyrazosulfuron	MAIZE	66	6.32
Triphenyltin acetate	MAIZE	23	2.20

Table 43.b. **Classification of pesticides used by farmers in Xieng Khouang, Laos**

PESTICIDE	WHO CLASS[113]	PAN HHP LIST[114]	NO. OF COUNTRIES BANNED[115]
2,4-D	II MODERATELY HAZARDOUS	X (GHS+ C2 & R2)	10
Abamectin	IB HIGHLY HAZARDOUS	X (H330, HIGHLY TOXIC TO BEES)	NOT KNOWN TO BE BANNED
Atrazine	III SLIGHTLY HAZARDOUS	-	60
Butachlor	III SLIGHTLY HAZARDOUS	X (EPA PROB LIKEL CARC)	39
Carbaryl	II MODERATELY HAZARDOUS	X (EPA PROB LIKEL CARC, GHS+ C2 & R2)	48
Cyhalofop	U UNLIKELY TO PRESENT ACUTE HAZARD	-	NOT KNOWN TO BE BANNED

[113] World Health Organization. (2019). The WHO recommended classification of pesticides by hazard and guidelines to classification. https://www.who.int/publications/i/item/9789240005662

[114] Pesticide Action Network International. (2024). PAN International list of highly hazardous pesticides. https://pan-international.org/wp-content/uploads/PAN_HHP_List.pdf

[115] Pesticide Action Network International. (2024). Consolidated list of banned pesticides. https://pan-international.org/pan-international-consolidated-list-of-banned-pesticides/

Table 43.b. **Classification of pesticides used by farmers in Xieng Khouang, Laos**

PESTICIDE	WHO CLASS	PAN HHP LIST	NO. OF COUNTRIES BANNED
Cypermethrin	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	42
Diquat dibromide	II MODERATELY HAZARDOUS	X (H330)	30
Emamectin benzoate	II MODERATELY HAZARDOUS	X (VERY PERS WATER, SOIL OR SEDIMENT, VERY TOXIC TO AQ. ORGANISM, HIGHLY TOXIC TO BEES)	NOT KNOWN TO BE BANNED
Fenobucarb	II MODERATELY HAZARDOUS	-	NOT KNOWN TO BE BANNED
Glyphosate	III SLIGHTLY HAZARDOUS	X (EPA PROB LIKEL CARC)	12
Imidacloprid	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	29
Mesotrione	III SLIGHTLY HAZARDOUS	-	NOT KNOWN TO BE BANNED
Methyl-parathion	IA EXTREMELY HAZARDOUS	X (H330)	80
Metsulfuron-methyl	U UNLIKELY TO PRESENT ACUTE HAZARD	-	1
Nicosulfuron	U UNLIKELY TO PRESENT ACUTE HAZARD	-	NOT KNOWN TO BE BANNED
Penoxsulam	U UNLIKELY TO PRESENT ACUTE HAZARD	-	NOT KNOWN TO BE BANNED
Pretilachlor	U UNLIKELY TO PRESENT ACUTE HAZARD	-	NOT KNOWN TO BE BANNED
Pyrazosulfuron	U UNLIKELY TO PRESENT ACUTE HAZARD	-	NOT KNOWN TO BE BANNED
Triphenyltin acetate	II MODERATELY HAZARDOUS	X (H330, GHS+ C2 & R2)	33

TOP 10 PESTICIDES USED BY FARMERS IN XIENG KHOUANG

1. GLYPHOSATE	65.26%
2. ATRAZINE*	64.78%
3. MESOTRIONE	63.35%
4. NICOSULFURON	37.32%
5. 2,4-D	28.52%
6. DIQUAT DIBROMIDE	10.62%
7. CARBARYL	8.42%
8. PRETILACHLOR	6.51%
9. IMIDACLOPRID	6.32%
10. PYRAZOSULFURON	6.32%

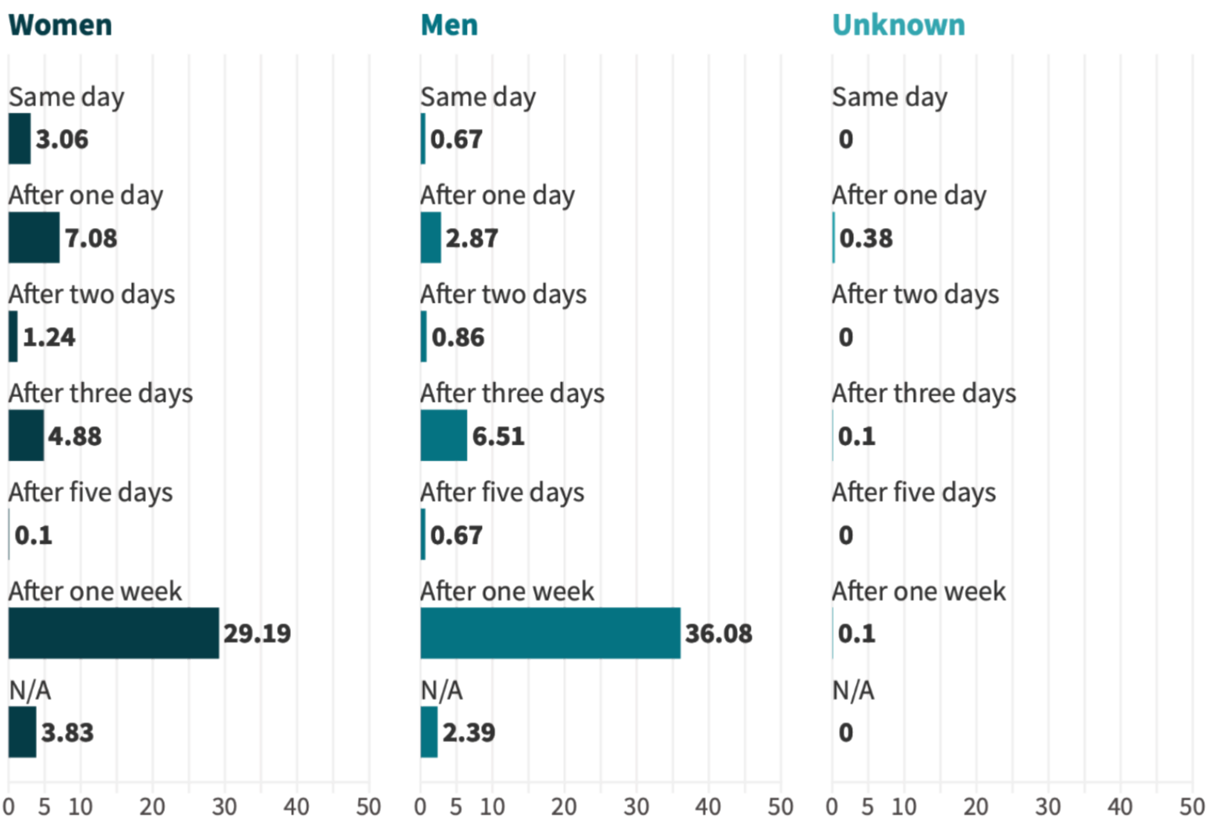
* The International Agency for Research on Cancer has recently found that **atrazine** is classified as probably carcinogenic to humans (Group 2A), with positive associations observed specifically for non-Hodgkin lymphoma with the t(14;18) chromosomal translocation

As mentioned earlier the class II (slightly hazardous) glyphosate's exposure has been shown to cause damage to the liver, kidneys, and skin cells. On the skin, it has been associated with premature aging and an increased risk of cancer, with absorption increasing up to fivefold if the skin is already damaged[116]. Research has also demonstrated that glyphosate can disrupt estrogen, androgen, and other steroidogenic pathways, and has been linked to the growth of human breast cancer cells[117]. Even at very low doses, glyphosate-based herbicides have been associated with reproductive health problems, including miscarriages, pre-term deliveries, low birth weights, and birth defects[118]. Evidence further suggests that glyphosate formulations may interfere with the immune system, contributing to respiratory illnesses (such as asthma), rheumatoid arthritis, and autoimmune conditions affecting the skin and mucous membranes[119]. Atrazine, another Class III pesticide, is strongly linked to endocrine disruption, including irregular estrogen levels, altered menstrual cycles, and unexplained infertility[120]. Studies have also associated atrazine exposure with abnormal birth weights, preterm delivery, and breast cancer, as well as congenital defects such as choanal atresia, stenosis, and gastroschisis[121]. Mesotrione, also classified as a slightly hazardous pesticide, has been documented to cause eye irritation and ocular lesions, as well as adverse effects on the liver, kidneys, and body weight in animal studies[122].

Pesticide exposure and spillage

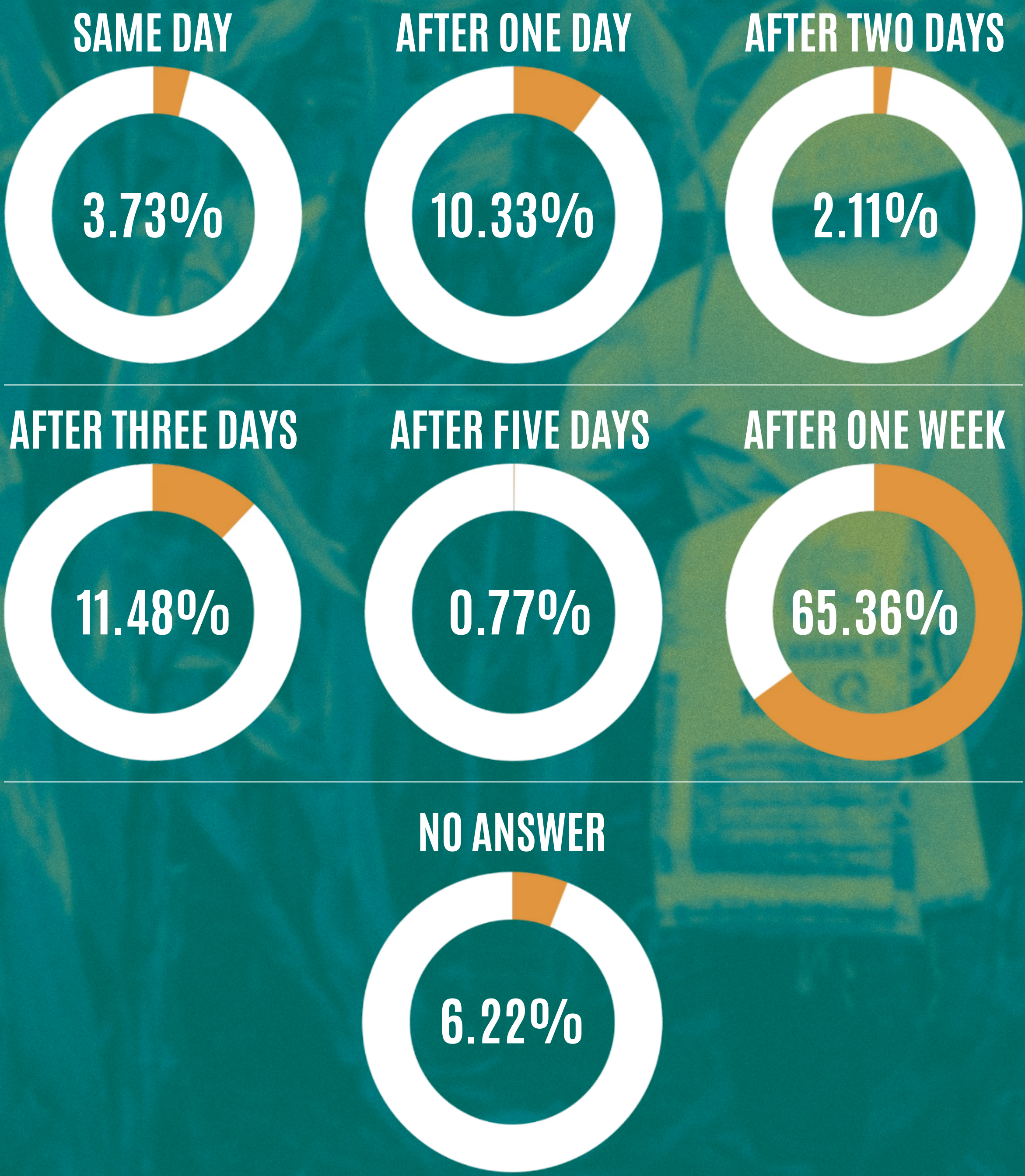
- Most farmers in Xieng Khouang re-entered their fields after a week (683, 65.36%; women: 305, 29.19%; men: 377, 36.08%; unknown: 1, 0.10%; Figure 139) from when pesticides spraying takes place.

Figure 139. **Farmers' re-entry into the field after pesticide spraying in Xieng Khouang province (%)**



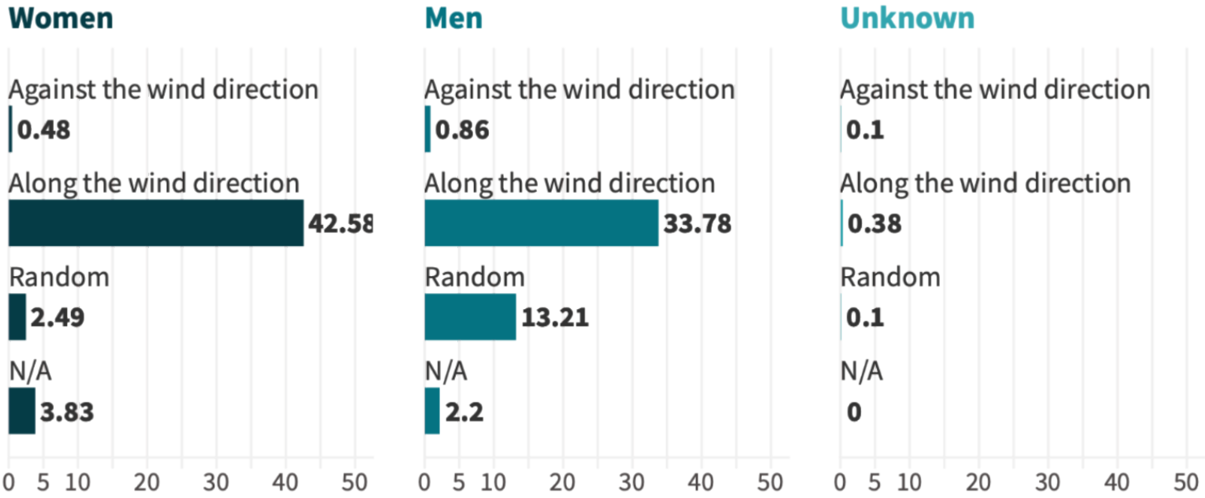
[116] PAN International. (2016). Glyphosate monograph. https://panap.net/resource/glyphosate-monograph/?ind=1603270594025&filename=Glyphosate-monograph.pdf&wpdmdl=3364&refresh=68c1285e7dd681757489246
[117] Ibid
[118] Ibid
[119] Ibid
[120] U.S Right to Know. (2025). Atrazine, an endocrine-disrupting herbicide banned in Europe, is widely used in the U.S. https://usrtk.org/pesticides/atrazine/
[121] Ibid
[122] USEPA. (2001). Mesotrione Fact Sheet. https://www3.epa.gov/pesticides/chem_search/reg_actions/registration/fs_PC-122990_04-Jun-01.pdf

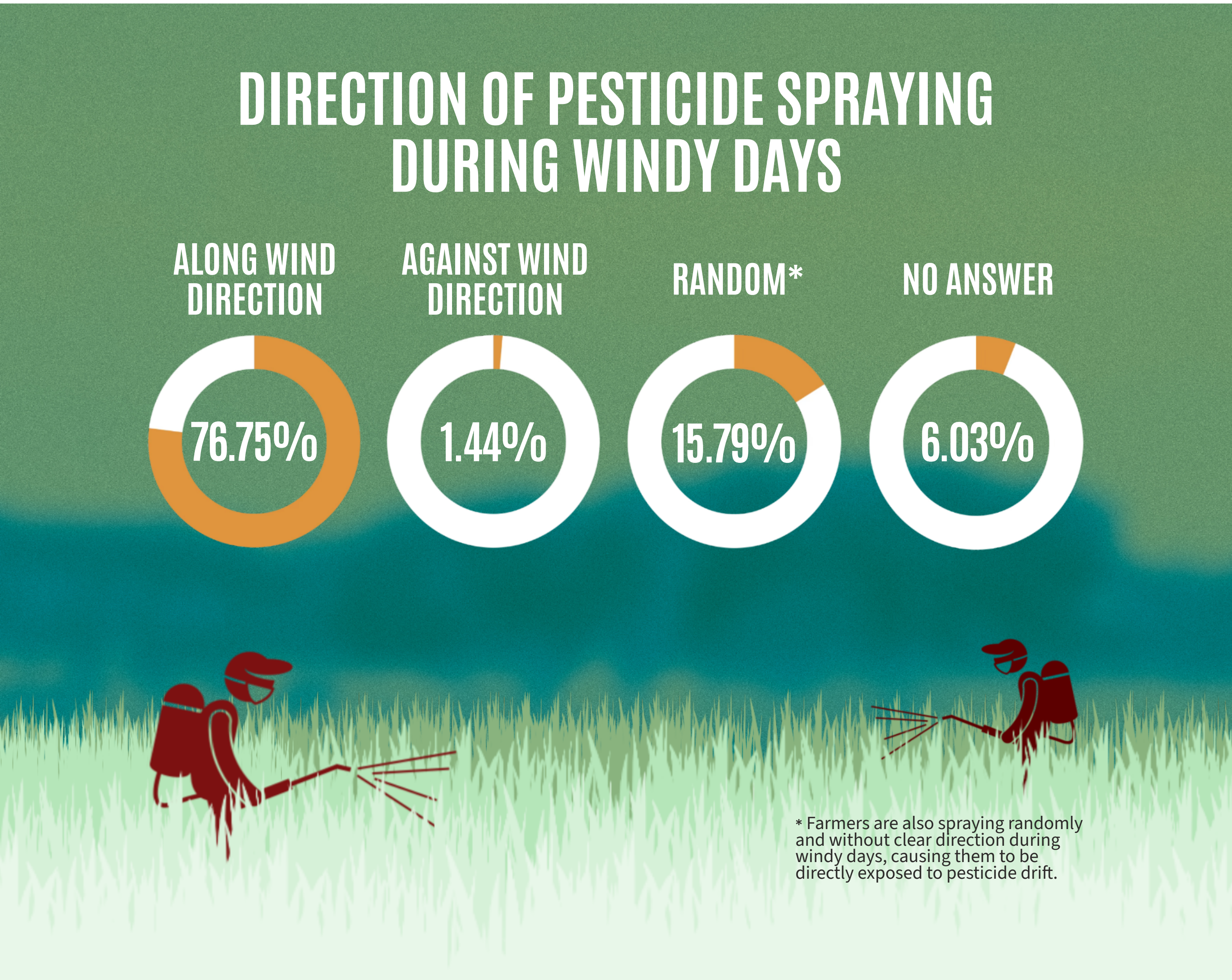
FARMERS' RE-ENTRY INTO THE FIELD AFTER PESTICIDE SPRAYING



- Most farmers (802, 76.75%) sprayed pesticides in the direction of the wind (women: 445, 42.58%; men: 353, 33.78%; unknown: 4, 0.38%; Figure 140).

Figure 140. **Direction of pesticide spraying during windy days (%)**



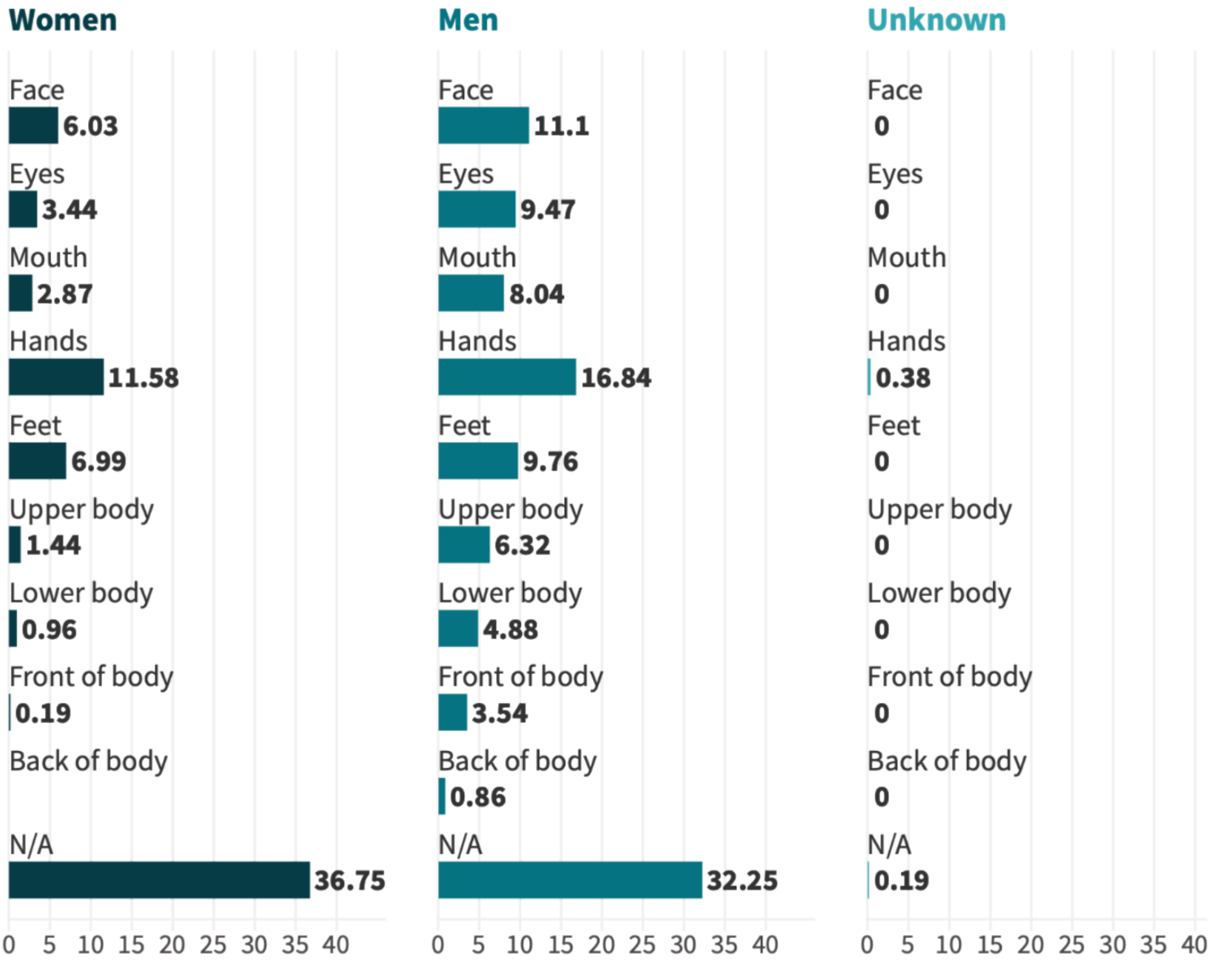


- Three hundred twenty-seven farmers (31.29%; women: 135, 12.92%; men: 188, 17.99%; unknown: 4, 0.48%) experienced pesticide spillage while 638 (61.05%; women: 332, 31.77%; men: 304, 29.09%; unknown: 2, 0.19%) had not experienced pesticide spillage.

- Majority of the farmers (298, 28.52%) experience spillage while spraying pesticides (women: 124, 11.87%; men: 170, 16.27%; unknown: 4, 0.48%).

- Majority of farmers (301, 28.80%) experienced spillage on their hands (women: 121, 11.58%; men: 176, 16.84%; unknown: 4, 0.38%; Figure 141).

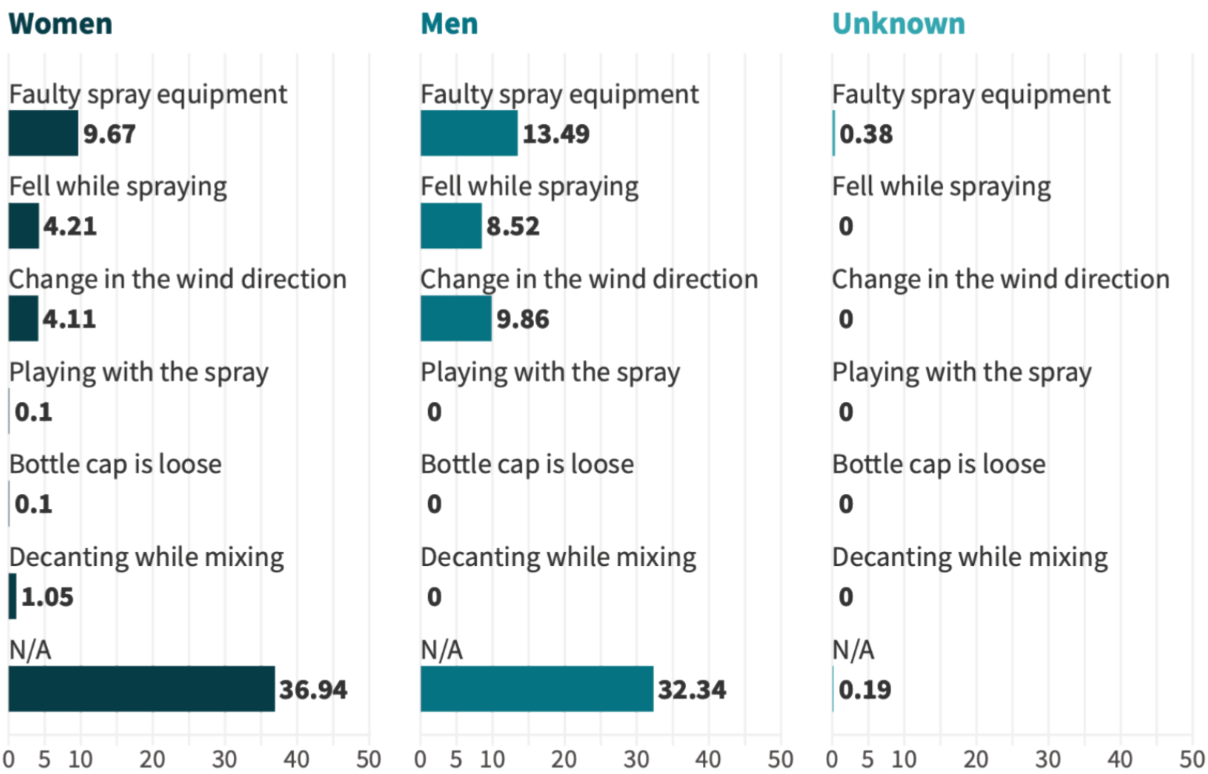
Figure 141. **Body areas exposed to spillage (%)**



Note: Total is not equal to 100% due to multiple responses

- Most farmers (246, 23.54%) experienced pesticide spillage due to faulty spraying equipment (women: 101, 9.67%; men: 141, 13.49%; unknown: 4, 0.38%; Figure 142).

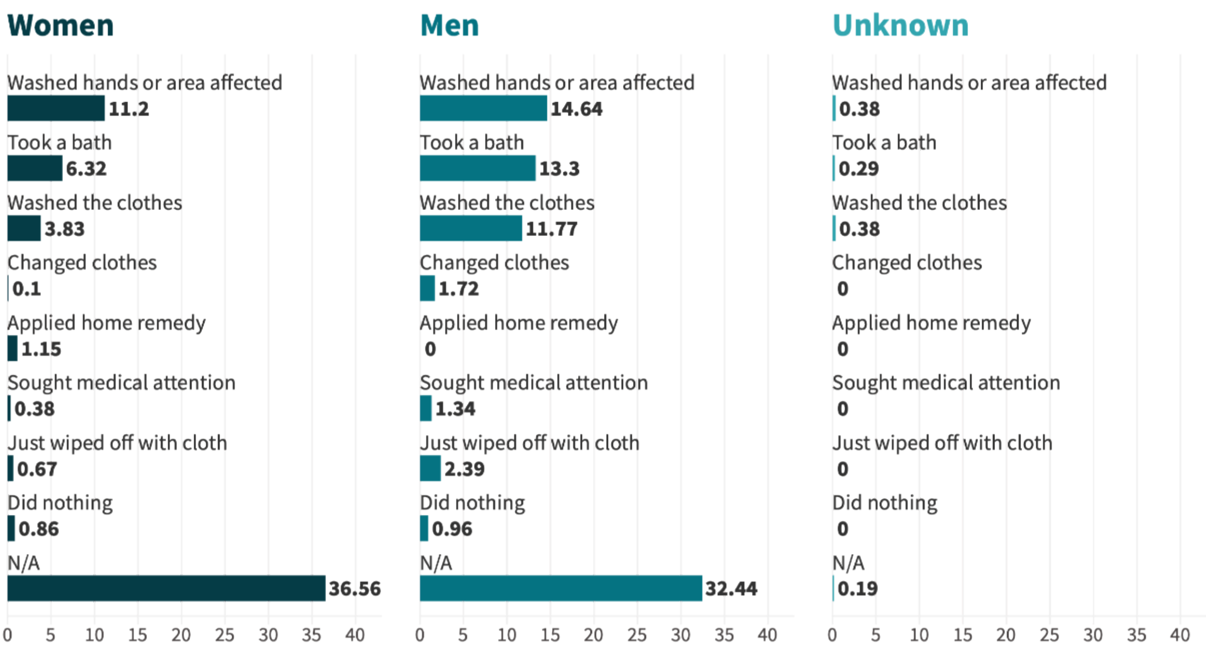
Figure 142. **Causes of pesticide spillage (%)**



Note: Total is not equal to 100% due to multiple responses

- The majority of farmers (274, 26.22%) washed their hands or the affected area after experiencing pesticide spillage (women: 117, 11.20%; men: 153, 14.64%; unknown: 4, 0.38%; Figure 143).

Figure 143. **Actions taken by farmers in response to pesticide spillage (%)**

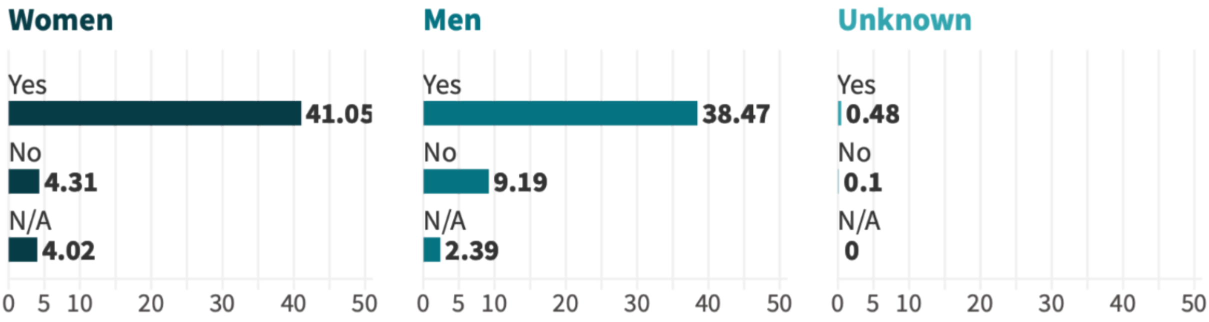


Note: Total is not equal to 100% due to multiple responses

PPE use

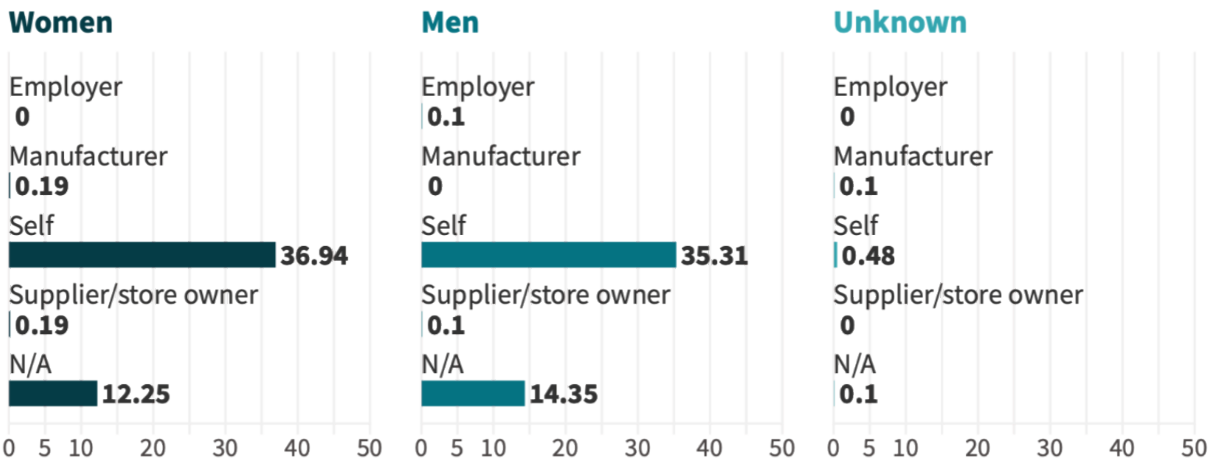
- Almost all farmers (836, 80.00%) used PPE when applying pesticides (women: 429, 41.05%; men: 402, 38.47%; unknown: 5, 0.48%; Figure 144).

Figure 144. **Use of PPE by farmers in Xieng Khouang province (%)**



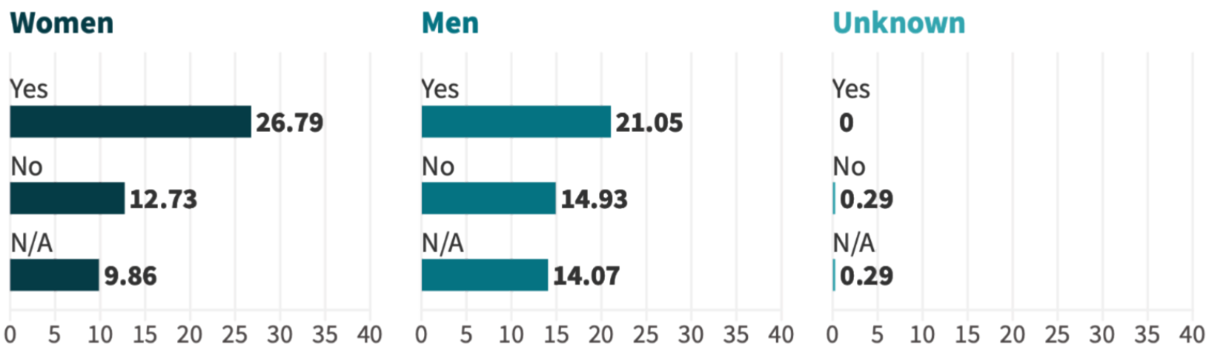
- Most farmers (760, 72.73%) acquired PPE themselves (women: 386, 36.94%; men: 369, 35.31%; unknown: 5, 0.48%; Figure 145).

Figure 145. **PPE provider for farmers in Xieng Khouang province (%)**



- Five hundred farmers (47.85%) had received instructions on how to use PPE (women: 280, 26.79%; men: 220, 21.05%; Figure 146).

Figure 146. **Availability of PPE instructions (%)**



- Farmers in Xieng Khouang mostly use face masks (757, 72.44%; women: 389, 37.22%; men: 366, 35.02%; unknown: 2, 0.19%; Table 44) and long pants (752, 71.96%; women: 381, 36.46%; men: 369, 35.31%; unknown: 2, 0.19%).

Table 44. **Types of PPE used by Xieng Khouang province**

PPE	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Boots/shoes	345	33.01	329	31.48	1	0.10	**675**	**64.59**
Eyeglasses	168	16.08	147	14.07	2	0.19	**317**	**30.33**
Face mask	389	37.22	366	35.02	2	0.19	**757**	**72.44**
Gloves	346	33.11	346	33.11	2	0.19	**694**	**66.41**
Long pants	349	33.40	345	33.01	2	0.19	**696**	**66.60**
Long-sleeved shirt	381	36.46	369	35.31	2	0.19	**752**	**71.96**
Overalls	44	4.21	-	-	-	-	**44**	**4.21**
Respirators	1	0.10	4	0.38	-	-	**5**	**0.48**
N/A	119	11.39	139	13.30	4	0.38	**262**	**25.07**

- Farmers in Xieng Khouang mostly use face masks (757, 72.44%; women: 389, 37.22%; men: 366, 35.02%; unknown: 2, 0.19%; Table 44) and long pants (752, 71.96%; women: 381, 36.46%; men: 369, 35.31%; unknown: 2, 0.19%).

