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Farm to Glass: Assessing how farms can benefit from future trends in the drinks industry

Written by:

Emily Aitchison NSch

March 2025

A NUFFIELD FARMING SCHOLARSHIPS REPORT

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A NUFFIELD FARMING SCHOLARSHIPS REPORT (UK)

NUFFIELD Farming Scholarships

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

Date of report: March 2025

Title	Farm to Glass: Assessing how farms can benefit from fut trends in the drinks industry.
Scholar	Emily Aitchison
Sponsor	Beckett Award
Objectives of Study Tour	• Assess opportunities for farmers to diversify into the drinks industry and research crops that can be grown in the current and future UK climate • Consider the feasibility for growing crops that can be made into drinks and the viability for further on-farm processing and drinks production • Understand the current UK drinks market and identify challenges in launching drinks products
Countries Visited	USA, France, Italy, and Georgia, UK
Messages	Following a "trend" does not always guarantee long-term success. The trend cycle in the food and beverage sector moves quickly. To build a successful brand and achieve longevity in the market you need to create a product you are passionate about, that has a unique selling point and ultimately tastes good. Marketing a 'farm-to-glass' product can be a challenge with competition from major global brands. However, there are opportunities for producers to reach the market, with an innovative, authentic, and delicious tasting product. The channels through which consumers are purchasing their food is changing. There is an appetite for alternative buying options, especially directly from the farm-gate, giving producers the opportunity to connect with their customer. The online grocery market also provides a fantastic sales platform.

EXECUTIVE SUMMARY

To encourage farmers to identify emerging trends and opportunities in the drinks sector, I set out on my travels to conduct beverage research, explore consumer preferences, and discover market opportunities. I hoped to uncover the next big drinks trend, the new 'craft gin' craze. I could see there was an enormous opportunity to diversify into drinks production in the UK that farmers could take advantage of. Drinks provide great scope for scalable businesses and allow farmers to grow crops with value-added production on farms.

The title of my report was broad and wide-ranging; after beginning my Nuffield in 2021, my focus turned to farming sustainably and this coincided with the DEFRA farm policy change to the Environmental Land Management scheme. It is a time of significant change in agricultural policy in the UK and these changes can be seen as an obstacle or a great opportunity. Although there will always be uncertainty surrounding policy change, there is no denying the growth in the consumer trend for sustainably produced food and drink. This is something farmers cannot ignore, both in their farming systems and wider on-farm businesses. After my initial extensive research, I focused on drinks that can be produced with sustainable ingredients that are grown in a way that encourages biodiversity and the move towards a regenerative farming future.

To do this, I travelled to dozens of drinks producers, vineyards and plantations in California, France, Italy, the UK, and Georgia to look at large and small drinks producers as well as learning from macro to micro businesses. During my visits, I found that a common thread emerged. Most notably, 'Farm to Glass' is not a recognised term or a defined concept in the UK or the other countries I visited. In contrast, the term 'Farm to Table' is widely recognised and understood, reinforced by the ‘Farm to Fork (F2F) Strategy’ that is a key part of the European Green Deal. Similarly acknowledged is eating local produce as part of a ‘slow food movement’, an established global organisation that aims to promote "good, clean, and fair" food. There is a disconnect between the consumer and the drinks producer, and this is due in part to the fact that drinks are not seen in the same way as food. Until now, drink ‘miles’, quality of ingredients, and traceability of supply chain in drinks have not been a consideration. However, consumers are increasingly looking for transparency and accountability from producers.

I believe 'Farm to Glass' is the ability to connect a farmer to a beverage. It doesn't need to be a circular system of growing ingredients and making a product on the farm. However, there needs to be clear transparency between the farmer and the local distiller, winemaker, or brewer. Furthermore, 'Farm to Glass' enables and empowers farmers to get a fair rather than a commodity price for the crops they grow. There is the chance to sell locally or export, which brings benefits to the wider local community, keeping people involved in agriculture and creating employment.

Predicting future trends in the drinks industry has been challenging; during my study, I realised that creating or being part of a 'trend' does not necessarily equate to long-term success. Trends run their course; you must find something you are passionate about producing that has a niche characteristic for longevity in the market. If you make a high-quality product with integrity, you will be able to sell it. I have yet to find the golden ticket tipple, but I learned many lessons. The overarching trend I have discovered is that sustainable production is the future; sustainability will be a lasting trend as it is a necessity.

"For decades, across the world, heritage and traditions were dying and biodiversity was in decline. There is a new generation of producers all determined to make drinks that belong to a more diverse and deeper story."(D. Saldino, 2023)

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CHAPTER 1: INTRODUCTION

Figure 1: The author, Emily Aitchison
Photo: Author's own

I grew up on a farm in the heart of the Suffolk countryside, and my family's farming heritage can be traced back to 1640. My father and grandfather have farmed in Northern Ireland, Isle of Man and East Anglia. I feel very privileged to have grown up and spent my career working on the farm.

I did not attend university, and at the age of twenty-one, I started three diversification businesses on our family farm. They include a wedding venue, glamping site and cookery school. The wedding venue can host up to 200 guests and features a woodland blessing area and formal gardens, all with the backdrop of a Tudor Hall. The glamping site features a Shepherd's Hut and Lodge tents, which can accommodate up to 20 guests and offers bespoke packages for group stays such as hen weekends. The cookery school offers seasonal courses ranging from sushi to bread-making. These are now established businesses running alongside the existing farming business.

In 2018, I was the Under 30's Chairman of the Farmers Club, London. This position opened my eyes to new opportunities and instilled in me the importance of sharing knowledge, especially within farming and the rural business sector. In early 2022, I started the Upper Deben Farm Cluster with a group of neighbouring farmers.

In October 2022, I set up a micro-bakery with my husband (chef and baker) on his family farm. We now farm 200 acres and aim to incorporate a circular farming system, growing and milling wheat for our bakery. We also planted our first 2,500 trees in an agroforestry system, with more tree planting planned, and we planted an 11 Ha vineyard in May 2024.

Having spent the past 12 years building my businesses, I wanted a challenge, and the Nuffield Farming Scholarship was just that. My scholarship has been an invaluable experience. It has taught me about farming for the future and that people and passion are at the heart of every successful rural business.

CHAPTER 2: BACKGROUND TO MY STUDY SUBJECT

"We can do with more delicious drinks in the world" (Kara Monssen, 2023)

The food and drinks industry in the UK is a substantial and economically significant sector. It is the country's biggest manufacturing sector by turnover, valued at £104.4 billion (Great.gov.uk, 2024, UK Government) It is larger than the automotive and aerospace industries combined. Many farmers have diversified into food production, growing, and making farm-to-fork products. However, there are significantly fewer making drinks.

There are perceived to be high barriers to entry when diversifying into drinks, and many may not see opportunities within this sector. The sector is diverse as it encompasses both alcoholic and non-alcoholic drinks. Launching a new beverage product into a competitive market is a decision not to be taken lightly. There is much legwork to be done before you ever fill your first bottle. However, I believe drinks production could provide a great way to add value to the crops we grow.

My definition of a 'farm-to-glass' drink, in its most simple form, connects the farmer to a product. Either with ingredients grown on a farm and processed into a drink at the same location. Or by a producer having full traceability of the ingredients used. This approach involves producers working directly with local farmers to obtain ingredients. It is aligned with a broader trend of on-farm craft production and a focus on quality and authenticity.

