ROAD SIDES

14

Fall 2025

FOODWAYS

Collection No. 14

Edited by

Matthäus Rest
Dolly Kikon

ISSN 2624-9081

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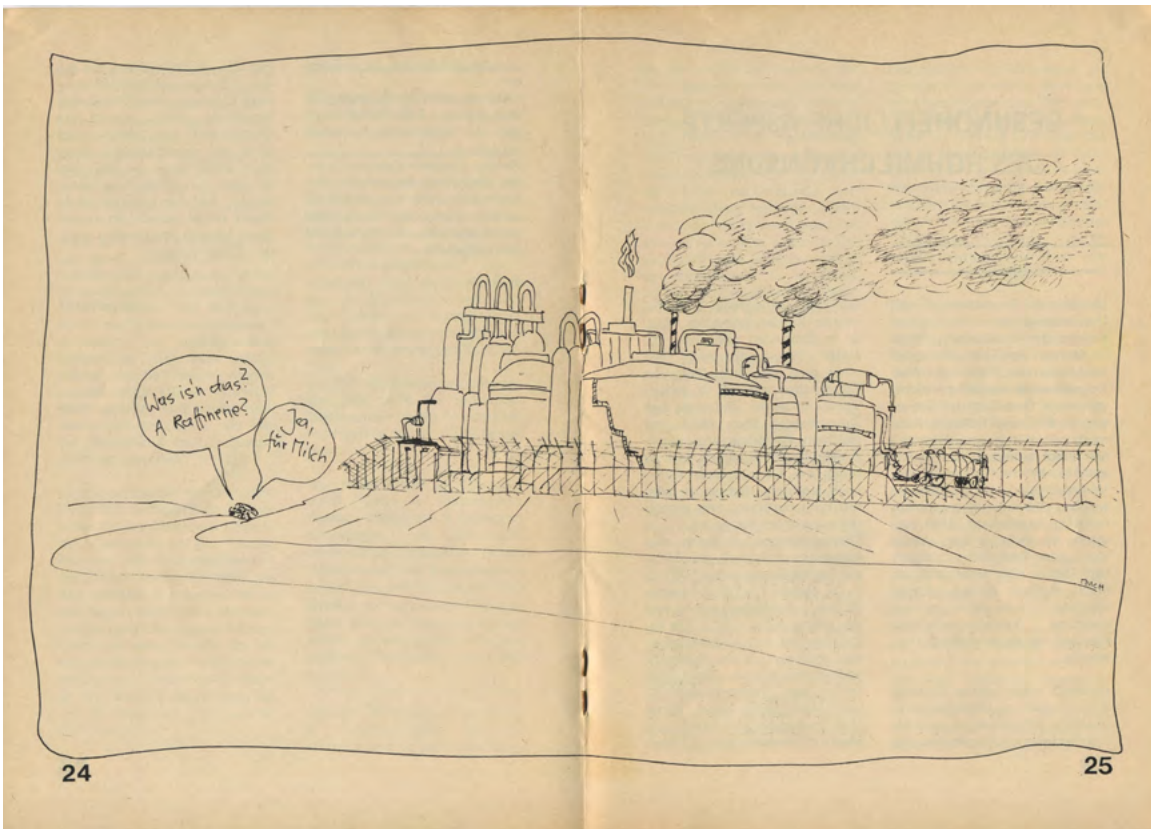
ISSN 2624-9081 • DOI 10.26034/roadsides-202501401

Foodways: An Introduction

Matthäus Rest and Dolly Kikon

Industrialized food is dependent on modern infrastructure for its production, processing and distribution. On its way from producer to consumer, the food that ends up in our kitchens is often transformed beyond recognition, and it moves on a global scale. In their introduction to *Limn*'s issue on food infrastructures, Bart Penders and colleagues (2014) reflect on the difference between catching a fish and buying fish fingers at your neighborhood supermarket to drive home this point. Modern food often undergoes complete deconstruction and reconstitution before it arrives in our refrigerators, even if the products we purchase seem natural and straight from the farm or the sea. In the documentary film *Das System Milch* (2017), Aart Jan van Triest, head of marketing at the Dutch multinational dairy cooperative FrieslandCampina, proudly proclaims "We are from grass to glass," and continues by comparing his company to an oil refinery, because a dairy plant transforms a single raw material into a vast array of products that "magically come out."



"What is this? A refinery?" – "Yes, for milk."
Source: Much 1982.

This comparison is not particularly novel. As early as 1982 the Austrian cartoonist and farmer Much had the same insight – albeit in rather a less triumphant reading – when he drew a dairy plant and had his characters say: "What is this? A refinery?" – "Yes, for milk." Many other agricultural products serve as raw material for the food industry in similar ways. They are broken down into their chemical compounds and nutritional building blocks; new products are created through the recombination of these parts. Whether something is lost in the process or if healthy nutrition is nothing more than the right ratio of nutrients remain active questions in nutritional science and beyond.

Many cosmologies – Indigenous and otherwise – believe that there is more to food than the sum of its parts. The Yamphu Rai of Eastern Nepal, for example, refer to the "essence of grain" *charawa*. This is what makes your belly full. When charawa is lost, you will eat and never satisfy your hunger, and the rice won't last you through the winter (Armbrecht-Forbes 1995: 70). Across Northeast India, accounts of food and community are intimately tied to belonging, care and sovereignty (Deka et al. 2022). Today, the movement of foods as commodities and cultural artefacts rests on infrastructure, a concept that encompasses physical and social networks. In this issue of *Roadsides*, we think through such cosmologies alongside the infrastructure that moves food around the world, and ask: how do foodways and their socio-cultural-cosmological scaffoldings and infrastructure condition each other?

Where the analogy between oil and food breaks down is the fact that many foodstuffs spoil quickly. This time sensitivity makes the relations between food and infrastructure particularly complicated and unequal, as those who control the systems for moving and processing food have exorbitant power over those who produce it. Before the invention of modern infrastructures, many raw foodstuffs had to be processed quickly, in relatively small batches, close to the point of origin. Across the planet and for millennia, people have come up with a host of different methods to transform these into forms that are stable, often for years, and therefore storable and tradeable over long distances.

In peasant societies, such preserved foods have often been important as emergency provisions. In the earlier times of Jordan's Wadi Feynan, nobody left for the deep desert without a dense ball of *jameed*, the local form of heat-acid coagulated cheese whose basic recipe is applied in modified versions all over Eurasia, from *ricotta* to *chhurpi* to *aaruul* (Reichhardt et al. 2021). Dried meat has served a similar function in many regions – different preparations and recipes include Borts in Mongolia, Pemmican in the North American steppes, Sukuti in the Himalayas, or Speck in the Alps. While such strategies helped diversify food supplies and increased food sovereignty, industrial agriculture and the integration of food production into global commodity chains has turned many farming communities into decentralized food factory workers dependent on grocery stores to feed themselves. Since processing has largely been concentrated in those factories, most farmers neither have the skills nor the equipment to turn their harvest into stable products. They are thus extremely dependent on the regular collection of their output.

The relations between food and infrastructure invite us to dwell on the circulation of goods and their attendant power networks. On resource frontiers around the world, infrastructures that allow the movement of comestibles such as tea and cash crops are facilitated by militarized structures of power. Tracing the nexus between market, capital and violence, we are interested in the way infrastructure both delivers and distracts from our knowledge of food production. Historian Jayeeta Sharma (2011) draws attention to the instrumentalized violence of the railroads that delivered tea from the frontiers of South Asia to ports like Kolkata and London. Non-industrialized forms of food production, on the other hand, rely on very localized materials to engineer the transformation of vegetables, meat and fish. Artisanal practices of curing, fermentation and pickle-making expand the notion of infrastructure to include social and cultural relationships and practices.

While co-editing this issue, Matthäus and Dolly reflected on their respective food journeys. They met at the Wenner-Gren symposium on Cultures of Fermentation in 2019 (Hendy et al. 2021). This convergence allowed them, along with fellow participants, to consider food traditions and the process of farming, standardization, industrialization, food processing and sustainability. Matthäus came to the anthropology of food through his upbringing on a dairy farm, his work as a cheesemaker on Swiss alpine summer pastures in his twenties (Rest 2021) and his involvement in the international peasant movement La Via Campesina. At the time of the symposium, he was working with a transdisciplinary group of biomolecular archaeologists interested in the early history and contemporary condition of dairying microbes in Mongolia and the Alps. For Dolly, the context of Indigenous food cultures, foraging and non-industrialized forms of

Heritage rice grains at the Annapurna Seed Library, Meleng, Assam.
Photo: Dolly Kikon, 2025.

fermentation led her to explore different food movements including the seed- and food-sovereignty practices in Northeast India (Deka and Kikon 2024). Her ethnographic approaches serve to ground community history and how Indigenous assertions in the Eastern Himalayas are integral to understanding contemporary political movements in the region (Kikon 2021).

The contributions gathered in this collection all deal with the relations between food and infrastructure. The authors offer different ways to understand infrastructure as a form of engagement, care, and as an ongoing process. They address the linkage of local foods with global flows, the logistics of eating, how the state and borders change food, how food makes and shapes communities, and how growing food interacts with questions of autonomy and dependence. In her photo-essay, Fizza Batool investigates how the Karakoram Highway has made family granaries obsolete. Dwelling on the fish trade in Sri Lanka, Meghal Perera draws our attention to the infrastructure behind the cold chain, and how this determines local understandings of freshness, flavour and quality. André Thiemann's essay extends this conversation to the Serbian raspberry industry and explores how value and communication constitute infrastructure. Sarah Rogers scrutinizes pesticide infrastructure and the production of food in Australia to reveal how food production is complicit in the global circulation of agrochemicals.

Uttam Lal and Mirza Zulfiqur Rahman focus on chhurpi, a preserved cheese, to examine the infrastructure of mobility, governance and connectivity in the Himalayan region. What these contributions highlight is the integration of local food production into global economies and flows and their far-reaching ramifications.

The second photo-essay, by Tuomas Tammisto, looks at plantation infrastructure in Papua New Guinea and how this intersects with the food that plantation workers grow for themselves. Writing about Jewish community cookbooks in the United States, Joanna Radin and Mark Stern consider these projects as material infrastructure of kin-relations, ethnic linkages and community. Vanessa Lamb and Zali Fung argue that food preparation in the Thailand–Myanmar borderland works as infrastructure of solidarity and community building during anti-dam protests. Inditian Latifa demonstrates the ways in which stories of lost marsh rice varieties in Indonesia reveal how crops, floods and memory expand the meaning of hydrological infrastructure. Finally, in the third photo-essay, Carlotta Molfese illuminates multispecies assemblages as infrastructure in Italy, where living mulch affords farmers a strategy to care for their land and livelihoods. These articles all address questions of community and belonging connected to food and its production.

Garo women traders selling foraged bamboo shoot at the Pillangkaka Market, Meghalaya.
Photo: Dolly Kikon, 2024.

What these various contributions show is the value and importance of an understanding of infrastructures that goes beyond their technical properties – these are much more than complex structures that simply move things. Rather, the articles employ a compellingly wide definition of infrastructure that includes community, kinship, memories, social connections, and things like pesticides, Indigenous rice varieties and community cookbooks. For decades, the term *foodways* has been used in food studies and beyond to account for the multifaceted relations between food, culture and identity – how the things we eat condition who we are and how we understand ourselves in relation to the world and to others. In line with the general thrust of *Roadsides*, we understand the term to focus on the ways food needs infrastructure to come into, move through and be in the world. And in revisiting Elizabeth Fisher's (1980: 59) claim that the "earliest cultural inventions must have been a container to hold gathered products," we might argue that this has been the case throughout human history.

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Acknowledgements:

We thank all authors, the editorial team and the following reviewers: Omer Aijazi, Sanjay Barbora, Jovana Diković, Catie Grassier, Bengt Karlsson, Lena Kaufmann, Galen Murton, Tahneer Oksman, Alessandro Rippa and Sharika Thiranagama. The Center for South Asian Studies (CSAS), University of California, Santa Cruz, contributed to this special issue. The CSAS contribution is part of their Ecologies of Care international initiative.

Cite as:

Rest, Matthäus and Dolly Kikon. 2025. “Foodways: An Introduction.” *Roadsides* 14: 1-7. https://doi.org/10.26034/roadsides-202501401

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ISSN 2624-9081 • DOI 10.26034/roadsides-202501402

The Empty Granary of Ishkoman

Fizza Batool

The wooden cover creaked as Daulat Bibi[1] pulled it open, releasing a puff of dust that glittered in the mountain sunlight. Inside the *ghuv* (غُو)[2] – a granary built of stones, mud and wood where generations of her family had stored their harvests of barley and wheat – only cobwebs remained. The last of the grain was taken out years ago for a family feast that now felt like a relic from another era. A short distance away, the sputter of a tractor echoed up the valley. Daulat Bibi's brother, Shaukat, was ploughing the field before sowing potatoes. "They bring in five times what wheat does," he had explained during our conversation the night before. Daulat Bibi ran her fingers along the granary walls, where notches still marked each year's yield. Her gaze remained fixed inside the granary for some time. Then she stepped aside, putting the wooden cover back. As the lid went down, it made the same creaking sound again.

This creak echoes in the larger silence across the Ishkoman Valley and all over Gilgit-Baltistan since the quiet disappearance of traditional grains. Such changes are part of a broader shift in the food system linked to political, historical and economic processes, including the state's wheat subsidy regime facilitated by the infrastructure of the Karakoram Highway (KKH).

[1] *Bibi* is a term of respect and formality in Urdu, a title akin to 'Mrs' or 'Madam'.

[2] Wakhi is an oral language utilizing several scripts. In this article, all Wakhi terms are rendered in the Perso-Arabic script.

↓ Ghuv *in the village of Mantramdan.*
Photo: Fizza Batool, 2022.


