

Glyphosate in Aotearoa New Zealand

11 May 2022

Summary report
on the call for
information



Disclaimer

The purpose of this report is to summarise responses to the call for information. The call for information is only the first step in the EPA understanding how glyphosate is currently used in Aotearoa New Zealand. Responses provided to the EPA comprised views, opinions, information, and supporting material (including citations, articles, and reports).

In preparing this summary report, the EPA has not substantiated or otherwise verified the information or supporting material provided by responders, and the EPA does not support or otherwise endorse responders' views or opinions, including those reflected in the summary report.

The call for information is a non-statutory process that people could voluntarily participate in. Therefore, this summary report only reflects the information provided by and views and opinions of people who voluntarily provided a response. Accordingly, responses and therefore the summary report may not reflect the views of all members of the public, professional users, or organisations across New Zealand that have an interest in glyphosate and may contain a degree of self-reporting bias.

Correction

12 May 2022 – We corrected the category of one response and updated the EU review dates.

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Executive summary

We have prepared this report following a call for information about the herbicide glyphosate, issued by the EPA between April and October 2021. This call for information was carried out in recognition of the many concerns that surround glyphosate, whether they be concerns about its possible impact on human health and the environment or concerns about the effects of glyphosate being unavailable on agriculture and the larger economy.

The use of glyphosate is a divisive topic, and unsurprisingly, we received a wide range of comments around glyphosate use in Aotearoa New Zealand.

People were concerned about a variety of possible health effects of glyphosate (including cancer), as well as the potential for environmental harm. They were also worried about the overuse of glyphosate, calling it a lazy method of weed control, and the possible effects of glyphosate formulations on bees.

On the other hand, lots of people discussed the many benefits of glyphosate, especially how it has revolutionised farming by allowing no-till agriculture. Many responders said that glyphosate is vital to their farming business as no single alternative is available that replaces all of glyphosate's uses. Responders said that, without glyphosate, outcomes for the environment and the economy would be worse.

Taking into account the responses of industry groups (who represent a large number of people), the majority of responders to the call for information were professional users who stated that glyphosate, if used according to controls and regulations, is safe and highly beneficial. Others pointed out that any chemical is dangerous if used incorrectly, but that risk can be avoided or mitigated through appropriate protective measures. A few responders stated that the benefits of glyphosate outweigh the risks.

Of the members of the public who responded to the call for information, more than half were non-users of glyphosate, who felt that glyphosate was a "toxic poison" that should be banned or at least restricted. The others were domestic users who mainly supported glyphosate use, with perhaps some extra restrictions.

This call for information is only the first step in gaining a better understanding of how glyphosate is viewed in Aotearoa New Zealand, and this document is a summary of the responses we received.

The next steps for the EPA are to:

- decide whether to seek grounds for reassessment of glyphosate
- engage with Māori on the topic of glyphosate
- review POEA surfactants
- use existing channels to reinforce the safe use of glyphosate.

Background

Glyphosate is a herbicide used to control weeds. Products containing glyphosate are among the most common herbicides used in Aotearoa New Zealand, and around the world. It was first approved for use in Aotearoa New Zealand in the 1970s. Glyphosate products are sold under a variety of brand names, with Roundup being the most recognisable brand.

Regulations in Aotearoa New Zealand

Glyphosate and all glyphosate-containing products are regulated in Aotearoa New Zealand under the Hazardous Substances and New Organisms Act 1996 (HSNO Act) and the Agricultural Compounds and Veterinary Medicines Act 1997 (ACVM Act).

Under the HSNO Act, all hazardous substances, including glyphosate, must be approved by the EPA before they can be imported or manufactured and therefore used in Aotearoa New Zealand.

Approved hazardous substances have rules placed on them to reduce risks. Rules include labelling, packaging, and disposal requirements and how to use the substance safely, such as wearing protective clothing, or limiting its use.

The ACVM Act regulates the importation, manufacture, sale, and use of all products used in the agricultural and horticultural industries to eliminate pests, treat and prevent diseases, and otherwise manage animals and plants. It also manages risks to trade, agricultural security, public health, and animal welfare along with making sure residue standards for pesticides, veterinary medicines, and other agricultural compounds are met.

Anyone using glyphosate in a workplace must also follow the rules under the Health and Safety at Work Act 2015 and the Health and Safety at Work (Hazardous Substances) Regulations. Councils may impose specific requirements in their local or regional plans.

Overseas regulators

We, the EPA, monitor international developments and the latest available research on glyphosate, and our position is aligned with most regulatory bodies around the world, including those from the European Union, the United States, Australia, and Canada.

Glyphosate is currently approved for use in the EU until 15 December 2022. That approval is now being reviewed as part of the regular re-registration programme, with a decision due sometime in 2023.

Purpose of the call for information

The EPA's position on glyphosate is that it is safe to use provided the specified controls and precautions are followed. That being said, we accept there are some concerns in the community about its possible impacts on human health and the environment.

We took a precautionary approach and issued a call for information about glyphosate and its use, running from April 2021 until October 2021. This call for information is only the first step in understanding how glyphosate is currently used in Aotearoa New Zealand.

The responses allow us to get a better picture of how glyphosate is used in Aotearoa New Zealand before the EU findings are released in 2023.

Summary of responses

The call for information was open from 28 April 2021 to 22 October 2021. We received 469 responses during this time, though, we found four duplicate responses, dropping the total number of responses to 465. We received responses from individuals, businesses, and organisations across Aotearoa New Zealand (and two responses from overseas – Australia and the United States). Each response reflected in this report can be viewed on our website.

Responders

While most of the responses were from individuals or individual organisations, 14 responses were from industry groups who represent a larger number of interested parties (see Table 1 below for more details). Unless otherwise stated, we have taken the number of people or organisations represented from the industry group responses.

Table 1. Industry groups who responded to the call for information

Responder name	Representing
Agcarm (Agricultural Chemical and Animal Remedy Manufacturers Association)	Manufacturers of crop protection and animal health products, including 14 crop protection manufacturers and eight distributors ¹
Animal Remedy & Plant Protectant Association	Approximately 20 member companies
Apiculture New Zealand	Approximately 2,500 beekeepers, ² response based on feedback from 36 members
Beef + Lamb New Zealand	9,000 beef and lamb farming businesses, response based on feedback from 60 Farmer Council members
Citrus New Zealand	320 growers of lemons, oranges, mandarins, limes, grapefruit, and tangelos
Federated Farmers of New Zealand (Federated Farmers)	Approximately 13,000 members, ³ response based on feedback from 1,568 members
Horticulture New Zealand	6,000 commercial fruit and vegetable growers

1 <http://agcarm.co.nz/membership/our-members>

2 <https://apinz.org.nz/about>

3 <https://www.fedsnews.co.nz/landing-page-2>

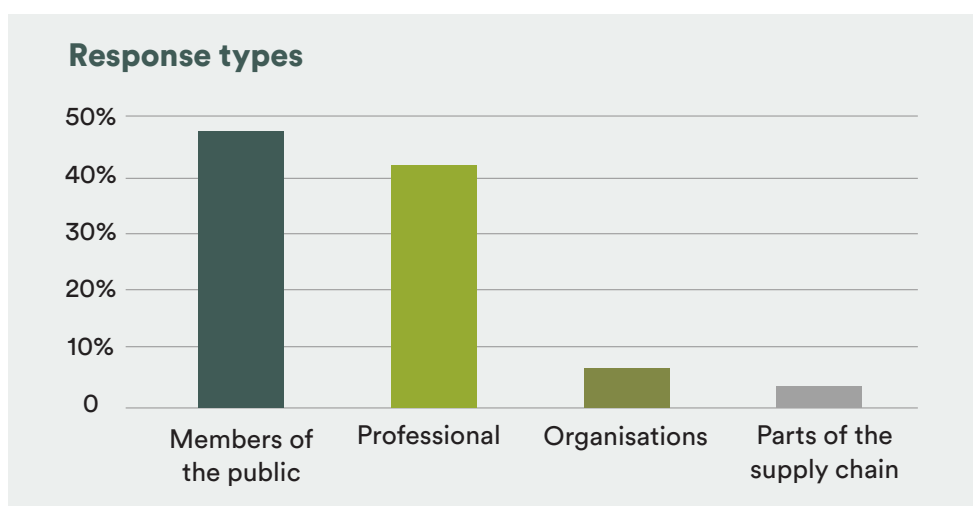
Responder name	Representing
New Zealand Apples and Pears	1,000 pipfruit growers ⁴
New Zealand Beekeeping Inc	Not provided
New Zealand Winegrowers	1,400 wine growers and wine makers
Northern Wairoa Vegetable Growers Association	51 vegetable growers
New Zealand Forest Owners Association (NZFOA) and New Zealand Farm Forestry Association (FFA) (joint submission)	NZFOA members who manage and/or own approximately 1.2 million hectares of Aotearoa New Zealand's plantation forests and over 80% of the annual harvest 2,000 FFA members
Pukekohe Vegetable Growers Association	280 commercial vegetable growers
Market Access Solutionz	18 grower groups comprising of 8,022 growers of berry, fruit, vegetable, and arable crops

Responders could identify themselves as:

- professional users (people that use glyphosate in a commercial or professional setting)
- organisations
- manufacturers, importers, or sellers of glyphosate products
- members of the public.

Figure 1 below shows the categories of individual responders. Members of the public were the biggest group of individual responders, at about 48 percent. Professional users made up 42 percent of the individual responses, and organisations comprised 7 percent. The glyphosate supply chain made up the remaining 3 percent.

Figure 1. Category of individual responders



⁴ www.applesandpears.nz/About_Us/About_Us/Membership

We asked each member of the public responder if they used glyphosate or not. About 60 percent of them were not glyphosate users.

We received 188 responses from individual professional users of glyphosate, with:

- 96 individual commercial growers in the horticulture or forestry industry
- 37 professional applicators or contractors
- 30 individual livestock farmers (of which one-fifth also grew some crops, usually for feed)
- 15 city or regional councils⁵
- two government departments (Ministry for Primary Industries and the Department of Conservation)
- eight professional users who fell into the 'other' category.

Of the 31 organisations (that were not industry group representatives) that responded to the call for information, 16 were community groups and seven were non-governmental organisations (NGOs). The remaining eight responses were other types of organisations, including a charitable trust, a golf club, a special interest group, and an agricultural consultancy company.

The smallest group of responders was from the glyphosate supply chain (15 responses), comprising:

- four retailers
- three manufacturers
- three importers
- one supplier
- four responders who had mixed roles (covering import, manufacture, and retail).

