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Revival and Survival: is the British cut flower industry prepared for a 2-degree warming world?

Written by:
Roisin Taylor NSch

February 2025

A NUFFIELD FARMING SCHOLARSHIPS REPORT

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A NUFFIELD FARMING SCHOLARSHIPS REPORT (UK)

Date of report: February 2025

"Leading positive change in agriculture.
Inspiring passion and potential in people."

Title	Revival and Survival: Is the British cut flower industry prepared for a 2-degree warming world?
Scholar	Roisin Beck Taylor
Sponsor	John Oldacre Foundation
Objectives of Study Tour	1. Understand the scope of the British cut flower sector in 2024 2. Understand whether the British cut flower sector is are prepared for a 2-degree warming world 3. To meet farmers and growers on the front line of climate change to understand what solutions might exist to help prepare farmers and farming businesses for the impacts of climate change.
Countries Visited	New Zealand, Kenya, Netherlands, UK
Messages	The British cut flower sector is disjointed and struggling to survive against the competition of imports. However there are huge opportunities for growth under the 'British' label, as seen in supermarkets and progress of groups like Flowers From The Farm. We need a growers' body that acts as a voice for the whole sector to challenge imports, advocate for policy change and push for further brand recognition for British flowers. Climate adaptation can be best achieved at an 'on-farm' level, with farmers leading the way and helping their communities adapt too. To do this well, we need to facilitate knowledge and exchange groups who share best practice and help one another in times of climatic extremes.

	British cut flower growers must not fall behind on the uptake of Integrated Pest Management (IPM) agroecological growing methods and energy reduction compared to our European counterparts. Transparency in the British cut flower sector may be a further market benefit compared to imports.

Executive summary

Britain is a nation of cut flower lovers in a rapidly warming world. The UK market for fresh flowers and indoor plants is valued at £2.2 billion, but only approximately 10% of that is grown in the UK. Since the 1980s, our national cut flower industry has been in a steep decline. In the 1970s, more than 120 chrysanthemum growers produced approximately 60 million stems a year. Today, there are no chrysanthemum growers left.

What happened to our cut flower industry, and how can growers survive in the face of a 2-degree warming world? Against the backdrop of a powerful $9.6 billion global industry, and the flower markets of Holland out-competing UK growers on price, what would it take for them to truly thrive? A 2-degree warming world means increases in pests and disease, unpredictable temperature extremes, flooding and droughts, but so far the flower growing sector has focused solely on emissions reduction. Where is the discussion about resilience, future proofing, and adaptation?

My Nuffield study, kindly made possible by the generous support of the John Oldacre Foundation, seeks to understand the opportunities that climate change presents, from floral production methods, to knowledge and exchange, to ways to survive climate related shocks.

Travels that took me by bike, train, boat, plane, car and foot to the Netherlands, Kenya, New Zealand and around the UK, meeting micro to macro producers, campaigners, scientists and leaders across various industries. I found answers to resilience that lay in how communities respond to emergencies and how they exchange and share knowledge. I discovered that the ideal place for climate adaptation is on a farming scale where farmers feel empowered to take action with the knowledge and research to back up their decisions, and with financial incentives from governments. This was ultimately a lesson of hope and opportunity rather than a counsel of despair.

Meeting growers in the UK was both sobering and motivating. As one grower put it, “Our challenge is not to get us from 90% imported to 50% imported, but to find a way to stop it becoming 95%”. Significant issues raised around infrastructure, energy costs, a lack of incentives for relevant sustainability practices, or access to R&D, results in businesses going under at alarming rates. There exists a vicious cycle of growers under financial pressures, leading to the government and civil society dismissing the sector, leading to a further lack of investment.

Ultimately, I expected to focus solely on climate adaptation in this research, but what emerged was a more substantial roadblock to change - the British cut flower industry is divided and struggling to survive. Whilst financial pressures and high levels of international competition impact our sector, there are nevertheless

emerging opportunities on the horizon as a result of climatic change. But no-one is leading with a unified voice, advocating to the government, civil society, or the public, at a time where growers are clamouring for support. We need a dedicated sector body that specialises in floriculture, taking positive, inclusive action with effective campaigning and advocacy, and dedicated research.

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Chapter 1: Introduction

A polytunnel cleaved in two by back-to-back storms, hundreds of metres of weed-barrier wrapped around trees, flooding and extreme daytime temperatures of 38 degrees celsius were all weather events that struck our two-acre flower farm over the course of only eight months in 2022. As a micro-producer of cut flowers in the north east of England, working with tight margins and little room for failure, I found myself wondering whether our business was ready for the 2-degree warming world the news was predicting? The answer, I realised with alarm, was no.

I began to look at other local micro-growers like myself, at their practices, and listening to farmers in the area talk about the 'changes they have seen in the past 20 years' and I felt unsettled. With a background in climate change policy in the environmental sector, I have spent many long hours getting to grips with the reality of a rapidly warming world. But heat is not everything. With a rapidly warming world comes increased droughts, increased flooding, erratic weather events like storms, cyclones and more. This boils down to one thing - unpredictability. 2024 has shown us just how unpredictable climate change can be for the British farming sector. Year on year it becomes harder to farm because we are unprepared. But how do we prepare for the unpredictable?

I embarked on this Nuffield farming scholarship to understand the cut flower sector better, but what I failed to understand was how fragmented and unsupported the sector is. The new wave of cut flower growers is a relatively recent phenomenon, but as anyone who ran a cut flower business through the pandemic knows, there is enormous consumer support for local growers. A gulf exists between larger scale commercial growers and the new wave of smaller agro-ecological growers, and as a result our voices are not being heard in policy spaces. This work has been a call-in for me to find a way to bring that collective voice and knowledge into one place, so that we can more effectively protect our businesses from the changes on the horizon.

This Nuffield research study has been nothing short of transformative. A self-described flower farmer and florist, who during the course of her scholarship has found herself without land for her business, not once, but twice. The challenges for cut flower growers in Britain are enormous without the instability caused by climatic change. Issues such as land access, lack of business support, supply chain access, energy costs and minimal resources for R&D, are just the most urgent barriers to overcome. These challenges are vast, but the opportunities are

ripe for taking, so much so that I have changed my own business plans to explore how I can better support the industry more widely to flourish.

Chapter 2: Background to my study subject

British floriculture

The British love their flowers. From literature, social media and popular culture, to gardens, green spaces and hedgerows. A bouquet symbolises celebration, love, sorrow and loss. But we have become hugely disconnected from the source of these flowers, mirroring our disconnection from food production. The world of cut flowers is so murky that it actively prevents us from understanding their origin, the methods and conditions of production, and presents a barrier to the public being able to make better decisions about the products they purchase.

Britain used to have a thriving floriculture sector, supported by growers of all shapes and sizes. In the 1980s, floriculture was a point of enormous pride for the UK horticulture sector. Greengrocers around the UK sold bunches of British grown flowers. Flowers were seen less as luxury goods then, more as something to cheer up a day, or express gratitude or devotion. And because they were grown in this country, their availability and familiarity made them part of everyday life. Ornamentals and cut flowers are worth £1.8bn in 2024 in the UK according to IBIS world, who also highlight a trend in UK consumers wanting to buy British (IBIS World).

