

Pesticide Infrastructures: From China to Australia

Sarah Rogers

Just to the north and west of where my family lives on Gulidjan Country is the Victorian wheatbelt, where wheat, canola, barley, pulses and other crops are grown on rotation. Australia produces far more of these crops than it consumes: in 2023–24, as much as 74 percent of coarse grains production was exported (ABARES 2025). Australian grains go to Southeast Asia, China and beyond to make noodles, bread, alcohol and livestock feed. A focus on transporting, stockpiling and shipping this food post-harvest would give only a very limited picture of how it is produced and the network of inputs that sustain industrialized food production in Australia. Broadacre (i.e. large-scale) farming is underpinned by the import of significant quantities of chemical inputs, including nitrogen and phosphate fertilizers, herbicides, insecticides and fungicides, none of which Australia produces domestically at the required scale.

This article asks what pesticide infrastructures can tell us about the production of food. By examining the supply chain for agrochemicals in Australian broadacre farming, particularly glyphosate and paraquat, I center a little-discussed element: extensive and entrenched herbicide use. Broadacre farming has long been dependent on a cocktail of chemicals to control weeds and sustain “no-till” methods. As labor has grown scarce, farms larger, machinery more advanced, and generic herbicides widely and cheaply available, products such as glyphosate, paraquat, pyroxasulfone, 2,4-D and others have become integral to spraying regimes. These pesticide infrastructures can readily be cast as “toxic infrastructures” (Olma and Hauer 2025): deeply political objects intertwined with systemic injustice, through which Australian food production is embedded in the global circulation of agrochemicals.

Glyphosate and paraquat are, by volume, the biggest-selling products on the Australian market and are used together in a double knock to control weeds where there is minimal or no tillage. Banned in many countries for its acute toxicity, paraquat continues to be widely employed in Australia because it is one of the few effective tools against glyphosate-resistant weeds in no-till systems. The active ingredients in these herbicides are almost exclusively produced in China. Formulated products – in other words, formulations with different grammages of active ingredient plus surfactants, adjuvants and other additives – are also primarily manufactured in China, though some formulation does take place in Australia. Indeed, China dominates the global supply of herbicides, particularly the cheaper, generic market of formulations with expired patents. Production is largely centered on Jiangsu and Shandong’s petrochemical bases but is also shifting inland to chemical parks in provinces such as Ningxia and Gansu (see Zhao and Rogers 2024) where energy is cheap and plentiful.

A herbicide production facility in Ningxia Province, China.
Photo: Sarah Rogers, 2025.



In recent work on the China-to-Australia pesticide supply chain, my colleagues and I have identified a complex set of companies – multinational, Chinese-owned and Australian-owned – that occupy different market shares and distinct steps in this supply chain. The Australian market is highly splintered, with Chinese-produced generics dominating but some market share retained by higher-value proprietary products such as Bayer and BASF. Two companies – Elders and Nutrien – command this landscape, selling generic formulations through their ‘white labels’ as well as higher-value products. However, low-cost suppliers that buy from China and sell direct to retail stores are growing their market share.

Once in Australia and cleared through ports, glyphosate and paraquat formulations are shipped out via logistics companies to retail stores across rural and regional Australia. Anyone can buy glyphosate, which is also widely stocked in nurseries for the home gardener, and any farmer with the appropriate permit can buy paraquat. It is through this supply chain and its many infrastructures that Australian food production emerges as being deeply interlinked with the global circulation of agrochemicals.

There are no data on the volume of glyphosate or paraquat used on Australian farms, nor where it is deployed. The Australian Pesticides and Veterinary Medicines Authority (APVMA) provides only sales figures for the general category “herbicides”. Nor are import data on specific formulations publicly available. Our industry interviews nonetheless suggest that Chinese-produced generics have come to dominate because they are

1,000-litre drums of paraquat for sale at a rural supplies store in western Victoria.

Photo: Sarah Rogers, 2025.



cheap, effective and produced at volume: “I did look it up a few years back where there was [sic] 82 different registrations in Australia for glyphosate. So, it is a dog-eat-dog world,” a company representative remarked in an interview in 2025. Off-patent generics are also widely available because of Australia’s low-cost and fairly loose product registration process for “closely similar” products:

you’ve got Syngenta ... who invented Gramoxone paraquat ... and the generic companies don’t need to spend any money; they’ll just wait on Syngenta to do it and then they’ll pay 10 bucks down the local shop and they’ll be able to jump on the registration bandwagon and get it registered as well (Interview with an agronomist, 2025).

