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Enhancing The Resilience Of UK Dairy Sector: How Do We Practically Adapt To Increasingly Volatile Weather Conditions?

Written by:

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June 2024

A NUFFIELD FARMING SCHOLARSHIPS REPORT

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

Title	Enhancing the Resilience of the UK Dairy Sector: How do we practically adapt to increasingly volatile weather conditions?
Scholar	Hattie McFadzean
Sponsor	AHDB
Objectives of Study Tour	- To explore how dairy farmers in different climates are adapting to climate change - To identify practical and proven adaptation practices that could inform more resilient approaches within UK dairy systems. - To understand what triggers whole-system change including the breaking points, mindset shifts, and motivations that push farmers to rethink how they farm. - To learn how knowledge, support networks, and peer influence shape decision-making and help farmers take action before crisis hits.
Countries Visited	Brazil, USA, Mexico, India, Ireland, UK
Messages	- Resilience is not optional, dairy farms need to act before climate shocks become more frequent and disruptive, not after. - Adaptation is practical and system-specific; there's no one-size-fits-all solution. Farmers need to choose changes that suit their land, livestock, and resources. - Resilience starts with mindset. Lasting change comes when farmers rethink how they manage risk, not just how they manage cows. - Science must be made usable. Climate data is only valuable if it's translated into clear, relevant advice at farm level. - It takes a whole supply chain to scale resilience, we need coordinated support from policy, processors, and knowledge networks, not just farmers.

EXECUTIVE SUMMARY

The UK dairy sector is set to undergo increasing pressure from a changing climate; from hotter summers and erratic rainfall to longer dry spells and storm events. The sector needs to better understand this phenomenon and start incorporating it into our decision making today.

This report explores how dairy farmers around the world are adapting to climate change, and what practical lessons can be utilised in the UK to support farm resilience.

Over a two-year period I visited farmers, research, processors, and stakeholders in USA, Mexico, Ireland, India, Brazil and the UK, to explore what adaptation looks like, what are the impacts of adaptation, and importantly, how do we weave adaptation and resilience thinking into farm management.

No two systems or perspectives were the same, but the core takeaways were consistent: resilience is achievable for many system types, but it requires planning, mindset shifts, and flexibility.

I grouped the most common adaptation practices into three categories:

- Herd Management: Breeding for heat- and disease-tolerant cattle, adjusting calving seasons, using smart collars for early health alerts, and managing stocking rates more carefully to match forage supply.
- Land Management: Improving water retention through composting and mulching, switching to drought-resilient forages, and experimenting with multispecies leys or silvopasture systems.
- Infrastructure: Providing shade (via trees or shelters), investing in cooling (fans, misters), and designing sheds and layout to maximise airflow and comfort.

Exploring these adaptation practices is not to blindly suggest their widespread adoption but is to showcase variety and case studies of how farms have transformed management over time to mitigate the impacts of extreme climates on their herds, their health, and their economics.

Resilience is not only about understanding what adaptation practices you can apply to dairy farms, but it's cemented through leadership and mindset. It's about having the headspace to predict the limits of the farm and understand how these limits might shift in the future. Many farmers I spoke to only made adaptive changes after a crisis forced them to think differently. These were painfully recalled; stories of herd welfare events, severe forage vulnerabilities, or mental health issues. We have the opportunity in the UK to leapfrog many of these 'breaking points' and use information to promote resilience leadership in the industry.

In the UK, we have an abundance of research, innovation, and knowledge exchange platforms but the frequency to which we discuss climate resilience still lags behind. By sharing global examples, this report aims to prompt action: to ensure the industry is not just reacting to climate pressures but preparing for them. This isn't fearmongering. It's about taking control and getting ahead.

TABLE OF CONTENTS

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CHAPTER ONE: PERSONAL INTRODUCTION

Coming from a long line of farmers, I'm the first generation of my family not to have grown up on farm. Despite this I've still found myself (thankfully) nestled in the world of agriculture.

After university, disillusioned with my degree in Economics, I undertook a Master's in Climate Science, seeking a career with purpose, and spurred on by the anxiety I felt over what may happen to my most beloved landscapes over my lifetime. What would climate change mean for the land my parents farmed growing up? What would it mean for the North York Moors, or Norfolk wetlands, or Cambridge flatlands?

Ten days after submitting my thesis, I was on a plane to Vietnam, and later Myanmar (Burma) where I would spend nearly three years working with farming communities to assess the effectiveness of agricultural resilience initiatives and adaptation funding.

I returned to the UK when COVID hit, to find a stark contrast between climate resilience conversations happening back home. Of course, Burmese farmers face greater vulnerabilities, but the lack of open, practical discussion about climate adaptation in British agriculture shocked me.

I started working for Promar International in their Sustainability Team. I specialise in sustainable agriculture, from carbon footprinting large supply chains to resilience research and incentive model advice. In my spare time I'm a creative, and love to paint, illustrate, construct, and sculpt.

CHAPTER TWO: SETTING THE SCENE

Our climate is changing at a rapid pace, impacting our natural systems and populations across the globe (IPCC, 2023). For the UK Met Office projections warn of hotter and drier summers, warmer and wetter winters, and more frequent and intense weather extremes.

For the agricultural sector climate change presents an unprecedented challenge. The 2021 UK Food Security Report points to it as one of the biggest risks to domestic food production through increased risks of droughts, floods, hotter temperatures and humidity, rainfall variability and milder cold snaps (DEFRA, 2021).

For livestock enterprises such as dairy, days that exceed the threshold for heat stress could rise by some 500% in the east of England by 2051-2070 in comparison to 1998-2017 (UK Climate Resilience Programme, 2021).

The interdependencies in milk production exacerbate this problem, meaning that the impacts of events are not only felt in one area of the production system, but are likely to have widespread effects across the sector.

The urgency of this research is underpinned by the current state of the dairy industry within the UK. Whilst still boasting around 7,200 dairy producers, this figure is declining (AHDB, 2024). Yes, herd sizes are increasing, minimising this gap, but these exits from the industry reflect the pressures felt among many in the sector, of stress, anxiety, poor work life balance, and uncertainty about the future (Wheeler & Lobley, 2012 and Gregoire, 2002).

Climate change has the potential to exacerbate these pressures, therefore making climate resilience a very important topic.

So, what is climate resilience?

Climate resilience is defined as the ability of systems to anticipate, prepare for, adapt to, withstand, and recover from the impacts of climate change and volatile weather events (Alvar-Beltrán, 2021).

Figure 1: Definition of Climate Resilience

The concept of climate adaptation and resilience is not new within the sector but arguably limited given the potential impacts.

This report builds on this context through collecting anecdotal evidence from dairy farmers around the globe operating in more extreme climates with the intention of understanding what can promote climate resilience within the UK dairy sector, and what adaptation could look like.

CHAPTER THREE: MY STUDY TOUR

My study tour started with the Contemporary Scholar's Conference in Brazil, and took me to US, Mexico, Ireland, India, and around the UK.