I was haunted by the words of one cut flower producer I met early on in my travels, on the south coast of the UK, under glass filled with alstroemeria, butterflies and ladybirds. He told me firmly, “Our job is not to take imports from 90% to 50%, but to prevent imports becoming 95%”. As one of my first research visits, I found myself questioning whether this was accurate, but as time went on I began to realise the truth. A sustainable business is not just about adapting to climate change, it is about economic and social sustainability. A sector cannot survive shocks if it cannot forward plan. A sector cannot forward plan if it is too busy working out how to survive the day to day.

This study looks at what farming and horticulture businesses are facing on the front line of climate change. However, it ultimately seeks to find an answer to the broader issue of a fragmented and broken industry and asks what next?

Chapter 3: My study tour

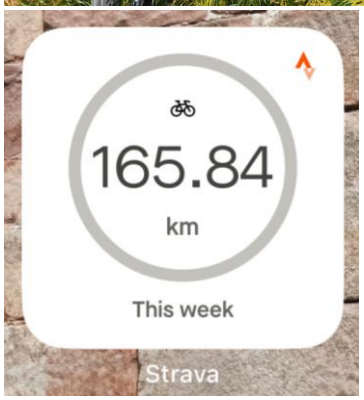
Over the course of 18 months, I visited and spoke to growers, florists, agents, scientists, leaders, decision makers, sector bodies, and farmers across the UK, Netherlands, Kenya and New Zealand. Some of those visits have not been captured in my report below, but have had a profound impact on my thinking and ultimately, my findings.

I would have liked to extend my travels to other areas of flower production such as Mexico and Columbia, as well as speaking with further voices from the wine industry in France and Italy, but my budget would not stretch that far this time. I hope I will be able to build on this work as the years go on.

I also felt strongly that countries closer to home could be reached by a mode of transport that had resulted in lower emissions. I tested this by bike-packing around the Netherlands, but this had its downsides as I found alternative transport such as the boat from Newcastle often costs six to eight times the cost of a flight. I would have required a larger amount of time to travel to countries closer to home without flying - something I wanted to prioritise - but budget and time would not allow for this. So I focused on maximising research within a fewer number of countries and relying on zoom for additional conversations.

Country visited	Who did I visit/speak to?
United Kingdom (by car, train and bike) (Two weeks)	Petalon Flowers Crossland Nurseries North Down Orchard Nicole Masters Regenerative Soil Workshops Grampian Growers Naylor Flowers Flowers by Clowance Flowers From The Farm (various members) Annas Flower Farm Wetherly Flowers Scarlet and Violet Florists Bon Bloemen Gateshead Forever Green Flower Company Flowers Grown in Scotland Professor David Bek
Netherlands (by bike and boat) (12 days)	RoyalFloraHolland Aalsmeer International Flower Auction Noordwijk International Flower Auction Together2Grow Gebr. Noort G.B Gerbera Daisy producer (unnamed) Brede Fleur Lilies Tulip Museum Lily Producer (unnamed) Xander Bek - Dairy farm
Kenya (by plane and car) (Two and a half weeks)	Tambuzi Roses Wildfire Flowers Unnamed Flower Farm Lolldaiga Conservancy Enock Ole Kiminta (water campaigner) Trout Farm Lewa Conservancy
New Zealand (by plane and car) (Three weeks)	Kerry Warsnop Beef and Dairy farm Laura - Project Co-ordinator for Waimata River Sandra Faulkner, farmer and farmer's union representative Field of Roses Eve Taylor Dairy Farm Manager Bragato Research Institute Ata Rangi Winery Tinpot Hut Winery The Wool Shed Museum



(Photos: Author's own. Author's sturdy (mostly) bike carrying luggage plus author to flower farms around the Netherlands. Final photo, screenshot of a few days of cycling. Author would like to add that the bikepacking element of this trip was easy thanks to the Komoot app and a quadlock for her phone.)

Chapter 4: The problem of flowers

The Science

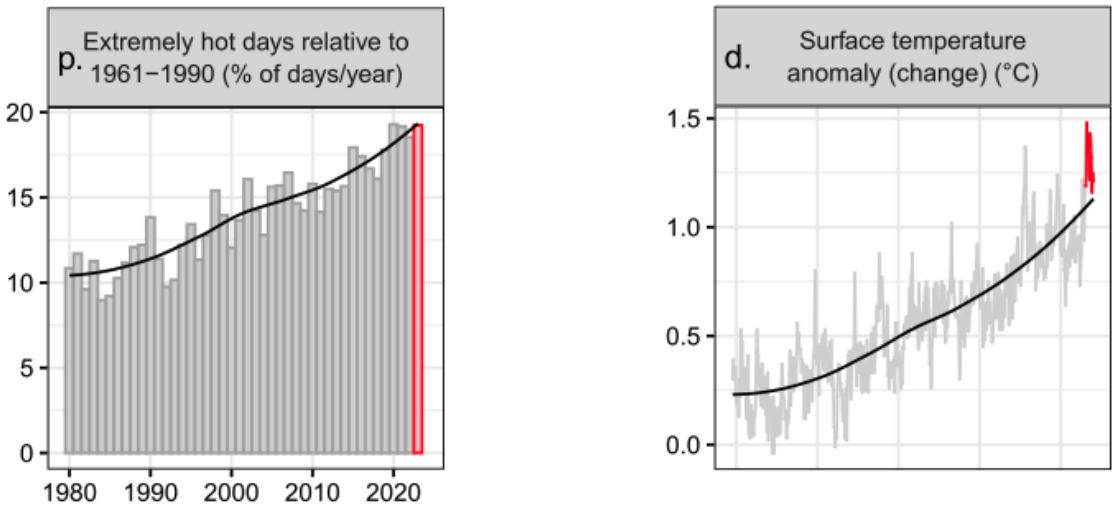
What does the climate science say?

The 2024 'State of the climate' report states; 'We are on the brink of an irreversible climate disaster... We are stepping into a critical and unpredictable new phase of the climate crisis'. When we think climate change, we think heat - which is partially correct. In July 2024 we had three of the hottest days on record globally and current climate policies have us on track for 2.7 degrees celsius warming by 2100. In 2023, farmers and city dwellers alike witnessed the hottest summer in 2000 years (Ripple et al. 1). Heat was not the only factor putting pressure on agriculture and horticulture in the UK. In 2024, UK arable farmers are predicted to lose over £1bn in revenue due to wet weather. Climate change is not just about temperatures, it is the water cycle too.

With concentrations of carbon dioxide and methane at record highs (Ripple et al, 4), with no legitimate signs of governments taking action to reduce this, Ripple et al predict that even in the most optimistic of scenarios, large-scale climate adaptation efforts will be needed (Ripple et al.10). The negligible attempts at tackling this gargantuan problem are only slowed further by those who benefit from the current fossil-fuel based system.

In the UK, the Met Office predict that compared to 1990, by 2070 we will see:

- Winters between 1 and 4.5 degrees warmer
- Winters up to 30% wetter
- Summers between 1 and 6 degrees warmer
- Summers up to 60% drier
- Hot summer days between 4 and 7 degrees warmer



(Graphs from 2024: State of Climate Report - https://doi.org/10.1093/biosci/biae087)

What is climate change adaptation?

Climate change mitigation deals with reducing our emissions like carbon and methane. According to the UN, climate change adaptation refers to changes in ecological, social or economic systems in response to actual or expected climate impacts (UNFCCC). My research focuses specifically on climate change adaptation, not on reducing emissions. Businesses should be doing their utmost to reduce their emissions, so I am taking that as a given. Many of the businesses I visited were actively thinking about emissions reduction. Here, we are looking to a world in which we are not able to reach Net Zero, what that looks like for our businesses and how we can better prepare for the instability on the horizon.

