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# Biodiversity for the Future of Fruit Farming?



*Written by:*

David Butler NSch

**March 2025**

A NUFFIELD FARMING SCHOLARSHIPS REPORT

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Date of report: March 2025

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

Title	Biodiversity for the Future of Fruit Farming?
Scholar	David Butler
Sponsor	Thatchers Cider
Objectives of Study Tour	To obtain any global ideas or strategies which biodiversity could aid in replacing chemical applications in commercial fruit farming.
Countries Visited	Netherlands Italy New Zealand Spain Chile
Messages	<i>"You cannot be green if you are in the red."</i>

## EXECUTIVE SUMMARY

With the ever-decreasing chemical arsenal UK fruit growers have to work with, is now the time to take a big leap towards biological control for pest and disease issues in our orchards?

I am a commercial fruit grower from Kent who loves the ideology of organic and regenerative farming for environmental reasons, however I am very sceptical over its merits in terms of the financial business sustainability and security.

As custodians of the land we farm it is hugely important that we work in conjunction with nature and the environment. We must do what we can to reduce damage and also improve where possible. We have a big responsibility to provide a large sustainable flow of quality produce to the public year after year by having a business model that works.

My project is based on researching global methods and strategies to see if it is possible to maintain good yielding orchards with a high percentage of class one fruit to feed an ever-growing population, while reducing a proportion of chemical inputs with biological control. This is a method I feel we must learn about and implement very soon as I believe it will be taken out of our hands and forced upon us whether we like it or not.

I visited Italy, The Netherlands, Spain, New Zealand, Australia, United Kingdom and Chile. In these countries I visited a number of growers, research centres, agronomists, tree and plant nurseries, vineyards / wineries, universities, packhouses and machinery manufacturing factories.

The discoveries that I made were very varied depending on the area I was visiting but never-the-less very interesting as a whole. It shows that wherever we are in the world, we are all fighting the same battles but with different rules, regulations, mindsets and cultures.

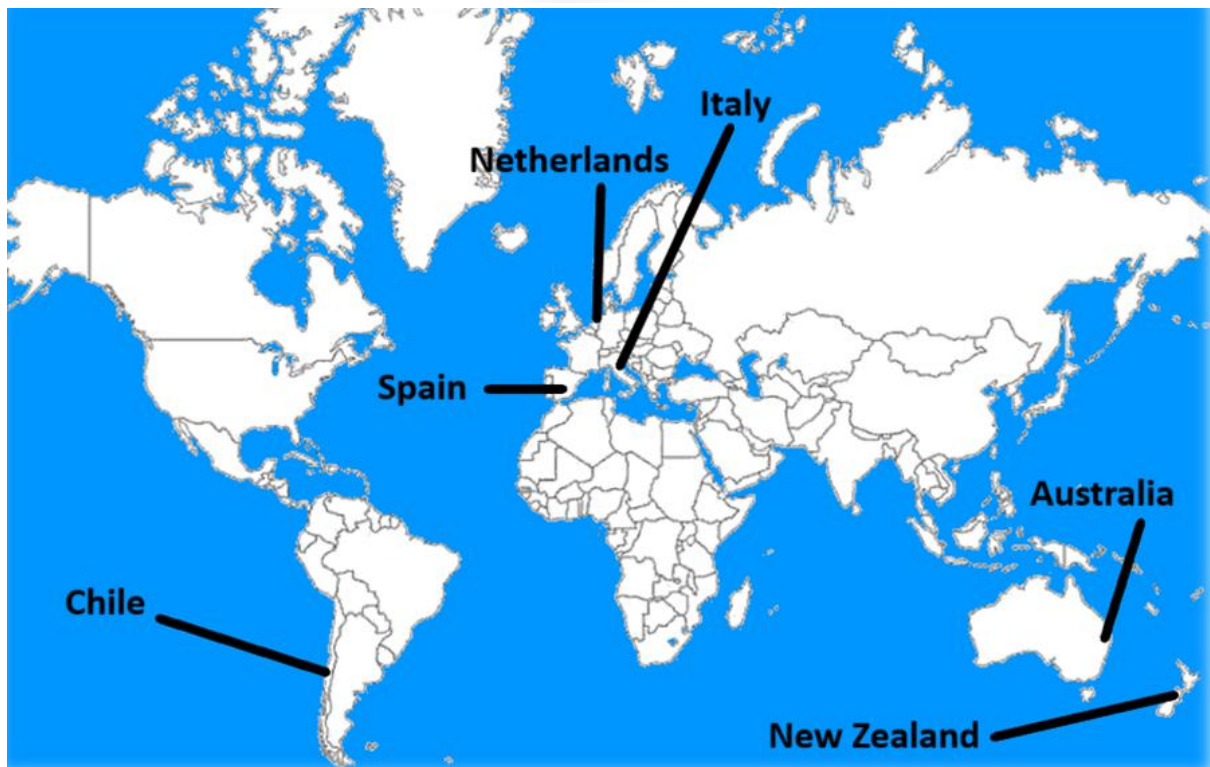
Some areas or regions do not have the restrictions that we have in the UK with regards to chemical ammunition. These people can be focused more on immediate issues that affect their business which could include water shortages, frost risks, labour shortages and market instability.

Where biodiversity was being implemented, there were fascinating methods of drilling cover crops in alternate rows to combat nematode issues, gene editing solutions to pathogens in trees and plants, wildflower meadows for increased pollination insects, mycorrhizal fungi added to the soil for root health and water retention, beneficial insects released in orchards to combat certain pests and the creation of habitat for year-round housing of such beneficials.

A stand-out conversation that was unfortunately unanimous was the global increase in prices on all aspects of farming impacting people's priorities.



Being green is great but we must not go into the red as a business and I'm unfortunately concerned about the financial implications of green methods impacting the future of businesses and the industry as a whole. Is the juice worth the squeeze?



