RAINFOREST ALLIANCE

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The Prohibition of Paraquat: A Global Call to Action

The Dangers of Herbicide Overreliance and Farmers' Experiences with Integrated Weed Management

The Rainforest Alliance is creating a more sustainable world by using social and market forces to protect nature and improve the lives of farmers and forest communities.

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EXECUTIVE SUMMARY

Paraquat is a non-selective contact herbicide, widely used by industrial agricultural plantations and smallholder farmers alike, due to its low cost and broad-spectrum efficacy. While an effective herbicide, it is harmful for the environment and highly toxic to humans. Small quantities of paraquat are fatal, and there is no antidote for it, making it a leading cause of death among farmers and rural community members. Deaths are often due to intentional ingestion; recent studies have shown it is one of the most commonly involved pesticides in death by suicide.[1]

The Rainforest Alliance prohibited paraquat in its first sustainable agriculture standard, published in 1993. Since then, and in close collaboration with farmers who participate in the Rainforest Alliance Certification Program, we have shown that key crops can be grown without paraquat in tropical agriculture supply chains. More generally, phasing out Highly Hazardous Pesticides (HHP) has been proven to protect against serious threats to the environment and human health, while bringing long-term benefits to tropical ecosystems and farmers.

Integrated Weed Management (IWM) is an approach that uses physical, cultural, and biological measures to control weeds and is at the core of the Rainforest Alliance's work driving more sustainable farming. Through this approach farmers work with, instead of against, nature. Farmers who engaged in successful transition to this system have highlighted that replacing paraquat can be achieved with non-chemical alternatives while sustaining or even increasing yields.

Paraquat Prohibition by the Rainforest Alliance:

(i) Paraquat has been successfully prohibited in the Rainforest Alliance Certification Program: four million farmers and farm workers globally, farming over six million hectares, are growing cocoa, coffee, tea, and bananas without paraquat.

(ii) Farmers in our program have started using socially and environmentally safer alternatives to paraquat, many of which are rooted in the principles of Integrated Weed Management (IWM).

(iii) Rainforest Alliance farmers have proven IWM is a long-term, cost-effective way to cultivate crops more sustainably.

The global response to a ban on paraquat has been slow, although efforts— including its prohibition in the Rainforest Alliance Certification Program—show a ban can be successful. But without a global phase-out, its negative impacts will continue.

Workers prepare to spray chemicals at a tea plantation in India.

This report identifies the main barriers to a successful phaseout, including slow government mobilization, and active attempts by agrochemical companies to maintain production and sales of paraquat despite scientific consensus on the dangers posed.

The following recommendations—directed at governments, businesses, and NGOs—outline the steps required to phase out paraquat globally.

- **Governments around the world** need to contribute to a global phaseout of paraquat by banning its use in their national regulations. They should also ensure paraquat is added to Annex III of the Rotterdam Convention.[2] This will provide unilateral observation and push for a global phaseout.

- **Companies in the food industry** are responsible for ensuring health and safety throughout their value chain. Companies in relevant agricultural supply chains should conduct due diligence processes that prevent the use of paraquat by upstream suppliers. Companies need to require suppliers not to use paraquat and other hazardous agrochemicals, while also offering incentives to increase the uptake of IWM practices. To increase awareness among suppliers, companies can promote IWM through funding, training, and knowledge hubs.

- **Companies, governments, and NGOs** should proactively and constructively strengthen collaboration to increase the uptake of IWM. Collaboration can be achieved through funding research and extending effective IWM in different crops and regions. Key stakeholders should fund knowledge exchange, training for farmers, and extension service providers.

1 Shu-Sen Chang, Chien-Yu Lin, Ming-Been Lee, Lih-Jong Shen, David Gunnell & Michael Eddleston (2022) The early impact of paraquat ban on suicide in Taiwan, Clinical Toxicology, 60:1, 131-135, DOI: 10.1080/15563650.2021.1937642

2 Rotterdam Convention Annex III http://www.pic.int/TheConvention/Chemicals/AnnexIIIChemicals

PARAQUAT: ITS USE AND RISKS

Paraquat was first made commercially available by Imperial Chemical Companies (ICI) in 1962 under the trade name Gramoxone. Currently, paraquat is primarily traded by Syngenta, a Swiss-headquartered, Chinese subsidiary agrochemical company. Syngenta currently has a 75 percent[3] market share; the other 25 percent is distributed by various companies under the trade names Crisquat, Detrone X, and Esgram. Syngenta have marketed commercial use based on their "stewardship role"—noting that they have provided farmer training, safe-use labelling, and Personal Protective Equipment (PPE) instructions. Nevertheless, this stewardship role has proven ineffective.[4] The European Union concluded that paraquat is never safe for use—even with PPE[5]—leading to an EU-wide ban in 2007. Scientific studies have corroborated that a global ban is the most effective way to avoid continued poisoning of farmers, agricultural communities, and their local environments.[6]