The good news is that good climate adaptation can be delivered on a farm-scale, as attested to by one of my interviewees, including Dr Andrew Tait from National Institute of Water and Atmospheric Research in New Zealand. Whilst climate adaptation does require finance and support from government, we can take action at a community level, or alongside other civil society actors, sector bodies and regional organisations, to better prepare our businesses and environment for change. Adaptation is a critical part of our collective response to protecting people, jobs, and the ecosystems we inhabit.

What is the science of flowers?

The carbon footprint of flowers is a thorny issue for the industry. There are finally new tools on the market for carbon, water and biodiversity footprinting such as the FloriPEFCR (Flori Footprint Tool) standard developed by RoyalFloraHolland, enabling growers to measure the carbon and water impacts of producing flowers more easily.

But with a niche sector comes a lack of funding for science and data. Very few scientific studies showcase the impact of cut flowers on the environment. One such study from Lancaster University in 2018, highlights the high carbon footprints of bouquets made up of imported stems or grown under glass, compared to stems grown for a bouquet produced outdoors in the UK. An imported mixed bouquet produces carbon ten times greater than a British-grown mixed bouquet. (Swinn, 2018)

One key trend in UK consumer purchasing habits for cut flowers (IBIS World) is more sustainably grown or local flowers. This mirrors a wider consumer trend for more sustainable produce. A McKinsey consumer report (McKinsey & Company, 2023) revealed that companies making ESG-related claims about their products accounted for 56% of growth, with smaller brands achieving a larger proportion of that growth. We have in the past decade seen a successful growing movement of micro-producers growing sustainable and local cut flowers operating as part of Flowers From The Farm (FFTF), as well as many successful micro-producers outside that network.

Flowers From The Farm was established in 2011, and now boasts over 1000 growers and florists around the UK, seeking to promote locally grown British cut flowers to consumers. The growth of organisations like FFTF and visibility associated with it, has contributed to many positive press stories about the 'blossoming British flower sector' (Laville, 2024). This however, does not represent the full sector, nor the scope of decline for larger growers, which I will touch on later.

We know from reports by Professor David Bek and Jill Timms as part of the Sustainable Cut Flower Project, that carbon footprints are 'a main concern for most stakeholders. For retailers and wholesalers, there is pressure resulting from legislation related to reducing Scope 3 emissions'. It is also noted that 'consumer perceptions are increasingly important for many stakeholders and there is a recognition that the sector as a whole needs to reduce its carbon footprint'. Recommendations from this work across the sector include 'access to reliable methodologies for calculating the impacts of carbon in the supply chain, as well as information sharing across the sector platforms, to enable those who can't afford to engage in R&D to benefit' (Bek et al. 8).

Agrochemicals are another contentious point with consumers for the cut flower industry. Agrochemicals are widely used across the cut-flower industry, both to promote growth and reduce impacts of pests and diseases on production. There are many issues associated with the use of these agrochemicals, such as farm workers, production facilities and florists' exposure to chemicals, which impact their physical and mental health. One report revealed that 10,000 workers (mainly women) in Kenya fell sick every year due to unsafe, unhealthy and unsustainable work and workplaces in the Kenyan flower industry (Bek et al. 8). Similarly research in Belgium detailed the impacts of chemical use on the other end of the chain, with levels of chemical residue causing impacts on florists' health, in some cases exposing florists to endocrine disrupting chemicals over four times their recommended exposure rate (Toumi et al. 1). Similarly pesticides have a carbon problem, with 99% of all synthetic chemicals, including pesticides, being derived from fossil fuels (Pesticide Action and Agroecology Network).

There is also an environmental impact of the use of agrochemicals on flower farms (Hance), impacting freshwater environments through runoff, as well as reducing the fertility of soils. This issue is increasingly pushing legislative change in countries like the Netherlands, leading to an increased uptake of integrated pest management (IPM), which seeks to provide alternative crop, disease and pest management techniques and move away from a reliance on chemicals. This is also being seen in Kenya where a drive from certifiers like Fairtrade are restricting the use of certain chemicals for farms to be certified eg, glyphosate. Regulation is becoming tighter on chemical use in the EU, and the British cut flower industry needs to be ahead of the curve to ensure they do not fall behind.

One of the other key issues for the cut flower industry is water usage. Flowers require large quantities of water; a rose stem requires approximately 7-13 litres of water during its production (Mekonnen et al. 2012). Flowers tend also to be grown in areas of increasing competition for water between agriculture and local communities, as exemplified in conversations I had during my trip to Kenya. This can lead to conflicts between growers and local communities as a result of over-abstraction, polluted water sources and damage to local ecosystems.

Climate change is exacerbating these problems, both in terms of water scarcity - drought not only puts pressure on existing water sources, but can lead to the accumulation of chemicals in that available water source (Wildlife and Countryside Link, 3). Risks around water, chemical usage, soil fertility and extreme temperatures are all having impacts on growing systems, whether they are hyper-controlled such as in a glasshouse model, or field-grown. Flowers are not exempt from the ravages of climate change, so building in plans to prepare for the extremes we will see in the next few decades has the potential to put flower farming at the front line of change in the horticultural sector.

A broken flower sector?

According to Paul Richard of BJ Richards, a family-run flower wholesaler and importer from Cornwall, the death of the British growers is linked heavily to the 'rise of the Dutch flower trade'. This was as a result of the Dutch government providing subsidies on energy for Dutch growers to expand in the 1980s and produce cheap flowers (Richards, 2013). By the 1990s, supermarkets began to emerge nationally, wanting cheaper flowers, fuelling a push for further imports. Richards says a combination of high energy costs, supermarket price pressures, cheap imports and apathy towards British flowers, plus a total lack of support from government, meant the industry could not cope. Interestingly, with the reduction in subsidies of the past few decades, Dutch growers are now struggling, particularly in the face of consumer pressure for more environmentally friendly farming practices. A dependency on Holland from supermarkets and florists is a significant issue for British cut flower growers, but with an increasing interest in British flowers, are we now in a position to turn the tide?

Cut flowers are not niche. The value of production in the ornamentals sector increased by 9.6% to £1.7bn between 2022 and 2023, of which flowers and bulbs represented an 8.5% growth (DEFRA). Yet, according to many of the growers I met, the sector remains in trouble. My first visit was to the south coast of England to meet Ben Cross, a fourth generation alstroemeria grower and advocate for the industry running his 'British Flowers Rock!' campaign. Ben grows under approximately four acres of glasshouse, harvesting millions of stems throughout the course of the year, with 1m squared expecting 200-300 viable stems over an

annual cycle. Ben outlines one of the key issues early on in our conversation, “We’re not investing in home-grown, we’re investing in flown”. This is not helped, he says, by the fact that we are 30-40 years behind other sectors on labelling and product placement. Ben agrees with Paul from BJ Richards, asking, "If we can grow something in the UK rather than importing it, why wouldn’t you help us to properly modernise our glasshouses, or fund us to do education work?”

[Ben Cross of Crosslands Nursery (left) and one of his alstroemeria glasshouses (right.) Photos: Author’s own]

For other growers, indoor production is not where the future of British blooms lie. Matthew Naylor runs Naylor’s Flowers in Lincolnshire, a field production business growing 600-700 acres of cut flowers including delphiniums, peonies, daffodils and ornamental cabbages. Naylor Flowers supply direct to supermarkets like M&S, Co-op, Waitrose and Lidl and manage to grow from January all the way through to December. Matthew argues that outdoor production is the more sustainable option, as it does not rely on energy inputs to heat a greenhouse or have 24/7 lights.