Some responses supported specific submissions made by industry group representatives. These responses were short emails with similar content. Twenty-two responders stated they supported the Agcarm submission, and 40 responders supported the Horticulture New Zealand submission. Five responders referred to or supported the Soil & Health Association response. Federated Farmers also told us their response was supported by New Zealand Pork and Rural Contractors New Zealand.

⁵ From 13 individual councils – two councils sent in two separate responses each, from different divisions/departments.

The reported concerns about glyphosate

We asked what concerns responders had about glyphosate and glyphosate products. The responses are summarised below. Numerous people pointed out that glyphosate is banned in many countries⁶ and suggested New Zealand should follow suit. Some responders raised concerns about flawed industry data being relied on for risk assessments for glyphosate done by regulatory bodies and private companies, introducing bias to the results.

Cancer

One of the most reported concerns was that glyphosate causes cancers, such as non-Hodgkin's lymphoma. Many responders discussed the report by the World Health Organization's International Agency for Research on Cancer (IARC)⁷ that classified glyphosate as a probable human carcinogen in 2015. Others also pointed out the many lawsuits against Monsanto/Bayer that claim people experienced health effects after glyphosate use (and the billions of damages paid out to claimants), citing these as evidence for glyphosate's carcinogenicity. We also received multiple personal accounts that linked the responders' (or their friend's or family member's) cancer to glyphosate use.

“It causes cancer, and there have been lawsuits. Just look at the August 2019 trial of Dewayne Johnson in which Bayer was found guilty and had to pay \$78 million.” Member of the public

Residues in food

Another concern mentioned frequently was that widespread glyphosate use in agriculture results in glyphosate residues getting into the food chain and contaminating food. The biggest concern responders had was the use of glyphosate as a pre-harvest desiccant on cereals, grains, and certain vegetables, such as onions and potatoes. Responders stated that such pre-harvest use on both animal and food crops results in a significant source of dietary exposure to glyphosate.

“The common practice of desiccation and/or ripening with glyphosate right before the harvest ensures that glyphosate residues are present in our food supply.” Member of the public

Several responders stated that glyphosate residues are often found in wheat and other grains, as well as in human urine and breastmilk samples. Again, we received several personal stories describing how responders had reacted to certain foods that had been

⁶ Glyphosate is currently banned in Luxembourg (effective from 31 December 2020) and Vietnam (effective from 30 June 2021). Two other countries (Mexico and Germany) have voted for a ban, to come into force from 2024. Some other countries have restrictions on specific uses, and some local authorities (for example, some cities or states) have banned it in their jurisdiction.

⁷ The 2015 IARC decision, see IARC. (2017). *Some organophosphate insecticides and herbicides* (IARC monographs on the evaluation of carcinogenic risks to humans). IARC Monographs Working Group with the World Health Organization.

sprayed with glyphosate. Many responders wanted a ban on pre-harvest use or a ban on use around food crops in general.

Waterways

Similar to concerns about glyphosate getting into the food chain, many responders were worried about glyphosate leaching into freshwater and marine ecosystems, as well as into groundwater and drinking-water supplies. People had concerns that non-target aquatic organisms may be affected, including phytoplankton, algae, seaweeds, corals, shellfish, sponges, molluscs, crayfish, and fish.

A marine ecology student and Friends of Taputeranga Marine Reserve discussed the decline of seaweed forests in the Wellington coastal area. Use of glyphosate on coastal roads and its subsequent leaching into the marine environment was proposed as one factor in this decline.

Bee health and residues in honey

Several professional beekeepers and their representative organisations raised concerns about the potential impact of glyphosate on honey bees. They agreed that glyphosate on its own is relatively safe for bees, but the surfactants present in some popular glyphosate products are not. Apiculture New Zealand (ApiNZ) advised that these surfactants were of exceptional concern as they may cause matting of bee body hair and consequent death.

ApiNZ also said that compounding effects from human activity negatively affect bee populations; synergistic interactions between these stressors (for example, exposure to agrichemicals) could substantially amplify their environmental effects. One responder discussed the potential impact of glyphosate on the gut bacteria in bees, suggesting that glyphosate exposure to bees alters their gut bacteria, increasing susceptibility to infection.

“The economic and environmental costs of further serious adverse pressure on honey bees is such that we consider that bees’ welfare is a legitimate regulatory goal in itself.” New Zealand Beekeeping Inc

New Zealand Beekeeping Inc advised that there are gaps in research on the effects that glyphosate and glyphosate formulations have on bees and that the safeguards currently in place may not be sufficient to protect pollinators from these unknown effects.

Many responders concerned about honey bees discussed the issue of stringent overseas maximum residue levels (MRLs) for glyphosate. Several responders mentioned the rejection of New Zealand honey by Japanese authorities due to glyphosate residues being detected above Japan’s very low MRLs. They identified that, because glyphosate is so widely used in Aotearoa New Zealand, it is near impossible for beekeepers to prevent their bees from pollinating plants that have been sprayed, inevitably leading to honey containing glyphosate. As a result, beekeepers were concerned glyphosate use is limiting their access to export markets and causing them to test and blend their products to meet requirements.

New Zealand Beekeeping Inc advised there is a need for non-application periods for glyphosate while target plants are flowering to allow for pollination, which should be

justified by the exceptional value of honey bees to society, the environment, and the economy. ApiNZ said that beekeepers already use careful placement of hives to reduce glyphosate residues in honey, but the relevant government bodies need to do more to address this issue. New Zealand Beekeeping Inc said that introducing MRLs for honey would in effect be protecting bees rather than consumers, but that should not make it any less of a priority.⁸

Surfactants and other co-formulants

Multiple responses (from all responder groups) discussed concerns about the toxicity of other components of glyphosate products, such as surfactants. Surfactants are added to herbicide formulations to help product mixing, dispersing, and spreading, thereby increasing its efficacy. However, responders pointed out that certain surfactants, such as POEAs, are more toxic and harmful to both people and the environment than glyphosate itself. Responders also suggested that co-formulants may act as synergists, amplifying the toxicity of glyphosate in the formulation.

“It is not the active ingredient that does the damage, it is often what is in the formula and in the tank mix that causes health and environmental effects.” ApiNZ

ApiNZ pointed out that the European Union prohibited POEA from being used as a pesticide co-formulant in March 2021 and requested that the EPA reassess surfactants and other co-formulants in relation to bee health. A couple of responders called for an outright ban of POEA and replacement with alkyl polyglycoside (APG) surfactants. Some responders also mentioned they moved away from using products that contain POEA.

Off-target effects

In addition to concerns for bees and aquatic organisms, many responders were worried about effects on other beneficial insects, as well as other animals, such as skinks, geckos, and birds.

Several people were also concerned about the effect glyphosate spraying in public spaces may have on pets such as cats or dogs, who “have no foot protection”. One person suggested that dogs sniffing glyphosate spray can cause nose tumours in the dogs. Several people talked about glyphosate affecting their pets, including cats, dogs, and a horse.

Finally, people were also worried about off-target plants (both native and garden plants) being killed through spray drift or poor use practices.

Soil health

Many responders were also concerned about the negative effects glyphosate may have on soil ecology, specifically on soil microorganisms. Responders pointed out that glyphosate works by interfering with the shikimate pathway (a metabolic pathway used by plants to synthesise certain amino acids). While animals do not have this pathway, microorganisms do, and therefore will be affected by glyphosate. Physicians and Scientists for Global

⁸ Please note, it is MPI, not the EPA, that sets MRLs, however the EPA does assess the environmental effects of hazardous substances on bees.

Responsibility stated that glyphosate could reduce the efficiency of nitrogen-fixing rhizobic bacteria. Similarly, another responder was concerned that destruction of soil food webs by glyphosate decreases soil fertility, leading to increased use of fertilisers and pollution.

Gut health

Likewise, some responders were concerned about glyphosate affecting the gut microbiome, as many beneficial gut bacteria will also be using the shikimate pathway. Responders were concerned that glyphosate may affect gut health, altering the balance between pathogens and beneficial biota and leading to diseases such as coeliac disease and inflammatory bowel disease (IBD), including Crohn's disease and ulcerative colitis. One responder's opinion was that the gut biome has been linked to many other health issues.

“The significant increase in IBD over the last decades coincides with the increase of glyphosate use, and a possible causal link should be considered.”

Member of the public

Other health concerns

Other health concerns were mentioned by many responders, although often in vague terms. Responders worried that glyphosate could accumulate in the body, saying it is “incredibly toxic”, “wreaks havoc on nearly all human organs”, and causes “chronic issues” and an increase in “various diseases”. Several responders stated glyphosate is an endocrine disruptor (affects hormones). Some responders provided personal anecdotes and stories of how they believe glyphosate affected them. Responders were concerned that glyphosate could cause:

- attention deficit hyperactivity disorder (ADHD) and autism
- allergies
- blood diseases
- cardiovascular disease
- cytotoxic and genotoxic effects
- degenerative disease
- depression and other mental health problems
- developmental disorders and learning disabilities
- diabetes
- fatigue
- headaches, nosebleeds, and dry eyes
- kidney and liver disease
- muscle aches
- Parkinson's disease and other neurological disorders
- reproductive harm, such as infertility and birth defects
- respiratory conditions, such as asthma
- skin conditions
- swelling, inflammation, and arthritis symptoms
- stomach cramps
- thyroid problems.

Alleged rule breaking

Many responders were concerned about how others (both professional and domestic users) were using glyphosate, including that some users were not complying with relevant regulations or not following good practice. The most frequent complaint was that people were not using appropriate personal protective equipment (PPE).

A second issue often raised by responders was the lack of notification about spray operations and lack of signage during spray operations. The Weed Management Advisory shared several examples of alleged breaches by council spray contractors.

Other examples of alleged rule breaking provided by responders included users:

- not reading labels
- spraying in adverse weather conditions (windy or rainy)
- using sprays near waterways
- creating spray drift
- being careless, resulting in off-target effects (killing native plants or affecting neighbours)
- not maintaining proper records of use
- allowing cattle to graze on dying vegetation.⁹

“Regardless of the rules and controls, it is being used and mis-used by people ignoring or failing to follow rules and controls effectively.” Member of the public

Overuse

A related concern voiced by many responders was the overuse of glyphosate. Responders frequently mentioned “indiscriminate” use by councils around public parks, roadsides, and playgrounds as a major concern. A repeating theme was the concern for children who play in parks and playgrounds, often barefoot, and are exposed to glyphosate.

Some responders discussed contractors who “drown the plants in spray” leading to potential effects on bees and other off-target creatures, including pets. A couple of responders discussed overuse resulting in bare ground that contributes to soil erosion and potentially landslides after heavy rain. Others were concerned about “blanket spraying” in the agricultural sector and seeing “the paddocks turn roundup orange every year”. Some responders provided photos, showcasing overuse, for example, as in Figure 2.