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All photographs are the author's own unless otherwise stated.

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Nuffield Farming Scholars are available to speak to NFU Branches, agricultural discussion groups and similar organisations.

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## CHAPTER 1: INTRODUCTION

In 2019 when I applied for my Nuffield Farming Scholarship, I set out on a noble quest to see if there were methods and farming practices that were being used or trailed around the world, that could help solve some of the issues we were facing at that time in our orchards.

Year-on-year, as commercial growers, we were losing chemical ammunition to combat the pest and disease issues which impact the quality and yields of our produce. With many people reporting on the decline of the environment, and farming being blamed for a fair proportion of that, in my opinion it was and is inevitable that we will be pushed into a more biological and greener direction of food production.

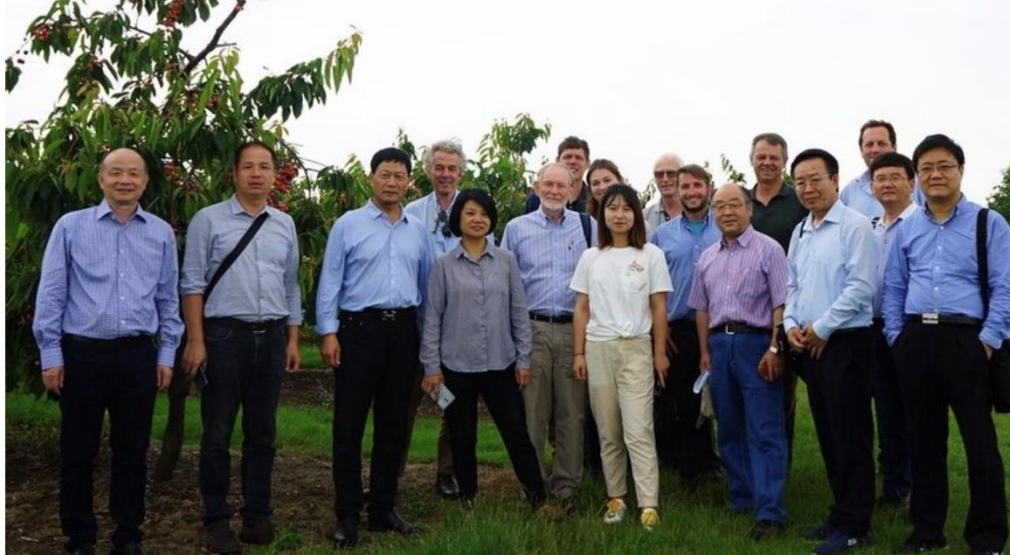
With my environmental head on and being a relatively young man with a young family, I completely concur with this concept and would love to live in world with chemical free processes, 100 per cent. However, I am also a realist and a businessman and the reality is that we have an exploding population, not just in the United Kingdom, but the world as a whole, who need to be fed. We, as farmers and growers, need to produce as much healthy, quality food as possible from the limited and ever-decreasing land that we have to work with. To be able to achieve these goals we have relied heavily on manufactured counterbalances against the problems that nature throws at us. This has resulted in higher crop yields, improved quality, and better farming practices over the years.

Without the assistance of chemical intervention, will the inevitable reduction in yield and quality push the food numbers below the target needed, not only for global food security but also the financial viability of the farmers' business which already operates on very small profit margins? With poorer productivity and potentially higher costs, could this see the future of fruit farming pushed too far and, regrettably, not being viable and lost forever?

Are there any practices and methods that could help solve these issues and help to make our industry and businesses more secure and still work for the greater good?



## CHAPTER 2: BACKGROUND TO MY STUDY SUBJECT



The inspiration behind my scholarship came from a visit we had back in 2019 from a delegation of Chinese professors, scientists and politicians who were travelling through various countries. Their objective was to gain expertise and knowledge to take back to China and turbocharge their own agricultural industry to become less reliant on imports.

I was fascinated by the concept of learning from those from different walks of life and from all over the globe. I researched if there was any opportunity for something similar in which I could participate. Fortunately, I was working on a research project at that time and met the former director of Nuffield Farming John Stones and he kindly set me on the path to my scholarship to which I am very grateful.

My study topic was chosen during the time we were working closely with NIAB EMR (a leading UK crop science organisation) on combating a very prevalent pest in our pear crops which was causing high percentages of devastation. The chemicals being used to control this issue had been removed and we were struggling to maintain our crops, however there were many trials and much work being done to control this pest with biological methods. We managed over time to stabilise the situation by introducing and encouraging beneficial insects to the orchards and developing the right habitat and environment for them to survive and thrive. This achievement set me on the path for more knowledge and opened my eyes to the possibility of other options and if they could be implemented and prove helpful.





## CHAPTER 3.1: MY STUDY TOUR - NETHERLANDS

In late 2019 I travelled to the Netherlands and visited Wageningen University and Agricultural Research Centre. They are regarded as at the forefront of fruit growing research in Europe and were trailing some excellent experiments in biodiversity and related topics.



After discussions regarding my study, they showed me to their newly implemented top fruit glass house centre. This is a one hectare orchard completely surrounded by glass which protects the trees from all external elements including weather, insects and humidity. They claim that with this system there is no need for any preventative or reactive chemical applications.



If this growing system is as efficient as intended, it would in theory be the answer I had been looking for. Apart from using nutritional feeds and drip irrigation



instead of rainfall, no chemicals need be applied and you should receive high yields with a high percentage of undamaged fruit. However, as an overall business plan, it is completely unfeasible as the installation cost of such a system in 2019 was 600,000 euros per hectare. This cost would immediately supersede any saving in chemical applications saved at an approximate value of £2,000 - £3,000 per hectare per year for many, many decades. It is financially unviable if you are budgeting on business profits as opposed to any windfall investments.