CHAPTER 3: MY STUDY TOUR

As a 2021 scholar, my Nuffield scholarship journey was not exactly plain sailing. Our cohort felt the effects of the pandemic after being awarded our scholarships in November 2020. As lockdowns continued into 2021, I struggled with uncertainty as I was not able to plan and book travel as I had wished. As well as travelling abroad, I visited farms and producers in the UK and interviewed many producers on Zoom. I visited the following countries during my study tour.

UK - Herefordshire/Somerset November 2021	Herefordshire and Somerset are famous for apple orchards and cider making. I discovered a new innovation in cider making and the only British made Cassis!
USA - California February 2022	Californian wine is amongst the best in the world. I also visited the almond plantations growing nuts for dairy alternative nut milks.
Italy June 2022	In Italy, I visited vineyards and learnt about their leading agro-tourismo industry which benefited wine-makers.
France - Champagne/Rhone August 2022	The most famous sparkling wine in the world is made in the Champagne region in France. There is huge growth in the UK sparkling wine sector. The Rhone is an old-world wine region with thousands of years wine-making history.
France - Provence/Languedoc July 2023	The Languedoc-Roussillon region is France's largest wine producing region, with roughly one-third of all French wines produced here. It is also known for its French Brandy.
Georgia September 2023	Georgia is the birthplace of wine, with over 8,000 years of wine-making history. Tea and hazelnuts are also grown here in a sub-tropical climate.

CHAPTER 4: IDENTIFYING TRENDS IN THE UK DRINKS INDUSTRY

Drinks trends in the UK are constantly evolving and are currently influenced by changing consumer preferences, health consciousness, sustainability, and a desire for unique and high-quality beverages. These trends reflect a growing emphasis on the demand for quality and variety. I wanted to inform farmers of future trends, allowing them to take advantage of the enormous scope to diversify into the drinks sector.

As my topic was so broad, I focused on researching three main trends. Firstly, the importance of sustainability in drinks production; secondly, the demand for more choice; and thirdly, how the wellness sector has influenced what we drink.

A good drink doesn't need to cost the earth. When visiting producers and farmers, sustainability was a recurrent theme. We are all becoming aware of how our purchasing decisions can shape the future. "42 %of global consumers are willing to pay more for products/services supporting climate change causes" (Kucher & Partners, 2021), but drinks have not previously had a good sustainability record. Vast amounts of water, heat and energy are used for brewing and distillation. However, from sustainable sourcing practices to alternative energy, producers are now implementing environmental policies driven by demand.

The concept of 'farm-to-glass' drinks aligns with the broader movement towards sustainable and locally sourced products. Consumers are increasingly interested in the stories behind drinks and are willing to pay a premium for drinks that are responsibly made and tasty; this trend is expected to grow. Consumers are not only searching for more sustainable drinks, but they are also wanting more variety. Drinks companies, large and small, must adapt to stay relevant. The rise of e-commerce and direct sales has allowed consumers to discover and purchase new drinks, with smaller and niche brands reaching a wider audience.

The wellness industry encompasses nutrition, fitness, beauty and more. The wellness economy reached a new peak of $6.3 trillion in 2023 and is projected to grow to nearly $9.0 trillion by 2028 worldwide (Global Wellness Institute, 2024). As healthier lifestyles and diets are pursued, so are healthy drinks. This has led to the rise of alcohol-free and low-alcohol beer, and high sugar carbonated drinks replacements like kombucha and plant-based milk.

With the increase in vegan, vegetarian, and flexitarian diets, the demand for plant-based milk has surged; it is no longer considered a 'niche' product. The UK plant-based milk market is forecasted to more than double by 2025 to £565 million (The Vegan Society, 2019). Oat milk is reportedly the supermarket's biggest seller, followed by almond, soya and coconut. Farmers in the UK can take advantage of this expanding market by growing oats and nut trees.

CHAPTER 5: WHAT CAN BE GROWN IN THE UK FOR DRINKS PRODUCTION?

After analysing current and future predicted trends, I started my research by assessing what crops can be grown successfully in the UK for drinks. Traditionally we think of growing apples, hops, blackcurrants, and berries to make drinks. I began my research by visiting 'farm-to-glass' producers in the UK.

My first visit was to White Heron drinks in Herefordshire to meet Jo Hilditch who makes British Cassis from blackcurrants grown on her farm; she also grows grapes to make a Charmat style English Sparkling Wine. From micro-to-macro, I then visited premium-mainstream cider producer Thatchers, Somerset. A family cider business established in 1904. Thatchers uses apples from its own 500-acre orchard and from other local growers. They also use a hedgerow-style of growing apple trees on wires, which makes harvesting easier and helps the fruit get the right amount of sunlight and rain. Next, I went across the county to The Newt and discovered 'Fine Cider' made using a secondary fermentation process with heritage apples that have been grown here for centuries. Records show that the secondary fermentation process of making cider (in glass bottles, sealed with corks) came well before Dom Pierre Pérignon reportedly invented Champagne.

Figure 2: The author, Emily Aitchison
Location: Apple Orchard, Somerset
Photo: Author's own

Figure 3: The author, Emily Aitchison with Martin Thatcher
Location: Thatchers Cider, Somerset
Photo: Author's own

Moving from alcoholic to non-alcoholic drinks, I visited Radnor Hills in Wales. There, the Watkins family found a water source on their farm and initially intended to use it for their livestock. The water had such an excellent taste that William Watkins (who had recently returned from university) decided it deserved to be shared with a larger audience. Just a year later, he began supplying British Airways with small bottles of mineral water and formally established Radnor Hills in 1990. A non-alcoholic beverage trend that piqued my interest was Kombucha, which gained traction in the late 2000s. In 2017, a local brand from Suffolk emerged when founder Louise Avery discovered kombucha and the endless possibilities of fermenting various tea leaves and combining them with flowers.

After researching historically cultivated crops for drinks, particularly apples for cider, I delved into crops that have not been conventionally used for drinks but can be transformed through innovative processing. This includes peas and potatoes for vodka, ancient grains like oats, rye, and spelt for spirits, as well as oats and nuts for plant-based milk. Grapes are now being cultivated successfully in the UK for wine production. Since my topic was extensive, I chose to concentrate on two significant growth areas: viticulture and the cultivation of oats and nuts for plant-based milk alternatives. Additionally, I wanted to examine a niche product to gain insight into how a specialised beverage can thrive, and I noticed the rise of tea gardens in the UK. While traveling to vineyards, nut orchards, and tea plantations, I evaluated sustainability, climate change, and the commercial viability of each of these products.

CHAPTER 6: VITICULTURE - THE FASTEST GROWING AGRICULTURAL SECTOR IN THE UK

In 2019, I read a report on Viticulture in the UK; it immediately grabbed my attention. I realised then that growing grapes in England had real potential. It is a huge growth sector, and English wine, especially sparkling, is gaining a good reputation. One of the fast-growing sectors in UK farming; sales of British Wine soared nearly 70 per cent from 2019-21, from 5.5 million bottles in 2019 to 8.3 million in 2021 (WineGB, 2022). Research reveals climate change is creating ideal conditions for grape-growing in the UK, especially in the South of England. I have visited many vineyards on my Nuffield travels; I wanted to learn how wine was produced in different countries and regions, the impacts of changing climates and soil types, and to understand what makes a good wine.