Figure 2 Study Tour Locations

Locations

New York State (USA)
Georgia State (USA)
Baja California (Mexico)
Sonora (Mexico)
Durango (Mexico)
Yucatan (Mexico)
Mato Grosso Do Sul (Brazil)
Republic of Ireland
Karnataka (India)
Punjab (India)

Respondents

50+ farms
Agricultural consultancies
Feed and forage processors
Milk processors
Beef, pig, and arable enterprises

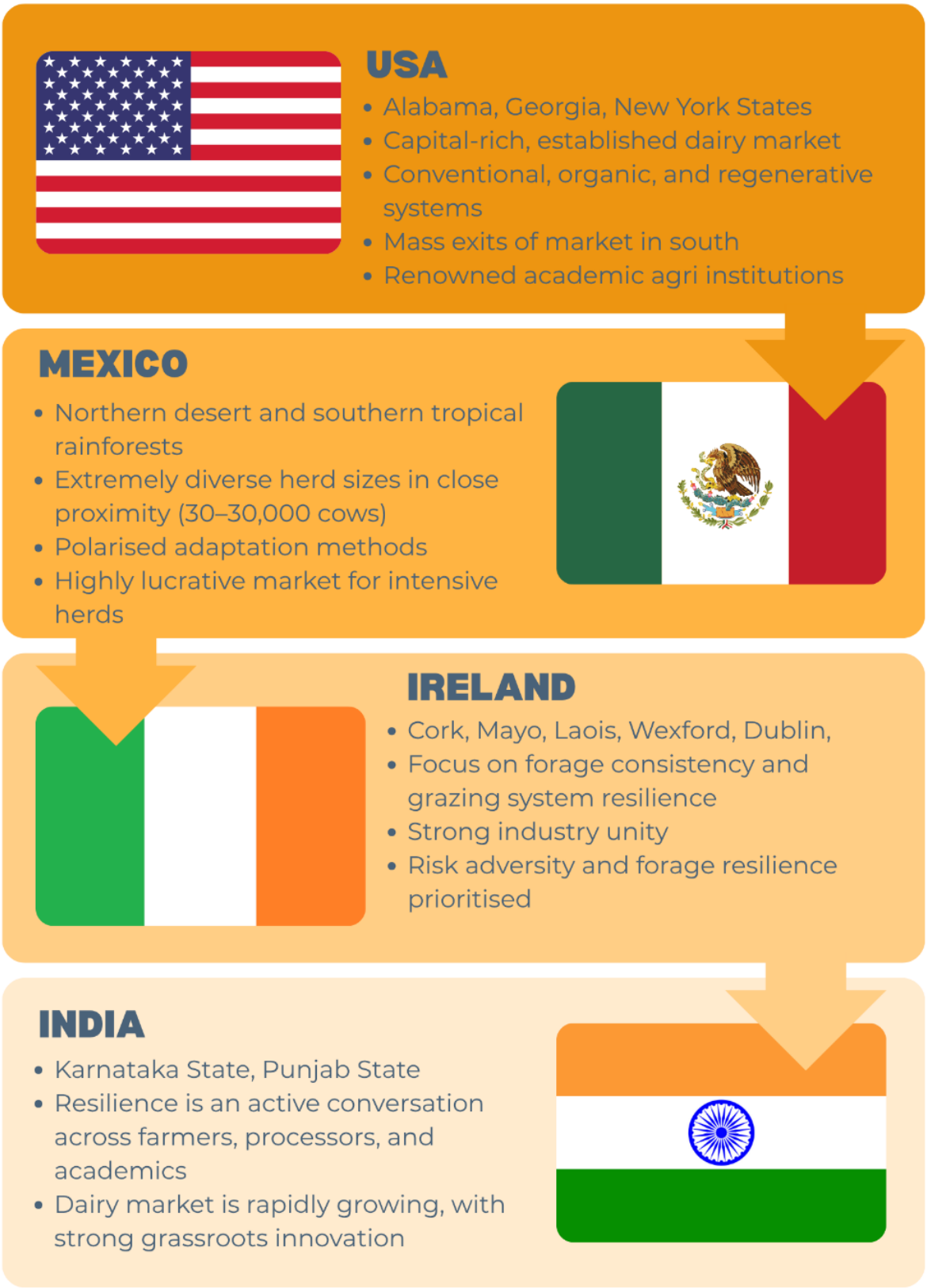
Institutions

Cornell University
University of Georgia
Teagasc
Universidad Autonoma de Baja California
Universidad Autónoma Agraria Antonio Narro
Universidad Autónoma de Yucatán
Ludhiana Agricultural University
Guru Angad Dev Veterinery and Animal Sciences University

When choosing locations, I wanted to go to places where dairy markets were established, but where systems varied in intensity, convention, market forces, and importantly, were situated in climates more extreme than the UK. Whilst the logic for Ireland is arguably muted on the last point, comparing the UK with a more united sector with similar conditions to the UK proved incredibly rewarding.

My study tour showed me what viable dairy systems could look like under drastically different climate circumstances. In some, they welcome rain a few times a year, and in others the rains come all at once and are violent and heavy. It introduced me to regions that were hot and dry, or muggy and oppressively humid. While the UK is not set to mimic these climates exactly, exploring a range of conditions provides an opportunity to understand mindset shifts and adaptation processes that farmers have been forced to adopt.

An overview of study tour locations.



CHAPTER FOUR: FINDING RESILIENCE

4.1 Our climate is changing

4.1.1 Experiences of changing climate

Farmers in each location largely expressed concerns about the rate of climate change. These mainly included concerns of heat stress, drought, a warming climate, weather volatility, harsh rainfall and humidity events.

I heard countless anecdotal stories, such as from farmers who remembered wearing jumpers in winters some 15 years ago, and no longer having to do so (Tiwana Farms, Punjab State India), or tales of no longer having to defrost water pipes, despite the region historically being used as ski country in the winter (Clark Farm Dairy, New York State, US).

The message was overwhelmingly clear for those in US, Mexico, and India especially, the climate has been changing at a fast enough pace for many to notice within the past 20 years.

Figure 3 Clark Farm Dairy Farms, New York State, USA

Farmers in India expressed climate concerns most frequently, hardly needing any prompting. There was a clear sense of worry as they talked about rising temperatures, more frequent droughts, and unpredictable weather becoming the new normal. For Ireland, these climate changes were expressed differently, more as climate variability and the concern for the future of forage stocks.

Within Northern Mexico - with temperatures now reaching over 50 degrees and with projections only set to boost this further- there was a notable lack of panic over the situation. Occasionally, concerns sprang up around water scarcity or supply chain variability. For one farm, housing 30,000 cows, uncertain water futures led to only one viable adaptation practice: moving the cows and system south, to where climates are more forgiving.

4.1.2 Impacts of a changing climate

The following table provides a summary of impacts specifically mentioned by respondents over the study tour. They range in intensity, frequency, and duration.

Table 1 Analysed Impacts of Climate Change Observed Over Study Tour

Impacts	India	Ireland	USA	Mexico
Decreased Milk Production *Ranging from 10% to 40%*	✓	✓	✓	✓
Decreased Milk Quality *Increased somatic cell counts, reducing shelf life of product*	✓	✓	✓	✓
Herd Behaviour Change *Reduced DM intake, lying time, respiration rate, relationships*	✓		✓	✓
Increased Pests *Monsoon season*	✓			
Increased Mortality *Heat stress, extreme storms*	✓		✓	✓
Increased Disease *Mastitis, Lameness, Fever*	✓	✓	✓	✓
Fertility Issues *Lack of fertility or staying in calf*	✓		✓	✓
Forage Production Issues *Quantity and Quality*	✓	✓	✓	✓
Differing crop pest profiles *Concerns about resistance*			✓	
Soil Health Deterioration *Soil erosion, water infiltration, OM%*	✓	✓	✓	✓
Mass Market Exits			✓	✓
Lower Incomes *Production issues, increased mortality, increased costs (i.e. feed and vet)*	✓	✓	✓	✓
Increased Carbon Intensity	✓	✓	✓	✓

Notably, the highest impacts were felt on more intensive systems that had not invested in adaptation.