The next interesting observation I came across was a small area of ground sacrificed for wild flower mixtures and habitat intended for beneficial and pollinating insects to thrive. The theory was to adopt this environment close to or in the middle of the orchards, thereby providing more natural predators to combat the pests attacking our trees and fruit when we need them. This should also allow them to stay there for longer periods with a source of food and shelter flourish and prosper. It would also attract pollinating insects, boosting their population for spring when they are needed to pollinate flowers and increase yields. This would reduce the need for to pay for expensive colonies of honey bees brought in to pollinate certain crops.

The objective of this trial would be to see if the trade-off with land taken out of production for fruit growing could improve the remaining orchard with enough benefit to outweigh the sacrifice of the area lost. This is something that can only be assessed over a long period of time so I have adopted this practise into some of my own orchards and will assess the research year-on-year.

The final part of my visit was spent talking in detail to the scientists and marketers of the tree breeding programme - Fresh Forward - who own and sell specific varieties and clones of fruit trees and plants. It became quickly apparent to me that the most exciting and potentially game changing development available was gene editing in the plant /tree development.

When breeders are developing trees /plants at a very early stage, there is a practice that is achievable and proven to manipulate the existing DNA, reducing their weaknesses to make them much stronger and resistant to pathogens, fungal infections and other issues. This process, called gene editing, is currently not legal under EU law so we have to spray chemical applications regularly to protect against these problems that would normally be very harmful to the tree or fruit once established in an orchard.



Here are several examples of the highly problematic issues that gene editing is reported to be able to overcome:

Tree Canker



Apple Scab



Chemical Application in Orchards



Gene editing, in my opinion, is a very exciting prospect and could be of amazing benefit if granted legal approval one day but must not be confused with genetically modified foods (GM). GM plants and foods have been under the microscope and seriously scrutinised for many years now. With GM the process adds and subtracts parts of plants' DNA to create something new in its genetic system whether it is stronger, bigger or a different colour etc. Gene editing only alters and enhances what is already in existence in the plants DNA to the benefit of the health of the plant long-term.

The concerns I have with this method would be does the tested and proven research of resistance last the lifetime of the tree/plant? If we plant an orchard with a lifespan of 20 years plus, and the trials we conduct are over, for example, five years, will the resistance break down over longer periods of time and the trees and fruit have the same issues as before the editing? Another major concern would be the financial cost of these trees to a grower after this work has been carried out. It would inevitably have an increased cost and would still need to fit into a budget in which the costs do not outweigh the income for the investment.





## CHAPTER 3.2: MY STUDY TOUR - ITALY

Also in late 2019 I was invited to Jesi, Italy to see the manufacturing plant for New Holland tractors. Although not directly related to biodiversity in orchards, it was a very interesting trip and there were presentations and demonstrations regarding their new prototype methane and hydrogen tractors.

This will be a very interesting development if it ever can be put into production as the fuel emissions will be nothing but water. This will, of course, revolutionise the future of all combustion engines and carbon emissions globally. Regrettably, as with most developmental projects, making them achievable with affordability is incredibly difficult. With this particular innovation, there must also be increased concern for the safety aspect of the new fuel source.

Hydrogen is an extremely difficult compound to extract and turn into the stable gas that would be needed for vehicles and transport and, despite its excellent advantages with green emissions, the security and safety of the raw material is a much bigger issue.





## CHAPTER 3.3: MY STUDY TOUR – NEW ZEALAND

In February 2020 I made the very long journey to the truly remarkable country of New Zealand. I reached out to a fellow Nuffield Scholar in Nelson on the south island called Julian Raine. He and his wonderful wife kindly hosted me and introduced me to some exceptional fruit growers in addition to himself. I fell in love with everything New Zealand!

It did not take long at all to realise that the priorities of the Kiwi growers were much different to the questions I was posing regarding greener and biological controls to orchard maintenance. They are absolute experts in what they do and their aim is to achieve maximum yield of the highest quality of fruit with as much uniformity as possible for their markets all over the world.



Despite having a similar growing climate to ourselves in the UK, there is a distinctive difference to their nation's objective of farming. With a population of only approximately five million in contrast to the UK's 67 million, they can more than easily cater for their own country's requirements and have a huge surplus to export to other nations. In terms of apple, pear and cherry sales, British growers only supply approximately 40 per cent of consumed product with the rest being imported.

Farming is big business in New Zealand. The wonderful abundance of quality land, their low population and the benefit of being a southern hemisphere country also means that they have produce when many parts of the world are out of season. This leads to high demand and ultimately more valuable assessments of their crops.





The people I met are totally focused on producing the required quality for their different customers, in particular China who not only have the wealth but a huge population to feed. This incentive is enough for the rules in New Zealand to allow far more applications of chemical protection for their crops but still under their country's legal guidance and regulations for safety.

Because of their amazing growing techniques and expensive systems, some of their apple crops, for example, are achieving yield results averaging over 100 tonnes per hectare, with some reported as much as 150 tonnes. This is an incredible result as for the same crop in the UK we would be lucky and delighted to get 75 tonnes per hectare. This facilitates reinvestment in orchards and businesses, resulting in more fruit per hectare and higher prices, thus creating a highly regarded industry.

In terms of my study topic, I did pick up on some very interesting techniques that the New Zealand growers do which we do not seem to adopt in the UK. That is to recycle the root stocks of trees rather than replace them, therefore not disturbing the soil at the point of a new orchard being created.

The root stock is the base of the tree with the rooting zone buried in the soil at the point of planting. A short way up the stock (which are universal for the crop) is a union upon which a clone of cropping wood is joined to create the variety of tree. In the UK it is general practice that after that cropping wood has exhausted itself and starting to decline (for example, apples aged 20-25 years) the whole of the tree is grubbed out of the ground and the soil is prepared. A new batch of trees are delivered in their entirety and replanted into the ground. Regrettably the soil does lose a fair amount of captured carbon during this process when it is disturbed.