Table 45. **Reasons for not using PPE among farmers in Xieng Khouang province**

REASON	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Not available	25	2.39	11	1.05	1	0.10	**37**	**3.54**
Too expensive	14	1.34	91	8.71	-	-	**105**	**10.05**
Uncomfortable	19	1.82	36	3.44	-	-	**55**	**5.26**
N/A	463	44.31	384	36.75	5	0.48	**852**	**81.53**

Note: Total is not equal to 100% due to multiple responses

FARMERS' USE OF PPE IN XIENG KHOUANG

USING PPE	NOT USING PPE	NO ANSWER
80.00%	13.59%	6.41%

TYPES OF PPE USED BY FARMERS

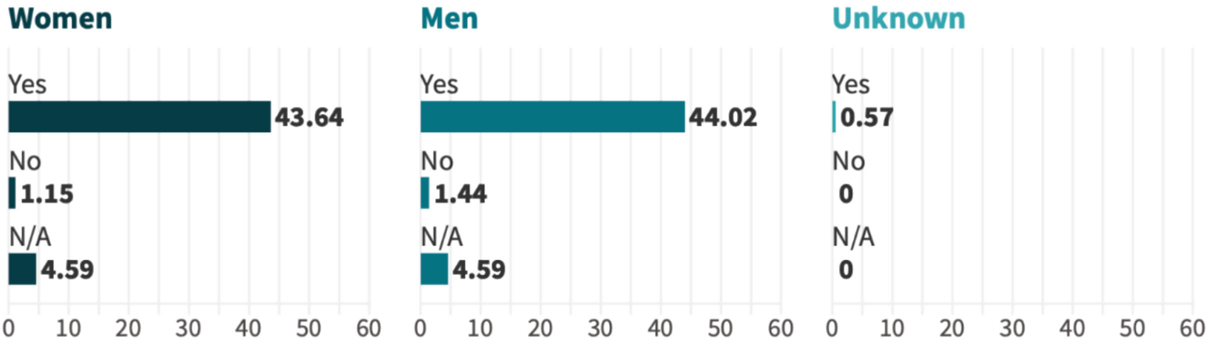
EYEGLASSES	30.33%
FACEMASK	72.44%
RESPIRATORS	0.00
GLOVES	66.41%
LONG-SLEEVED SHIRT	71.96%
LONG PANTS	66.6%
LUNGI (MEN'S SKIRT)	0.00
OVERALLS	4.21%
BOOTS/SHOES	64.59%

Note: Total is not equal to 100% due to multiple responses

Washing facilities

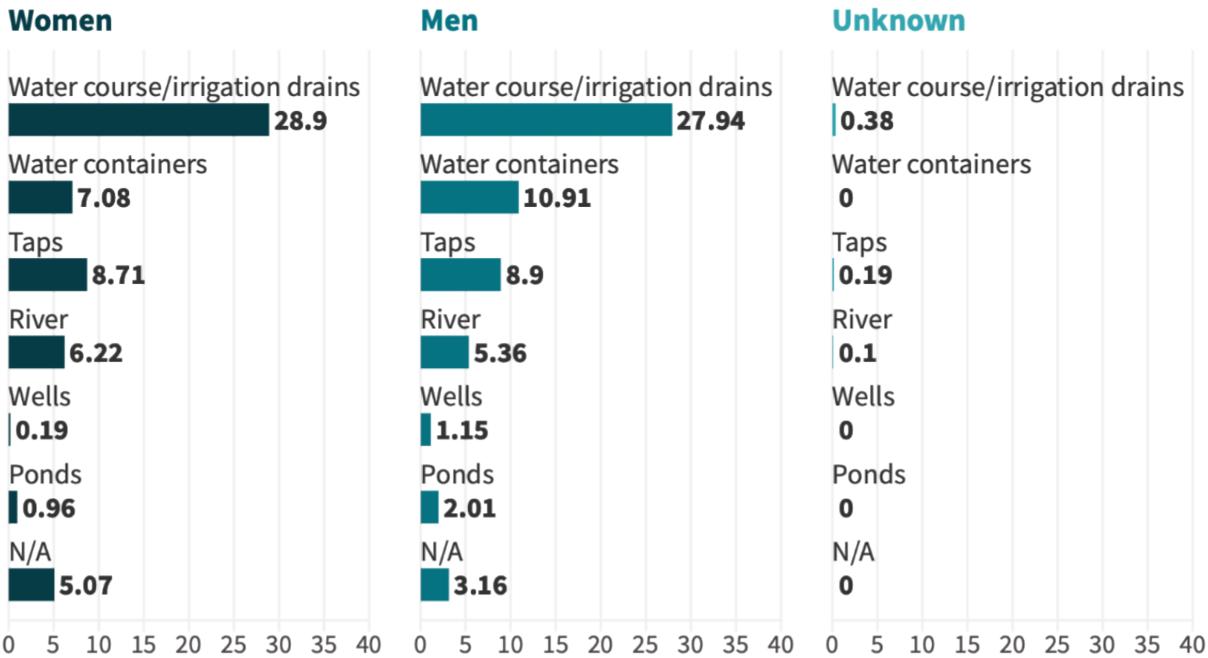
- Nine hundred and twenty-two (88.23%) farmers had washing facilities available after applying pesticides (women: 456, 43.64%; men: 460, 44.02%; unknown: 6, 0.57%; Figure 147).

Figure 147. **Availability of washing facilities in in Xieng Khouang province (%)**



- Watercourses and irrigation drains were the most commonly used washing facilities among farmers (598, 57.22%; women: 302, 28.90%; men: 292, 27.94%; unknown: 4, 0.38%; Figure 148).

Figure 148. **Types of washing facilities for farmers (%)**

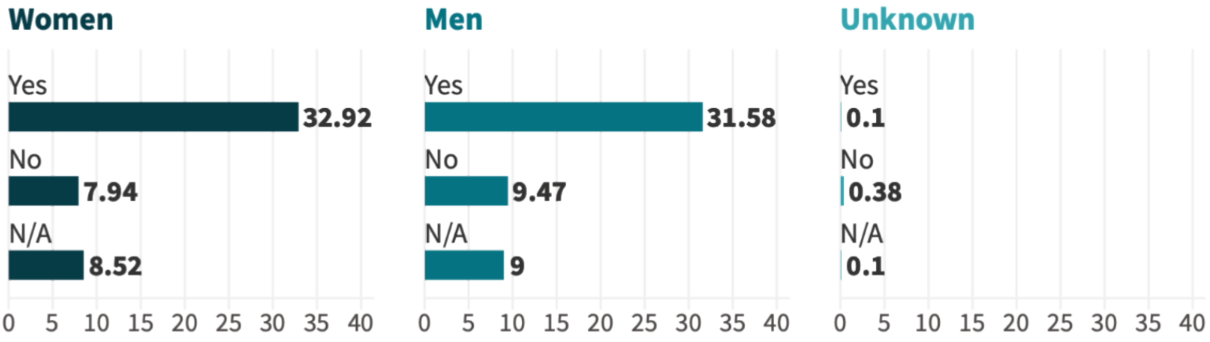


Note: Total is not equal to 100% due to multiple responses

Labels

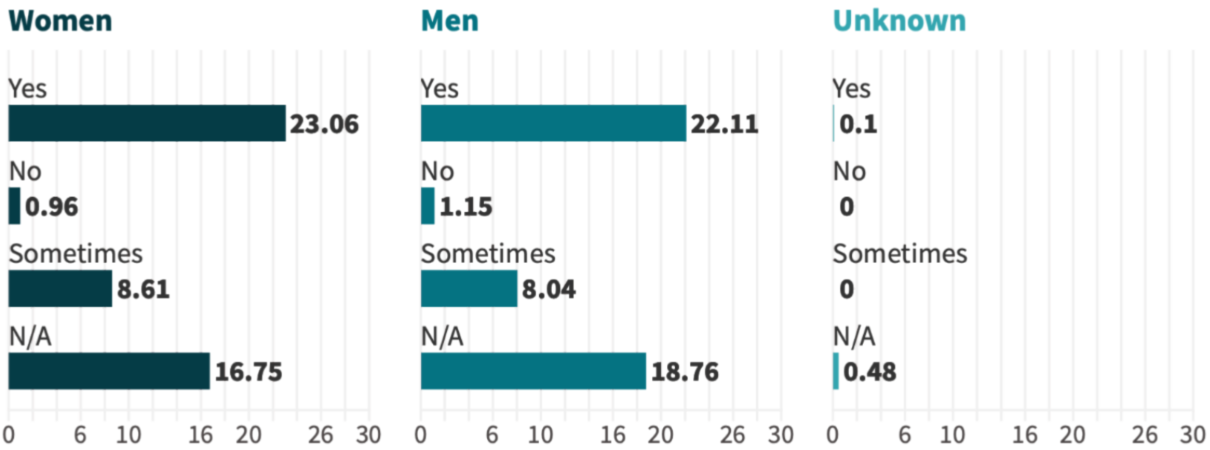
- Six hundred and seventy-five (64.59%) farmers had access to the labels of the pesticides they used (women: 344, 32.92%; men: 330, 31.58%; unknown: 1, 0.10%; Figure 149).

Figure 149. **Farmers' access to labels on pesticides they use (%)**



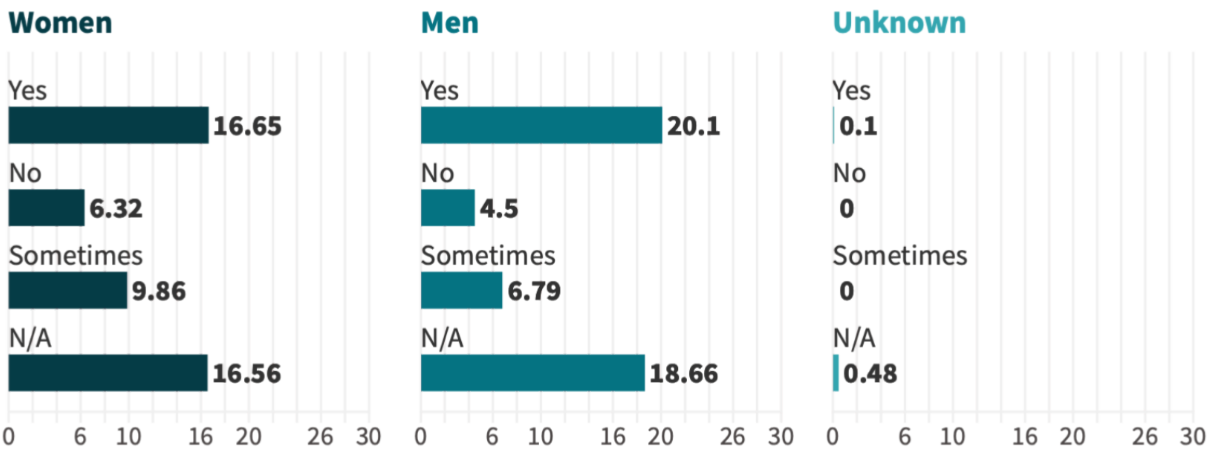
- Most farmers (473, 45.26%) read the labels (women: 241, 23.06%; men: 231, 22.11%; unknown: 1, 0.10%; Figure 150).

Figure 150. **Pesticide label reading practices among farmers (%)**



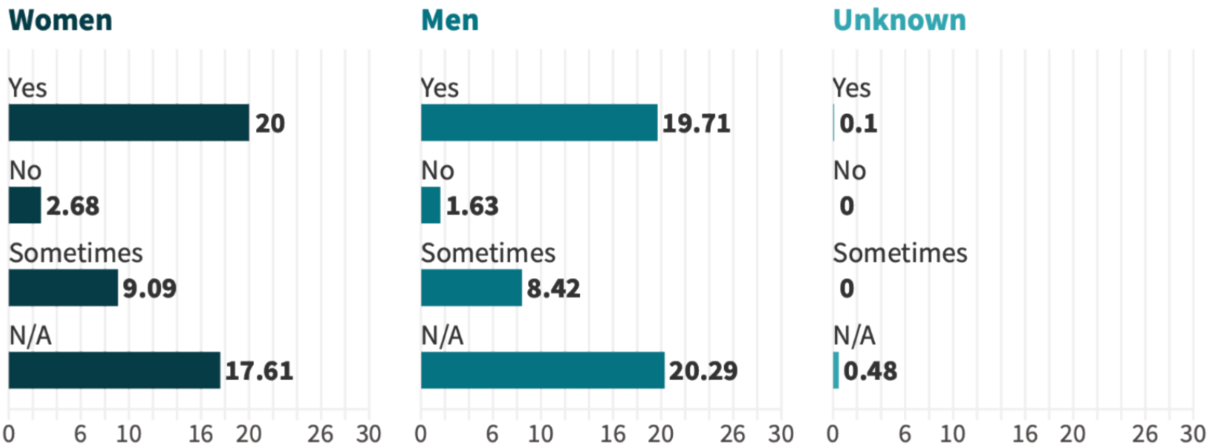
- Most labels (385, 36.84%) were in local languages, according to the farmers (women: 174, 16.65%; men: 210, 20.10%; unknown: 1, 0.10%; Figure 151).

Figure 151. **Availability of pesticide labels in in local language (%)**



- Most farmers (416, 39.81%) found the information on the pesticide labels to be legible (women: 209, 20.00%; men: 206, 19.71%; unknown: 1, 0.10%; Figure 152).

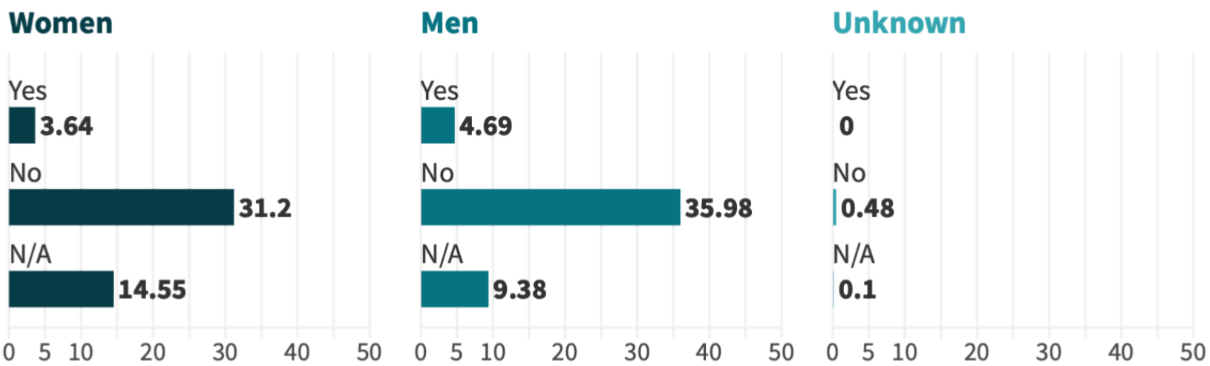
Figure 152. **Legibility of pesticide information labels (%)**



Training on pesticide use, purchase, storage and disposal

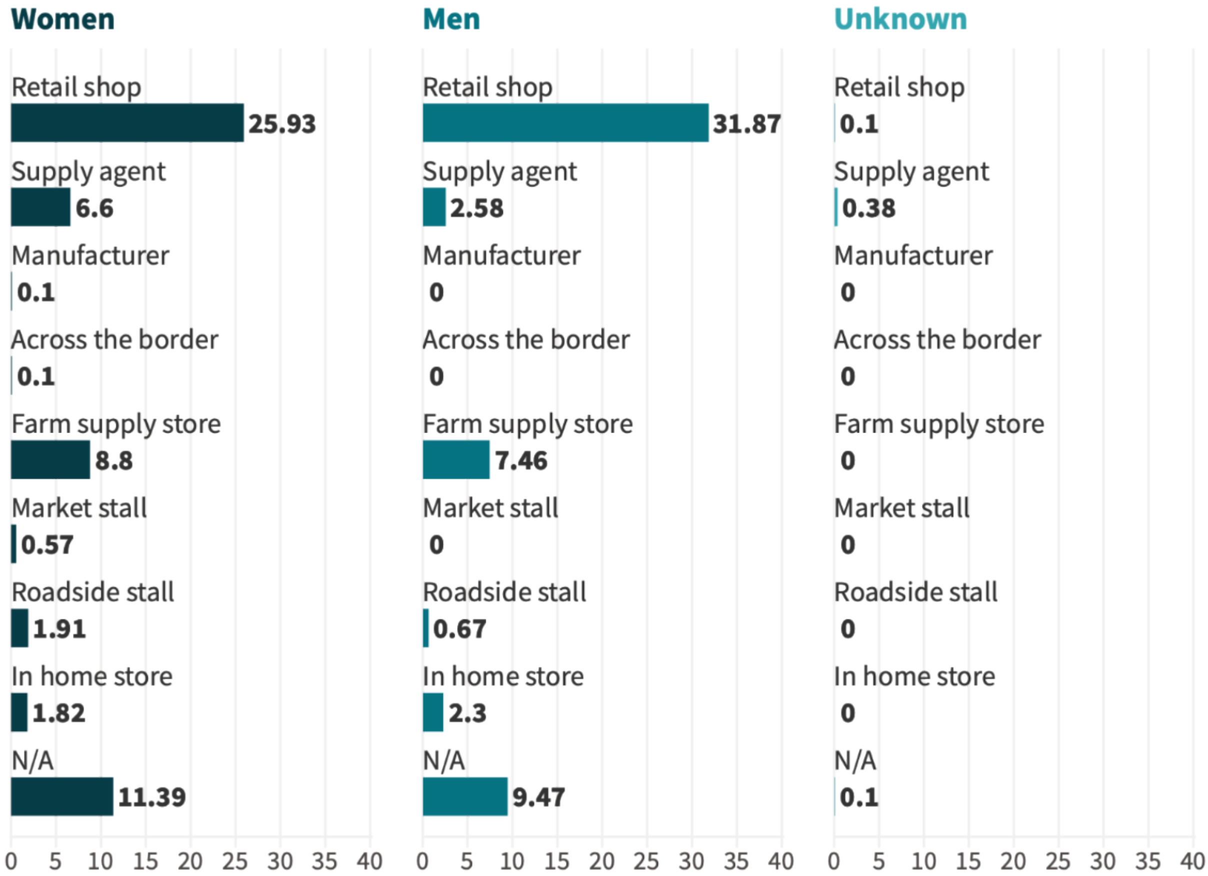
- Farmers (707, 67.66%) were not trained on the pesticides they used (women: 326, 31.20%; men: 376, 35.98%; unknown: 5, 0.48%; Figure 153).

Figure 153. **Farmers' training on handling and using pesticides (%)**



- Most farmers (605, 57.89%) purchase their pesticides from retail shops (women: 271, 25.93%; men: 333, 31.87%; unknown: 1, 0.10%; Figure 154).

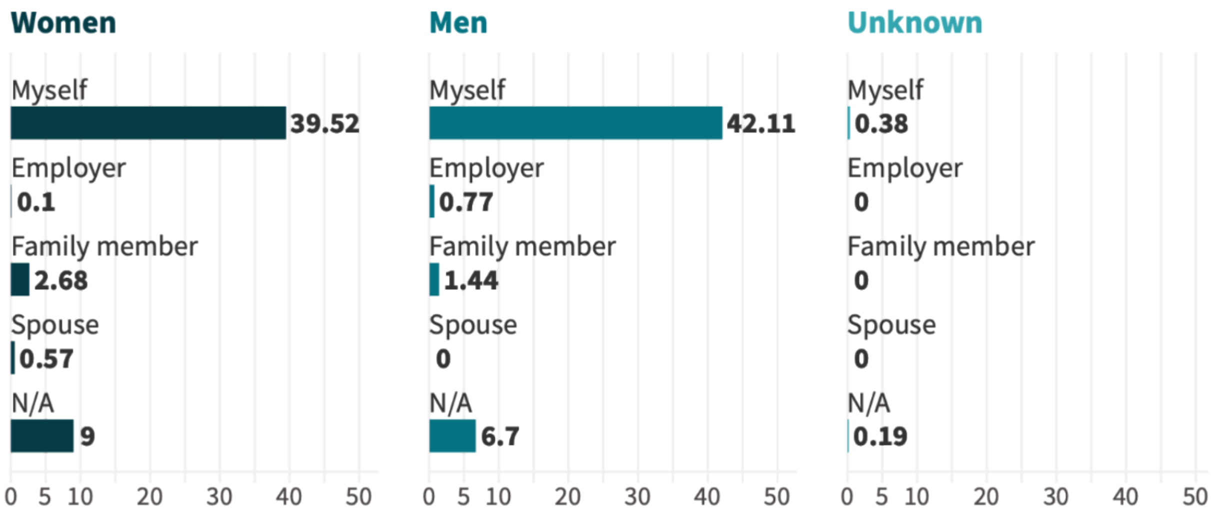
Figure 154. **Farmers' pesticide purchase location (%)**



Note: Total is not equal to 100% due to multiple responses

- Farmers mostly (857, 82.01%) purchased the pesticides by themselves (women: 413, 39.52%; men: 440, 42.11%; unknown: 4, 0.38%; Figure 155).

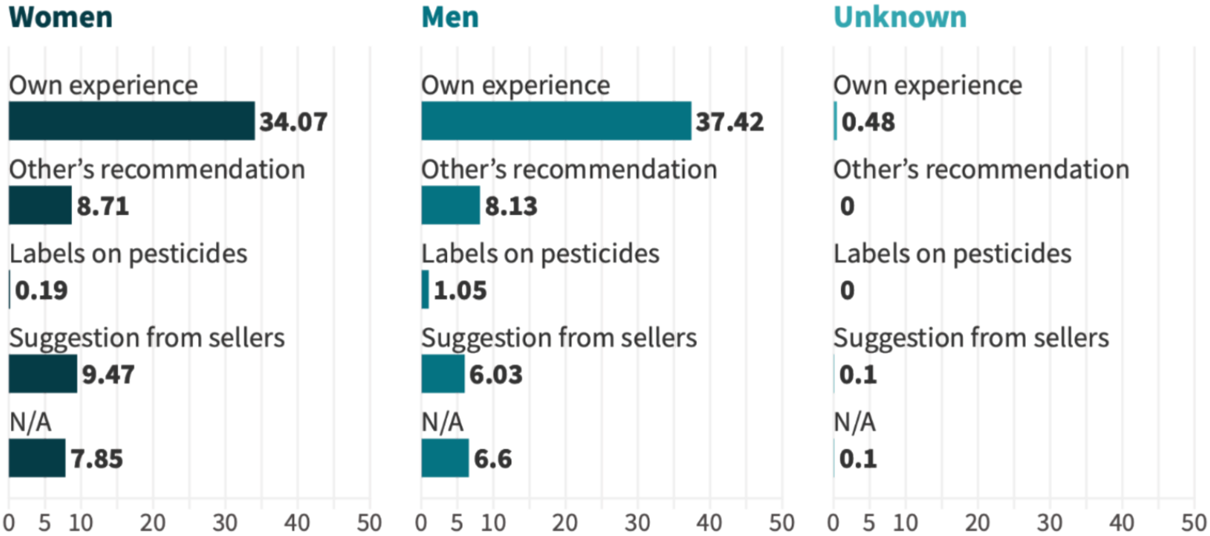
Figure 155. **Person in charge of purchasing pesticides in each household in Xieng Khouang province (%)**



Note: Total is not equal to 100% due to multiple responses

- Most pesticides (752, 71.96%) were purchased based on the farmers' own experience (women: 356, 34.07%; men: 391, 37.42%; unknown: 5, 0.48%; Figure 156).

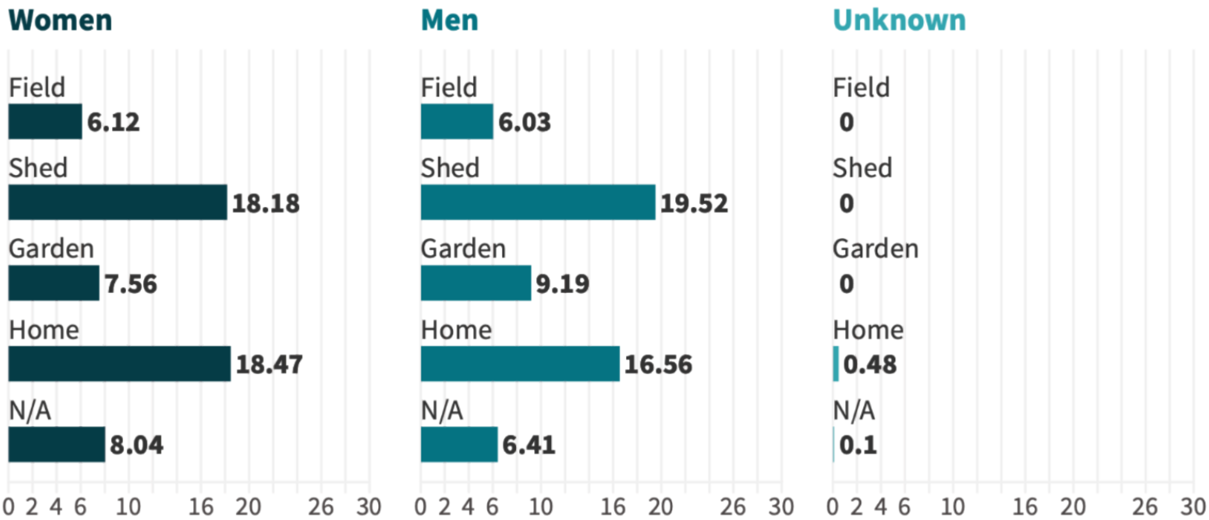
Figure 156. **Factors influencing farmers' pesticide choices in Xieng Khouang province (%)**



Note: Total is not equal to 100% due to multiple responses

- Farmers often (394, 37.70%) store pesticides in the shed (women: 190, 18.18%; men: 204, 19.52%; Figure 157).

Figure 157. **Pesticide storage locations used by farmers in Xieng Khouang (%)**



Note: Total is not equal to 100% due to multiple responses

PESTICIDE STORAGE LOCATION BY FARMERS IN XIENG KHOUANG

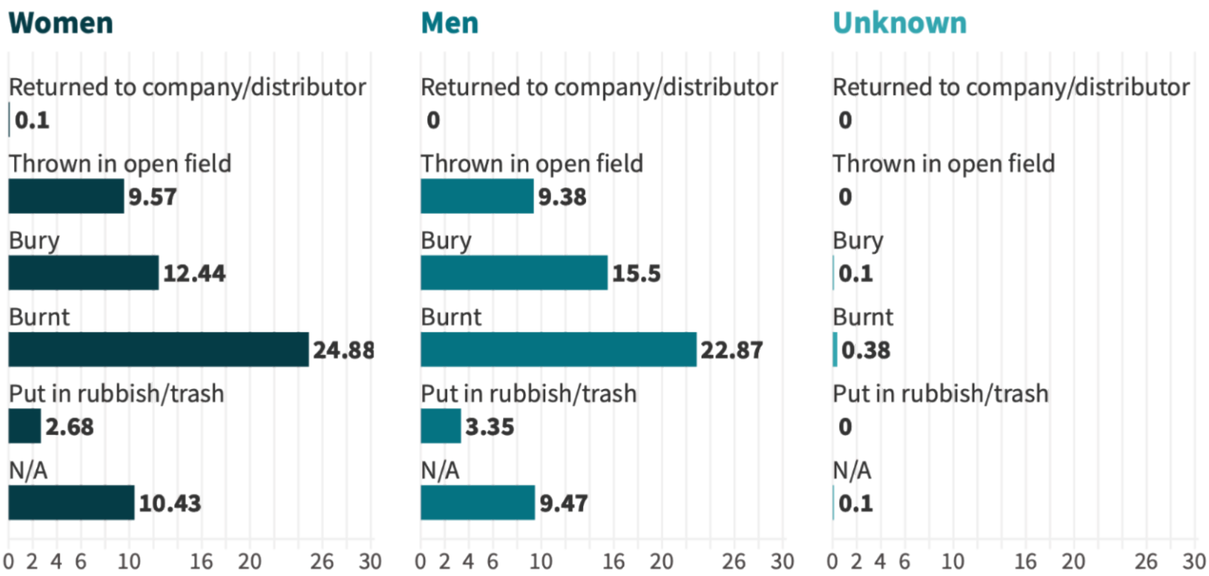
	WOMEN	MEN	UNKNOWN
HOME	18.47%	16.56%	0.48%
FIELD	6.12%	6.03%	0.00
SHED	18.18%	19.52%	0.00
GARDEN	7.56%	9.19%	0.00

- One hundred and nine farmers (10.43%) reused pesticides containers, mostly as refuelling containers or household items (women: 59, 5.65%; men: 46, 4.40%; unknown: 4, 0.38%).

- However, one woman farmer was found to dangerously use a pesticide container for food and water storage, despite answering 'no' to the question.

- Most farmers (503, 48.13%) disposed of pesticides by burning them, risking pesticide exposure (women: 260, 24.88%; men: 239, 22.87%; unknown: 4, 0.38%; Figure 158). Burning pesticide containers can release toxic compounds, due to both the plastic materials of the containers and the chemical structure of the pesticide residues left inside.

Figure 158. **Pesticide disposal methods used by farmers in Xieng Khouang (%)**



Illness after pesticide exposure

- Most farmers (373, 35.69%) experienced dizziness (women: 174, 16.65%; men: 195, 18.66%; unknown: 4, 0.38%; Table 46), followed by headaches (363, 34.74%; women: 190, 18.18%; men: 169, 16.17%; unknown: 4, 0.38%) after being exposed to pesticides

Table 46. **Pesticide exposure symptoms reported by farmers in Xieng Khouang province**

SYMPTOMS	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Blurred vision	46	4.40	94	9.00	-	-	140	13.40
Diarrhoea	53	5.07	41	3.92	-	-	94	9.00
Difficulty of breathing	73	6.99	63	6.03	-	-	136	13.01
Dizziness	174	16.65	195	18.66	4	0.38	373	35.69
Excessive salivation	53	5.07	64	6.12	4	0.38	121	11.58
Excessive sweating	66	6.32	106	10.14	4	0.38	176	16.84
Hand tremors	35	3.35	25	2.39	-	-	60	5.74
Headaches	190	18.18	169	16.17	4	0.38	363	34.74
Irregular heartbeat	42	4.02	25	2.39	-	-	67	6.41
Constricted pupils/miosis	25	2.39	53	5.07	-	-	78	7.46
Nausea	99	9.47	89	8.52	-	-	188	17.99
Skin rashes	39	3.73	17	1.63	-	-	56	5.36
Sleeplessness/Insomnia	65	6.22	53	5.07	4	0.38	122	11.67
Staggering	21	2.01	2	0.19	-	-	23	2.20
Vomiting	70	6.70	55	5.26	-	-	125	11.96
Nothing	4	0.38	-	-	-	-	4	0.38
N/A	242	23.16	283	27.08	-	-	525	50.24

Note: Total is not equal to 100% due to multiple responses

- Despite not being pregnant, women farmers experienced nausea (89, 8.52%) and vomiting (61, 5.84%), which could possibly be related to pesticide exposure, though other factors cannot be ruled out.

- Most farmers (661, 63.25%) called family members when they suspected someone was poisoned by pesticides (women: 335, 32.06%; men: 321, 30.72%; unknown: 5, 0.48%; Table 47).

Table 47. **Farmers' contacts for suspected pesticide poisoning**

CONTACT	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Family member	335	32.06	321	30.72	5	0.48	661	63.25
Friend	13	1.24	8	0.77	-	-	21	2.01
Hospital	252	24.11	210	20.10	1	0.10	463	44.31
Local doctor	67	6.41	58	5.55	4	0.38	129	12.34
Local remedies	2	0.19	10	0.96	-	-	12	1.15
Poison centre	4	0.38	7	0.67	-	-	11	1.05
N/A	82	7.85	75	7.18	-	-	157	15.02

Note: Total is not equal to 100% due to multiple responses

Highlights of the report from Xieng Khouang

55.00% of pesticides are HHPs according to PAN International list of HHPs.

20.00% of pesticides are highly toxic to bees.

13.59% of farmers do not wear PPE.

2.58% of farmers did not have proper access to washing facilities after pesticides application.

9.96% of farmers live less than 1km from pesticide spraying location.

35.50% of farmers store pesticides in their homes.

Summary

In **Xieng Khouang**, the vast majority of farmers (95.50%) reported using pesticides, with a nearly equal distribution among women (46.22%) and men (48.71%). Most farmers (47.94%) reported using pesticides for 10 to 19 years, with similar patterns of use observed among their family members (52.06%). The most commonly used pesticides include glyphosate (65.26%), atrazine (64.78%), and mesotrione (63.35%), primarily in maize cultivation. The widespread use of these chemicals raises serious concerns about soil degradation, water contamination, and biodiversity loss, particularly given the known environmental toxicity of glyphosate and atrazine. Risky handling practices remain common, with 43.16% of farmers decanting pesticides, increasing their risk of direct exposure. Furthermore, about one-third of farmers (31.29%) reported experiencing pesticide spillage, most frequently while spraying (28.52%), with hands being the most affected area (28.80%). The primary cause of spillage was faulty spraying equipment (23.54%), affecting both men and women farmers. Such incidents further heighten farmers' exposure to hazardous pesticides. Farmers complain about dizziness 35.69% of farmers and about headaches 34.74%, with women slightly more affected than men by dizziness (16.65%) and headaches (18.18%). Long-term exposure to these hazardous pesticides has been linked to neurological disorders, respiratory illnesses, and possible carcinogenic effects. The high prevalence of pesticide-related symptoms highlights the urgent need for improved safety practices, comprehensive training on safe pesticide handling, and a transition toward safer agricultural alternatives. In addition, it is important to provide both financial support and practical training to help farmers transition away from pesticide dependence and adopt agroecological practices that are safer, more sustainable, and community-centered.

4.4. Vietnam

4.4.1. Hai Hau District

Demographic profile

- A total of 353 respondents were surveyed in Hai Hau, comprising 183 women (51.84%), 169 men (47.88%), and one respondent (0.28%) of unknown gender.

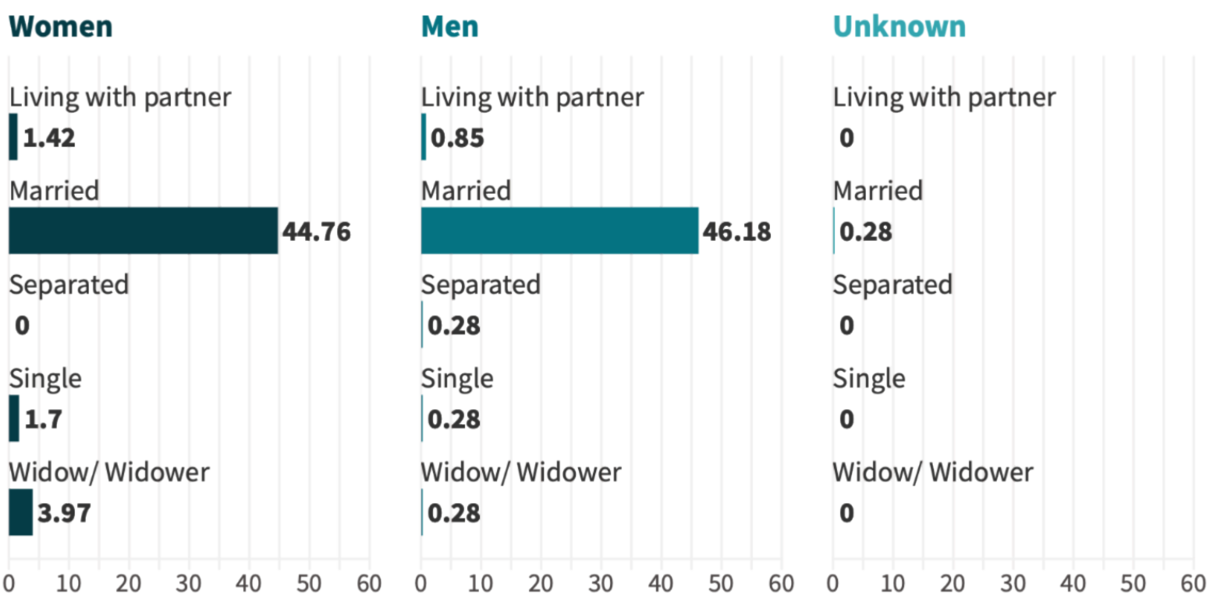
- The largest age group of farmers was between 60 to 69 years old accounting for 105 farmers or 29.75%(women: 47, 13.31%; men: 57, 16.15%; unknown: 1, 0.28%; Table 48).