SUICIDE RISK

Pesticides are a leading cause of suicide, accounting for roughly 14-20 percent of all suicides every year.[7] This is a shockingly high number, with an estimated 234,000–326,000 people dying from pesticide suicides each year.[9] Paraquat is one of the most frequently used pesticides in these suicides.[10] An estimated 20 deaths per million persons are attributed to paraquat every year, most of them from intentional self-poisoning.[11] Paraquat is a leading cause of pesticide suicide because of the low amount needed to cause death. Unlike other, less toxic pesticides, which provide a chance of recovery, paraquat's fast acting compound and lack of an effective antidote mean that a spur of the moment decision is often irreversible. For this reason, paraquat has been devastating rural communities around the world since its introduction to the market. Those most vulnerable to deliberate pesticide self-ingestion are men living in rural farming communities,[12] accounting for a high proportion of overall suicides from pesticide poisoning. The disastrous effects of the substance are felt most severely in middle- to low-income countries. For example, 63 percent of all suicides in Trinidad and Tobago between 1986-90 were attributed to paraquat.[13]

OTHER HEALTH RISKS

While the risk of death by suicide is high, non-intentional poisonings are also of high concern. Sub-lethal doses or absorption through skin exposure can cause severe damage to the lungs and kidneys.[14] Exposure during application is also problematic: Inhalation can cause pulmonary edema and impair lung function,[15] while skin contact causes dermatitis, and sub-lethal absorption can also cause severe lung and kidney damage.[16] Paraquat is further implicated in chronic health impacts—a recent metanalysis, for example, confirmed an association between paraquat use and Parkinson's disease.[17] Due to the growing awareness around these occupational hazards, Syngenta is currently facing 1,153 plaintiffs in the United States alone. The lawsuits have been filed against the firm for allegedly causing Parkinson's disease in workers through liability and gross negligence.[18]

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3 Martin Taylor, Chairman of the board of directors of Syngenta, during the AGM 2007, cited by Berne Declaration, Goodbye Paraquat (February 2009), 2.

4 (Grabosch, Robert. (2011). The Distribution of Paraquat: Does Syngenta Respect Human Rights?.

5 European Commission Regulation (EU) (2010) No 15/2010 of 7 January 2010 amending Annex I to Regulation (EC) No 689/2008 of the European Parliament and of the Council concerning the export and import of dangerous chemicals. Official Journal of the European Union L 204

6 Gamini Manuweera, Michael Eddleston, Samitha Egodage, and Nick A. Buckley 2008 Do Targeted Bans of Insecticides to Prevent Deaths from Self-Poisoning Result in Reduced Agricultural Output? Environmental Health Perspectives 116:4 CID: https://doi.org/10.1289/ehp.11029

7 https://www.downtoearth.org.in/news/health/pesticide-consumption-a-leading-cause-of-suicides-worldwide-report-66631

8 Gunnell D, Knipe D, Chang SS, Pearson M, Konradsen F, Lee WJ, Eddleston M. Prevention of suicide with regulations aimed at restricting access to highly hazardous pesticides: a systematic review of the international evidence. Lancet Glob Health. 2017 Oct;5(10):e1026-e1037. doi: 10.1016/S2214-109X(17)30299-1. Epub 2017 Aug 11. PMID: 28807587.

9 Ibid, Gunnel et al. 2017

10 Shu-Sen Chang, Chien-Yu Lin, Ming-Been Lee, Lih-Jong Shen, David Gunnell & Michael Eddleston (2022) The early impact of paraquat ban on suicide in Taiwan, Clinical Toxicology, 60:1, 131-135, DOI: 10.1080/15563650.2021.1937642

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12 Lee et al, (2020) The cost-effectiveness of banning highly hazardous pesticides to prevent suicides due to pesticide self-ingestion across 14 countries: an economic modelling study (*Outliers to this trend are Bangladesh and India, writing respectively, women make up the majority and a high minority)

13 Hutchinson, G./Daisley H. 1999 : Paraquat poisoning, letter, in : The Lancet, Vol. 353, No. 23, p. 322

14 Neumeister L & Isenring R (2011): Paraquat. Unacceptable health risks for users. 3rd Edition. Berne Declaration, Pesticide Action Network UK, PAN Asia and the Pacific; Isenring, R. (2017) "Poisoning and Adverse Health Effects Caused by Paraquat among Agricultural Workers and the Public: A Bibliography of Documented Evidence".

15 Dalvie, M.A. et al. (1999) "Long-Term Respiratory Health Effects of the Herbicide, Paraquat, among Workers in the Western Cape". Occupational and Environmental Medicine 56(6): 391–396.

16 Schenker M B, Stoecklin M, Lee K, Lupercio R, Zeballos R J, Enright P, Hennessy T, and Beckett L A (2004): Pulmonary Function and Exercise Associated Changes with Chronic Low-level Paraquat Exposure. Am. J. Respir. Crit. Care Med

17 (Tangamornsuksan W, Lohitnavy O, Sruamsiri R, Chaiyakunapruk N, Norman Scholfield C, Reisfeld B, Lohitnavy M. Paraquat exposure and Parkinson's disease: A systematic review and meta-analysis. Arch Environ Occup Health. 2019;74(5):225-238. doi: 10.1080/19338244.2018.1492894. Epub 2018 Nov 25. Erratum in: Arch Environ Occup Health. 2019;74(5):292-293. PMID: 30474499.