Despite this list of impacts, it was widely reported by specialists that stakeholders can routinely underestimate the impacts of detrimental climate events. Professor Shao Tao, University of Georgia, expressed that the impacts of heat stress on dairy animals go beyond the lactating cow, explaining that impacts on calves and dry cows are under-recognised, and that impacts can show up on the day, months after, and will even affect the lifetime productivity of the cow *and* her progeny. He noted the additional risk to UK dairy herds, who will be less accustomed to climate extremes, and therefore more reactive to changes within the weather.

Interestingly, the farms that were showing the most resilience had a better understanding of what climate impacts they had experienced before. The more attentive they were to their changing conditions, the better prepared they were to face them.

Figure 4 Native Breeds under research trials at Akshayakalpa Research and Development site, Karnataka State, India

4.2 How are farmers adapting to the situation?

4.2.1 Review of observed adaptation practices

Adaptation practices come in many shapes, sizes, relevance, capital intensity, and palatability. The following chart demonstrates most of the tangible adaptation practices I observed, with the X access displaying frequency of observation.

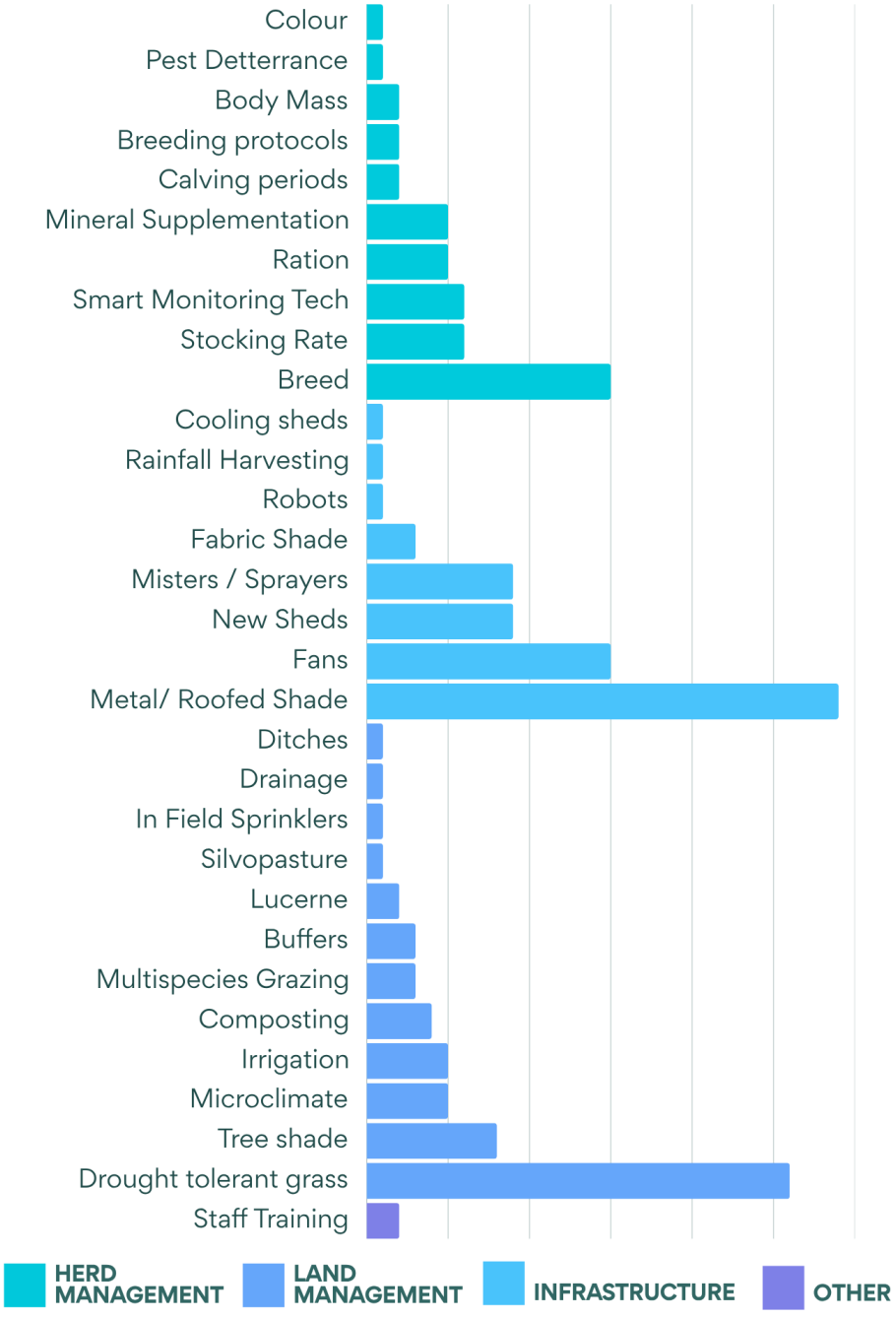


Figure 5 Frequency of Observed Adaptation Practices Across India, Ireland, US, and Mexico

In some moments of my tour, the sheer number of practices I observed felt overwhelming. Sure enough, several headlines slowly started to take shape that drew all these visits together:

ADAPTATION HEADLINES

- **Adaptation mainly spans three key areas: herd management, land management, and infrastructure**, but none of it works without people, knowledge exchange, and a shift in mindset.

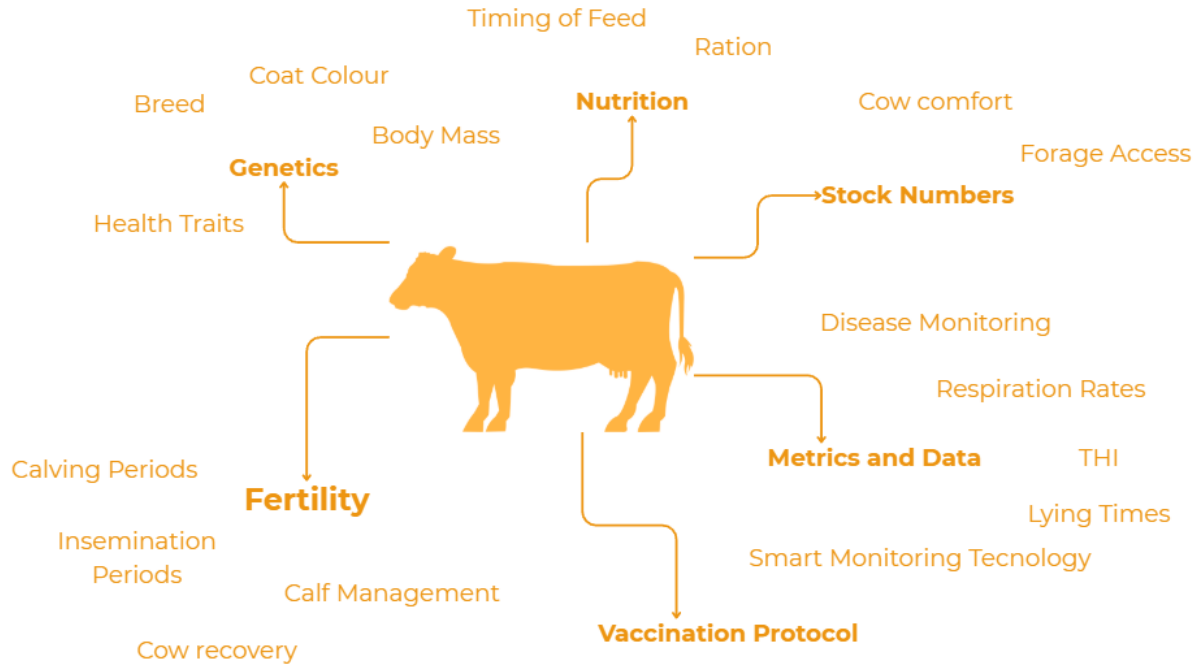
- **The UK has plenty of quick wins for climate adaptation** but risk forecasting remains a major barrier to action.