Glyphosate and paraquat are used as a ‘knock down’ prior to seeding in April, sometimes as an ‘over-the-top’ spray at lower rates to control weed seeds, and then as a summer spray to suppress growing weeds, particularly if there is summer rain. Acutely toxic paraquat is supposed to be applied through enclosed systems, from 1,000-litre drum-to-boom sprayers, with no direct physical contact by the operator. But farming practices and regulatory oversight inevitably vary. Some 20-litre paraquat containers are still being sold, while farmers and agronomists may mix different chemicals on farms with little oversight. Some may even use chemicals off-label, i.e. applying them to crops or in uses that they are not registered for. Moreover, while there are mandatory maximum residue levels and routine testing for residues on exported food, residue levels for domestic sales within Australia are sporadic.

Food production in Australia is thus deeply embedded in what Becky Mansfield and colleagues (2023: 395), building on Ryan Galt’s earlier work (2008), call the “global pesticide complex”. Interviewees repeatedly emphasized that there are no viable alternative sources of the generic products that Australian farmers have come to rely on: India may take on a greater role in the future, but China’s advanced manufacturing and logistics capacity has cemented its role as the world’s supplier. In removing tariffs on formulations, the China–Australia Free Trade Agreement has only redoubled the entanglement of China’s petrochemical industry and Australian farming.

It is not enough simply to pinpoint China as the root of these toxic geographies: two dynamics in particular demand more detailed examination. First, the impacts of China’s pesticide complex are unevenly felt *within* China. The waste and emissions from petrochemical production impact the lives and wellbeing of nearby residents (Mah and Wang 2019; Lou 2022), while state-owned and private companies reap a profit. Shifting chemical production to inland provinces potentially exposes more vulnerable, poorer communities and their workers to factory pollution and hazardous chemicals. Chinese farmers also use these products, which result in soil and water contamination in rural communities with sustained human-health impacts. Paraquat is banned in China, but large volumes of glyphosate and other generic herbicide, insecticide and fungicide formulations are used (Rogers et al. 2023), typically with little personal protective equipment. Within China, therefore, these toxic geographies materialize in highly uneven ways.

Second, to get to the heart of entrenched pesticide use, we must examine farming practices. Australian farming is so closely intertwined with the global pesticide complex because of the rise of no-till methods. In the 1990s, Australian farmers turned from ploughing the soil to relying on herbicides to knock down weeds in a bid to retain soil moisture, prevent erosion and save on labor costs and time. From industry interviews it became clear that chemical companies were involved in pushing this practice change from the outset, including Monsanto and Syngenta. Decades later, farmers are now contending with extensive glyphosate resistance in weed species and looking for new chemicals to add into rotation in order to control rising herbicide resistance. The flow-on effects of pesticide infrastructures are therefore difficult to anticipate and to contain. Industry nonetheless remains strongly supportive of no-till methods, even re-positioning them as critical in a changing climate:

So, within the context of climate change, no till is absolutely required. And even without climate change happening, if you don't want to see riparian systems filled with nutrients leading to algal blooms through nitrogen and phosphorus concentrations, if you want to see the soil stay where it is, we need no till (Interview with an agronomist, 2025).

Pesticide infrastructures are in one sense the very toxic infrastructures that Olma and Hauer (2025) speak of, in that they domesticate and enable toxic flows of paraquat and glyphosate. They make possible acute and long-term exposure to paraquat, the build-up of herbicide resistance in weeds and a trail of chemical residues on food, in people's bodies, and in our soil and water.

But they are also more than toxic and more than infrastructure. Glyphosate and paraquat underpin the production of food that millions of people eat; in this sense, such agrochemicals are also *life-giving*. The term infrastructure here suggests a level of containment that is inappropriate for these fundamentally "unruly and often uncontainable" chemicals (Müller and Balayannis 2025: 74). Transported through infrastructures such as factories, drums, ships, trucks and boom sprayers, pesticides have become fundamental to industrialized food production; they are part of the everyday lives of producers and consumers. Making these infrastructures and what they both enable and disable more visible is the first step in identifying points of intervention for safer and more just food systems.

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Discussion Questions

1. What types of pesticides and fertilizers are used on farms in your community, region or country, and where are these manufactured?
2. What are the potential environmental and social impacts at both the sites of production and the sites of use?

Author:



Associate Professor **Sarah Rogers** is a geographer whose research focuses on environmental, social and political change in rural China and beyond. In one of her current collaborative projects she is examining China's agrochemical complex (which encompasses both pesticides and fertilizers) with a focus on how it materializes in Australia and intersects with Australian farming practices and regulatory politics. This stems from an earlier project looking at agrarian change and farming practices in China. She teaches on the Master of Contemporary Chinese Studies at the University of Melbourne and is a member of the Asia Institute's Centre of Contemporary Chinese Studies.

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