Figure 2. Example responder photo of glyphosate use by a council

⁹ Please note, as glyphosate does not have a withholding period, grazing cattle on glyphosate-sprayed vegetation does not breach any rules. However, a couple of responders felt this practice was against the rules or should not occur.

Concerns with overuse were not limited to professional users. Some responders complained that domestic users do not use glyphosate products appropriately, applying more than necessary “as the results are perceived to be better”. Two responders indicated they use stronger concentrations than advised.

Resistance

Many responders were concerned that inappropriate use and overuse of glyphosate are causing herbicide resistance in Aotearoa New Zealand and overseas. Responders worried that controlling resistant plants will be more difficult in the future.

A couple of responders also felt that introducing glyphosate-resistant (genetically modified) crops would be a bad idea.¹⁰ Glyphosate-resistant crops allow glyphosate to be sprayed to control weeds without affecting the crop.

In addition to herbicide resistance, a few responders were also worried that glyphosate induces antibiotic resistance, rendering human and animal treatments less effective.

The reported benefits of glyphosate

We asked glyphosate users to tell us why they choose to use glyphosate products, to understand the benefits glyphosate provides. The main benefits and advantages of glyphosate reported by responders are summarised below.

Many responders told us that glyphosate has no negative effects on people or the environment if used responsibly, correctly, and following label instructions.

Effective

The most cited reason given (by both domestic and professional users) for glyphosate use was that it is effective, killing weeds quickly, efficiently, and reliably. Several users mentioned that glyphosate was often the only herbicide that worked on certain hard-to-kill weeds (examples given included couch, paspalum, fescue, kikuyu grass, ginger, bamboo, and old man’s beard). Responders also told us that glyphosate even works well on large and/or well-established annual weeds.

“I am retired, and the weeding required, without using glyphosate, would be well beyond me.”

Member of the public

Systemic

Responders stated that glyphosate was systemic (meaning it travels in a plant from the site of application down to the root system). In contrast to a contact herbicide, which just burns off (kills) the greenery it touches, glyphosate is effective at killing the whole plant (including any underground roots, rhizomes, tubers, or bulbs) with no regrowth. Responders noted that glyphosate therefore only needs to be used once for effective weed control, resulting in overall less herbicide use compared with other alternatives that require multiple treatments.

¹⁰ Please note, genetically modified organisms are controlled under the HSNO Act. There are currently no genetically modified crops approved for release in Aotearoa New Zealand.

Responders also stated that the benefit of the systemic mode of action is that full coverage of the plant surface is not necessary for glyphosate to be effective.

Broad spectrum

Responders also commented that glyphosate is broad spectrum or non-selective, meaning it kills a wide variety of plants, both grasses (monocotyledons) and broad leaf plants (dicotyledons) and both annual and perennial plants. Nufarm New Zealand stated that the spectrum of weeds controlled by glyphosate is probably the largest compared with any other herbicide used in Aotearoa New Zealand. This means glyphosate can be used alone in situations where multiple herbicides might otherwise be required.

“We use glyphosate simply because it provides excellent control of the broad spectrum of weeds we encounter.”
Cambridge Tree Trust

Enables reduced or no-till agriculture

Agcarm provided a report from the New Zealand Institute of Economic Research (NZIER report)¹¹ that described glyphosate as “a cornerstone tool for farmers in modern agriculture”, stating that glyphosate has revolutionised agriculture, streamlined processes, and increased productivity and production.

Many growers and farmers discussed how glyphosate allows them to plant crops without the need for cultivation, using minimal or no-till/direct-drill methods. During direct drilling, the seed is placed without any prior soil cultivation or ploughing into the stubble of the previous crop (see Figure 3). This requires the use of glyphosate to kill off any remnants of the previous crop and any weeds present.

Figure 3. Comparison of a tilled with a non-tilled maize field



¹¹ New Zealand Institute of Economic Research. (2021). *The benefits of glyphosate to New Zealand*. Report to Agcarm.

“Glyphosate is in the process of replacing the plough.”
Professional user and consultant

Responders discussed the significant benefits of this process. Conventional cultivation or tillage involves the turning of soil sods in preparation for planting. Responders pointed out this method disrupts the soil structure, affects soil microbiology, and causes soil erosion through wind and rain. Responders said that preparing the seed bed with glyphosate and using direct-drill methods maximises soil health, improves soil quality and soil structure, and maximises water retention while minimising soil carbon loss. It also improves water quality as there is less sediment and phosphate run-off.

Additionally, farmers and growers stated that reducing cultivation also reduces their environmental footprint and the production of greenhouse gases. Traditional cultivation methods require multiple passes with the tractor (resulting in more diesel usage and carbon dioxide emissions) and extra irrigation (using more water).

Non-residual

Another benefit of glyphosate commonly cited by responders is that it does not have any residual activity in the soil, meaning it does not remain active in the ground after spraying. Responders told us that the lack of residual activity means new plants can be planted soon after spraying, as glyphosate does not interfere with seed germination or seedling development. This allows growers and farmers to use glyphosate for seed-bed preparation before direct drilling and for crop pre-emergence application without any detrimental effect on their planted crops. Similarly, some native planting groups and organisations said glyphosate’s lack of residual soil activity meant new planting could be done very soon after spraying.

Many responders told us that many of the common alternative herbicides have soil residual activity and therefore cannot be used in a similar manner.

Does not leach

Several responders also pointed out that while glyphosate is water soluble, in the ground it binds tightly to soil particles, meaning it does not leach (travel in and with water). This means glyphosate is not likely to leach into groundwater or waterways, such as lakes or streams.

Responders told us that this is highly beneficial as it means glyphosate can be used near sensitive areas with minimal risk of impact on non-target plants. This was especially highlighted by several organisations involved in native planting and revegetation projects, who want to reduce any impact on non-target, indigenous flora.

No withholding period

Several responders stated that other advantages of glyphosate are that it breaks down quickly and there is no withholding period required. A withholding period is the minimum length of time between application of an agricultural chemical and the harvest, sale, or use of the treated produce or crop in order to ensure any chemical residues in food are below

maximum allowable levels. The nil withholding period that applies to glyphosate products allows pasture or crops to be sprayed before processing silage or direct livestock grazing. Federated Farmers did note that while product labels indicate stock could be returned immediately to areas treated with glyphosate, industry practice was generally to follow longer withholding periods, especially with lactating stock.

Fonterra cited the Ministry for Primary Industries (MPI) National Chemical Contaminants Programme raw milk summary reports, which test raw milk for a range of residues and contaminants. Although this testing has confirmed no detectable glyphosate residues in milk as a result of grazing stock after spraying, Fonterra pointed out the issue of perception: where herbicide is seen to be applied or application is evident (through yellowing or browning of foliage), grazing or cropping of such pastures has been perceived as a risk to animal health and food products.

A vegetable grower stated that they regularly tested their vegetables for chemical residue levels and have not detected any glyphosate residues (or any other chemicals they use) for the past 30 years.

Low human toxicity

Many responders stated that glyphosate's low toxicity to humans is a primary reason they use it, emphasising that it is especially safe compared with other herbicides available on the market. Several responders provided personal anecdotes of decades of glyphosate use with no negative or ill effects.

Several domestic and professional users discussed widespread misinformation on glyphosate's safety profile, stating that its low toxicity to humans is not grounds to ban it. Several responders argued that objective, scientific evidence should take priority over social media campaigns based on the fear of what 'might be'.

Fonterra argued that IARC's review¹², which concluded glyphosate is a probable carcinogenic for humans, was a hazard assessment not a risk assessment and is substantially flawed.

“On the issues of IARC and its ‘probably carcinogenic to humans’ ruling, it must be weighed up against whether, when used appropriately, there is any actual risk. We eat red meat and drink red wine, both of which have been identified as probably carcinogenic, but we do not regulate these products.” Horticultural expert

Some users referred to civil lawsuits in America concerning supposed health effects caused by glyphosate exposure, saying that the settlements reached did not reflect the science and have led to unfounded paranoia in the public and the media. These users often pointed out that there are a substantial number of journal articles and scientific regulatory bodies that have concluded glyphosate has low toxicity to humans, and these scientific bodies are more capable of carrying out technical toxicology analytics than the courts. Many users

¹² The 2015 IARC decision, see IARC. (2017). *Some organophosphate insecticides and herbicides* (IARC monographs on the evaluation of carcinogenic risks to humans). IARC Monographs Working Group with the World Health Organization.

mentioned that, even if glyphosate is carcinogenic, the risk of developing cancer from glyphosate is very low, advising they follow safe mixing practices and wear PPE, such as overalls, gloves, facemasks, eye protection, and approved footwear, to reduce exposure. Some professional users reported using highly qualified spraying contractors and approved handlers who are well aware of safety standards.

Low impact on the environment

Many users reported that glyphosate is considered safe for the environment provided label directions are followed correctly. Some users argued that glyphosate is less harmful than other herbicides due to its low persistence after application. Others discussed the biological reaction pathway by which glyphosate operates being specific to plants and therefore of little concern to non-target organisms. Fonterra stated glyphosate has little impact on soil microbiology, breaking down quickly once applied.

“[Glyphosate products] have no properly peer reviewed, scientifically proven, negative environmental impacts.”
Livestock farmer

Cost effective

A large number of users, both domestic and professional, told us that glyphosate is very cost effective, economic, and affordable, usually being the cheapest option of weed control available.

A high number of professional users said that, for weed control, manual labour and ploughing are impractically expensive compared with glyphosate and other herbicide alternatives.

Waitaki District Council discussed its use of glyphosate for urban weed control, saying it has tried alternatives, such as pine oil and steam, however glyphosate has proven to be the cheapest option for rate payers and clients. It has reduced maintenance costs due to lowered labour needs, which this council advised was also true for other councils across the country.

Such a reduction in maintenance costs for parks, gardens, pathways, and other public areas was echoed in the NZIER report,¹³ which advised that Christchurch City Council had halted glyphosate use three years ago and, since then, its weed control bill has increased by over four and a half times.

“The cost of alternatives in municipal applications is by a magnitude greater.” Member of the public

¹³ New Zealand Institute of Economic Research. (2021). *The benefits of glyphosate to New Zealand*. Report to Agcarm.

Positive economic impact

Responders attributed the low cost and high availability of glyphosate in Aotearoa New Zealand to significant profitability in forestry, agriculture, horticulture, and livestock farming.

The NZIER report¹⁴ analysed the economic impacts of glyphosate use. It advised that the reduced agriculture costs from glyphosate use have increased Aotearoa New Zealand's competitiveness globally and decreased the cost per unit of food. It argued that lower production costs have allowed farmers to increase the volume of product being sent to market.