California is one of the most famous wine-growing regions in the world. It has a Mediterranean climate; its mountain ranges and soil profiles provide ideal conditions for vineyards to thrive. Spanish missionaries founded their missions and cultivated vineyards in the middle of the 18th century; this is when the Gold Coast state first produced wine; but it was in the 1970s that Californian wine was put on the map. Napa Valley wines beat French wine in each category in the 'Judgement of Paris' in 1976. The wine industry has boomed since then, but due to new weather patterns caused by climate change, the state is in the spotlight for causing pressure on water resources. Californian wine growers are increasingly placing sustainability at the forefront of their operations, with over 50 per cent of California's vineyards holding sustainability certificates. Wine growers recognise that climate change will be the biggest challenge in the future.

My first stop in California was Clarksburg, in the Sacramento Valley, where I visited US Nuffield Scholar Tom Merwin. Tom is a seventh-generation farmer and grows 600 acres of vines; he represents a new generation of wine growers and farmers in California. Tom believes collecting and analysing data is critical to Merwin Vineyard's success. In response to drought, Tom has begun to convert older vineyards from flood to drip irrigation and is investing in technologies to monitor soil moisture. The family also grows cover crops within rows to help maintain moisture, keep dust down and reduce erosion.

My next visit was to Darek Trowbridge of Old World Winery, another family-owned winery. Using grapes from their organic vineyards, they make "natural wines" that reflect their family history and traditional winemaking practices. Darek is passionate about improving soil health in his 100-year-old vineyards. He uses woodchip inoculated with arbuscular mycorrhizal fungi as mulch. I was fascinated by his approach to using holistic methods to increase production in his old vines, which were declining. In most cases, he reversed the decline using inoculation and brought these vines back to full production.

Both Darek and Tom's vineyards are SIP (Sustainability In Practice) certified. This certification follows the three P's of Sustainability – People, Planet, and Prosperity; it is recognised as the gold standard for sustainable wine growing. Consumer demand to understand the winemaking process compelled a group of like-minded vintners to set up an official programme assessed by third-party stewards. Growers evaluate and improve their sustainable practices, from habitat protection to water conservation, soil health and human resources. The certification has succeeded and built trust between the producer and customer.

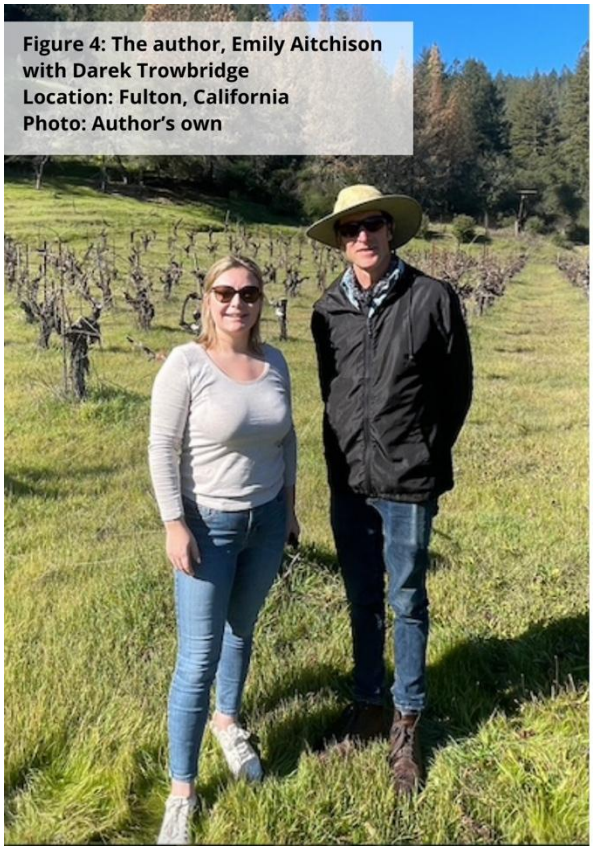


Figure 4: The author, Emily Aitchison with Darek Trowbridge
Location: Fulton, California
Photo: Author's own

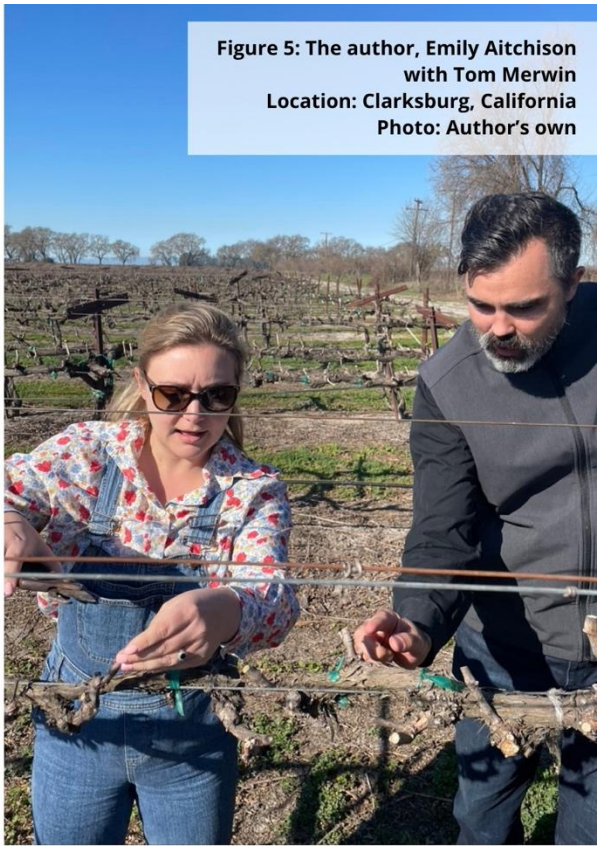


Figure 5: The author, Emily Aitchison with Tom Merwin
Location: Clarksburg, California
Photo: Author's own

Georgia is the oldest wine-producing region in the world. The fertile valleys and sub-tropical climate have been home to grapevine cultivation and neolithic wine production for over 8000 years. Georgia has recently seen a resurgence of interest in its ancient Qvevri winemaking technique as the organic and bio-dynamic wine movement has gained popularity. Ramaz Nikoladze makes wine in the Imereti region of Georgia. He uses the Qvevri technique and harvests rare grape varieties with organic practices. He planted his vineyard nine years ago and produces 6-8,000 bottles per year and exports 90 %of it. He is a small-scale producer, and his passion for winemaking is unmistakable; he believes a bad man can't make a good wine! Georgian winemakers have a deep respect for the environment, and many produce organic, natural and 'Qvevri' wines, which can command a higher price. However, there are no official organic certification standards, which makes it harder for small-scale vintners to produce quality over quantity.

Frances's most famous wine export is Champagne. Situated north-east of Paris, Champagne lies over a chalk plain, significantly influencing its terroir. Sparkling wine has been produced here for decades, but in the 19th century, Champagne producers set about defining rules of origin to protect their heritage. In 1935, controlled designation of origin (AOC) was introduced, and the Champagne designation was recognised the following year. This means only sparkling wine produced in the region can be called Champagne. All bottles must spend at least 12 months ageing on their lees (the spent yeast cells from the second fermentation). Over 325 million bottles of Champagne were shipped from Champagne in 2022, surpassing €6 billion (£5.2 billion) in sales for the first time (Champagne Trade Association, 2023).