GOVT. OF GILGIT-BALTISTAN
FOOD DEPARTMENT GHIZER
CIVIL SUPPLY DEPUT
IMMIT

This essay examines the transformation of Ishkoman Valley from the proverbial 'breadbasket' of Gilgit-Baltistan into a landscape of paradoxes: terraces that once sustained food sovereignty now grow cash crops for distant markets, while communities that withstood centuries of mountain winters are dependent on wheat trucks snaking along the KKH from the plains of Punjab, Pakistan. The region now imports roughly 81 percent of its grain supply, or 150,000 metric tonnes, per annum (SJCPP 2022). For the financial year 2024–2025, the Federal Government of Pakistan has allocated 15.872 billion Pakistani rupees (PKR) for the government of Gilgit-Baltistan to procure 1.5 million metric tonnes of subsidized wheat for the region (GoGB 2025).

↑ ***Government Granary, Immit Village, Ishkoman Valley.***
Photo: Fizza Batool, 2022.

Gilgit-Baltistan, Karakoram Highway and the Wheat Subsidy Regime

Gilgit-Baltistan, a "disputed territory," is in a situation of permanent liminality (Tariq 2020) since it has been embroiled in the Kashmir issue with India since 1947. It remains devoid of political representation, in what some describe as a condition of "postcolonial colonialism" (Sökefeld 2005: 969). The 1970s were a watershed, when geopolitical events such as the Sino–Indian War (1962), the Indo–Pakistan War (1965) and East Pakistan's secession (1971), and agitation by locals for democratic rights prompted Pakistan to consolidate control over Gilgit-Baltistan (Haines 2012).

Government wheat in standardized burlap sacks arrives at Civil Supply Headquarters, Gilgit.
Photo: Fizza Batool, 2022.

A populist government in Pakistan abolished the Frontier Crimes Regulations[3], a feudal territorial structure of princely states, and restructured and expanded the state-subsidized food distribution system to the entire region between 1972 and 1974 (Dittrich 1995). According to Holden (2023), these subsidies were a strategic tool to integrate Gilgit-Baltistan into the Pakistani state and they hinged on a critical artery: the Karakoram Highway, completed in 1978 with Sino-Pakistani collaboration for strategic and territorial imperatives (Dinar 2023; Kreutzmann 2024: 212–33).

[3] Also known as black law from British colonial times, which invested all powers (executive, judicial and magisterial) in the hands of political agents and gave no rights and justice to the local population.

The KKH facilitated smooth access for Pakistani state institutions and international NGOs into Gilgit-Baltistan (Ali 2019), exposing it to global and transnational forces (Haines 2012). This intensification of communication and commercial exchange transformed livelihoods and regional agriculture. Juxtaposing the story of the KKH and the wheat subsidy regime demonstrates how infrastructure can simultaneously integrate and subordinate. It acts both as a lifeline and a leash.

← A local man argues over the wheat quota with the food dealer, Mantramdan Village.
Photo: Fizza Batool, 2023.

→ A local man takes wheat from the state store to his house on his back, Mantramdan Village.
Photo: Fizza Batool, 2023.

The Unraveling of Agrarian Self-Sufficiency

Traditional farming in Ishkoman is "mixed mountain agriculture" (Nüsser and Clemens 1996: 121), combining irrigated crop growing, livestock rearing and utilization of *aylóq* (اَیلُوق, 'high summer pastures'). Before the arrival of the KKH, agriculture was small scale, subsistence based and ecologically attuned. Farmers maintained polycultures, diverse crop species, and fragmented yet productive landholdings (Staley 1969: 227; MacDonald 1998, 2010).

The opening of the KKH brought new actors, including state agencies and rural development schemes such as the Aga Khan Rural Support Programme and the Food and Agriculture Organization (Spies 2019). The highway acted as the essential infrastructure that made the wheat subsidy policy logistically possible and politically effective, thereby enabling the state to reshape the region's agrarian economy. Subsidized wheat supplies, introduction of high-yield variety seeds, the promotion of horticulture and tuber crops (Abdullah 1972) were all part of development initiatives by the state.

↑ ***Soil prepared for potatoes to be sown, Immit Village, Ishkoman Valley.***
Photo: Fizza Batool, 2023.

Potatoes being loaded onto a truck, Chandigh, Immit Village.
Photo: Fizza Batool, 2022.

Historically, the area supplied wheat not only to neighboring regions such as the Pamirs (Whiteman 1985: 42) but also to military garrisons stationed there (Dittrich 1998). Today, however, it is classified as food-insecure (FAO 2019: 253), a stark reversal attributed to state policies that have prioritized commercial agriculture over subsistence farming. As early as 1972, the first government report on agricultural development in the region advocated subsidized staple foodstuffs brought from the plains of Punjab, thereby "freeing" mountain valleys to specialize in a range of cash crops such as potatoes and soft fruit (Abdullah 1972: 8–12). As one farmer in Chatorkhand Village, where I conducted my fieldwork in 2022, explained:

> *Subsidized wheat is really cheap. If we grow it on our own farms, it is costly, as we have to bear much more expense. The question is why we should grow it, when we can buy so cheaply from the state.*

This disincentive of cheap wheat, coupled with the aggressive state promotion of cash crops, led to a dramatic decline in cereal cultivation. The area under orchards and potato cultivation has been continuously expanding, while the area of Gilgit-Baltistan under

Potatoes depart from the upper part of Ishkoman towards the village of Immit.
Photo: Fizza Batool, 2022.

Abandoned farmland in the high pastures, Tarboht Nullah of Immit Village, Ishkoman Valley. Photo: Fizza Batool, 2023.

cereal farming has been declining and accounts today for just 17 percent of cultivated land (personal communication, director at Agriculture Research Institute 2022). The recent provincial agricultural policy clearly stated:

> *The goal of the policy options is not necessarily to maximize growth of production in any particular subsector/commodity but to create the necessary and sufficient conditions for the agricultural sector/farmers to adjust to a more competitive environment and raise their standards of living (GoGB 2018: 3).*

This shows that the aim of the policy has been the integration of the region into market-oriented agriculture. Cheap subsidized wheat has played an instrumental role in this transition, instead of the needs of the local population.

Similarly, the *aylóq* – summer pastures traditionally used for barley farming – are now completely abandoned due to labour shortages and the convenience of subsidized wheat, further reducing local food production. The region has been rendered highly dependent on cheap, imported wheat, while its fertile land grows cash crops for faraway markets.[4] This shift has not only eroded the longstanding food sovereignty and agroecological knowledge but has also created a long-term dependency and undermined political sovereignty.

[4] In winter 2024–25, the food dealer sold 1kg of wheat for 29 PKR (0.101 US$) in the village of Mantramdan in Ishkoman Valley.

From a diversity of grains to wheatification.
Photos: Fizza Batool.

The Epistemic and Ecological Rift: Loss of Grains and Knowledge

The loss here extends beyond empty granaries; it is just as much a loss of biological and cultural diversity. Historically, farmers cultivated eight or nine distinct grains, including local varieties of wheat such as Ladakhi, Bachgallian, Safaidak and Jaldak, as well as barley, buckwheat, fava beans, foxtail millet, maize, wild peas, lathyrus and sorghum. However, since the 1990s the shift towards cash crops – particularly potatoes and later to cherry orchards – along with the influx of subsidized wheat has disrupted traditional farming systems and reduced agro-biodiversity. As one farmer from Immit noted:

> *The change in agriculture here is that, firstly, wheat is accessible under subsidy, it is cheap… a 100kg sack costs… 2,000 PKR. However, because the subsidy is available, people don't pay much attention to the cost or to farming itself. They have become* tayarakhour *[*تَیارَا خُور *– a local term referring to someone who consumes everything readymade and has nothing to do with production]. People just pay and take their sack of wheat home and use it.*

The introduction of subsidized wheat has led to a 'wheatification' of the local diet, making it the dominant crop consumed as a cereal. This erosion of crop diversity mirrors a deeper epistemic rift (Schneider and McMichael 2010: 467–77): whenever elderly farmers shared the names of different cereals and varieties of wheat, it always left young people shocked as they were completely unaware of them – revealing a loss of local knowledge, history and methods of production.

Conclusion: The Sound of Dependency

Daulat Bibi's empty *ghuv* stands as stark evidence: the KKH, a symbol of connection, became the instrument through which a unique local world was dismantled and made dependent, proving that infrastructure never just brings about positive outcomes. It has radically reshaped the Ishkoman Valley's agrarian economy, food systems and dietary practices, with far-reaching social and political consequences. Before subsidies, the region cultivated a range of nutrient-rich grains which have now nearly vanished from both fields and diets. The loss of these indigenous crops extends beyond the local, reflecting a global pattern with serious implications for climate change resilience, regional food security, and the genetic diversity that underpins disease resistance (Mattioni et al 2023).

Daulat Bibi's day now revolves around a different calendar: the arrival of government wheat in the depot, anxiety over quota changes, fear of the next price hike. The silent and empty *ghuv* is a museum to a past of self-reliance, while the sound of Shaukat's tractor prepping for another potato harvest – a harvest that will travel along the same road that brings the wheat – is the sound of the present, a present of dependency.

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Cite as:

Batool, Fizza. 2025. "The Empty Granary of Ishkoman." *Roadsides* 14: 8-19. https://doi.org/10.26034/roadsides-202501402

Research Exercise

The Disappearing Diet: Uncovering Our Local Food Knowledge Rift

Students will be able to define 'epistemic rift' in the context of food systems, collect qualitative data through interviews, and critically evaluate modern food trends against historical local knowledge.

Part 1: The Investigation

Students conduct a recorded interview with an elderly family member or community farmer about dietary changes over their lifetime.

1. What did a typical meal look like for you fifty years ago?
2. What were the staple grains and vegetables? Where were they sourced?
3. When and why did you perceive a major shift towards today's diet?
4. What food-related skills or knowledge (e.g., milling grain, preserving fruit) have been lost?

Part 2: The Analysis

Students write a two-page report analysing their findings:

- summarize the key dietary changes identified;
- explain these changes as an example of an 'epistemic rift' – the loss of practical local knowledge about food;
- connect this local story to the larger trend of industrial monoculture replacing diverse local crops.

Part 3: The Debate

Class discussion: 'The Superfood Solution?' Given the loss of local food diversity and knowledge you have documented, is the trend of buying globally sourced 'superfoods' a solution to our nutritional problems, or does it worsen the epistemic rift?

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ISSN 2624-9081 • DOI 10.26034/roadsides-202501403

Thin Ice

Meghal Perera

Near the entrance to Mr Damith's office is a glass tank full of ornamental fish and a row of shoes, as the staff of the Peliyagoda Central Fish Market must remove their footwear before entering. Inside, the air conditioning is turned up and Mr Damith, the Operations Manager, sits opposite a massive screen broadcasting live CCTV from across the largest fish market in Sri Lanka. It is 10.30am and the market is winding down, the screen showing birds scavenging scraps, vendors counting cash and cleaners hosing down bloody floors. Even so, when a staff member briefly stands in front of the screen, blocking it for a few seconds, Mr Damith waves him away.

The Peliyagoda Central Fish Market (henceforth, the Market) was built in 2011 on reclaimed marshland 5 kilometres outside Colombo. Its construction was partially funded by the Asian Development Bank (ADB), which stated that the old wholesale market – St John's Fish Market – lacked the facilities to ensure "high-value fish production" (ADB 2007: 4). The new Market promised a 25-tonne flake ice factory, three cold storage rooms, better parking and a wastewater treatment plant. The ADB (2007: 5) predicted that these facilities would "induce an increased supply of fish for the export market." Such modernising as per Global North standards reflects the hold that lengthening supply

chains have on markets in the Global South. Revamped cold-chain infrastructure is intended to maintain quality suitable for consumers in the EU, Japan and the USA, who make up the bulk of Sri Lanka's seafood export markets. Drawing from fieldwork conducted across the supply chain in Colombo over 2022–2023, this article explores how local understandings of freshness and preferences with regard to types of fish influence how different actors use, ignore and subvert cold-chain infrastructure at the Market.

Scholars have noted how artificial coldness and the infrastructures of the cold chain enable a certain mastery over time, space and entropy (Twiley 2012; Thiemann 2024). The cold chain has lengthened supply chains and increased market penetration, initially resulting in the delocalisation, industrialisation and standardisation of food across geographies (Freidberg 2009). The value addition to products generated by cold-chain infrastructure is usually collected by retailers and cold-chain entrepreneurs rather than farmers, rural labourers and logistics workers (Thiemann 2024; Sánchez-García 2025). Cold-chain infrastructure has changed the quality and materiality of fresh produce, and reconfigured expectations and conceptions of freshness among consumers (Freidberg 2009).

For most of history, the consumption of fresh fish was limited to local populaces or elites, constrained by geography and by the seasons. It is ice that keeps fish colder, moister and fresher than mere refrigeration, thereby expanding the limited geography of fish consumption (Freidberg 2009). In doing so, ice changed understandings of freshness. The freshness of fish is socially constructed by humans and emerges through socio-material arrangements that include certifications, shelves, labels, ice and the fish itself (Truninger et al. 2020).

Fish displayed on ice at a wholesale section of the Market.
Photo: Anisha Gooneratne, 2023.

In an island nation such as Sri Lanka, consumers are accustomed to steady supplies year-round and they expect and prioritize fresh fish (Bimalka et al. 2025). However, prior to the advent of railway infrastructure, fish could only be sold within a day's journey of the coast, with the majority of the inland population consuming dried fish. The introduction of ice plants between 1940 and 1960 increased the processing and dissemination of fresh fish (Alexander 1977). By delaying decay, ice lengthened the span of time in which fish could be considered fresh. Yet frozen fish was not acceptable – a survey of residents in Colombo in 1951 found that over 80 percent of consumers who had bought frozen fish would not do so again (Petersen 1951). Clucas and Bennett (1991) noted that more and more retailers and shops were using ice to display and preserve fish, and today it is employed universally, as demonstrated by Ravi, a fish-seller from a low-income settlement:

> *Ice keeps the fish moist and fresh, even overnight. When you pack it into the rigiform*[1] [box] *it's ok, I mean even with fish when you are in the boat, it's on the ice for a year right*[2]*? The fridge will dry it out, it won't taste right. People are idiots for buying fridges* (Fieldwork interview, June 2022).