Table 48. **Age range of farmers in Hai Hau district**

AGE	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
20 – 29	1	0.28	1	0.28	-	-	**2**	**0.57**
30 – 39	30	8.50	19	5.38	-	-	**49**	**13.88**
40 – 49	40	11.33	42	11.90	-	-	**82**	**23.23**
50 – 59	56	15.86	36	10.20	-	-	**92**	**26.06**
60 – 69	47	13.31	57	16.15	1	0.28	**105**	**29.75**
70 – 79	7	1.98	14	3.97	-	-	**21**	**5.95**
N/A	2	0.57	-	-	-	-	**2**	**0.57**
TOTAL	**183**	**51.84**	**169**	**47.88**	**1**	**0.28**	**353**	**100.00**

- The majority of farmers (321, 90.93%) are married (women: 158, 44.76%; men: 163, 46.18%; unknown: 1, 0.28%; Figure 159).

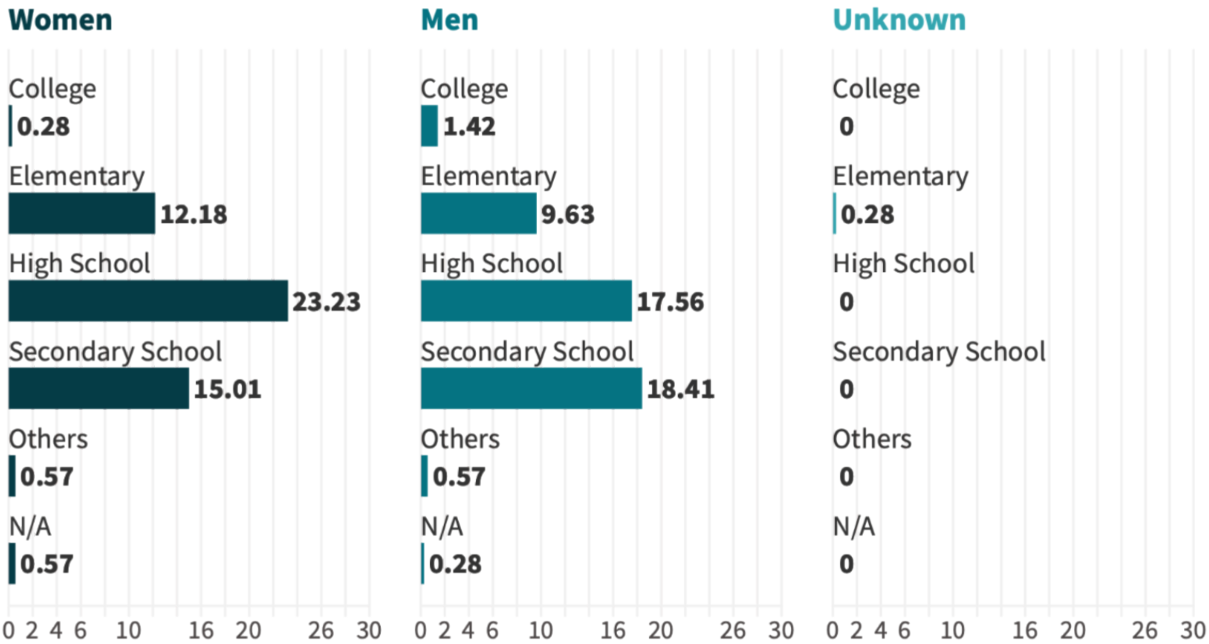
Figure 159. **Marital status of farmers in Hai Hau district (%)**



- Nearly all women farmers (182, 99.45%) were neither pregnant nor breastfeeding at the time of the survey, with only one woman (0.55%) not responding.

- In terms of education, 144 farmers (40.79%) had attained a high school education (women: 82, 23.23%; men: 62, 17.56%; Figure 160).

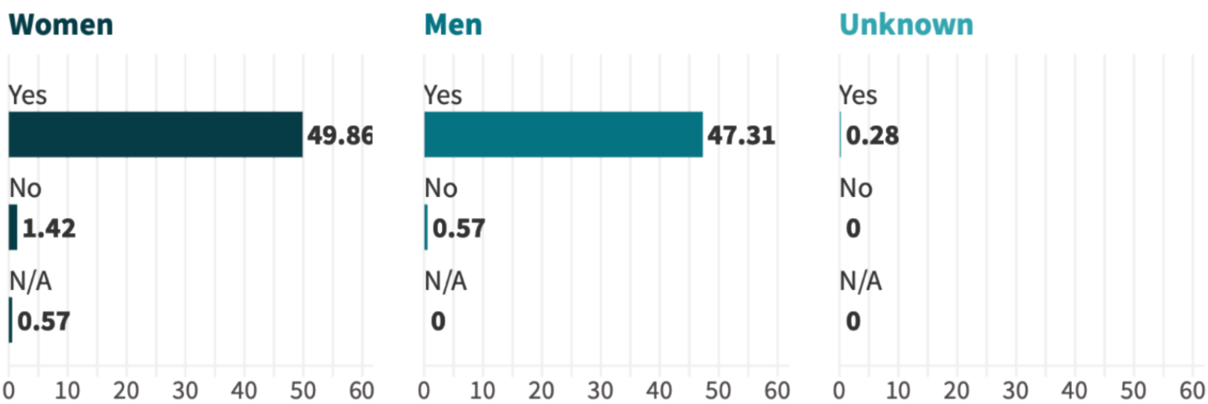
Figure 160. **Education levels of farmers in Hai Hau district (%)**



- A total of 329 farmers (93.20%) reported being self-employed (women: 171, 48.44%; men: 158, 44.76%; unknown: 1, 0.28%), while 23 farmers (6.52%) were employed (women: 12, 3.40%; men: 11, 3.12%).

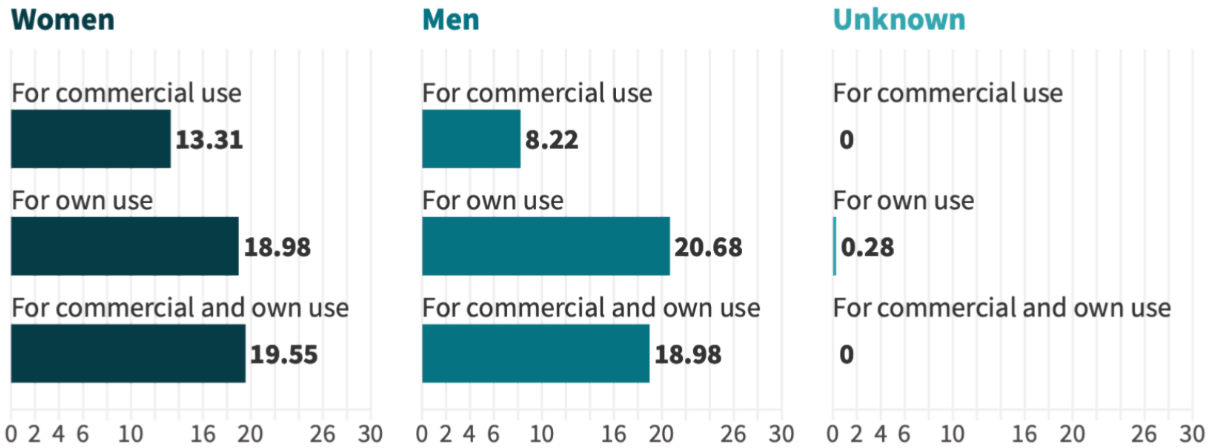
- Land ownership was common, with 343 farmers (97.17%) owning the land they worked on (women: 176, 49.86%; men: 167, 47.31%; unknown: 1, 0.28%; Figure 161).

Figure 161. **Land ownership of farmers in Hai Hau district (%)**



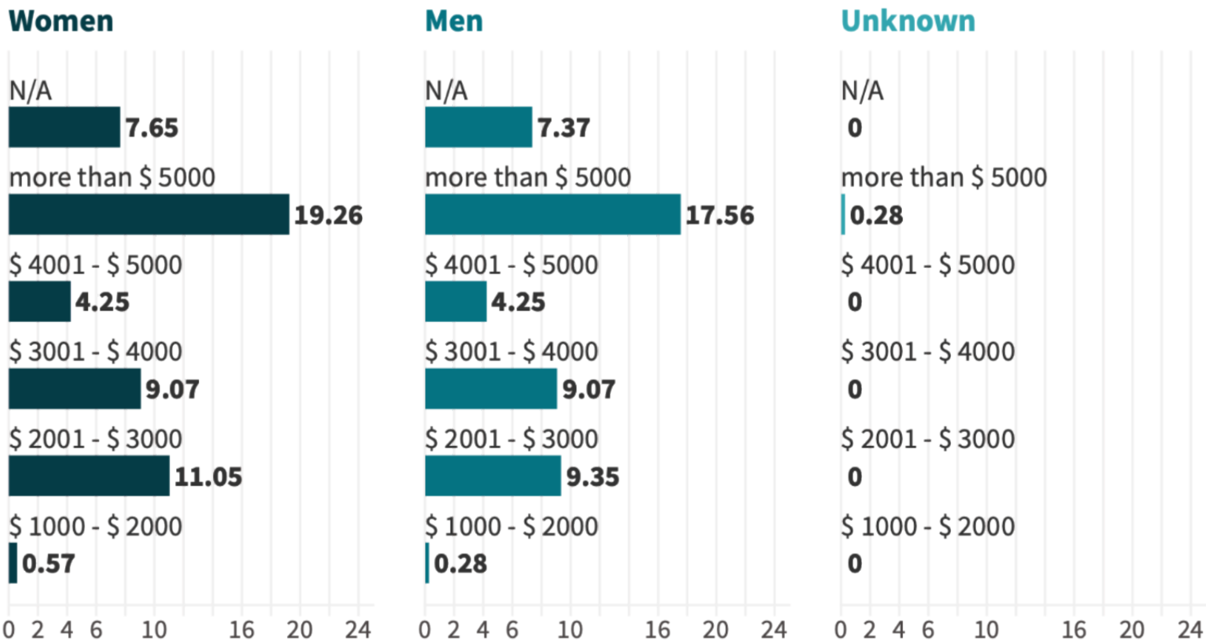
- Most farmers (141, 39.94%) worked on their farms primarily for subsistence (women: 67, 18.98%; men: 73, 20.68%; unknown: 1, 0.28%; Figure 162).

Figure 162. **Farming activities on land in Hai Hau district (%)**



- In terms of household income, 131 farmers (37.11%) reported earning more than USD 5000 annually (women: 68, 19.26%; men: 62, 17.56%; unknown: 1, 0.28%; Figure 163).

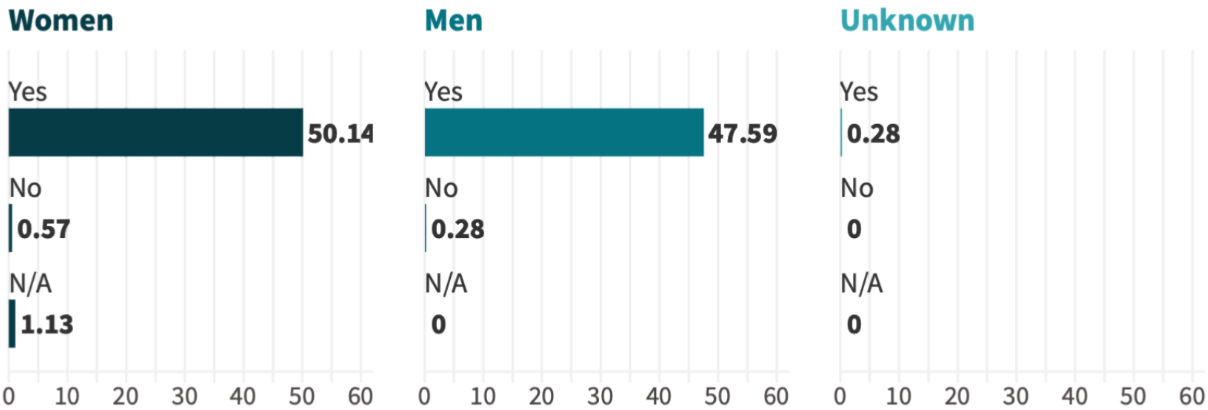
Figure 163. **Annual income of farmers in Hai Hau district (%)**



Pesticide use

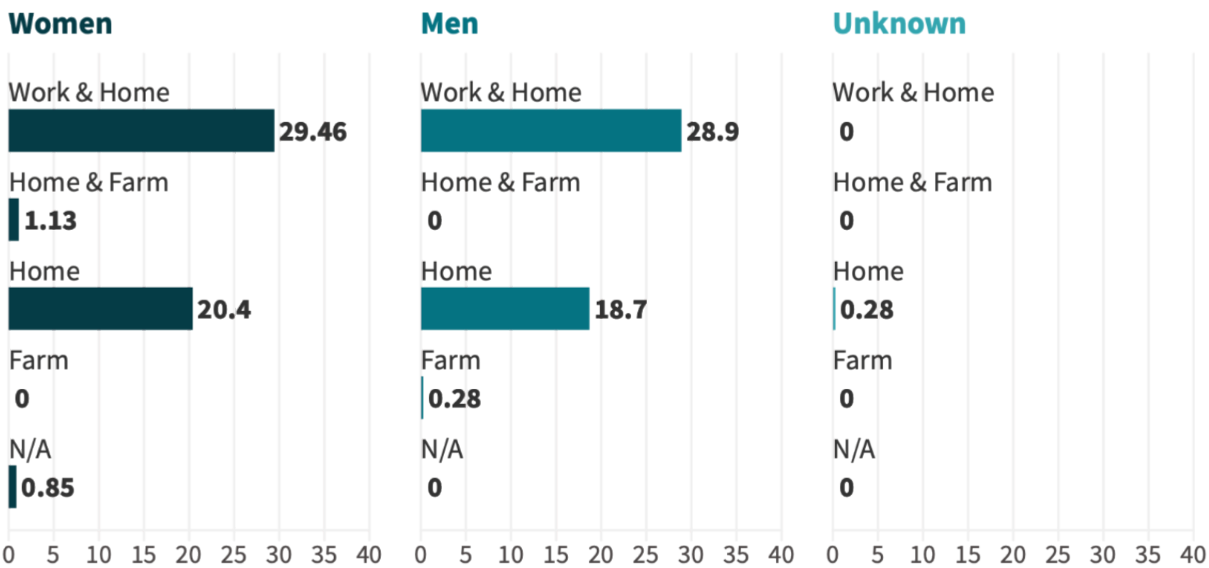
- Almost all farmers in Hai Hau (346, 98.02%) reported using pesticides (women: 177, 50.14%; men: 168, 47.59%; unknown: 1, 0.28%; Figure 164).

Figure 164. **Farmers' use of pesticides in Hai Hau district (%)**



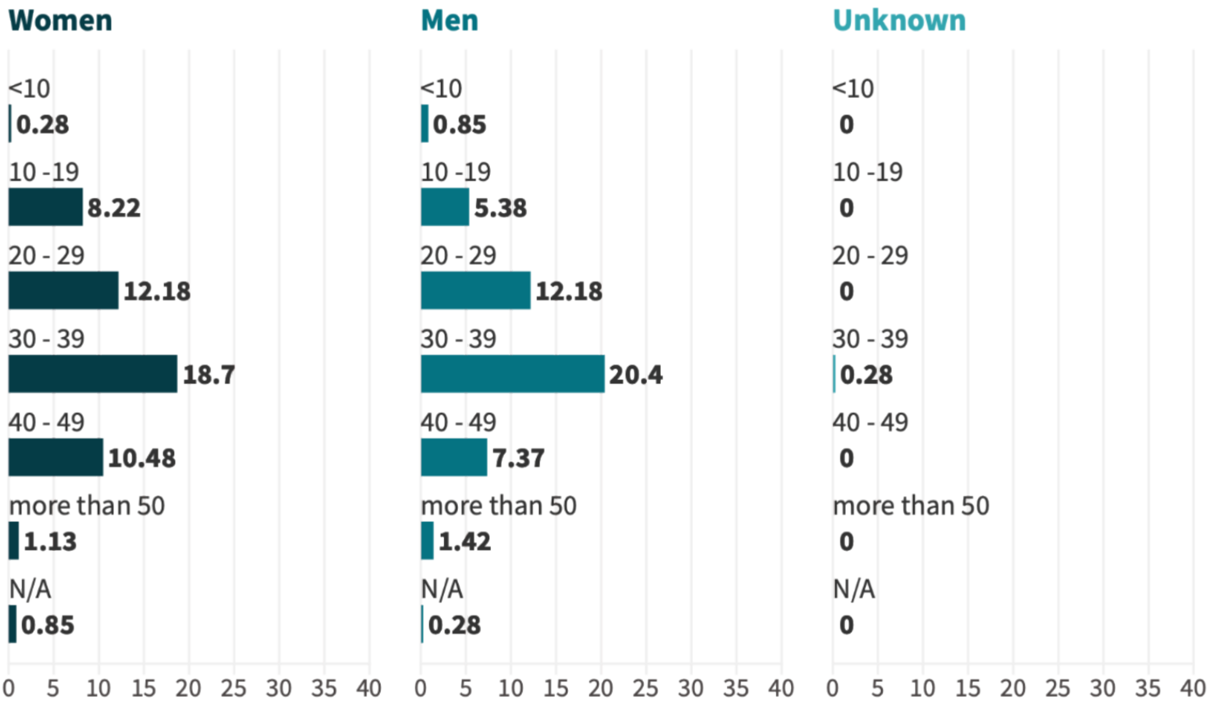
- The primary location of pesticide use is on farms (206, 58.36%; women: 104, 29.46%; men: 102, 28.90%), followed by both home and farm use (139, 39.38%; women: 72, 20.40%; men: 66, 18.70%; unknown: 1, 0.28%; Figure 165).

Figure 165. **Locations of pesticide use in Hai Hau district (%)**



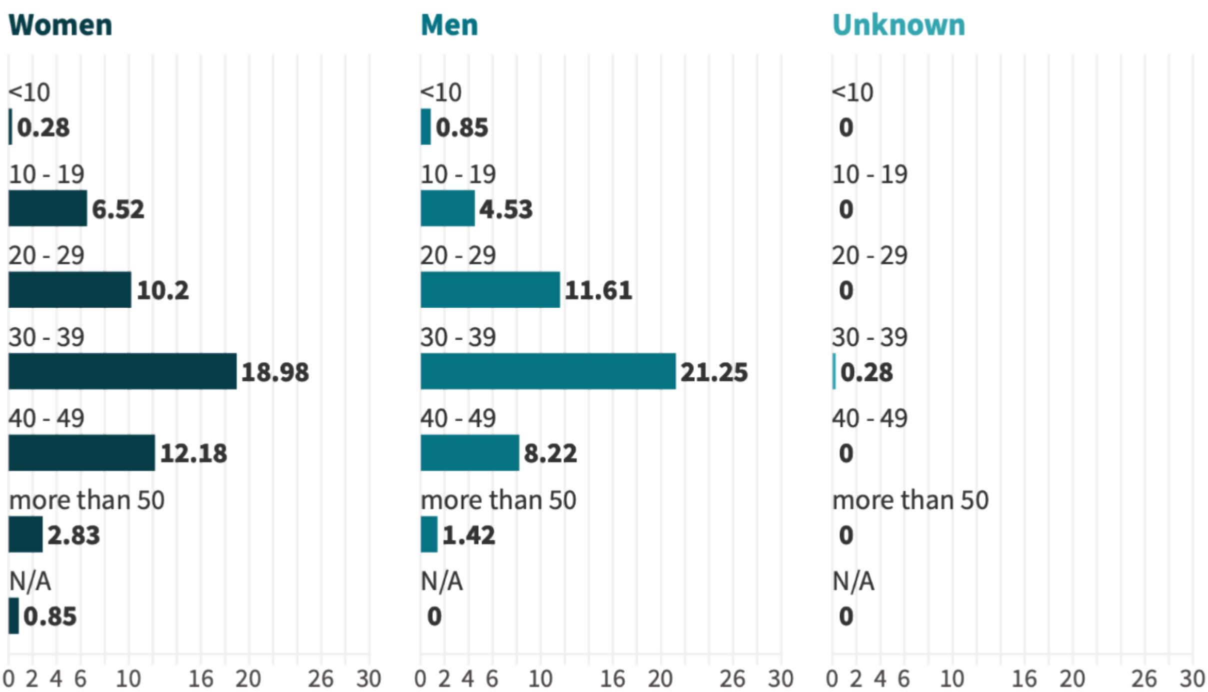
- The most common duration of pesticide use is 30 to 39 years, reported by 139 farmers (39.38%; women: 66, 18.70%; men: 72, 20.40%; unknown: 1, 0.28%; Figure 166).

Figure 166. **Years of pesticide use in Hai Hau district (%)**



- Similarly, 143 farmers (40.51%) stated that their family members have been using pesticides for the same period (women: 67, 18.98%; men: 75, 21.25%; unknown: 1, 0.28%; Figure 167).

Figure 167. **Years of family's pesticide use in Hai Hau district (%)**



- The primary pesticide-related activity reported by 346 farmers (98.02%; women: 177, 50.14%; men: 168, 47.59%; unknown: 1, 0.28%) is applying or spraying pesticides in the field. Other common activities include washing clothes used during spraying or mixing (234, 66.29%; women: 122, 34.56%; men: 111, 31.44%; unknown: 1, 0.28%) and cleaning application equipment (219, 62.04%; women: 116, 32.86%; men: 103, 29.18%; Table 49).

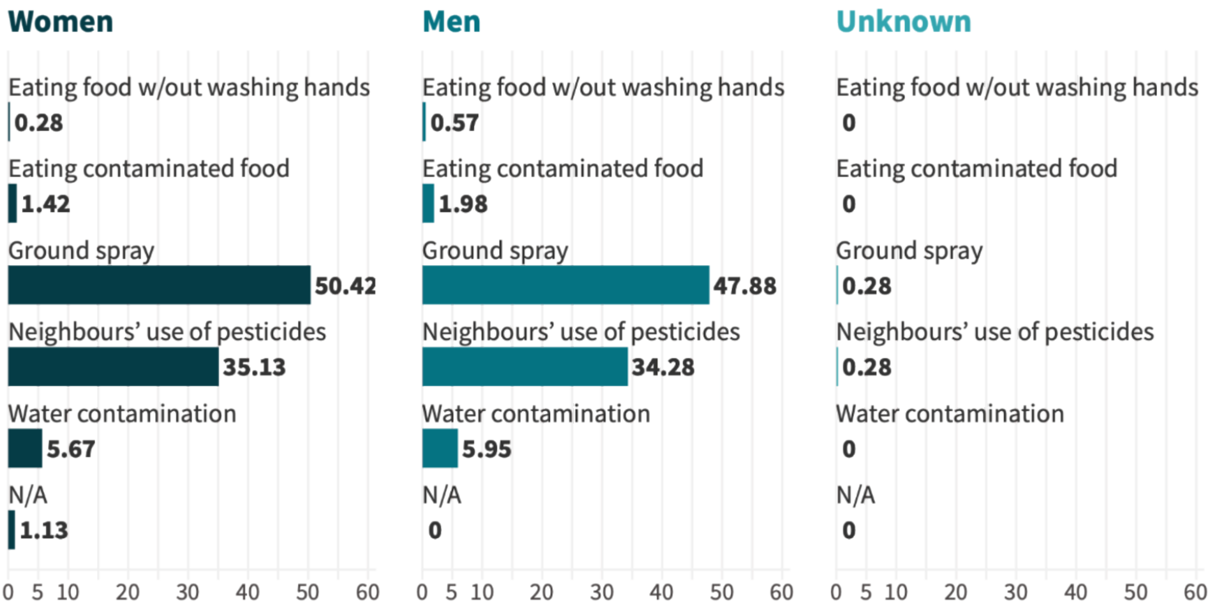
Table 49. **Farmers' pesticide-related activities in Hai Hau district**

ACTIVITY	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Apply/spray pesticides in the field	177	50.14	168	47.59	1	0.28	**346**	**98.02**
Apply pesticides in the household	105	29.75	96	27.20	-	-	**201**	**56.94**
Human therapeutic purposes	3	0.85	3	0.85	-	-	**6**	**1.70**
Mix/load/decant pesticides	12	3.40	25	7.08	1	0.28	**38**	**10.76**
Purchase or transport pesticides	44	12.46	48	13.60	-	-	**92**	**26.06**
Vector control	68	19.26	63	17.85	-	-	**131**	**37.11**
Veterinary therapeutic purposes (e.g. use for foot and mouth disease)	13	3.68	24	6.80	-	-	**37**	**10.48**
Wash clothes used during pesticide spraying or mixing	122	34.56	111	31.44	1	0.28	**234**	**66.29**
Wash equipment used during pesticide spraying or mixing	116	32.86	103	29.18	-	-	**219**	**62.04**
Work in fields where pesticides are being used or have been used	81	22.95	76	21.53	1	0.28	**158**	**44.76**
N/A	3	0.85	-	-	-	-	**-**	**0.85**

Note: Total is not equal to 100% due to multiple responses

- Most farmers (348, 98.58%) are exposed to pesticides through ground spraying (women: 178, 50.42%; men: 169, 47.88%; unknown: 1, 0.28%; Figure 168).

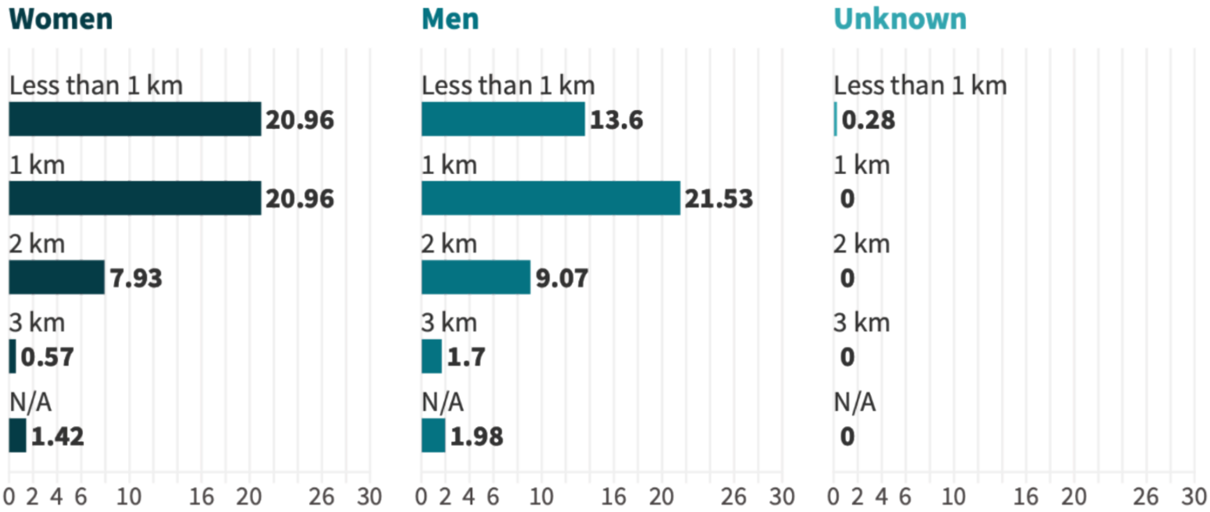
Figure 168. **Farmers' exposure to pesticides in Hai Hau district (%)**



- Nearly all (348) refrain from decanting pesticides into other containers. Only one man (0.28%) and four women (1.13%) reported doing so.

- In terms of proximity, most farmers live either within 1 kilometre (150, 42.49%; women: 74, 20.96%; men: 76, 21.53%) or less than 1 kilometre (123, 34.84%; women: 74, 20.96%; men: 48, 13.60%; unknown: 1, 0.28%; Figure 169) from pesticide spraying areas.

Figure 169. **Distance between farmers' homes and pesticide spraying locations (%)**



- The most commonly used pesticides in Hai Hau include hexaconazole (187, 52.97%), emamectin benzoate (173, 49.01%), and alpha-cypermethrin (159, 45.04%). These pesticides are predominantly used in rice cultivation (Table 50; Image 5).

Image 5. **Some of the pesticides commonly used by farmers in Hai Hau (from left: A.v.t vil 5SC - Hexaconazole, Fattac – Alpha-cypermethrin & Reasgant 3.6EC – Abamectin)**

Table 50.a. **List of pesticides used by farmers in Hai Hau, Vietnam**

PESTICIDE	CROPS TREATED	NO. OF FARMERS	%
Abamectin	RICE, PEANUTS, BEANS, CORN, VEGETABLES	128	36.26
Acetamiprid	RICE	38	10.76
Acetochlor	RICE, MAIZE	9	2.55
Alpha-cypermethrin	RICE, CORN, VEGETABLES	159	45.04
Bromadiolone	VEGETABLES	3	0.85
Buprofezin	RICE	19	5.38
Chlorantraniliprole	RICE, CORN, PEANUTS, VEGETABLES	11	3.12
Chlorfenapyr	RICE VEGETABLES	41	11.61
Chlorfluazuron	RICE	11	3.12
Chlorothalonil	RICE	33	9.35
Chlorpyrifos ethyl	RICE	15	4.25
Cymoxanil	RICE, VEGETABLES	8	2.27
Cypermethrin	RICE, MAIZE	41	11.61
Cyromazine	RICE	12	3.40
Deltamethrin	RICE, MAIZE, VEGETABLES	95	26.91
Difenoconazole	RICE, VEGETABLES	31	8.78
Diphacinone	RICE	2	0.57
Emamectin benzoate	RICE, CORN, VEGETABLES	173	49.01
Fenobucarb	RICE	10	2.83
Fipronil	RICE	11	3.12
Glufosinate ammonium	RICE, VEGETABLES	12	3.40
Hexaconazole	RICE CORN	187	52.97
Imidacloprid	RICE, MAIZE, VEGETABLES	130	36.83
Indoxacarb	RICE, VEGETABLES	121	34.28
Isocycloseram	RICE, VEGETABLES	4	1.13
Isoprocarb	RICE	10	2.83
Isoprothiolane	RICE, MAIZE	54	15.30
Kasugamycin	RICE, VEGETABLES	43	12.18
Lambda cyhalothrin	RICE, VEGETABLES	24	6.80
Mancozeb	RICE, VEGETABLES	42	11.90
Metalaxyl	VEGETABLES	20	5.67
Nereistoxin	RICE, MAIZE	8	2.27
Niclosamide olamine	RICE, VEGETABLES	10	2.83
Nitenpyram	RICE, MAIZE	101	28.61

PESTICIDE	CROPS TREATED	NO. OF FARMERS	%
Permethrin	RICE, MAIZE	22	6.23
Propiconazole	RICE, MAIZE	28	7.93
Propineb	RICE	4	1.13
Pyrazosulfuron ethyl	RICE, VEGETABLES	6	1.70
Quinclorac	RICE, VEGETABLES	6	1.70
Thiamethoxam	RICE	53	15.01
Thiosultap sodium	RICE, VEGETABLES	22	6.23
Tricyclazole	RICE, MAIZE	25	7.08

Table 50.b. **Classification of pesticides used by farmers in Hai Hau, Vietnam**

PESTICIDE	WHO CLASS[123]	PAN HHP LIST[124]	NO. OF COUNTRIES BANNED[125]
Abamectin	IB HIGHLY HAZARDOUS	X (H330, HIGHLY TOXIC TO BEES)*	NOT KNOWN TO BE BANNED
Acetamiprid	II MODERATELY HAZARDOUS	-	NOT KNOWN TO BE BANNED
Acetochlor	III SLIGHTLY HAZARDOUS	X (GHS+ CARC (1A, 1B), GHS+ C2 & R2)	51
Alpha-cypermethrin	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	29
Bromadiolone	IA EXTREMELY HAZARDOUS	X (H330, GHS+ REPRO (1A ,1B))	31
Buprofezin	III SLIGHTLY HAZARDOUS	X (EU EDC)	NOT KNOWN TO BE BANNED
Chlorantraniliprole	U UNLIKELY TO PRESENT ACUTE HAZARD	X (VERY PERS WATER, SOIL OR SEDIMENT, VERY TOXIC TO AQ. ORGANISM)	NOT KNOWN TO BE BANNED
Chlorfenapyr	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	38
Chlorfluazuron	U UNLIKELY TO PRESENT ACUTE HAZARD	X (VERY BIO ACC, VERY TOXIC TO AQ. ORGANISM)	29
Chlorothalonil	U UNLIKELY TO PRESENT ACUTE HAZARD	X (H330, EPA PROB LIKEL CARC)	42
Chlorpyrifos ethyl	II MODERATELY HAZARDOUS	X (GHS+ REPRO (1A ,1B), HIGHLY TOXIC TO BEES)	44
Cymoxanil	II MODERATELY HAZARDOUS	X (GHS+ REPRO (1A ,1B))	NOT KNOWN TO BE BANNED
Cypermethrin	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	1

[123] World Health Organization. (2019). The WHO recommended classification of pesticides by hazard and guidelines to classification. https://www.who.int/publications/i/item/9789240005662
[124] Pesticide Action Network International. (2024). PAN International list of highly hazardous pesticides. https://pan-international.org/wp-content/uploads/PAN_HHP_List.pdf
[125] Pesticide Action Network International. (2024). Consolidated list of banned pesticides. https://pan-international.org/pan-international-consolidated-list-of-banned-pesticides/

PESTICIDE	WHO CLASS	PAN HHP LIST	NO. OF COUNTRIES BANNED
Cyromazine	III SLIGHTLY HAZARDOUS	-	NOT KNOWN TO BE BANNED
Deltamethrin	II MODERATELY HAZARDOUS	X (GHS+ C2 & R2, HIGHLY TOXIC TO BEES)	NOT KNOWN TO BE BANNED
Difenoconazole	II MODERATELY HAZARDOUS	-	NOT KNOWN TO BE BANNED
Diphacinone	IA EXTREMELY HAZARDOUS	X (WHO IA)	31
Emamectin benzoate	II MODERATELY HAZARDOUS	X (VERY PERS WATER, SOIL OR SEDIMENT, VERY TOXIC TO AQ. ORGANISM, HIGHLY TOXIC TO BEES)	NOT KNOWN TO BE BANNED
Fenobucarb	II MODERATELY HAZARDOUS	-	37
Fipronil	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	49
Glufosinate ammonium	II MODERATELY HAZARDOUS	X (GHS+ REPRO (1A ,1B))	29
Hexaconazole	III SLIGHTLY HAZARDOUS	-	41
Imidacloprid	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	29
Indoxacarb	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	29
Isocycloseram	-	-	NOT KNOWN TO BE BANNED
Isoprocarb	II MODERATELY HAZARDOUS	-	29
Isoprothiolane	II MODERATELY HAZARDOUS	-	NOT KNOWN TO BE BANNED
Kasugamycin	U UNLIKELY TO PRESENT ACUTE HAZARD	-	NOT KNOWN TO BE BANNED
Lambda cyhalothrin	II MODERATELY HAZARDOUS	-	NOT KNOWN TO BE BANNED
Mancozeb	U UNLIKELY TO PRESENT ACUTE HAZARD	X (EPA PROB LIKEL CARC, GHS+ REPRO (1A ,1B), EU EDC)	37
Metalaxyl	II MODERATELY HAZARDOUS	-	1
Nereistoxin	-	-	NOT KNOWN TO BE BANNED
Niclosamide olamine	U UNLIKELY TO PRESENT ACUTE HAZARD	-	31
Nitenpyram	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	28 †
Permethrin	II MODERATELY HAZARDOUS	X (EPA PROB LIKEL CARC , HIGHLY TOXIC TO BEES)	39

PESTICIDE	WHO CLASS	PAN HHP LIST	NO. OF COUNTRIES BANNED
Propiconazole	II MODERATELY HAZARDOUS	X (GHS+ REPRO (1A ,1B))	30
Propineb	U UNLIKELY TO PRESENT ACUTE HAZARD	X (EPA PROB LIKEL CARC)	31
Pyrazosulfuron ethyl	U UNLIKELY TO PRESENT ACUTE HAZARD	-	NOT KNOWN TO BE BANNED
Quinclorac	III SLIGHTLY HAZARDOUS	-	NOT KNOWN TO BE BANNED
Thiamethoxam	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	28
Thiosultap sodium	-	-	NOT KNOWN TO BE BANNED
Tricyclazole	II MODERATELY HAZARDOUS	-	30

† Not banned in any country but approval has been withdrawn in the European Union.
*Please refer to Annex A for explanatory notes on HHPs

TOP 10 PESTICIDES USED BY FARMERS IN HAI HAU

1. HEXACONAZOLE	52.97%
2. EMAMECTIN BENZOATE	49.01%
3. ALPHA-CYPERMETHRIN	45.04%
4. IMIDACLOPRID	36.83%
5. ABAMECTIN	36.26%
6. INDOXACARB	34.28%
7. NITENPYRAM	28.61%
8. DELTAMETHRIN	26.91%
9. ISOPROTHIOLANE	15.30%
10. THIAMETHOXAM	15.01%

Hexaconazole, a Class III (slightly hazardous) pesticide, is known to cause endocrine disruption, leading to symptoms such as mood swings, depression, weight gain, and hot flushes.[126] It has also been shown to affect the nervous system, with impacts that include impaired learning and memory, oxidative stress, and a potential carcinogenic risk.[127] Emamectin benzoate, a Class II (moderately hazardous) pesticide, primarily affects the gastrointestinal tract and central nervous system.[128] Reported symptoms include sore throat, nausea, vomiting, abdominal pain, dizziness, and confusion. In more severe cases, ingestion can result in respiratory distress, seizures, metabolic acidosis, and even death.[129] Alpha-cypermethrin, also classified as a Class II (moderately hazardous) pesticide, has been linked to metabolic and redox imbalances.[130] These effects may cause maternal physiological impairments during pregnancy and lead to fetal metabolic changes, raising concerns about its impacts on both maternal and child health[131].