Market Access Solutionz (MAS) advised that AgResearch has estimated in 2017 that the conservative cost of controlling a small number of high-profile weeds in Aotearoa New Zealand currently exceeds NZ\$1.658 billion per year (based on 2014 data), and this cost will increase if glyphosate is made unavailable as glyphosate is so widely used. Agcarm data estimated that glyphosate represents 11 percent of total herbicide sales.

MAS discussed Aotearoa New Zealand's economic recovery from COVID-19 and the role that growers of fruit, berry, arable, and vegetable crops hope to play in the government's Fit for a Better World Aotearoa New Zealand roadmap by adding NZ\$44 billion in export earnings over the next decade, with glyphosate seen as being a key factor in achieving this outcome.

Horticulture New Zealand also mentioned this NZ\$44 billion target and the importance of weed control to meet it. Horticulture New Zealand valued the horticulture industry at NZ\$6.73 billion with NZ\$4.55 billion in exports annually, employing 60,000 people in Aotearoa New Zealand, reiterating that the industry's reliance on glyphosate is high.

The NZIER report estimated the total attributed value to horticulture, vegetables, forestry, pasture, and field crops from herbicides between NZ\$2.7 and NZ\$8.6 billion (this is a cumulative average from 2018 to 2020). It discussed glyphosate's contribution to technical efficiency, which is the most cost-effective way of providing a product.

“Glyphosate has had a massive positive effect on efficiency of growing food, therefore dropping the cost of food.” Livestock farmer

The NZIER report also talked about the high cost of labour in Aotearoa New Zealand compared with places like Australia and the United States, advising that replacing glyphosate with manual labour might be more feasible in other countries but would have greater financial consequences here.

Vital for conservation

Glyphosate's broad spectrum and systemic activity was cited by several responders as being very beneficial to managing invasive exotic weeds as part of conservation activities revegetation and native planting projects and maintaining native biodiversity. As an example, Bayer cited studies that show that invasive grey willow outcompetes native vegetation in wetlands and that effective willow control has been achieved using aerial glyphosate applications, giving replanted native vegetation an advantage.

¹⁴ New Zealand Institute of Economic Research. (2021). *The benefits of glyphosate to New Zealand. Report to Agcarm.*

“Glyphosate is a valuable weapon in our battle against invasive alien land species.” Maketū Ōngātoro Wetland Society

Several community organisations commented on the lack of volunteers for manual weeding, with Whaingaroa Weedbusters, Raglan, commenting that people are not prepared to work physically hard to eradicate pest weeds. Cambridge Tree Trust also commented that the average age of its members is 75 years, and some find hand weeding or operating equipment difficult. As a result, these organisations stated that glyphosate herbicides remain essential in allowing them to continue with their conservation work.

Helps manage resistance

Many professional users mentioned the importance of having a wide range of herbicide products to manage herbicide resistance. One professional user advised that a weed management programme should include products with different modes of action to prevent resistance, citing that glyphosate is especially valuable due to its flexibility of timing of applications throughout the growing season compared with other products. Several professional users referred to glyphosate as being an important tool for slowing or preventing resistance.

“A herbicide programme with a range of products containing different active ingredients and modes of action is necessary to manage herbicide resistance.”
New Zealand Apples and Pears

The effects of glyphosate not being available

We asked responders what they thought would be the possible effects if glyphosate were unavailable in the future. Responses were divided depending on whether the responder felt glyphosate was harmful and should be banned (in which case the response discussed the positive effects of a glyphosate ban) or considered glyphosate beneficial (in which case the response discussed the negative effects of a glyphosate ban).

Proposed positive effects

Those who wanted glyphosate banned said the effects of it being unavailable would be a shift away from glyphosate products to safer alternatives. Sustainable and environmentally friendly agricultural practices and ways of controlling invasive weeds would become more favoured. Responders stated that this would lead to positive effects on people, communities, and environmental health, resulting in healthier waterways and more bees.

“Improving our eco-system does not have a price – it has a value.” Member of the public

One responder acknowledged that some farmers would struggle until they found safe alternatives, stating that alternatives are available but “there just needs to be a will to do this”. Other responders thought that a ban on glyphosate could trigger a move away from chemical reliance, rather than simply substituting glyphosate for another herbicide.

Some responders thought that glyphosate should be phased out gradually, suggesting that a motion to ban glyphosate would drive innovation and development of new weed control methods. Others mentioned that a ban would eliminate glyphosate residues from food, which are perceived as a health concern by some.

One responder stated that a ban on domestic products would have little to no impact as the issues lie in industry but that an industry ban would lower the pressures that herbicidal pollution puts on the environment.

Proposed negative effects

Those who wanted glyphosate retained said the general effects of it being unavailable would be the increased use of stronger, more expensive, and possibly more dangerous products as alternatives. This would lead to higher labour costs and weed control costs and may result in no net reduction in the environmental impacts of herbicide. Responders emphasised that these costs are likely to be passed on to the consumer via price increases.

Responders stated that the unavailability of glyphosate would have major effects on the farming industry, including:

- increased costs of production, productivity and yield losses, and therefore loss of profitability leading to a considerable rise in food costs
- a return to cultivation, meaning more damage to soil structure resulting in soil erosion, nutrient loss, and carbon loss
- greater carbon emissions due to the extra tractor passes required

- increased costs of operating and maintaining tractors
- more surface run-off and sediment in waterways
- a reduced ability to compete in export markets
- reallocation of resources, employees, and finances away from innovation
- negative effects on rural communities.¹⁵

“Productivity would plummet, weeds would be everywhere, crop yields would fall.”
Beef + Lamb New Zealand

Similarly, responders discussed possible effects on biodiversity and conservation efforts, including:

- the unmitigated spread of invasive species leading to a decline in or loss of native habitat and breeding/spawning areas for some species
- visual changes to iconic landscapes and an increase in nuisance or toxic plants
- loss of taonga species
- a weakened ability to respond to a biosecurity incursion of a new invasive weed species
- a risk to the wilding conifer control programme
- no control over invasive plants that are resistant to other herbicides
- increased use of herbicides that are more harmful to non-target plants and waterways
- less conservation work undertaken and completed due to the higher cost of alternatives
- reduced carbon sequestration due to weeds competing with seedlings in re-forestation efforts.

“The long-term environmental impact of an NZ without glyphosate is much more negative than an NZ with glyphosate.” Arable farmer

Finally, responders also discussed possible effects in other areas, such as:

- more flood events and roadside erosion due to water being trapped or diverted by unmaintained vegetation
- greater costs of road maintenance to ensure clear visibility
- an increase in council rates due to the higher cost of alternatives
- lower standards of service from contractors (for example, reduced aesthetic quality of public gardens) if cost implications cannot be met by councils and rate payers.


“The cost of weed spraying for councils would substantially increase with the limited alternatives on offer now.” Member of the public

¹⁵ Specific effects not provided in the response.

Glyphosate use in Aotearoa New Zealand

One of the main goals of the call for information was to allow us to gain a better understanding of how glyphosate is used in Aotearoa New Zealand. Glyphosate is a very popular herbicide, used in a variety of situations and by many individuals, businesses, and organisations (see Table 2 and the discussion below).

Table 2. Main use patterns of glyphosate

	Domestic use	Gardens Driveways and pathways Fence lines Around sheds
	Livestock farming	Preparing paddocks for re-grassing Seed-bed preparation (fodder crops) Spot spraying around yards, farm buildings, tree shelters Controlling weeds toxic to grazing animals Desiccating pasture for summer fallow
	Arable and vegetable farming	Preparing seed beds (direct drilling / no till) Terminating weeds before cultivation Pre-emergence weed control ('stale seed-bed' system) General inter-row weed control Pre-harvest use as a harvest aid Post-harvest clean-up around glass houses Fallow paddock weed management
	Orchard use	Reducing weed competition Sward maintenance Shelter/boundary maintenance Part of integrated pest management
	Forestry industry	Planting preparation Release spraying Roadside spraying Targeted weed control
	Amenity use	Parks, public gardens, reserves, sports fields Footpaths, roadsides, kerbs, berms, car parks Road signs, street furniture Recreational facilities (huts, campsites, picnic areas, historic sites, tracks) Drainage networks, river management, flood protection schemes
	Exotic weed control	Native planting projects Revegetation programmes Wilding conifer control Biosecurity



Apiculture industry

Apiary sites
Honey storage and processing facilities
Driveways and fence lines
Sites with plantings for bees to forage on



Spray contractor use

Most, if not all, of the use patterns listed above

Glyphosate products

We asked responders to tell us what glyphosate products they used. As many responders provided quite generic answers (for example, “Roundup” or “glyphosate 360”), we could not always identify specific products. However, the most common glyphosate formulation type reported was soluble concentrate followed by the gel form of glyphosate. A few professional users also reported using suspension concentrates (these usually had other herbicides actives, such as amitrole and terbuthylazine in addition to glyphosate) and glyphosate granules.

The most popular concentration of glyphosate used was 360 g/L. Councils, commercial growers, and contractors also reported using the higher concentrations of soluble concentrates (for example, 490 g/L and 560 g/L of glyphosate). Federated Farmers, who surveyed approximately 1,600 of its members, found some interesting geographical clustering of glyphosate concentration usage. This was attributed to territorial agrichemical supplier advice or contractors being engaged in a particular area, leading to similar use patterns in these regions.

The Animal Remedy & Plant Protectant Association reported that glyphosate product pack sizes vary depending on the market: in the agricultural sector, the most common pack sizes range from 5 to 1,000 L (soluble concentrates) and 5 to 20 kg (water-soluble granules). Liquid products are most commonly packaged in high-density polyethylene (HDPE), while granules are packaged in low-density polyethylene (LDPE) / cardboard.

Domestic users told us they rarely find the need to decant or repackage glyphosate products. Users who purchase larger quantities often buy bulk containers (such as 100 and 1,000 L) and decant into smaller containers (often 20 L) for ease of handling and pouring. Some decanted glyphosate products into even smaller containers if the 20 L size was not practical (for example, backcountry work or spot spraying). Many users who discussed decanting also made a point to mention that they ensured containers were properly labelled.

Quantities imported, manufactured, or sold

We received 17 responses from the importers, retailers, and distributors of glyphosate products or their industry groups. Most did not provide any information on quantities of glyphosate products they imported, manufactured, or sold, many stating that this information is commercially sensitive.

As only a few companies provided us with information on import, manufacture, and sales volumes, we cannot present national quantities in this report. The responses that did include such information pointed to volumes in the millions of kilograms of active ingredient per year. Based on Agcarm sales data, the NZIER report¹⁶ estimated that glyphosate sales represent 11 percent of total herbicide sales and 5.5 percent of all pesticide sales. Overall, the report estimated herbicides represent 45–50 percent of all agrichemical sales.