Climate change will impact outside growing operations like daffodils, peonies and sweet williams more significantly, but that does not mean that indoor operations are exempt from those changes, as I discovered in Kenya. Indoor flower operations are controlled environments, but if our operations are not fit for purpose due to a lack of investment in the sector, the old and outdated glasshouses from the 1980s are unable to cope with the increase in temperatures. Drought, as we have seen in the UK in the last few years, will put significant pressure on flower crops with higher water intake, whilst flooding has the potential to impact high value outdoor crops like peonies and bulbs. This leads us to thinking about whether we are planting the right crop in the right place, or whether the long term impacts of climate change make these crops unviable.

Harriet Thompson from Harriet's Plants, a British houseplant producer from Cornwall, spoke of decisions around crop planning being much easier to navigate as a small-scale business. Having the flexibility to change crops annually as new evidence becomes available, means she is able to react to changes on the horizon with less risk. Larger businesses relying on a monocrop such as tulips, are not able to be as flexible. This highlights the importance of crop planning for the future. However, this is not something that is easy to do when pressures on finances determine crop decisions year on year.

[Harriet Thompson of Harriet's Plants (left), interview with author (right) Harriet and Roisin. Photos: Author's own]

But there is optimism in the sector too, across a spectrum of growers - British blooms are booming. For James Cock, owner of Flowers by Clowance, the only barrier to selling more flowers is being able to get his hands on flowers. British flowers are gaining traction with florists driven by a desire for local flowers, the only issue is supply. Petalon, a B-Corp flower delivery service with a flower farm, is growing British produce in Cornwall for all-British bouquets for four to five months in the year. They are a fascinating middle ground between the world of floristry and cut flower production. Starting as a florist business in London, Florence and James moved their business to Cornwall and have their own Field Flowers operation growing supplementary flowers for their bouquets which are distributed by post. The larger cut flower growing operations are broadly selling to supermarkets, meaning that the availability of cut flowers from small growers is not a high enough quantity for Florence and her team to use. So Field Flowers became about filling that gap, doing so in a way that is aligned with their values, and an attempt to move away from imports where possible. But James pointed out that the decision is also motivated by a desire to grow, and that financially it does not cut costs to grow them.

[Florence, her flowers and her husband James from Petalon: Photos: Author's own]

Overall, the British cut flower sector is in a strange and fragile place. After years of neglect by the government and being priced out by competitors abroad, there is a rise in consumer demand for British produce according to wholesalers like Clowance or florists like Petalon. However, through a lack of either commercial growers to meet demand, or the supply logistics to move flowers around the country efficiently, we are not able to make the most of this.

There is an opportunity here for the sector to grow and thrive, but we need a voice that advocates for the whole sector, with space to facilitate discussion and sharing across and outside floriculture.

CHAPTER 5: COMMUNITY ADVOCACY AND KNOWLEDGE EXCHANGE

I arrived in New Zealand, in the midst of a cyclone, which felt appropriate for meeting with farmers, community organisers and climate scientists on the front-line of climate change. During the midst of that cyclone I drove the length of the North Island, across to the east coast in Gisborne for my first stop. There I met with women whose stories had a profound impact on me, and reminded me that one of the best tools for resilience is community-based advocacy.

Kerry Warsnop, a fellow Nuffield scholar and sheep and beef farmer from New Zealand, welcomed me onto her farm embedded in a landscape that had been left pockmarked by five cyclones in the previous eight months, significantly impacting the landscape - at one point trapping both Kerry and her husband on separate farms with no way to access one another for several months. Over the course of two days, Kerry took me to see farmlands devastated by the impact of the cyclone, with flooding and downstream silt in some places 20m deep, and many roads still unable to be driven eight months later. Cyclone Gabrielle in February that year, was described as a 'weather bomb' and broke records across the country. It is considered to be the worst weather event to hit New Zealand this century. Kerry suggested that farmers are the best placed people to respond to crises like these. In many cases councils could not access roads and farmers were the only ones able to respond immediately. Laura Watson, the local catchment area project manager and farmer on the Waimata river, emphasised this. She explained that communities are the ones on the front line, not governments, and that in the second phase after the disaster, things begin to fall on individuals to keep recovery on track. "People hit the wall, rules start to catch up with you and resources begin to run out". What struck me was that leadership and responsibility often sat repeatedly with particular individuals. Laura went above and beyond for her community in a time of crisis, but was exhausted from the weight of it. Begging the question, what role does human resilience play in community action?

[Farm destroyed by Cyclone Gabrielle, 2024 (left). Waimata river following a cyclone (middle) Kerry and son at Waimata river New Zealand (right). Photos: Author's own]

Sandra Faulkner was a similar case, who like Laura assumed the role of community leader in the midst of cyclone Gabrielle. She created structures, local information points and support networks that could coordinate and deploy resources from the government, where and when farmers most needed it. In one particularly harrowing story, Sandra explained that she had to take to the radio airwaves to communicate with farmers trapped on their farms, on land too remote to reach for days, if not weeks at a time. With no WiFi or phone signal, the radio was the only voice farmers heard during the crisis. Listening to lessons from her parents, who were farming during Cyclone Bola in 1988, which dropped 900mm of rain in 72 hours, she explained that farmers needed to hear three things on this one-way communication, "We're here and we know you're there, we're coming for you, and you have to eat and sleep and take it one job at a time." Laura and Sandra's emergency responses in a devastated region are testament to the importance of established community relationships, formalised industry structures connected into government to receive aid quickly, and trusted, charismatic leaders who are able to mobilise their communities quickly.

Further examples of formalised industry structures such as the Bragato Research Institute funded by the New Zealand Wine Growers Association, were impressive examples of a sector working to share information that would support their growers to make more informed decisions on their growing practices. The Bragato Institute is a levy-based organisation which maximises growers' return on investment by four or five times in terms of revenue and advocacy. I met Braden Crosby in Martinborough, one of the prime wine growing regions in New Zealand. Over a strong coffee, Braden argued that wine is the canary in the coal mine, due to the inability to move the vines. A long term crop like vines has similarities to perennial cut flower stock like a peony. The impacts of erratic weather and the increase of pests and diseases on the vines is something that requires huge thought. This is because these plants will not see a return for years. Braden told me about visiting growers in Gisborne in the aftermath of cyclone Gabrielle, with silt covering the vines in their entirety, requiring growers to dig the vines out by hand. Martinborough, a few hours south of Gisborne is famed for its Pinot Noir, a red wine grape of the variety *Vitis vinifera*. Growers and winemakers are concerned, due to the relationship between the grape and the terroir (the specific environment, including soil and farming practices in which vines are grown), as they are unable to move the vines once planted. For many wine makers and growers, this means either having to adapt growing styles, or even varieties of grape.

"The North Island is sending messages to the South", said Braden, "So how do we work through these issues to future proof the South Island? Cyclone Gabrielle this year was the most devastating cyclone for wine since Cyclone Bola. The

modelling suggests that the number of ex-tropical cyclones will increase, the number of hot days over 25 degrees will increase and rainfall will increase around harvest time". The Bragato institute also looks to alternative growing industries like apples or other wine growing locations like Australia. Many Australian vineyards are reporting vintage compressions, where the number of harvest days are reducing rapidly. This has a sizable impact on logistics for harvest time frames as well as production days.