- **Adaptation can be simple or strategic** from encouraging water breaks for staff to relocating entire farms to escape long-term water scarcity.

- **Adaptation and mitigation aren't the same, but they are connected** and both are vital to building a future that balances people, profit, and planet.

- **Herd, land, and infrastructure strategies are often seen as short-, medium-, and long-term fixes** but timelines aren't fixed, and flexibility is key.

4.2.1.1 Herd management



Many farmers I spoke to were able to act upon herd management changes faster than land and infrastructure changes. Those more achievable practices included stocking rates, nutrition revisions, or speaking to vets to understand the impacts of climate variabilities and the associated solutions.

Genetics

Genetics was a key solution for many farmers dealing with heat stress, drought, and disease – this was particularly accessible for farms where infrastructure was limited or capital was inaccessible. It was more necessary to adapt the cow to the environment, rather than vice versa. Many utilised breed choice, coat colour, and genetic index traits to select straws that would provide less variability in milk production as the weather changed. For extensive farms in Mexico, like La Almeda Ranch (dairy, calf-at-foot), Holstein/Simmental crosses would outperform Holstein

Fresians due to the continuity of milk production throughout the year, showing less signs of heat stress, disease susceptibility, and fertility issues.

Figure 6 La Almeda Ranch, with dairy crosses, outperforming Holstein-Friesians under heat stress condition

In both Northern Mexico and India, farmers observed cows with lighter coat colours were less prone to heat stress and aimed to select Holstein Friesians that were lighter in colour, despite increased vulnerabilities to ocular infections.

Figure 7 Tiwana Farms, Punjab State India, Breeding for Lighter Coat Colours

Native crossbreeding, to promote consistent milk yields and better disease resistance, is a stipulated contractual agreement between Akshayakalpa Organics in Karnataka State, India and their suppliers. Each cow must at least be a 25% native cross, enhancing her chances of being more suited to the loose-housed open air systems that were typical of this supply chain.

Fertility:

In the hottest regions of the study tour, fertility management had also shifted in response to the climate. In India, Mexico, and parts of the US, AI was often paused during the hottest months, allowing for the delay between instances of heat stress and later fertility responses also.

Technology:

Smart collars were being used as an adaptation technique in six of the farms, with at least one in every study location. Usually introduced because of declining health indicators for the herd, or issues with labour and staffing, the collars provided an opportunity to catch disease and health incidents early, invest into fertility, and to reduce vet call outs.

Most of these collars tracked respiration rate, feed intake, and rumination. One farm in Punjab State (conventional 200 cow herd, housed) in India estimated that collars saved them 15,000 rupees per cow (~£140) in vet bills and lost productivity. Before they used collars, peak milk yields ranged wildly between 15 to 40 litres for their Holstein Friesian herd. After collars and heat stress monitoring, peak yields were less variable, at 35-40 litres. Incredibly, mortality in the hot season reportedly dropped dramatically - from 15% down to just 2%.

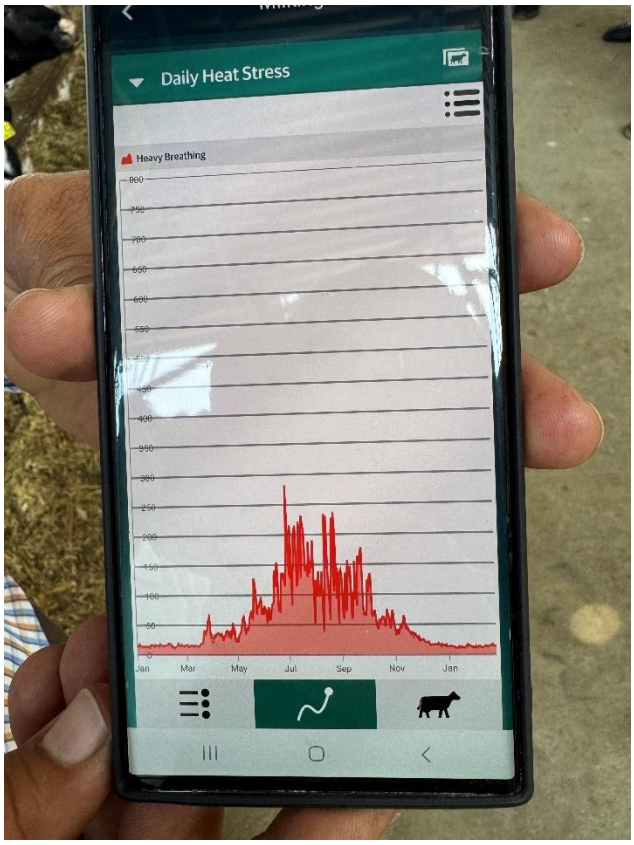
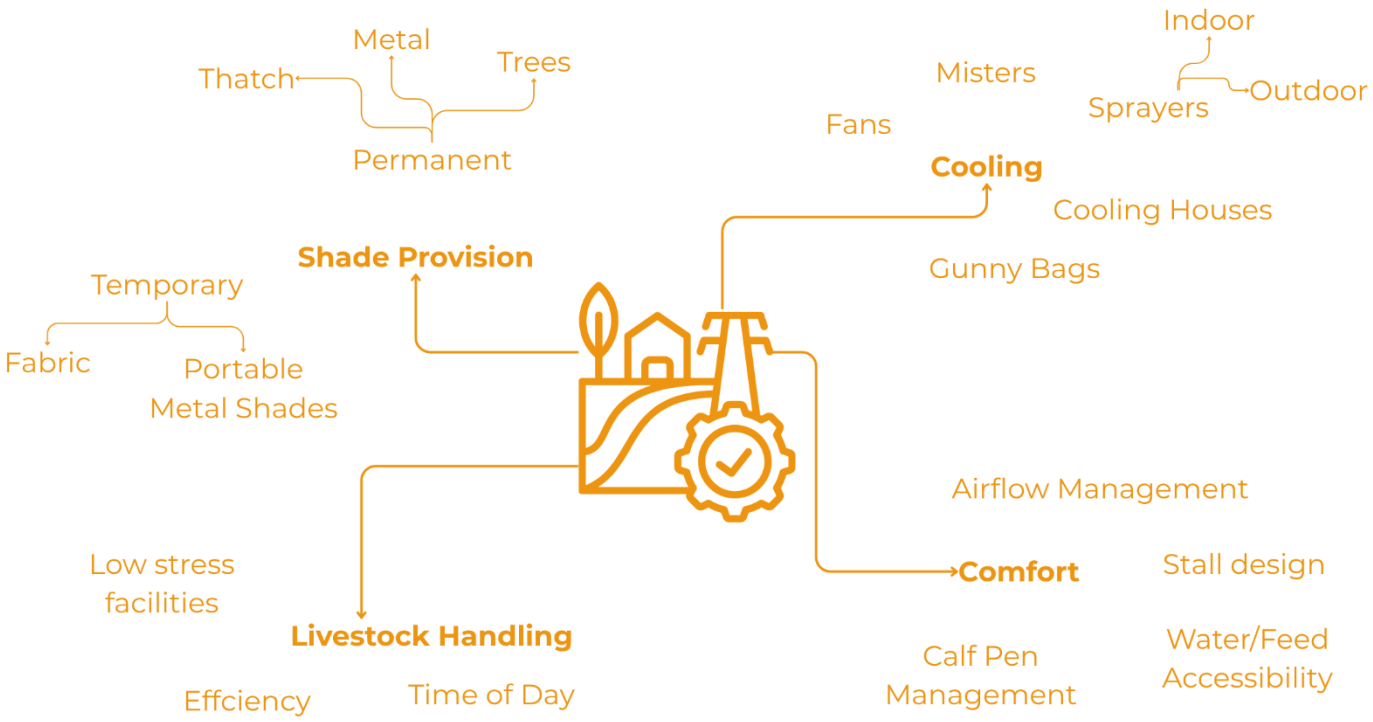