“(...) why is this information on quantities not already collected on a national basis?” Weed Management Advisory



Domestic use

Many domestic users reported using glyphosate products in their garden, on driveways and pathways, and around the section in general. Some also reported using it around fence lines and sheds. One responder said they used it on plants with deep or spreading roots that cannot be manually weeded easily.

A few domestic users told us they add a bit of penetrant or sticking agent (such as a surfactant) to the mix.

Domestic users mainly reported using glyphosate products in handheld or backpack sprayers and applying glyphosate in gel or paste form by painting it on. A few responders also mentioned use of weed wands and quad bike sprayers.

Most domestic users said they only use glyphosate occasionally or seasonally, with many stating they use it only a couple of times a year, usually spring and summer (during the active growing season). A smaller portion of domestic responders told us they use glyphosate more often, sometimes monthly or weekly.

Domestic users reported using between 1 L and 20 L of diluted spray at a time (but usually at the lower end of this range), which generally equates to 10–200 mL of glyphosate concentrate.



Livestock farming

Livestock farmers encompass both dairy farmers (along with smaller milk industries, such as goat milk producers) and sheep, beef, and deer farmers.

Farmers reported using glyphosate on paddocks mainly before re-grassing for pasture renewal or preparing for fodder crop planting (mainly in spring and autumn). Farmers reported applying glyphosate products using gun and hose, and boom sprayers (from quad bikes, tractors, and other farm vehicles). Some also reported using weed wipers/rollers to control thistles in pasture.

¹⁶ New Zealand Institute of Economic Research. (2021). *The benefits of glyphosate to New Zealand. Report to Agcarm.*

Federated Farmers reported that dairy farmers used, on average, 35 percent less glyphosate product per year compared with sheep and beef farmers (an average of 166 L compared with 255 L of glyphosate per year per farm respectively).

Livestock farmers told us they also spot spray (year round, usually using backpack sprayers) for several reasons, including:

- to control grass and weeds around yards, farm buildings, and around garden areas of the farmhouses
- for border planting, including shelter belts and areas set aside from production to encourage native biodiversity
- to control weeds (such as ragwort and goat's rue) that are highly toxic to grazing animals such as sheep, cattle, and horses.

Beef + Lamb New Zealand also stated that, in dry climates, glyphosate is used to desiccate pasture in a field over summer (before the next crop is sown). This 'summer fallow' retains moisture in the ground (as plants are not growing and using it) and makes it available for the next crop.



Arable and vegetable farming

The arable industry produces cereal grains (such as barley and wheat), maize, and pastoral and vegetable seeds. Some of these are for human consumption, while a significant portion is for supplementary feed for the livestock sector (including poultry). Seed production is both for sowing and oil production.

Vegetable growers encompass a range of crops, including asparagus, onions, potatoes, kumara, root vegetables, leafy vegetables, legumes, and stalk vegetables.

Federated Farmers stated arable farmers use glyphosate products mainly for seed bed preparation (710 L per year per arable farm). Many arable farmers and vegetable growers discussed applying glyphosate pre-planting to control weeds or terminate the previous crop in order to use direct drilling for low or no cultivation farming methods or before cultivation. Many also used glyphosate for pre-emergence weed control as part of the stale seed-bed system. Two responders mentioned that having a 'clean' crop is essential for seed crops. Some also reported using glyphosate as a pre-harvest aid (for example, to wilt silage before baling).

“It is used by some prior to cultivation, but as glyphosate opens up the opportunity to grow crops WITHOUT cultivating the soil, hence protecting the soil, more and more, it is simply used to control the vegetation prior to direct drilling.” Professional user and consultant

Growers of asparagus, butternut squash, kumara, and leafy vegetables advised performing post-harvest clean-up applications as well. Other uses reported included spraying around glasshouses to avoid 'green bridges' that allow pests and diseases to move in and spot spraying around buildings, fence lines, and driveways.

Responders said the most common application method they used was ground-driven or self-propelled boom sprayer. The most frequent application rate was one to two times per year, depending on the crop. Many responders said they always apply glyphosate according to label instructions. The reported application rates were between 1 and 5 L/ha, but most commonly between 2 and 4 L/ha.



Orchard use

Orchards encompass all plantations of trees or shrubs that are maintained for food production. This includes fruit trees and vines, berry crops, citrus groves, and vineyard grapevines.

Responders described glyphosate as a key tool to manage weeds on the orchard floor that compete with fruit trees and vines for water and nutrients. Additionally, responders discussed the need to maintain a clear sward between orchard rows for the health and safety of workers and staff. Finally, some growers discussed spot spraying to control weeds by shelter belts and boundaries, as well as using glyphosate to control weeds that could host pest organisms.

“Glyphosate is an important part of our Integrated Pest Management plan.” Orchard grower

New Zealand Winegrowers (NZW), who certify 96 percent of the country’s vineyard producing areas, reported that glyphosate was applied 12,982 times in the 2020/21 season. Glyphosate accounted for 52 percent of all herbicide applications in the industry over the last eight years, although the trend was downward (from 60 percent of all herbicide applications in 2013/14 to 46 percent in 2020/21). NZW also advised that glyphosate was the sole herbicide used by 19 percent of vineyards in 2020/21, down from 35 percent in 2013/14. Since 2013, an average of 76 percent of vineyard blocks used glyphosate in some capacity, with an average number of applications of 1.6–1.8 per block per year.

New Zealand Apples and Pears Incorporated (NZAPI) advised there are 10,000 ha of apple and pear orchards in the country. With data from 885 blocks, NZAPI reported that 96 percent of blocks are sprayed with glyphosate at least once per year. Typically, glyphosate is applied two to three times per year, but frequency ranges from one to four applications, depending on the block. NZAPI reported glyphosate is sprayed in the spring to prevent competition for nutrients and to reduce frost risk (as bare soil results in warmer temperatures) and again in early summer, when weeds typically increase. A winter application post-harvest is sometimes done as well. The usual application method is by boom under the tree.

Similarly, for stone fruits and tamarillos, orchard growers reported that a quad bike- or tractor-mounted boom sprayer is used one to four times per year. Weeds under stone fruit crops are sprayed post-harvest in autumn and again in late winter / early spring.

Weeds affecting tamarillos are sprayed in spring/autumn after pruning. Kiwifruit growers told us they apply glyphosate three to four times a year (in spring, summer, and autumn) via handgun, backpack sprayer, or small motorised sprayer. Weeds affecting berry crops are sprayed via boom and backpack sprayer (for spot treatments), at rates of one to two times per year on seedling weeds.



Forestry industry

The New Zealand Forest Owners Association (NZFOA) reported widespread use of glyphosate in the forestry industry, primarily to kill existing vegetation before planting and to control competing weeds while the seedlings get established. Glyphosate is sprayed both before planting new young-growth forests (afforestation) and replanting previously harvested areas, often in conjunction with the herbicide metsulfuron.

The NZFOA estimated that an average of 200,000 kg of glyphosate is sprayed in plantation forests nationwide during the pre-planting stage each year. Additional glyphosate is sprayed in afforestation projects, however, an estimated amount for this was not provided.

Application methods reported vary depending on the size of the operation. Large-scale plantations spray glyphosate using vehicle-mounted sprayers, and aurally (using helicopters). The NZFOA reported that this type of spraying uses approximately 2–4 kg of active ingredient for each hectare. Small-scale operations apply glyphosate manually via backpack (applied in 1 m diameter circles on a grid before planting), which reduces the amount of glyphosate product required per hectare. Backpack spraying also allows release-spraying after the planting stage.

Additionally, the NZFOA told us that glyphosate is also used for roadside spraying and targeted weed control to comply with regional pest management plans.



Amenity use

Territorial local authorities (such as local and regional councils) and other organisations such as the Department of Conservation (DOC) are tasked with maintaining and managing various public assets and amenities.

Councils reported using glyphosate for infrastructure maintenance, such as kerbs, berms, edges of roads, footpaths, car parks, cemeteries, sports fields, and in parks, gardens, and reserves. Some councils also reported using glyphosate to control pest plants in riparian margins and to control weeds in the drainage network and around flood protection schemes. One council also mentioned using glyphosate around environmental monitoring sites.

Application methods reported included handheld sprayers, backpack sprayers, gun and hose, as well as boom sprayers on a trailer, truck, quad bike, or ute.

DOC told us that staff use glyphosate products to manage weeds around recreation areas and buildings (such as 967 huts, public toilets, campgrounds, picnic areas, historic sites, and 14,600 km of tracks and trails). DOC reported that staff (and occasional contractors) usually use backpack sprayers, a vehicle-mount hose and gun, or cutting and pasting to apply glyphosate products within these areas.

The reported frequency of application varied depending on the situation, from several times per month to once per year. In situations such as maintenance of roadsides and local parks or reserves, councils reported using glyphosate as required year round (usually three to five times a year), although most of the use was in the high-growth seasons.

Some councils discussed their weed management programmes or policies. These councils told us that they aim to minimise glyphosate use (sometimes as part of a larger goal to reduce total chemical use in their works programmes), using other weed management options (including revegetation, grazing, mechanical control, mulching, sealing/gravelling high use areas, and biocontrol agents), and only using glyphosate if other methods are not effective.

“Our policy is to use the least harmful option of the effective control options available. If manual control is not an option, and glyphosate is known to be effective for the target species, then that is our preference.” Greater Wellington Regional Council

As part of their response, the Soil & Health Association included the results of their Local Government Official Information and Meetings Act 1987 requests (submitted in 2019/2020) to various councils, which included a number of questions about how councils use glyphosate and if they use alternative weed control methods. The responses from councils revealed that while many used mechanical weed control, and some used ‘natural’ sprays, spraying with glyphosate remained the main weed control strategy for most. However, several councils discussed operating ‘no spray’ registers, where residents or landowners can opt out of having any herbicide spray near their property. Some councils also reported not spraying glyphosate, or limiting spraying, within or around children’s play areas.

Not all councils keep records of glyphosate volumes used by them or contractors. Those that do reported quite variable total usage of glyphosate, from under 100 L to over 23,000 L per year (average approximately 1,500 L). Some of this difference will be due to variation in the area governed by the local authority in question.



Exotic weed control

Many organisations (including councils, MPI, and DOC) and community groups are involved in the control of exotic weeds, native planting, and revegetation projects, as well as biosecurity operations. Some farmers and growers also manage noxious and invasive weeds and wetland restoration or revegetation projects on their private land. DOC reported that, in the last financial year, over 200 invasive plant species, including herbs, shrubs, trees, and vines, were controlled by the use of glyphosate products.