[1] Ravi is referring to an insulated cool box made of styrofoam that is locally branded as 'rigifoam'.

[2] Ravi is referring to multi-day fishing vessels which sometimes spend up to a month at sea.

Ice is essential at every stage of the seafood supply chain. Suppliers transporting produce from the beach to the Market require 75 kilograms of ice for every 100 kilograms of fish. Despite having cold-storage facilities, wholesale vendors at the Market prefer Ravi's method, packing fish with ice and salt in rigiform boxes. The reliance on ice for preserving fish generates complications as it collides with standardized infrastructure that does not cater to local preferences. The president of the Fish Trader's Association explained that cold storage was better for large fish like tuna, but that smaller species such as goldstripe sardinella were better preserved in ice. The two methods of preservation reflect two different markets, as tuna is one of Sri Lanka's most popular seafood exports, while goldstripe sardinella is an extremely cheap fish widely consumed across the country and referred to by Ravi as "the poor man's friend."

The variety of ice is also crucial, as fishers and vendors have long preferred to use block ice instead of flake ice (Senanayake 1978). According to ADB estimates, the new flake ice factory at the Market would generate 28 million Sri Lankan rupees (LKR) in revenue through sales of ice.[3] Yet these estimates do not consider that there is no demand for flake ice, despite it being considered industry best practice. For fishers and vendors both wholesale and retail, flake ice melts too fast and is not suitable for preserving fish for long periods of time in the way of block ice. The Market Board decided to build a block ice factory in July 2015, but no action has yet been taken due to a land dispute. However, mismatched cold-chain infrastructure has still proved useful to commercial interests. In 2019, Ceylon Fish Market Group (Pvt) Ltd, was awarded the tender for operating all cold-chain infrastructure. Citing the high costs of maintaining the flake ice factory, particularly in light of the low demand, the company asked Fishing Ministry officials for a reduction in the rent, manipulating the tender to save 30 million LKR.

[3] During the time of fieldwork the exchange rate was 323 LKR to 1 USD. In March 2023, a kilo of rice was 195 LKR and a kilo of sugar 237 LKR.

> *There are no power cuts here. But we have generators and enough diesel to power five or six markets* (Interview with the Operations Manager of the Market, February 2023).

Sacks of ice in lorries behind the retail stalls. Photo: Anisha Gooneratne, 2023.

Maintaining coldness is an energy-intense affair, with ice production and refrigeration dependent on energy infrastructures. Sri Lanka's 2022 economic crisis triggered a complete breakdown in the energy landscape with fluctuations in the supply of kerosene and diesel, and daily power outages. Electricity tariffs were increased by 75 percent in August 2022 and a further 65 percent in January 2023.

At that time, a single company had been supplying block ice for two years, amidst procurement irregularities flagged by auditors in 2021. At the height of the crisis, vendors at the Market reported that the ice supplier was price gouging and selling 50kg blocks for 1,000–1,600 LKR compared to the earlier price of 300 LKR. Vendors frequently referred to this monopolistic behaviour as the work of the "ice mafia." One vendor harboured a suspicion that the company running the cold storage was shutting off the electricity at night to lower costs after the tariff hikes. There was a disjunction in the management's faith in the strength and resilience of Market infrastructure and the real and imagined inadequacies that concerned vendors. The uninterrupted supply of electricity meant little to them in the absence of facilities to produce the type of ice they wanted. The lack of foresight left vendors and retailers vulnerable to compounding shocks, and price gouging on ice impacted fish prices throughout the value chain.

Faced with rigid Market infrastructure, vendors created their own localized cold chain, packing leftover fish in rigiform boxes with ice and storing it in freezer trucks stationed overnight in the carpark. This alternative cold chain was cobbled together as vendors embraced, rejected or repurposed Market infrastructure to make it work for local sellers and consumers. The pricing of storage differed, with cold rooms charging by the kilo while freezer trucks charged 100 LKR for a 25kg container. Freezer trucks were thus repurposed from transport to storage, and vendors took advantage of the increased

Frozen seafood displayed on deep freezers in the retail section.
Photo: Channaka Jayasinghe, 2023.

parking space that enabled freezer trucks to park overnight. Parking rates were 200 LKR a day for the first three days, increasing to 1,000 LKR on the fourth day. Freezer trucks often circumvented this fee by driving out of the parking lot on the third day and returning a few hours later.

Cold-chain infrastructure made for the export market and hijacked by local commercial interests increased the vulnerability of vendors to shocks like the energy crisis. However, vendors were also able to make Market infrastructure work for them, devising an alternative cold chain that aligns with local ideas of freshness. Rather than simply accelerating and intensifying the flow of fish to the Global North, cold-chain infrastructure is re-engineered and localized, as vendors continue to keep fish from spoiling in the way that they think best.

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Acknowledgements:

The fieldwork for this paper was conducted under the Living Off-Grid Food and Infrastructure Collaboration, which is supported by the UK Research and Innovation Global Challenges Research Fund.

Cite as:

Perera, Meghal. 2025. “Thin Ice.” *Roadsides* 14: 20-26. https://doi.org/10.26034/roadsides-202501403

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ISSN 2624-9081 • DOI 10.26034/roadsides-202501404

Information Infrastructure:

Shaping Raspberries through Geographical Indication?

André Thiemann

In summer 2019, as part of ongoing fieldwork on global food supply chains and their infrastructures, I carried out participant observation at the "World Capital of the Raspberry" in the municipality of Arilje in Serbia. Here, under the blistering sun, some ten thousand agricultural laborers and farmers across more than four thousand smallholdings pick approximately twenty thousand tons of raspberries every year, predominantly in June and July.

Although there were variations in the farms I visited in terms of size, capital investment, infrastructures, numbers of farm workers etc., all integrated three stable building blocks – or infrastructural modules – of raspberry cultivation: they used the same cultivar named Willamette, they trellised the canes in rows and they transported the fruit every evening to a nearby cold store (Thiemann 2024a: 298–301).

The three agronomic modules of Arilje's raspberry country: the Willamette cultivar, trellised rows, picked raspberries stacked for transport.
Photo: André Thiemann, 2019.

Between 1975 and 1993, these three modules had been developed by a since defunct local socialist cooperative's agronomic station. In this "legal-scientific infrastructure" (Lammer and Thiemann 2024: 205–7), Arilje's agronomists had researched, aligned and evidenced the modules' effectiveness by conducting field trials, running statistics and writing papers. But with the closure of the agronomic station, the agronomists had dispersed and their modules were taken up across Serbia, Kosovo, Bosnia-Herzegovina, Macedonia and Bulgaria.

Yet a network of Arilje's agronomists strove to retain an infrastructure of value, by concentrating on communicating their raspberries' singular qualities in face of the growing competition. Before explaining this emerging information infrastructure (Lammer and Thiemann 2024: 203–5), I must quickly introduce another type of infrastructure in place, i.e. the combined infrastructures of containment and transportation – this is the cold chain (Lammer and Thiemann 2024: 201–3).

The cold chain that concerns us here is centred around the former cooperative cold store in downtown Arilje. The atmosphere in its production halls is literally the polar opposite of the warm, bucolic fields outside: in a clean, cold white cube kept at minus ten degrees Celsius, I saw twenty-five workers hastily sorting freshly frozen raspberries into 10kg boxes, separating on a conveyor belt the first-class quality berries from the rest. The boxes were stacked on palettes and retained for storage, resorting, processing and packaging.[1]

[1] On the moral economy of the cold chain see Freidberg 2015; on its modules: freezing, packaging, storage and transport, see Thiemann 2024a: 295–98.

Part of the cold chain: Workers sorting fresh-frozen raspberries in Arilje's major cold store. Photo: André Thiemann, 2019.

Infrastructures of Value

This article adopts an approach to "infrastructures of value" (Lammer and Thiemann 2024: 195–218) that, rather than forcing an either-or decision between the critique of political economy and the ontology of more-than-human assemblages, studies how infrastructures' manifold materialities can be used to valuate (qualify the properties of) and valorize (realize a profit with) foodstuffs. Ethnographically, the piece hones in on how Arilje's raspberry supply chain has been copied elsewhere in the region, which has created huge competition and turned a singular, expensive good into a comparatively cheap mass commodity, a tendency that the new information infrastructure strove to counter.[2]

Several dialectics abounded in Arilje's raspberry value chain. I have already shown how the interaction between Arilje's smallholding agriculture and its agronomics shaped fresh raspberries. Second, I further considered how the fresh, delicate composite fruits were frozen into red, rolling marbles to be stacked in boxes, allowing for future valuation and valorization. Third, over the remainder of this piece I will demonstrate how, to counter the loss of realized value per kilogram because of mass commodity competition, Arilje's agronomists pushed for a Geographical Indication (GI) of Arilje's raspberry – by evidencing and thus valuing its special qualities that stemmed from the regional tradition of growing this particular fruit.

[2] On the economy of singularities and its judgment devices that qualify both product and consumers, see Karpik 2010.

As the agronomists worked on establishing an information infrastructure to market Arilje's special "Taste of Place," they became engaged with the dialectics of genericness and uniqueness in global markets. These aspects have existed since the nineteenth century, when the consumption of fresh fruit became a cherished urban practice, leading to fierce competition in metropolitan markets such as Paris (Freidberg 2010: 122–56). In the twenty-first century, fresh-frozen, industrially processed fruits entered the food aisles and with them the uniqueness-genericness dialectic, too.

Conference merch at the 11th International Raspberry Organization meeting in Veliko Tarnovo, Bulgaria. Photo: André Thiemann, 2018.

While I attended the 11th International Raspberry Organization (IRO) meeting in Bulgaria in 2018, a Chilean exporter laid out for me how the global raspberry market had been shaped. It started around 1980, when Chile's agribusinesses opened up a luxury niche in the US-American food market by organizing daily airlifts of fresh raspberries. But by 1990, Guatemalan smallholders wrestled their way in and became the leading fresh raspberry exporter to the USA by leveraging their relative proximity and using the cheaper method of trucks for transport. Chileans now had to freeze their raspberries and seek out new markets. Thus they encountered the post-socialist Eastern European producers with whom they established IRO in 1996: Hungary, Poland and Yugoslavia. Each of these countries had exported on average twenty to thirty thousand tons of fresh-frozen raspberries per year throughout the 1980s (see Šoškić 1988: 13).[3] Also in 1996, food scandals in Guatemala helped to re-channel US foreign direct investment into new agronomic infrastructures – polytunnels – for fresh raspberry production in Mexico's Baja California (Flynn 2013; Zlolniski 2019).

[3] Since the 1990s, Poland's Polana and Polka and Serbia's Willamette varieties have outcompeted Hungary's tasty *Fertődi zamatos* ('the juicy of Fertőd').

Serbia never strategically invested in fresh raspberry production. Instead, it scaled up its fresh-frozen capabilities. In 2016 it produced a record 113,000 tons of raspberries, equalling 16 percent of production by the ten top producing countries worldwide.[4] Fruit traders regularly paid a few cents per kilogram more for Serbian raspberries, and Arilje's raspberries fetched somewhat higher prices again.

[4] See https://www.tridge.com/intelligences/raspberry/production

Information Infrastructure

In 2006, aiming to boost its export agriculture, the municipality of Arilje established an Innovation Centre for Agriculture, employing several agronomists. Initially funded by Scandinavian donations and German and Swiss rural development projects, the Centre has pushed for the GI *Ariljska malina* ('Arilje's raspberry') to increase the local price premium. It also pursued field trials with varietals for fresh consumption, a longer shelf-life and harvesting period, and introduced the food standard Global G.A.P. that defines procedures for the production of hygienic and non-contaminated food (Thiemann 2024b).

Ariljians also produce Hungarian and Polish varieties.
Photo: André Thiemann, 2019.

The GI idea was originally taken from the French wine world, where *appellations d'origine contrôlées* (AOC) were pioneered after the global recession of 1929, boosting sales by communicating specific qualities to consumers, such as a wine's *terroir* (Krüger 2024). Often referred to as 'the taste of place,' a terroir incorporates a distinct geographical location and history of production and processing. Legal-scientific infrastructures can evidence a terroir's qualities, and information infrastructures communicate these qualities to market participants (Ana 2024).

On 3 June 2008, local entrepreneurs submitted a "Report on the production methods and specific characteristics of the product ARILJE'S RASPBERRY" drafted by the Innovation Centre to the Intellectual Property Office of the Republic of Serbia.[5] The report incorporated historical data such as descriptions of Arilje's first raspberry nursery from 1956 and detailed the organoleptic qualities of fruits produced in its 'raspberry country' (*malinogorje*). On 19 March 2009, the GI was approved under the registration number 52.

[5] Translations from Serbian are mine.

The Geographical Indication logo.
Source: https://www.zis.gov.rs/en/vesti/2023-triumph-of-tastes-with-the-protected-geographical-origin/

Between 2014 and 2022, the Innovation Centre was invited to join a "strategic coalition of trans-scalar networking actors" (Turner 2016: 399) of entrepreneurs and agribusinesses, cold stores and cooperatives, as well as the Fruit Research Institute Čačak and the Serbian Ministry of Agriculture, in a project funded by the Food and Agriculture Organization of the United Nations (FAO) and the European Bank for Reconstruction and Development.[6] Citing pilot research on nine GIs, the FAO argued that an international GI label could benefit the whole value chain and improve prices by 20–50 percent.

[6] It was named "Serbia – strengthening quality standards in the agri-food sector."

Thus, in December 2015 Arilje's entrepreneurs resubmitted an updated Innovation Centre report to Serbia's Intellectual Property Office, emphasizing that "Ariljian quality" was already recognized on the international market, as referenced by numerous awards, gold medals and trophies. The GI certificate was reissued in March 2016. But today Arilje's raspberry has still not been recognized internationally, while the FAO has continued to lobby for it.

In 2019, the Innovation Centre was unceremoniously closed. As its former head explained to me in 2023, for the European Union to recognize Serbian Geographical Indications, Serbia must first align its Law on Agriculture with wider European legislation. While in 2020 an adapted draft law had been submitted to Serbia's Parliament, it was never ratified (Thiemann 2024b).