Figure 8 Tiwana Dairy Farm, Punjab State, India. Collars used to monitor heat stress

Stocking Rate:

Stocking rates were constantly evolving on the farms visited;, some setting sights on expansion, some in the process of reducing to suit the limits of the farm size. In Ireland, for David Kerr, reducing stocking rates helped maintain forage stability throughout the year, and to ease pressure on pasture. For dairy farms in India and the US, intensification and expansion were common. In India, this was in response to increasing demand for high quality milk, whereas in the US, it was to promote economies of scale and to fill gaps from regional farms exiting the industry. In both cases, expanding the farm could be done so with resilience priorities engrained within the new systems.

4.2.1.2 Infrastructure



Shade structures:

Providing shade in pastures or housed systems was a must in most study regions and is reportedly undervalued as an effective adaptation technique in moderate climates. The most common type within the study regions were corrugated iron shelters, chosen for their simplicity, durability, and relatively low-cost instalment.

Palm thatch was less common but still frequent, which boasted more effectiveness at cooling cows, but was less favoured by many due to aesthetics and upkeep.

Temporary fabric shades were also a common sight within India, crucially to expand shaded areas for a low cost in the hottest of days.

Trees, one of nature's original solutions, come hand in hand with a plethora of positive impacts, but were a contentious issue across the regions. Some, like Professor David Midmore, University of Reading, and Professor Solorio, Universidad Autonoma de Yucatan, championed them, listing the multifaceted benefits of natural cooling, storm protection, soil health, income generation, and minimal maintenance once established. Others were less convinced, worried about lost pasture productivity or permanence of the trees.

At Akshayakalpa farms in India, integrated trees like mango and coconut were common for loose housed systems, providing shade, microclimate creation, and additionally, a secondary source of income through fruit and husk production.

Figure 9 Akshayakalpa supplier, Karnataka State, India. Holstein crosses enjoying the shade of integrated coconut and mango trees in a loose housing system

Figure 10 Barrington Dairies, Georgia, USA. Replacement heifers under moveable shade structures.

Internal cooling

On more intensive farms, especially where cows were partially or fully housed, fans and misting systems were essential.

In Mexico Rancho Lucero manages to produce milk from 30,000 cows in temperatures over 40°C, with plans to expand by another 10,000. The only way this has been possible was heavy investment into climate-controlled housing. Fans, misters, and sprayers with high roofs and draught management contribute to reasonably stable milk production, even in the hottest months. Additionally, the farm has constructed special 'cooling houses' where cattle can be moved in the

hottest times of the year, to stand under fans and sprayers. The level of capital investment required for this system is huge and should not be ignored.

Figure 11 Rancho Lucero, Sonora, Mexico. Cows waiting to enter parlour under fans and misters

Robotic milking systems.

Robotic milking systems (RMS) don't automatically come to mind when we think of adaptation to climate variability, but for Kyle Clark, who runs Clark Farm Dairies in New York State, switching to RMS have freed up time (a hot commodity) that can be spent on herd management. The economics of RMS can be prohibitive, but if feasible this could be a window to using time more effectively in a sector that suffers from chronic understaffing.

4.2.1.3 Land management

Water use and retention:

In the hotter climates of Georgia (USA), Mexico, and India, agriculture was highly dependent on irrigation. A lot of the conversations regarding water usage weren't just about getting it on the land, but mostly about keeping it in the soil. Composts and mulches were utilised throughout Mexico and South India to promote water

retention on the land. Composting, with a layer of coconut husks for good measure, for farms in Karnataka State (India) could reduce irrigation demands from daily to every few days, creating less stress on water demands in the dry seasons, and providing soil structure to cope with the excessive water received in monsoon season.

Figure 12 Mexicali Desert, Mexico. The impact of irrigation on food production within desert systems

Figure 13 Rancho Nuevo, Mexicali, Mexico. Compost production for soil protection, enhancement, and water retention

Forage

The impacts of climate volatility on forage production were of huge concern in all regions of the study tour. Many were utilising drought-resilient grass varieties, like Napier, Buffel, and Johnson, having to trade more biomass for less nutritional value. For Rancho Lucero, situated in the Mexicali desert, adaptation meant giving up all forage production due to unreliability, and choosing to buy in everything.

One solution specific to Ireland were multispecies leys. One of their biggest supporters was Kevin O'Hanlon in Kilkenny. Kevin introduced multispecies leys in 2019, supported only by dirty water, and saw worm counts jump from 3 to 23 within a year. Bonus advantages also were reported drought tolerance and protective high swards reducing parasite risks for calves.

Figure 14 Karnataka State, India. Drought-resilient Napir grass varieties

Figure 15 Kilkenny, Ireland. Multi-species leys on Kevin O'Hanlon's farm

Interrupting water runoff

Water runoff can be troublesome for multiple reasons: the threat of soil erosion, contamination, and underutilisation of water. Embankments, ditches, buffers, and tree breaks can be established to interrupt water flow and promote retention. In India, organic farmers utilised these methods to divert run-off from neighbouring conventional fields and to manage the extremes of monsoon rains. The incorporation of trees along the embankments further helped anchor the soil and added an extra source of income through fruit, timber, or shade.

Figure 16 Akshayakalpa Demonstration Farm, Karnataka State, India. Embankment with trees integrated for water diversion and soil erosion protection

4.3 Case Studies: Resilience Must be A Whole-System Approach

The report so far has only briefly looked at some adaptation practices in isolation - many are too complex to address in depth. The most important thing is how interconnected adaptation practices must be across the farm to be successful, and how critical it is to match adaptation with it's geographical boundaries to promote resilience. I could have highlighted this concept in 20+ farms, instead, I chose four to illustrate the point.

4.3.1 Case Study: Akshayakalpa Organic

In the heat and humidity of southern India, Akshayakalpa Organic is helping small dairy farmers reach resilient production through incentives, access to capital investment, and best practice conditions. The processor has a clear vision, spurred by rising demand for organic milk in the region: they want to get farmers of 5 cows to resilient herds of 25, better equipped for future climates and therefore creating more stability in the supply for Akshayakalpa itself.

Akshayakalpa led me around their facilities and took me to several local farmers for two days. Two things impressed me over this time period:

- The tangible evidence of how farmers' lives had improved through Akshayakalpa's programme: socially, economically, sustainably, and with huge gains in animal welfare on farm;

- The level of investment that Akshayakalpa was pouring into knowledge transfer for their suppliers.