18 MDL judge advances most paraquat claims against Syngenta, Chevron

ENVIRONMENTAL RISKS

Paraquat's environmental risks are also high. It is a non-selective herbicide that kills all plant tissue it touches, destroying everything that is sprayed, including soft weeds and cover crops that provide habitats for natural enemies of pests. The herbicide's composition also poses acute danger to mammals, birds, and aquatic ecosystems, particularly during application[19] After it has been applied, paraquat binds quickly to surface soil and clay; However, it is resistant to aerobic microbial degradation and does not photodegrade in aqueous solutions, therefore posing a threat to surface water via runoff. Recent studies have concluded that paraquat is one of the top three most dangerous chemicals for aquatic ecosystems and waterways.[20] Separate studies have also linked paraquat to disrupting local pollinators such as bees. The chemical has been found in honeybee egg colonies because of spraying close to larval food.[21] Furthermore, paraquat has been proven to lead to soil erosion by suppressing soil bacteria and reducing dehydrogenase activity.[22] In effect, paraquat reduces soil fertility, leading to reductions in farmers' yield capacity, and hindering the long-term production potential of farms.

INTERNATIONAL CONCERNS OVER PARAQUAT

The World Health Organization (WHO) have recommended that paraquat bans are needed to protect agricultural communities. Several countries have recognized the unacceptable consequences of using paraquat and have independently taken the necessary steps to outlaw its use. Paraquat is now illegal in 67 countries, including in the European Union (EU), and most recently South Korea, Sri Lanka, Togo, and Zimbabwe. The phaseout of paraquat has proven to have quick and clear results: In South Korea for example, suicides by paraquat amounted to 3,206 in 2010, the year before the chemical was banned. After the ban came into force in 2011, overall pesticide suicide mortality in South Korea halved. Similar data is available for Japan and China.

Bees rest on the glove of a beekeeper in Guatemala. Paraquat can disrupt pollinators like bees, leading to local ecosystem damage.

19 (Wesseling C, van Wendel de Joode B, Ruepert C, León C, Monge P, Hermosillo H, Partanen TJ. Paraquat in developing countries. Int J Occup Environ Health. 2001 Oct-Dec;7(4):275-86. doi: 10.1179/107735201800339209. PMID: 11783857.

20 Nedeljka Rosic, Joanne Bradbury, Megan Lee, Kathryn Baltrotsky, Sandra Grace, (2020) The impact of pesticides on local waterways: A scoping review and method for identifying pesticides in local usage, Environmental Science & Policy, Volume 106, Pages 12-21, ISSN 1462-9011, https://doi.org/10.1016/j.envsci.2019.12.005.

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23 WHO. Preventing suicide: A global imperative; 2014 www.who. int/mediacentre/news/releases/2014/suicide-prevention-report/en/

24 Eun Shil Cha, Shu-Sen Chang, David Gunnell, Michael Eddleston, Young-Ho Khang, Won Jin Lee, Impact of paraquat regulation on suicide in South Korea, International Journal of Epidemiology, Volume 45, Issue 2, April 2016, Pages 470–479, https://doi.org/10.1093/ije/dyv304

25 Seok SJ Gil HW Jeong DS Yang JO Lee EY Hong SY Paraquat intoxication in subjects who attempt suicide: why they chose paraquat Korean J Intern Med 2009; 24:247– 51.

26 Ito T Nakamura Y Deaths from Pesticide Poisoning in Japan, 1968-2005: Data from Vital Statistics J Rural Med 2008; 3: 5 – 9.

27 Kong Y Zhang J Access to farming pesticides and risk for suicide in Chinese rural young people Psychiatry Res 2010;179 :217– 21.

THE RAINFOREST ALLIANCE'S SUCCESSFUL PROHIBITION OF PARAQUAT

The Rainforest Alliance recognized the high risks presented by paraquat when developing its original sustainable agriculture standard in 1993, banning its use in banana production. As the Rainforest Alliance's Certification Program expanded to include tea, coffee, cocoa, and pineapples, paraquat was incrementally banned for each additional sector in the program. After the Rainforest Alliance and UTZ merged in 2018 under the Rainforest Alliance name, the merged organization developed a new Sustainable Agriculture Standard, published in 2020, that continued to ban the use of paraquat. The Rainforest Alliance Certification Program now includes four million farmers and farm workers across 60 countries, farming on six million hectares. It shows production of key crops without paraquat is technically and economically achievable on a large scale.

Key crops for the Rainforest Alliance, with yields listed from 2021:

	Cocoa production without paraquat	Coffee production without paraquat	Banana production without paraquat	Tea production without paraquat
Hectares	>2.5 million ha	>1 million ha	185,000	>708,000
No. of farmers (cocoa, coffee) or farms (banana, tea)	>800,000	>475,000	2,500	>1 million
Estimated production	>1 million metric tons	1.6 million metric tons	9.5 million metric tons	>1.5 million metric tons

SPOTLIGHT ON PINEAPPLES

Pineapples in Costa Rica account for a high proportion of the 685k metric tons of Rainforest Alliance Certified pineapples per year. On average, pineapple cultivation produces 250 tons of crop waste per hectare.[28] For Costa Rican pineapples, paraquat use has been linked to the risk of rapidly rotting pineapple foliage post-harvest. The wastage can become a breeding ground for stable fly, which can in turn become a pest to livestock. The Rainforest Alliance works with farmers participating in its certification program to ensure paraquat is prohibited at every stage of pineapple processing. This is achieved through an integrated approach to reincorporate the plant's organic matter back into the soil, which provides soil fertility and moisture. By 2020, 95 percent of farmers participating in the Rainforest Alliance Certification Program had received training and none were using paraquat.