As of 2025, most European consumers still do not know how many of their fresh-frozen raspberries come from Serbia, let alone from Arilje. This is because the shiny new information infrastructure – the GI – was built on an eroding legal-scientific infrastructure, as Arilje municipality ferociously attacked the infrastructuring science (the Innovation Centre), while failing to lobby for the infrastructuring law (the drafted legislation adapted to EU conditionality).

Packaging of frozen raspberries for export to a German supermarket chain, without the GI. Photo: André Thiemann, 2019.

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Cite as:

Thiemann, André. 2025. "Information Infrastructure: Shaping Raspberries through Geographical Indication?" *Roadsides* 14: 27-34. https://doi.org/10.26034/roadsides-202501404

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ISSN 2624-9081 • DOI 10.26034/roadsides-202501405

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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Acknowledgements:

This research received funding from the Centre for Contemporary Chinese Studies and the Faculty of Arts at the University of Melbourne. I would like to acknowledge the contributions of my co-investigators Brooke Wilmsen, Zhao Yue, Sonia Graham and Zoe Wang, and thank Vanessa Lamb for her comments on a draft. Any errors are my own.

Cite as:

Rogers, Sarah. 2025. "Pesticide Infrastructures: From China to Australia." *Roadsides* 14: 35-41. https://doi.org/10.26034/roadsides-202501405

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?

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ISSN 2624-9081 • DOI 10.26034/roadsides-202501406

Chhurpi Connectivity:

Himalayan Cheese as Bioregional Frame

Uttam Lal and Mirza Zulfiqur Rahman

Chhurpi – the Himalayan cheese as referred to in a range of languages like Nepali, Pahari, Tibetan and Bhutia – signifies food sovereignty for the highland communities of this region. The exceptionally hard chhurpi has long been ubiquitous in cold-arid, alpine and temperate terrain with bare-bones infrastructure and a minimal ecological footprint, situating this foodstuff at a unique intersection of food culture, environmental stewardship and local resilience across the Himalayas. Production of the cheese is an ecologically adaptive response among highland pastoral and nomadic communities who graze yaks, cattle, sheep and goats across highland pastures and passes.

Their physically demanding lifestyle among rugged mountains requires these communities to have reliable sources of locally produced protein. Chhurpi solves the problem of storing milk and of transporting it long distances, and over time the highland communities have adapted their palate to consume milk in this form (Lal and Lepcha 2024). Traditionally, hard chhurpi was a trusted travel companion, serving as an energy-rich snack for nomads, pastoralists and traders during their highland traverses.

Chhurpi being sold at a local stall at Kalimpong bazar in the Eastern Himalayas.
Photo: Uttam Lal, 2025.

The threads that tie chhurpi together, as it hangs in front of numerous shops across the Himalayas, afford us a chance to examine critical questions of highland mobility, connectivity, infrastructures and state-making across the region. We employ the analogy of 'chhurpi connectivity' in the face of "pickled infrastructure" (Rahman 2019), where local communities are not able to meaningfully use such connectivity infrastructure such as the roads and bridges laid out by the respective nation-states. Pickled infrastructure and chhurpi connectivity is a metaphor to explain the dynamics of connectivity and infrastructure development across the Himalayas, in relation to how local communities are able or unable to use, absorb, or participate in the decision-making processes that pertain to transformational change in the region. The social and cultural relationships bound up in the production and circulation of chhurpi help to explain the modern developmental landscape of the Himalayas.

As nation-state borders are becoming hardened, traditional hard chhurpi is getting softer. Securitized borders make it difficult for communities to access many high-altitude pastures, leading to scores of people resettling in the lower valleys with better connectivity. Thus, they do not necessarily produce or require hard chhurpi to be carried around and stored easily. The hard bordering practices of nation-states across the high Himalayas resemble the hard-textured yak-milk chhurpi traditionally consumed in these higher reaches. Yet these highland communities are being dispersed to lower altitudes due to the intensification of securitized bordering effects. Now they must navigate, negotiate and chew on these hardened border realities.

Chhurpi, being something of an acquired taste, has undergone a softening of its texture and flavour as it has migrated to lower-lying areas and been adapted to the palate of the milder subtropical Himalayas – a process that is in stark contrast to the nation-state's increasingly robust bordering practices. The ever-growing sovereignty and security concerns of the Himalayan borderscapes have ushered in more and more restrictions on movement and on the accessing of grazing areas, as well as bans on open grazing in regions like Sikkim, which have forced herders to move away from their traditional pastoral pursuits (Lal 2021).

Freshly made yak chhurpi being smoked-dried inside a herder's hut in Sikkim.
Photo: Uttam Lal, 2018.

Imitating how chhurpi itself is made, the hard bordering effects in the Himalayas have led to a lot of churning among Indigenous communities and have desiccated longstanding bioregional/ecoregional connectivity in terms of trans-Himalayan trade, local ecologies and food cultures across the region, of which high-pasture hard chhurpi is an important identifier. As Himalayan yak herders are forced to considerably scale down their herd sizes, this has led to reduced yak-milk production. Thus, in turn we are seeing reduced production of pasture-raised hard cheese. But paradoxically, with the commercial commodification of this special Himalayan foodstuff and an ever-expanding market for it, pasture-grazed yak, goat and sheep chhurpi are fast being replaced by chhurpi made from farm and stall-fed cattle milk of subtropical Himalayas. Recently, farmers in Arunachal Pradesh in northeastern India have innovated to produce chhurpi from the milk of the mithun (*Bos frontalis*), also known as the gayal, a semi-wild bovine which is only partially domesticated, never kept in homestead enclosures and which grazes in the forests around villages.

The traditional connections as threaded by chhurpi across the Himalayas accentuate the analogy of chhurpi connectivity in a bioregional/ecoregional frame, where Himalayan communities constantly navigate and negotiate multiple nation-state borders and the deployment of border infrastructures. As the herders moved around with a bare minimum of belongings, they used animal hides for storing milk, churning it into butter and cheese, as well as for transporting these across valleys and ridges. Chhurpi, when it is still soft and fresh, is subject to going stale; in order to combat this, chhurpi would be squeezed tightly and dried by hanging them near the hearth or out in the sun. With scarcely any moisture content left after this treatment, the cheese emerged as a much drier and harder mass, suitable for longer-term storage and for being transported across borders and challenging topography. Traditionally, it used to be a major fuel to energize traders, pilgrims and pastoralists treading across pastures and passes.

Harris (2023) contends that trans-Himalayan infrastructures have been built upon and shaped by the imaginary of past connections and historical trade routes, and in this context chhurpi connectivity reflects a pace of regional infrastructure development which is more sensitive to local communities' worldviews and aspirations. Such consideration ought to help emphasize bioregional/ecoregional development aspects, instead of just the narrow nation-state-centric development narratives that are in motion across the Himalayas.

Chhurpi on the shelf of a mall in a Nepal–India border town.
Photo: Uttam Lal, 2025.

Chhurpi is a significant marker of the Himalayan bioregion, food sovereignty, ecological resilience and cultural worldviews. As a Himalayan food product, chhurpi comes from the Himalayan borderlands, which have often been politically marginalised despite being a culturally rich area. Hence, through a bioregional and ecoregional lens, chhurpi transcends its nutritional role, symbolizing ethnic identity, cultural continuity and locavore practices. Its production is embedded within high-altitude agroecological systems characterized by short growing seasons and shallow soil profiles, where conventional forms of agriculture are constrained. In its hard, preserved form, chhurpi functions as an index of ecological adaptation and a durable expression of seasonal food practices intrinsic to Himalayan livelihoods. It is central to the diet of such communities, used in its hard form as well as in softer forms in curries, momos, chutneys and salads.

To the outsider, chhurpi might be seen to have an unusual texture and as somewhat unsophisticated compared to other cured and fermented cheese varieties from around the world, particularly well-known examples from Europe. As an Indigenous food, chhurpi is an important identity marker and an integral part of biological and social life of local communities. Popularly known as Himalayan chewing gum, it is probiotic, high in protein and nutritious (Ghatani and Tamang 2017), and it is primarily meant for human consumption. Nonetheless, supermarkets in the Western world are now marketing chhurpi as Himalayan dog chew, which is proving to be a lucrative business for some local entrepreneurs. Yet this comes as a shock to the cultural sensitivities of Himalayan communities, who consider chhurpi as a food of high cultural value and deeply rooted in their ecological worldviews. Such a development also offers interesting contrasts to the situation where food cultures of the Eastern Himalayan foothills in Northeast India are a surprise to communities further south in the subcontinent, as these include consumption of dog meat and fermented soybeans, considered to be 'tribal' food (Kikon 2018).

When chhurpi travels on a global scale to the supermarkets of the western world as Himalayan dog chew, or when purchased as a curious souvenir by visitors to the region, it is transformed beyond recognition for the social and cultural sensibilities of Himalayan communities. This home-made hard cheese has now turned into a scaled-up modern commercial venture, as opposed to what was once just a pastoral and family occupation. These market and scalar shifts have also wrought subtle changes to its taste and texture. Chhurpi is increasingly being made from cow's milk and is now often softer in texture in order to be relatively palatable and chewable for tourists visiting the Himalayas. It is still perceived and presented as coming straight from the farm and as being culturally rooted; but meanwhile, there are substantial changes happening to its production processes as these evolve from subsistence pastoral origins to being made in bulk quantities industrially in urban settings. These are sold for example as "Chhurpi for Humans" and "Chhurpi for Dogs." While companies like Gorkha Products, Churpi.in and HelloSikkim sell chhurpi online from India, Chhurra Chhurpis has started marketing various flavours of chhurpi online and in retail stores in Nepal. Further, chhurpi has gone international with brands like Himalayan Dog Chew, Yak Chew and Yakies. Such transformations have led to a change in the economics of chhurpi production, and of its demand, supply and circulation; indeed, the high price

of today's chhurpi has gradually taken it out of the reach of most common people inhabiting the Himalayas. What used to be a culturally rooted, ecologically resilient, seasonally produced essential food item traditionally known for its long shelf life, now quickly flies off the shelves of supermarkets in faraway lands.

Chhurpi has always been a hyper-local foodstuff, rather than catering to distant mainstream power centres outside the Himalayas. In light of this, the analogy of chhurpi connectivity also highlights the layers of geographical differences, the existence of "multiple Himalayas" (Sarkar 2023: 218), and the importance of verticality as a spatial perspective in understanding the socioeconomic and cultural organization of communities inhabiting such spaces (van Schendel 2018). There is a lot of chhurpi to chew on while examining how development infrastructure and connectivity are shaped in the Himalayas, all of which profoundly affects the food sovereignty of Indigenous communities.

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Cite as:

Lal, Uttam and Mirza Zulfiqur Rahman. 2025. "Chhurpi Connectivity: Himalayan Cheese as Bioregional Frame." *Roadsides* 14: 42-49. https://doi.org/10.26034/roadsides-202501406

Discussion Questions

1. How has chhurpi been ecologically, culturally and economically interconnected?
2. How might you view the analogy of chhurpi connectivity differently from your own understanding of and reading about the Himalaya?

Activity:

Map the transboundary and ecoregional journey of chhurpi from the Himalayan pastures to food store shelves.

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ISSN 2624-9081 • DOI 10.26034/roadsides-202501407

Roads, Marketplaces and Plantations

Tuomas Tammisto

In March 2024, a group of people living between large-scale oil palm plantings in Wide Bay blocked the main road going through their village. Shortly before this, women from the village accustomed to selling food on the plantation had been expelled by the company. The villagers considered this to be unfair, and in protest staged the roadblock, which hindered plantation production.

This incident shows how food and infrastructure are entangled in numerous ways both on and around the oil palm plantations in Wide Bay, on the eastern coast of New Britain Island, Papua New Guinea. First, the plantations are highly infrastructured spaces producing palm oil used to make food, fuel and consumer products. Second, the oil palm plantation in Wide Bay was established in 2009 as a part of a plan by local politicians to bring not only income and employment possibilities, but also roads to connect this remote and rural area to urban centers (Tammisto 2024a: 157–62). Third, women from local communities sell food they grow on the plantation, while traders from town use the precarious road connection to come and buy rural produce from locals. In this photo-essay I describe how the plantation and local food infrastructure coexist, intersect and constitute one another, and the ways in which the unequal relations between the plantation company, workers and villagers are materialized in and enacted through food and infrastructure.

↓ A local food market on the oil palm plantation during payday.
Photo: Tuomas Tammisto, 2019.

Plantation Infrastructure

Along the seemingly endless rows of oil palms, roads are a characteristic feature of the Tzen plantation in Wide Bay as they grid the 7,000 or so hectares of plantings (Tammisto 2024: 179). After harvest the fruit of the oil palm spoils quickly (Li and Semedi 2021: 95). It must be transported to the mill within two days, where it is pressed into crude palm oil, the export product of the plantation. All fields thus have to be surrounded by roads, because workers first carry the fruit from the fields in wheelbarrows to the nearest collector road, and from there by tractor and truck to the mill.

The company has established several extensions to the main plantings in Wide Bay outside the original estate. They too are gridded by collector roads, but the connection to the main estate is by a single coastal road that runs through several villages located on ancestral land held and cultivated by the villagers under the customary land title of PNG's land legislation. In Wide Bay, most vehicular traffic is related to plantation production: trucks and tractors transport oil palm fruit from the field to the mill, while supervisors and maintenance workers – such as mechanics – move by car between the company locations.

↑ A man working as a harvester for the plantation company walks to the oil palm plantings.
Photo: Tuomas Tammisto, 2024.

The interface between local oil palm plantations and the global markets: palm oil is pumped into a tanker.
Photo: Tuomas Tammisto, 2019.

The palm oil mill is situated on the main estate. A pipeline runs from the mill to the shore, on land belonging to the neighboring village. Periodically, tanker ships arrive and palm oil is pumped onto them via the pipeline. The company hires villagers as stevedores who help the operation with their motorboats.

Taken together, this is the official infrastructure of the plantation zone, which is the area influenced by plantations consisting of the estate, all its plantings and the spaces around and between them (see Li and Semedi 2021; Tammisto 2024a: 179–86).