Akshayakalpa believe knowledge exchange is best promoted through the following four methods:

1) Peer-to-peer learning through one 'best practice' farm in every village;
2) A dedicated team of vets and nutritionists that meet with every farm at least once a month;
3) Working, commercial demonstration sites for evidence-based training;
4) Contract stipulations on certain practices i.e. organic requirements and loose, yard-based housing (as opposed to tethered0.

Through these four pathways most Akshayakalpa suppliers have adopted the following adaptation practices:

- Microclimate creation (fruit trees surrounding the yard)
- Shade provision
- Buffers or embankments for water redirection
- Cow genetics to comprise at least 25% native species per cow
- Ration alignments per season
- Loose housing, as opposed to traditional tethered practices
- Shed position and structure tailored to wind position and shade optimisation
- Income diversification through diversification of crops
- Soil water retention through composting, covering bare soil, and deep rooting plants
- Constant feed and water supply

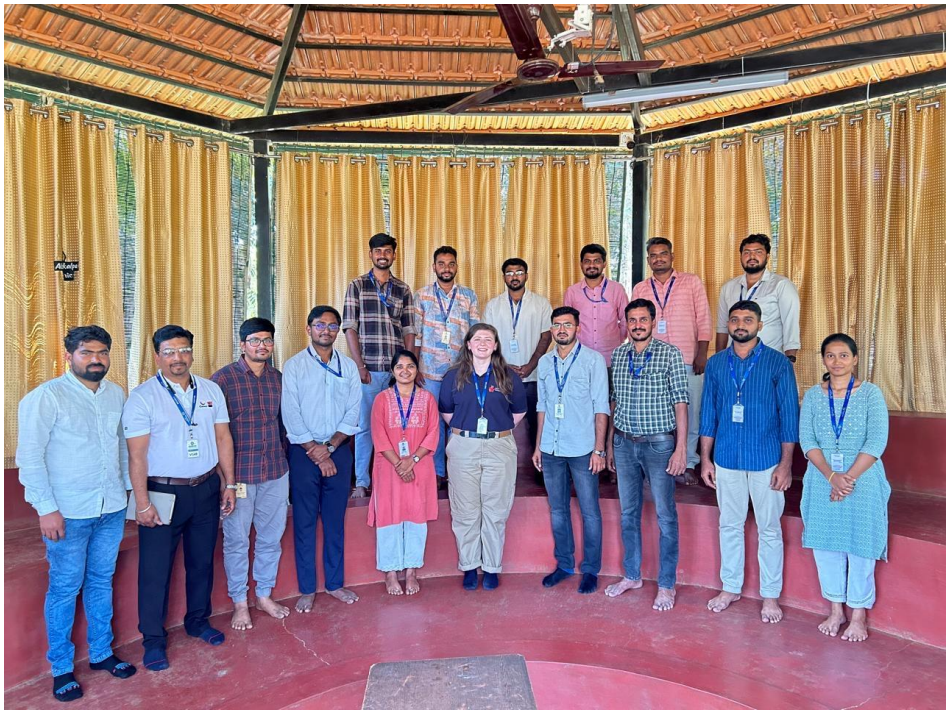
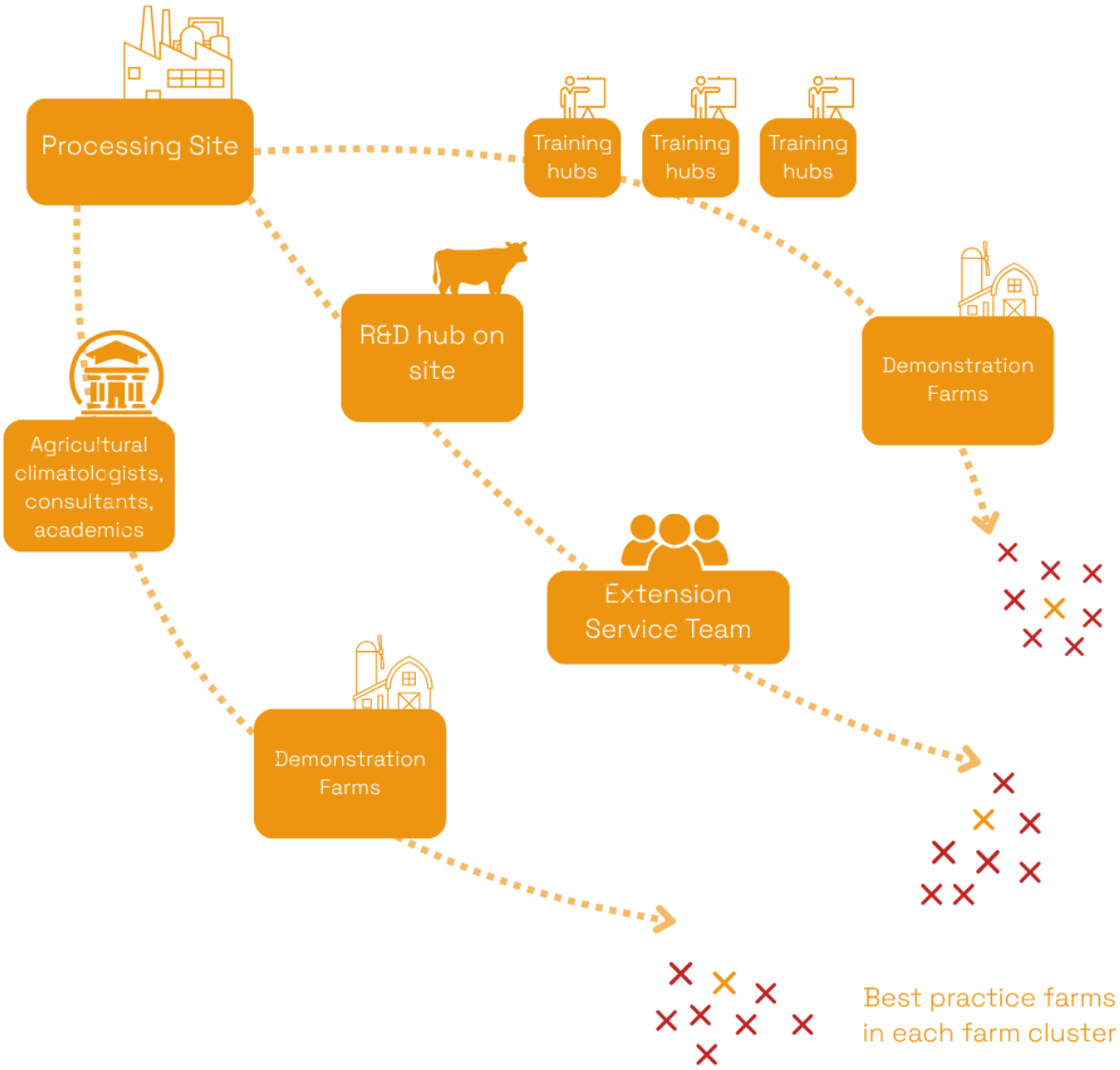


Figure 17 Akshayakalpa, Karnataka. Extension service team of vets and nutritionists

Figure 18 Akshayakalpa Demonstration Farm, Karnataka State, India. Compost from manure and mulch

Figure 19 Akshayakalpa Demonstration Farm, Karnataka State, India. Microclimate creation from planting trees outlining loose housed dairy system

Akshaykalpa believe that providing tangible evidence is crucial. Suppliers consistently reported higher fertility rates, lower mastitis levels and somatic cell counts, higher and less variable milk production per cow throughout the seasons, lower mortality, pest and disease rates, and ultimately an increase in income per cow, signifying the relationship between resilience and economic viability.