Nicoverde is a Costa Rican pineapple marketer that aims to implement good agricultural practices and support its 120 producers in their aim for continuous improvement. In collaboration with the Rainforest Alliance, since 2018 Nicoverde have aimed to reduce pesticide reliance. Pineapple farmers have been able to upscale the positive impacts of reducing herbicides, with on-farm biodiversity trainings for producers. They have also run pilots to prove results. The trainings centered on chopping and applying bio decomposer microbes, then reincorporating the organic matter back into the soil. The techniques have provided quick and clear improvements through crop waste reduction, avoiding health risks, and increasing soil quality.

Pineapples growing on a farm in Costa Rica.

28 Lopez-Herrera M, WingChing-Jones R, Rojas-Bourrillón A (2014) Meta analysis of pineapple plant (Ananas comosus) as ruminant feed. Agronomía Mesoamericana 25:383–392

NEGATIVE EFFECTS OF HERBICIDES

The introduction of herbicides in the 1940s lead to a huge shift in farming practices. By the 1960s, chemical weed management was the predominant choice among farmers, largely sold and used under the slogan of "ending the war on weeds." Yet, 60 years on, that war has largely continued, without the desired effect. Weeds have not only persisted but have often become resistant to herbicides. Furthermore, herbicide application has demonstrably hindered global uptake of nature-based solutions (like regenerative agriculture) that are proven to improve ecosystems and reduce risks to human health.

Farmland that has been sprayed with paraquat and other herbicides.

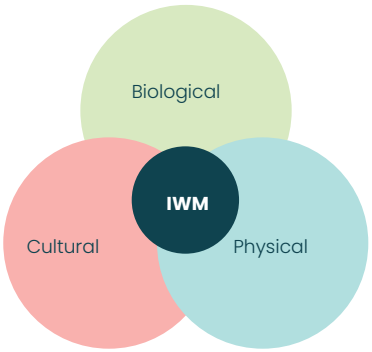
Replacing paraquat with other herbicides is only a patchwork solution. Less dangerous chemical alternatives are often less potent when dealing with weeds, so farmers spray increasing amounts.[29] Basically, when high quantities of these chemicals are used, exposure and negative effects for farmers and ecosystems increase.[30] Although the risks might be lower, alternative herbicides also have toxic effects. Increasingly, research is demonstrating that the use of herbicides has led to biodiversity loss, damages to plant health, reduced soil fertility, endangered aquatic life, and reduced pollinator populations due to habitat destruction.[31] For example, the herbicide metribuzin poses a heightened risk of groundwater contamination affecting aquatic species.[32] Similarly, herbicides can actually make certain crops even more vulnerable to fungal diseases.[33]

HERBICIDE APPLICATION INCREASES FARMERS' COSTS

As herbicide use increases, weeds can develop resistance to them. Farmers therefore need to apply ever more to compensate for lower effectiveness. Widely used chemical alternatives to paraquat have proven to also be prone to resistance.[34] Essentially, farmers will be forced to increase costs far beyond their original forecasts, which drives tight revenue turnover into lower profit margins. This is especially the case for smallholder farmers, who already struggle to ensure a decent standard of living for their families.[35] Due to a lack of understanding of how to shift from agrochemical use and reduce dependency, these "sunk costs" are often unaccounted for by farmers. Non-chemical weed control mechanisms, on the other hand, are believed to save as much as US$1,300 per hectare.[36]

INTEGRATED WEED MANAGEMENT IS A LONG-TERM SOLUTION

IWM provides more sustainable solutions for phasing out paraquat in the long-term. IWM achieves this by incorporating multiple strategies to manage weed populations in an economically and environmentally sound manner. It helps to reduce the use of herbicides by a staged approach of prevention, monitoring, and mechanical or cultural interventions. As a last resort, spot applications of herbicides are conducted if necessary. IWM holds a unique opportunity to offer weed maintenance that works in harmony with ecosystems, biodiversity, and soil fertility. IWM optimization contributes to the Rainforest Alliance's vision for regenerative agriculture, which takes a conservation and rehabilitation approach to farming where agroecology and integrated system management approaches are combined.