Local Logistics

In addition to the traffic related directly to palm oil production, there is a more informal food infrastructure upheld by village women who go to the plantation to sell things that they grow, along with the men who transport them and urban traders who come to Wide Bay to buy rural produce.

Inhabitants of Wide Bay predominantly grow the food they eat in swidden gardens, and gain monetary income from the cultivation of cash crops, such as cocoa and coconut, in more permanent orchards. They are, in short, food-producing peasants. Many local women travel to the plantation to sell food and betel nut – a mild stimulant used throughout Papua New Guinea – to workers.

Two women visit their swidden garden. Next to the plot are some previous gardens in the process of reforesting and in the background mature rainforest.
Photo: Tuomas Tammisto, 2024.

Women fro nearby villages hitch rides on plantation vehicles or hire one of the few locally owned cars to get to the plantation. People from further away travel by boat, because the main road is in many places cut off by rivers or creeks. The few cars that exist in Wide Bay are largely owned by regional government, a local cooperative and some aid posts, as well as a handful of individuals.

A market-seller woman preparing to return from a far-away workers' compound on board an oil palm plantation truck. Photo: Tuomas Tammisto, 2024.

One village close to the plantation is in possession of a car. It was left there when the previous owners scuppered it while crossing a major river – in itself a testimony to the precarious road infrastructure of Wide Bay. After several years of abandonment, some enterprising locals salvaged the vehicle. These men now operate it like public transport: their fellow villagers pay for rides, and women in particular hire the car to travel to the plantation in order to sell produce.

This village car is kept running through ingenuity and skill. A rather ancient vehicle, the local men service and repair it themselves. The main driver, a man who previously worked for a logging company, knows how to cross the rivers without bridges and the various routes to distant worker compounds among the mazelike road network of the plantation fields.

↓ The driver fixes the salvaged car after it has broken down in the middle of a run at night. Photo: Tuomas Tammisto, 2024.


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Traders from town hire cars and travel to the plantation and its logging compounds, namely as far as the road will take them. From there, they visit nearby villages and purchase betel nut by the bag. To venture further into Wide Bay in search of more betel nut, traders hire local boat operators who bring them to villages beyond the reach of the road and then back with their cargo. In town, these traders sell the betel nut wholesale to urban market-sellers.The work of villagers maintaining and driving the salvaged car, the boat operators and the peasant women selling their produce to workers on the plantation are all examples of "logistics in the margins" (Stenmanns 2019), demonstrating the effort, skill and ingenuity needed to make things move with limited built infrastructure and little technology. Indeed, market-seller women and local drivers "are just as skilled logistical entrepreneurs as the high-paid experts of multinational transport companies" (Schouten, Stepputat and Bachmann 2019: 782).

↑ Betel nut being packed into an oil palm fertilizer bag in a local betel nut grove.
Photo: Tuomas Tammisto, 2024.

Intersecting Infrastructures

Plantations require cheap labor, and labor is *made* cheap in part through food (Dennis [1980]; Tammisto 2024a). The plantation company sells food on wage credit to the workers, who also cultivate their own food on the plantation. Workers grow staples such as banana and sweet potato near their houses, on roadsides and – when the plantation was new – amidst the young oil palm plantings. Through these measures the company shifts the costs of the reproduction of labor onto the workers themselves, a common feature in the history of plantations – and of capitalism more broadly (Trouillot 1988: 66; Federici 2004; McKittrick 2013: 9–10; Besky 2024: 2213).

A market on the plantation during payday.
Photo: Tuomas Tammisto, 2024.


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At the same time, while the provision of land on which plantation workers and slaves could grow their own food was part of a strategy by plantations to help maximize profits, for those who tended these areas they were also sites of autonomy, resistance and of rooting oneself in the land (Wynter 1971: 97–99, 101; Trouillot 1988: 77, 84; McKittrick 2013: 10). Indeed, Sylvia Wynter (1971: 99–100) observes how both "plot and plantation" emerge from the same historical process but represent two distinct values. These are, on the one hand, exchange value and profit pursued by the plantation owners; and, on the other, use values pursued by plantation workers, often from peasant backgrounds.

Workers coming from the nearby villages also receive food from their relatives, and the produce sold by local women is more affordable than that available in stores. For women in the villages, selling food on the plantation is an important source of income (see also Curry, Koczberski and Inu 2019: 241, 244). Yet the food sent by rural kin or sold by local women can be regarded as a 'subsidy' for the plantation, because it allows the company to keep wages at a low level (see Denoon [1980]: 4).

While the company benefits from the cheap food sold to workers, it has also on occasion sought to restrict market selling to certain times and to the formal marketplace of the plantation, in order to prevent workers from going to makeshift markets during working hours. As noted, locals considered this unfair and protested by blocking the main road in their village, thereby preventing the transport of oil palm fruit from the extension plantings to the mill (Tammisto, forthcoming). The roadblock was quickly lifted after managers came to discuss the situation with the locals. Officially, market selling remained restricted to the main market, but in practice local women continued to sell their food as before.

↑ ***Women return from the market along the main road running through the oil palm plantings.*** Photo: Tuomas Tammisto, 2024.

The road through the plantation: traders with their cargo of betel nut wait by the security gate. Photo: Tuomas Tammisto, 2024.

Conclusions

The relation between the plantation company and the neighboring villages is ambiguous. Some villagers work on the plantation and a number of women receive income from the sale of food to workers. The plantation company clearly benefits from the efforts of its workers and of the market-seller women. On the other hand, the relationship is highly unequal due to exploitative labor conditions, the company's control of activities in the plantation area and the restrictions on the flow of money from workers to local communities, with food sold on store credit.

This ambiguous and unequal dynamic is materialized both in food and through infrastructure in the plantation zone of Wide Bay. The plantation company is able to produce cheap palm oil for global markets because its workers are kept cheap by food they grow, purchase from the company, receive from kin or buy from other locals. The residents, meanwhile, utilize the plantation infrastructure and have also created a parallel food infrastructure for themselves. The inhabitants of Wide Bay are skilled in logistics, organizing their own transport system and markets. Furthermore, if angered by the company, they are ready to disrupt the plantation infrastructure so as to make their voices heard.

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Acknowledgements:

Thanks to Bayan Arouri, Tero Frestadius, Laura Huttunen, Mari Korpela, Arvi Pihlman, Sanna Poelman and Minna Seikkula for commenting on a seminar presentation on which this essay is based. I am especially grateful to Heikki Wilenius for reading and offering feedback on an earlier draft, and for all our discussions in general. I extend my gratitude to Dolly Kikon and Matthäus Rest, as well as Tina Harris, David Hawkins and Agnieszka Joniak-Lüthi, for all their help and for editing this issue, and to Bengt Karlsson for his thoughtful comments. My research in Wide Bay would not have been possible without the help and patience of my interlocutors, to whom I am most grateful. A special shoutout to all at the *mama maket* as well as Ludvig Tniengpo and Paulus Mrelate.

Cite as:

Tammisto, Tuomas. 2025. "Roads, Marketplaces and Plantations." *Roadsides* 14: 50-60. https://doi.org/10.26034/roadsides-202501407

Discussion Questions

1. How is plantation labor made cheap?
2. What does it mean that relations are materialized in terms of food and infrastructure?
3. How do the inhabitants of Wide Bay live with and alongside oil palm plantations?

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ISSN 2624-9081 • DOI 10.26034/roadsides-202501408

Community Cookbooks and the Remembrance of *Kugels* Past

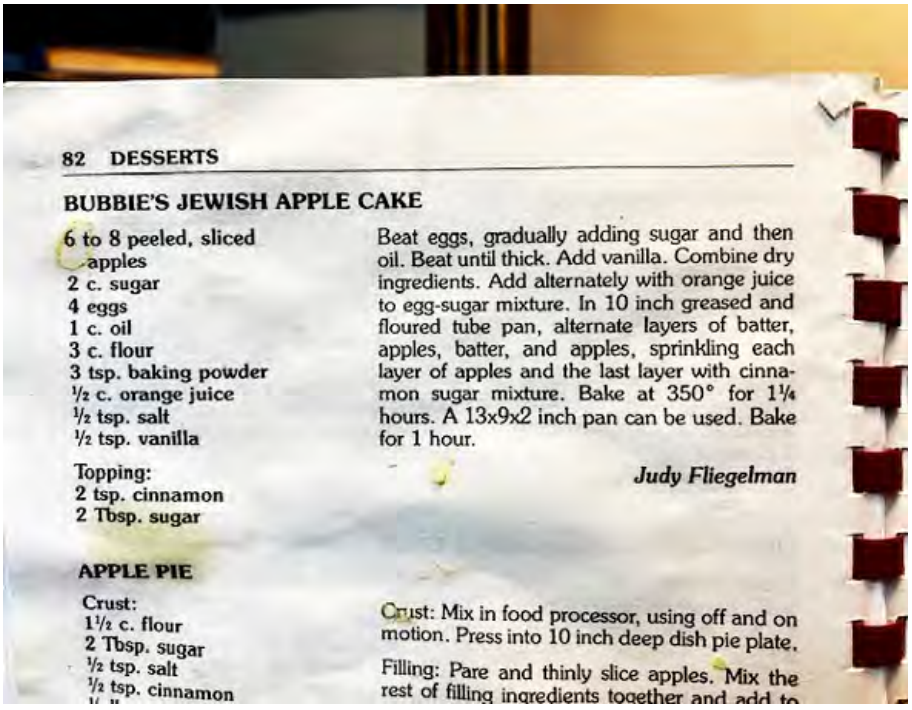
Joanna Radin and Mark Stern

Scene 1 – Mark Stern

My mom recently suffered a stroke[1] and, while helping out at the apartment she lives in with my dad, I was poking through closets and drawers for artifacts that reminded me of my 1980s childhood. In the hospital, I was present to her horizontal needs. Back at the apartment, I dissociated through artifacts that let her be vertical, leaning over the kitchen sink in the house where we grew up, having gotten home from work, under a halo of bad fluorescent lighting, singing a Billy Joel song (preferably from the album *Turnstiles*), with a Phillies game on the TV above the fridge. This is not a specific memory, and I am not sure all these things actually ever happened at the same time. And yet it is a memory I know is real.

[1] She is doing much better now.

What is also real is that I have been appropriating things from my parents' apartment for at least fifteen years, a timeframe which coincides with my dad's drastic health deterioration. A crewneck sweatshirt here. A tote bag there. A bottle of Aqua Velva. A mug with my mom's initials. Relatively small things, but ritual items that keep them present to me. It was in this sticky-fingered mode that I came across (and stole) the 1994 edition of *Culinary Creations*, a community cookbook put out by the Sisterhood of Congregation Or Ami, the synagogue my family attended. I remembered this book immediately. Because each recipe was contributed by a member of the community, and because we knew most of the people in that community, there was always something slightly voyeuristic about looking through it. As someone who has since come to own LOTS of cookbooks, I was immediately taken by the kinship and familiarity I felt in flipping through the pages. I could smell and taste so many of these recipes. These were memories of my grandparents, holidays, long rides in the car with my sister, and of my parents, all of which felt more like the photographs from family albums. The recipes were food, but the memories were people.



82 DESSERTS

BUBBIE'S JEWISH APPLE CAKE

6 to 8 peeled, sliced apples
2 c. sugar
4 eggs
1 c. oil
3 c. flour
3 tsp. baking powder
½ c. orange juice
½ tsp. salt
½ tsp. vanilla

Topping:
2 tsp. cinnamon
2 Tbsp. sugar

Beat eggs, gradually adding sugar and then oil. Beat until thick. Add vanilla. Combine dry ingredients. Add alternately with orange juice to egg-sugar mixture. In 10 inch greased and floured tube pan, alternate layers of batter, apples, batter, and apples, sprinkling each layer of apples and the last layer with cinnamon sugar mixture. Bake at 350° for 1¼ hours. A 13x9x2 inch pan can be used. Bake for 1 hour.

Judy Fliegelman

APPLE PIE

Crust:
1½ c. flour
2 Tbsp. sugar
½ tsp. salt
½ tsp. cinnamon

Crust: Mix in food processor, using off and on motion. Press into 10 inch deep dish pie plate.

Filling: Pare and thinly slice apples. Mix the rest of filling ingredients together and add to

Drops of batter from a tried and tested recipe. Photo: Mark Stern, 2025.

Community cookbooks like this became staples of civic organizations such as religious congregations, schools, services clubs in the United States in the twentieth century. While diverse in origin, Alton Brown (2010: xi) suggests that such volumes share certain qualities: they are often spiral-bound, recipes are submitted by people in the community, they are democratic as everybody gets to submit without editorial or taste censorship, and they speak to and of a specific place at a particular moment in time. Created, curated and circulated overwhelmingly by women, the tens of thousands of these cookbooks can be understood as a kind of roux that mediated social, political and ancestral bonds (Bower 1997; Lindgren and Germer 2018). In them it is possible to identify strains of the prominence of home economics, new technologies, women's work

and, among other things, the centrality of civic organizations in everyday life (Shapiro 1996). Insofar as infrastructures refer to cathections between people, land, time and nonhuman ecologies, these cookbooks are gooey infrastructures, rooted in domestic spaces, where communities archived their histories and aspirations.[2] They are, as Janet Theophano (2002: 70) writes, "a guide to the identity and ethos of a community [and] a story [the group] tell[s] themselves about themselves."

[2] See, for example, the number of *trayf*, Yiddish for non-Kosher, recipes in synagogue editions.

It makes sense, then, as to why this particular cookbook, dotted with splotches of grease and batter, seemed so important at this moment in my own life – a time when I was grappling with the transient, yet grounding, nature of community and identity. Community cookbooks like this one, as per the acknowledgements page of Culinary Creations (1994: i), started as a "fund raising project and quickly became a 'fun raising' project." This cookbook was something that helped me remember the funds of the past as my parents and I moved into a yet to be determined future.