I visited Thibaud Brocard, a fifth-generation winemaker in the Champagne region; he told me, "I consider myself as a winemaker responsible for his terroir. In the vineyards, no synthetic chemical products are used; we manage the mildew carefully with a tiny dose of copper. Glyphosate was banned more than 20 years ago. In my eyes, to understand and take care of my vineyard is the biggest part of my job as a winemaker." Brocard Pierre is part of a quiet revolution in Champagne, which has seen a shift in power from the huge producers to small growers who make wine as they do in Burgundy. Thibaud gained experience in winemaking in Burgundy and brought his learnings back to his family's Champagne house.

Figure 6: Quevri Winery
Location: Georgia
Photo: Author's own

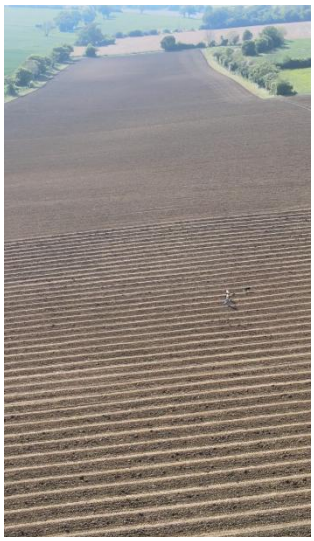
Figure 7: Thibaud Brocard
Location: Champagne region, France
Photo: Author's own

Pinot Noir, Pinot Meunier and Chardonnay are the primary grape varieties used to make Champagne; these are used for making sparkling wine worldwide. Sparkling grape varietals grow best in cool climates where grapes struggle to ripen. The flavours, acidity and sugar created in grapes in such conditions are vital in making traditional sparkling wine. The region, however, is facing challenges; with the temperatures rising and volatile weather patterns, there are fears that the region could become unsuitable for growing sparkling varietals. Land is also priced at over £1 million per acre, so despite soaring demand for sparkling wine, it is not easy for champagne houses to expand. Southern England is seen as the next best place to grow suitable grapes, and it even has chalky soils. Grapes are a premium crop with a high value; in 2017, Champagne Tattinger planted vines in Kent as they could foresee climate-based challenges.

While the UK has a rich history of grape cultivation that goes back thousands of years, the wine sector remains in its infancy but is growing rapidly. At present, there are over 1,000 vineyards across Great Britain, and the number of new vine plantings continues to rise each year. English wine historically had a poor reputation, but gradually, over the last three decades, a transformation has occurred, and England is now creating high-quality sparkling and still wines.

The current success of English wine and vineyards is largely fuelled by the shifting climate and recent changes in government policies regarding the UK wine industry. This sector is set to thrive on innovation and improved efficiency. During my time in France, I came across the term 'terroir', which was unfamiliar to me and doesn't have a direct English translation. 'Terroir' is a French concept that refers to 'a sense of place'. Each wine-producing region and vineyard is distinct. It is the 'terroir' that gives each wine its individuality. The future of winemaking in the UK holds great promise, and, similar to agriculture, the unique 'terroir' of each area will contribute to its distinctiveness.

Case study: Establishing an English Vineyard



On Sunday 12th May 2024, we planted the first vine in a field on our farm nestled in the beautiful Suffolk countryside. This significant moment had been many years in the planning.

A few years ago, my husband Alexander and his father discovered a south-facing sloping field on the farm that they believed would be ideal for a vineyard. Meanwhile, my father and brother were considering cultivating oats for oat milk. Around the same time, I submitted my application for a Nuffield farming scholarship and decided to investigate the broader UK drinks sector, including wine and various farm-to-glass beverages.

Throughout my Nuffield studies, meeting and gaining insights from viticulturists, winemakers, and various professionals in the wine sector ignited a newfound passion and curiosity for wine. Among all the individuals I encountered, Tom Merwin, a viticulturist from California, and Thibaud Brocard, a champagne producer from France, had the greatest impact. Touring their vineyards and wineries led to numerous enlightening moments and instilled in me the confidence that we could successfully cultivate grapes in Suffolk.

Following an unexpected encounter between Alexander and English wine expert Stephen Skelton Master Winemaker, in a Somerset pub, we sought guidance on establishing a vineyard. After extensive consideration, we opted to plant 45,000 vines on a 10-hectare site, focusing on four varieties suitable for sparkling wine, which will be sold under contract to an English winemaker. Below is additional context regarding the choices we made:

Location of Vineyard: Suffolk, England

Site Size: 10 hectares, 45,000 vines

Varieties: 37% Pinot Noir, 37% Chardonnay, 20% Pinot Meunier, 6% Precose

While the minimum recommended Winkler Growing Region (Appendix A) for pinor noir, chardonnay, pinot meunier, and precose varieties is Region 1a; our grapes are intended for sparkling wine production, which allows them to have higher acidity and lower sugar levels. Due to their tendency to develop tightly packed clusters, the risk of disease, especially botrytis, is significant, necessitating careful canopy management that may include green harvesting. Green harvesting (vendage verte) consists of removing some immature fruit around the time of ripening to enhance the overall quality of the harvest. This practice involves additional costs and is typically reserved for premium wines but,

considering the high prices grapes fetch for sparkling wine, it is a justifiable expense. Like any marginal grape-growing environment, the threat of powdery and downy mildew is anticipated, thus a stringent spray regimen will be essential to avert serious problems. Nevertheless, as Suffolk is the driest county in the UK, the site benefits from excellent airflow and has no nearby vineyards, giving it the best possible opportunity for success.

One possible problem that could arise related to the canopy is spring frost, considering our geographical location. Since Pinot Noir is a variety that has an early bud break and ripens early, this concern is heightened, but the selected site features an 8-degree slope that lets cold air flow away, and a frost break (an area intentionally left unplanted at the bottom of the vineyard) will be maintained to reduce the impact of frost. Additional measures for frost protection, such as frost lights, fans, or micro misters, might be considered; however, I estimate that only about 5% of the vineyard's crop yield will be affected by frost once every five years in regions where cold air settles. When weighing this risk against the expenses associated with purchasing and maintaining the equipment, I consider it a reasonable risk to accept. A stock of frost candles should be adequate for short periods of severe frost unless it lasts for an extended period.