29 Sumith JA (2005) Sri Lanka country report. In Proceedings of the Asia Regional Workshop on Implementation, Monitoring and Observance International Code of Conduct on the Distribution and Use of Pesticides. Bangkok, Thailand: Food and Agriculture Organization of the United Nations. http://www.fao.org/3/af340e/af340e0k.htm#bm20. Accessed: June 10, 2019

30 Cech, R.M., Jovanovic, S., Kegley, S. et al. Reducing overall herbicide use may reduce risks to humans but increase toxic loads to honeybees, earthworms and birds. Environ Sci Eur 34, 44 (2022). https://doi.org/10.1186/s12302-022-00622-2

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32 Oukali-Haouchine, O., Barriuso, E., Mayata, Y. et al. Factors affecting metribuzin retention in Algerian soils and assessment of the risks of contamination. Environ Monit Assess 185, 4107–4115 (2013). https://doi.org/10.1007/s10661-012-2853-0

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35 Sanyal D Bhowmik P. CAndersonR. Land Shrestha A Revisiting the Perspective and Progress of Integrated Weed Management. Weed Science. 2008

36 Scott. F, Cook T (2016) Costs of Key Integrated Weed Management Tactics in the Northern Region

IMPLEMENTATION OF INTEGRATED WEED MANAGEMENT IN THE RAINFOREST ALLIANCE CERTIFICATION PROGRAM

Since the 1990s, the Rainforest Alliance Certification Program has been committed to stopping the use of highly hazardous pesticides, including paraquat. In recent years the organization has broadened this approach by increasing its requirements—and support—for farmers to implement integrated pest and weed management. Certified farmers are now required to implement cultural, biological, and physical alternatives that limit risks to human health and support healthy ecosystems.

(i) **Cultural techniques** aim to ensure that crops are healthy and therefore keep their competitive advantage over weeds.

(ii) **Biological techniques** require interventions that alter ecosystems' natural processes by increasing living organisms that feed on weeds or prevent their growth.

(iii) **Physical techniques** involve the use of mechanical and manual practices that disrupt the germination of weeds.

By implementing IWM, many farmers have since demonstrated that maintaining yields without herbicide application is possible.[37] Several independent studies have confirmed this trend, with bans on paraquat having no impact on production for multiple crops.[38] [39] Phasing out herbicides has been characterized as a triple-win:(i) increased ecosystem fertility, (ii) increased farmer health, and (iii) maintained crop yields.

SPOTLIGHT ON TEA

The Rainforest Alliance's IWM work originated in India in 2005, with the recognition that farmers too easily resorted to alternative herbicides, without consolidating their efforts around non-herbicide options. The initial projects were aimed at training farmers on the positive impacts that selective weeding could bring: Firstly, about the importance of uprooting noxious weeds— identified through their strong roots systems—which are habitats for harmful insects and compete for nutrients, water, space, and sunlight. The training's second aspect was about identifying soft weeds—based on their weak root composition—and recognizing their positive impact on soil moisture retention and habitat provision for key pollinators. Based on the findings and results of these projects, the Rainforest Alliance developed a curriculum, training manuals, and posters to disseminate information about noxious and beneficial weeds.

Cocoa plant that has perished despite the use of pesticides.

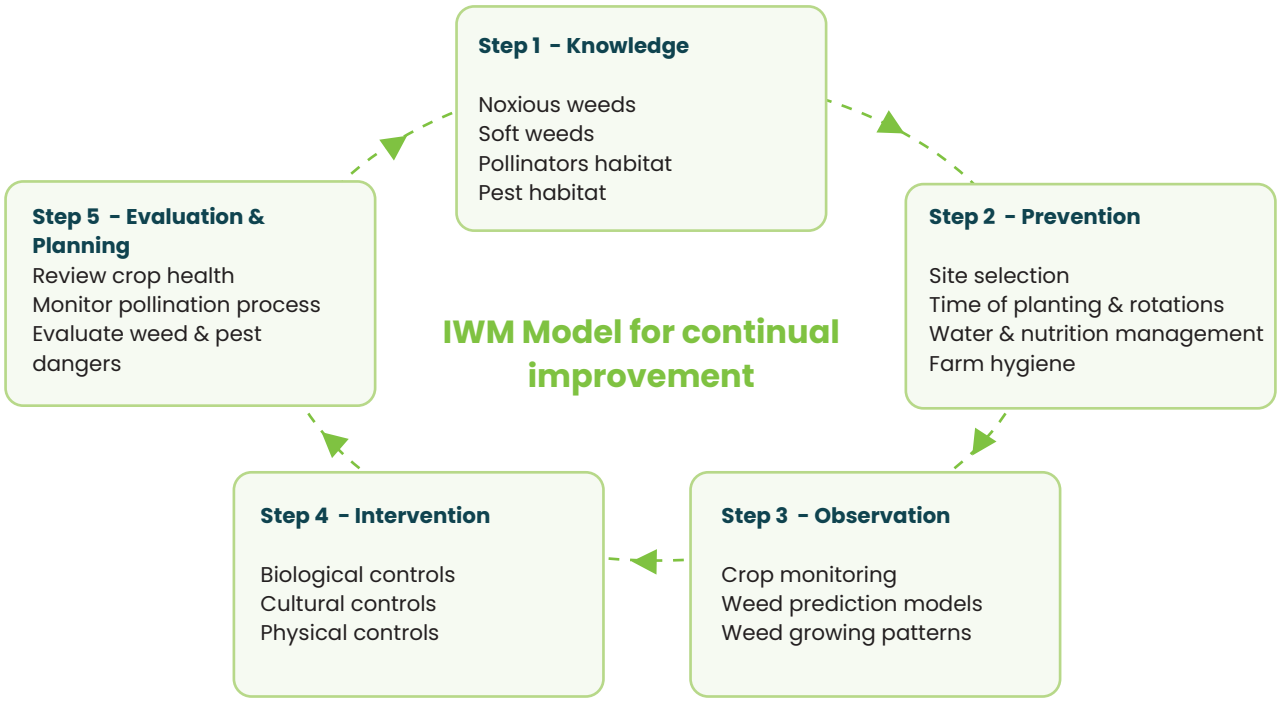
Rainforest Alliance's IWM implementation strategy