126 Santa Cruz Biotechnology. (2008). Hexaconazole – Material Safety Data Sheet. https://datasheets.scbt.com/sc-235290.pdf

127 Li, F., Pang, J., Wang, M., Yang, T., Wang, Y., Sun, D. & Zhang, Q. (2024). Neurotoxicity of hexaconazole on rat brain: The aspect of biological rhythm. Ecotoxicology and Environmental Safety, Vol 282 116722. https://doi.org/10.1016/j.ecoenv.2024.116722

128 Pan, C. S., Chen, C. H., Mu, H. W., & Yang, K. W. (2024). Review of Emamectin Benzoate Poisoning. Journal of acute medicine, 14(3), 101–107. https://doi.org/10.6705/j.jacme.202409_14(3).0001

129 Ibid

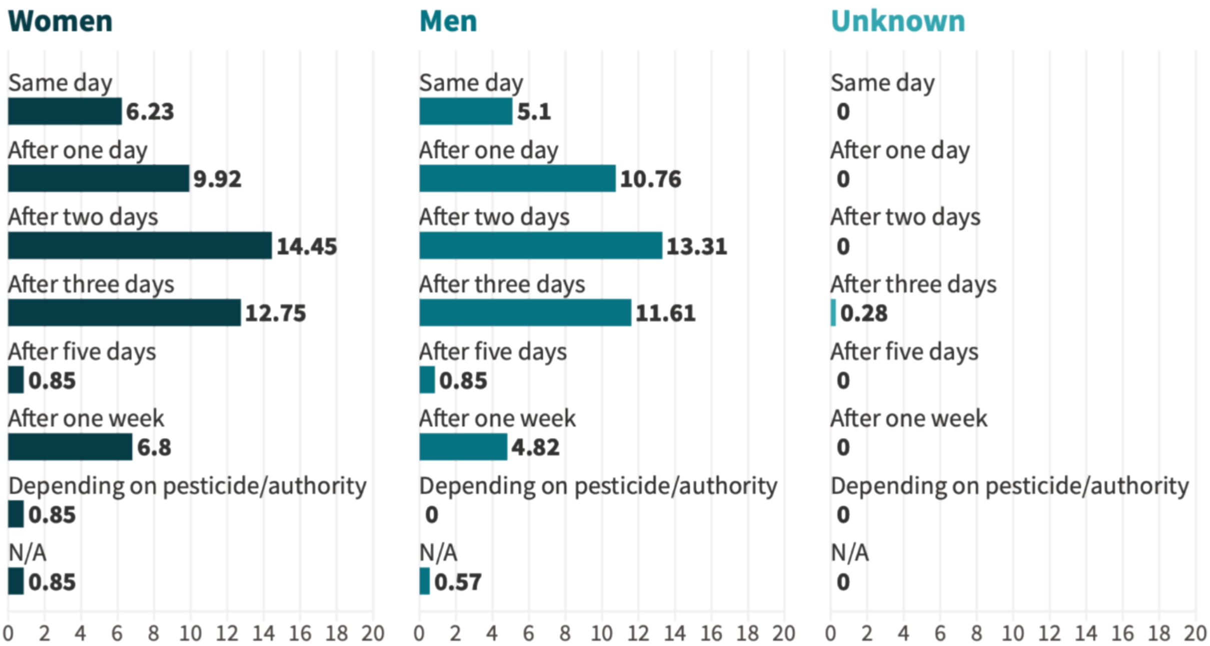
130 Hocine, L., Merzouk, H., Merzouk, S. A., Ghorzi, H., Youbi, M. & nacre, M. (2016). The effects of alpha-cypermethrin exposure on biochemical and redox parameters in pregnant rats and their newborns. Pesticide Biochemistry and Physiology, Vol 134, 49-54. https://doi.org/10.1016/j.pestbp.2016.04.007

131 Ibid

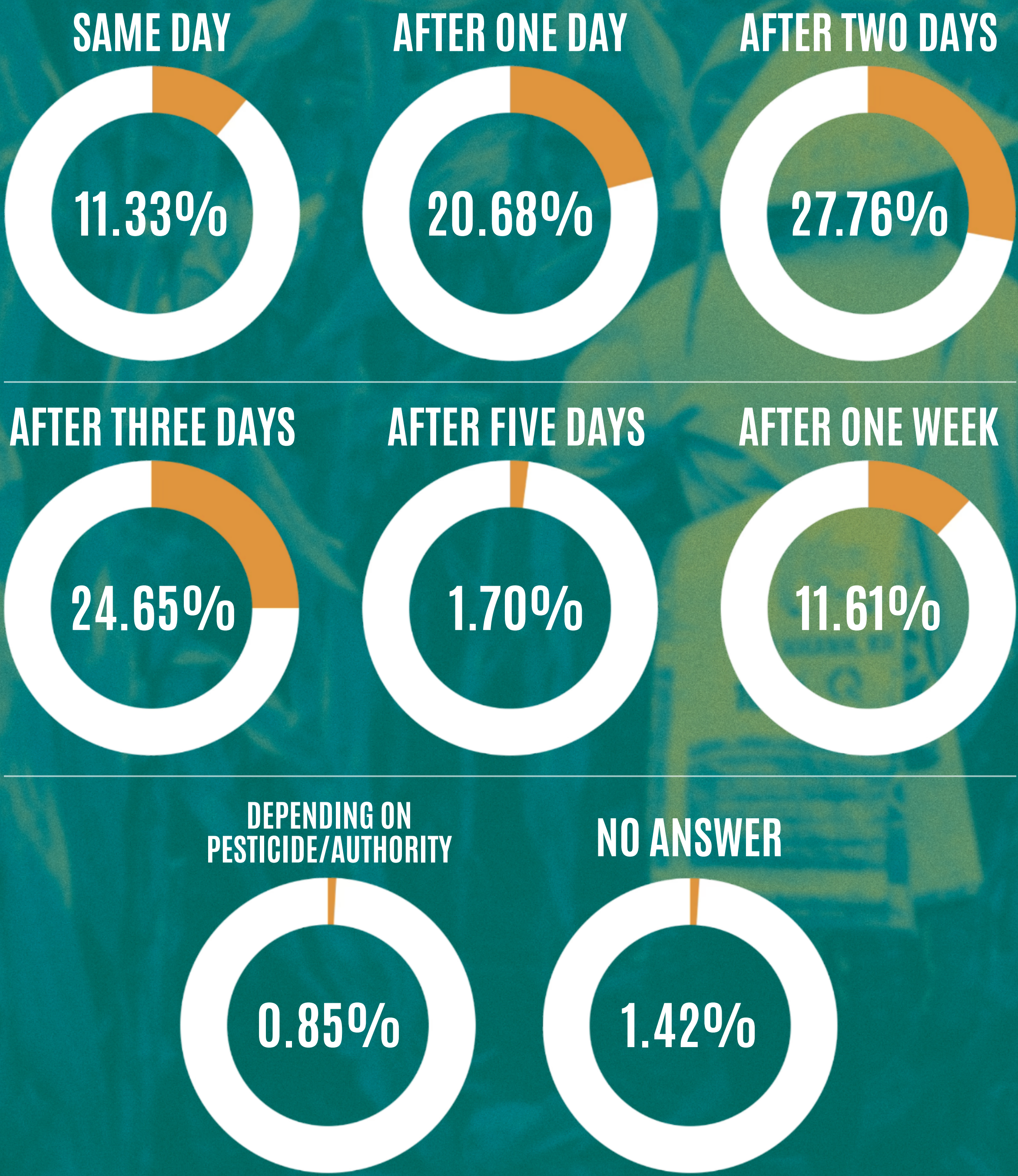
Pesticide exposure and spillage

- In Hai Hau, most farmers (98, 27.76%) re-enter their fields just two days after spraying, risking them to pesticide exposure (women: 51, 14.45%; men: 47, 13.31%; Figure 170).

Figure 170. **Farmers' re-entry into the field after pesticide spraying in Hai Hau district (%)**

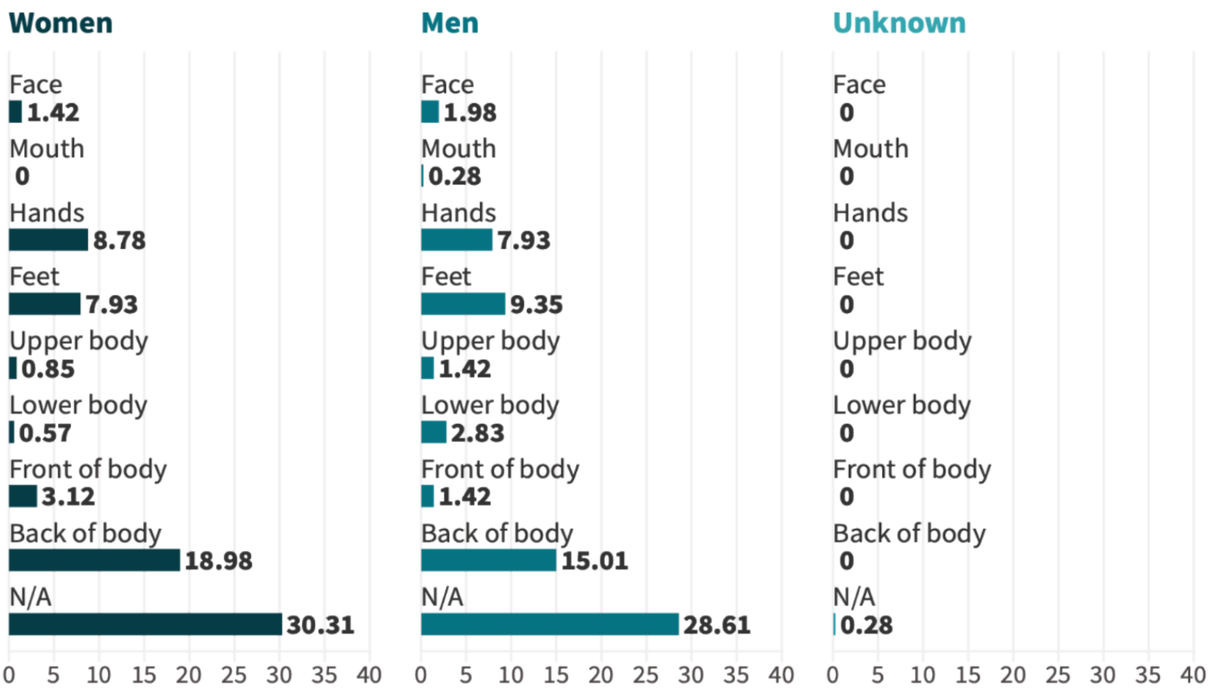


FARMERS' RE-ENTRY INTO THE FIELD AFTER PESTICIDE SPRAYING



- All (352, 99.72%) farmers spray pesticides along wind direction except for one man farmer (0.28%) who sprayed randomly.
- One hundred forty-four farmers (40.79%; women: 76, 21.53%; men: 68, 19.26%) reported experiencing pesticide spillage while 205 (58.07%; women: 104, 29.46%; men: 100, 28.33%; unknown: 1, 0.28%) have not experienced pesticides spillage while three women (0.85%) and one male farmer (0.28%) did not respond.
- Almost all the farmers (348, 98.58%) experienced spillage while spraying pesticides while one man (0.28%) and four women (1.13%) did not answer.
- A majority of farmers (120, 33.99%) experienced spillage on the back of their body (women: 67, 18.98%; men: 53, 15.01%; Figure 171).

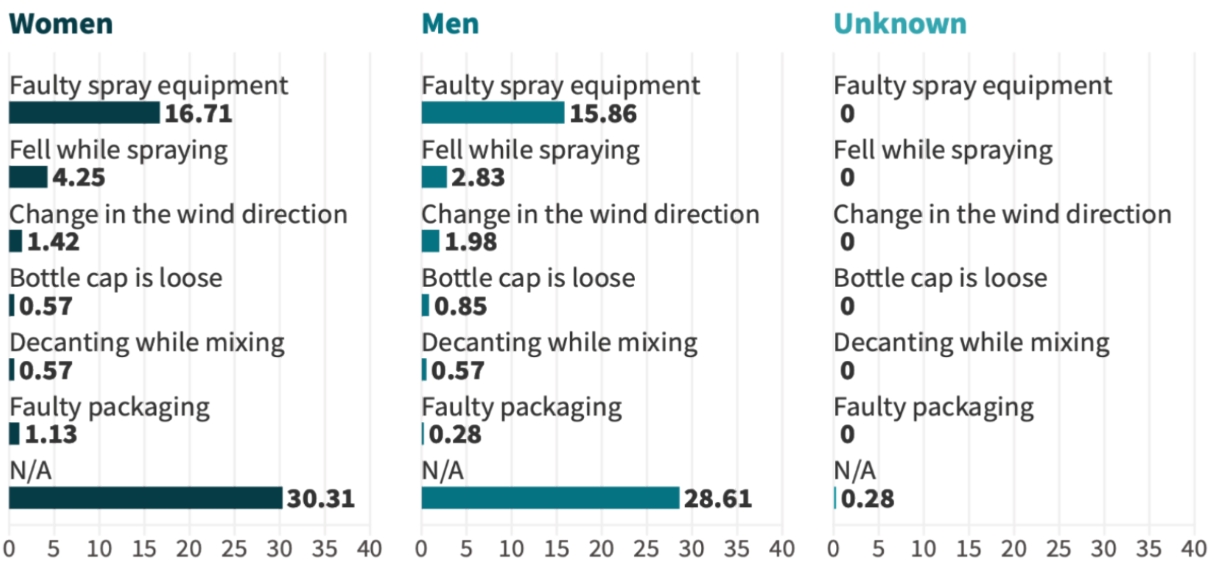
Figure 171. **Body areas exposed to spillage (%)**



Note: Total is not equal to 100% due to multiple responses

- Most farmers (115, 32.58%) experienced pesticide spillage due to faulty spraying equipment (women: 59, 16.71%; men: 56, 15.86%; Figure 172).

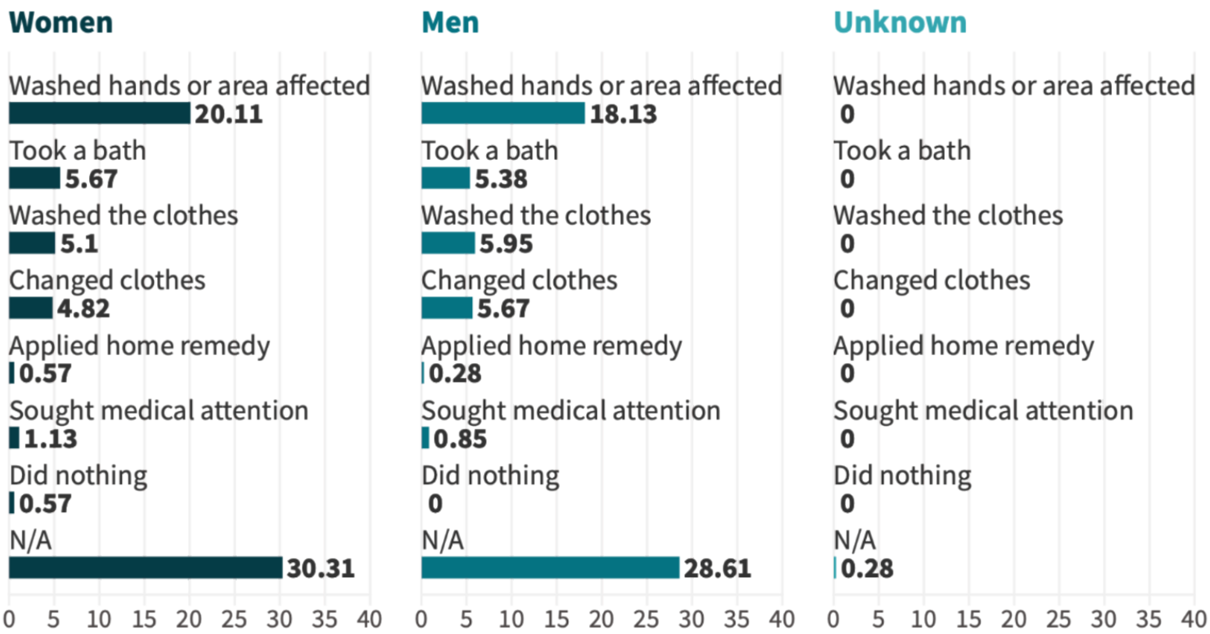
Figure 172. **Causes of pesticide spillage (%)**



Note: Total is not equal to 100% due to multiple responses

- Majority of farmers (135, 38.24%) washed their hands or the affected area when experiencing pesticide spillage (women: 71, 20.11%; men: 64, 18.13%; Figure 173).

Figure 173. **Actions taken by farmers in response to pesticide spillage (%)**

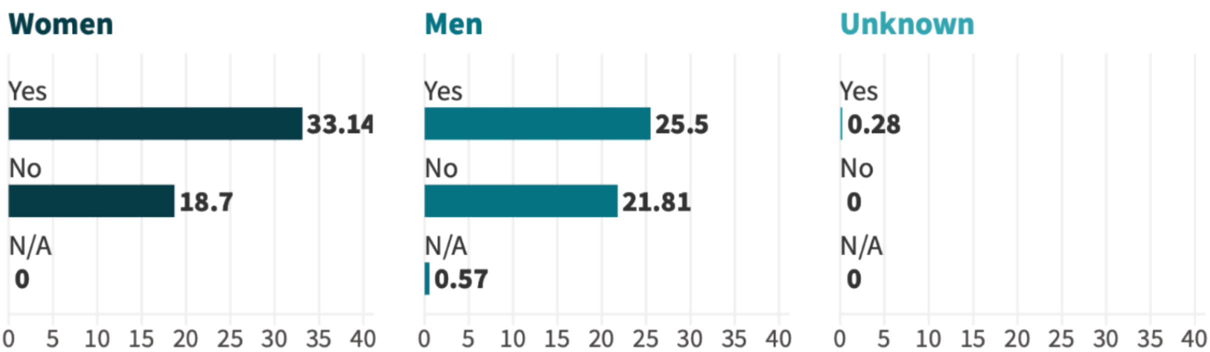


Note: Total is not equal to 100% due to multiple responses

PPE use

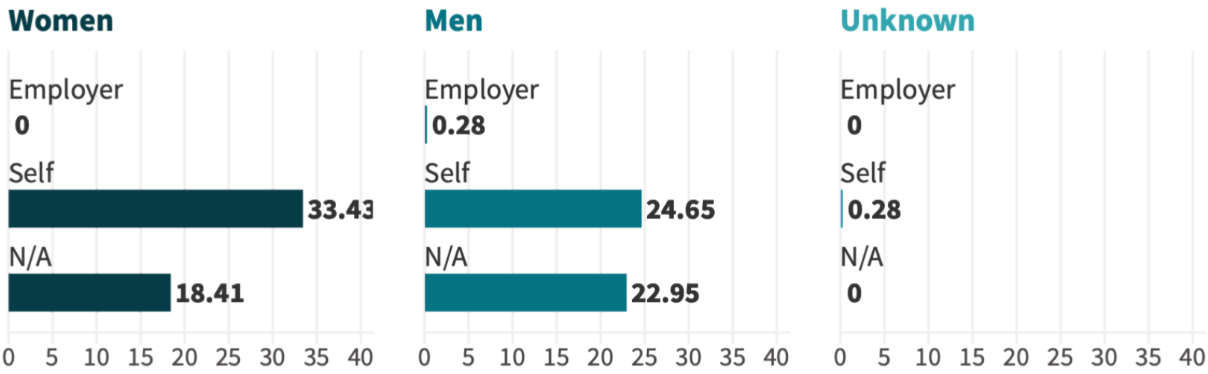
- Although 208 farmers (58.92%) wear PPE when they are applying pesticides (women: 117, 33.14%; men: 90, 25.50%; unknown: 1, 0.28%; Figure 174), 143 farmers (40.51%) still risk exposure to pesticides by not wearing PPE when applying pesticides (women: 66, 18.70%; men: 77, 21.81%) while two men farmers (0.57%) did not respond.

Figure 174. **Use of PPE by farmers in Hai Hau district (%)**



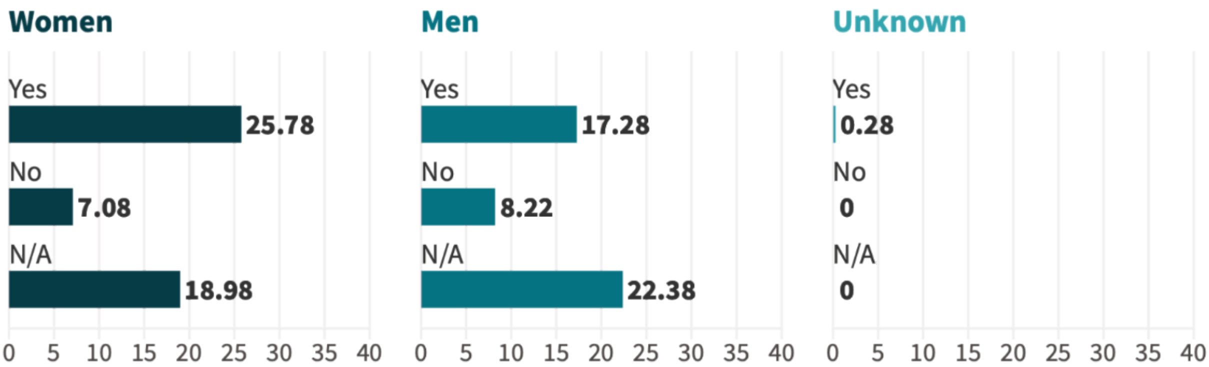
- Two hundred and six farmers (58.36%) who use PPE acquired it themselves (women: 118, 33.43%; men: 87, 24.65%; unknown: 1, 0.28%; Figure 175).

Figure 175. **PPE provider for farmers in Hai Hau (%)**



- Most farmers (153, 43.34%) received instructions on how to use PPE (women: 91, 25.73%; men: 61, 17.28%; unknown: 1, 0.28%; Figure 176).

Figure 176. **Availability of PPE instructions (%)**



- Most farmers (153, 43.34%) received instructions on how to use PPE (women: 91, 25.73%; men: 61, 17.28%; unknown: 1, 0.28%; Figure 176).

Table 51. **Types of PPE used by farmers in Hai Hau district**

PPE	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Boots/shoes	116	32.86	87	24.65	1	0.28	**204**	**57.79**
Eyeglasses	116	32.86	40	11.33	-	-	**156**	**44.19**
Face mask	116	32.86	87	24.65	1	0.28	**204**	**57.79**
Gloves	104	29.46	70	19.83	-	-	**174**	**49.29**
Long pants	113	32.01	88	24.93	1	0.28	**202**	**57.22**
Long-sleeved shirt	99	28.05	75	21.25	1	0.28	**175**	**49.58**
Overalls	8	2.27	8	2.27	-	-	**16**	**4.53**
Respirators	5	1.42	4	1.13	-	-	**9**	**2.55**
N/A	65	18.41	78	22.10	-	-	**143**	**40.51**

Note: Total is not equal to 100% due to multiple responses

FARMERS' USE OF PPE IN HAI HAU

- USING PPE: 58.92%
- NOT USING PPE: 40.51%
- NO ANSWER: 0.57%

TYPES OF PPE USED BY FARMERS

- EYEGLASSES: 44.19%
- FACEMASK: 57.79%
- RESPIRATORS: 0.00
- GLOVES: 49.29%
- LONG-SLEEVED SHIRT: 49.58%
- LONG PANTS: 57.22%
- LUNGI (MEN'S SKIRT): 0.00
- OVERALLS: 4.53%
- BOOTS/SHOES: 57.79%

Note: Total is not equal to 100% due to multiple responses

- Despite farmers mentioning wearing PPE, some of the PPE do not comply with the International Code of Conduct on Pesticide Management's Guidelines for personal protection when handling and applying pesticides as surgical masks are not recommended for spraying pesticides (Image 6).

Image 6. **PPE worn by farmers in Hai Hau district**

- Farmers who do not use PPE stated that they find it uncomfortable (121, 34.28%; women: 55, 15.58%; men: 66, 18.70%; Table 52).

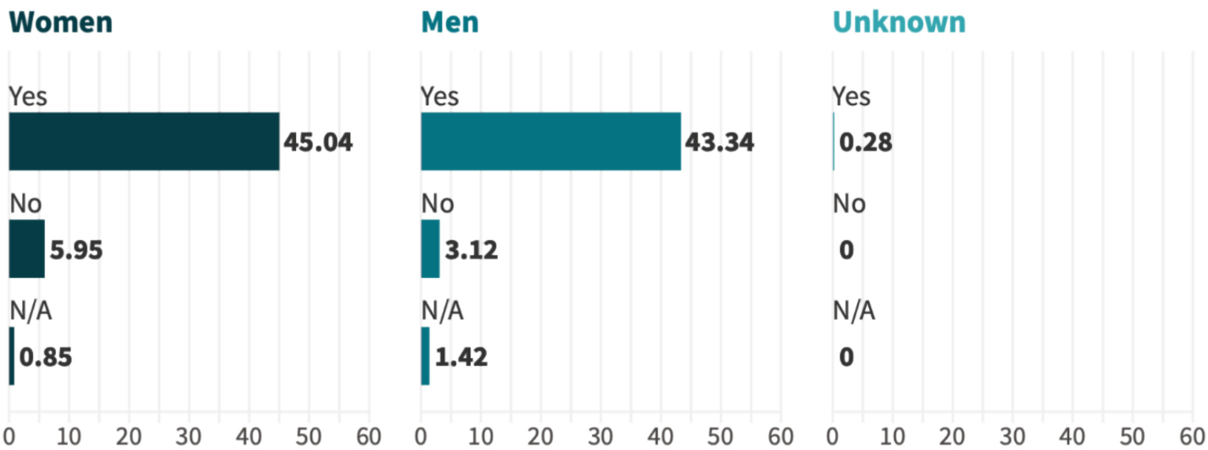
Table 52. **Reasons for not using PPE among farmers in Hai Hau district**

REASON	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Not available	8	2.27	10	2.83	-	-	**18**	**5.10**
Uncomfortable	55	15.58	66	18.70	-	-	**121**	**34.28**
N/A	120	33.99	93	26.35	1	0.28	**214**	**60.62**

Washing facilities

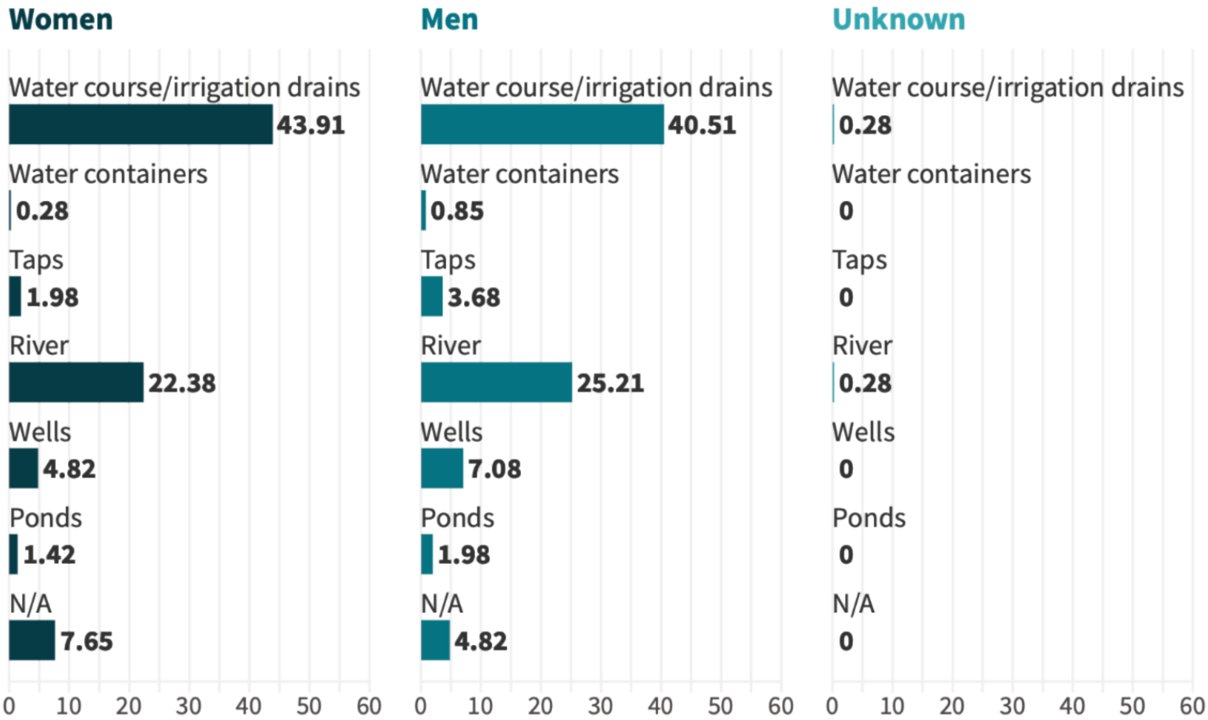
- Three hundred and thirteen (88.66%) farmers have washing facilities available after applying pesticides (women: 159, 45.04%; men: 153, 43.34%; unknown: 1, 0.28%; Figure 177).

Figure 177. **Availability of washing facilities in in Hai Hau district (%)**



- Watercourses or irrigation drains were the most commonly used washing facilities by farmers (299, 84.70%; women: 155, 43.91%; men: 143, 40.51%; unknown: 1, 0.28%; Figure 178).

Figure 178. **Types of washing facilities for farmers (%)**

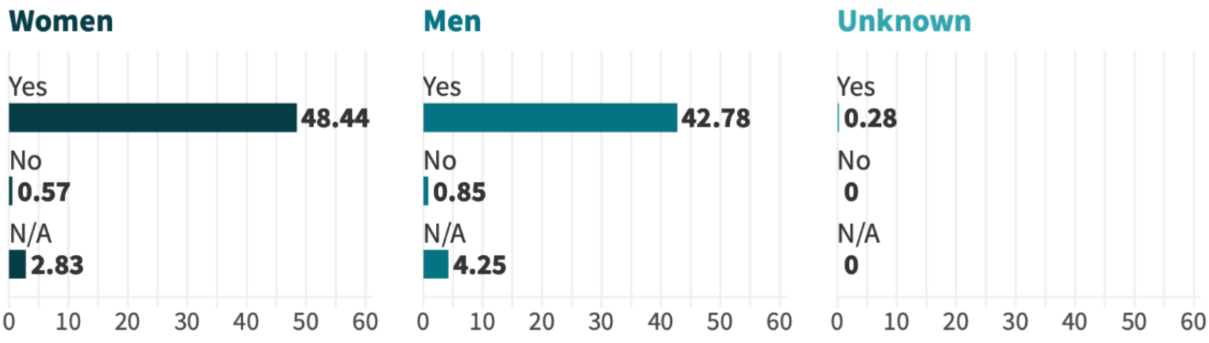


Note: Total is not equal to 100% due to multiple responses

Labels

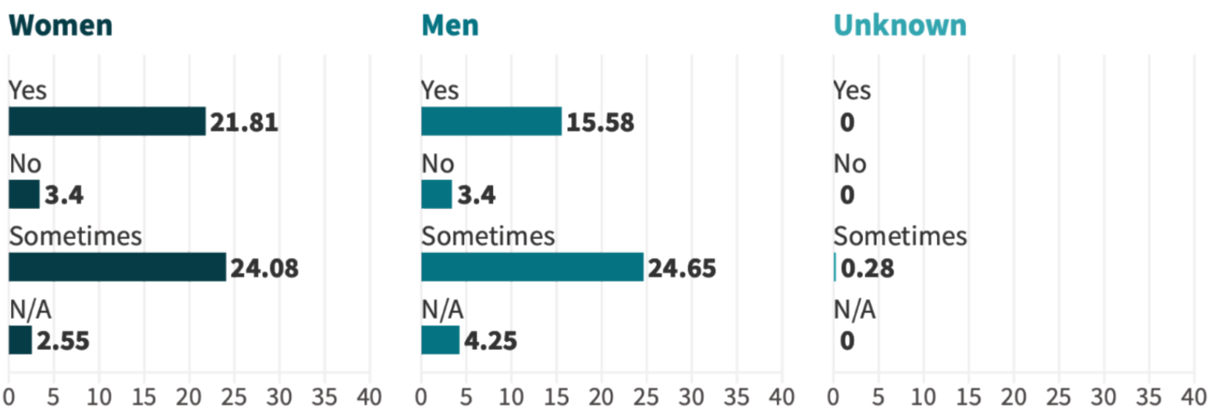
- Three hundred and twenty-three farmers (91.50%) have access to the labels of the pesticides they use (women: 171, 48.44%; men: 151, 42.78%; unknown: 1, 0.28%; Figure 179).

Figure 179. **Farmers' access to labels on pesticides they use (%)**



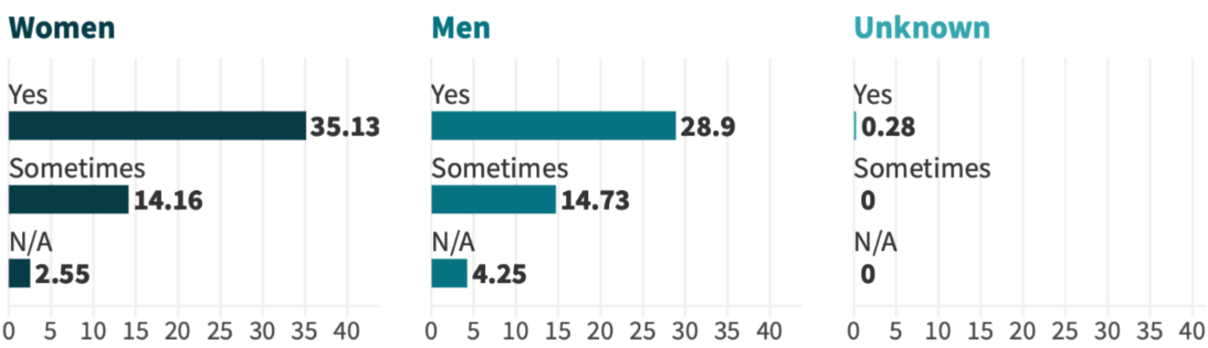
- However, most farmers (173, 49.01%) only read labels sometimes (women: 85, 24.08%; men: 87, 24.65%; unknown: 1, 0.28%; Figure 180).