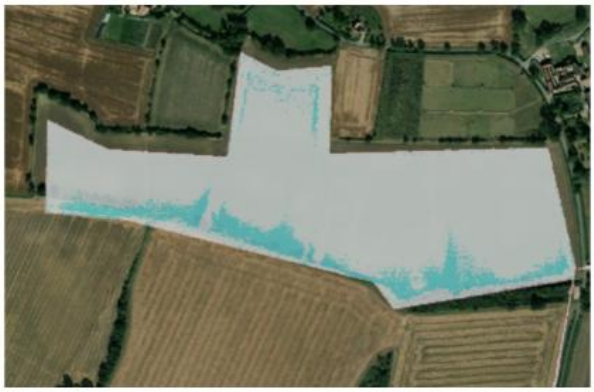


Figure 8: Vineyard site frost pockets
Location: Suffolk

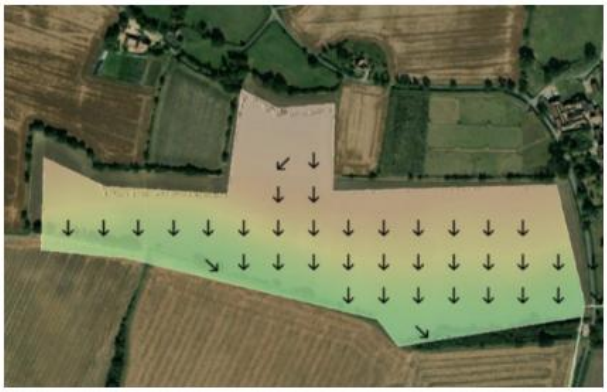


Figure 9: Vineyard site airflow
Location: Suffolk

Row Orientation: North-South

Trellising Type: Vertical Shoot Positioning (VSP)

Training/Pruning Method: Double Guyot

Vertical Shoot Positioning (VSP) is the best trellising system and is the most effective method for vines with low to medium vigour, particularly when there is a high likelihood of disease pressure, as it simplifies the management of various practices aimed at reducing this pressure, such as leaf removal, shoot removal, and cluster thinning.

The completion of these tasks and the characteristics of a well-maintained and even canopy make for a more even spray coverage, which is crucial considering that the average rainfall during the growing season is between 400-450mm and June typically sees 60-65mm of rain in our region. This indicates that spraying will need to occur every 10-15 days throughout the growing season. Additionally, it enables the mechanisation of certain processes, which helps lower costs and allows for timely canopy management.

The VSP system, along with its north-south orientation, enables the canopy to capture the maximum amount of solar energy, which is crucial considering the anticipated solar exposure. I recommend a trellis height of 1.8 meters and a spacing between rows of 2.2 meters to optimise light availability for both the canopy and the fruiting wire, with a plant spacing of 1.2 meters to suit the medium Vigor of the rootstock alongside the dwarfing characteristics of clay soil.

The Double Guyot pruning method requires fewer plants per hectare than Single Guyot and helps to maintain the quality and structure of the grapes and wine, an important consideration in quality English Sparkling Wine.

CHAPTER 7: TEA - A BRITISH BREW

I was unaware that tea was grown in the UK before starting my scholarship; it has been grown in Cornwall since 2005 by Nuffield scholar Jonathon Jones and, more recently, in Scotland. The tea plant, Camellia Sinensis, is ornamental-looking; it is simple to grow and can withstand the extreme temperatures in the UK climate. I wanted to visit tea plantations abroad to see how the changing climate impacted tea production and to see how a niche product can be successful.

Georgia is known as the birthplace of wine, not as a tea-growing country, yet it has a rich history of tea. Tea has been produced in Georgia for more than 170 years. "*During the Soviet Union, there were over 70,000 hectares of tea plantations, which produced approximately 150,000 tonnes annually*, *Georgia made 95% of the whole Soviet Union's tea. Factories were built, and all the women in the local villages picked tea"* said Lika Megreladze, a Georgian tea grower. As the USSR collapsed, so too did the tea industry, as it lost its primary export market. The subtropical climate in western Georgia is the perfect place to grow tea. Cold nights and the cooler winter months prevent disease, and therefore, there is no need to use pesticides. Georgian tea has been slowly having a renaissance; there is a community of tea growers rehabilitating abandoned factories and restoring overgrown plantations. Instead of re-establishing the vast monoculture of tea plantations, smaller areas are being planted. The climate, together with acidic soil, gives the tea a unique taste. Historically, the quality was poor as all the leaves were picked, but now only carefully selected young leaves (first flush) are used for black and green tea and the tips for white tea.

Figure 10: Tea Plantation
Location: Ozurgeti, Georgia
Photo: Author's own

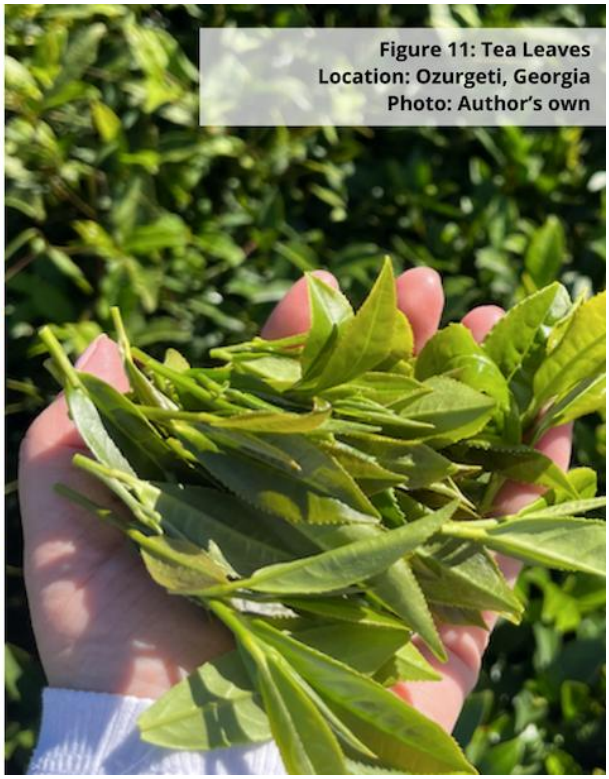


Figure 11: Tea Leaves
Location: Ozurgeti, Georgia
Photo: Author's own

Figure 12: Historic Tea Plantation Photos
Location: Ozurgeti, Georgia
Photo: Author's own

I visited tea producers in the region of Ozurgeti, who are producing small batches of high-quality tea. Nana Kirmelashvili is co-founder of Negomari Tea, a hard-to-find 10-hectare tea plantation which she began regenerating with a grant from the European Union's ENPARD initiative. The plantation employs 33 women aged between 15 and 80. They pick just over 5 tonnes of tea leaves each year, but there are plans for expansion to boost that to 15 tonnes annually within a few years. Nana also owns an art gallery in Tbilisi and has two “daughters”, art and tea.

Davit Teniashvili started cultivating tea 25 years ago. Since then, he has planted a large-scale tea plantation. He pioneered the creation of a "Tea Route" with Lika Megreladze to connect tea producers to tourists, like the "Wine Route" in Kakheti. The route was created, but the road needed to be more suitable for tourists. He gained EU funding for road improvement works, and the small village of Bakhvi became more economically stable. He explained that “*wherever there is a road, the economy starts developing, the region's awareness increases, and the population has more opportunities”*. The agri-tourism from the tea route has made small-scale tea production viable, as customers purchase directly from the farm gate.

In California, I saw the success of the wine route, and the same was true of the tea route in Georgia. As consumers take more interest in where their food and drink come from, the opportunity for agri-tourism is growing, especially as visitors like to see and hear how drinks are produced. Tastings provide an excellent extra revenue stream. Agri-tourism initiatives benefit all the farmers and help to make small-scale production more viable.

Case Study: Tea Gardens of Scotland

In Scotland, I discovered the 'Tea Gardens of Scotland', a group of nine ladies who, in 2016, started growing, making, and selling tea in central Scotland; together they planted over 40,000 saplings. They launched an artisanal tea brand in 2020, Nine Ladies Dancing, a 100% pure Scottish-grown black tea which is made from tea leaves picked from all their gardens. From Ronnie and Pinkie, two of the nine ladies; I learnt that tea growing in the UK is a challenge, especially in Scotland and a polytunnel is essential to get tea plants established.