Head winemaker Helen Masters at Ata Rangi, in Martinborough, one of the best Pinot Noir producers in New Zealand, told me that wine is a very systems-based industry and changing grape varieties is not simple. With 80% of wine produced in New Zealand being Sauvignon Blanc, the rootstock nurseries are flooded with one single variety of Sauvignon Blanc rootstock - 3309, which not only blocks the market for other varieties, but builds vulnerability into the system. With pests and disease on the increase, essentially creating a monocrop by planting one root stock could cause huge losses, or even radically change the style of one of New Zealand's most significant industries. Owner of Tinpot Hut wineries, Fiona Turner, told me that pests and disease that had not been seen on the South Island before, were starting to impact vines for the first time. This was a serious concern and many growers and winemakers have been looking to the North Island to learn about best practice in responding to these climatic impacts.

[Braden Crosby at Bragato Institute (left) and Helen Masters at Ata Rangi winery (right.) Photos: Author's own]

In a wet but warm Wellington, I met with Dr Andrew Tait, Chief Climate scientist for Climate, Atmosphere and Hazards at the National Institute of Water and Atmospheric research. Dr Tait, was the lead author on the Australasia chapter of the Intergovernmental Panel on Climate Change Fifth Assessment Report and believes that farmers are in an excellent position to effect change and take action

on climate change adaptation. New Zealand has been following the UK's example for delivering a National Climate Adaptation Plan, but it is the work with farmers and sector bodies that is embedding real change.

Andrew was keen to express that there is a huge amount of uncertainty around what our farmed landscapes will look like and what the impacts will be, because they have to work with different scenarios. Data allows them to show what impacts might be under different pathways of government action, for example whether governments move quickly to lower our emissions, whether we make no change at all, or whether we might accelerate our emissions. All of these options create different futures and much of the work of climate scientists is to showcase these and represent that uncertainty. These are really challenging conversations to be having with farmers and growers, but Andrew says, "Folks get it. We're really quite adaptable here in New Zealand... The uncertain future is easy for them to get their heads around, it is just about understanding what those scenarios might look like and how we can best prepare for them." He tells me that decisions around the primary industries are being more and more influenced by these adaptation scenarios as time goes on. The embedding and join-up between the sectors and scientists is clearly having a profound impact on the future development of the primary industries sector.

Preparing to adapt for changes that will come over a long period is one thing, but adapting to devastating extreme events like cyclones requires a different approach. The traditional model, Andrew argues, is to try to clean up and get back to business as quickly as possible and absorb the economic impact. However, that model may soon, if not already, be defunct because the next extreme event is just around the corner. Many scientists like Andrew believe that there can be no return to business as usual. This means we must re-assess the economic viability of land. This is the most challenging piece of behaviour change work on the horizon.

[Dr Andrew Tait at NIWA, New Zealand. Photos: Author's own]

My trip to New Zealand highlighted to me how reliant on human capital we are. The human ability to keep going during one devastating climate related event is remarkable, but the erosion of that resilience happens quickly when communities are consistently hit by events such as cyclones, flooding or drought. Andrew agrees, saying however, that once you interact much more closely with a community to understand the pressures and needs that they have, you begin to see pathways to survival in emergency scenarios. Adaptation happens at the local level, and we must do more to provide spaces for our communities to come together and learn, debate and contribute to future planning. I left our meeting with our discussion ringing in my ears. I was asking myself whether local adaptation cafes for growers, or collaborations between councils, local people, businesses and farmers, could allow us to start future proofing our systems, co-creating local adaptation plans that the entire community supports, so that they understand how to respond in the face of extreme climatic impacts.

Later in my travels, I bike-packed around the Netherlands meeting with growers and agents. After a few hundred kilometres along Dutch cycle paths, I arrived at Together2Grow Alstroemeria to meet Fedor van Veen, who delightfully informed me that his nine acres of alstroemeria-filled glasshouses sit amongst 20 other alstroemeria producers within 10km^2. I can confirm that cycling through the Naaldwijk area, it was back-to-back glasshouses interspersed with herons, coots and the occasional crawfish on the road. Together2Grow is a growers co-operative, and is focused on delivering alstroemeria in the most sustainable way possible. The UK is their most important market, selling directly to supermarket retailers like ASDA and Morrisons.

[Fedor van Veen at Together2Grow (left and middle) and author at Together2Grow with alstroemeria in arms (right). Photos: Author's own]

Fedor, like many of the other growers I met, spoke about the public perceptions of the Dutch flower business and how it has changed. "In Holland, 15 years ago everyone was proud of the flower trade, but now the media, the public and government are more critical. Together2Grow is a group of growers who are accelerating change to become more environmentally friendly growers and boost public opinion around what can be achieved." By 2026, Together2Grow aims to be completely chemical-free, and will be using the new FloriPEFCR standard, RoyalFloraHollands new environmental analysis tool, to showcase their carbon and biodiversity standards. Fedor believes that data is the only way to lead. Farmers not only need to know their data, but be prepared to share it with the public to build trust.

Growers groups like these are leading the way in transparency and showcasing how other growers can move in a more sustainable direction. They are also working with the government to advocate for policies that help growers achieve more sustainable practices around water, energy and IPM. Fedor told me that whilst retailers do not care that much about chemical usage, their growing group knows that further restrictions will be on their way and they need to get ahead of the challenge by testing, trialling and taking action now. Carbon was the frontline. Now consumers are starting to ask about chemical usage and growers are more effective at finding solutions together. Fedor is clearly proud of what they are achieving with the business and the co-operative and wants to shout from the rooftops about what they are doing with the sector to increase research into climate and nature-friendly alternatives to fertilisers, chemicals and water use.

Hubs, collaboration groups, grower collectives and industry bodies such as the Bragato Institute, the Pinot Noir Collaboration Group, Together2Grow and community farming groups that Andrew works with, are examples of growers working together, not just to share skills and knowledge around resilience, but to problem solve issues for the whole industry. This collective knowledge sharing is a

model which we do not have in the UK flower industry, operating in a much more silo-ed and secretive way. This makes responses to extreme impacts often an expensive and depressing solo affair. Many of the growers I have spoken to have emphasised the need for growers' bodies that facilitate the exchange of best practice, and help to advocate for the sector with Defra, government and consumers.

Chapter 6: Data and right plant, right place

The concept of 'right plant right place' came up plenty of times across the conversations I had on my travels. A key adaptation technique was modifying crops or where farmers are growing them, and was most successfully delivered when backed by high-quality data.

Jane from Tambuzi Roses in Nanyuki, Kenya, highlighted how innovative thinking, forward planning and a focus on resilience can result in long term benefits for their B-Corp certified Kenyan Flower Council Gold Standard business. Tim Hobbs, owner of Tambuzi arranged for Jane to give me a tour of their operation, and proved to be a phenomenal demonstration of how a business can be profitable, whilst delivering huge environmental and community benefit. Tambuzi sells between 130,000 and 160,000 roses a week direct to customers around the world, and is the only B-Corp flower farm in Kenya. Unlike other rose growing operations who feed fertiliser to roses seven days a week 365 days a year, Tambuzi feed their roses three days a week with inorganic fertiliser. The rest of the time they are fed organic sheep urine, then further fed by compost and vermicast produced on site. Jane explained that increasing heat waves along the equator, which never used to happen, are impacting their operation, alongside flooding hitting their polytunnels and creating compaction issues, as well as in some cases wiping out rose crops. Jane explained that the frequency of these flooding events is encouraging the team to think about where on the farm they plant new crops to reduce the impact of larger flooding events, not just focusing on the right plant, but more importantly for them, the right place.