What is common practice in New Zealand's orchards is a process that we used in Britain quite a lot in the 1950s through to the 1980s called grafting. Historically, orchards had a much lower tree density per hectare, resulting in less physical



work. In contrast, modern orchards have increased to 2,500–3,000 trees per hectare, significantly increasing the workload. The objective was to leave the trees in the ground, cut off the older cropping wood bonding new pieces of different young cropping wood to the stock using hot wax. The purpose of this technique was to utilise the established rooting zone in the ground to save time on growth. It also takes advantage of the life expectancy of the root stock of approximately 50 years and therefore gives you two crops from the same stock without disturbing the soil and buying in completely new trees.



After visiting a research centre and speaking to some of the scientists there, I observed their work on biodiversity issues that align with my research interests. They prioritise their tasks effectively. Despite facing similar challenges, they remained focused and dedicated to improving the performance of trees, fruit, and storability for various transportation needs during export.

# Plant & Food **RESEARCH**

RANGAHAU AHUMĀRA KAI







On my second part of the New Zealand tour I travelled to the north island and was fortunate enough to join a meeting with Steve Saunders the CEO of robotics company Robotics Plus.



They were in the process of completing the development of a fully automated and autonomous kiwi fruit harvesting robot. It was a remarkable piece of engineering and worked using many sensors to scan and locate the hanging fruit. Once all the fruit were scanned, the machine determined the potentially ripe ones ready for harvesting. A mechanical arm reaches out to the individual kiwi and squeezes it very gently giving it a pressure test.





If the pressure is combatable with the threshold for picking, it removes the fruit and places it into a carriage tray, if not it leaves it on the vine for harvesting at a later date.



After a truly amazing trip to New Zealand I headed off to Australia in late February 2020 for the Nuffield International Conference (CSC), and to start my first leg around what I hoped to be an equally inspiring nation. Little did we know that was unfortunately the start of a very difficult time for everyone as, after only a couple of days, the news broke that a global pandemic had started and we all had to depart for home. Considering the travel time, cost and time needed to explore such a vast country, sadly I was unable to return to complete my travel plans and what was due to be an amazing CSC in Australia. This was highly disappointing but I consider myself extremely fortunate to have seen what I did and met the amazing people I did before the COVID-19 pandemic blighted our lives for the following few years.



## CHAPTER 3.4: MY STUDY TOUR – SPAIN

In June 2022 the world had returned into something more like normality and I took myself off for a short visit to Spain. The landscape of Spain is very varied depending on where you go. Fruit growing is suitable in regions like Zaragoza, which has flat green land. However, much of the country is less suitable for agriculture due to its rocky and mountainous terrain. What I learnt from a couple of growers is they try to use land that is not productive and utilise those sites for as much benefit as they can for things such as honey bee apiaries and water retention areas.







## CHAPTER 3.5: MY STUDY TOUR – CHILE

In August 2022 I completed the final leg of my studies when I flew to South America and travelled around Chile. I stayed with a fellow 2020 international scholar Antiono Bunster Zegers and his amazing family. He managed to arrange so many fantastic connections and meetings for me; it was what I really hoped the Nuffield scholarship experience would be all about and it did not disappoint.



Our first visit was to an organic biodynamic vineyard and fruit producers called Matetic Vineyards based east of Santiago in the Rosario Vally. I was introduced to the head winemaker Julio Bastias and his assistant Carlos Rojas and the manager of their blueberry production Jose. During the trip we looked at the beautiful vineyards, blueberry fields and winery and they explained the practices they implement to be classed as organic biodynamic.

They use systems of production that ferments and improves the health of the ecosystem and the biological activity of the soils. With these practices, no chemicals or pesticides are used at all. They use different animals to help with these practices e.g. grazing the weeds while their manure improves soil health. They use biodynamic preparations based on natural waste such as cow manure, quartz and medicinal herbs to produce compost which is applied regularly.

This process does seem quite labour intensive with lots of repeat applications, but you cannot help but admire their dedication and passion for the pursuit of their end ambition.



Regular deep rotavation up and down the strips is performed to destroy weeds, aerate the soil and integrate compost to improve the quality in the ground.



The structure of the soil in this area is naturally granitic and not great for growing, but using biodynamic processes they are able to produce soil rich in microorganisms which produce healthy and high quality grapes for their wines.

Another fascinating system they implement with success is pinpointing very specific needs in either the soil or the plant itself, and drill cover crops to combat either nutritional deficiencies or pest issues for the cropping area.





The use of green fertilisers and covering vegetables have been proven to be very useful for certain issues such as soil dwelling nematodes in their blueberry fields.



These soil dwelling nematodes would routinely attack the rooting structure of the blueberry bushes under the soil's surface and destroy its ability to grow the plant and produce the fruit. This would eventually end productivity and kill the bush completely. Scientists discovered that these nematodes cannot survive with a mustard crop also growing in the soil. Drilling mustard is now standard practice on all of their blueberry fields and the plants have thrived. This particular success is unique to the soil in that area, the crop planted and the pest that is present, but ultimately an excellent example of specific integrated pest management and how manipulated practices can bring nature together to solve an issue without the use of chemical interventions.









One of the most important things that I have learnt about growing fruit in Chile is the vital capture of its most precious resource, water. Chile has an extremely low rainfall during its summer months and it is critical to have the infrastructure in place to try and store and retain as much water for use in the growing season.



As I found in New Zealand, different countries and different regions prioritise certain issues and concentrate on them more depending on their importance to their business. In this case, water is very high up on the list and every farm and site I visited were constantly trying to improve their ability to capture and retain water from the months of the year where it does rain to use during the dry months. The landscape of Chile, with its mountainous structure, means that water runs and flows down from the hills during the winter, where each land owner tries their best to have gravity-fed reservoirs wherever possible. The more water they can store, the more they can supply to their crops when water is needed. This ultimately could and should result in a better yield and quality aspect to their fruit come harvest time.