How does Akshayakalpa engage with farmers on resilient practices?

Akshayakalpa promotes knowledge sharing through various dedicated teams. From research and development teams on site, to demonstration farms nearby that are commercially viable. Prospect suppliers and existing suppliers are routinely invited to the facilities to learn by doing. In addition, are a dedicated team of extension service vets, who tailor advice for each farm, aiming to visit suppliers monthly. Finally, is the investment into peer-to-peer learning. Each village or farm cluster will have a best practice farm. A farmer who is particularly engaged, usually holder of the bulk milk tank, but knows the local community well and can demonstrate further the returns on investment of resiliet farming.

Figure 20 Knowledge Transfer, Akshayakalpa, Karnataka State, India

4.3.2 Case Study: Will Harris – White Oak Pastures

Will Harris was someone I had to go and speak to – recommended highly by local peers, and internationally known for his sharp-shooting, no-nonsense approach to resilience. I stayed on Will's farm in a log cabin in the woods, surrounded by the hum of insects, and met him in the morning for breakfast – before he loaded me into the jeep and we took a tour of his regenerative, resilient farm.

In the 1990s, Will Harris ran a profitable, conventional beef operation focused on fast growth: high fertiliser use, feedlots, hormones, and antibiotics, typical of the beef industry of the time. Eventually Will started to take a step back, realising the long-term implications of what he was doing: he quit intensive farming overnight to focus on a low input, resilient system, that would better serve his family for generations to come.

Will transformed White Oak Pastures into a regenerative, multi-species farm, adopting:

- Rotational grazing on diverse pastures
- Compost use, reduced stocking rate
- No fertilisers, antibiotics, or hormones
- Integration of pigs, sheep, and poultry
- Focus on soil health and biodiversity

The transition wasn't easy. He warned of financial strain and the recovery period for pastures, but the long-term payback was clear:

- Better soil structure and water retention
- Resilience to droughts and floods
- Self-sufficient forage
- Fewer pests and livestock health issues
- Jobs and regeneration for the local community

Will's now helping others do the same through the Center for Agricultural Resilience, sharing what real-world adaptation can look like.

Figure 21 White Oak Pastures, Georgia, USA. Regenerative beef production on rotational grazing

Figure 22 White Oak Pastures, Georgia, USA. Integration of mixed livestock. Pigs being soaked on a hot day, returning to woodland pasture area afterwards

4.3.3 Case Study: Ranch Solorio

In the steamy tropical forests of Yucatán, where humidity regularly hits 86%, Ranch Solorio is a standout example of how even the most degraded land can be brought back to life with vision and patience.

Once a barren cactus plantation with barely any soil, the land was acquired by Professor Solorio, an agroecologist and farmer, who saw potential. He believed that livestock could be the solution to this land if managed regeneratively.

Over two decades, he transformed the land using silvopasture and agroecological principles:

- Planting 1,000 fruit and nut tree species created microclimates, shade, and income
- Leucaena improved protein in cattle diets and reduced methane
- Multispecies grazing and rainwater harvesting helped build soil and reduce climate exposure
- Windbreaks and forage trials shaped both productivity and resilience, keenly balancing, nutrition, yield, and soil enhancement

The result is the thriving 120-hectare ranch that I had the pleasure of exploring, supporting:

- 40 crossbred dairy cows
- Over 500 goats, sheep, poultry, and quail
- 40 families who live and work on the land

The real story is the fairly rapid turnaround of this land, through a whole-system approach, balancing livestock with the requirements of the land, and shaping the system to promote soil formation.

Figure 23 Solorio Ranch, Yucatan, Mexico. Crossbred dairy herd on silvopasture, with drought resilient grass varieties (Author's own source)

4.3.4 Case Study: David Kerr

After the 2018 drought, David Kerr realised that pushing for higher production didn't guarantee resilience. At the same time, as many in the industry can feel, he was struggling to find hours in the day where he could spend elsewhere, instead of chasing around the farm. He cut his herd from 160 to 140 cows — and gained more security and space to breathe in the process.

He also:

- Used collars and flexible milking (13 milkings in 7 days)
- Outsourced routine jobs to free up time for management and mental health
- Focused on genetics that thrive on forage
- Planted multi-species leys for more reliable feed
- Dedicated 12% of the farm to biodiversity: woodlands, habitats, and a new pond

Kerr’s story shows how a mindset shift doesn’t have to mean radical change — just smarter priorities, more balance, and making space for long-term thinking.

Figure 24 Laois, Ireland. David Kerr's 1.5 acre pond habitat

CHAPTER FIVE: DISCUSSION

5.1 The Climate Resilience Framework

Most adaptation practices observed could be grouped into three main areas, which starts to provide a framework for use for UK farmers. The level of investment/prioritisation of each corner to this triangle will vary from farm to farm. What has been alluded to throughout this report, however, is that isolated adaptation may be another way to stick a plaster over a growing problem. Knowledge transfer, at the centre, aims to address the importance of understanding the balance of resilience across the system, prioritising long-term sustainability, i.e. social, environmental, and economic opportunities.

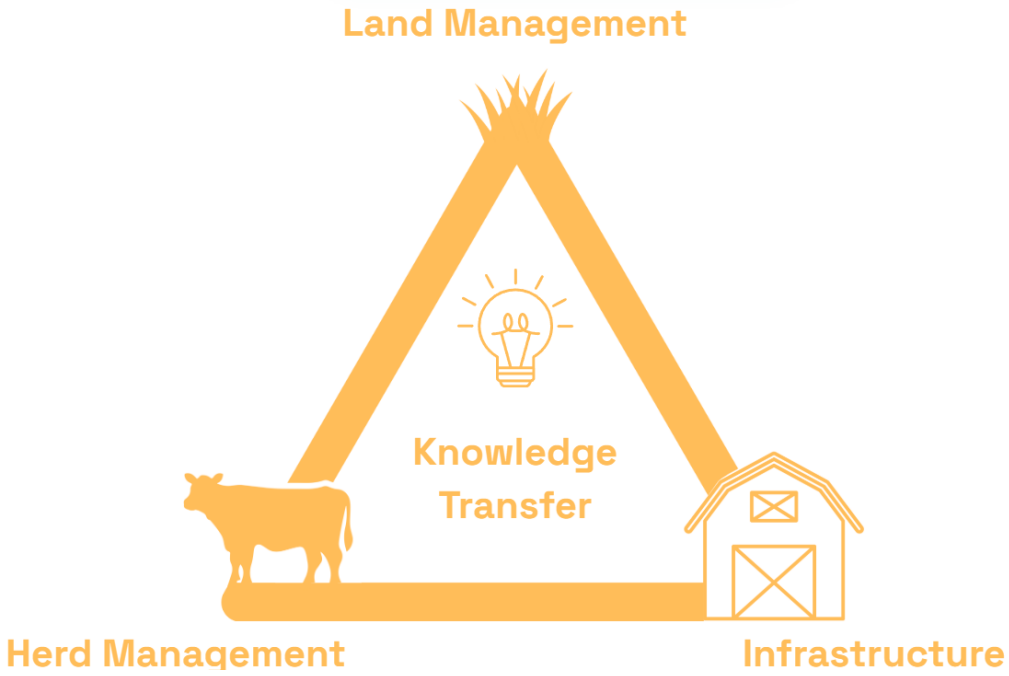


Figure 25 Climate Resilience Framework

The concept of knowledge transfer also extends beyond the farm to the sector. Resilience is such a key concept for the UK dairy industry to get right over the next 10 years; we have to work collaboratively.