Competition with Ecuador and Columbia on bloom size is one reason that Tambuzi has purchased a new farm at a higher altitude. Altitude creates a larger bloom with a stronger stem and leaves, and is part of the business' process of developing new plants and new market opportunities. Tambuzi also test and trial plants rigorously, both for the market and for the environment. They have 50 varieties in production at any one time, with space to test a further 150 varieties across a spectrum of criteria such as bloom size, colour, pest and disease tolerance, and ability to grow in the environment. This is the definition of 'right plant, right place' thinking about what is likely to succeed without too much intervention. Jane explained that resilience is at the heart of these trials, working to get a better sense of what these longer term crops are capable of and where in the marketplace they sit eg: are florists going to buy them?

[Rose harvester at Tambuzi Roses (left) and Rose in bloom (middle) Rose testing area for new varieties (right) Photos: Author's own]

Grampian Growers is a farmer-owned cooperative based on the East coast of Scotland, with 12 daffodil members. In 2024, they produced 8 million bunches of daffodils for British supermarkets over a 6-8 week period. Alasdair Allan, Commercial Director for Grampian Growers, also spoke to the 'right plant right place' method of thinking. Scotland provides an ideal climate for bulb and flower production with cool daytime temperatures and long daylight hours. Growers also produce bulbs for markets, going to the UK, USA and Europe. Alasdair explains that whilst there is weather unpredictability, which is having an impact on their autumn planting and conditions when harvesting, compared to Cornwall, where most daffodil harvesting takes place, they experience fewer pests as a result of the weather being colder than the warmer climate of Cornwall. Similarly, the warmer soils we will see as a result of climate change are not good for bulbs, and Scotland being further north means that bulb production is likely to be more stable and require less intervention than the south coast. Alasdair is also keen to explore other cut flower options, like alliums, but is clear that data is what guides the growers. If a bulb works for the market, the growers, and the environment, they will explore introducing it.

[Daffodil field, Grampian Growers (left), Author in Narcissi field left for bulb collection (middle) Daffodils for cut flowers (right). Photo 1 and 3 courtesy of Alasdair Allan. Photo 2: Author's own]

Whether you are an outdoor grower like Matthew Naylor of Naylor Flowers in Lincolnshire, or a small-scale agroecological grower like Cel Robertson of Forever Green Flower Company in Norfolk, many British outdoor growers are already focusing on 'right plant right place'. But these decisions need to be backed up by the data. Cel explains that good data tells you which plants are most resilient and the resilience of a crop means more stability during climatic extremes. Cel also informs me that data is a major issue for the cut flower industry, both in terms of the quality of data collection, as well as the availability of that data once collected. She tells me that because we do not have a good sense of the market, we do not understand where we can scale up certain crops, or what regions might be best suited for particular growing conditions in years to come. Grampian Growers and Flowers Grown in Scotland, a collective of growers raising the profile of Scottish grown flowers, both agree that the lack of data in horticulture makes it difficult to make decisions on crops, business and marketing. Many of the growers I spoke to in the UK, highlighted the need for better data for growers to encourage them to see the benefits of certain crops, or to understand the changes on the horizon and how that might affect them.

[Matt Naylor from Naylor Flowers M&S advert (top left) and Flowers Grown In Scotland AGM (top right). Cel Robertson Forever Green Flower Co. interview on zoom (bottom) Photos 2 and 3: Author's own]

Chapter 7: Adapting to your environment

I arrived in Kenya in the middle of major political upheaval, where only weeks before the rains had caused such devastating flooding that over 260,000 people were displaced. Over the course of my three week visit, young working class Kenyans came together to protest against the finance bill which sought to penalise them, with many young protesters in Nairobi killed by the army and the police. It was against this backdrop, of a government unable to provide adaptation for their citizens in the face of major flooding and extreme price tariffs, that I met with growers, farmers and campaigners to understand the role that flower farms play in the wider economic, social and environmental picture.

Kenya is one of the UK's largest competitors, supplying over 40% of the UK's flowers (Fredenburgh). Kenya's second largest export is cut flowers and it is estimated that flower farms provide approximately 150,000 jobs in their economy. One of the main flower farming areas is Lake Naivasha, north west of Nairobi, which boasts one third of all flower farms in the country, many of which are owned by Dutch or British companies. Lake Naivasha is also an internationally significant RAMSAR (wetlands of international importance) site for biodiversity. Not only was it almost impossible to get into flower farms at Lake Naivasha - Wildfire Flowers only agreed to see me on the recommendation of my AirBnB host, but it revealed the impact of readily available roses in our supermarkets on the local environment.

I met with Enock Ole Kiminta, a Kenyan water campaigner and advocate, in a bustling street mall in Naivasha. He explained that a few years ago Lake Naivasha was at risk of completely drying up, with flower farmers abstracting too much water and returning any water to the lake filled with inorganic fertilisers and agrochemicals. Enock explained that pressures from the flower farms are creating tensions in Naivasha, because whilst the farms contribute to GDP and create jobs for locals, there are issues around over-abstraction on the lake and around fair pay. The average Kenyan flower farm worker receives only £78 a month whilst the estimated living wage is £211 a month (Paveley, 2021).



[Enock Ole Kiminta, photograph from Enock's Linkedin (left). Lake Naivasha RAMSAR site (middle). Flower farm on the shores of Lake Naivasha (right). Photos 2 and 3: Author's own]

Enock's direct action to showcase the impact of flower farms on the local environment resulted in him having to flee the country in fear of his life in 2009. He was supported by International NGO Natural Justice for raising awareness about the impact of these businesses on the environment. However, as a result of his work, he now runs a Water Users Association running citizen science programmes to deliver water monitoring, bringing stakeholders including flower farms to the table to tackle issues the community is impacted by, and educating young people in how to campaign for change. Enock's work is not just brave but also highlights how important transparency is for flower farms, and the importance of practices that are not completely extractive. Extractive refers to practices that take more than they give back to the environment. Kenya's lack of transparency around their farming practices does not stand in isolation, Ecuador and Columbia face similar issues, often resulting in understandably negative press by investigative reporters into workers pay or sickness as a result of exposure to chemicals.

Flower farms are still resistant to providing funding for Enock's work, or to engage in a meaningful way in the Water Users Association, instead remaining closed off and separate. My experience was to be similarly stonewalled. After contacting over 40 flower farms in Kenya, I was only permitted to visit three, all of them businesses with the highest environmental and social record who had a history of doing public relations work. My experience has been mirrored by other growers and florists in the sector when seeking out similar information, and begs the question why do flower farms not want us to see behind the doors of their polytunnels? Particularly given that so many of these companies are British or Dutch owned? Moreover, does this present a market opportunity for British growers? Can we capitalise on the comparison, by being more transparent on pay and growing standards?

At one of the few farms I was able to visit, Wildfire Flowers in Naivasha owned by Australian born Peter Szapary, rose harvesting takes place twice a day with targets to produce a minimum of 200,000 stems per week in the down season and 500,000 stems during peak season ie, Valentine's day and Mother's Day, with the farm running for 365 days a year. The operation provides jobs for 650 people and 98% of the product goes directly to the EU, often to supermarkets with only approximately 10% going to auctions in Holland. To achieve this 365 day production, roses are given fertiliser seven days a week all year around. At Wildfire they employ IPM, which has seen quick adoption due to the Kenyan government 'speeding up the registration process for biological control products' (Meadows, 2022). Whilst biological controls such as parasitic wasps are visibly in use, so are chemicals. It is important to state that the lack of transparency more widely on

flower farms means it is hard to determine the volume of chemicals still in use across the country. Campaigners like Enock delivering water testing, are often the only way to understand what chemicals may still be in use in a space where regulation and monitoring remains lax.