Figure 180. **Pesticide label reading practices among farmers (%)**



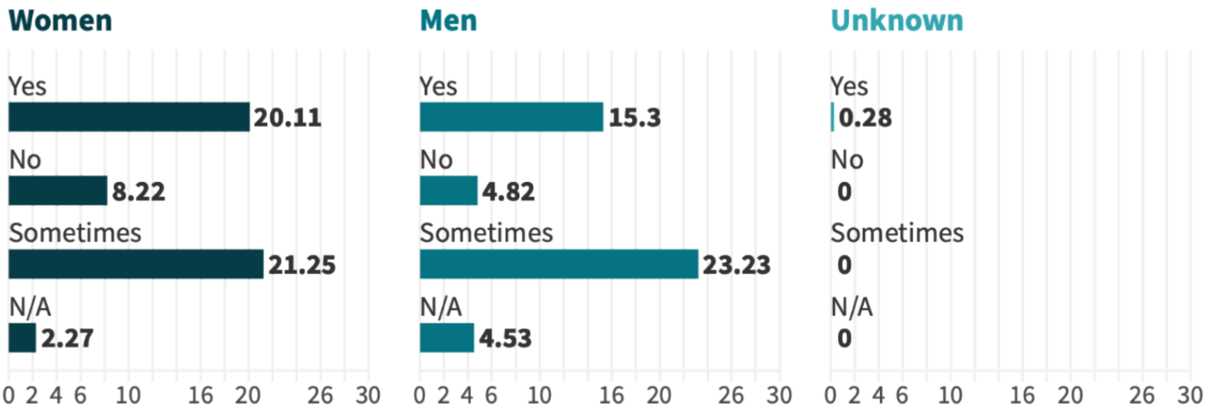
- Most labels (227, 64.31%) are available in local languages (women: 124, 35.13%; men: 102, 28.90%; unknown: 1, 0.28%; Figure 181).

Figure 181. **Availability of pesticide labels in in local language (%)**



- Most farmers (157, 44.48%) report that the information on pesticide labels is only sometimes legible (women: 75, 21.25%; men: 82, 23.23%; Figure 182).

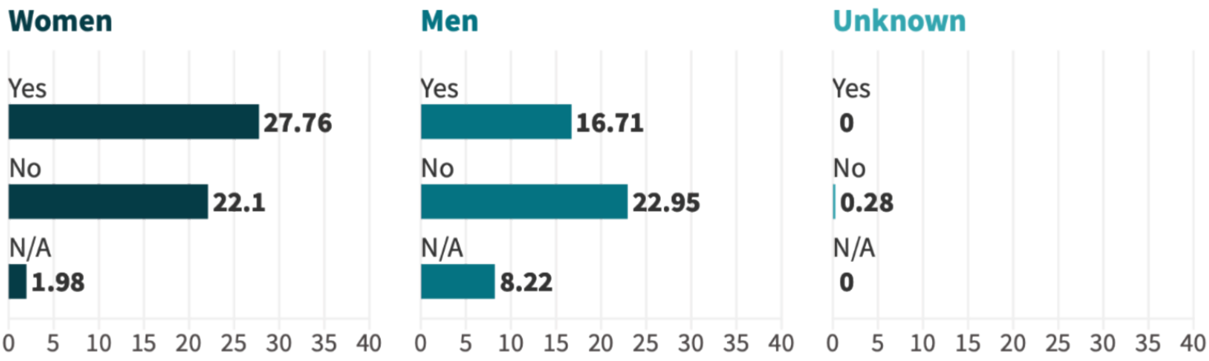
Figure 182. **Farmers response to information readability (%)**



Training on pesticide use, purchase, storage and disposal

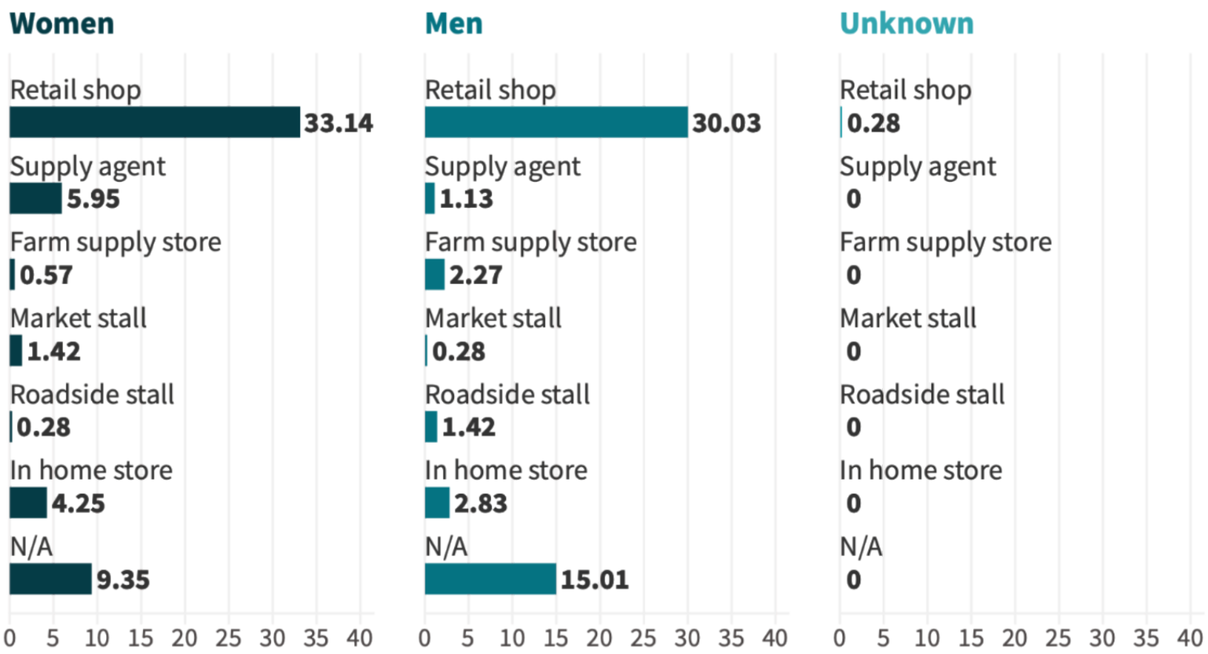
- Almost half of the farmers (160, 45.33%) have not received training on the pesticides they use (women: 78, 22.10%; men: 81, 22.95%; unknown: 1, 0.28%; Figure 183).

Figure 183. **Farmers' training on handling and using pesticides (%)**



- Most farmers (224, 63.46%) purchase their pesticides from retail shops (women: 117, 33.14%; men: 106, 30.03%; unknown: 1, 0.28%; Figure 184).

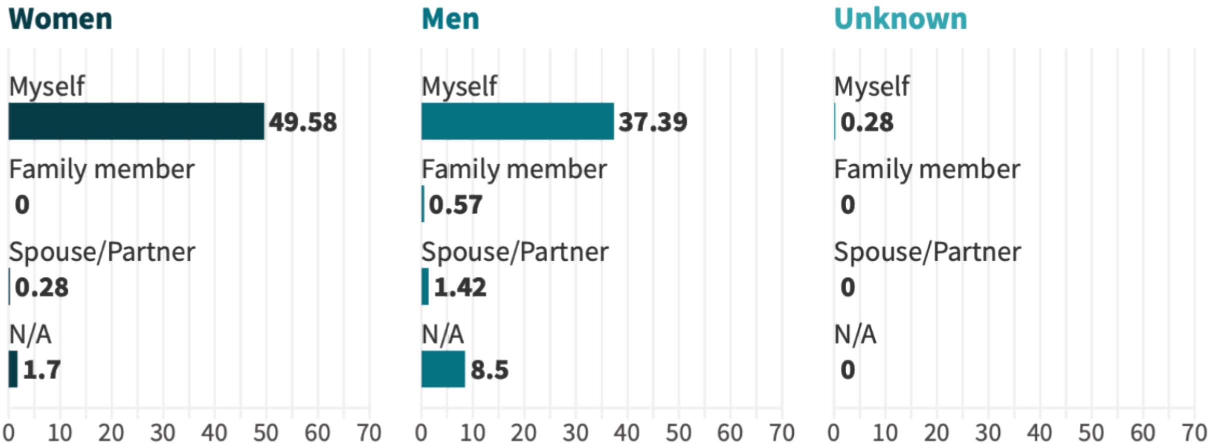
Figure 184. **Farmers' pesticide purchase location (%)**



Note: Total is not equal to 100% due to multiple responses

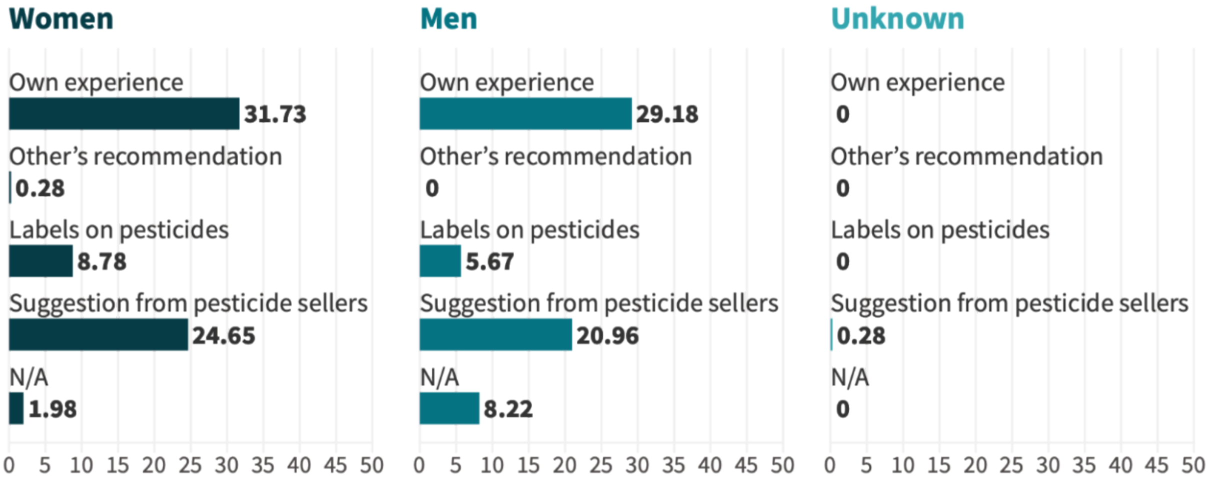
- Majority of the farmers (308, 87.25%) purchased pesticides themselves (women: 175, 49.58%; men: 132, 37.38%; unknown: 1, 0.28%; Figure 185).

Figure 185. **Person in charge of purchasing pesticides in each household (%)**



- Most farmers (215, 60.91%) base their pesticide purchases on personal experience (women: 112, 31.73%; men: 103, 29.18%; Figure 186).

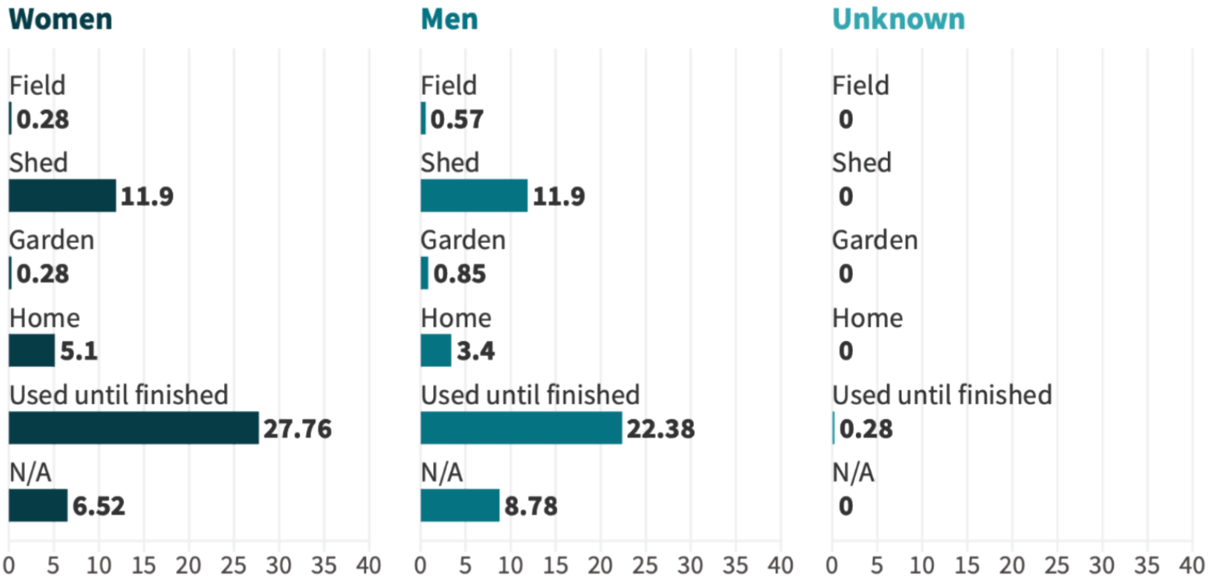
Figure 186. **Factors influencing farmers' pesticide choices (%)**



Note: Total is not equal to 100% due to multiple responses

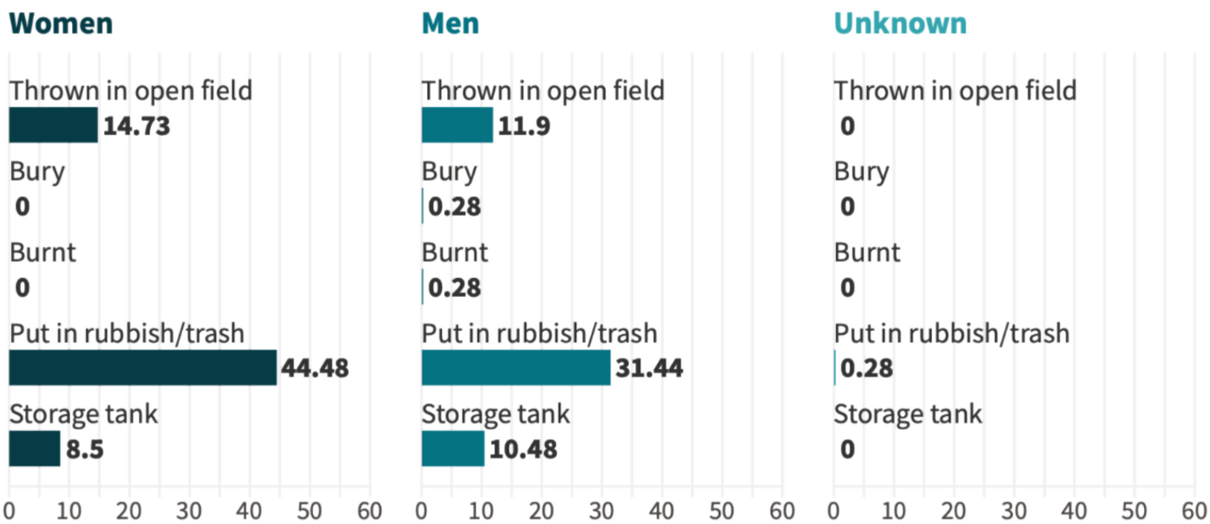
- Many farmers (178, 50.42%) use up all pesticides to avoid storage (women: 98, 27.76%; men: 79, 22.38%; unknown: 1, 0.28%; Figure 187).

Figure 187. **Pesticide storage locations used by farmers in Hai Hau (%)**



- All farmers surveyed (353, 100.00%) reported not reusing pesticide containers or bags for other purposes. Most farmers (269, 76.20%) dispose of pesticide waste in the trash (women: 157, 44.48%; men: 111, 31.44%; unknown: 1, 0.28%; Figure 188).

Figure 188. **Pesticide disposal methods used by farmers in Hai Hau district (%)**



Note: Total is not equal to 100% due to multiple responses

Illness after pesticide exposure

- Most farmers experienced headaches (233, 66.01%; women: 123, 34.84%; men: 110, 31.16%; Table 53), followed by dizziness (205, 58.07%; women: 110, 31.16%; men: 95, 26.91%) and excessive sweating (150, 42.49%; women: 65, 18.41%; men: 85, 24.08%; unknown: 1, 0.28%) when they were exposed to pesticides.

Table 53. **Pesticide exposure symptoms reported by farmers in Hai Hau district**

SYMPTOMS	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Blurred vision	33	9.35	36	10.20	-	-	69	19.55
Convulsions	1	0.28	1	0.28	-	-	2	0.57
Diarrhoea	28	7.93	18	5.10	-	-	46	13.03
Difficulty of breathing	38	10.76	32	9.07	-	-	70	19.83
Dizziness	110	31.16	95	26.91	-	-	205	58.07
Excessive salivation	8	2.27	4	1.13	-	-	13	3.68
Excessive sweating	65	18.41	85	24.08	1	0.28	150	42.49
Hand tremors	51	14.45	43	12.18	-	-	94	26.63
Headaches	123	34.84	110	31.16	-	-	233	66.01
Irregular heartbeat	4	1.13	6	1.70	-	-	10	2.83
Nausea	30	8.50	27	7.65	-	-	57	16.15
Skin rashes	44	12.46	46	13.03	-	-	90	25.50
Sleeplessness/Insomnia	22	6.23	20	5.67	-	-	42	11.90
Staggering	29	8.22	26	7.37	-	-	55	15.58
Vomiting	29	8.22	21	5.95	-	-	50	14.16
N/A	13	3.68	9	2.55	-	-	22	6.23

Note: Total is not equal to 100% due to multiple responses

- Although not pregnant, women farmers experienced nausea (30, 8.50%) and vomiting (29, 8.22%), which could possibly be related to pesticide exposure, though other factors cannot be ruled out.

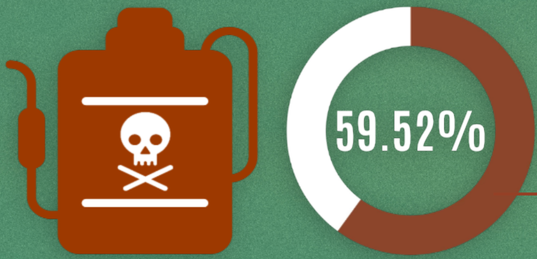
- Most farmers (263, 74.50%) contact family members when they suspect pesticide poisoning (women: 134, 37.96%; men: 129, 36.54%; Table 54).

Table 54. **Farmers' contacts for suspected pesticide poisoning**

CONTACT	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Company	-	-	1	0.28	-	-	1	0.28
Family member	134	37.96	129	36.54	-	-	263	74.50
Friends	1	0.28	-	-	-	-	1	0.28
Hospital	4	1.13	9	2.55	-	-	13	3.68
Local doctor	98	27.76	92	26.06	-	-	190	53.82
Local remedies	-	-	1	0.28	-	-	1	0.28
N/A	4	1.13	2	0.57	1	0.28	7	1.98

Note: Total is not equal to 100% due to multiple responses

Highlights of the report from Hai Hau



of pesticides are HHPs according to PAN International list of HHPs.

of pesticides are highly toxic to bees.

of farmers do not wear PPE.

of farmers did not have proper access to washing facilities after pesticides application.

of farmers live less than 1km from pesticide spraying location.

of farmers store pesticides in their homes.

Summary

Farmers in **Hai Hau, Vietnam**, have a long history of pesticide use, with nearly all (99.15%) reporting pesticide application, primarily in rice cultivation. The majority have been using pesticides for 30 to 39 years, and many live in close proximity, 1 kilometre or less, from spraying areas, increasing their risk of exposure. Hexaconazole is the most commonly used pesticide (52.97%), followed by emamectin benzoate (49.01%) and alpha-cypermethrin (45.04%). Although farmers report using personal protective equipment (PPE), many rely on surgical masks, which do not meet the International Code of Conduct on Pesticide Management's guidelines for safe use, leaving them vulnerable to exposure.

Almost all farmers (98.58%) reported experiencing pesticide spillage while spraying, with the back of the body being the most commonly affected area (33.99%). The main cause of these spillages was faulty spraying equipment (32.58%), further increasing the risk of dermal exposure during pesticide application. A majority of farmers experienced symptoms such as headaches (66.01%), dizziness (58.07%), and excessive sweating (42.49%) following pesticide use. Women farmers, despite not being pregnant, report nausea (8.50%) and vomiting (8.22%), which could possibly be related to pesticide exposure, though other factors cannot be ruled out. Chronic exposure to pesticides like hexaconazole and alpha-cypermethrin has been linked to neurological disorders, hormonal imbalances, and increased long-term health risks. The continued reliance on hazardous pesticides, combined with improper protective measures, highlights the urgent need for safer pesticide management practices and increased awareness of the health risks associated with prolonged exposure. In addition, it is important to provide both financial support and practical training to help farmers transition away from pesticide dependence and adopt agroecological practices that are safer, more sustainable, and community-centered.

"It was uncomfortable, like restlessness, aching hands and feet, numbness, then the dizziness, nausea, blurred vision. Thus, everytime I spray pesticides, I am scared. Pesticides to treat the blast rice disease is the heaviest one and make me the most uncomfortable, with very bad symptoms like tired uncomfortable in my hands and feet, even pain in both temples, headaches. I cannot remember those kinds of pesticides as they are all in foreign language, except for the rice blast. It's toxic, for sure. The fish in the water even came up to die when pesticides is sprayed."

-Mrs. Le Thi Khuyen, 62 years old, Hamlet 4, Hai Cuong commune,
Hai Hau district, Nam Dinh province

4.4.2. Son La Province

Demographic profile

- One hundred and seventy respondents were surveyed in Son La Province of whom 97 (57.06%) were women, 70 (41.18%) were men and three (1.76%) were of unknown gender.

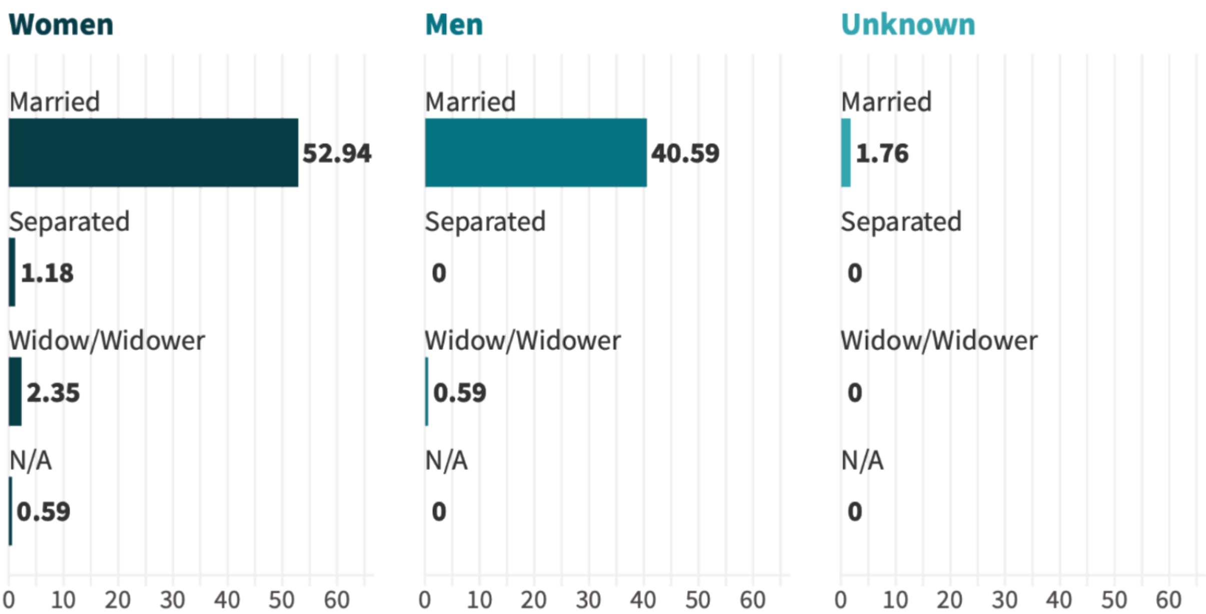
- The majority (81, 47.65%) of the farmers are within the age range of 30 to 39 years old (women: 42, 24.71%; men: 39, 22.94%; Table 55).

Table 55. **Age range of farmers in Son La province**

AGE	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
20 – 29	30	17.65	12	7.06	2	1.18	44	25.88
30 – 39	42	24.71	39	22.94	-	-	81	47.65
40 – 49	13	7.65	8	4.71	1	0.59	22	12.94
50 – 59	5	2.94	6	3.53	-	-	11	6.47
60 – 69	7	4.12	5	2.94	-	-	12	7.06
TOTAL	97	57.06	70	41.18	3	1.76	170	100.00

- Most farmers (162, 95.29%) are married (women: 90, 52.94%; men: 69, 40.59%; unknown: 3, 1.76%; Figure 189).

Figure 189. **Marital status of farmers in Son La province (%)**

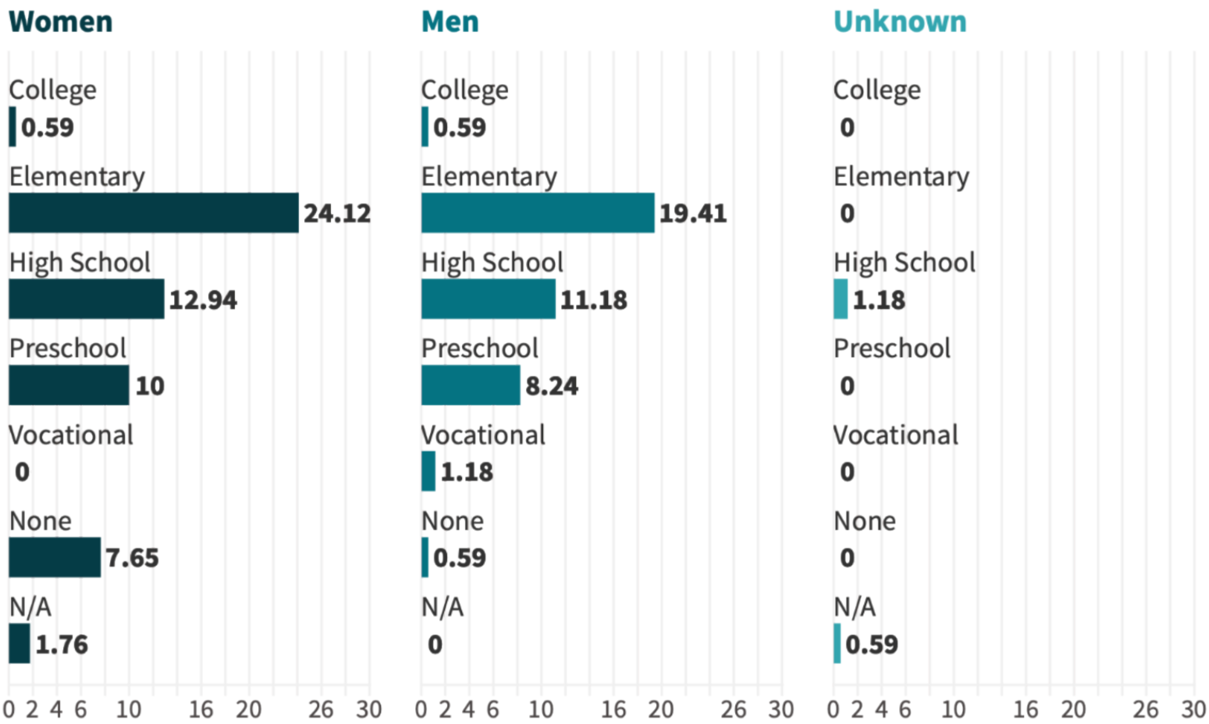


- One woman farmer (1.03%) was reported to be pregnant and one (1.03%) woman farmer did not answer the pregnancy question, while the rest of the women farmers (95, 97.94%) reported not being pregnant during the time of survey.

- Meanwhile, almost all the women farmers (93, 95.88%) were reported not to be breastfeeding during the time of survey except for three women farmers who reported to be breastfeeding (3.09%) and one-woman farmer (1.03%) who did not respond.

- Seventy-four (43.53%) farmers had only attained elementary-level education (women: 41, 24.12%; men: 33, 19.41%; Figure 190).

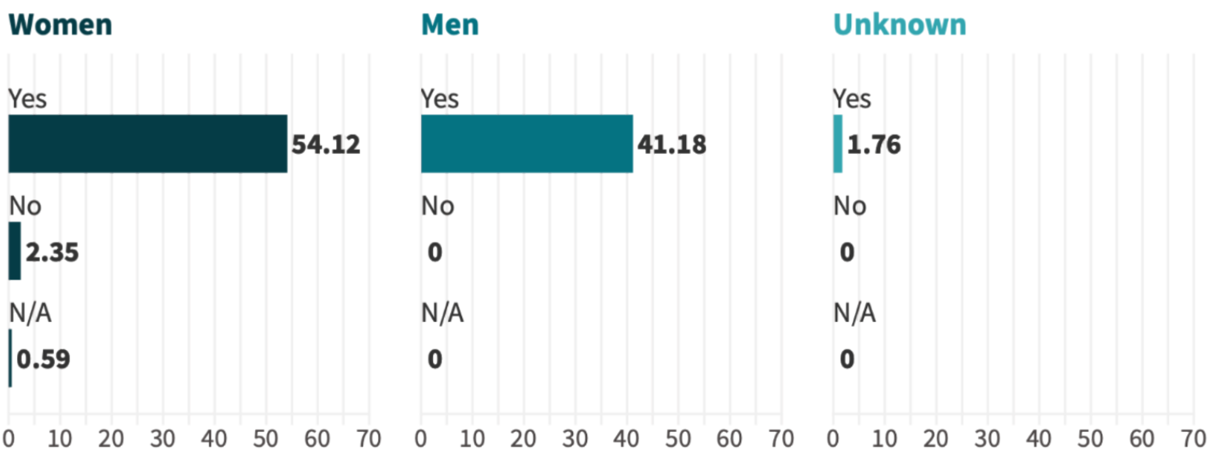
Figure 190. **Education levels of farmers in Son La province (%)**



- One hundred sixty-seven (98.24%) reported being self-employed (women: 97, 57.06%; men: 68, 40.00%; unknown: 2, 1.18%) while three farmers (1.76%) did not answer (men: 2, 1.18%; unknown: 1, 0.59%).

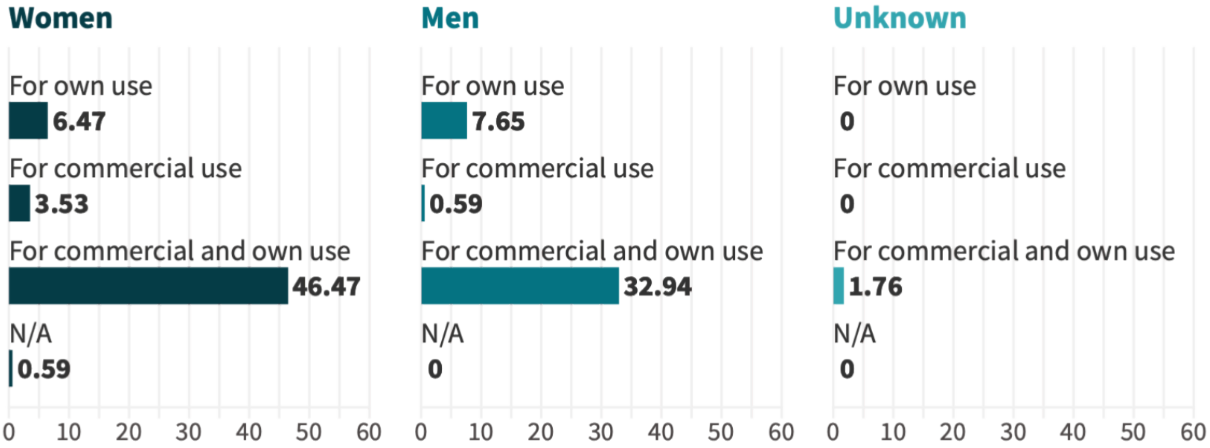
- Most farmers (165, 97.06%) own the land they work on (women: 92, 54.12%; men: 70, 41.18%; unknown: 3, 1.76%; Figure 191).

Figure 191. **Land ownership of farmers in Son La province (%)**



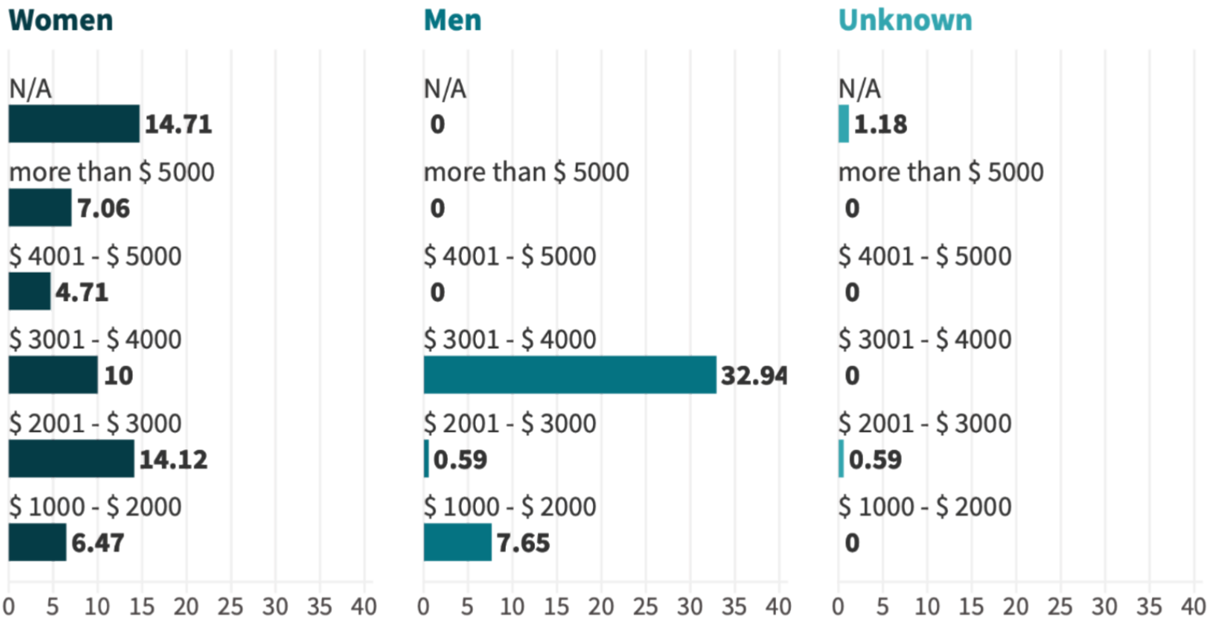
- Most farmers (138, 81.18%) farm for both commercial and personal use (women: 79, 46.48%; men: 56, 32.94%; unknown: 3, 1.76%; Figure 192).

Figure 192. **Farming activities on land in Son La province (%)**



- Farmers in Son La mostly (73, 42.94%) have an average household income of USD 3001 to USD 4000 (women: 17, 10.00%; men: 56, 32.94%; Figure 193).