Organisations told us that glyphosate is used for control of exotic weeds in a variety of sites and ecosystems, including grasslands, shrublands, native forests, sand dunes in coastal areas, riparian margins, agricultural land, and pest-proof fences in residential/lifestyle blocks. Councils also reported using glyphosate for conservation purposes in native bush or in reserves to control invasive weeds on council land, and for biosecurity purposes on private land (both residential and agricultural). DOC described native tree restoration projects as being key to sequestering carbon and meeting Aotearoa New Zealand’s obligations under the Paris Agreement on climate change.

For ecological restoration programmes to be successful and new plantings to survive, responders told us that glyphosate is used for site preparation, pre-plant spot spraying, and control of weeds post planting (while native plants establish and get big enough to suppress weed growth).

Some glyphosate products are approved for aquatic and wetland use (although extra training/certification is required for operators using glyphosate in this manner). DOC and some councils reported using these to control serious pest plants (such as grey willow) within or close to wetlands or lakes, rivers, or streams. DOC also reports using glyphosate

to prepare buffer sites along riparian margins for restoration planting to improve water quality.

Organisations and groups managing exotic weeds reported using glyphosate year round, but mainly in spring and summer (usage usually drops in the winter and in wet months in general). Reported frequency of use varied greatly as it is driven by weed pressure at a particular time and location. A few responders also mentioned that use drops off rapidly once an area is under control.

“In conservation settings, the outcomes sought reduce herbicide use over time at any given site by removing pest plants to very low levels and encouraging ecosystem resilience through increased canopy cover.”
Auckland Council¹⁷

DOC manages approximately 8.5 million hectares of land (almost one-third of Aotearoa New Zealand’s land area) and reported using approximately 3,800 L of glyphosate products each year. This covers both the recreation teams (responsible for managing visitor facilities and historic assets) and biodiversity teams (responsible for managing natural heritage). MPI estimated the National Wilding Conifer Control programme uses 3,000–4,000 L of glyphosate products per year.

The smaller community groups involved in exotic weed control and replanting projects reported using much smaller quantities of glyphosate products (usually less than 20 L per application), most often in gel form.

Methods of application reported also varied, dependent on the situation, weed problem, and location. Community groups told us their volunteers usually use small handheld sprayers and sometimes backpack sprayers. Application methods mentioned by the bigger organisations (DOC and councils) included spraying using a backpack, vehicle-mounted boom, vehicle-mounted hose and gun, and occasional aerial spraying (from helicopters or fixed-wing aircraft). Two councils mentioned using drones (especially in particularly inaccessible areas).

Most of these organisations also reported, for woody weeds and weed trees such as wilding pines, using:

- cut and paste (glyphosate gel or paste is painted onto a newly cut stump)
- drill and fill (the trunk of a tree is drilled and glyphosate is injected into the drilled hole)
- ground basal bark application (the herbicide is applied as a wide collar around the trunk).

Additionally, DOC reported sometimes using aerial basal bark application on weed trees (especially for difficult-to-access trees in the high country, such as those growing on cliff-faces), where helicopters are used to apply herbicide via a nozzle on a long lance.

¹⁷ This response was provided by Auckland Council staff and does not represent a formally endorsed position by Auckland Council.



Apiculture industry

Apiculture encompasses those engaged in keeping and maintaining bees for commerce. Apiculture New Zealand (ApiNZ) conducted a survey of its members to find out how beekeepers use glyphosate. Most responses (61 percent) were from commercial beekeepers, with the rest being hobbyists or honey packers and exporters.

ApiNZ reported that about one-third of beekeepers who responded to the survey did not use glyphosate at all. This was further supported by Federated Farmers, who also stated that one-third of the apiculture industry does not use glyphosate.

Most of the beekeepers who reported using glyphosate products do so to control weeds at apiary sites or honey storage sites, to maintain driveways and fence lines, and to maintain sites where trees are planted for bees to forage on.

Most beekeepers reported spraying glyphosate using a backpack sprayer, with only a couple stating they use a handheld sprayer, a quad bike sprayer, or a boom sprayer. Most also used small volumes, usually less than 10 L a year.

Reported frequencies of application varied but were mainly one to four times a year, with only a few responders to the ApiNZ survey stating they used glyphosate monthly. Two further responders stated they use glyphosate as required.

ApiNZ also pointed out that many beekeepers keep their hives on property owned by others and are therefore affected by how these landowners use glyphosate. Most beekeepers reported that local landowners do not take extra precautions to protect bees when using glyphosate or communicate with them about spraying operations, although the 2021 update to the New Zealand Standard for Management of Agrichemicals (NZS8409) includes new provisions requiring applicators to notify beekeepers before spraying if hives are known to be within 1 km of the application area.



Spray contractor use

Spray contractors perform most (if not all) of the spray patterns described above. Many responders (such as many councils and some farmers and growers) discussed engaging external contractors for spraying operations. The contractors who replied to the call for information discussed the breadth of work they undertake, also including conservation and invasive weed control work, sports turf maintenance, garden maintenance, and keeping gravel and waste areas clean around commercial buildings and yards.

Federated Farmers told us that contractors use glyphosate products year round, favour higher concentrations of the active ingredient, and usually spray using boom trucks. As this is their primary business, contractors report the highest average annual use of glyphosate (around 10,000 L per year per contractor).

Weeds targeted

We asked responders which weeds they targeted with glyphosate. As glyphosate is broad spectrum (killing a wide range of plants, from grasses to broadleaf plants), the reported range of weeds was quite long. A visual representation of the weeds most commonly mentioned by glyphosate users is shown in Figure 4 below.

Figure 4. The weeds targeted by glyphosate users



“DOC currently recognises over 300 invasive plant species as environmental weeds, and this number is estimated to be increasing by two new species every year on average.” DOC

Impacts on Māori

Part 2 of the Hazardous Substances and New Organisms Act 1996 (HNSO Act) requires us to consider “the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, wāhi tapu, valued flora and fauna, and other taonga” when exercising any powers or duties under the HNSO Act. While our call for information is not a statutory process, we asked responders about what impacts glyphosate may have on Māori.

Many responders did not answer these questions, while some commented they could not speak for all Māori and so were not able to comment. Some said these questions are best answered by mana whenua themselves, however, we did not receive any responses from anyone representing an iwi or hapū.

Other responders commented that Māori would be impacted the same as any other person. Those who felt glyphosate was useful and beneficial discussed the general benefits of glyphosate (such as lower food production costs and better soil health). Those who wanted glyphosate banned discussed the negative effects on human health and the environment.

Several professional users discussed working with, and for, local iwi and hapū, Māori trusts, and Māori farmers. Responders pointed out that Māori own significant farming and horticultural operations as well as nearly half of the plantation forestry land in Aotearoa New Zealand, and glyphosate is an important tool for the management of these areas. Responders stated that by decreasing the need for cultivation, glyphosate benefits soil health and results in less erosion and that both factors are positive for Māori relationship with land.

However, another responder stated that “te ao and mātauranga Māori values and principles do not support volatile agrichemicals but rather regenerative agricultural practices that support indigenous knowledge and methods”.

Many responders discussed the negative effects glyphosate may have on:

- wai ora (water)
- mahinga kai (the natural resources that allow people to gather food)
- rongoā (traditional Māori medicine) medicinal plants
- mauri (life force or essence) of te taiao (nature)
- wairua (spirit, soul)
- kauri (by destroying synergistic fungi and bacteria in the soil that supports the trees).

“Any such toxic chemical must be an abhorrence to Māori values of people, land, and water, as well as the birds and animals and insects that are part of the traditional Māori world.” Member of the public

Other responders stated that environmental weeds pose a greater risk to the mauri of te taiao, valued flora and fauna, mahinga kai, rongoā, and other taonga than glyphosate and that glyphosate is useful in controlling invasive foreign weeds on ancestral lands. DOC told us that protecting the habitats of taonga species, as well as protecting Aotearoa New Zealand’s natural and historic heritage, supports tangata whenua in maintaining cultural traditions and connections to valued sites and species. The Pest Free Kaipātiki Restoration

Society stated that “if we lose our native biodiversity, we are directly impacting tāria te wā and kaitiakitanga, or long-term thinking and guardianship.”

Responders also disagreed about whether use of glyphosate is for or against the Treaty of Waitangi. Resilient Dunedin stated that “chemically altering our whenua is not how we honour Te Tiriti.” On the other hand, another responder argued that “under the terms of the Tiriti, we are bound to control the exotic species introduced by Pākehā that threaten tohu, such as these heritage areas.”

“Glyphosate is clearly a useful tool when it comes to helping Māori serve as kaitiaki for their ancestral lands, water, sites, and taonga species.” Member of the public

Managing the risks of glyphosate

Glyphosate products are subject to a number of controls under the HSNO Act, the Agricultural Compounds and Veterinary Medicines Act 1997 (ACVM Act), as well as WorkSafe regulations under the Health and Safety at Work Act 2015 (HSW Act). We asked responders whether they were aware of rules around the use of glyphosate.

Of the 279 people who answered this question, 26 percent of domestic users stated they were aware or very aware of the rules. This can be compared with 52 percent of professional users and 100 percent of those who described themselves as part of the glyphosate supply chain. Those who work with glyphosate in a professional setting generally described themselves as more aware of the rules than members of the public.

“Most occasional users in the private sector are not aware of these rules and don’t follow protective procedures at all.”
Member of the public

Domestic users

We wanted to find out how respondents managed risks associated with using glyphosate products. Most of the responses from domestic users stated they would always read and follow the label instructions, spray in favourable conditions (in calm and dry weather) and wear personal protective equipment (PPE).

Those responders who reported rarely reading and following labels often stated they had previous experience using agrichemicals through Growsafe / certified handler training. Due to the ease of use and previous experience applying products, some responders reported they did not always re-read labels before each application.

Personal protective equipment

Of the five pieces of PPE we asked about in the call for information, gloves were the most common piece of PPE responders reported wearing, followed by enclosed footwear, coveralls, glasses, and masks. Users who mainly applied glyphosate in gel form reported

using less PPE, usually only gloves. Users already wearing prescription glasses or sunglasses usually did not wear other safety glasses. A community group reported they educate their members to use gloves and wear enclosed footwear and coveralls. A few individuals mentioned they wore no PPE.

Use and application

Most of the responses we received showed users only sprayed when weather conditions were favourable to avoid spray drift, harming beneficial plants, and wasting product and time. Responders who use a gel over spray products mainly checked for rain as spray drift is less of a concern when using gel formulations.

Most domestic users told us they avoided using glyphosate products near waterways. The applications that were reported near waterways were for riparian planting, revegetation projects, and near ponds, drains, and wetlands on private property. Users reported being cautious when working near waterways, preferring to use gel, low-pressure nozzles, and a spray hood to avoid spray-drift.