[Author and worker at Wildfire Flowers (left) and worker in one of the rose tunnels (middle). Stripped and packed roses for transport (right). Photos: Author's own]

Speaking to the local staff who gave me a tour of the polytunnels, they explained the impact that climate change is having for their day jobs. Drought means they need to abstract more water from the lake, rain and cold weather prevents the roses from growing and flowering, creating humidity which can lead to devastating diseases like botrytis and an increase in pests. All this can make consumer demand hard to meet. This was a common story across Kenya. Weeks before I arrived in Naivasha, many of the poorest neighbourhoods, in which many of the tens of thousands of flower farm workers reside (The Star, 2024), were displaced due to extreme flooding the country was not prepared for. When I asked what preparations had been taken to think about the impact of climate change in the future, no one could really answer me. In the Netherlands, agents I met were concerned about the flooding that had hit Kenya and the impact it would have on rose supplies around Dutch Mother's Day on 11 May, one of the Dutch cut flower market's most important days on the calendar. Growers with business in Kenya told me that growers could not get the product to airstrips, and even if they could the airstrips were flooded. This has an impact on the price of roses in the auctions, in some cases elevating the prices of competitors. Not delivering adaptation at scale will only create further issues down the line.

Back at Tambuzi with Jane, we spoke about the way the business had changed over the years. One clear difference between Tambuzi and other Kenyan flower operations was their focus on water. Tim and Maggie made a decision 15 years ago to stop abstracting water, instead building their own lake and co-founding a water association with the local community. Now they only abstract water from their lake, ensuring that the local community have access to their own water

source and their flower farm is not taking from it. Alongside rainwater harvesting, they also use a combination of gravel, charcoal and reed beds to filter the wastewater from the irrigation, acting as a natural filtration system to remove chemicals from the water so that it can be re-used or is safe to be returned to their lake. Jane explained that Tim and Maggie's determination to ensure there was thoughtful engagement with the community, as well as high environmental standards for the growing of the crop, plus a focus on their staff, is one of the reasons the business is so successful both in its relationships with locals and international sales.

East of Tambuzi lies Lolldaiga Conservancy, spread over 109,515 acres and run by Richie Van Aardt. Richie warmly welcomed me to stay with him and his family in their house overlooking far off flower farms lit 24 hours a day in the distance, constant pools of light in an otherwise pitch black expanse. Richie runs 4000 indigenous Boran cattle following the regenerative mob approach, moving the cattle mob every hour for 12 hours at a time. Kenya has a blossoming beef market; as the middle class grows, so does a market for beef. But Richie believes (and is attempting to prove) that beef production does not have to come at the expense of biodiversity. For a start, the cattle are chosen for their adaptability for the environment. Many commercial beef herds in Kenya have European genetics, but the Boran cow is much more appropriately suited and requires less intervention in the Laikipia region of Kenya. A significant problem with grazing cattle in the past has been overgrazing, which led, Richie explained, to tension during the dry season because the land is not able to cope with the drought or flash flooding because the soil cannot store water. The techniques used by Richie and his team of locals eradicates the unpalatable couch grass (which is a fire risk during drought season) and opens up the ground canopy, allowing for an increased diversity of grass and broadleaf species, as well as creating more shoots for wildlife to feed on.

To prove this method of grazing works, the team conducted hourly tests with a qualified botanist, Boniface, who talked me through the various tests using the Soil Mentor app. Boniface explained that soil with better organic matter and a higher diversity of plants for ground cover is able to store water, which means it is more capable of coping with both flooding and drought. Joseph, one of the locals who works with pastoralists from the community, talked extensively about the importance of involving the local community in the project, not just employing them but also sharing knowledge. Many of the local elders are sceptical of Richie and Joseph's work. However, showcasing the benefits through data, through the health of the cattle, through the land's resilience during the drought and the rainy season, they are able to spread the word about how this method of beef production can be helping the land to repair the water system, and provide locals with a viable source of income. Small-scale flower farms in the UK and abroad are already employing similar regenerative agroecological tools, focusing on soil restoration, bringing livestock back into the system, and viewing their farms as

whole and balanced ecosystems. There are learnings here that are transferable over to commercial flower operations too.

[Soil testing with Richie's team Joseph and Boniface using the soil mentor app (left). Richie Van Aardt (middle). 2000 strong mob of Boran cattle (right). Photos: Author's own]

In the Netherlands, I met Daan Noort an agent and exporter, who picked me up at 4:30am outside my hotel, bright-eyed and ready to show me around the Noordwijk floral auction house, one of the three major branches of RoyalFloraHolland's multi-billion pound global flower auction. Noordwijk is the second largest auction after Aalsmeer auction house which I cycled to a few days earlier. Aalsmeer is the largest flower market in the world and sells on average 46 million flowers every day. As an agent running Gebr Noort, it is Daan's role to get flowers out to his customers across Europe, and to provide his customers with the best possible deal on quality and price. Daan started on the auctions aged just 13 years old and has developed excellent relationships with many of the local growers, meaning I was able to visit several growing operations including a gerbera operation and two lily production facilities. The production processes are fairly standardised for indoor cut flowers, and they are highly controlled environments, which means that erratic climate events have less of a direct impact. One standard I was intrigued to see was the roll out of IPM. According to Daan, and later, Fedor at Together2Grow, IPM is becoming standardised within the Dutch grower operations.

[Daan Noort in Noordwijk auction house (left). Worker harvesting gerbera daisies in Noordwijk (middle). Roisin in a gerbera daisy cut flower facility (right.) Photos: Author's own]

The push for a reduction in chemical usage in Europe is driven by the European Commission's 'Farm to Fork Strategy (2020)', which seeks to reduce the overall use and risk of chemicals by 50% by 2030. It does so by promoting IPM and alternative control techniques for weeds, pests and disease. Most growers in the Netherlands appear to be driven to change by these policy and regulation changes, with a few like Fedor acting in a voluntary manner to speed up the process towards chemical-free flowers. The uptake of IPM falls into one arm of the regenerative farming movement, an approach that encourages farmers to see their farming operations as an ecosystem. Speaking with Nicole Masters, a leader in the regenerative farming movement, she tells me that a diverse system is a healthy system and that the future of agriculture depends on a movement away from a reliance on chemical inputs. This is one area in which micro-growers in Britain are potentially leading the way already. There is also a successful marketing element of this approach, a premium associated with 'chemical-free, locally grown, seasonal flowers'. But if the drive for IPM continues within the flower sector, might our argument that 'chemical-free, British is better' begin to stall?

Julie Treanor at the Pickery in Wellington, New Zealand, champions the 'whole ecosystem' approach for flower growing, working with nature to create a system that means there are no chemical inputs, which is something she successfully markets. This is important because Julie explains that New Zealand does not have a tradition of buying flowers like the UK, and does not have the same brand trust as the 'British flowers' label. Interestingly, 75% of the flowers in New Zealand are grown in New Zealand, compared to the 10% of flowers bought in the UK being grown in Britain. Julie suggests that without a trade body advocating for New Zealand flowers, it is hard to encourage consumers to purchase locally grown flowers. We are fortunate in Britain to have strong brand loyalty to British

produce, but we need to ensure we are not falling behind on standards like IPM being rolled out elsewhere in the industry.