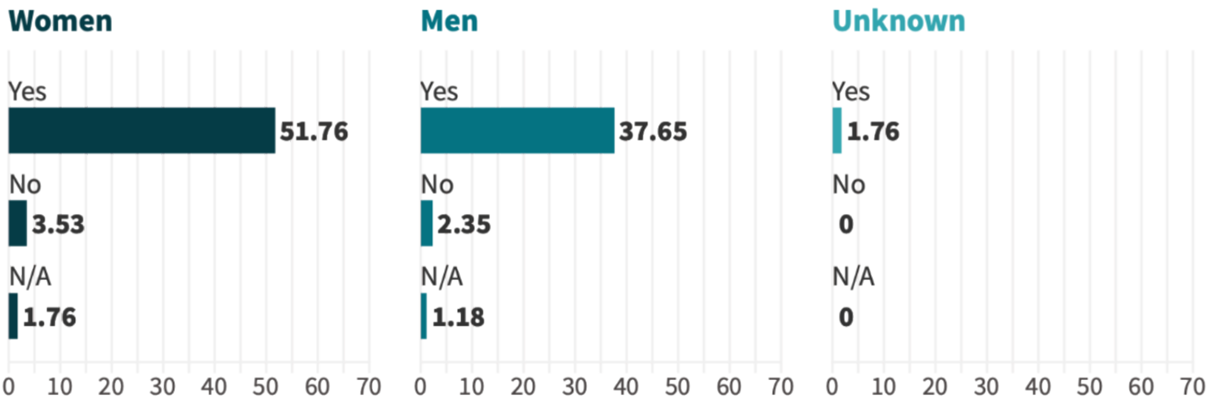
Figure 193. **Annual household income of farmers in Son La province (%)**



Pesticide use

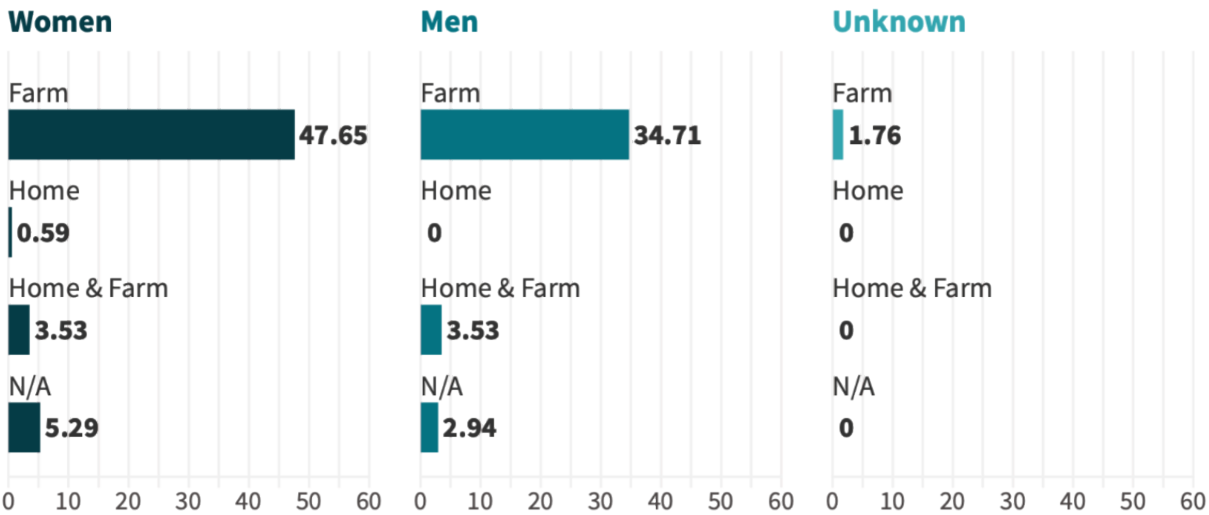
- Almost all the farmers (155, 91.18%) use pesticides (women: 88, 51.76%; men: 64, 37.65%; unknown: 3, 1.76%; Figure 194).

Figure 194. **Farmers' use of pesticides in Son La province (%)**



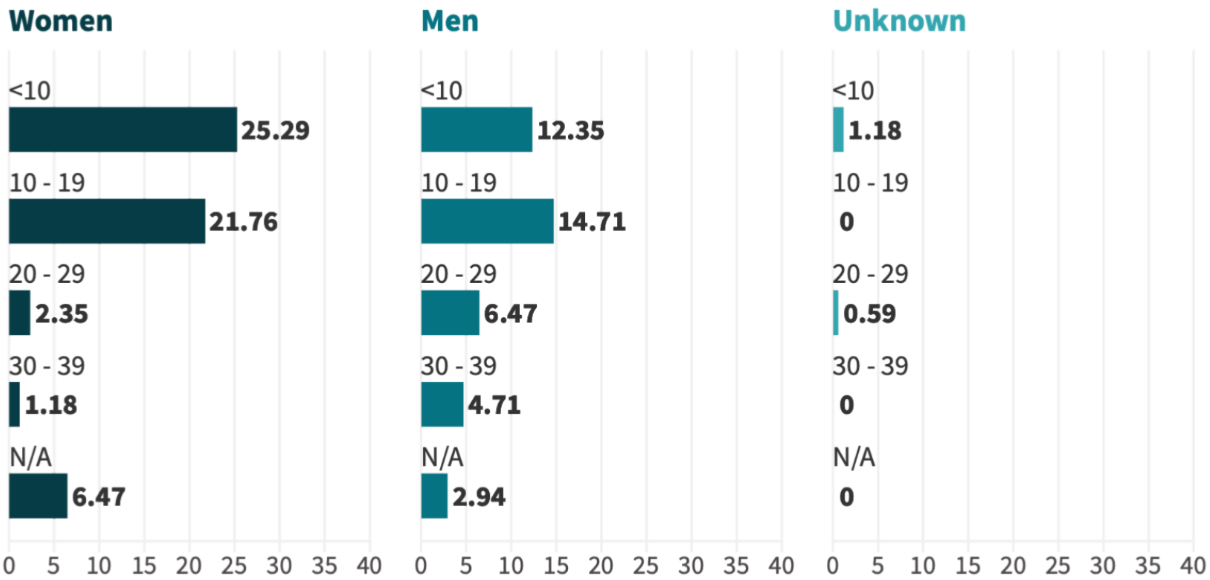
- Farmers mostly use pesticides in their farms (143, 84.12%; women: 81, 47.65%; men: 59, 34.71%; unknown: 3, 1.76%; Figure 195).

Figure 195. **Locations of pesticide use in Son La province (%)**



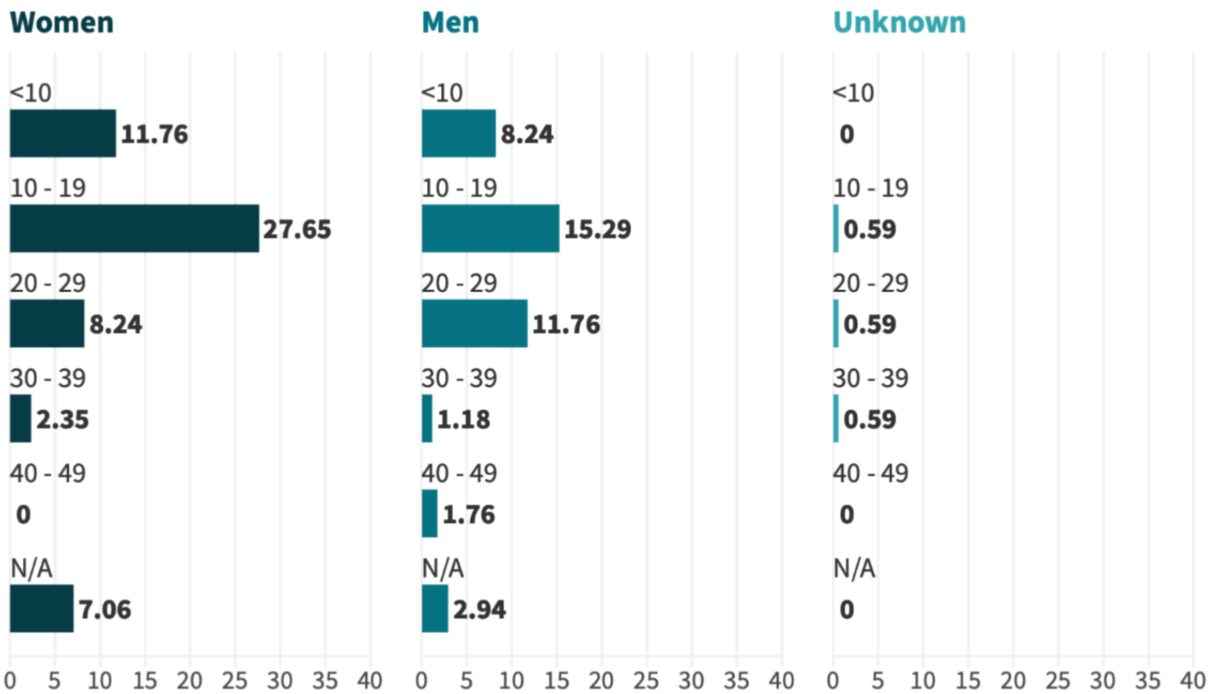
- Most farmers (66, 38.82%) have been using pesticides for less than 10 years (women: 43, 25.29%; men: 21, 12.35%; unknown: 2, 1.18%; Figure 196).

Figure 196. **Years of pesticide use in Son La province (%)**



- Most farmers' family members (74, 43.53%) have been using pesticides around 10 to 19 years as well (women: 47, 27.65%; men: 26, 15.29%; unknown: 1, 0.59%; Figure 197).

Figure 197. **Years of family's pesticide use in Son La province (%)**



- One of the major pesticide-related activities farmers in Son La Province engage in is spraying pesticides in the field (154, 90.59%; women: 86, 50.59%; men: 65, 38.24%; unknown: 3, 1.76%; Table 56).

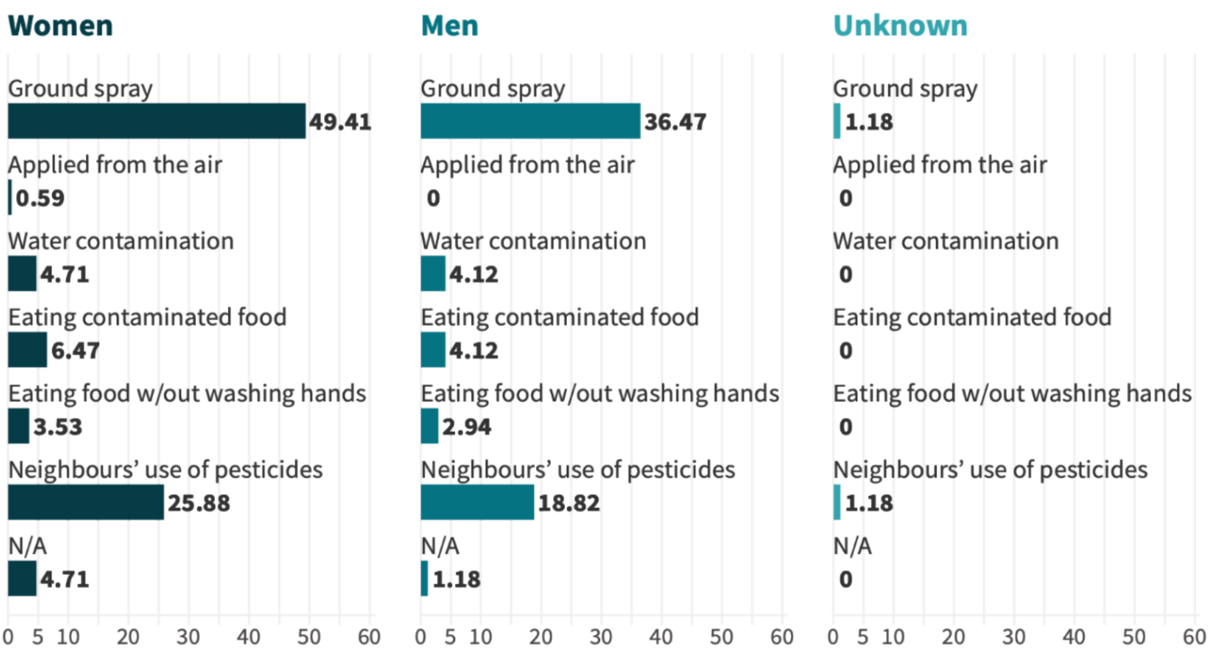
Table 56. **Farmers' pesticide-related activities in Son La province**

ACTIVITY	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Apply/spray pesticides in the field	86	50.59	65	38.24	3	1.76	**154**	**90.59**
Apply pesticides in the household	3	1.76	2	1.18	-	-	**5**	**2.94**
Human therapeutic purposes	3	1.76	6	3.53	-	-	**9**	**5.29**
Mix/load/decant pesticides	76	44.71	66	38.82	3	1.76	**145**	**85.29**
Purchase or transport pesticides	41	24.12	27	15.88	1	0.59	**69**	**40.59**
Vector control	2	1.18	5	2.94	-	-	**7**	**4.12**
Veterinary therapeutic purposes (e.g. use for foot and mouth disease)	1	0.59	-	-	-	-	**1**	**0.59**
Wash clothes used during pesticide spraying or mixing	50	29.41	34	20.00	1	0.59	**85**	**50.00**
Wash equipment used during pesticide spraying or mixing	44	25.88	35	20.59	1	0.59	**80**	**47.06**
Work in fields where pesticides are being used or have been used	50	29.41	32	18.82	1	0.59	**83**	**48.82**
N/A	7	4.12	4	2.35	-	-	**11**	**6.47**

Note: Total is not equal to 100% due to multiple responses

- Almost all (136, 80.00%) do not decant pesticides into other containers. Farmers are constantly (148, 87.05%) exposed to pesticides through ground spraying (women: 84, 49.41%; men: 62, 36.47%; unknown: 2, 1.18%; Figure 198).

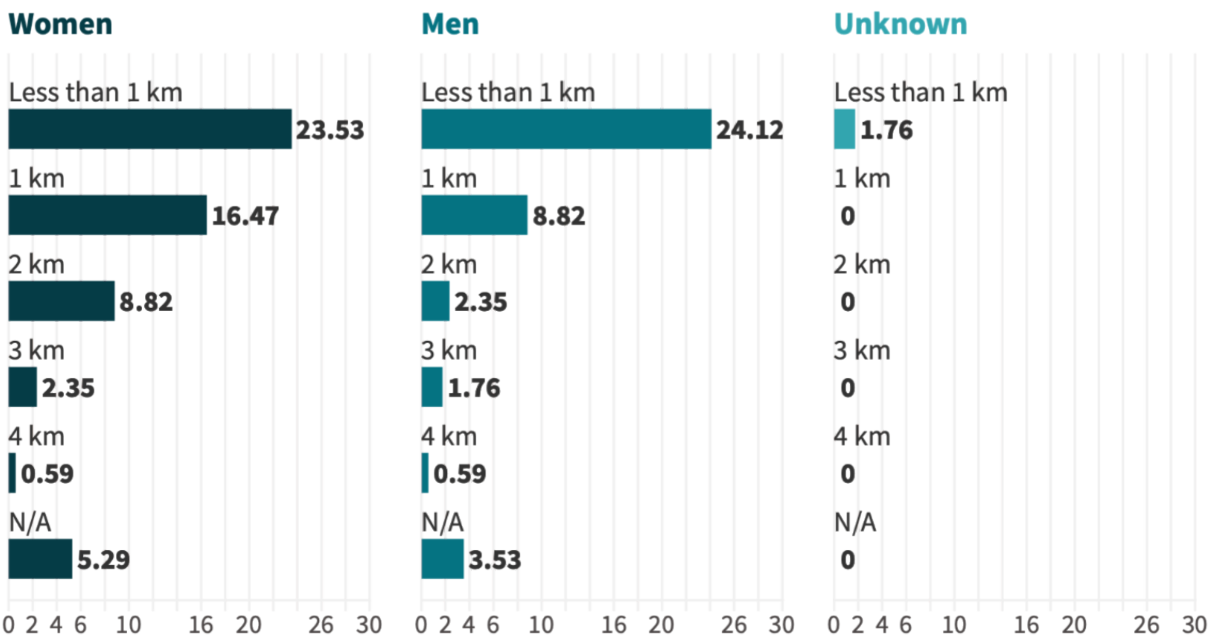
Figure 198. **Farmers' exposure to pesticides in Son La province (%)**



Note: Total is not equal to 100% due to multiple responses

- Most farmers in the Son La province live less than 1 kilometre (84, 49.41%; women: 40, 23.53%; men: 41, 24.12%; unknown: 3, 1.76%; Figure 199) from where pesticide spraying takes place.

Figure 199. **Distance between farmers' homes and pesticide spraying locations (%)**



- The most common pesticides that are being used by farmers in Son La are glufosinate ammonium and kasugamycin (22, 12.94%), followed by emamectin benzoate (19, 11.18%; Table 57; Image 7) and most of these pesticides are used in rice, maize and coffee cultivation.

Image 7. **Some of the pesticides commonly used by farmers in Son La (Trâu đen – Glufosinate ammonium, Kamsu 2SL – Kasugamycin, and Tasteu 1.9 EC – Emamectin benzoate)**

Table 57.a. **List of pesticides used by farmers in Son La, Vietnam**

PESTICIDE	CROPS TREATED	NO. OF FARMERS	%
Abamectin	RICE	2	1.18
Acetamiprid	RICE	3	1.76
Alpha-cypermethrin	RICE, MAIZE	16	9.41
Atrazine	MAIZE	12	7.06
Azoxystrobin	COFFEE	1	0.59
Butachlor	RICE	2	1.18
Carbosulfan	-	1	0.59
Chlorfenapyr	RICE	1	0.59
Chlorpyrifos ethyl	RICE	3	1.76
Cypermethrin	RICE, MAIZE	7	4.12
Dimethoate	COFFEE	8	4.71
Diquat dibromide	COFFEE	4	2.35
Emamectin benzoate	COFFEE	19	11.18
Fenobucarb	RICE	2	1.18
Fipronil	RICE	1	0.59
Glufosinate ammonium	MAIZE, COFFEE	22	12.94
Glyphosate	COFFEE, RICE, YAM	9	5.29
Imidacloprid	RICE	15	8.82
Kasugamycin	RICE	22	12.94
Lambda cyhalothrin	RICE	2	1.18
Metsulfuron-methyl	RICE	18	10.59
Nereistoxin	RICE	4	2.35
Niclosamide olamine	RICE	6	3.53
Permethrin	MAIZE	1	0.59
Tricyclazole	RICE, COFFEE	3	1.76

Note: Total is not equal to 100% due to multiple responses

Table 57.b. **Classification of pesticides used by farmers in Son La, Vietnam**

PESTICIDE	WHO CLASS[132]	PAN HHP LIST[133]	NO. OF COUNTRIES BANNED[134]
Abamectin	IB HIGHLY HAZARDOUS	X (H330, HIGHLY TOXIC TO BEES)	NOT KNOWN TO BE BANNED
Acetamiprid	II MODERATELY HAZARDOUS	-	NOT KNOWN TO BE BANNED
Alpha-cypermethrin	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	29
Atrazine	III SLIGHTLY HAZARDOUS	-	60
Azoxystrobin	U UNLIKELY TO PRESENT ACUTE HAZARD	-	NOT KNOWN TO BE BANNED
Butachlor	III SLIGHTLY HAZARDOUS	X (EPA PROB LIKEL CARC)	39
Carbosulfan	II MODERATELY HAZARDOUS	X (H330, HIGHLY TOXIC TO BEES, PIC)	63
Chlorfenapyr	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	38
Chlorpyrifos ethyl	II MODERATELY HAZARDOUS	X (GHS+ REPRO (1A ,1B), HIGHLY TOXIC TO BEES)	29
Cypermethrin	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	42
Dimethoate	II MODERATELY HAZARDOUS	X (GHS+ REPRO (1A ,1B), HIGHLY TOXIC TO BEES)	38
Diquat dibromide	II MODERATELY HAZARDOUS	X (H330)	30
Emamectin benzoate	II MODERATELY HAZARDOUS	X (VERY PERS WATER, SOIL OR SEDIMENT, VERY TOXIC TO AQ. ORGANISM, HIGHLY TOXIC TO BEES)	NOT KNOWN TO BE BANNED
Fenobucarb	II MODERATELY HAZARDOUS	-	NOT KNOWN TO BE BANNED
Fipronil	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	NOT KNOWN TO BE BANNED
Glufosinate ammonium	II MODERATELY HAZARDOUS	X (GHS+ REPRO (1A ,1B))	31
Glyphosate	III SLIGHTLY HAZARDOUS	X (EPA PROB LIKEL CARC)	12
Imidacloprid	II MODERATELY HAZARDOUS	X (HIGHLY TOXIC TO BEES)	29

[132] World Health Organization. (2019). The WHO recommended classification of pesticides by hazard and guidelines to classification. https://www.who.int/publications/i/item/9789240005662
[133] Pesticide Action Network International. (2024). PAN International list of highly hazardous pesticides. https://pan-international.org/wp-content/uploads/PAN_HHP_List.pdf
[134] Pesticide Action Network International. (2024). Consolidated list of banned pesticides. https://pan-international.org/pan-international-consolidated-list-of-banned-pesticides/

PESTICIDE	WHO CLASS	PAN HHP LIST	NO. OF COUNTRIES BANNED
Kasugamycin	U UNLIKELY TO PRESENT ACUTE HAZARD	-	29
Lambda cyhalothrin	II MODERATELY HAZARDOUS	-	NOT KNOWN TO BE BANNED
Metsulfuron-methyl	U UNLIKELY TO PRESENT ACUTE HAZARD	-	1
Nereistoxin	-	-	NOT KNOWN TO BE BANNED
Niclosamide olamine	U UNLIKELY TO PRESENT ACUTE HAZARD	-	NOT KNOWN TO BE BANNED
Permethrin	II MODERATELY HAZARDOUS	X (EPA PROB LIKEL CARC , HIGHLY TOXIC TO BEES)	1
Tricyclazole	II MODERATELY HAZARDOUS	-	NOT KNOWN TO BE BANNED

† Not banned in any country but approval has been withdrawn in the European Union.
*Please refer to Annex A for explanatory notes on HHPs

TOP 10 PESTICIDES USED BY FARMERS IN SON LA

1. GLUFOSINATE AMMONIUM	12.94%
2. KASUGAMYCIN	12.94%
3. EMAMECTIN BENZOATE	11.18%
4. METSULFURON-METHYL	10.59%
5. ALPHA-CYPERMETHRIN	9.41%
6. IMIDACLOPRID	8.82%
7. ATRAZINE	7.06%
8. GLYPHOSATE	5.29%
9. DIMETHOATE	4.71%
10. CYPERMETHRIN	4.12%

- Glufosinate ammonium, a Class II (moderately hazardous) pesticide, is associated with hypotension, respiratory failure with apnea, memory loss, loss of consciousness, and seizures; in severe cases, exposure may lead to death.[135] As previously mentioned, emamectin benzoate, also a Class II (moderately hazardous) pesticide, mainly affects the gastrointestinal tract and central nervous system.[136] Symptoms of exposure include sore throat, nausea, vomiting, abdominal pain, dizziness, and confusion, while severe cases can progress to respiratory distress, seizures, metabolic acidosis, and even death.[137]

[135] Shankar D., Murali T., Gopinathan T., Varun S. (2022). A rare case of glufosinate ammonium poisoning. Journal of Evidence Based Medicine and Healthcare 9(08):1-6. https://www.jebmh.com/articles/a-rare-case-of-glufosinate-ammonium-poisoning-87795.html

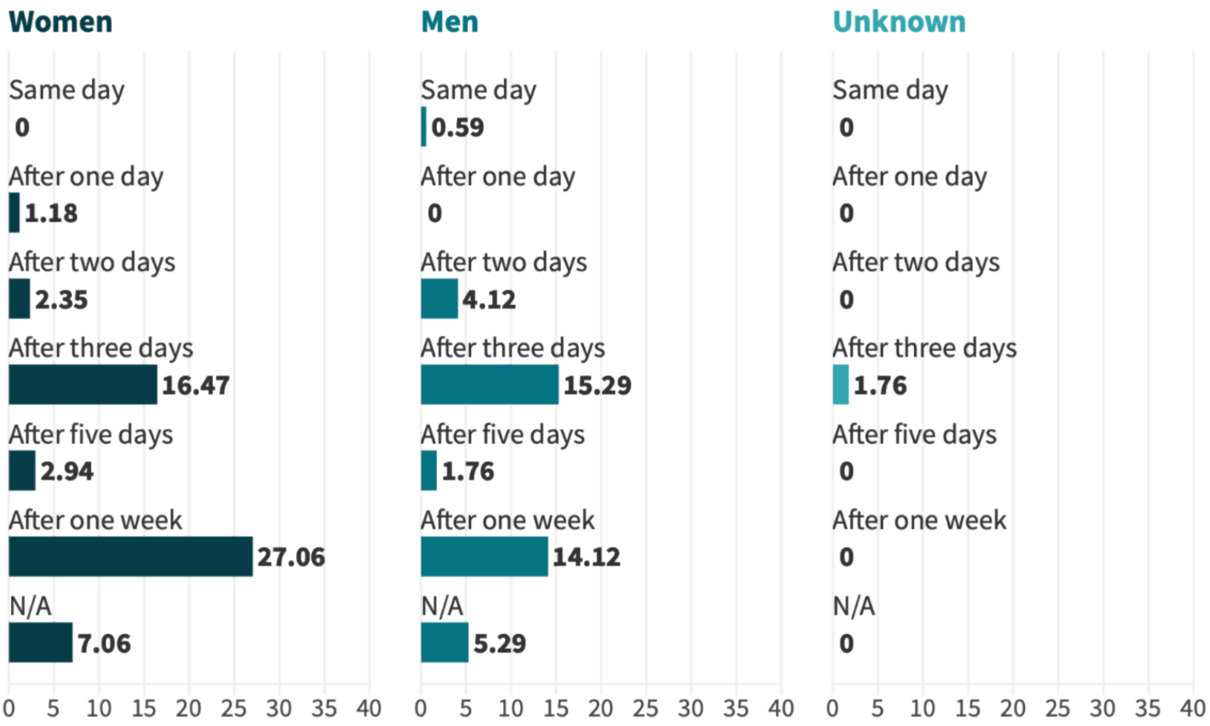
[136] Pan, C. S., Chen, C. H., Mu, H. W., & Yang, K. W. (2024). Review of Emamectin Benzoate Poisoning. Journal of acute medicine, 14(3), 101–107. https://doi.org/10.6705/j.jacme.202409_14(3).0001

[137] Ibid

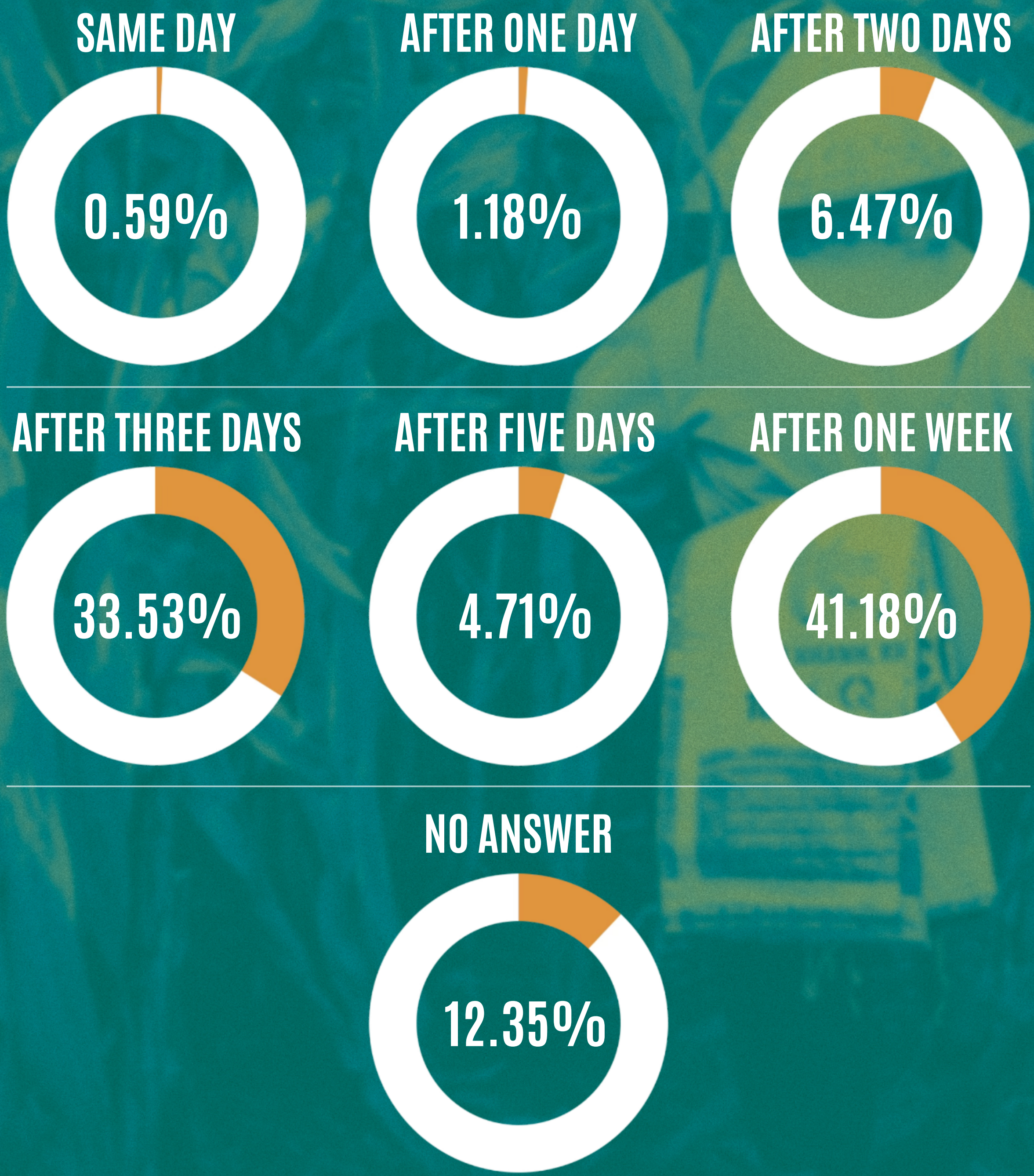
Pesticide exposure and spillage

- Most farmers in Son La re-enter their fields after one week (70, 41.18%; women: 46, 27.06%; men: 24, 14.12%; Figure 200).

Figure 200. **Farmers' re-entry into the field after pesticide spraying in Son La province (%)**

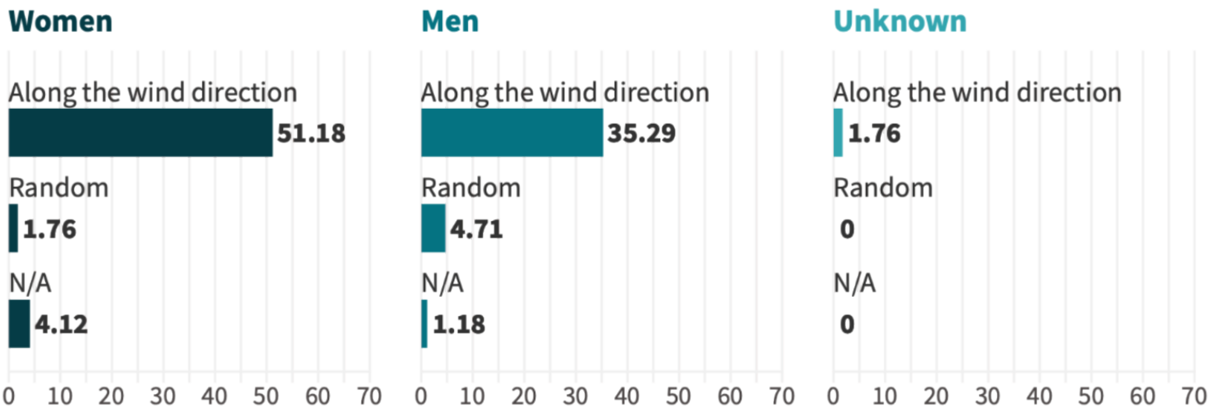


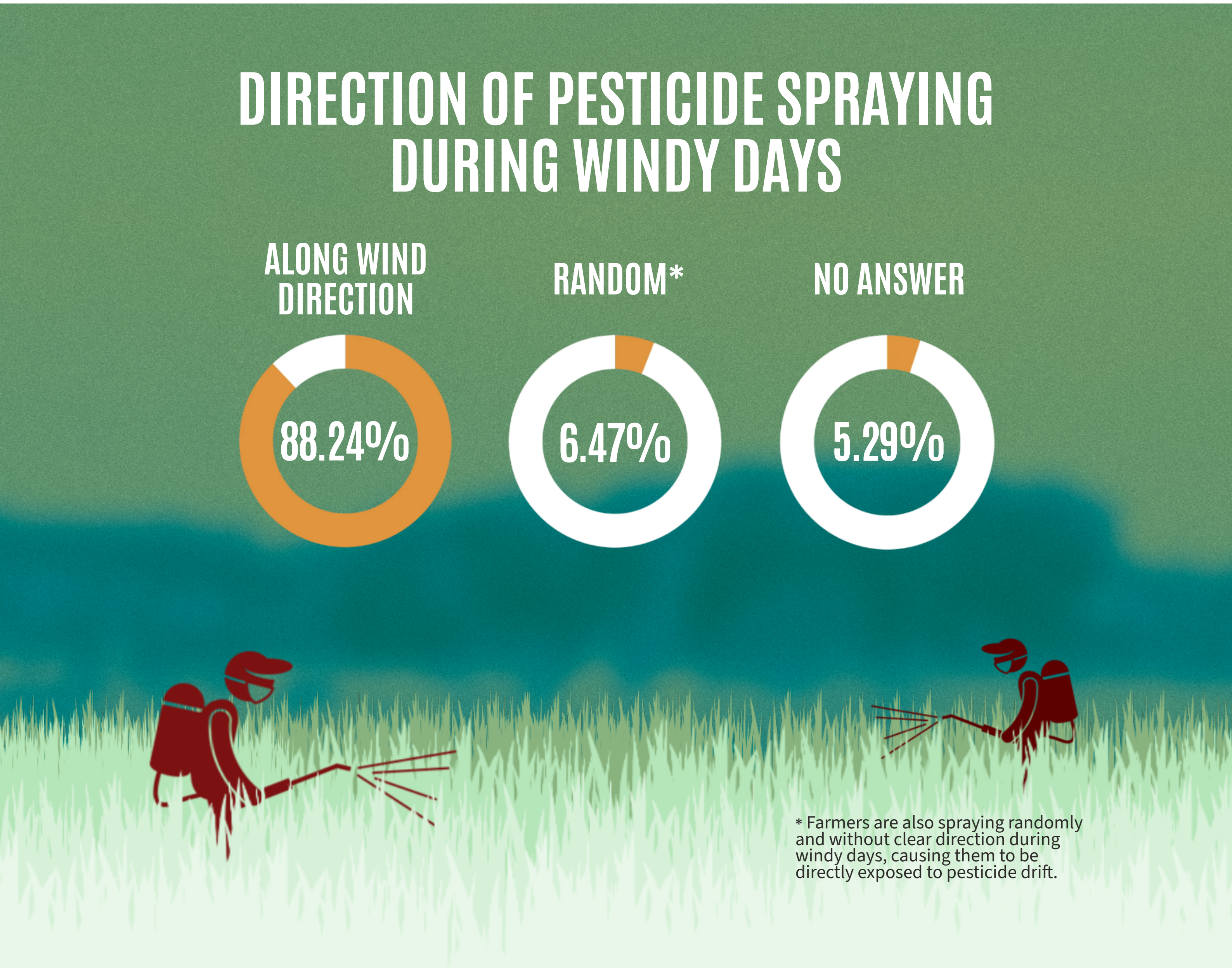
FARMERS' RE-ENTRY INTO THE FIELD AFTER PESTICIDE SPRAYING



- Almost all farmers (150, 88.24%; women: 87, 51.18%; men: 60, 35.29%; unknown: 3, 1.76%; Figure 201) sprayed pesticides in the direction of the wind.