Sri Lankan tea became a focus for the Rainforest Alliance's IWM strategy in 2015, under the project goal of herbicide-free integrated weed management (HFIWM). There are roughly 200,000 ha of tea farms in Sri Lanka, the majority (73 percent) comprised of smallholder plots. The Rainforest Alliance saw an opportunity to upscale the positive benefits of HFIWM in the country, where paraquat has been banned since 2012. In accordance with the IWM principle of physical techniques, the Rainforest Alliance organized training to provide farmers with an array of weed prevention methods that did not need herbicides. The first step of the program was to identify the noxious weeds and subsequently manually remove them, allowing the soft weeds to dominate the farmland. The impacts have been studied since the beginning of the project and have proven to be cost-effective, as they reduce fertilizer and labor costs, while increasing yields. HFIWM enables farmers to take advantage of mulching and composting, along with cover cropping, to retain soil moisture. With support from Unilever, the Rainforest Alliance was able to train 18,000 smallholders in 2015. By 2018, the Rainforest Alliance had trained 30,000 farmers to follow HFIWM as part of its certification program.

37 More information on Integrated Weed Management can be found in Chapter 3 of the Integrated Pest Management Guidance document of the Rainforest Alliance 2020 Certification Standard. https://www.rainforest-alliance.org/wp-content/uploads/2020/12/guidance-h-integrated-pest-management.pdf

38 Sethi, A., Lin, CY., Madhavan, I. et al. Impact of regional bans of highly hazardous pesticides on agricultural yields: the case of Kerala. Agric & Food Secur 11, 9 (2022). https://doi.org/10.1186/s40066-021-00348-z

39 Stuart, Alexander et al. (2022). Agriculture without paraquat is feasible without loss of productivity. Lessons learned from phasing out a highly hazardous herbicide. 10.21203/rs.3.rs-1955952/v1.



Mahendra Peiris, manager of the Hapugastenne Tea Estate in Sri Lanka. The farm allows beneficial weeds to grow, thereby replenishing nutrients in the soil, while noxious weeds are manually uprooted and composted into organic fertilizer.

SPOTLIGHT ON COFFEE

Rainforest Alliance Certified coffee in Latin America, East Africa, and Asia covers roughly 1 million hectares and encompasses 400,000 certified farmers, 75 percent of whom are smallholders. Coffee farmers taking part in the Rainforest Alliance Certification Program have been pursuing alternatives to paraquat since its prohibition in the Standard. The goal of IWM strategies in coffee is to make use of naturally occurring non-competitive soft weeds to act as cover crops. The benefits are vast for soil conservation and moisture retention—which has proven particularly important during the dry seasons and the increasing occurrence of droughts. By moving beyond paraquat and reducing the use of other herbicides, farmers can avoid issues such as phytotoxicity, high application amounts, and harmful spillover effects to pollinators and local biodiversity (see section 2).

SPOTLIGHT ON COCOA

Cocoa in Indonesia has been recognized as a key area for the reduction of pesticide use. One study identified that 79.8 percent of the 111,811 cocoa farmers were using herbicides,[40] primarily to clear all weeds. Forty-three percent of cocoa farmers in Indonesia used paraquat.[41] Due to the environmental and health problems caused by herbicides, the Rainforest Alliance partnered with field staff and the cocoa industry to upscale IWM practices. The program was implemented based on the successes with IWM in Sri Lanka and the tea sector, and included a curriculum, farmer training manuals, and posters. These materials were aimed at promoting the mechanical, cultural, and biological IWM techniques which have proven successful in managing cocoa without the need for herbicides like paraquat. What follows are interviews conducted in 2022 about farmers' experiences around the prohibition of paraquat and the uptake of IWM on their farms.

40 Swiss Confederation (2017) Pesticide Baseline Report Sustainable Cocoa Production Baseline https://www.swisscontact.org/_Resources/Persistent/f/d/e/7/fde7dd60f901d578f3fb7e966cbe4adf09290269/2017%20Pesticide%20Baseline%20Report.pdf

41 Ibid

"This flower, for some farmers who don't know the benefits—they might underestimate it. In fact, it's highly useful to attract flying insects to make the pollination process faster. Secondly, it acts as a pest repellent." - Rustan Effendi, cocoa farmer in Poso, South Sulawesi

Rustan Effendi

Rustan Effendi is a 43-year-old cocoa farmer from Panda Jaya Village, Central Sulawesi. He has been farming since 2010, after moving to Panda Jaya from South Sulawesi to begin farming and open a motorcycle store. Rustan currently has a three-and-a-half-hectare farm where he grows cocoa and durian. Rustan is the only one overseeing his land and uses the farm to provide an income for his wife and daughter. Several years ago, Rustan realized that herbicides not only harm his health, but also the ecosystem on his farm. He felt he needed to make a change. "When using the grass killer, it brought some negative impacts to my health such as shortness of breath while spraying the herbicide" said Rustan.