As a country Chile stretches from north to south approximately 2,670 miles and only 217 miles east to west. It is an incredibly narrow country but one with a vast length so covers a very wide range of growing season variation. If you are growing the same crop, for example cherries in the north as opposed to the south of the country, there could be weeks and weeks in difference of timings. This has a massive effect on the different growers as they rely heavily on their ability to supply to their biggest customer at the right time for the maximum price.

As with New Zealand, Chile's southern hemisphere location puts it in a prime place to supply China with its in-season produce. This is a particular bonus for the cherry producers, which is one of the biggest growing crops in the country, as they can target the vastly profitable Chinese New Year market.

Chinese New Year begins with a new moon that falls sometime between the end of January and the end of February and lasts for 15 or 16 days. It is tradition for family members to exchange red gifts throughout this period and large red cherries are a favoured choice for these celebrations. They symbolise happiness, prosperity and are considered an auspicious gesture that strengthens family ties.



Above: <https://smartcherry.cl/en/quienes-somos/>. Below: Advert in China





This period coincides with the harvest of some of the cherry growers in Chile and if they can take advantage of the market, they can realise up to 300% or more. Most growers were saying that the standard price of cherries per kilo was the equivalent of £2.50 - £3.00. Shipping cherries to China during their New Year can fetch over £10 per kilo. With an average yield of six tonnes per hectare, this results in a turnover of £60,000 per hectare. In exceptionally productive years, yielding up to 10 tonnes per hectare, turnover can reach £100,000 per hectare. This financial incentive has led many with limited land to plant as many cherries as possible.

On a visit to see one of Chile's most successful companies - Garces Fruit - I learnt the scale and value that these sorts of markets can produce. Garces Fruit is so impressive in terms of scale and production it produces over 7,500,000 boxes of cherries in 2021 / 22 and over 3,500,000 boxes of other produce.



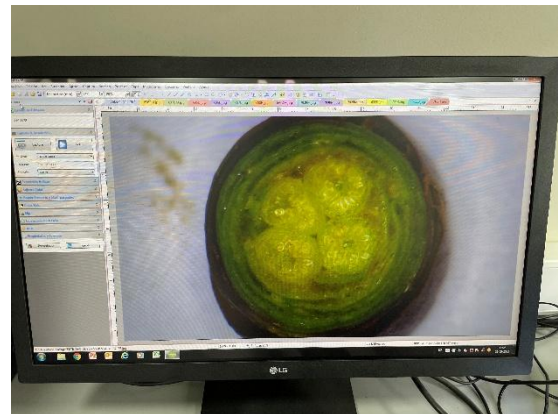
They have acquired and operate sites across the country to ensure that they can maximise supply within the required timeframes during the growing season, and manage this process efficiently.

I was also privileged enough to meet and stay with a fruit agronomist for a few days in Curcio called Roberto Contardo. He was a very enthusiastic man who took me to see quite a few interesting sites where they were conducting trials and research.





One scientific procedure they offer to growers is taking cherry bud samples during winter dormancy and examining them in a laboratory. By analysing the buds under a microscope, they can assess how many flowers are in those buds taken throughout the orchard. By knowing how many flowers approximately there are on average per bud, then how many buds per tree and how many trees there are per hectare, they can determine the optimal and subsequently how much fertiliser is needed. to apply for the crop. This ensures minimal wastage and maximises fruit potential at harvest.



Also, I was taken to see how they have assessed some trees, bushes or plants that are not directly linked to fruit growing but are very good hosts for beneficial insects which are advantageous to the crop a farmer is trying to grow. These plants have been added to the ends of the fruit tree rows with the expectation of housing insects that will predate the pests which cause so much damage and we try so hard to eradicate from our orchards. Of course, there are not always beneficial insects that target the pest we want to disrupt, and, if there are, we have not always found a plant or habitat to encourage them; but if we can find a few, it must be a bonus.







## CHAPTER 4: AFTER MY STUDY TOUR

Once I visited a country or a farm that highlighted some interesting ideas, I started to implement some of things I felt were useful and could potentially benefit my own farm and business. I was keen to try the wildlife havens in and around my orchards to see if I could directly witness an increase in beneficial and pollinating insects and the value they could add. Rather than go into this naively, I contacted The Bumblebee Conservation Trust for advice and joined a project that they were conducting called “Making a Buzz for the Coast”.

This particular project was a survey and enhancement programme to increase and monitor the numbers and species of bumblebees across the north Kent coast between Dartford and Deal. Their advisor Kate Fidczuk-Sterry provided me with some appropriate wild flower mixtures and growing advice and I set to work sewing them into and around the farms.







When it came to choosing locations for these areas, I was mindful of sacrificing good productive ground while still having a meaningful outcome, so proceeded tentatively. I started off by enhancing areas of an awkward shape in corners of fields unsuitable for trees, next to farm tracks and buildings, areas with buffer zones due to neighbours' property, in effective spare land, and pockets that were too small to plant and operate an orchard.



In 2020 when I added these plots the weather was extremely accommodating for the growth and establishment of the seeds and plants with a warm calm spring and beautiful hot summer. Therefore, initial development of these areas was successful and I was very pleased to see the vast array of colours and vibrancy around the fruit trees. It didn't take long to witness many different types of bees and other pollinating insects foraging on the new flowers, which was encouraging. They included a rare species of bee (pictured above) called a Ruderal Bumblebee (*Bombus Ruderatus*) with its long pointed and white abdomen among the many different breeds found.







The overall objective of creating these sites on a fruit farm is to increase the number of these insects so they are ready to work in the early spring when the fruit trees come into blossom. The seed mix, with its many different varieties of flowers, was chosen according to their bloom times and appeal to pollinators. This is so the flowers last from late spring to late summer providing the pollinators a food and home source to survive and boost their numbers ready for early the following year. It is very important that you do not choose any flowers or plants that bloom too early and become direct competition to the fruit tree blossom, otherwise the insects may visit those instead of pollinating the areas required.