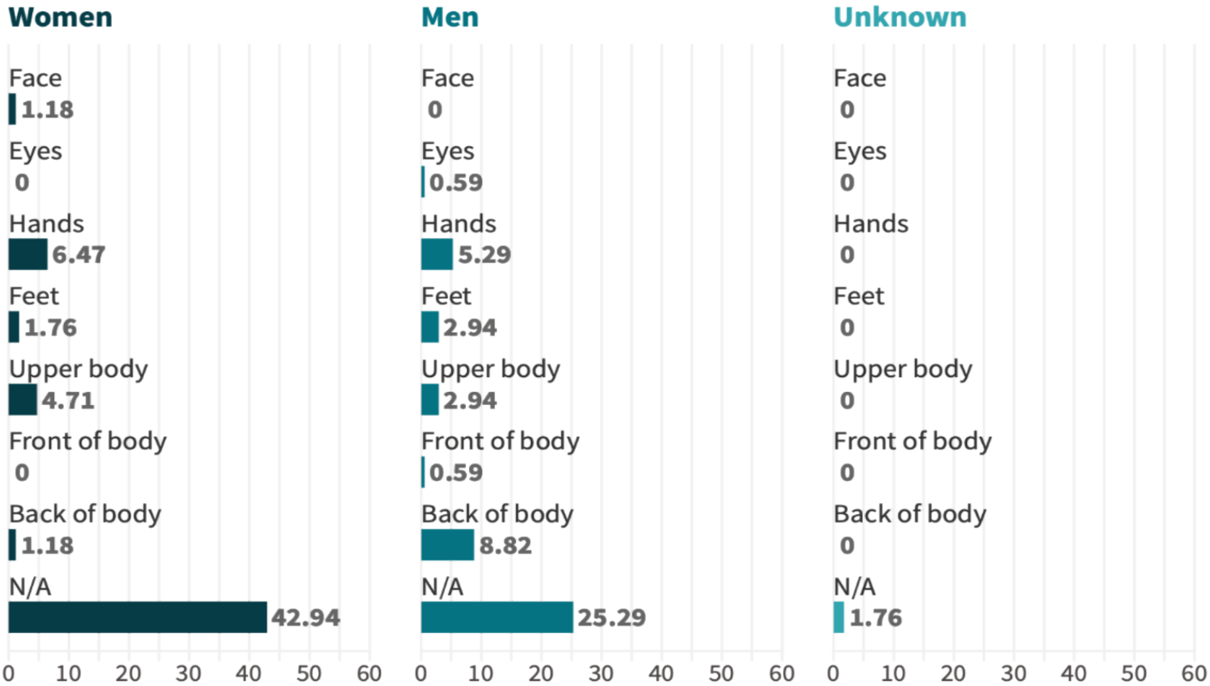
Figure 201. **Direction of pesticide spraying during windy days (%)**





- Fifty farmers (29.41%; women: 23, 13.53%; men: 27, 15.88%) experienced pesticide spillage while 110 (64.71%; women: 67, 38.24%; men: 40, 22.35%; unknown: 3, 1.76%) have not experienced pesticides spillage while seven women farmers (4.12%) and three men (1.76%) did not respond.
- The majority of farmers (33, 19.41%) experienced spillage while spraying pesticides (women: 13, 7.65%; men: 20, 11.76%).
- The majority of farmers (20, 11.76%) experienced spillage on their hands (women: 11, 6.47%; men: 9, 5.29%; Figure 202).

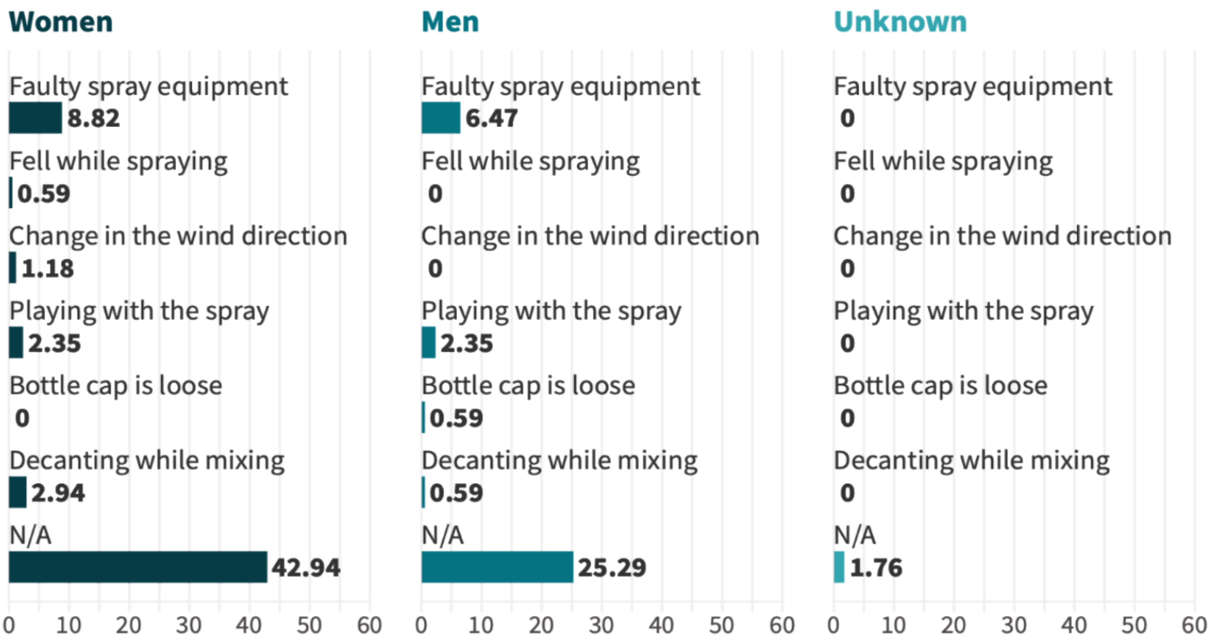
Figure 202. **Body areas exposed to spillage (%)**



Note: Total is not equal to 100% due to multiple responses

- Most farmers (26, 15.29%) experienced pesticide spillage due to faulty spray equipment (women: 15, 8.82%; men: 11, 6.47%; Figure 203).

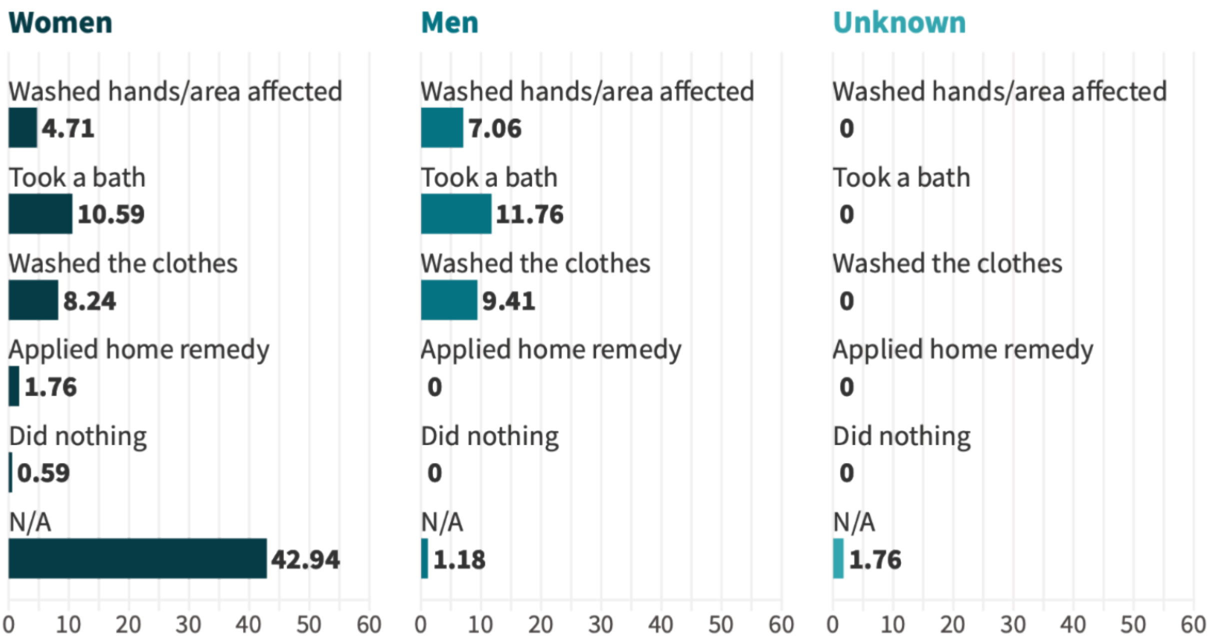
Figure 203. **Causes of pesticide spillage (%)**



Note: Total is not equal to 100% due to multiple responses

- The majority of farmers (38, 22.35%) took a bath after experiencing pesticide spillage (women: 18, 10.59%; men: 20, 11.76%; Figure 204).

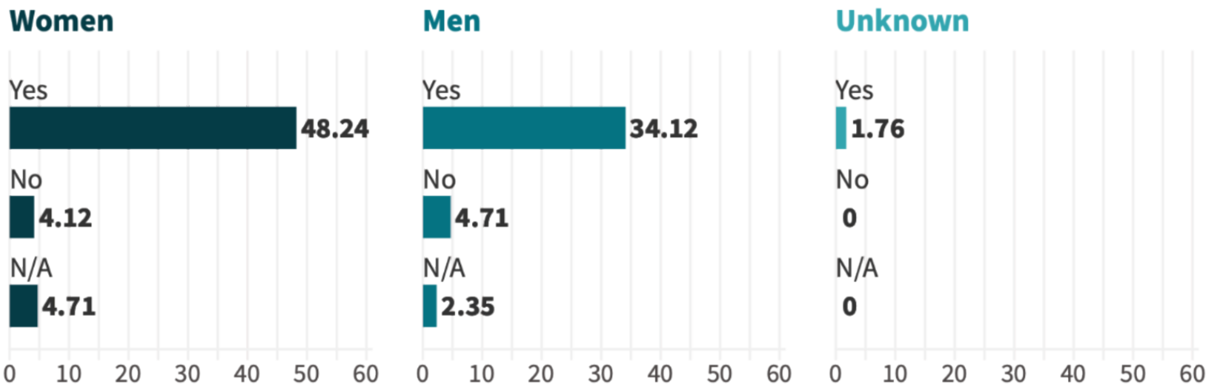
Figure 204. **Actions taken by farmers in response to pesticide spillage (%)**



PPE use

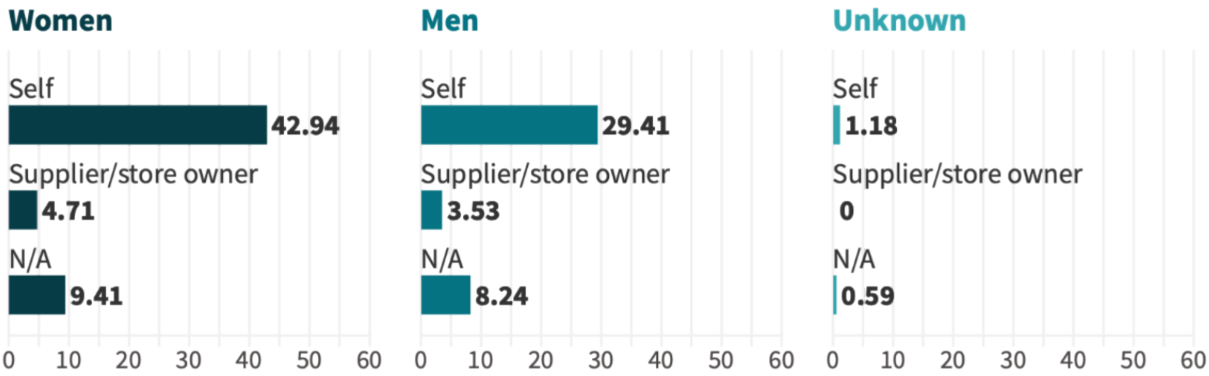
- Almost all farmers (143, 84.12%) wear PPE when applying pesticides (women: 82, 48.24%; men: 58, 34.12%; unknown 3, 1.76%; Figure 205).

Figure 205. **Use of PPE by farmers in Son La province (%)**



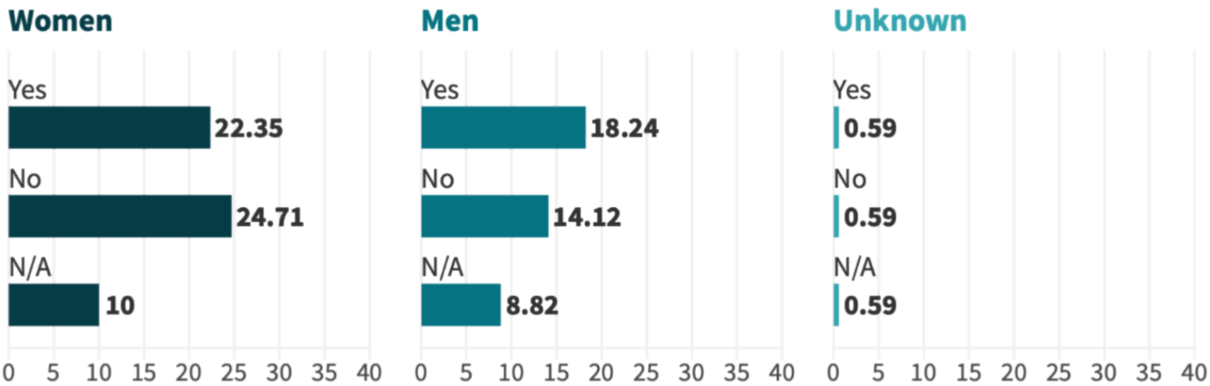
- Most farmers (125, 73.53%) who use PPE acquired it themselves (women: 73, 42.94%; men: 50, 29.41%; unknown: 2, 1.18%; Figure 206).

Figure 206. **PPE provider for farmers in Son La province (%)**



- Seventy farmers (41.18%) received instructions on how to use PPE (women: 38, 22.35%; men: 31, 18.24%; unknown: 1, 0.59%; Figure 207).

Figure 207. **Availability of PPE instructions (%)**



- Farmers in Son La mostly use face masks (137, 97.16%; women: 79, 56.03%; men: 57, 40.43%; unknown: 1, 0.71%; Table 58) and gloves (136, 95.45%; women: 77, 54.61%; men: 57, 40.43%; unknown: 2, 1.42%).

Table 58. **Types of PPE used by farmers in Son La province**

PPE	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Boots/shoes	65	38.24	51	30.00	1	0.59	**117**	**68.82**
Eyeglasses	8	4.71	12	7.06	-	-	**20**	**11.76**
Face mask	79	46.47	57	33.53	1	0.59	**137**	**80.59**
Gloves	77	45.29	57	33.53	2	1.18	**136**	**80.00**
Long pants	51	30.00	30	17.65	2	1.18	**83**	**48.82**
Long-sleeved shirt	64	37.65	48	28.24	2	1.18	**114**	**67.06**
Overalls	2	1.18	1	0.59	-	-	**3**	**1.76**
N/A	14	8.24	12	7.06	1	-	**27**	**15.29**

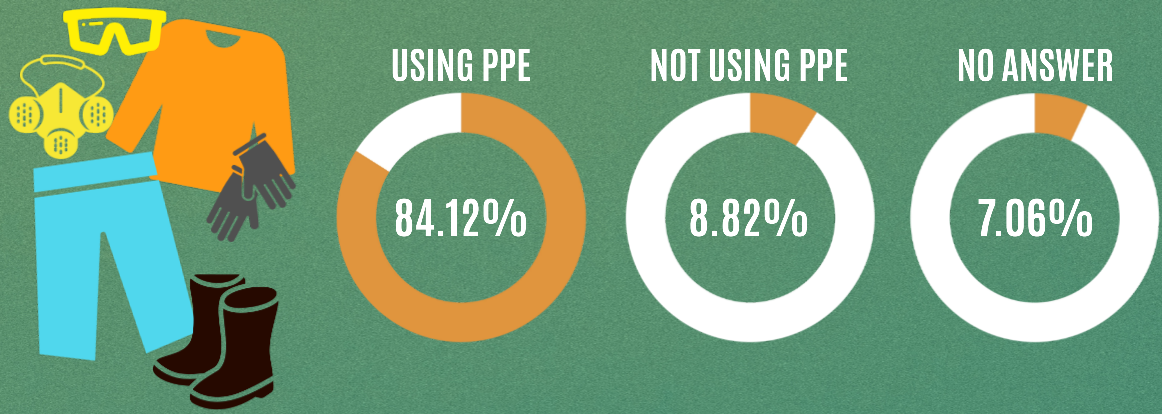
Note: Total is not equal to 100% due to multiple responses

- Farmers stated that PPE is not available in their area (12, 7.06%; women: 6, 3.53%; men: 6, 3.53%; Table 59).

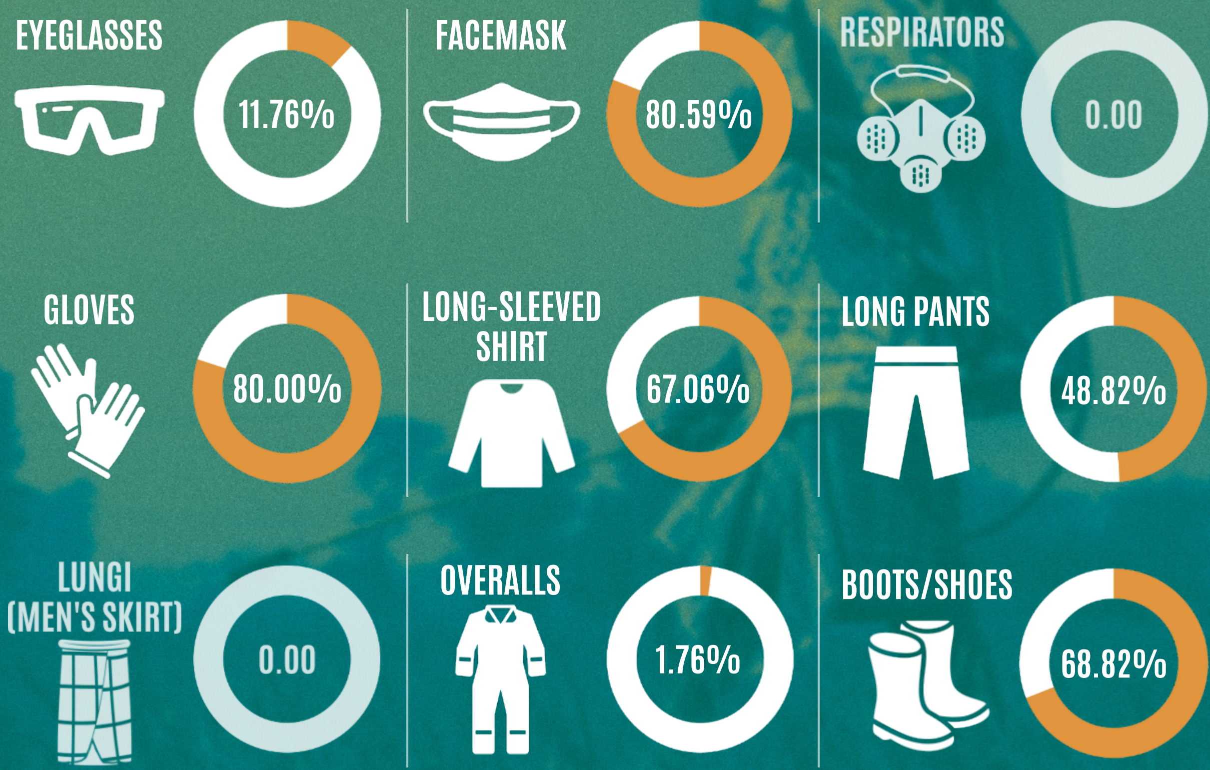
Table 59. **Types of PPE used by farmers in Son La province**

REASON	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Not available	6	3.53	6	3.53	-	-	**12**	**7.06**
Uncomfortable			1	0.59	-	-	**1**	**0.59**
N/A	91	53.53	63	37.06	3	1.76	**157**	**92.35**

FARMERS' USE OF PPE IN SON LA



TYPES OF PPE USED BY FARMERS

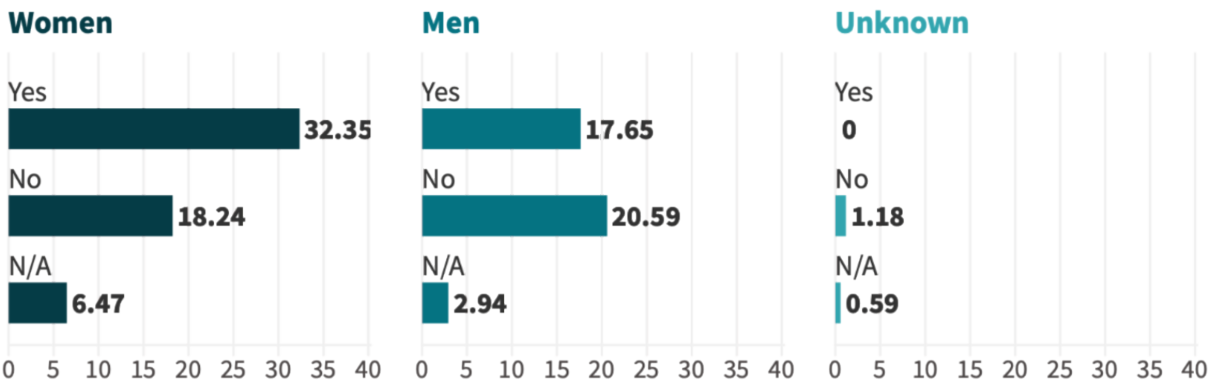


Note: Total is not equal to 100% due to multiple responses

Washing facilities

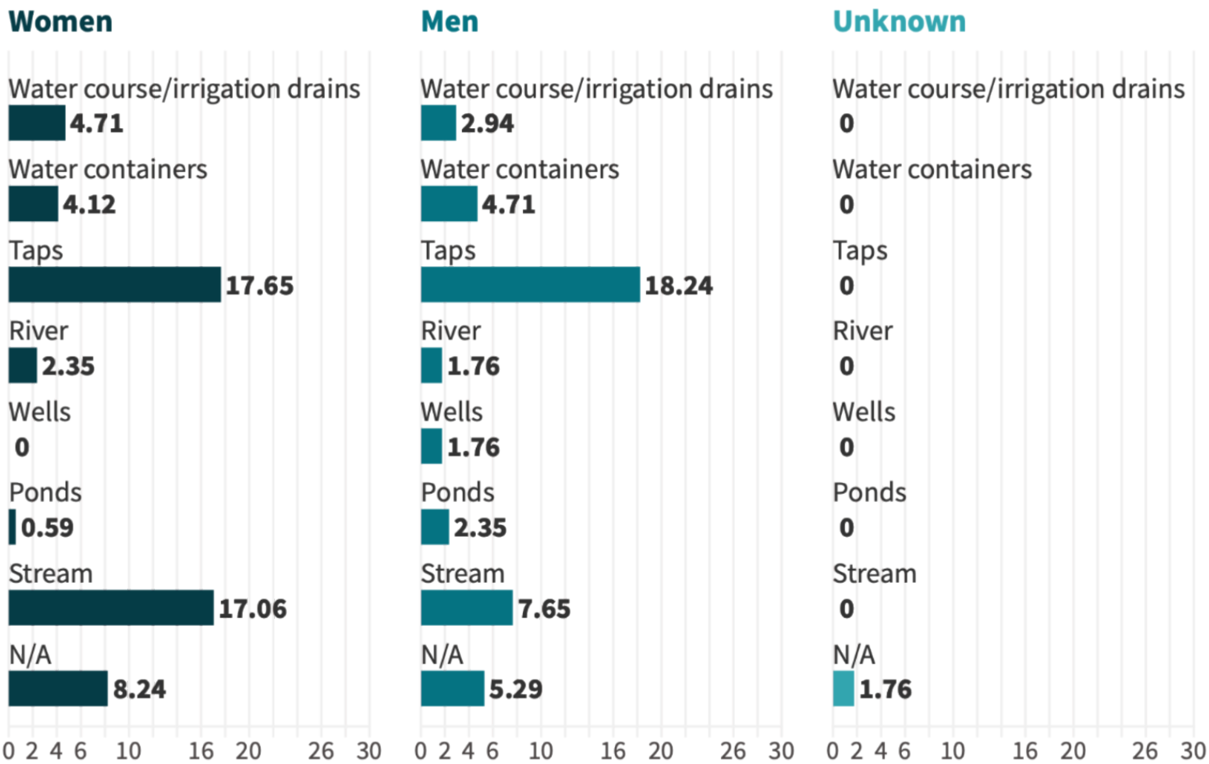
- Eighty-five farmers (50.00%) have washing facilities available for use after applying pesticides (women: 55, 32.35%; men: 30, 17.65%; Figure 208).

Figure 208. **Availability of washing facilities in in Son La province (%)**



- Taps are the most commonly used washing facility among farmers (61, 35.88%; women: 30, 17.65%; men: 31, 18.24%; Figure 209).

Figure 209. **Types of washing facilities for farmers (%)**

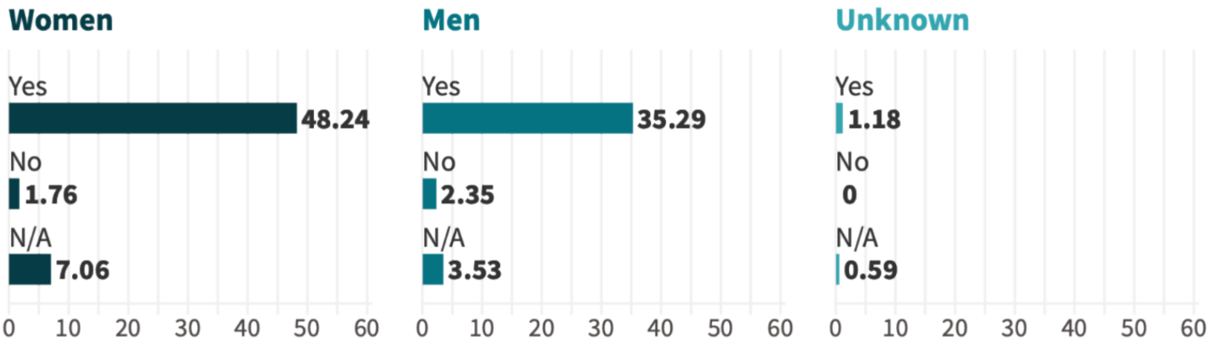


Note: Total is not equal to 100% due to multiple responses

Labels

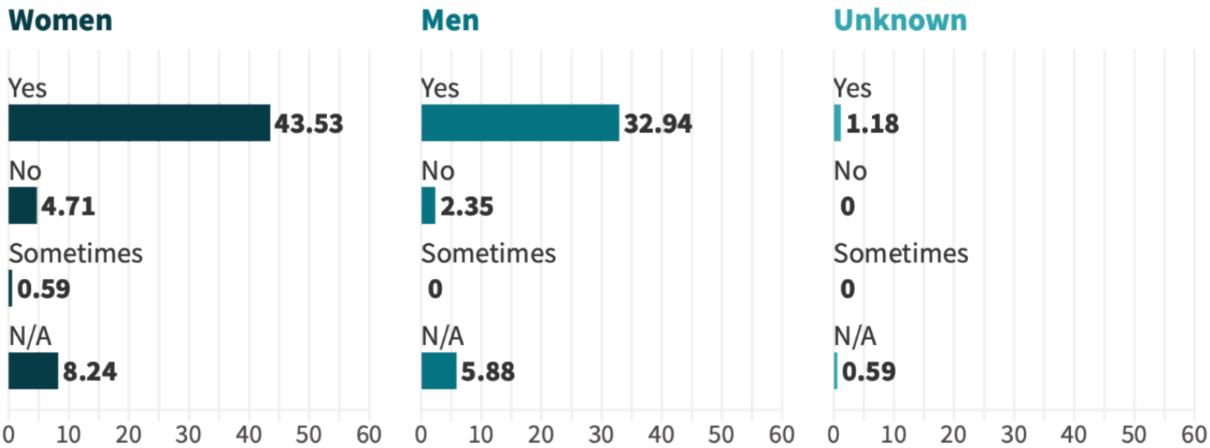
- One hundred and forty-four farmers (84.71%) have access to the labels of the pesticides they use (women: 82, 48.24%; men: 60, 35.29%; unknown: 2, 1.18%; Figure 210).

Figure 210. **Farmers' access to labels on pesticides they use (%)**



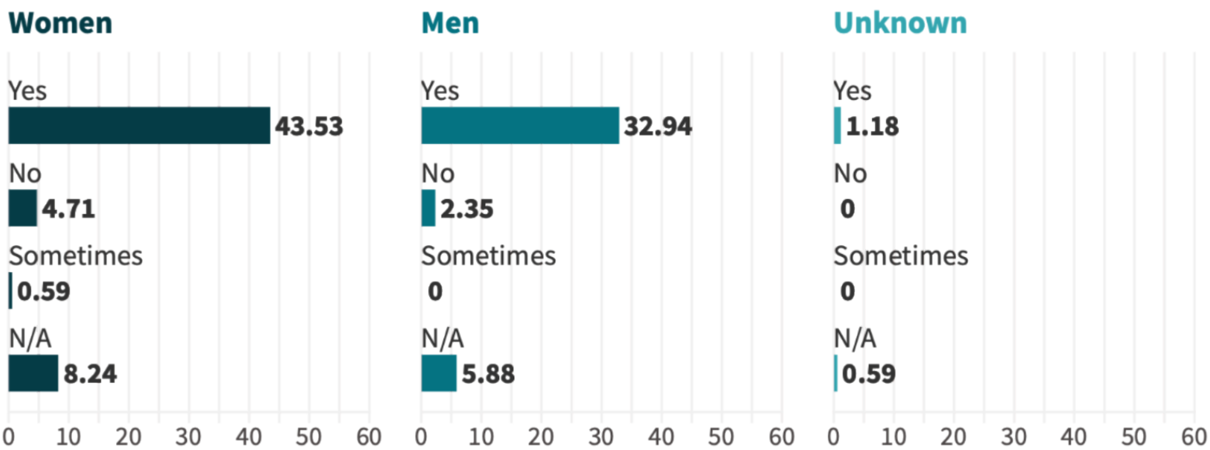
- Most farmers (132, 77.65%) read the labels (women: 74, 43.53%; men: 56, 32.94%; unknown: 2, 1.18%; Figure 211).

Figure 211. **Pesticide label reading practices among farmers (%)**



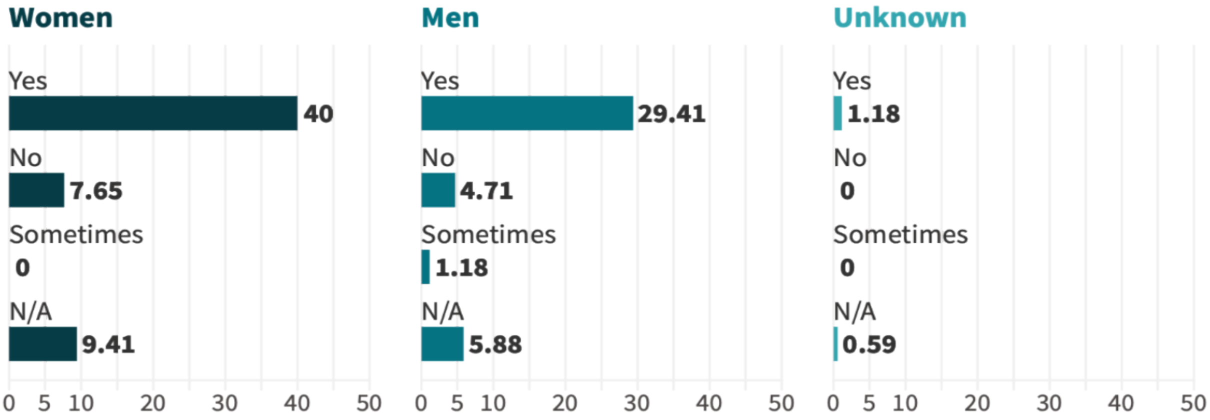
- Most labels (120, 70.59%) are in local languages (women: 68, 40.00; men: 50, 29.41; unknown: 2, 1.18%; Figure 212).

Figure 212. **Availability of pesticide labels in in local language (%)**



- Many farmers (131, 77.06%) find that the information on the pesticide labels is readable (women: 71, 41.76%; men: 57, 33.53%; unknown: 3, 1.76%; Figure 213).

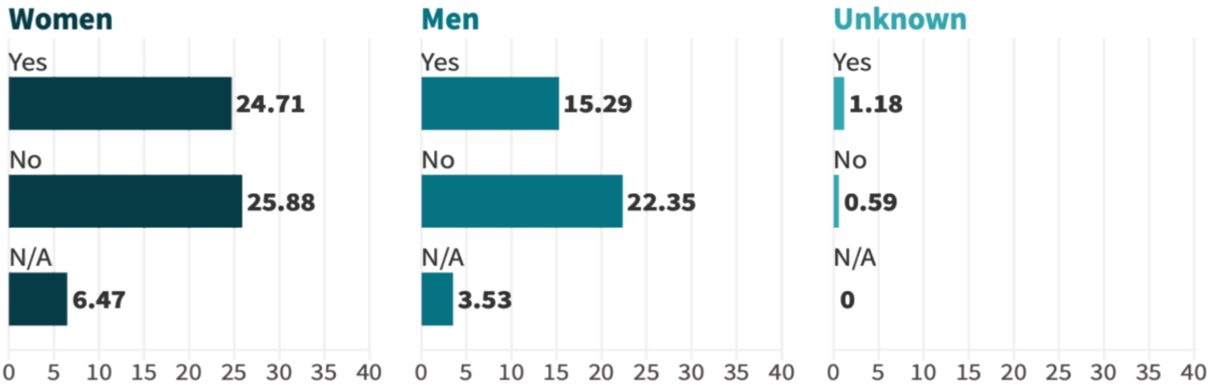
Figure 213. **Availability of pesticide labels in in local language (%)**



Training on pesticide use, purchase, storage and disposal

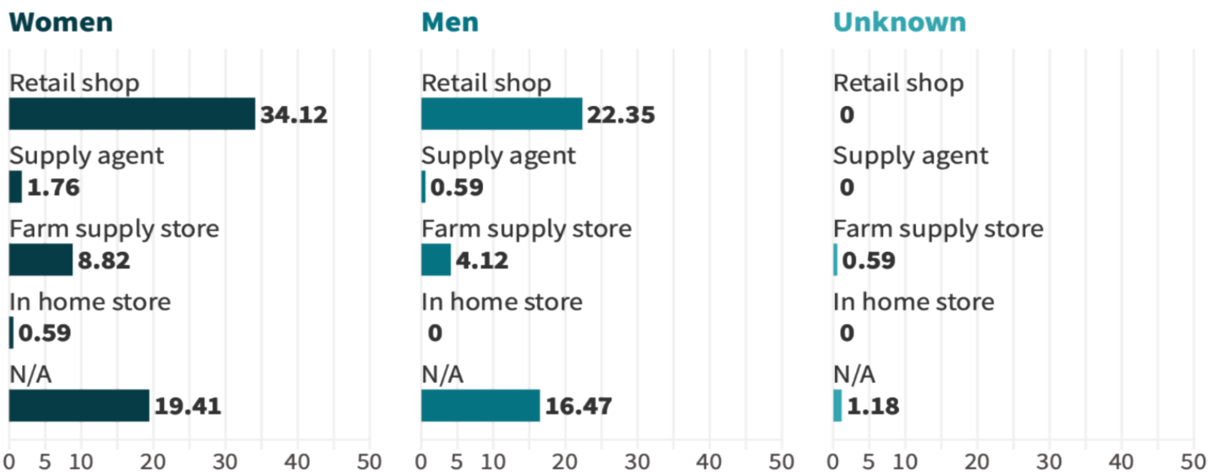
- Slightly less than half of the farmers (83, 48.82%) are not trained in the use of the pesticides they apply (women: 44, 25.88%; men: 38: 22.35%; unknown: 1, 0.59%; Figure 214).

Figure 214. **Farmers' training on handling and using pesticides (%)**



- Most farmers (96, 56.47%) purchase their pesticides from retail shops (women: 58, 34.12%; men: 38, 22.35%; Figure 215).

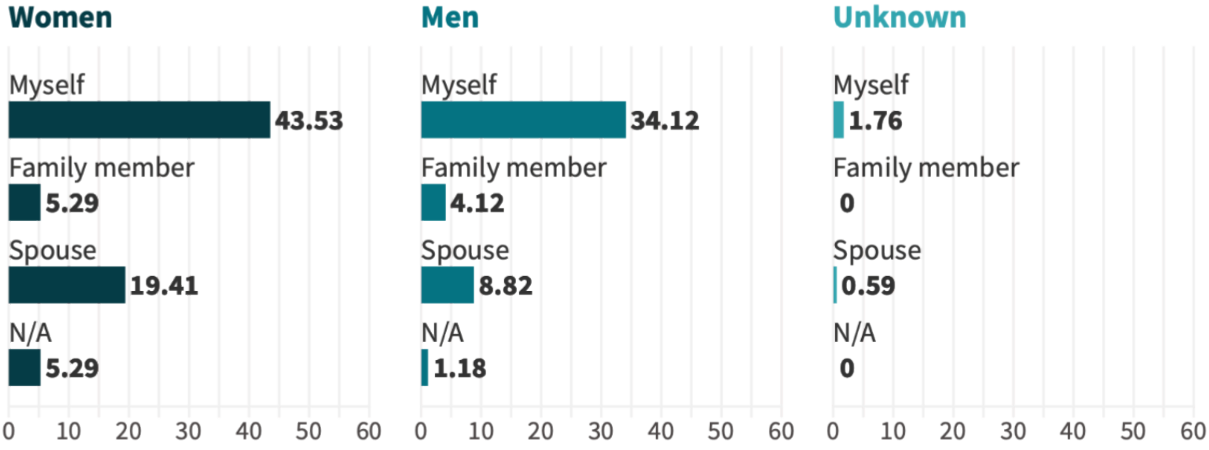
Figure 215. **Farmers' pesticide purchase location (%)**



Note: Total is not equal to 100% due to multiple responses

- Farmers mostly (135, 79.41%) purchased the pesticides themselves (women: 74, 43.53%; men: 58, 34.12; unknown: 3: 1.76%; Figure 216).