Figure 13: The nine ladies of Tea Gardens Of Scotland
Photo: teagardensofscotland.co.uk

None of the group had farming or tea growing experience before they embarked on this enterprise. They needed to come together as a group to have enough tea to sell commercially until their gardens became fully productive which takes up to seven years.

Collaborating allowed them to gain EU LEADER funding, which financed consultancy, viability studies and shared equipment. To start with, the tea production was outsourced to a centralised factory, and they decided to pursue the wholesale route and started supplying the likes of Fortnum and Mason. Selling wholesale tea meant they did not need to think about branding and marketing in the early days of learning how to grow tea. The group wanted to be the first to put Scottish tea on the map and they were successful. Their initiative has provided invaluable experience as they began their tea growing journey, most notably it enabled knowledge sharing. The collaboration has increased the profile of Scottish tea, a platform they can all use individually or as a group; to sell their product. They also hope that by creating an agri-tourism offering, they will have a direct-to-customer sales opportunity. Growing tea in the UK in marginal conditions is possible but at a high cost and low yields. The increase in demand for high-quality speciality teas makes this niche product viable.

Figure 14: Tea Gardens Of Scotland
Photo: teagardensofscotland.co.uk

CHAPTER 8: GROWING CROPS AND NUT TREES FOR ALTERNATIVE MILK DRINKS

With the increasing demand for healthier drinks and the growth in the non-dairy milk market, I researched growing oats and nuts in the UK for plant-based drinks. *"We have seen a huge acceleration in sales thanks to the growth of young, ethical consumers who understand what kind of world they are going to inherit and are prepared to make personal changes to protect it. Plant-based eating is not a trend. We are only at the beginning of this movement."* (Toni Petersson, Oatly CEO, 2019)


Figure 15: Author with Glen Anderson
Location: Central Valley, California
Photo: Author's own

I visited California not only to look at its vineyards but because it also produces 80% of the world's almonds and 100% of the United States' commercial supply. In the Central Valley in California, I saw the countryside turn from vines to almond blossoms. For miles, all you could see was a monoculture of almond orchards with bare earth floors. Almonds are the leading crop in Californian agriculture in acreage and revenue generated. However, this dominance has created problems. I had read about the industrialisation of growing almonds and the catastrophic consequence it was having on the honey bees, biodiversity, and soil health, with disease wiping out huge orchards. Therefore, I was relieved to discover an organic orchard, a nature-friendly oasis in an almond tree dessert. I spent an afternoon with farmer Glenn and daughter Wendy of Anderson Almonds. They farm 18 acres of certified organic almonds; Glenn was a pioneer in organic farming, and Wendy helped to set up The Almond Board of California. Glenn said the success of his orchard was the result of developing a fully regenerative system that stacked multiple practices. He had permanent ground cover of wildflowers and used no synthetic agri-chemical inputs.

Although we can't easily grow almonds in the UK climate, I was interested in the way that nuts were grown in response to an increase in demand for plant-based milk. I realised that fulfilling the demand for a new 'trend' does not always have a positive impact, and when an industry grows quickly, problems can occur due to lack of forward thinking and future planning. Water scarcity is a problem not only for the vines in California but also for the almond trees, which need significant irrigation.

Hazelnuts have been cultivated in the UK for centuries; the most common are cobnuts, but filberts are also grown. Cobnuts are round and have a short husk, which exposes part of the nut, but the filbert is long and has a husk which completely covers the nut. In ancient Rome, hazelnuts symbolised happiness, and Celtic tribes saw hazelnuts as a symbol of wisdom and knowledge. Hazelnuts are a highly valuable crop used in many culinary forms, most famously confectionery, in Nutella or Ferrero Rocher, but it is also a very popular syrup flavour and nut milk drink.

Turkey is the biggest grower of hazelnuts, but Georgia has many hazelnut orchards in the West of the country near the black sea in Zugdidi. There are a vast number of growers and processing facilities in this region. The Georgian Hazelnut Growers Association was established in 2013 and has over 30,000 members. The

group has 75,000ha of fruit-bearing hazelnut plantations, which employ 70,000 farmers and about 60 processing plants. I visited Jai Agawalla in Zugdidi, a farmer who grows hazelnuts on 250 acres; he also has a shared processing facility. I also visited the Geo-Nuts factory, which processes a monthly volume of 500 tonnes of nuts in its state-of-the-art facility.

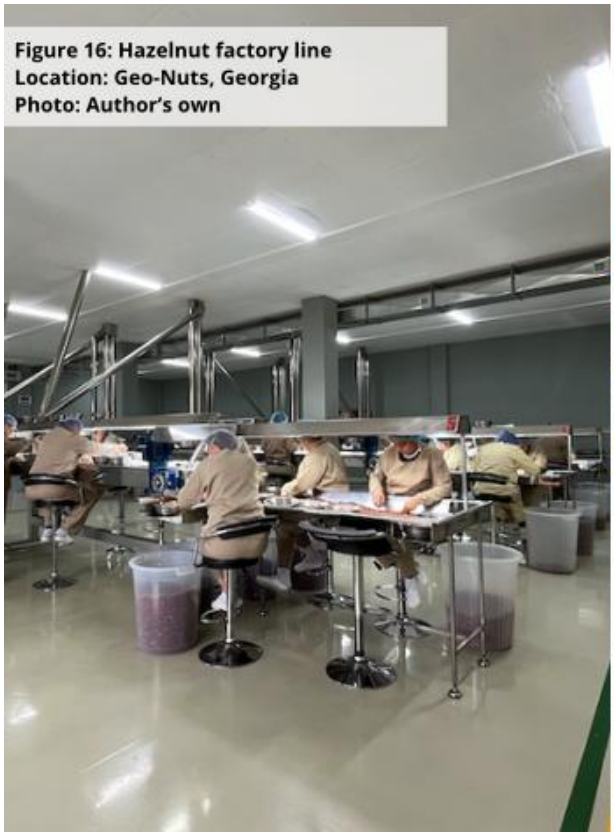


Figure 16: Hazelnut factory line
Location: Geo-Nuts, Georgia
Photo: Author's own

Figure 17: Author in Hazelnut orchard
Location: Zugdidi, Georgia
Photo: Author's own

It is a simple process to make hazelnut milk, unlike oat milk, which needs significant processing. To make hazelnut milk, soak hazelnuts, then blend with vanilla extract and cold water until they reach a creamy, milky consistency. Nutritionally, hazelnuts are a good source of antioxidants, as well as vitamins E and B, protein, calcium, and healthy fats. Hazelnut milk is also sustainable as the nuts grow on trees, which help to sequester carbon. They are a robust crop which can thrive without pesticides, and they don't need to rely on pollinators as they are wind pollinated. In terms of the plant-based milk market in the UK, currently, hazelnut milk has a relatively small share. However, research suggests that the hazelnut milk sector is on a growth trajectory and is set to expand at an annual growth rate of nearly 14 per cent.

On my travels, I saw trees grown in small and vast orchards. I learnt about the challenges of growing nut trees in this traditional format, from the invasion of

stink bugs in Georgia threatening crops to the pressure on water allocation for almond orchards in California. One solution to these challenges would be to grow nut trees as part of agroforestry systems. Fruit and nut trees are the perfect options to integrate into agroforestry; less dense planting would allow for natural predators and biodiversity.