After making the decision to stop using herbicides in 2020, Rustan decided to implement **mechanical methods** to remove weeds on his farm and bought a grass cutting machine. Together with the Rainforest Alliance and local government field extension teams in Poso, he ensured he was using the best techniques for his farm. Rustan observed that his yields have been increasing since he stopped using chemicals, and that he has cut down on the high costs of herbicides.

"My cocoa trees produced more fruits than the previous years, before using a grass cutting machine. My cocoa plants grow perfectly, the leaves are not dry. Back then, the leaves were drier when using herbicides."

Rustan explained that the herbicides were not only killing the weeds, but also the habitats of key pollinators—and even the pollinators themselves. This was affecting cocoa development cycles, with longer waits between harvests and a lack of clarity on yield quality. By using an integrated approach, Rustan can target noxious weeds and maintain soft weeds that provide habitats for pollinators. Rustan also said that by identifying the habitats of the cocoa pod borer (a common pest), it was easier to allow the soft weeds to flourish and replace the pest habitats.

"[We work] to find ways to make the most of our farm. We're thinking of how to preserve the land so our descendants can inherit the fertile lands that bring benefits in the long term."

Mohammed Rizal Umani

Mohammad Rizal Umami is a 31-year-old cocoa farmer from Maya Jaya village in South Sulawesi. Mohammed has been farming since 2008 and took over his family farm in 2015. He inherited half a hectare and has since increased the size of his farm to one and a half hectares. Mohmmed supports his wife and two sons with the earnings from his farm and currently grows cocoa and durian. Mohammed is motivated to implement IWM because he wants other farmers to follow in his footsteps: "My future hope is that other farmers can follow me in using organic substances to maintain our health as well as soil fertility."

Mohammed said that he originally used herbicides, including paraquat, to keep weeds at bay, but realized there

was a better way. He examined his farm and saw that his crops were drying out. He also began experiencing negative health effects after exposure to herbicides. So, he made the decision to stop. Mohammed immediately noticed the benefits of phasing out herbicides both for his health and his farm:

"For land fertility, it is too dry and for the plants, if we keep using herbicides, later the plants become drier too. From a health aspect, after spraying, if we are using herbicide, I would experience shortness of breath."

Mohammed decided that his farm would benefit from an integrated weed management approach that **combined mechanical** and **cultural methods**. First Mohammed and other fellow farmers in the area began collaborating with Rainforest Alliance and government field extension officers to learn more about these methods. Pak Sabar, another local farmer, showed Mohammed that it is best to use a grasscutter first. Unlike herbicides, a grasscutter can be applied in any weather condition. Mohammed began to target the hard lawn weeds with a grasscutter and allowed the soft weeds to grow.

"A rorak is like a hole or excavation that is stuffed with materials such as cacao pod husks from harvested cacao, then thrown into the trenches. A rorak will be the place where the harvest by-products are gathered, such as cocoa pod husks, weed cuttings, or banana stems." - Mohammad Rizal Umami, cocoa farmer in South Sulawesi

"Previously when using herbicides, these kinds of (harder) lawn weeds grew easily around the farm" said Mohammed, "after I stopped using herbicide, the softer lawn weeds started to grow, and the soil was no longer dehydrated."

After seeing the improvement in the farm's soil fertility, Mohammed began to grow **cover crops**. When relying on herbicides alone, it was difficult to grow other crops. Mohammed can now use an integrated approach that diversifies the number of soft weeds covering the soil. In effect, cover crops not only support soil health, but also provide organic matter that can be used as mulch to support the future growth of cocoa. With an integrated weed management approach, farmers can break up the cycle of weeds and use the organic matter as fertilizer, further reducing synthetic input costs.

Ketut Sudomo

Ketut Sudomo has almost five decades of cocoa farming experience. He is in his mid-70s and started his farm, in Candikusuma Village, Jembrana, Bali, in 1975. Farming is a family tradition for Ketut, who inherited the land from his father. The farm is roughly 3 hectares, has around 2,000 cocoa trees, and provides an income for his wife and children. Ketut said that herbicides were never used on his farm, instead continuing the way farming has always been done by his family. To him, it is important to preserve the land for the next generation. Currently Ketut does all the maintenance on his own but needs three people to help with harvesting. Ketut has been using **shade trees** to maintain soil fertility and prevent the ground from drying out. He explains there are many benefits to using shade trees, that they prevent weeds that compete with the crops for nutrients, and simultaneously maintain moisture essential for soil health.

"It's highly beneficial if the farmers use natural techniques as the farmland will be clean, reduce competition for nutrients, and it's safer for the trees. If we use the poisonous method, the land will be very clean but dry."

Ketut has also been using **crop rotation** to prevent weeds from adapting to the weed control tactics common in any one crop. In effect, the prevention technique of crop rotation broke up the cycle of perennial weeds to favor cocoa. There were additional benefits from crop rotation beyond breaking the cycle of weeds, including increased farm biodiversity and pollination processes. Furthermore, by increasing crop diversification, there is an additional bonus of opening farmers to new revenue streams, which reduces their vulnerability to global market price fluctuations for specific crops.