5.2 Leapfrog the Breaking Point

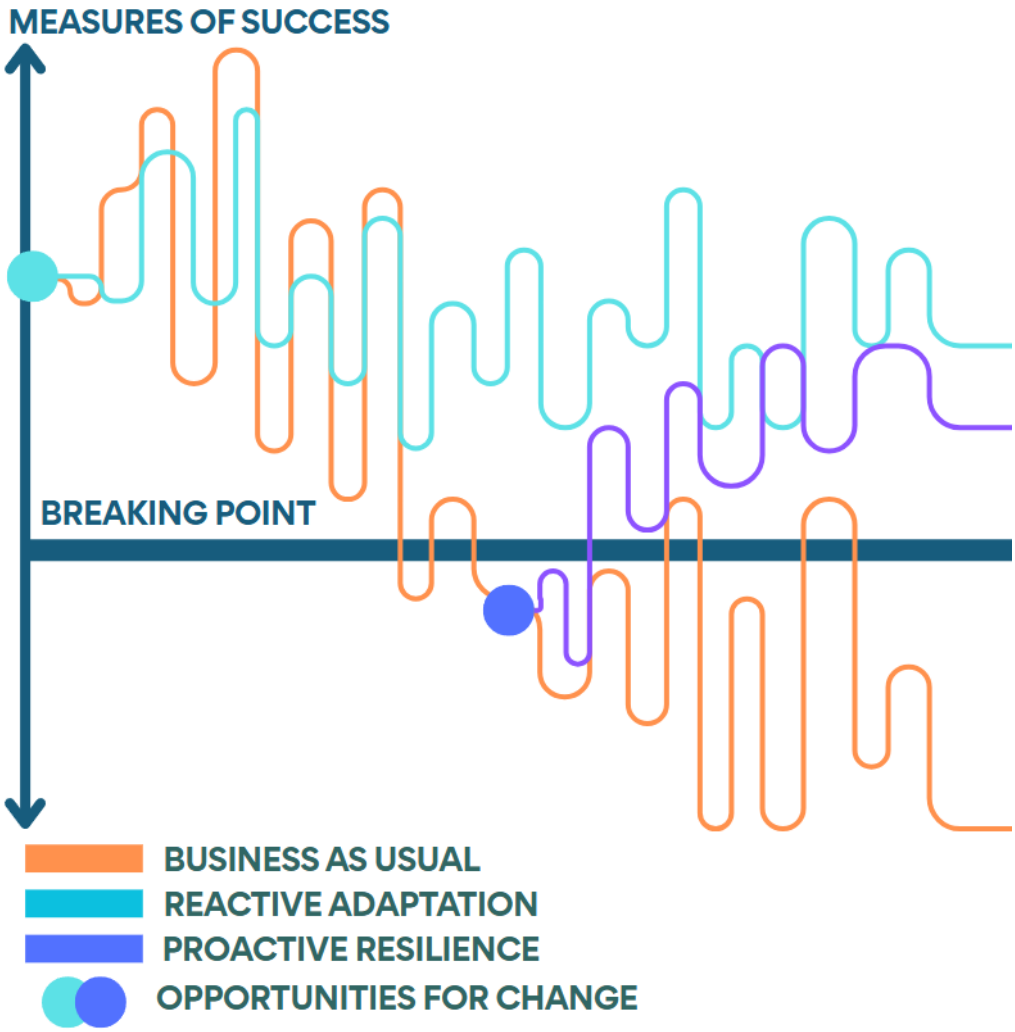


Figure 26 Illustrative Diagram of Leapfrogging The Breaking Point, Through Proactive Resilience

One of the most striking things I heard from farmers was how they reached their point of change. Often it came after hitting a breaking point when systems were pushed to their limits. While this can trigger real transformation, it's also painful and high risk.

In the UK we have an opportunity to avoid that as best as we possibly can. Our climate pressures are growing, but manageable. Now is the time to build proactive resilience, as opposed to waiting until we must implement reactive adaptation.

5.3 Resilience and Sustainability

Being a sustainability consultant I can't ignore the concept of how climate resilience blends within the sustainability lens of social, economic, and environmental stability for the long term. Intuitively, you can't have one without the other: however, in practice it may not feel that simple.

Resilient farms within this report have been able to demonstrate social benefits – supporting communities, or even the ability to have more free time away from the farm.

For economics, this is more challenging to summarise. Many farmers I spoke to are in a better financial position than if they had taken no adaptive action. However, economics is a key barrier for UK dairy farmers when presented with the concept of resilient investment, especially as we may be investing into answers to problems that are yet to present themselves. This may be especially demanding in market downturns where spare capital for investment is limited.

For environmental, whether we use indicators such as greenhouse gas emissions, carbon sequestration, biodiversity, or soil and water metrics, we can start to project a better of understanding of what resilience may mean for sustainability. For example, climate adaptation practices have occasionally been shown to decrease carbon intensity but increase total farm emissions if this leads to herd expansion opportunities. Investment into soil health for the long run should often marry with both resilience and sustainability objectives. But what if adaptation practices lead to less livestock on pasture - instead opting for a climate-controlled housing system? We live in a diverse landscape of dairy enterprises, which is a benefit, and thankfully a climate that allows us to have this diversity. But when prioritising resilience, we must be able to critically analyse what resilience means for the sector and our land too, through the lenses of social, economic, and environmental sustainability too.

CHAPTER SIX: RECOMMENDATIONS

We need to create a sense of urgency, but not panic, within the industry. I recommend this is done through regional campaigns through established knowledge transfer leaders and channels, bringing together stakeholders who hold climate projection data, with those that are specialist in key adaptation areas (ideally farmer-led).

Climate projections need to be tangible, and the impacts need to be translated into real world metrics to help stakeholders understand what inaction could lead to within the system.

Climate resilience needs to be blended within the sustainability space and the regenerative space, as they are inherently linked to both concepts. This will also enhance understanding and uptake within the sector.

More adaptation practices must be incentivised, either through supply chain incentivisation or through government farming schemes. Whilst some already are, resilience must blend with sustainability incentives. Research should be carried out to show processors and stakeholders the impact climate change could have on key supply chains in order to justify funding for key initiatives.

A note on these recommendations:

1. This must be conducted on a whole farm approach – land, herd, infrastructure and knowledge – to be effective.
2. Ownership must lie with the farmer. Steering by key industry players is encouraged, but ownership by farmers
3. Climate resilient initiatives must be inherently flexible, in order to work with farm limits, and to work off farm strengths and vulnerabilities..

CHAPTER SEVEN: AFTER MY STUDY TOUR

I'm in the privileged position to work with many key industry stakeholders and leaders in my day job. After this study, I will be turning these insights into action, working with the industry to help raise awareness of climate resilience, and to create initiatives that demonstrate what resilience could look like within the sector. I'll be working within the industry to help translate climate data into something tangible for farmers, making projections feel relevant at farm level, focusing on the impacts of forage production first, leading into other areas at a later stage. Through collaboration with knowledge exchange organisations and climate working groups, I'll continue to promote joined-up, practical solutions - and ensure this work doesn't sit in a silo but drives real change on the ground.

CHAPTER EIGHT: ACKNOWLEDGEMENT AND THANKS

A lot of people along this journey warned that it would be the busiest couple of years of my life to date – and I can't say that they were wrong. Many supported me on this journey, too many to count and too many to individually thank. I would like to say thank you to everyone I met, spoke to, contacted, or stayed with along the way.

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