The British cut flower market must take steps to adapt using a whole ecosystem approach, thinking about water, soil management and leaning into IPM where appropriate, with a focus on a system that encourages pest predators rather than chemicals. Without doing so, our growing environments are at a greater risk as they become locked into systems that keep them static rather than resilient, and we cannot cope with shocks. But we also potentially lose our edge. We know consumers want British, but if consumers are wanting more sustainable products, that means looking at our approaches to growing here in the UK now, so that we are ahead of the rest of the industry.

[Julie Treanor on her small scale flower farm in Wellington (left). Julie's ranunculus in bloom (middle). Growing beds for spring at The Pickery (right). Photos: Author's own]

Chapter 8: Conclusion

I set out to understand how the British cut flower sector was preparing for a 2-degree warming world, but what I found was a fragmented and struggling sector. However, I also found a determined, motivated and brilliant community of growers at all scales who wanted to see that change.

My research took me to meet those on the front line of climate change, and we must heed their warnings rather than think or hope that we are safe here in the UK. I often hear farmers and members of the public talk about 'a few more hot days', but the future is uncertain, and with uncertainty comes risk. Braden Crosby in New Zealand told me that wine was the 'canary in the coal mine', and this experience has shown me that the impacts of climate change are here right now in the UK, whether they are in the form of extreme flooding, drought or rising sea levels. We as farmers have a responsibility to adapt and build resilient systems, for both the future of farming and the future of our businesses.

Is the British cut flower industry prepared for a 2-degree warming world? No. But it is clear to me that none of us are. The three pillars of adaptation and building resilience for the cut flower sector are:

1. Community building and advocacy centred around knowledge and exchange
2. Planting the right plant in the right place
3. Learning to adapt our practices to a changing environment with a whole ecosystem approach

Growers across the world are implementing these changes to ensure their businesses are more robust and can survive the shocks on the horizon. Now it is up to us to lead the way.

Chapter 9: Recommendations & What's Next

Recommendations for policy and decision makers:

1. Establish a British Cut Flower Association which advocates for growers in policy spaces, with a network of floral media champions, facilitating stakeholder engagement and knowledge exchange cross-sectors
2. Labelling for retailers for cut flowers bouquets which clearly identifies country of origin by 2026
3. Funding to be made available for targeted research into cut flower development, agro-ecological growing methods, supply chains and data
4. Horticulture strategy which has been consulted on by cut flower growers and users, with a Ministerial spokesperson with responsibility for this area.
5. Collaborative consumer campaign about the benefit of British flowers for the environment, aligning with similar messages coming from the food sector.

What is next?

The industry needs a voice that represents it in policy, political and consumer spaces. Following my research, I am now seeking funding to establish the British Cut Flower Association, bringing together key stakeholders in the space and identifying what we need to do to turn the tide on imports.

I believe we are in a position to radically transform this industry, but one person cannot do that alone. Seed funding will enable me to establish a project that brings the industry together, identify its core aims, and establish a plan to deliver advocacy, campaigning and establish how better policies can help the British cut flower sector thrive once more. It is my hope that the British Cut Flower Association can encourage the uptake of cut flowers for on-farm diversification, increase the numbers of cut flower growers producing high quality crops, and build on the British Flowers brand to encourage consumers to buy British first.

I have meetings booked in with stakeholders in November and December to explore this process, and I am currently working on a business case for funding. I will be presenting my findings and further plans to the Flowers From The Farm conference in January, participating in the Oxford Real Farming Conference in January, and am hoping to host cut flower focused sessions at Groundswell this year. Please do get in touch if you want to be involved, would like me to speak at your event, or are interested in contributing funding for this work to get off the ground.

Chapter 10: Acknowledgements and Thanks

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Organisations/Businesses included in this research:

International:

- B Corp
  - https://www.bcorporation.net/en-us/certification/
- Soil Mentor App (App for regenerative farmers)
  - https://soils.vidacycle.com/
- Nicole Masters at Integrity Soils (Regenerative agriculture education and exchange, biological education specialists)
  - https://integritysoils.com/

UK-based:

- Flowers From The Farm (UK-based growers association)
  - https://www.flowersfromthefarm.co.uk/
- Flowers By Clowance (British flower wholesaler)
  - https://flowersbyclowance.co.uk/
- Sustainable Cut Flowers Project (UK-based research project acting as a knowledge exchange hub for sustainable floriculture)
  - https://sustainableflowersresearch.org/
- Harriets Plants (UK-grown house plants)
  - https://harrietsplants.co.uk/
- BJ Richards (UK-based, British wholesale, grower and importer)
  - https://bjrichardsflowers.co.uk/
- Naylor Flowers
  - https://naylorflowers.co.uk/
- Crossland Nurseries (British grown alstroemeria)
  - https://www.facebook.com/CrosslandsFlowerNursery
- Petalon (Cornwall-based florists and flower farmers, bouquet delivery service)
  - https://petalon.co.uk/
- Flowers Grown in Scotland (Growers group raising the profile of Scottish grown flowers)

    - https://www.flowersgrowninscotland.co.uk/
- Grampian Growers (Potato and daffodil co-operative on east coast of Scotland)
    - https://www.grampiangrowers.co.uk/
- Forever Green Flower Company (Seasonal flowers grown in Norfolk)
    - https://www.forevergreenflowerco.co.uk/
- Scarlet and Violet Florists (London-based florists working on sustainability in floristry)
    - https://scarletandviolet.com/
- SSAW Collective (Collective to encourage consumers to make more informed, nature led and seasonal decisions)
    - https://www.ssawcollective.com/
- Anna's Flower Farm (gardener, educator and designer)
    - https://www.annasflowerfarm.com/

Kenya based:

- Tambuzi Roses (Kenyan-based Rose business)
    - https://www.tambuzi.co.ke/
- Wildfire Flowers (Kenyan rose producers, on Lake Naivasha)
    - https://www.wildfire-flowers.com/
- Lake Naivasha Water Resource Users Association (LANAWRUA)
    - https://www.facebook.com/lanawrua/?locale=en_GB
- Lolldaiga Conservancy (Conservancy in Laikipia region of Kenya)
    - https://www.lolldaigaconservancy.org/

Netherlands based:

- RoyalFloraHolland (International floriculture platform)
    - https://www.royalfloraholland.com
- Together2Grow (Alstroemeria growers group in Netherlands)
    - Together2grow
- Gebr. Noort Bloemenexport (Family run cut flower exporter business)
    - https://gebrnoort.nl/

New Zealand based:

- Bragato Research Institute (New Zealand Wine research institute)
    - https://bri.co.nz/
- National Institute for Weather and Atmospheric Research (New Zealand)
    - https://niwa.co.nz/
- The Pickery (Small cut flower growing business in Wellington, New Zealand)
    - http://www.thepickery.co.nz/
- Ata Rangi Wineries (Winery in Martinborough, New Zealand)
    - https://atarangi.co.nz/
- Tinpot Hut Wineries (Winery in Marlborough, New Zealand)
    - https://www.tinpothut.co.nz/
- Field of Roses (Locally grown seasonal flowers grown in the Gisbourne region of New Zealand)
    - https://www.fieldofroses.co.nz/
- Verve Flower Farm (Locally grown seasonal flowers grown in the Marlborough region of New Zealand)
    - https://www.verveflowers.co.nz/

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