Case Study: George Crossley of Toats Mylk

In the UK, one of the leading farm-to-glass plant-based milk on the market is oat milk. There are several huge brands making oat milk, but there are a small number of producers growing oats and making milk on farms or in co-operatives. George Crossley produces Toats Mylk on Rushmere Farm in Hampshire using oats grown on the farm as part of his rotation. An engineer-turned-farmer, George started making oat milk whilst he was living in Cornwall with the view of using his father's oats in the future.

Figure 18: Toats Mylk
Location: Hampshire, UK
Photo: toatsmylk

He began selling his milk in reusable glass bottles in a local round. He then moved back to the farm and started a circular system of growing and processing the oats, making the milk in a farm building. He offered bulk refill boxes alongside his glass bottles and found it was a niche but profitable product.

He then discovered cafes were a great market, using huge volumes for daily coffee fixes. Most of his product now goes to local and London coffee shops. George has encountered many challenges, including food hygiene regulations, certification, labelling, nutrition testing and setting up processes and systems. However, he believes his farm-to-glass approach sets him apart from other producers, and the on-farm production is essential. *"We all need to get more value out of what we produce somehow. Oats grow fantastically well on our soils and, when grown in a regenerative rotation, require little input except to help maintain a balanced ecosystem. Nature does the hard work with ease."*

Farms can be perfect places to diversify into processing and production as many have space and buildings that can be utilised for this purpose. The primary considerations when looking at on-farm processing are the cost of equipment and installation, access to transportation and local labour supply. Food standards legislation can seem overwhelming, but with careful planning, it can be

overcome. On-farm processing can have many benefits, and from a marketing perspective, it gives you a unique story-telling opportunity for a genuine 'farm-to-glass' product. George believes "*authenticity is key, and once your customers have been to the farm, they can connect with you and your product. Producing oat milk on my farm is part of the vision to be sustainable and adopt a whole ecosystem approach.*"

CHAPTER 9: DISCUSSION

Once I had conducted my research and study tour, I started to consider the viability of launching a 'farm-to-glass' drinks product from a UK farm. I considered what you can grow, how to process the primary crop, the drinks production process, how to create an eye-catching brand and the route to market for your product. Below are some of my thoughts on the considerations ahead of diversifying into drinks:

9.1 What can be grown on UK farms for drinks?

With the changing climate and faster developing technologies, new opportunities in agriculture are emerging. This has given rise to a new generation of farmers and farming practices which attempt to capitalise on these developments. A whole new batch of crops as well as forgotten, traditional crops are now being grown throughout the UK.

For example, agroforestry allows an opportunity for a cash crop from the trees in the form of timber or edible fruit and nuts alongside cereal crops. Viticulture is changing substantially as the climate changes. Phenology is advancing and growing seasons are lengthening, all of which can impact yield, quality and wine characteristics (Quénol et al., 2017).

It may not be that a completely new crop needs to be grown, but there can be value added to those already growing well, which could be supplied to a new, emerging market. We see this in examples like oat milk and kombucha.

9.2 What primary processing is required?

Farmers are well placed to grow ingredients for drinks as well as being a primary processor. Some drinks ingredients simply need to be pressed and bottled, others need distillation or fermentation, pasteurisation or sterilisation, or filtration or carbonation. Tanks for aging product or fermentation require space and food standard regulations to be followed. Farm buildings can be the perfect spaces and not all equipment needs to be high-tech or brand new. I visited many farms that were using older kit and producing a great product.

A good example is Nick Layton, who makes sustainable tonic water in Herefordshire. He converted a cattle shed into a 21st century cannery for his soft drinks brand Foreva Farmers. Taking sustainability to the next level, the CO^2 generated during the anaerobic digestion process is captured and repurposed for the CO^2 to carbonate their drinks. This circular system not only reduces waste but also reliance on external sources of CO^2, lowering their carbon footprint.

However, I don't believe on-farm processing is always necessary and another good option is to share primary processing with other local farmers for some or all of the processing stages. The tea producers in Scotland demonstrated that where geographical sensible, sharing equipment can work well. This can also be seen in a corporative of oat growers growing for a large oat milk brand sending oats to a centralised processing plant. In viticulture, the contract winemaker, Defined Wines, opened their new winery in Suffolk in September 2024 (Vineyard Magazine, 2024). They are a contract-only winery, with no vineyards or brands of their own. This facility is available for rapidly expanding vineyards in East Anglia.

While I believe there are plenty of opportunities for processing on farms, I also see there are ways of developing a new product by outsourcing processing stages. Therefore, reducing the barriers of funding whilst a brand and business are in their infancy allowing investment at later stages.

9.3 What further packaging is required?

Packaging and labelling for drinks is crucial as it is not only a practical consideration, but it also influences sales. Regulations in the UK stipulate that the packaging must securely hold the liquid without compromising its taste or quality. From glass and plastic to paperboard and cans, there are plenty of beverage packaging types and a lot of thought that goes into it before it hits the shelves. Even the smallest details can determine which brands succeed.

From William Watkins at Radnor Hills, I learnt that the key to success was the diversity and versatility in soft drink development. Radnor Hills has made significant investments in advanced processing to stay up-to-date with trends. The company identifies opportunities in the market and creates products accordingly.

In viticulture, mobile bottling services are a standard practice in many wine regions, I saw this most notably in France and Italy. They are economically beneficial, opting for a contract service is often much better than purchasing expensive equipment that may only be used a few times annually. Wine producers see the benefits of mobile services, not only for cost, but effectiveness, speed, and convenience, but also the advantage of having skilled operators and high-quality equipment that helps maintain the standard of winemaking.

9.4 How to brand, market and sell a drinks product

Branding, marketing, and selling a drinks product is a Nuffield topic in itself. From the producers I visited, I learnt that you need the following to successfully launch a drinks brand:

- A strong name and story behind your product is key, it is more important than ever to the customer and, as farmers, we all have a story to tell.
- With the digital age comes a new way of marketing and connecting to your customer. Direct sales via e-commerce and farm-gate sales allow producers to retain margins. Subscriptions and local deliveries allow you to reach a hyper-local audience and postal sales allow you to reach those further afield.
- From two tea collaborations, one in Georgia and the other in Scotland, I have learnt that collaborating to achieve commercial success has many advantages.
- There are other routes to market a product, as many farmers don't want to become marketeers, you can skip the entire branding, marketing, and sales step by selling your product in wholesale or bulk markets. The rise in collaboration between farmers to grow crops for a consolidated brand, for example Wildfarmed, who sell high quality regeneratively farmed flour to bakeries across Britain, allow you to produce a crop and gain a higher than commodity price.
- The opportunity for true 'farm-to-glass' drinks is enormous, in line with the success of the 'farm-to-fork' movement. The key to success is connecting and communicating with your customer.

I believe the farm-to-glass movement represents a convergence of craftsmanship, sustainability, and community. By embracing local ingredients and artisanal practices, producers can create drinks that capture the essence of their regions while promoting environmental stewardship. As this trend continues to grow, it offers both producers and consumers a deeper appreciation for the flavours and stories that make each farm-to-glass drink unique.