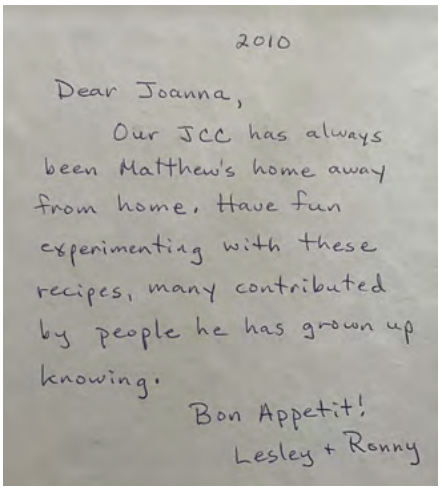
Scene 2 – Joanna Radin

> *I feel obliged to tell you of an old saying: "If a woman can't make a kugel – divorce her." I disapprove of this.*
>
> Leo Rosten, *The Joys of Yiddish*

I had already been married to Matthew for three years when his parents, Lesley and Ronny, gifted me *Still Cookin' After All These Years*, a cookbook produced in honor of the 75th anniversary of their Jewish Community Center in Binghamton, New York. The book had been published in 2003 by Morris Press Cookbooks of Kearney, Nebraska, which claims to be "The Number One Publisher of Cookbooks in America." Accordingly, it bore the trademark binding and standardized formatting that facilitated the compilation of recipes that otherwise existed on stained scraps of paper, bent index cards, or in the muscle memory of their makers. In 2010, Matthew was a newly minted medical doctor – that sought-after species of American Jewish masculine achievement. His mother was anxious that he should remain well fed. The inscription in *Still Cookin'* made it clear that I, his wife, was to do the feeding. Out of resentment and pride in my own journey towards doctorhood, albeit as a historian of medicine, I stowed the book on a high shelf with no intention of using it.

Many more years later than any of our parents would have wished, Matthew and I had a son. He turned one in March of 2020. In that first season of COVID, cut off from family, as well as our workplaces, Mark – a dear friend we had shared for nearly 20 years – came to live with us for a while. Three doctors (two of us PhDs) and a baby. My own expertise suggested to me that the pandemic and its consequences would stretch far beyond spring, as had the 1918 influenza a century earlier. For the first time in nearly a decade, *Still Cookin'* spoke to me, offering to feed my hunger for connection. Together, we baked our own *challah* to celebrate the Sabbath – as much a means of marking the otherwise undifferentiated time of quarantine as for braiding the queer family we had effectively become.[3] Lauren Epstein's challah recipe became one of the first solid foods our son learned to enjoy.

[3] Theologian Abraham Joshua Heschel's (1951: 2) depiction of the Sabbath as an "architecture in time" directly informed our efforts to seek solace from temporal disorientation in ritual.



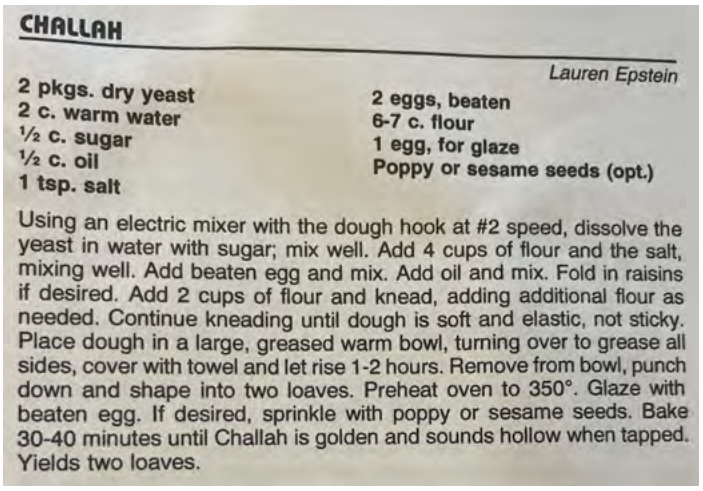
2010

Dear Joanna,

Our JCC has always been Matthew's home away from home. Have fun experimenting with these recipes, many contributed by people he has grown up knowing.

Bon Appetit!

Lesley + Ronny



CHALLAH

Lauren Epstein

2 pkgs. dry yeast
2 c. warm water
½ c. sugar
½ c. oil
1 tsp. salt
2 eggs, beaten
6-7 c. flour
1 egg, for glaze
Poppy or sesame seeds (opt.)

Using an electric mixer with the dough hook at #2 speed, dissolve the yeast in water with sugar; mix well. Add 4 cups of flour and the salt, mixing well. Add beaten egg and mix. Add oil and mix. Fold in raisins if desired. Add 2 cups of flour and knead, adding additional flour as needed. Continue kneading until dough is soft and elastic, not sticky. Place dough in a large, greased warm bowl, turning over to grease all sides, cover with towel and let rise 1-2 hours. Remove from bowl, punch down and shape into two loaves. Preheat oven to 350°. Glaze with beaten egg. If desired, sprinkle with poppy or sesame seeds. Bake 30-40 minutes until Challah is golden and sounds hollow when tapped. Yields two loaves.

← A loving inscription from in-laws to author. Photo: Joanna Radin, 2025.

→ Challah *recipe, an architecture in bread.* Photo: Joanna Radin, 2025.

Summer turned to autumn and Matthew started pining for kugel, the comfort casserole of his youth. I had never developed a taste for this squishy casserole, and encouraged Matthew to satisfy his own yen. Still Cookin' came down off the shelf once again. Unlike the challah, which garnered only one entry, there were nearly twenty recipes for kugel. The sole ingredient they shared was eggs, ranging from one to eight, a binding agent for infinite permutations of carbohydrate. He landed on "Very Rich Kugel," the sole kugel recipe supplied by a man – indeed it was one of the only recipes in the whole cookbook not contributed by a woman. Matthew claimed it was purely the promise of decadence that hailed him, but I could not help but wonder if there were other forms of recognition at play.

If a man cannot make kugel for himself, find him a cookbook with evidence of one who can.

Scene 3 – Us

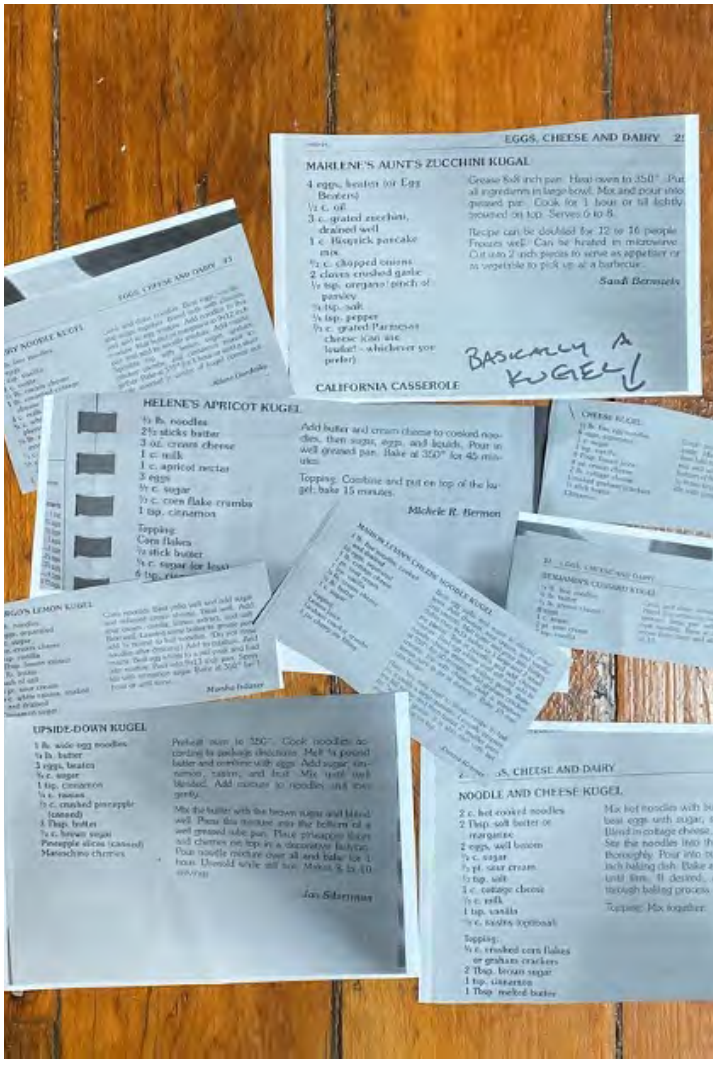
During the summer of 2025 we found ourselves in the Green Mountains of Vermont. Mark's wife Leah and daughter Orly, beautiful additions to the family we have been weaving, had gathered to practice what have come to be known as 'earth skills' in a setting overlaid with Jewish teachings. Weaving was more than a metaphor, given that Leah had recently returned from a weaving class at a folk school in North Carolina, her loom in tow. It was Leah who had brought us to this gathering, called in Hebrew *Melacha U'vracha* (**הכרבו הכאלמ**, 'The work of our hands and the blessings they bring'). Mark's parents had been in and out of the hospital all summer, while Matthew was stranded there as an on-call physician. We were tired but also hungry, in need of practices that would help us feel more alive, a part of something bigger than our individual struggles.

As we sat around a makeshift kitchen table on the side of a mountain, Mark guided us in the preparation for pickling of fruits and vegetables harvested from his garden. "What recipe are you using?" asked one of the organizers of the gathering. As my six-year-old son, Raphi, gained confidence peeling carrots and chopping cabbage, Mark

replied that the recipe, not actually found in any of the community cookbooks we have come to treasure, was simply in his head and in his hands. We were fermenting – making culture out of life – and preserving that knowledge in the form of food to eat when we were no longer co-present.

The recipes in the community cookbooks we reached for were interventions of a previous generation in the flow of time, efforts to preserve moments where knowing hands and heads might not be accessible. What it has meant to be Jewish in community is different for us from what it was for our parents. Community cookbooks preserve a snapshot of a much messier and dynamic past, available for life in diasporas of space and time. What kinds of records will we leave from our own efforts at making community? It is our deepest wish that our children know how to nourish their bodies as well as their souls, even if those lessons are not spiral bound.

Scene 4 – Two Community Cookbooks, 29 Kugel Recipes



← *20 from* Still Cooking After All These Years.
Photo: Joanna Radin, 2025.

→ *9 from* Culinary Creations.
Photo: Mark Stern, 2025.

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Cite as:

Radin, Joanna and Mark Stern. 2025. "Community Cookbooks and the Remembrance of *Kugels* Past." *Roadsides* 14: 61-67. https://doi.org/10.26034/roadsides-202501408

Pedagogical Provocations

1. How did these cookbooks constitute a sense of community? Are there contemporary examples of artefacts that do the same?

2. What kinds of experiences do cookbooks make possible beyond the opportunity to prepare a recipe?

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ISSN 2624-9081 • DOI 10.26034/roadsides-202501409

Food, Solidarity and Infrastructure

Vanessa Lamb and Zali Fung

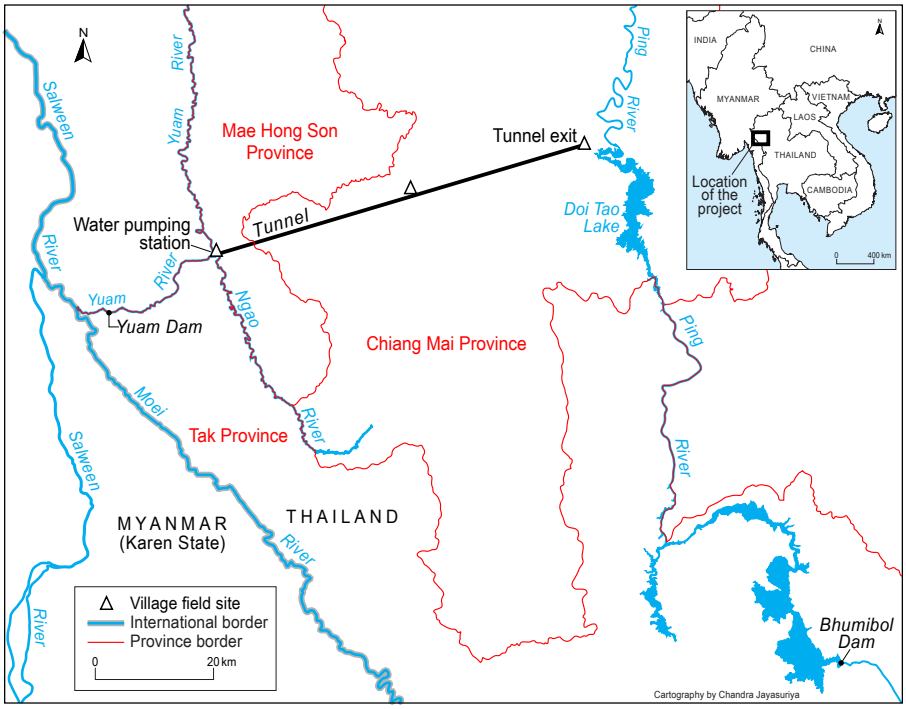
Introduction: Making Food, Infrastructure and Solidarity

Along the Salween River-border between Thailand and Myanmar, state-led infrastructures such as long-proposed hydropower dams and water diversions threaten to displace Indigenous Karen residents from land and livelihoods, including their capacity to cultivate and provide food. A key aspect of contesting these infrastructures in the making includes work undertaken primarily by women to feed and sustain large anti-dam gatherings, including on the annual International Day of Action for Rivers, or International Rivers Day. This entails extensive preparatory labour to source and prepare food in relatively remote communities and for hundreds of attendees. In this contribution, we highlight how the social networks around food and food provisioning for community and social movement gatherings forge alternative infrastructures. In a context of rising authoritarianism, we contend that the networks and socio-political spaces fostered through food function as "solidarity infrastructure" (Tazzioli 2021: 606) between multiple communities in Northern Thailand and across the Salween River Basin.

We approach infrastructure as a social and material technology that is always in the making. This is important for our analysis because it reveals how infrastructure is a "living mediation of what organises life" (Berlant 2016: 393) and how it requires ongoing care and engagement—by a range of actors—for establishment and continued use (Domínguez-Guzmán et al. 2022; Lamb 2025). In doing so, we show how communities forge new social and material infrastructures including the networks, expertise, labour and logistics for providing and preparing food. For example, women mobilise existing networks to source rice to feed hundreds of people. We demonstrate how this is accomplished not only as utility, but as a form of solidarity.