During the first year, I avoided drilling and planting these mixtures directly in the orchards to exercise caution. Instead, I initially opted to create portable environment bulkers as a preventive measure.



These bulkers were designed to be moved into and out of the orchards as required, for instance if an insecticide were about to be sprayed, I wanted to protect any bees residing in them. They established well but needed quite a lot of maintenance with regards to regular watering.

In 2021 I made the decision to sacrifice some ground in a newly planted orchard and drill mixes direct into the soil to evaluate if a heavier crop would result and compensate for the land released. The Bumblebee Conservation Trust created a case study out of the work we did together which follows.





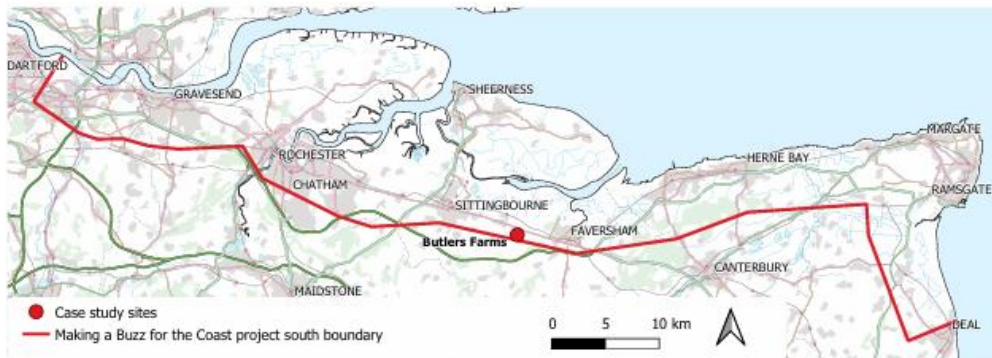
## Case Study

# Butler Farms

## Introducing management options for bumblebees and pollinators to commercial fruit farms

### Making a Buzz for the Coast

The north Kent coast is recognised nationally for the diversity of bumblebee species it supports with 22 of the 24 UK species, including five of the seven nationally rare and scarce bumblebees. Much of Kent's cultural and economic heritage is intrinsically linked to bees, with a landscape of orchards, arable flowering crops and grassland. Kent's bumblebee diversity can be linked to its varied habitats and the milder southern climate.



The Making a Buzz for the Coast project was set up to re-address the decline and help to conserve wild bees in north Kent. Making a Buzz for the Coast is working to safeguard Kent's wild bees, focusing on coastal areas from Dartford to Deal. The aims of this ambitious project, are 1) to create and restore flower-rich habitat 2) recruit, train and support volunteers to take action for bumblebees and other wild bees 3) raise awareness about the value of these important insects and their conservation needs.

Making a Buzz for the Coast is a multi-partner project led by Bumblebee Conservation Trust (BBCT) and with key partners including Kent Wildlife Trust, Kent County Council, Natural England, Royal Society for the Protection of Birds, Swale Borough Council, Thames Water and Thanet District Council, as well as numerous landowners and supporters. Its primary funder is the National Lottery Heritage Fund.



Long grass left between apple trees.

### Site introduction

Butler Farms is a commercial fruit business managed by David Butler; located between Sittingbourne and Faversham on the North Kent coast, it is made up of multiple sites covering 65ha. The farm is comprised of orchards (apple/pear/cherry), areas for soft fruit, grassland, hedgerows, offices and associated buildings. David Butler also works as the fruit manager for Blackbird Farming and has been improving land for pollinators in partnership with Making a Buzz for the Coast on their land also.

First visited by BBCT in May 2019, Making a Buzz staff have had a close relationship with Butler Farms and have continued to support and provide bespoke advice working alongside David Butler ever since.

During the initial site visit in 2019, it was recognised that the farms already had excellent bumblebee forage with species such as Red and White dead-nettle, Teasel, Common vetch, Ground ivy, Thistle species, and Bramble present. The sites have the potential to increase the floristic diversity and provide a greater range of forage





plants from early in the spring all the way through to autumn; creating pockets of quality tussocky grass nesting habitat would also be of major benefit to bumblebees.

The farms are actively moving toward biological pest control and natural ways to support and enrich the biodiversity, soil and land.

### Nuffield scholarship

David Butler has been involved in the Nuffield Scholarship scheme since 2019 with his chosen focus on 'Biodiversity for the future of fruit farming'. David has used his enthusiasm to improve the biodiversity of his own fruit farms to make major changes to increase habitat for pollinators. He also plans to carry on with pollinator engagement as he uses his farms for education tours. As well as a chance to talk about fruit varieties and orchard management, he is keen to pass on best practice habitat management for bumblebees and other pollinators and spread the word on the amazing wildlife of Kent.

### Butler Farms and rare bees

During a site visit and survey in August 2020, the presence of the Ruderal bumblebee (*Bombus ruderatus*) was confirmed on one of the orchard sites; feeding on a spectacular lavender hedge planted alongside an apple orchard.

The numerous orchard sites are located in a hotspot area for rare bees. It will be interesting to see if any other rare and scarce bumblebees are recorded in subsequent years, now bumblebee specific management and enhancement has been implemented and focus has been put on the monitoring.



### Commercial orchard habitat management for bumblebees and other pollinators

Butler Farms are a conservation-focused farming business and are incorporating various management throughout the orchard sites that are of benefit to bumblebees and other pollinators.