CHAPTER 10: RECOMMENDATIONS

1. Creating a successful 'farm-to-glass' drink is down to the person, place, and passion for the product. The term 'terroir' inspired me to consider a product being 'of a place' and that makes it truly authentic.

2. Sustainability in growing, processing, and packaging must be at the forefront of our minds when planning new ventures. Planning for the long-term is key in view of changing climates.

3. During this time of tremendous change in agricultural policy, a forward-thinking response is for farmers to diversify and utilise farm assets. Therefore, choosing a farm diversification must be based on more than just a 'trend'. During my Nuffield journey, I learned the difference between following a 'trend' and creating a business with provenance and endurance in the market.

4. Overall, I have found that most people who are passionate about making a product will make a delicious one as they put the time and care into creating something special. The key to creating a successful business is knowing your market - who you are going to sell it too, which routes to market are you going to take and how much do you want to scale up your business as you'll need to find the right balance. Research into similar local products is essential and knowing the quality and worth of your product.

CHAPTER 11: AFTER MY STUDY TOUR

Before embarking on my Nuffield Farming Scholarship, my husband Alexander and I had talked about our future agricultural ventures and entertained the idea of establishing a vineyard. After my study tour and the research I undertook, we planted a vineyard on our farm in Suffolk. For now, the grapes will be sold through a contract to an English sparkling winemaker. Looking ahead, we intend to plant additional vines, create a winery, and develop a hospitality experience centred around our farm and vineyard.

We not only decided to establish a vineyard, but we also developed a vision for the entire farm, aiming to create a circular farming system that incorporates the vineyard. We have already launched a micro-bakery and begun cultivating wheat to produce our own flour. Through this small yet powerful food venture, we have built a dedicated local customer base who appreciate our straightforward online ordering, subscription, and delivery options. We believe that this hyper-local strategy enables us to connect with our customers and fosters a sense of community.

I look forward to sharing the insights, advantages, and drawbacks of starting a vineyard in England. I'm thrilled to advocate for the English wine industry. As the saying goes, the early bird catches the worm. By sharing my personal experiences, I aim to assist the industry in developing and enhancing over time, particularly by drawing from the wine tourism routes I have experienced on my travels.

CHAPTER 12: ACKNOWLEDGEMENT AND THANKS

Firstly, I'd like to thank my sponsors, Alan and Anne Beckett and the wider Beckett family and group of scholars. I am truly grateful for the wonderful opportunity they have awarded me. Secondly, I'd like to thank my 2021 scholar cohort who are an incredible group of driven, ambitious and fun individuals. We had a difficult journey and have made friendships that will last a lifetime. Thanks also goes to my mentor, Nic Snell, whose patience and advice was invaluable during the whole process. Lastly, but certainly not least, I'd like to thank my husband Alexander and family for the endless support during my scholarship.

I have been blown away by the amazing generosity of all those I visited during my study trips. I met some remarkable people who continue to provide help and support.

William Watkins, Radnor Hills

Jo Hilditch, Heron Drinks

Martin Thatcher NSch, Thatcher Cider

George Crossley, Toats Mylk

Henry Chevallier-Guild, Nonsuch

Arthur Cole, The Newt

Stephen Ware NSch, Throne Farm

Susie Walker-Munro, Kinnettles Tea

Veronica Murray-Poore, Broich Tea

Nana Kirmelashvili, Nagomari Tea

Gabo Tenieshvili, Teni Tea plantation

Lika Megreladze, Komli Tea

Jai Agarwalla, Hazelnut plantation

Geo-Nuts

Martvili Marani, Marani winery

Ramaz Nikoladze, Nikoladze Wine

David Leladze, Leladze's Winery

Baia Abuladze, Baias Wine

Darek Trowbridge, Old World Winery

Glenn Anderson, Anderson Almonds

Nathan Macaulay, Apricot Lane Farm

Tom Merwin NSch, Merwin Vineyards

Deborah and Peter Core, Mas Gabriel

Adrien Chabbert, Chateau Chennai

Thibaud Brocard NSch, Brocard Champagne

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APPENDIX A: WINKLER INDEX

Winkler index

Region/class	°F units	°C units	General ripening capability and wine style
Region Ia	1500–2000	850–1111	Only very early ripening varieties achieve high quality, mostly hybrid grape varieties and some *V. vinifera*.
Region Ib	2001–2500	1111–1389	Only early ripening varieties achieve high quality, some hybrid grape varieties but mostly *V. vinifera*.
Region II	2501–3000	1389–1667	Early and mid-season table wine varieties will produce good quality wines.
Region III	3001–3500	1668–1944	Favorable for high production of standard to good quality table wines.
Region IV	3501–4000	1945–2222	Favorable for high production, but acceptable table wine quality at best.
Region V	4001–4900	2223–2700	Typically only suitable for extremely high production, fair quality table wine or table grape varieties destined for early season consumption are grown.

APPENDIX B: CALIFORNIA DREAMIN'

Article for The Farmers Club Journal, Spring 2022

After being awarded a Nuffield Scholarship in October 2020, our year group was stalled by Covid-19, so it was a relief to start travelling in February, and my first destination was – California!

My study is *"Farm to glass; assessing how farms can benefit from future trends in the drinks industry"*. I am researching new trends and opportunities, which can be adopted by farmers interested in entering the drinks sector, with a focus on health and wellness, sustainability and new product innovation.

I had not visited the USA's west coast before and was blown away by the scale of its agriculture, but was also pleased to meet innovators on smaller farms leading the change to more regenerative, nature-led farming.

Near San Francisco I visited Darek Trowbridge's Old World Winery, a small, family-owned business. Using grapes from their sustainable, organic vineyards they create 'natural wines' reflecting the family's history and traditional winemaking. Darek is passionate about improving soil health in his 100-year-old vineyards using wood chip based mycorrhizal inoculants. Next was Clarksburg, on the Sacramento River, where 2022 Nuffield Scholar Tom Merwin grows 600 acres of vines at his family's Merwin Vineyards and produces Silt wines with two childhood friends. I also visited an urban craft winery, Revolution wines, where Colleen Sullivan, a 20-something winemaker, is on a mission to put Clarksburg Chenin Blanc on the map.

Down the Central Valley vines are replaced by almond blossom. I spent an afternoon with farmer Glenn and daughter Wendy, who farm 18 acres of certified organic almonds as Anderson Almonds. Glenn was a pioneer of organic farming and Wendy helped set up The Almond Board of California. I was particularly interested in the rising demand for almond milk and its effect on organic almond farmers.

The landscape then switched to citrus trees on the Pacific coast. Just 40 miles north of Los Angeles the 214-acre Apricot Lane Farms was founded in 2011 by John and Molly Chester, who regeneratively grow more than 200 varieties of fruit and vegetable, alongside livestock within a dynamic ecosystem. The farm is certified organic, biodynamic and regenerative organic (ROC) and featured in the Netflix film 'The Biggest Little Farm'. They will soon release a new series. I was interested in their lemonade, developed over recent years from 30 acres of lemon trees.

My main take-home lesson was to take time to explore, learn, gain and share knowledge. A common thread was farmers wanting to ensure they are farming in the future and leave the land in better shape for the next generation. This

whirlwind, jam-packed trip, proved the power of Nuffield. I felt like I got to see the real California. Of course, the wine tasting was a highlight!

APPENDIX C: UK VITICULTURE OVERVIEW 2022-2023

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