"Besides the cocoa tree, we are growing other trees such as coconut, banana, durian, vanilla, and mangosteen. We don't rely on one type of tree. The variety of trees attracts more birds and insects to come, maybe because they see that the surroundings are very comforting. We hope with more trees within the limited land, we can improve on the income side of things."

Ketut said that along with the crop rotation cycles there was an increase in biomass, leading him to integrate **biological** methods. He explained that the added benefit of using biological methods is that they also complement physical techniques. Animals—in this case, goats—graze on weeds and can easily be fed using grass cuttings and young leaves from the cocoa tree.

"The combination of raising a goat and cultivating cocoa trees perfectly complement each other. For the feed, it's not hard to find since we can get it from the cocoa tree, such as the cocoa pods or young leaves."

Ketut observed that using IWM centered around biological interventions can lead to further benefits from livestock on the farm. The goats, for example, provide manure that can be used as fertilizer to maintain soil productivity.

"Integrating farming and livestock— particularly with goats —will support us in cultivating the tree. The dung benefits the cocoa tree. Doesn't matter if starting small scale because the point is, it will support us in the cocoa farm management." - Ketut Sudomo, cocoa farmer in Jembrana, Bali

Click here to see Indonesian farmers' experience with IWM

A CALL FOR ACTION TO BAN PARAQUAT

Although the Rainforest Alliance, most other certification standards, and 67 governments around the world have banned the use of paraquat, it is still one of the most used herbicides globally. More needs to be done to ensure paraquat will soon be a chemical of the past.

The Rainforest Alliance is calling on governments and businesses to increase their efforts to phase out paraquat and upscale the adoption of Integrated Weed Management.

As expressed by Indonesia cocoa farmer Ketut Sudomo:

"Chemical substances can be eliminated. That is our hope for the future. Hopefully, we as cacao farmers are given some support to encourage us, which makes us confident to stop using harmful substances. We hope in the future the government can monitor hazardous substance application for lawn weed control."

Herbicide producers have many questions to answer for their role in the continued manufacturing, selling, and marketing of herbicides that are scientifically proven to have such devastating effects. The dangers of paraquat are a clear reason to prevent this herbicide from being on the market. Paraquat producers should stop its production and sale.

Governments around the world need to contribute to a global phase out of paraquat by banning its use and production in their national regulations. They should also ensure paraquat is added to Annex III of the Rotterdam Convention. This Annex provides a list of harmful chemicals that are recognized as such by all ratifying parties. Paraquat was formally recommended to be added to Annex III in 2009 and almost all parties agreed. Unfortunately, ratification was blocked by India and Guatemala.
The inclusion of paraquat in Annex III will ensure unilateral observation and push for a global phaseout. Governments that have already banned paraquat for domestic use should also ban production and exports to extend health and safety protocol in the form of mirror bans. Roughly 100,000 tons of paraquat are still produced and shipped every year—primarily from China (56,000 tons in 2019) and the UK (28, 000 tons in 2020).[42] This presents a clear double standard: both countries have banned its use in domestic markets but continue to ship vast quantities to countries where use is unregulated, such as Jamaica, India, and Guatemala.

Companies in the food industry are responsible for ensuring health and safety throughout their value chain. Their due diligence processes need to identify HHPs, such as paraquat, which pose risks to farmers, and they need to enforce preventative processes that take appropriate action to ban the use of those harmful substances. These due diligence processes are currently still largely voluntary, but upcoming legislation—including the EU Corporate Social Due Diligence Directive (2024) and the German Supply Chain Act (2023)—will make it obligatory for companies to identify the most hazardous chemicals in their supply chains and ensure that they are effectively prohibited. Companies can simultaneously incentivize producers to phase out paraquat by financially rewarding farmers for implementing IWM and by promoting IWM through funding and the provision of human resources to increase knowledge hubs, trainings for farmers, and promote awareness among suppliers.

Companies, governments, and NGOs should proactively and constructively strengthen collaboration around IWM between farmers, businesses, governments, and agronomists. They need to provide funding and human resources to conduct research on effective IWM practices (in different crops and regions) and should fund knowledge exchange and trainings for farmers and extension service providers.

CONCLUSION

Paraquat is a deadly herbicide which has many safe alternatives. The four million farmers participating in the Rainforest Alliance Certification Program around the globe have shown that farming without paraquat in tropical regions is possible. The Rainforest Alliance calls for a global phaseout of paraquat, and support for farmers to implement IWM. Controlling weeds through mainly biological, mechanical, and cultural practices is the only fully sustainable and long-term solution for farmers which protects human and environmental health. All stakeholders need to contribute to the global paraquat phaseout. Without action, paraquat will continue to devastate agricultural communities, as it has done for the past 60 years.

42 Greenpeace (2020) https://unearthed.greenpeace.org/2020/09/10/banned-pesticides-eu-export-poor-countries/.

RAINFOREST ALLIANCE

rainforest-alliance.org
email: **info@ra.org**