Rows of fruit trees in the orchards are planted with alternative rows of Cobnut trees. Cobnut, grown traditional in Kent for Hazlenuts, are planted instead of thorny hedgerow species such as Blackthorn and Hawthorn. When planted near apple, pear and cherry tree, these commonly-occurring thorn hedgerow plants can increase the risk of disease transmission that can specifically affect the commercial fruit crop; Cobnut rows are a great alternative within the orchard and provide great habitat for natural predator species of the pear sucker pest; such as useful predatory bugs, earwigs and beetles who tend to inhabit willow and nut tree species as well as long grass habitat. Early flowering thorny hedgerow species are incredible sources of food for early

emerging bumblebees so finding areas on site that they can be planted but not affect the crop would be of great benefit to the wider landscape.

Grass is left long under the pear trees in the orchard throughout the summer season until harvest in the autumn, to increase the benefit of natural pest control. Long grass, similarly to cobnut trees promotes natural pest control species of the pear sucker; this directly helps the pear tree growth as well as providing great summer nesting habitat for bumblebee species. This is a great additional benefit of traditional pear orchard management, as well as moving to natural biocontrol methods instead of pesticide spraying. Under the apple and cherry trees, the grass removed all year round as there isn't a direct link between a specific pest such as pear sucker; although leaving the grass long under these crops will do no harm and enhance biodiversity.

Grass is also left long and uncut between rows of fruit trees throughout the orchards. These are left uncut from April till just before harvest in August; providing added long grass habitat that promotes biodiversity with a focus on fruit tree pest predators. This also allows the natural seed bank to flower and since Butler Farms have been leaving this uncut many beautiful species have appeared; such as carpets of Self-heal and Common century; adding extra forage for pollinators throughout the farm complex.



Ruderal bumblebee male on lavender hedge by apple orchard.



### Previous management of other areas

Prior to the first site visit in 2019 the main management for grassland areas across the site outside of the orchard tree rows (such as margin and corner habitat) were regularly cut throughout the season and arisings left in place across the site.

### Bumblebee habitat improvement and creation throughout the project

#### Seeding field margins and corners

Field margins, corners and strips between fruit rows can be seeded to increase floristic diversity. Increasing the food available along margins creates connections between habitat, linking up nesting areas and increasing pollinator coverage across the site with particular focus within the fruit growing areas. In spring 2020, Butler Farms seeded field margins and corner plots across four of the orchard sites which will help to provide forage and connectivity to approximately 23ha of the farm site.

The areas were scarified with a site-owned power harrow set to a light scarification setting prior to seed sowing; ideally a lighter method would be recommended (such as a tyne harrow) so as not to overly disrupt the soil but working with the pre-existing farm equipment was easier and more accessible for the farm and did not create a drastically different end result.

After scarification, a UK native meadow mixture was added; a showy cornfield annual mix was also combined with the meadow mixture to create a beautiful display in year one after sowing. Butler Farms wanted these areas to be spectacular from the start and they will be part of the education tours David Butler has planned. As Butler Farms were sowing in to existing grassland, a mixture of solely wildflower seeds was chosen. A traditional native meadow mixture takes a few years to become fully established as it contains mainly perennial species so a cornfield annual mix is a good way to create an eye-catching display in the first summer after sowing. There will be natural grassland seeding as a comparison planned for 2021; this will provide a good example of native UK wildflowers and create a more natural and traditional farmed landscape.

#### Margin and corner grassland management

Grassland margins and corners provide great opportunities not only for extra forage plants through seeding but also for naturally generated grassland flowers as well as much-needed tussocky nesting habitat. Changes to management have been implemented and edge grassland areas are now being kept long throughout the bumblebee flight season (April–October) and cut on a rotational routine (alternate margins mowed on a yearly basis) in the autumn with arisings removed where possible. This management works well for the newly seeded margins as well as the unseeded margins; removing arisings will decrease the ground fertility and increase the floristic diversity without the need for seed addition although the benefit of this change will be a longer-term enhancement.

#### Moveable bumblebee planters

David Butler has created a number of bumblebee specific planters from recycled used fruit bins that can be moved easily around the farm using a forklift. These add extra flowering plants to areas that lack pollinator forage at different times in the year or to provide resources in areas that are soon to change use and where wildflower seeding is not applicable at the moment. The tubs were planted with a mix of flowers with long corollas, aimed at attracting longer tongued pollinators such as bumblebees. Planted flowers include members of the Deadnettle family including Mints and a range of Salvias, as well as Rosemary.



Kate Filizak-Sherry/Bumblebee Conservation Trust

Flowering buffer strip summer 2020.



Kate Filizak-Sherry/Bumblebee Conservation Trust

Uncut rows full of Self-heal between old pear trees orchard



Kate Filizak-Sherry/Bumblebee Conservation Trust

Moveable bumblebee planters.





### Future enhancement for bumblebees and other pollinators

Grubbing out (removing old orchard trees) areas on site provides a great opportunity to add large scale floristic improvements before new orchard trees are added. Seeding is planned for spring 2021 with grubbed out areas and newly purchased orchard plots being scarified and seeded before new orchard fruit trees are planted. This allows the creation of large areas of wildflower grassland instead of just adding floral margins around traditional orchards and will provide a greater nectar and pollen source.

Wildflower seed mixes planned for 2021 will be long-season native and more traditional meadow species, without the addition of cornfield annuals. These will demonstrate to visitors a natural wildflower meadow and how important they are to our native pollinators.

Rotation cutting regimes (alternate margins mowed on a yearly basis) will be carried out with cuttings removed where possible.

Solitary bees, as well as bumblebees are vital pollinators of commercial fruit trees and providing nesting habitat for solitary bees will encourage more of these important pollinators. Butler Farms plans to add in linear solitary bee banks for ground nesting bees across a few of the orchard sites as well as adding in aerial nesting habitat such as bamboo bee hotels.