We build on Tazzioli's idea of "solidarity infrastructure," which underscores not only how infrastructure is in the making, but how citizens enact solidarity with/for migrants and asylum seekers using infrastructural tools (2021: 603). Tazzioli reveals how, in the French-Italian alpine border region, citizens provide and maintain "mobile infrastructures of solidarity across the border" including temporary shelters for rest, clothing for cold weather and provisions (604). These longstanding transversal alliances and solidarity between migrants and citizens are obscured by rising anti-migrant rhetoric in Europe.

Extending this work, we focus on food for its potential to bring people together, and food provisioning across borders as an act of reciprocity and solidarity. For Ahmed (2004: 216), solidarity "involves commitment, and work, as well as the recognition that even if we do not have the same feelings, or the same lives … we do live on common ground." This approach recognises that solidarity is built over time and based on trust, reciprocity, relationships, and in our case, via the solidarity infrastructures that coalesce around food.



This map shows the Yuam River water diversion in Thailand, including dam site, water-pumping station and tunnel. The Yuam is part of the Salween Basin. Cartography: Chandra Jayasuriya.

Context and Methods: Research at the Salween River Basin

Along the Thai-Myanmar border, political context shapes the way that borderland residents respond to infrastructure development, as well as how they make food and enact solidarity. Both Myanmar and Thailand are currently under authoritarian rule. Myanmar has experienced several decades of military rule since independence, and an ongoing civil war since a coup d'état in 2021. Thailand was under miliary rule from a coup in 2014 until contested elections in 2023, the results of which left the country with a "culture of dictatorship." At the border, physically gathering in large numbers poses differentiated risks—for instance, stateless residents risk jeopardising their citizenship applications by overtly protesting state-led development. But to suggest that residents are not speaking out or resisting under such conditions overlooks the range of ways this happens. This includes ceremonies that enable people to gather and express concerns about infrastructure development in a manner that can entail less risk than overt protest (Fung and Lamb 2023).

Our analysis draws on fieldwork, primarily interviews and participant observation with Salween residents, conducted independently and together by the co-authors in the Thai-Myanmar borderlands from 2021 to 2024. Here, Indigenous Karen residents' livelihoods include subsistence agriculture, collecting edible plants and fishing, alongside growing cash crops such as konjac and soybeans. Many depend on the river for food and to earn a living. The current government proposals for dams and water diversions in the borderlands are largely extractive and would displace residents from their land, rivers and livelihoods.

A meeting point where community members gather to cook and share food, and where we conducted interviews. We have not included photos showing faces for confidentiality reasons. Photo: Vanessa Lamb.

In the Salween Basin, hydropower dams and water diversions have been proposed and resisted by communities and civil society actors for several decades, and they remain unbuilt (Fung 2024). The most recent infrastructure proposal, the Yuam River water diversion project, would divert water from a dam on the Yuam, part of the Salween River Basin, to Central Thailand's Bhumibol Dam, primarily for irrigation. This infrastructure would serve those in the center of the country, rather than develop local economies or support borderland communities. It would have major implications for several villages and protected forest areas across Northern Thailand; research by impacted communities shows substantial impacts on their way of life, including changes to river and land access as well as agriculture. For instance, the water diversion would alter the timing and predictability of seasonal water flows and negatively influence residents' ability to fish and collect shrimp in small streams (Sitthikriengkrai et al. 2025: 127). Despite these challenges, we see borderland residents enact solidarity infrastructure, particularly in the work and logistics of preparing and sharing food for gatherings, including larger gatherings on International Rivers Day.

Shrimps are collected from small streams connected to the Yuam River for daily subsistence and for events like International Rivers Day. Here, a visitor holds their catch.
Photo: Vanessa Lamb.

Women's Food Preparation for International Rivers Day Gatherings

In March 2022, we joined activities for International Rivers Day, including women's food preparation. The event took place in a village community located alongside the Yuam River that would be directly impacted by the Yuam diversion. Visitors included NGO staff, urban Thai citizens, students and researchers, including us. Across the Salween Basin, on both sides of the border, and globally, communities host gatherings on International Rivers Day to celebrate rivers and challenge unjust development, including the dams and diversions proposed for the Basin. The locations for this event in the Salween can shift each year depending on where focus and solidarity are most needed.

The cooking team plays an important role in the event. As Sorn[1], a young Karen woman and environmental defender explained, "The food team is big because 300-500 people come and we need to cook lunch. The year I joined, the cooking team woke up at 3am to cook." The menu included fried chicken, chilli paste and sticky rice.

Sorn explained that food provisioning entails extensive preparatory labour to source and prepare food in relatively remote communities and for hundreds of attendees. It is thoughtfully planned in advance by the cooking team, who are Indigenous Karen women. They must collectively decide which dishes to cook, and this depends upon the funding available for ingredients as well as visitors' palates. Ingredients are sourced locally and in fresh markets. This requires knowledge and skill but also access to different types of infrastructures in order to provision and prepare the food – roads,

← Some dishes, like sticky rice wrapped in plastic or bamboo, are convenient to serve large numbers of guests but take time to prepare.
Photo: Vanessa Lamb.

→ On International Rivers Day, makeshift signs such as this paper plate are hung to show solidarity with those in the community impacted by the proposed water diversion.
Photo: Vanessa Lamb.

[1] Sorn is a pseudonym, as are all the names used in this article.

Boats docked at the Thai–Myanmar border ready to carry rice along the Salween River. Food provisioning at and across the border requires both social and logistics networks.
Photo: Vanessa Lamb.

a vehicle, an outdoor area for makeshift communal kitchen, and large pots. The work is voluntary and often undertaken at night and in the early morning prior to the day's protest activities. Similarly, Wijunamai (2022: 37) positions women's cleaning and care labour as "invisible logistics … behind the scenes."

Oma, a middle-aged woman and member of the cooking team, explained that the Yuam diversion would impact their ability to provide food: "I am so proud to live like this… That's why I don't want the dam to happen. If they build the dam, it will be hard for me to find all these ingredients."

Across our various interviews, the women emphasised that they "help each other out" and see food preparation as a way to connect with other women in the village. Reciprocity—expressed via food provision—extends to Karen residents and the visitors who come on International Rivers Day to support residents' struggles. Jane, preparing food the evening before the next day's activities, explained: "People come from many places, and we want to welcome them and make them feel supported. In this area, it is not easy to find food [for visitors]."

Jane highlights that sourcing enough food in the area to feed hundreds of visitors and match their tastes requires knowledge and skill. Because it can be difficult to source and prepare so much food, women spend a good deal of time planning meals and

travelling to source ingredients. These efforts draw on and strengthen existing Karen networks and bring together a range of people, both Thai and those from elsewhere, in the struggles over infrastructure development and the future of the river. Such collective effort constitutes a form of emergent solidarity infrastructure. Moreover, the hard and soft infrastructures involved in provisioning food are key to making the gatherings happen, and as noted, this is undertaken in a context of limited external or state-led infrastructural support.

In sum, Karen women's food provisioning and preparation enacts solidarity both within and between Salween and Northern Thai communities who are contesting the Yuam diversion and their exclusion from development decision-making. Serving food at large anti-dam gatherings brings together diverse individuals and groups with shared commitments. Many women positioned sharing food and cooking as their way of participating in a movement contesting dams and diversions, even if in a less overt way—because, for instance, they are stateless and less confident to speak out against state-led development.

Overlooking this work would miss a key expression of solidarity and contestation of infrastructures in the making: the work by Indigenous women to support a movement and sustain a cross-border network. As Soe emphasised, food is important for bringing together hundreds of residents and visitors, "If we didn't have food, people would be hungry and leave right away!"

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Acknowledgements:

Thank you to the residents of the Salween River Basin who took time to speak with us about their struggles and work to forge alternatives. Vanessa Lamb would like to thank Anne Décobert for our critical conversations about the meaning of solidarity and Fanqi Liu for introducing her to food as infrastructure. Zali Fung would like to thank collaborators, including Mueda Nawanat, Sanya Arora, and members of the People's Network of the Yuam, Moei, Ngao, and Salween River Basin, for their time and support during fieldwork. Thank you to the editors, Matthäus Rest and Dolly Kikon, for crafting a compelling call for papers and for guiding our work.

Cite as:

Lamb, Vanessa and Zali Fung. 2025. "Food, Solidarity and Infrastructure." *Roadsides* 14: 68-76. https://doi.org/10.26034/roadsides-202501409

Discussion Questions

1. What sorts of social networks and spaces form around food, or are required to provide and provision food in the Salween Basin/Thai–Myanmar border?
2. In what ways is food, its provision and preparation important for solidarity?
3. Student reflection: What visible and less visible infrastructures enable food and food provision that you see in your own life?

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ISSN 2624-9081 • DOI 10.26034/roadsides-202501410

The Brave Rice:

Reimagining Indonesia's Agricultural Waterworks

Inditian Latifa

Salbiah's rice field lay lower than most. It was September 2024, and even after a long dry season, water still pooled across its surface. "I couldn't plant any rice this year," she observed with frustration. We stood amidst marshland off the Peusangan River on Aceh's east coast, where the landscape had been partly remade into rice fields under Indonesia's food estate program, which cast flood-prone areas as "slumbering giants" (*raksasa tidur*) to be awakened through planting. For such terrain, officials promoted Inbrida Padi Rawa (in short, Inpara) rice, a later generation of Green Revolution varieties bred to grow tall and endure flooding. "But it's still scared of water when there's too much," Salbiah quipped. With no canals or drainage channels, water in her area often rose beyond Inpara's tolerance range. By contrast, she recalled Si Muà, a deepwater rice once common here, now disappeared. Its name in Acehnese means 'the brave,' for the way it fearlessly kept growing taller to match rising floodwaters. This essay traces the disappearance of deepwater rice along the Peusangan through memories of Si Muà, recounted as fields flood without functioning infrastructure. These recollections reveal water management in agriculture as emerging not only from built waterworks but also from the adaptive relations between rice and water, now largely undone by the logics of capitalist development.

Inundated low-lying rice field, bordered by marsh vegetation, Aceh.
Photo: Inditian Latifa, 2024.

Rice and Infrastructure

With tens of thousands of varieties, *Oryza sativa*, sometimes called Asian rice, has always been more than food. It has shaped social and ritual life, placemaking processes and projects of collective identity (Bowen 1993; Fox 1997; Ohnuki-Tierney 1993). It has long figured in the power schemes of states (Scott 2009), a dynamic intensified by the US-promoted Green Revolution of the mid-twentieth century, which introduced varieties whose survival depended on state-capitalist technoscience, including hard infrastructure (Shiva 2016). Extending critiques of technoscientific projects, a strand of scholarship rethinks infrastructures built for and by humans as also emerging from the entangled relations of plants, animals, spirits, soil, and other elements (Jensen and Morita 2016). Deepwater rice, a subgroup of *O. sativa* that inherited stem-elongating traits from wild perennial grasses, is especially good to think with in this regard (Catling 1992). In Thailand's Chao Phraya catchment, for instance, Atsuro Morita (2017) demonstrates how small patches of cultivated deepwater rice help mitigate flood risks to Bangkok, revealing flood control as a "multispecies infrastructure" in which rice plays an active part.

In the riverine floodplains of Aceh's east coast, farmers once cultivated several varieties of deepwater rice (*padé paja*), of which Si Muà was one. Rather than in embanked fields (*sawah*), this rice was cultivated in open patches where weeds mingled with the crop, making it easy to mistake the patches for nothing more than marsh. Much like elites'

condemnation of swidden agriculture in the uplands as irrational and uncontrollable (Dove 1985), this mode of cultivation in the lowlands was portrayed in the eighteenth-century Acehnese epic *Hikayat Pocut Muhammad* as slack and disorderly farming (Siegel 1979). Two centuries later, the Bimas (*Bimbingan Massal*, or mass guidance) program sought to reform these "traditional" practices by promoting state-approved rice varieties (McVey 1990). Farmers in Aceh, however, note that state-backed rice, bundled as it is with fertilizers, pesticides and credit, arrives before the requisite canals or channels – gaps in timing that have turned the promise of modernity into "infrastructural violence" (Rodgers and O'Neill 2012). Yet from within these very gaps, memories of deepwater rice that survived without infrastructural support resurface. Like memories of lost foods under modernity more broadly, they can form the basis for political critique while making different configurations of infrastructure visible (Seremetakis 1994; Carse and Kneas 2019).

The Work of Elongation

One morning in September, I went with a group of women from a village bordering the Peusangan into one of the marshes, barefoot but for knee-high football socks, a modest armor against freshwater leeches. They were gathering *binyeut*, a sedge used for weaving, to meet a commissioned order of handwoven bags as corporate merchandise from Pupuk Iskandar Muda, a state-owned fertilizer company. As we searched for a good patch, my foot struck a firm strip of earth, just high enough to catch a step or snag a canoe. The women explained that it was the remnant of a village-funded

The marsh rewilds, leaving the embankment barely discernible, Aceh. Photo: Inditian Latifa, 2024.

embankment, later submerged when the Peusangan breached in 2017. I knew of this flood from stories of an important bridge that had washed away on the road between Aceh and North Sumatra, though I had not realized the water reached this far. They reminded me the waters here had in fact risen from below, part of a marshland-river continuum, a "fluid space" of surface flows and underground capillaries (Steinberg and Peters 2015). This diffuse hydrological space, never fully containable, is what built agricultural waterworks and Inpara must constantly contend with.

From these flooded fields, some farmers wait or lobby for waterworks, others sell. Still others speak of the history of deepwater rice cultivation in this landscape. They reference Si Muà, but also Manyang Meuhamboe and Manyang Röe, each remembered for its distinctive sensory qualities, but, most notably, its shared ability to elongate with rising water. "I'd ride in a canoe with my grandmother to check on the rice after the high waters. We didn't have irrigation back then either," Salbiah recalled. "The rice would be there, only taller. The other grasses drifted away." Evoked in a flood-prone landscape without built waterworks, Salbiah's memory gestures toward a relational understanding of water management grounded in the interplay between rice and water, where management arises not through external waterworks but through the plant's capacity to keep elongating and adjusting with hydrological rhythms. In this sense, elongation shares with built waterworks the infrastructural capacity to work with and manage water, yet does so through adaptive living rather than through inert architectures of control.