Storage and disposal

Domestic users also reported storing glyphosate products primarily in a shed / garden shed, usually locked. Storage was also in inaccessible spaces, such as a high shelf or places away from children and sometimes in (locked) cabinets. One responder stored products in plastic bins (bunds) to contain any potential spillage.

We also asked how domestic users disposed of empty containers and unused product. The most frequent response was to rinse containers before throwing them in the general rubbish or recycling. A few responders told us they refilled their used containers from bulk purchases, therefore not requiring disposal of containers. In terms of unused product, many responders reported they never had any unused product left over as they used it all up in their application.

Extra precautions

Washing hands and the skin exposed after an application was the most frequent extra precaution responders reported taking. Other precautions responders mentioned included:

- washing clothes after application
- keeping hands away from the face
- not eating or drinking during application
- mixing outside
- keeping animals and other people away from the spray area
- using marker dyes.

“Always treat it with respect as a potentially dangerous product.” Waikauri Bay Reserve Ltd

Native planting groups reported using limited quantities and being careful in their usage, as well as using signage to warn the public of spray operations.

Professional users

We received numerous responses from professional users (many of whom reported being Growsafe certified) in our call for information. Most professionals indicated they adhered to product labels, New Zealand Good Agricultural Practice (NZGAP) and New Zealand Standard Management of Agrichemicals (NZS8409) during application. Professional users also reported adhering to the laws and regulations of:

- HSW Act
- Health and Safety at Work (Hazardous Substances) Regulations 2017
- Agricultural Compound and Veterinary Medicines Act 1997
- territorial authority plans under the Resource Management Act 1991
- Civil Aviation Act 1990
- Land Transport Management Act 2003.

Personal protective equipment

Many professional users told us appropriate PPE is worn as per regulations, NZS8409, standard operating procedures, and product labels.

Use of glyphosate

Responders indicated they checked for favourable weather conditions and only carried out spray applications in these conditions to avoid spray drift. Other anti-spray drift measures mentioned included:

- anti-spray drift nozzles (such as air induction nozzles)
- anti-spray drift additives
- spray guards on wands
- marker dye.

In addition, respondents said they avoided spraying products near or around waterways when using glyphosate for terrestrial weed control.

Storage and disposal

In accordance with the NZS8409 and regulations, professional users reported storing products in a bunded system to avoid spillage. They also reported disposing of empty containers primarily through the Agrecovery recycling programme (which collects and recycles empty agrichemical containers).

Like domestic users, professionals mentioned they never had product left over and only used what they require. Many farmers mentioned they hire trained professional contractors and did not manage the disposal and storage of the products themselves.

Extra precautions

We received a comprehensive list of different measures responders follow to limit the environmental and human health exposure to substances containing glyphosate, with the most common precautions taken being:

- extended withholding periods for livestock
- enclosed cabs and cab filters for operators

- awareness of insects, bees, and pollinators by avoiding any spraying when they were present or crops were in flower
- signage to indicate spraying activity and advising nearby residents of spraying, as well as keeping a ‘no spray’ list
- relevant health and safety plans, standard operating protocols, and risk assessments.

“We administer a ‘no spray’ list where property owners adjoining roads or rivers can apply to ensure the maintained road or river adjacent to their property is not sprayed.”
Tasman District Council

Effectiveness of current controls

We wanted to hear if responders thought the current measures, rules, and controls were enough to manage the risks of glyphosate use.

Most domestic users of glyphosate said the existing measures were sufficient if handled correctly (and following the label instructions), only applied where needed in minimal quantities, and without over usage by professional users.

However, many users who felt the current controls were sufficient also commented that often people may not know or understand the rules, or some may disregard the rules. We received several anecdotes of this nature, reporting what responders believed was rule breaking by other users of glyphosate, including poor practice due to lack of PPE, spray drift, and over spraying.

“The problem arises that people seem to think that if you can buy it off the shelf, it must be benign. People’s own poor practice has been the product’s biggest downfall.”
Whaingaroa Weedbusters

Some of the domestic users felt the measures were inadequate or were unsure of their effectiveness because of the possible impacts on insects (especially bees) and worries about food-chain contamination and soil impoverishment. One responder stated it was easy to become complacent and not read labels or wear full PPE each time. Several responders felt that, while the protective measures they took themselves while using glyphosate were sufficient to protect human health and the environment, the actions and behaviour of other users was of concern.

Two responders questioned whether the controls were effective for residential users, as private users are not audited to check for compliance.

Almost all the professional users considered the current measures to be effective or very effective. Many commented that risks are negligible when fully trained and certified operators used glyphosate according to label instructions, NZS8409, and regulations.

“We believe these measures are effective provided that all directions and programmes are complied with.” Fonterra

We also received a number of responses from members of the public who did not use glyphosate. Almost all of them considered that the current rules were inadequate, with half calling for a total ban of glyphosate in Aotearoa New Zealand, while many requested more stringent controls.

“I don’t think that actual laws are effectively managing the risk of this chemical.” Marine ecology student

Proposed changes to current controls

We asked responders to comment on whether any extra restrictions or new controls should be imposed on glyphosate products. Responders were divided on whether glyphosate should be available for professional users and trained operators only or available to all. Some felt that glyphosate should only be available to rural professionals with training (such as Growsafe certification) or should require licensing. Several responders commented that the average domestic user does not know or understand the risks posed or how to manage those risks. However, others felt that indiscriminate use by professional users (who may only be looking out for their time and money) was of greater concern than limited use by domestic users.

“There was also general concern across respondents that glyphosate products were not being used in a safe and minimal manner by domestic users in an urban setting.”
Federated Farmers

“I think that the ‘professional’ users are doing the most damage, i.e., our councils and contractors and large landowners. Home gardeners use minimal amounts and are generally pretty responsible.” Member of the public

Members of the public who do not use glyphosate mainly wanted a full ban of glyphosate, with some proposing limiting its availability to trained/professional users only.

Many responders also provided us with a range of other suggested controls or restrictions to be imposed on glyphosate.

- One of the most frequent restrictions responders mentioned was to limit the number of retail shops that sell glyphosate products. Many responders said it should not be available in hardware shops, supermarkets, or retail shops in general.
- Many responders said they wanted restrictions on the quantities sold and used by both professional and domestic users.
- A couple of responders suggested an age restriction to allow only adults and not minors to purchase glyphosate products.
- Many responders commented on the lack of information on glyphosate risks and mitigation measures available at the point of sale. Responders suggested more education or advocacy was necessary to ensure responsible usage.

“Education is key to changing attitudes, awareness and behaviour.” New Zealand Agrichemical Education Trust

- A few responders said glyphosate should only be used as a last resort once all other methods of weed removal have been attempted, rather than the go-to method.
- Those responders concerned about glyphosate getting into and contaminating the food chain wanted glyphosate use on food crops to be prohibited.
- Other responders wanted a ban on glyphosate usage in public spaces (roads, footpaths, parks, and playgrounds) or even all urban environments.
- A few responders also wanted better signage and the use of marker dyes to warn others of glyphosate spraying.
- Finally, a couple of individuals wanted to see stricter controls on various additives, such as surfactants present in glyphosate formulations, which may be more toxic than glyphosate itself.

“Our preferred option would be to see practical controls in place that support the safe use of glyphosate.” ApiNZ

Alternatives to glyphosate

Responders proposed a range of alternatives, including:

- manual (hand) weeding
- mechanical weeding (using scrub bars / line trimmers, chainsaws, mowers)
- soil cultivation
- thermal methods of weed control (steam and hot water, electrochemical, fire and flame)
- biocontrol agents (insects and plant pathogens)
- organic herbicides or bioherbicides (substances derived from plants or other natural sources)
- other herbicides
- alternative landscape or agricultural practices that reduce weed problems
- autonomous robot and drone technologies.

However, responders did not identify any single alternative to glyphosate that was broad-spectrum, systemic, and as efficient and cost effective. The main pros and cons of each alternative that was mentioned by responders are summarised below.

Manual and mechanical weeding

Both professional users and members of the public suggested hand weeding and weeding using mechanical tools, such as chainsaws and scrub bars, as alternatives that are environmentally friendly and safer for people and the community. However, several organisations involved in native planting restoration projects commented on the lack of volunteers for weeding and that manual or semi-manual methods were not feasible for them. Many professional users pointed out that manual weed control is impractical for large or remote areas, due to extensive time requirements and certain regions being geographically inaccessible to workers.

In a similar vein, responders commented that many of these alternate methods were more labour intensive, and this would result in higher costs for councils and therefore higher rates for ratepayers. A professional user stated that manual weeding would be difficult on larger weeds. Many professional users advised that manual weed control does not kill the weeds, instead allowing them to regrow, which increases the cost of weed control even further. In the forestry industry, manual and mechanical control is not considered a viable alternative due to difficulty accessing labour for such work. DOC discussed the hazards of manual weeding, including the risk of injury to workers and that some weeds are poisonous to handle. On the other hand, some members of the public pointed out the benefit of providing more employment opportunities.

“Weed eating with 2-stroke uses fossil fuels, and exhaust is much more toxic at the typical user exposure levels.”

Conservation volunteer



Manual weeding

- Environmentally friendly
- Safer for people
- Provides employment
- Labour intensive
- Impractical for large areas
- More expensive
- Time consuming
- Less effective
- Hazardous to workers



Mechanical

- Safer for people
- Provides employment
- Environmentally friendly
- Labour intensive
- Impractical for large/remote areas
- Fire risk
- More emissions
- Less effective (only cut, not kill)
- More expensive on hard surfaces

Soil cultivation

Many professional users who work in agriculture agreed that non-chemical techniques have some uses but often only in specific situations, and these techniques are not applicable to wide, day-to-day use by many professional operations. Specifically, farmers and growers stated that their two major alternatives are mechanical cultivation/tilling of soil or use of other herbicides.

Cultivation involves turning soil using ploughs and discs. This has the effect of burying (and usually killing) the weeds. However, many professional users pointed out that this agricultural practice leads to significantly higher soil loss due to wind and water erosion and soil run-off, more emissions (more tractor passes required), and loss of moisture and carbon from the soil.



Cultivation

- Safer for the planet
- Safer for the community
- Easy to implement
- More expensive
- Time intensive
- Causes soil erosion/loss
- More emissions
- Moisture loss, carbon loss

“Farmers are particularly worried that mechanical means of weed control have deleterious effects on the environment attributable to erosion caused by repeated cultivation.”

Beef + Lamb New Zealand

Thermal and electrothermal weeding

Many professional users and a few members of the public proposed thermal weeding (which uses heat to kill weeds) as an alternative to glyphosate. This is usually done by applying hot (boiling) water, hot foam, steam, or flames to weeds. In some cases, electricity can also be used. Flame weeding (or flaming) does not usually set the plant on fire but raises the weeds’ temperature beyond the point of survival.