Butler Farms have shown amazing dedication to local wildlife, achieving so much in terms of pollinator specific management over the last few years. It will be very exciting to see the impact that their continuing hard work and clear dedication will bring to local pollinators populations and how the habitats develop over time, as well as the benefit to the commercial fruit crop. To follow their progress take a look on their website: [www.ecofruittrees.co.uk](http://www.ecofruittrees.co.uk)

For further information and general management advice for bumblebees and pollinators, view the Bumblebee Conservation Trust Land Management Factsheet: 'Managing Commercial Fruit Orchards for Bumblebees', on the Bumblebee Conservation Trust website, [www.bumblebeeconservation.org](http://www.bumblebeeconservation.org)



Common carder bee on Cornflower.



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[www.bumblebeeconservation.org](http://www.bumblebeeconservation.org)

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As well as the wildflower mixtures, I planted a lot of cobnut trees in my pear orchards and allowed some areas in the grass strips to grow stinging nettles. Nettles, long grass and hazel nut trees have been proven to give food, shelter and an environment for beneficial insects called anthocorids which are an excellent predator of the pear sucker, the biggest threat in pear growing. We have been releasing bottled anthocorids for a while now at the critical times of the growing season, but studies have shown that without the correct environment and habitat they will only stay for a short while. They do a reasonable job by eating the pear sucker larvae but will soon either perish or move on to somewhere else which is better suited and less sterile. With the new ecosystem, we are confident that not only will they stay for longer, but they will also procreate naturally and we, as growers, can become less dependent on buying in bottled insects on a regular basis.







I have also been applying PAS100 compost under my fruit trees as well as straw and other organic matter products to improve the soil in the poorer areas of the farm. The benefits will take time but, over a period of years, it will transform the quality of the soil and, therefore, hopefully, the productivity of the trees and fruit which have struggled for vigour and relied on manufactured fertilisers in the past. In my quest to become much less reliant on these products, and being inspired with the robotics I saw, I had the soil and the trees scanned in a couple of the orchards.



This technology gave me some quite detailed readings and maps of the deficiencies in the soil. With this information, applications of fertiliser which could link to a GPS governed variable rate spreading machine can apply just the right amount for the specific areas needed rather than a blank canvas spreader, potentially saving quite a lot of product and not being wasteful.





The tree scanning information can apparently highlight and pinpoint areas in the orchard where the trees are weaker or suffering from a pathogen issue and could be treated proactively rather than reactively. They also claim that it can do detailed crop number and size analysis if performed closer to harvest. It can count the number of apples or pears per tree and help with the decision making for thinning the crop if necessary and provide quite accurate figures for budgeting and marketing analysis.







## CHAPTER 5: DISCUSSION

The conclusion of my study has proven to be much more difficult than I anticipated due to many changing and unforeseen circumstances. I truly set out and hoped to find some methods and practices that could help improve our fruit growing industry even if on a very small scale.

In mid-2019, when I embarked on this wonderful adventure, I was full of optimism and hope. The industry was not exactly buoyant and making good returns, but it was workable and reasonably positive and I thought I could see my future in it. However, the 2020 pandemic had severe personal and financial impacts on many.

As I have stated, one of the main things I have taken away from meeting such a diverse and wide-ranging group of people is that we prioritise different aspects of the world according to how they rate them in importance.

Five years ago, I was very keen on improving the environment from my own little platform and I obviously still wish for that to happen, but common sense and reality must be first and foremost. The rate in which costs have gone up - from electricity and power, rent, food, chemical and fertiliser prices, fuel, wages and everything else imaginable - has certainly changed my priorities. The value in what I produce has not risen to anywhere near the value of my costs and it has become a very unstable and I believe an unsustainable situation.

I would love to say that all the biological control measures I put in place have made a wonderful difference and I can afford to have all the orchards scanned to help with certain issues, but the reality is I have to really count the pennies now and every decision made on farm has to have serious financial scrutiny.

When you grow top fruit as I do, the time and investment is long term with very often no return for many years until the trees establish, with margins so small at the end questions have to be asked. *'It's great to be green but you must not be in the red'*.

On my travels I saw some truly amazing things and met some wonderful people whose perspective on the industry really opened my eyes to new possibilities. I honestly believe that to push for environmental changes, to lead and encourage all the great things that are possible and do the right things, you need to come at them from a position of strength. By strength I mean that your business and life must be in a comfortable place to spend the time, money and resources needed for these things.

I truly loved the time and effort I put into my initiatives and I do believe that they will add benefit to my farm in an environmental sense, which is fantastic. The sad truth is they are not free and everything has a cost. The 30 per cent hike of vital and essential items like rent, fuel, electricity and, of course, my own highly inflated living costs, is forcing me to take a step back.



My business does not operate lavishly and neither is my lifestyle, but regrettably I am not in the same position as I was five years ago and cannot add to my budget techniques and practices that would be wonderful for the greater good, and would make me feel a lot better, but do not add any financial value in compensation.

I sincerely hope that we can soon see a drop in inflation and prices can revert back to something more affordable and we can go back to focusing on these issues. The farming community is facing tough times and unless there are other financial incomes available to businesses through windfalls, development, subsidises, old money or diversification, smaller growers like me are going to have to be very prudent and prioritise the survival and prosperity of me and my family.

You cannot help others while not being strong yourself and I believe that gaining that strength is the key to getting back on track. Without the support of our leaders and the markets, we are in danger of falling into decline and I can assure you once a farm is lost it never comes back. I would hate to think that we as a country find ourselves without the ability to feed our nation one day and become beholden to others.



## CHAPTER 6: ACKNOWLEDGEMENTS AND THANKS

My heartfelt thanks must go out to all the people that have encouraged, supported and guided me through this project. It was incredibly challenging at times, but ultimately so rewarding, and I owe so many people my debt of gratitude and I will be eternally grateful for all your help.

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Mr Roberto Contardo and his family

Miss Kate Fidczuk-Sterry

Dr Amanda Kelstrom

Dr Michelle Fountain

Dr Duncan Westbury

All the Nuffield Team involved: Mike, Charlotte, Claire, Kendra

My 2020 Nuffield Cohort

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