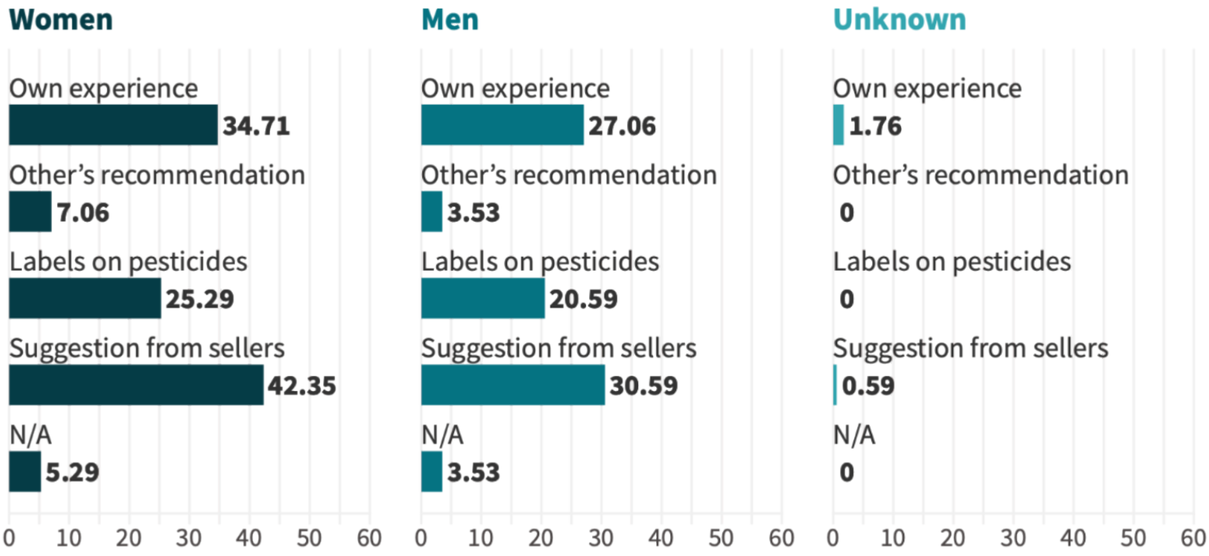
Figure 216. **Person in charge of purchasing pesticides in each household (%)**



Note: Total is not equal to 100% due to multiple responses

- These pesticides are purchased mostly based (125, 73.53%) on suggestions from pesticide sellers (women: 72, 42.35%; men: 52, 30.59%; unknown: 1, 0.59%; Figure 217).

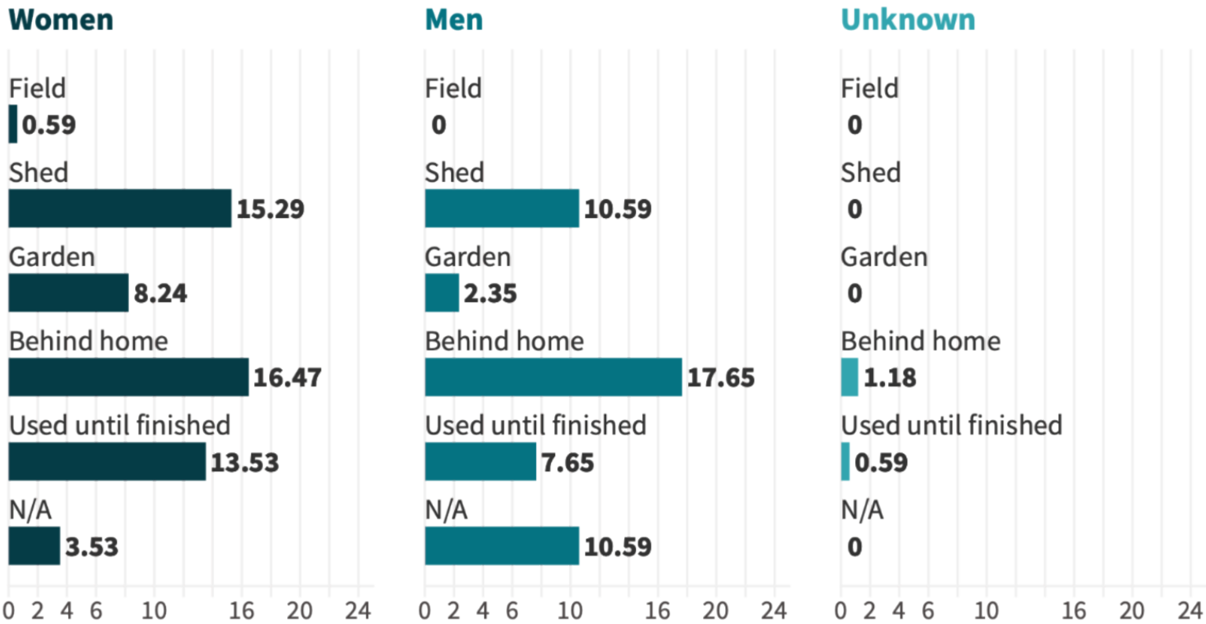
Figure 217. **Factors influencing farmers' pesticide choices in Son La (%)**



Note: Total is not equal to 100% due to multiple responses

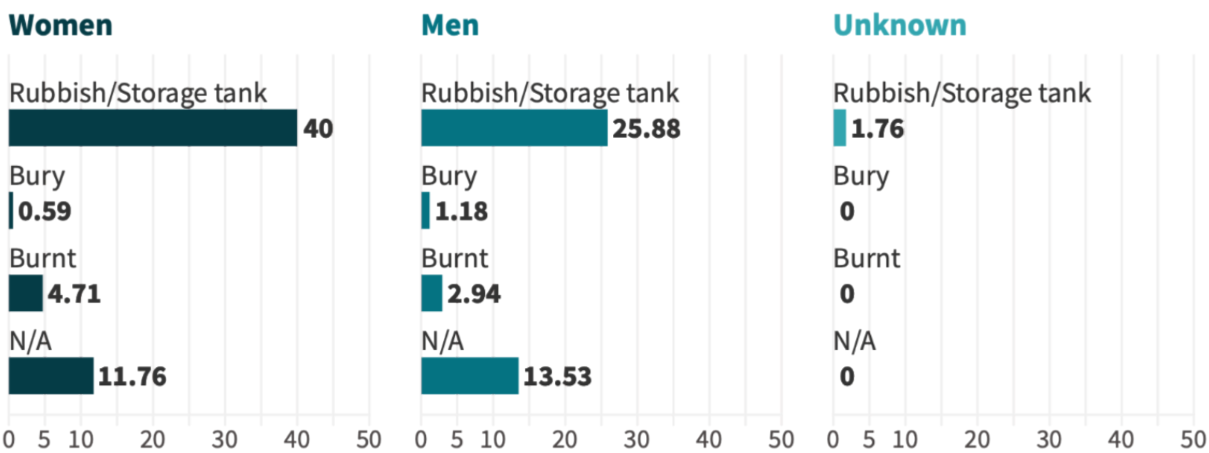
- Farmers often (60, 35.29%) store pesticides behind their homes (women: 28, 16.47%; men: 30, 17.65%; unknown: 2, 1.18%; Figure 218).

Figure 218. **Pesticide storage locations used by farmers in Son La (%)**



- Almost all farmers surveyed (131, 77.06%) do not reuse pesticide containers or bags for other purposes, except for one male farmer (0.59%) who uses them as containers. Most farmers (115, 67.65%) dispose of pesticides in rubbish or storage tanks typically provided by the government (women: 68, 40.00%; men: 44, 25.88%; unknown: 3, 1.761%; Figure 219).

Figure 218. **Pesticide disposal methods used by farmers in Son La (%)**



Illness after pesticide exposure

- Most farmers reported experiencing headaches (64, 37.65%; women: 31, 18.24%; men: 33, 19.41%; Table 60), followed by dizziness (58, 34.12%; women: 25, 14.71%; men: 32, 18.82%) when exposed to pesticides.

Table 53. **Pesticide exposure symptoms reported by farmers in Son La**

SYMPTOMS	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Blurred vision	4	2.35	8	4.71	1	0.59	**13**	**7.65**
Convulsions	-	-	1	0.59	-	-	**1**	**0.59**
Diarrhoea	1	0.59	-	-	-	-	**1**	**0.59**
Difficulty of breathing	25	14.71	32	18.82	1	0.59	**58**	**34.12**
Dizziness	1	0.59	1	0.59	-	-	**2**	**1.18**
Excessive salivation	2	1.18	4	2.35	-	-	**6**	**3.53**
Excessive sweating	3	1.76	4	2.35	-	-	**7**	**4.12**
Hand tremors	31	18.24	33	19.41	-	-	**64**	**37.65**
Headaches	1	0.59	1	0.59	-	-	**2**	**1.18**
Irregular heartbeat	-	-	3	1.76	-	-	**3**	**1.76**
Nausea	4	2.35	4	2.35	-	-	**8**	**4.71**
Skin rashes	1	0.59	2	1.18	-	-	**3**	**1.76**
Sleeplessness/Insomnia	-	-	1	0.59	-	-	**1**	**0.59**
Staggering	3	1.76	5	2.94	-	-	**8**	**4.71**
Vomiting	13	7.65	12	7.06	-	-	**25**	**14.71**
N/A	14	8.24	25	14.71	1	0.59	**40**	**23.53**

Note: Total is not equal to 100% due to multiple responses

- Despite not being pregnant, some women farmers experienced nausea (4, 2.35%) and vomiting (3, 1.76%), which could possibly be related to pesticide exposure, though other factors cannot be ruled out.

- Most farmers (109, 64.12%%) contact a local doctor when they suspect pesticide poisoning (women: 56, 32.94%; men: 51, 30.00%; unknown: 2, 1.18%; Table 61).

Table 54. **Farmers' contacts for suspected pesticide poisoning**

CONTACT	WOMEN	%	MEN	%	UNKNOWN	%	TOTAL	%
Family member	15	8.82	15	8.82	1	0.59	**31**	**18.24**
Friend	2	1.18	-	-	-	-	**2**	**1.18**
Hospital	16	9.41	18	10.59	2	1.18	**36**	**21.18**
Local doctor	56	32.94	51	30.00	2	1.18	**109**	**64.12**
Local remedies	2	1.18	1	0.59	-	-	**3**	**1.76**
N/A	27	15.88	7	4.12	-	-	**34**	**20.00**

Note: Total is not equal to 100% due to multiple responses

Highlights of the report from Son La

55.56% of pesticides are HHPs according to PAN International list of HHPs.

40.74% of pesticides are highly toxic to bees.

8.82% of farmers do not wear PPE.

40.00% of farmers did not have proper access to washing facilities after pesticides application.

49.41% of farmers live less than 1km from pesticide spraying location.

35.29% of farmers store pesticides in their homes.

Summary

In **Son La province, Vietnam**, the majority of farmers (92.35%) reported using pesticides, with a higher proportion of women (52.35%) compared to men (38.24%). The most commonly used pesticides include glufosinate ammonium and kasugamycin (12.94%), followed by emamectin benzoate (11.18%), which are primarily applied in rice, maize, and coffee cultivation. The widespread use of these chemicals raises concerns about potential environmental contamination and long-term soil degradation, particularly in intensive farming systems. Farmers complain about headaches which is the most frequently reported symptom (37.65%), affecting both women (18.24%) and men (19.41%). Dizziness was also common, reported by 34.12% of farmers. Repeated exposure to pesticides, especially without adequate protective measures, may increase the risk of chronic health conditions. In addition, it is important to provide both financial support and practical training to help farmers transition away from pesticide dependence and adopt agroecological practices that are safer, more sustainable, and community-centered.

"Before 2019, many families in our commune used paraquat and glyphosate to kill weeds on coffee plantations. However, from 2021 onwards, we have not used the above active ingredients. When trained and discussed by the project, we used weed cutters and traditional tools such as weed knives and hoes to cut and weed instead of using chemicals."

-Bac Thi Bien, women farmer from Bon Phang commune

5. CONCLUSION

The CPAM report reveals in stark detail the conditions and realities that farmers in certain regions of Bangladesh, India, Laos, and Vietnam face in relation to pesticide use. What emerges is not simply a story of pesticide application, but of rural communities living amidst constant toxic risks, with their food, water, bodies, and environments being contaminated.

Across sites most farming households report years, often decades of pesticide use, with younger family members carrying on similar practices. The result is not a series of isolated, episodic exposures, but cumulative exposure at the household and community levels heightening long-term health risks for all. The same common pesticide-related tasks are applying/spraying, mixing and loading, decanting, washing contaminated clothing and cleaning equipment were reported repeatedly .

Most communities live very near to sprayed fields; many households located within a kilometre. This proximity makes non-applicators, women, children and the elderly, regularly exposed to spray drift and second-hand exposures. This reality documented by the partners' CPAM turns what is considered "occupational exposures" into community exposures, magnifying public-health impacts.

Widespread illiteracy and the routine purchase of pesticides on a vendor's recommendations mean many farmers cannot identify the active ingredients, referring to chemicals only in generic terms. This erodes their ability to protect themselves and makes it difficult for surveillance, medical diagnosis, and regulatory enforcement. Field documentation shows hazardous practices such as decanting, burning or unsafe disposal and household storage that contribute to contamination of soil, water and food. Herbicides and insecticides recorded are toxic to non-target organisms; pollinators, beneficial insects and birds with soil biota are at risk. Overall, it is undermining biodiversity.

In addition, the report also reveals in all four countries, farmers are using highly hazardous pesticides, including those classified by WHO as extremely or highly hazardous (Class Ia and Ib), and pesticides listed under the Rotterdam and Stockholm Conventions.

As outlined in the Consolidated Analysis section, PANAP has identified several highly hazardous pesticides that require immediate attention. These are:

- **Glyphosate**: The most widely used pesticide in this study, associated with liver, kidney, and skin cell damage, hormonal disruption, and increased risks of cancer, reproductive harm, and autoimmune disorders.[138]
- **Bromadiolone**: Exposure can cause internal and external bleeding, including nosebleeds and hematuria.[139]
- **Diphacinone**: Interferes with blood clotting, potentially causing internal bleeding, liver and kidney damage, and neurological effects after long-term exposure.[140]
- **Methyl Parathion**: Listed under the Rotterdam Convention[141]; exposure can cause neurological disorders, convulsions, respiratory distress, and severe gastrointestinal symptoms.[142]
- **Abamectin**: Associated with acute poisoning (tremors, seizures, coma) and chronic reproductive toxicity, including male fertility impairment.[143]
- **Carbofuran**: Listed under the Rotterdam Convention;[144] linked to reproductive, developmental, and endocrine system disruption, including testicular degeneration.[145]

[138] PAN International. (2016). Glyphosate monograph. https://panap.net/resource/glyphosate-monograph/?ind=1603270594025&filename=Glyphosate-monograph.pdf&wpdmdl=3364&refresh=68c1285e7dd681757489246
[139] National Pesticide Information Center. (2013). Bromadiolone Fact Sheet. https://npic.orst.edu/factsheets/bromadgen.html
[140] New Jersey Department of Health. (1999). Hazardous Substance Fact Sheet – Diphacinone. https://nj.gov/health/eoh/rtkweb/documents/fs/0794.pdf
[141] Rotterdam Convention. (2017). Annex III Chemicals. https://www.pic.int/theconvention/chemicals/annexiiichemicals
[142] Agency for Toxic Substances and Disease Registry (US). (2001). Toxicological Profile for Methyl Parathion. Atlanta (GA), RELEVANCE TO PUBLIC HEALTH. https://www.ncbi.nlm.nih.gov/books/NBK600341/
[143] Aminiahidashti, H., Jamali, S. R., & Heidari Gorji, A. M. (2014). Conservative care in successful treatment of abamectin poisoning. Toxicology international, 21(3), 322–324. https://doi.org/10.4103/0971-6580.155386
[144] Rotterdam Convention. (2017). Annex III Chemicals. https://www.pic.int/theconvention/chemicals/annexiiichemicals
[145] University of Hertfordshire. (2025). Pesticide Properties Database – Carbofuran. https://sitem.herts.ac.uk/aeru/ppdb/en/Reports/118.htm

- **Monocrotophos**: Also listed under the Rotterdam Convention[146]; causes neurotoxic, reproductive, and metabolic disorders, and severe acute poisoning symptoms such as breathing difficulty and convulsions.[147]
- **2,4-D**: Widely used in Laos; considered potentially carcinogenic, with links to reproductive harm, organ damage,[148] and Parkinson's disease.[149]
- **Cypermethrin**: Acutely toxic to humans and particularly harmful to children, causing neurotoxicity, endocrine disruption, and increased cancer risks.[150]
- **Chlorpyrifos**: Damages the developing brain, causing long-term cognitive deficits in children; also linked to metabolic, immune, and organ toxicity.[151]
- **Diafenthiuron**: Associated with poisoning cases in India, causing temporary blindness, unconsciousness, and neurological disorders among exposed farmers.[152]
- **DDT**: Banned under the Stockholm Convention[153] and listed in the Rotterdam Convention[154]; linked to Type II diabetes, neurological symptoms, and classified as a possible human carcinogen (IARC).[155]
- **Fipronil**: A Class II (moderately hazardous) pesticide and possible carcinogen; causes severe environmental harm, including soil contamination and harm to non-target species.[156]
- **Imidacloprid**: Causes neurological and respiratory symptoms in humans and is highly toxic to honeybees, threatening biodiversity and pollination.[157]
- **Lambda-Cyhalothrin**: Causes skin and respiratory irritation, neurological effects, and is highly toxic to fish, raising environmental concerns.[158]
- **Malathion**: Linked to cancer, reproductive toxicity, and neurodevelopmental disorders, even at low exposure levels.[159]
- **Paraquat**: Causes chronic lung, kidney, and heart damage, with long-term scarring of internal organs and is linked to Parkinsons disease.[160]
- **Profenofos**: Leads to cholinesterase inhibition, resulting in nausea, confusion, and respiratory paralysis in severe cases.[161]
- **Atrazine**: Classified as probably carcinogenic to humans (Group 2A), with positive associations observed specifically for non-Hodgkin lymphoma with the t(14;18) chromosomal translocation.[162]

---

[146] Rotterdam Convention. (2017). Annex III Chemicals. https://www.pic.int/theconvention/chemicals/annexiiichemicals
[147] National Institute for Occupational Safety and Health. (2019). Monocrotophos. https://www.cdc.gov/niosh/npg/npgd0435.html
[148] New Jersey Department of Health. (2017). Hazardous Substance Fact Sheet – 2,4D. https://nj.gov/health/eoh/rtkweb/documents/fs/0593.pdf
[149] Agency for Toxic Substances and Disease Registry (US) (2020). Toxicological Profile for 2,4-Dichlorophenoxyacetic Acid (2,4-D). CHAPTER 2, HEALTH EFFECTS. Atlanta (GA). https://www.ncbi.nlm.nih.gov/books/NBK590138/
[150] PANAP. (2025). Cypermethrin Fact Sheet. https://panap.net/resource/20-pesticides-toxic-to-children-factsheet-cypermethrin/?ind=1594051470093&filename=pesticides-factsheet-hhps-cypermethrin.pdf&wpdmdl=2164&refresh=68d2466ee02101758611054
[151] PANAP. (2022). Urgent Need to Ban the Brain-Harming Chlorpyrifos. https://panap.net/resource/urgent-need-to-ban-the-brain-harming-chlorpyrifos/?ind=1658812902276&filename=Chlorpyrifos-PANAP-Policy-Brief.pdf&wpdmdl=4760&refresh=68d66ba7ef87c1758882727
[152] PANAP. (2020). Yavatmal poisonings: Syngenta's pesticide far more heavily involved. https://panap.net/2020/09/yavatmal-poisonings-syngentas-pesticide-far-more-heavily-involved/
[153] Stockholm Convention. (n.d.). All POPs listed in the Stockholm Convention (Annex B). https://www.pops.int/TheConvention/ThePOPs/AllPOPs/tabid/2509/Default.aspx
[154] Rotterdam Convention. (2017). Annex III Chemicals. https://www.pic.int/theconvention/chemicals/annexiiichemicals
[155] Agency for Toxic Substances and Disease Registry. (2022). ToxFAQs™ for DDT, DDE, and DDD. https://wwwn.cdc.gov/TSP/ToxFAQs/ToxFAQsDetails.aspx?faqid=80&toxid=20
[156] California Department of Pesticide Regulation. (2023). Fipronil Risk Characterization Document. https://www.cdpr.ca.gov/wp-content/uploads/2024/10/fipronil_rcd.pdf
[157] National Pesticide Information Center. (2010). Imidacloprid (General Fact Sheet). https://npic.orst.edu/factsheets/imidagen.html
[158] National Pesticide Information Center. (2001). Lambda cyhalothrin (General Fact Sheet). https://npic.orst.edu/factsheets/l_cyhalogen.pdf
[159] Earth Justice. (2021). Malathion. https://earthjustice.org/feature/organophosphate-pesticides-united-states/malathion
[160] Centers for Disease Control and Prevention. (2024). Paraquat – Chemical Fact Sheet. https://www.cdc.gov/chemical-emergencies/chemical-fact-sheets/paraquat.html
[161] United States Environmental Protection Agency. (2000). Profenofos Facts. https://www3.epa.gov/pesticides/chem_search/reg_actions/reregistration/fs_PC-111401_1-Jul-00.pdf
[162] International Agency for Research on Cancer. (2025). IARC Monographs evaluation of the carcinogenicity of atrazine, alachlor, and vinclozolin. https://www.iarc.who.int/news-events/iarc-monographs-evaluation-of-the-carcinogenicity-of-atrazine-alachlor-and-vinclozolin/

Re-enter into sprayed fields: In many sites, farmers re-enter fields within hours or a few days of spraying. Immediate or next day re-entry is common in Bangladesh and India, while some farmers in Laos and Vietnam, wait up to a week. Such early return exposes workers to pesticide residues lingering on crops, soil, and in the air, driving chronic low-dose exposure and heightening the risk of acute poisoning, particularly for those working long hours in treated fields.

Spraying pesticides against the wind: Most farmers say they spray with the wind, yet many still work against it, dramatically raising inhalation and skin exposure. Farmers are also spraying randomly and without clear direction during windy days, causing them to be directly exposed to pesticide drift. Even those spraying with the wind remain at risk, as spray drift can still settle on exposed skin and clothing or travel toward nearby homes and schools.

Pesticide spillage during spraying is a recurring problem across countries. Farmers frequently experience pesticide contact on their hands and other body parts such as the back or lower body, resulting dermal absorption, a major route of pesticide poisoning. One of the leading causes of spillage is faulty or poorly maintained spray equipment. In Laos and Vietnam, a strikingly high proportion of farmers reported spills linked to broken or leaking equipment.

Use of PPE: There is significant variation across countries and provinces. In Laos (Xieng Khouang) and Vietnam (Son La), most farmers report wearing PPE, while in Bangladesh (Cumilla) and India (Yavatmal), the majority do not. Even when farmers use PPE, it is typically limited to basic items such as face masks, long pants, or simple gloves, none of which provide adequate protection against toxic pesticide sprays. Many rely on surgical masks or regular clothing that do not meet international standards for pesticide handling and provide little protection against inhalation or dermal absorption. These gaps in access, awareness, and enforcement of safety practices create a false sense of security while leaving farmers highly vulnerable to pesticide poisoning.

In fact, the International Code of Conduct on Pesticide Management, (Article 3.6) recommends that "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". This reinforces the urgent need that highly hazardous pesticides should not be used by small holder farmers and agricultural workers who lack training and information, and PPE to manage these risks.

Access to washing facilities after spraying varies widely across regions. In Laos (Xieng Khouang) and Vietnam (Hai Hau), a large majority of farmers reported having these facilities, while in Bangladesh (Manikganj) and India (Son La, Kerala), roughly half of farmers said they lacked them. This unevenness highlights that many farming communities face a much higher risk of prolonged pesticide exposure due to lack of washing facilities. Even where such washing facilities exist, farmers and workers often depend on shared or open water sources such as ponds (Bangladesh), irrigation drains (Laos, Vietnam), or wells (Yavatmal, India) contaminating surrounding areas with pesticide residues.

Pesticide Labels: Across the surveyed countries, most farmers reported having access to pesticide labels. Access was highest in Vietnam (Hai Hau and Son La) and Bangladesh (Manikganj), where more than 80% confirmed access. Even when labels are accessible, this does not guarantee that farmers consistently read or understand them. Farmers in Laos and Son La, Vietnam reported relatively higher engagement, regularly reading labels. While, in Bangladesh (Cumilla, Manikganj) and India (Yavatmal, Kerala), most farmers admitted to reading labels "sometimes" or "not at all".

This gap between having safety information and actually using it exposes deeper structural barriers. Language is a major obstacle in many regions. In Bangladesh and India, many farmers reported that labels were often not available in local languages, making it difficult to understand essential instructions. By contrast, Laos and Vietnam performed better, with a higher proportion of labels provided in local languages. Readability is another widespread issue. Small font sizes render labels practically useless for many, especially in Yavatmal, India, where more than a third of farmers said the text was simply too small to read.

Pesticide purchasing practices: Across all surveyed countries, most farmers reported buying pesticides from retail shops and with decisions guided either by personal experience (Bangladesh, India, Laos, Hai Hau) or by seller recommendations (Cumilla, Son La). This reliance on unverified advice increases the risk of overuse, misuse, or dependence on hazardous products.

Storage: Many farmers in Bangladesh (Manikganj) and Vietnam (Son La) stored pesticides at home or behind their houses, directly exposing families to toxic chemicals. Farmers in India and Laos more often stored pesticides in sheds, which, while safer, still poses risks if poorly ventilated. In Cumilla, storing pesticides directly in the fields actively increases the risk of environmental contamination. In contrast, many farmers in Hai Hau avoid storage by using up pesticides immediately, though this practice may signal potential over-use.

Unsafe reuse of pesticide containers remains a serious problem in some areas. In Manikganj, farmers admitted to reusing containers for household purposes, including food storage, a dangerous practice. Similar cases were reported in Laos, where container reuse was reported, including one case of food/water storage posing dangerous risks. By contrast, in Cumilla, Hai Hau, and Son La, most farmers reported not reusing containers, demonstrating a safer practice.

Disposal practices: In India and Laos, farmers commonly burned plastic containers, releasing toxic fumes that endangered communities and the environment. In Bangladesh and Vietnam, containers were often disposed in fields or mixed with household trash, posing long-term risks to soil and water. Only in Son La did some farmers mention using government-provided disposal facilities, reflecting a more structured approach to waste management.

Acute health symptoms: Across all surveyed countries, farmers reported a range of acute health symptoms following pesticide exposure, with dizziness, headaches, nausea, vomiting, and excessive sweating being the most common. Given that some pesticides used are highly hazardous or carry long-term effects, these symptoms may indicate both immediate toxic effects and potential health impacts, even though other factors cannot be ruled out. Farmers' responses to suspected poisoning vary widely: in Bangladesh and India, they primarily seek care from local doctors and hospitals, reflecting relatively better integration of pesticide-related illnesses into the health system. In contrast, in Laos and some parts of Vietnam, farmers often turned first to family members for help.

Since the release of the last CPAM report, Of Rights and Poison (2018), little has changed on the ground, leaving farmers still exposed to hazardous pesticides and their associated risks. Yet some incremental positive changes are worth noting.

Compared to 2018, more farmers, particularly in India, are practicing organic farming and agroecology, showing that safer and more sustainable alternatives are beginning to take root. Several highly hazardous pesticides (HHPs) have also been banned since the last report, including alachlor, benomyl, carbaryl, diazinon and others in India, as well as glyphosate, fipronil, and chlorpyrifos in Vietnam. These policy measures are important steps, yet they remain insufficient: HHPs are still widely available in the market and continue to be purchased and used by farming communities.

Awareness of pesticide dangers also remains uneven. It is stronger in areas where PANAP and its partners are actively intervening, but remains very limited in many rural regions where communities are left without adequate protection or alternatives. At the same time, agroecology is becoming more visible and prominent across different sites, representing not only a viable but also an urgently needed alternative pathway. Sustaining this progress, however, demands far greater support, scaling-up, and policy commitment if farming communities are to break free from the cycle of pesticide dependence and exposure.

The evidence gathered by CPAM shows that pesticide use is not just an occupational hazard for individual farmers but it is a crisis that affects the entire communities, driven by the dominant corporate agricultural model in these countries. Consumers are also exposed when they eat food contaminated with pesticide residues. Protecting farmers, rural communities and consumers requires more than small, incremental change; it demands a fundamental transformative of the food system. Highly hazardous pesticides must be urgently phased out and replaced with agroecology: a farming system rooted in ecological processes, protects biodiversity, and prioritises the health and wellbeing of people rather than dependency on harmful chemicals.

6. RECOMMENDATIONS

Based on the findings from the survey conducted across four Asian countries, PANAP presents the following key recommendations to address the urgent concerns related to pesticide use and its impacts on small-scale farmers:

1. **Phase Out HHPs**: Governments must urgently ban HHPs, in line with international commitments such as the Global Framework on Chemicals and the International Code of Conduct on Pesticide Management. Governments should work with farmers and workers group as well as CSOs to develop a national list of highly hazardous pesticides. PAN International's list of HHPs can serve as a useful reference.
2. **Adopt the Code of Conduct in national regulations**: Ensure that the International Code of Conduct on Pesticide Management is integrated into national and local legislation, with strict enforcement to ensure better practices. Adopt the precautionary principle in national regulation which require alternatives assessments, risk/hazard assessments rather than just risk mitigation. Precautionary principle is defined as "taking preventive action in the face of uncertainty, shifting the burden of proof to corporations who sell these pesticides, and prioritizing the avoidance of harm"
3. **Immediate Government Action to Comply with Article 3.6 of the International Code of Conduct on Pesticide Management**: Governments should take immediate action to comply with Article 3.6 of the Code by banning pesticides that require the use of Personal Protective Equipment (PPE). PPE is often unavailable, expensive or not appropriate for a hot, humid weather in most of Asia. Such measures are essential to protect farmers from exposure to hazardous chemicals that pose serious risks to their health and safety.
4. **Ban BRS-listed Pesticides**: The Basel, Rotterdam, and Stockholm (BRS) Conventions are key international treaties aimed at protecting human health and the environment from hazardous chemicals and wastes. The Basel Convention controls the transboundary movement and disposal of hazardous waste; the Rotterdam Convention requires countries to be informed and to give prior consent before importing banned chemicals, including pesticides; and the Stockholm Convention calls for the elimination or restriction of persistent organic pollutants (POPs). Pesticides listed under these conventions are internationally recognized as highly hazardous and pose serious risks to human health and ecosystems. These chemicals, including the pesticides covered by the BRS Conventions, must be progressively phased out.
5. **Pesticide Industry Responsibility and accountability**: The pesticide industry must immediately cease importing and selling pesticides that require PPE, particularly in countries where small-scale farmers are exposed to them. This measure is critical to preventing the widespread use of hazardous chemicals that endanger farmers, particularly those who lack the resources to adequately protect themselves. In addition, the pesticide industry must be transparent about health and environmental impacts; conduct independent monitoring; recall or stop sale when harm becomes evident (Article 5.2.5) and ensure that pesticides that are banned domestically are not produced and exported to developed countries. (Article 6.2.7 (data/reporting) and Article 9 (Information Exchange) taken from the International Code of Conduct on Pesticide Management.)[163]
6. **Strengthen Training and Awareness**: Educate and train farmers on pesticide risks and agroecological alternatives, using culturally relevant materials in local languages. Ensure clear pesticide labelling with hazard information and PPE guidance, in all local languages. Monitor and protect health by training users on safe handling and tracking both acute and chronic exposure impacts.
7. **Improve Regulation and Enforcement**: Train and license pesticide retailers to ensure safe sales and proper guidance to farmers. Establish pesticide-free buffer zones around schools and residential areas to protect communities. Ban unsafe aerial spraying practices to reduce drift and unintended exposure.
8. **Support for Agroecology**: Governments must back small-scale farmers, through funding, technical support, and enabling policies, to phase out hazardous pesticides and adopt agroecology and other sustainable, community-led practices that safeguard health, protect biodiversity, and defend farmers' rights and livelihoods.

These actions are essential to safeguarding the health and well-being of small-scale farmers, their communities and consumers while advancing a safer, more sustainable future for agriculture, one where communities are safeguarded, ecosystems are restored, and food systems are freed from reliance on toxic chemicals.

[163] Food and Agriculture Organization of the United Nations, & World Health Organization. (2014). International Code of Conduct on Pesticide Management. FAO & WHO. https://www.fao.org/fileadmin/templates/agphome/documents/Pests_Pesticides/Code/CODE_2014Sep_ENG.pdf

Annex A. **Explanatory notes regarding the table of HHPs**[164]

WHO Ia:	Extremely hazardous (Class 1a) according to World Health Organisation
WHO Ib:	Highly hazardous (Class 1b) according to World Health Organisation
H330	'Fatal if inhaled', hazard classification according to the EU or Japan Globally Harmonised System (GHS)
EPA carc	Human carcinogen according to EPA
IARC carc	Human carcinogen according to IARC
GHS+ carc (1A, 1B)	Known or presumed human carcinogens (1A or 1B) according to EU or Japan GHS
EPA prob/likel carc	Probable/ Likely carcinogen (including "Likely to be Carcinogenic to Humans: At High Doses" according to EPA
IARC prob carc	Probable carcinogen according to IARC
GHS+ muta (1A, 1B)	Substances known to induce heritable mutations or to be regarded as if they induce heritable mutations in the germ cells of humans. Substances known to induce heritable mutations in the germ cells of humans' (Category 1A or 1B) according to EU or Japan GHS.
GHS+ repro (1A, 1B)	Known or presumed human reproductive toxicant according to EU or Japan GHS.
GHS+ C2 & R2	Pesticides classified GHS Carcinogen Category 2 AND Reproductive Category 2 following EU or Japan GHS
EU ED	. ED criteria met according to points 3.6.5 and/or 3.8.2 of Annex II of Regulation (EC) 1107/2009 as amended by Commission Regulation (EU) 2018/605
Very bio acc	Very bio accumulative (BCF >5000) or Kow logP >5 (BCF values supersede Kow logP data)
Very pers water, soil or sediment	Very persistent in water (half-life > 60 days), soils or sediments (half-life > 180 days)
Very toxic to aq. organism	Very toxic to aquatic organisms (Acute LC/EC50 <0,1 mg/l for Daphnia species)
Highly toxic to bees	Hazard to ecosystem services – Highly toxic to bees (<2 µg/bee) according to U.S. EPA as listed by FOOTPRINT data
Montr Prot	Ozone depleting chemical according to the Montreal Protocol
PIC	Listed in Annex III of the Rotterdam Convention or meeting the criteria for being listed
POP	Listed in Annex III of the Stockholm Convention or meeting the criteria for being listed

[164] Pesticide Action Network International. (2024). PAN International list of highly hazardous pesticides. https://pan-international.org/wp-content/uploads/PAN_HHP_List.pdf

PAN ASIA PACIFIC

For a just and pesticide-free future

PAN Aisa 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 the assertion of rights to land and livelihood, and advocates food sovereignty and gender justice.

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

PAN Asia Pacific (PANAP)
48-1, Persiaran Mutiara 1, Pusat Komersial Bandar Mutiara,
14120 Simpang Ampat, Penang, Malaysia

Tel: +604–502 2337 | **Email**: info@panap.net | **Web**: www.panap.net
Facebook: www.facebook.com/panasiapacific
Twitter/X: @PANAsiaPacific | **Instagram**: @justpesticidefreeasia