One member of the public told us that the hot-water technologies can also be used for cleaning pavements, road signs, seats, bus shelters, and graffiti at the same time as weeding. Other advantages mentioned by both professional and domestic users included no spray drift and no run-off into the environment.

Responders disagreed about some advantages and disadvantages of these methods. The professional users that discussed hot-water technologies were in agreement that they are more expensive, however, a few domestic users and one conservation group said they were cheap.

Two professional users also pointed out that mechanical and thermal methods generate more greenhouse gas emissions as they require petrol to run or propane for flame fuel. DOC noted that the use of petrol and diesel motors produces fumes and particulates that are known carcinogens. The need to transport large equipment to remote locations was cited as a further barrier. One council pointed out the practicality issues of using hot water systems in rural areas, with the truck needing to be refilled frequently.

A couple of farmers and growers also discussed using fire as another alternative. Burning using a controlled fire has been used in the past for clearing a field after harvest and for weed control. One arable farmer pointed out that burning is also good for sterilising weed seeds before the next planting. However, responders pointed out the issues with using fire, including reduced local air quality, loss of nutrients, as well as the risk of soil erosion and sediment run-off.

Hot water, hot foam, and steam



- Environmentally friendly
- Safer for people and animals
- Cheap
- Can be used in all weather
- Can also be used for cleaning
- Labour and time intensive
- Cumbersome
- Impractical for large areas
- More expensive
- Less effective / contact only
- High water and energy use
- Dangerous
- Also kills worms and soil insects

Flame and electrothermal



- Environmentally friendly
- Safer for people
- Sterilises soil
- Fire risk and risk of burns
- Labour and time intensive
- Cumbersome
- Impractical for large areas
- More expensive
- Less effective / contact only
- Higher emissions
- Affects air quality

“In public places, the use of steam, which if you include the social and health costs from glyphosate, is far cheaper.”

Member of the public

Biocontrol agents

A select number of responders discussed the use of biocontrol agents (invertebrates and plant pathogens) for controlling weeds. One council stated that, once established, biocontrol agents can be highly effective and safe. Unfortunately, this method has high start-up costs and long lead-in times to find and approve new agents, limiting how many species can be targeted. DOC advised that while biocontrol is sometimes effective, it is not a suitable method for protecting individual plants from weed overgrowth and that it is not available for many species. Some growers have also pointed out that this method of weed control is not useful for them due to the wide range of weeds they have to manage.



Biocontrol agents

- Effective
- Safe for people
- Safe for the environment
- Long lead times
- High start-up costs
- Inefficient
- Limited usefulness for small populations and eradication

Organic herbicides or bioherbicides

Many responders, both professional and domestic users, also discussed using organic or “natural” sprays, such as pine oils, fatty acids, salt, and vinegar. While these can be effective (especially on small and young plants/seedlings), several of the professional users also pointed out the problems, mainly that they are contact herbicides only and require high amounts or frequent reapplication. Salt and vinegar sprays can also affect soil quality and pH. One agrichemical retailer pointed out that often the fatty acid herbicides are derived from palm oil and said that, when customers find out that these are palm-based, they choose glyphosate.

Organic herbicides



- Environmentally friendly
- Safer
- Less effective / contact only
- Reapplication required
- High amounts required
- More expensive
- Some have strong smell
- Lack of long-term data (potentially more hazardous)

Vinegar



- Cheap
- Safer
- High amounts required
- Less effective / contact only
- Ineffective on woody weeds
- Harmful to insects
- Reapplication required
- Causes soil acidification
- Affects earthworms

Other herbicides

Many professional users and a small number of domestic users suggested other herbicides as alternatives to glyphosate. However, these responders did not identify any one herbicide that is as safe, effective, and affordable as glyphosate and that could replace all its uses. Other alternatives that were proposed usually had one or more of the characteristics of:

- selective (does not manage the breadth of weeds controlled by glyphosate, often being selective for grasses (monocotyledons) or broad-leaf plants (dicotyledons), but not both)
- contact only (does not travel within the plant to kill the root system and therefore can allow weeds to regrow)
- soil residual (is persistent and remains active in soil and therefore prevents planting in the area after spraying)
- soil leaching (can travel in soil and water and could therefore affect other, non-target plants through root uptake or move into waterways).

Most of these responders discussing alternative herbicides also pointed out that many of these other products have higher hazard and toxicity classifications compared with glyphosate and are often significantly more expensive.

The seven most frequently mentioned alternative herbicide are presented in Table 3 below, which compares their characteristics to glyphosate (as provided by responders).

Table 3. Properties of alternative herbicides compared with glyphosate

Herbicide	Effective as a product	Systemic	Broad spectrum	No soil residual activity	Does not leach	Low human toxicity	Low environmental toxicity	Cost effective
Glyphosate	●	●	●	●	●	●	●	●
Amitrole	●	●	●	●	○	●	●	●
Glufosinate	●	●	●	●	●	●	●	●
Haloxypop	●	●	●	●	○	●	●	●
Metsulfuron	●	●	●	●	●	●	●	●
Paraquat/diquat	●	●	●	●	○	●	●	●
Picloram	●	●	●	●	●	●	●	●
Triclopyr	●	●	●	●	●	●	●	●

Compared to glyphosate properties:

- Mentioned as similar
- Mentioned as somewhat worse, or there was disagreement between responders
- Mentioned as worse
- This information was not provided in the responses

Other herbicides also mentioned by responders were: 2,4-D, 2,4,5-T, aminopyralid, clopyralid, dicamba, endothall, imazapyr, indaziflam, MCPA, simazine, and terbuthylazine, all of which had similar drawbacks.

Responders pointed out that good practice requires farmers to use glyphosate in conjunction with other actives to avoid herbicide resistance. Most growers use glyphosate together with other actives to ensure that weeds are being controlled by multiple modes of actions, which makes the development of resistance significantly less likely.

New Zealand Apple and Pears mentioned that some of the alternative herbicides are not permitted for use in key export markets. Two responders discussed the fact that development and registration of new herbicides is a slow and costly process.

Alternative landscape or agricultural practices

Some conservation groups and a few members of the public discussed redesigning problem areas so that maintenance is made easier or weeds are less of an issue. This included multiple suggestions for wildflower or native plantings of certain areas that are currently sprayed (such as roadside berms) and mulching around trees. Another specific example given was drain planting with Carex to shade out weed growth.

Native planting



Provides habitats for insects
Supports honey industry

A few responders (mainly members of the public who do not use glyphosate) also suggested better land use practices, holistic approaches, regenerative agriculture, permaculture, integrated weed management, and systems thinking. Horticulture New Zealand discussed their Lighter Touch programme, which focuses on understanding the agroecosystem and reducing the opportunity for pests to thrive, which in turns reduces the need for using chemical crop protection interventions.

Sustainable/regenerative agricultural practices



Safer for animals and people
Reduced pesticide use
Reduced pesticide resistance
Cheaper
Higher soil fertility
Reduced plant diseases
Higher cost

“In the long term, the best solution would be to change our perception and work with rather than against natural ecosystems.”
Member of the public

Autonomous robot and drone technologies

The Soil & Health Association response discussed the use of robotic technologies as alternatives to glyphosate use. Such technologies can range from aerial drones and small bots for turf management to automated robots that operate alone or in a fleet and even inter-row cultivators that can cultivate multiple rows in a single pass.

The Soil & Health Association response also discussed using machine-detectable differentiation of crop species using labels or markers, machine vision or sensors, and artificial intelligence (AI) adaptive learning systems for weed identification and removal (without affecting the crop) using abrasion, cultivation, high-pressure water, flaming, or lasers.



AI and robots

- Reduced labour costs
- Reduced pollution in soil and water
- Safer for people and environment
- High capital investment
- Lack of standardisation
- Concerns about safety
- Still being developed

Responder requests

A broad range of EPA actions were requested by responders. Some responders called for a reassessment of glyphosate, a thorough review, or a risk assessment. We received multiple requests to completely ban glyphosate and many requests asking for more stringent restrictions around glyphosate use, including a ban on its use in public spaces, a ban on pre-harvest use, or only allowing certified handlers to buy and use glyphosate products. Additionally, some responders (including ApiNZ), requested that we reassess surfactants and other co-formulants in relation to bee health.

On the other hand, several responders discussed the need to make decisions based on science and evidence rather than anecdotes and emotion. A large number of responders (most professional users and many domestic users) opposed any ban on glyphosate and requested that the access to glyphosate not be changed. Several responders requested that we recognise that glyphosate is safe, provides significant benefits, and should remain approved.

“Please follow the science and only the science, that is all I ask.” Member of the public

Supplementary information received

Many responders sent in additional information as attachments. We have not reviewed the documents provided at this time. As a summary, we received:

- 62 journal articles
- 30 photos
- 22 reports (including two copies of the NZIER report and three copies of the IARC report)
- 12 news articles / blog posts
- 10 factsheets and data sheets
- six EPA supplementary forms
- four forwarded emails or copies of letters
- three spreadsheets
- three book excerpts
- two council management plans
- one petition
- one court transcript.

Next steps

The EPA will decide whether to seek grounds for reassessment of glyphosate

This summary report, as well as other information, will form part of the information that could be used to assess whether to seek grounds to reassess the use of glyphosate in Aotearoa New Zealand. We are aware of the European review of glyphosate, and those findings may also provide useful information to be considered. A decision to apply for grounds for reassessment has not been made at this time.

However, the initial review of the information received in this call for information does suggest opportunities for the EPA to undertake activities that are complementary to the reassessment decision-making considerations for glyphosate and any statutory processes that may flow from those decisions.

The EPA will engage with Māori on the topic of glyphosate

While some of the responders to the call for information may have been Māori, no one specifically identified as such, or stated they were providing a Māori perspective. This leaves a gap in our understanding of how Māori view glyphosate and its use. As a result, we will engage with Māori to discuss their views on glyphosate, which will be highly beneficial to inform any future decision on a possible glyphosate reassessment.

The EPA will review POEA surfactants

Some respondents raised their concerns about certain non-active components of glyphosate-containing products, particularly POEA surfactants, being more toxic to people and the environment than glyphosate itself. POEA surfactants are also used in more than just glyphosate formulations. We will therefore review the available information on POEAs to determine if regulatory action is required.

The EPA will reinforce the safe use of glyphosate

The call for information responses highlighted that awareness of glyphosate safe handling practices could be improved in both commercial and domestic settings. We will plan to use existing EPA channels, such as our Safer Homes programme and our primary industry sector contacts, to reinforce the need for users' understanding and knowledge of rules and safe practices for glyphosate products.