Metal sheet piles harden the Peusangan's banks, transforming its flood dynamics, Aceh.
Photo: Inditian Latifa, 2024.

A sketch by Acehnese artist Muhammad Darwin, depicting marshes during the civil war.
Photo: Qurratul Aina, 2025.

The Making of Disappearance

How did deepwater rice disappear from the Peusangan floodplain? Alongside state-backed Green Revolution reforms, farmers often point to the civil war between the Free Aceh Movement (*Gerakan Aceh Merdeka*) and the Indonesian state from 1975 to 2005, when the marshlands became both refuge and battleground, later depicted in Acehnese writer Ida Fitri's novel *Paya Nie* (2024). In those years, farmers generally stayed away from the marshes. Yet the rice's disappearance also followed prevailing ideas of what made some kinds of rice more valuable than others—commercially, ritually, and socially. Farmers recalled Si Muà's thin, narrow grains, which when cooked were firm, less sticky than popular varieties, and had a coarse, nutty mouthfeel with an aromatic scent when cooked. It was everyday rice, eaten at home, but had little market demand and was never served at *kandoeri* feasts for weddings, births, funerals, or other ceremonies, where rice from *sawah* was preferred for being sweeter, softer, fuller, and more presentable (*pantas*). As one farmer put it, everything that came from the marsh back then, even the fish, like snakeheads (*bacee*), was considered lowly.

At the same time, the disappearance of deepwater rice needs to be understood through broader and longer transformations of the Peusangan's riverscape and hydrology. Industrial water intake facilities have lined its banks since the 1980s, their pipelines leading to factories, ports, offices, and housing in nearby Lhokseumawe, known in the late twentieth century as Petrodollar City, a name earned during the gas boom. In doing so, the riverbanks have been hardened in various sections, from metal piling to concrete lining, continuing a history of efforts to "normalize" the Peusangan's flow. In the early twentieth century, for instance, Dutch engineers canalized this stretch to its outlet at the Malacca Straits in an effort to protect the railway lines and roads running along Aceh's east coast from encroaching water during the colonial occupation. These interventions exemplify what Anna Tsing et al. (2019) call "modular simplifications," the streamlining of ecological complexity in the name of control. They transformed the Peusangan from a slow, braided river—its main channel, as one farmer put it, "only as wide as a betel nut tree split in half"—into a fast, linear channel, bringing fewer but more destructive floods and disrupting the hydrology for deepwater rice patches.

Dutch-built railway line partially washed away during the Peusangan's breach in 1902. Collection Wereldmuseum Coll. nr. TM-FV-0096-2953, Amsterdam.

From Inpara to Raskin

With deepwater rice gone, farmers in Aceh have grown dependent on hard-engineered agricultural works, long accessible mainly to wealthier or more resourceful rural residents since Indonesia's early Green Revolution (Stoler 1977; Winarto 2004). Inpara, though bred to be tall, cannot match Si Muà's elongating capacity without sacrificing yield, as taller plants divert more energy to stems than to grain. This trade-off sits uneasily with the state's push for capitalist rice production, even in regions like Aceh, where only some areas were historically commercial rice-growing zones (Andaya 2008). Yet for farmers like Salbiah, deepwater rice was never about producing abundance but about the assurance that there would always be rice at home, come high water or not. "These days, if you don't have rice from the fields, there's Raskin," she chuckled.[1] Alongside such wry reflections on what rice farming has become, the memory of Si Muà endures, holding open other relations with water foreclosed by dominant assumptions and norms about agricultural waterworks.

[1] Raskin (Beras untuk Rakyat Miskin, or Rice for the Poor) is a government assistance program that supplies rice to low-income households.

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Cite as:

Latifa, Inditian. 2025. "The Brave Rice: Reimagining Indonesia's Agricultural Waterworks." *Roadsides* 14: 77-85. https://doi.org/10.26034/roadsides-202501410

Exercise: Drawing Rice Farming

Picture the countryside many Indonesians grow up drawing: two mountains on the horizon, the sun between them, and a road cutting through neat grids of rice fields. The rice field suggests order, whereas the rice patch marks disorder. On a blank page, draw both rice fields and rice patches. You might find one easier to draw than the other. What might that difference tell us about how we picture control, water and growth?

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ISSN 2624-9081 • DOI 10.26034/roadsides-202501411

On (De)composing Mulch:

Growing Soils and Autonomy

Carlotta Molfese

It's 2025, and as I lift the thick layer of woodchip mulch laid out at the bottom of an apple tree, a lively scene is suddenly interrupted.[1] A worm tries to wiggle its way back into the soil; a group of woodlice disperses frantically away from the light; and several beetles and spiders scurry back into the darkness. In one corner of the uncovered ground, I notice a few white fuzzy filaments of mycelium spreading across the woody debris. The soil underneath the woodchips feels damp and cool. A moist, earthy smell arises from it, revealing the millions of bacteria and other microorganisms not visible to the naked eye that make this their home.

[1] ***For a similar scene unfolding beneath a mulch layer, watch this video.***
Video: Carlotta Molfese, 2022.

Seven years earlier, I would have not encountered this bustling "underground city" (Tsing 2011: 5). In fact, an act as seemingly gentle as planting a seedling would have caused my fingers to bleed. Back then, the soil of my smallholding was severely compacted and highly unproductive. In the first couple of years it was incredibly difficult to grow any food without the use of mechanical means, plus enormous amounts of water and external inputs like fertilizers and pesticides.

In this photo-essay about mulch and its (de)composition, I reflect upon my practice and experience of growing soil with mulch as a way to explore the relationship between infrastructures and autonomy in agroecological food production. I do so by conceptualizing mulch as a multispecies infrastructure (de)composed by agroecological farmers and billions of soil organisms, and by attending to the material and affective exchanges between humans and nonhumans that mulch enables. Framing mulch as a multispecies infrastructure allows us to challenge notions of autonomy as an exclusively human achievement by revealing the more-than-human relations and collaborative practices that contribute to it.

***←** Woodchip mulch under an apple tree.*
Photo: Carlotta Molfese, 2020.

***→** Growing soil with mulch.*
Photo: Carlotta Molfese, 2024.

The particular soil ecology in question lies at the foothills of a mountain in southern Italy, in an area that has been subject to land degradation for some time (Forino et al. 2015). Soil damage here has been fueled by socioeconomic policies implemented over the last century to modernize and industrialize agriculture. In this montane ecology, with its steep slopes, shallow clay soils and rocky terrain, the adoption of productivist agricultural models and technologies such as tractors, tillers, synthetic fertilizers and pesticides, have caused the depletion of soils through processes of erosion, pollution,

← Deep cracks running through the earth, showing signs of desertification and salinization due to poor drainage, overfertilization and lack of biological activity in the soil.
Photo: Carlotta Molfese, 2019.

→ Bare patches where no vegetation grows expose the ground to the beating sun.
Photo: Carlotta Molfese, 2019.

removal of organic matter and loss of biodiversity. As the photographs below demonstrate, the wounds left by these developments were physically inscribed in the tough and unproductive tilth I encountered when I first started farming this land.

As soil degrades and loses its fertility, farming becomes increasingly reliant upon mechanical and chemical inputs: tractors and tillers are needed to break the hard pan and allow better water infiltration and aeration; water requirements intensify; pesticides become vital for the prevention of fungal and bacterial diseases; and synthetic fertilizers are necessary to feed crops (Gliessman 2007). This, in turn, locks farmers into relationships of dependence with agrochemical companies and their products, along with outside expert knowledge, as well as state and non-state infrastructures for water and other inputs (e.g. fossil fuels). These conditions ultimately reduce farmers' autonomy in decision-making and in action, inhibiting their ability to take care of the land by farming it the way they see fit, and diminishing their resilience to climate change and infrastructural failures (van der Ploeg 2010; Diković 2025).

It is in the context of this exhausted soil undermining my autonomy as a grower that I began to think about and experiment with mulch.

Mulch is generally known as material used in gardening and agriculture to insulate, protect and enrich soils, but what if we were to think of it as a multispecies infrastructure for actually growing the soil? What would such a conceptualization reveal about the relationship between farmers and their soils, and the kinds of infrastructural interventions needed for their autonomy?

A mulch may be created with a variety of organic and inorganic materials, many of which can be produced on the farm, gathered for free or acquired cheaply. Some of the materials I have used include cow manure from neighbouring farms, discarded leaf-litter and grass clippings from the village, cardboard boxes from local shops, ash from my woodburner, self-produced compost and woodchips, cover crops and more. Each of these mulches has its own material specificities, but they all perform some key basic functions, including shielding the soil from climatic extremes, protecting it from erosion and compaction, absorbing and retaining water, and adding organic carbon and nutrients.

Collecting tree prunings to make woodchip mulch. Photo: Carlotta Molfese, 2020.

However, a mulch is also more than the sum of its materials. As an agroecological practice, mulching has a long and diverse history, having been widely employed by farmers as a flexible and informal strategy to manage their land and resources sustainably without, and despite, the state and other external actors (Gliessman 2007). By recycling and reusing agricultural by-products – such as animal manure, crop residues and tree prunings – as mulch, farmers sponsor their own soil fertility and enact an ethic of care for the land which is fundamental to their identity and sense of autonomy (Diković 2025). *Hojarasca* ('leaf-litter') (Lyons 2020), lithic mulches (Lightfoot 1996), "slash/mulch" practices (Thurston 1997) and living mulches (Paine and Harrison 1993) are just some of the mulching compositions assembled by farming communities across the world to maintain their soils and their livelihoods.

Cardboard and cow manure mulch applied between rows of crops. Photo: Carlotta Molfese, 2019.

Living mulch (cover crops) protecting the soil against erosion while increasing biodiversity. Photo: Carlotta Molfese, 2019.

Besides humans assembling and applying mulch to soils, the composition of this infrastructure brings other players onto the scene. Beneath the mulch layer, bacteria, fungi, protozoans, nematodes, earthworms and many kinds of arthropods all gather and begin an energetic feast. They start shredding and chewing, extracting and consuming, digesting and shitting, digging and burrowing, and eventually they die and decompose. Through these cycles of growth and decay they transform, transport and exchange elements and molecules across a vast network of microscopic life in the soil.

It is by way of this more-than-human co-performance of (de)composition in which mulch materials are collected, broken down and exchanged, that soil is grown. The following photographs show some of the nonhuman beings active in mulch (de)composition, revealing it as a multispecies infrastructure in which humans and nonhumans work together towards a common goal: creating a habitat to support their way of life – the very soil itself (Puig de la Bellacasa 2019).

Unlike the use of synthetic inputs, the act of mulching encourages a more embodied and situated engagement with soils. If farmers are able to become experts in the unique ecology of their soil, they can rely less on agrochemical products and better utilize their knowledge of how to grow food while taking care of the land and its resources. Mulch is thus not so much a tool but a material intermediary, one that allows farmers to work with soil organisms to cultivate autonomy.

← Larvae of the rose chafer beetle (*Cetonia aurata*) living in and decomposing mulch.
Photo: Carlotta Molfese, 2019.

→ Yellow slime mould growing on and decomposing woodchip mulch.
Photo: Carlotta Molfese, 2022.

Composting worms breaking down cow manure.
Photo: Carlotta Molfese, 2025.

After seven years of (de)composing various mulches on my smallholding, the soil ecology has begun to change and so has my autonomy as a grower. The soil has become darker and crumblier, a more diverse vegetation is beginning to grow, and under the sheltering darkness of mulch a vibrant soil community has formed. Assembling mulch has also instigated new relations and collaborations with neighbouring farms, provoking conversations and the sharing of knowledge and practices. Moreover, these new social and ecological relations have allowed me to alter my farming practices and resource use. I now require significantly less water to irrigate my crops, I spend less time weeding, and the work of tilling and fertilizing the land is carried out with a regenerated and diverse soil community.

Undoubtedly, assembling mulch can often entail physically hard work, and the benefits it generates are not as immediate as when using synthetic fertilizers or weedkillers. Many farmers are also constrained in their choices by regulations, markets and other financial mechanisms, and mulch – on its own – cannot address these wider structural issues. Nevertheless, investing time and effort in managing resources and growing soils with mulch can also bring a sense of fulfilment and the dignity that comes with autonomy. It was certainly rewarding for me to observe the soil community at work and how it changed over time, seeing trees and crops getting stronger and less thirsty thanks to mulch, and being able to produce and eat healthy food through this (de) composition work.

The material politics that mulch enables is thus one of rearrangement and recomposition, rather than opposition and contestation (Papadopoulos 2018). It is by readjusting the flows of energies and materials within an agroecosystem and by nourishing human–soil relations that mulch can reconfigure the political and economic space of action for food producers. This "minor" (Barua 2023) account of a multispecies infrastructure might not satisfy some interpretations and readings of infrastructural politics. Transformation here occurs literally underground, and it is necessarily slow, being reliant upon and adjusted to the more-than-human needs and temporalities of soil (Puig de la Bellacasa 2019). Nevertheless, reframing mulch from a passive material substrate to a multispecies infrastructure encompassing "unknown, overlooked and undervalued worlds of non-human species" (Morita 2017: 754) recognizes the more-than-human relations and practices that are key to the survival and autonomy of many human collectives. In the case of agroecological food production, growing soil is a way of growing autonomy, a process that starts and ends with the work of (de)composition, and one that can be facilitated by mulch.

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Cite as:

Molfese, Carlotta. 2025. "On (De)composing Mulch: Growing Soils and Autonomy." *Roadsides* 14: 86-94. https://doi.org/10.26034/roadsides-202501411

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Roadsides is a diamond Open Access journal designated to be a forum devoted to exploring the social, cultural and political life of infrastructure.

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ISSN 2624-9081

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Swiss National Science Foundation
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